

2024/25 KSP Policy Consultation Report

Indonesia Implementation Strategy for Green Investment for the Indonesian Government



Government Publications
Registration Number

11-1051000-100062-01



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Project Title	Implementation Strategy for Green Investment for the Indonesian Government
Prepared for	The Government of the Republic of Indonesia
In cooperation with	Ministry of Finance (MoF)
Supported by	Ministry of Economy and Finance (MOEF), Republic of Korea
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English Editor	Korea Translations Co., Ltd.

Government Publications Registration Number 11-1051000-100062-01
ISBN 979-11-7566-006-9 95320
979-11-5932-164-1 (set)

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Implementation Strategy for Green Investment
for the Indonesian Government

Indonesia

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2024/25 KSP with Indonesia

Heera Kim (Korea Development Institute)

2024/25 KSP with Indonesia

Heera Kim (Korea Development Institute)

Indonesia has ratified the Paris Agreement and committed to achieving net-zero emissions by 2060. To meet this target, the government has initiated a national transition away from coal and other fossil fuel-based power generation toward renewable energy sources. This transition also reflects a broader sustainability agenda, including the promotion of the circular economy, bioeconomy, green workforce development, and sustainable forest management.

To implement this vision, the government has introduced several key policy strategies, including the **Sustainable National Long-Term Development Plan (2025–2045)**, the **Energy Transition Mechanism (ETM)**, and the **introduction of a carbon tax or levy**, among others.

However, Indonesia faces significant challenges in executing its green transition. Chief among these is the urgent need to mobilize adequate financing, particularly for energy sector transformation and the development of climate-resilient infrastructure.

To address these challenges, the government is working to strengthen its institutional and policy frameworks for investment. A central mechanism in this effort is the **Government Investment Policy**, which is expected to play a critical role in facilitating public investments aligned with the goals of the green transition.

In 2019, the Government of Indonesia enacted **Government Regulation No. 63 (PP 63/2019)** on government investment. Overseen by the **Ministry of Finance**, this regulation enables the government to invest through a range of financial instruments—including equity, debt financing, direct investments, mutual funds, and other capital market vehicles—with the aim of generating both economic and social returns. Nevertheless, a regulatory gap remains: Indonesia currently lacks a dedicated framework for green investment.

To address this gap, the Knowledge Sharing Program (KSP) was launched at the request of the Directorate of Investment Management System within Indonesia's Ministry of Finance, with the approval of the Ministry of Economy and Finance of the Republic of Korea. The initiative aims to support the Ministry in developing an **Implementation Strategy for Green Investment**, with the goal of operationalizing the Government Investment Policy in line with Indonesia's climate and development goals. Through this collaboration, the KSP seeks to enhance policy design, refine public investment instruments, and build institutional capacity to support green investment initiatives.

Following preliminary meetings between the KDI team and Indonesia's Ministry of Finance in August 2024, three subtopics were agreed upon for the 2024/25 KSP, with a particular focus on the energy transition. Experts were selected for each subtopic based on their respective areas of expertise. To ensure that the policy consultation reflects the local context and fosters collaboration, Indonesian local consultants were also selected and paired with each subtopic, following recommendations from the Ministry of Finance.

	Sub-topics	Researcher(s)	Local Consultant
1	Improving Regulatory Framework for the Implementation of Green Investment Schemes under the Government Investment Policy	Wook Sohn (Professor, KDI School)	Noor Syaifudin (Advisor to the Secretariat General for Strategic Planning Affairs, Secretary General, Ministry of Finance of Indonesia)
2	Expanding Investment Instruments, Investor Participation and Incentives for Energy Transition	Sangche Lee (Senior Researcher Korea Institute of Finance)	Achmad Syaiful Mujab (Head of Subdirector of Local Government/Regional Owned-Enterprises Investment, Directorate of Investment Management System, Directorate General of Treasury, Ministry of Finance of Indonesia)
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After months of planning and preparation, the project officially commenced with the **Launching Seminar and High-Level Meeting** held in Jakarta from November 3 to 6, 2024. During this visit, Korean experts and the Ministry of Finance discussed project details and the research scope. In addition, key government stakeholders were interviewed to gain a deeper understanding of Indonesia's existing Green Investment Ecosystem and institutional framework.

To collect further information, Korean researchers visited Indonesia for the second time from February 23 to 28, 2025. During this visit, they conducted interviews with key stakeholders, including the Fiscal Policy Agency, the Ministry of Energy, the Ministry of Environment, PT SMI, and others. They also conducted site visits to better understand power plant operations and the potential for renewable energy development in Indonesia.

The KSP team visited Cirata, located 100 km southeast of Jakarta, known for its large-scale renewable energy projects. They visited Indonesia's first and largest floating solar farm, the Cirata Floating Solar Power Plant, as well as the Cirata Dam, the country's largest hydroelectric power plant. This information was used to refine and enhance the research scope. During the visit, local consultants also presented an overview of Indonesia's current policy context and recent developments during the seminar.

One of the strengths of the KSP is its emphasis on mutual learning and knowledge exchange. As the next phase of the KSP cycle for the Interim Reporting and Policy Practitioners' Workshop, a delegation of four representatives selected by Indonesia's Ministry of Finance was invited to the Republic of Korea from April 28 to May 1, 2025, to gain firsthand insight into Korea's green investment policies. The delegation, led by the Director General of Treasury of the Ministry of Finance of Indonesia, visited key institutions such as the Finance Commission Services, Korea Development Bank, Korea Eximbank, and the Korea Energy Economics Institute to learn from Korea's experiences and policy approaches. To understand Korea's energy mix, the delegation also visited a nuclear power plant operated by Korea Hydro & Nuclear Power Co., Ltd. in Ulsan.

The Interim Reporting Seminar featured presentations by Korean experts on their interim findings and tentative policy recommendations. The delegation engaged in in-depth discussions with the local experts, deepening their understanding of practical implementation strategies. Additionally, the seminar was streamed online to increase participation by stakeholders from the Ministry of Finance in Jakarta. Incorporating comments and feedback received, the delegation finalized the report and policy recommendations.

As the final step of the project, the KSP team returned to Indonesia from June 24 to 27, 2025, to hold the Final Reporting Seminar, to present the final policy recommendations for each subtopic and corresponding action plans for further implementation. The seminar also fostered productive discussions and meaningful networking opportunities among participants. The Director General of Treasury attended the seminar from the Ministry of Finance, representatives from related directorates such as Multilateral Cooperation, Energy Conservation, Electricity Program Development, Public Financing and Project Development, as well as representatives from the Asian Development Bank (ADB), GIZ, and other organizations.

During this final visit, the Korean delegation traveled to Bandung to discuss the regional implementation of the policy recommendations with the regional office of the Ministry of Finance, as well as experts from Institut Teknologi Bandung (ITB) and Universitas Padjadjaran (UNPAD). This engagement reinforced both sides' commitment to advancing the implementation of the KSP recommendations at the regional level.

The policy recommendations from the 2024/25 KSP with Indonesia are expected to offer practical guidelines for promoting green investment instruments. In addition, this KSP project is expected to deepen bilateral cooperation between Korea and Indonesia through continued knowledge sharing and collaboration

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Chapter

Improving the Regulatory Framework for the Implementation of Green Investment Schemes under the Government Investment Policy

Wook Sohn (KDI School of Public Policy and Management)
Noor Syaifudin (Ministry of Finance of Indonesia)

Keywords:

Green transition, Investment policy, Regulatory framework, Government investment, Green finance

Improving the Regulatory Framework for the Implementation of Green Investment Schemes under the Government Investment Policy

Wook Sohn (KDI School of Public Policy and Management)

Noor Syaifudin (Ministry of Finance of Indonesia)

1. Introduction

Climate risks and disaster threats necessitate urgent action by Indonesia to build institutions and infrastructure capable of withstanding expected climate shocks. Ensuring adequate green investment for a sustainable future is both environmentally and economically imperative. Climate-related disasters are increasingly recognized to have destabilizing long-term effects on the financial system, as the lack of adequate climate risk mitigation increases the likelihood of financial risks such as defaults, credit risks, and strain on insurance companies.

Former Indonesian President Joko Widodo prioritized “green” as a central pillar of economic growth, stating that monetary stimulus measures prioritizing spending on green and climate-related infrastructure would create a more resilient economy and support his vision of green economic development. In line with this vision, the country has been working to establish a supportive regulatory framework that prioritizes investment in climate infrastructure and attracts global green capital.

In this context, Indonesia’s Ministry of Finance requested knowledge-sharing on strategies for implementing green investments, including revisions to key regulations such as Government Investment Regulation No. 63. The aim is to develop a more precise, government-led green investment policy aligned with the energy transition and other relevant frameworks. This knowledge-sharing project addresses the following three key topics:

- **Improving the regulatory framework for green investment:** As a signatory to the Paris Agreement, Indonesia has pledged to achieve zero carbon emissions by 2060 and is pursuing the Energy Transition Mechanism (ETM) policy. However, achieving this transition requires addressing several issues, particularly the need for a comprehensive government investment system to accelerate the retirement of coal-fired power plants and promote the adoption of environmentally friendly alternatives. Given the significant financial expenditure and investment risks involved, along with uncertain economic returns, a strong management mechanism should be incorporated into the regulatory system.

- **Expanding investment tools and investor participation:** To build an ecosystem that supports government investment in the energy transition sector, numerous institutions—including PT Sarana Multi Infrastruktur (PT SMI), which manages energy transition policies—must be fully integrated into the government's broader investment strategy. This integration requires improvements to the national investment system. Furthermore, greater engagement from the private sector and the wider industrial community is essential for the successful implementation of green investment initiatives.
- **Strengthening the risk management:** Effective strategies for managing the inherent risks of energy transition programs are crucial. Since energy transition funds are sourced from the national budget, robust mechanisms must be in place to manage investment losses and mitigate high-risk exposures throughout implementation. This includes identifying acceptable types and levels of green investment losses and establishing clear accountability for such losses.

This chapter examines the first sub-topic of a study on improving the regulatory framework for green investment. It analyzes Korea's roadmap, policies, and legal frameworks related to its green transition, including financial policies and mechanisms supporting green transition initiatives. The analysis aims to inform policy recommendations based on international guidelines for green transitions.

This paper presents the current status and key challenges of energy transition and infrastructure investment in Indonesia, with a focus on the core issues related to green investment. It strengthens the depth and relevance of policy advice by incorporating evaluations and analyses of Indonesia's green investments using data from international organizations. The research was conducted in close collaboration with Indonesia's Ministry of Finance, state-owned enterprises involved in green investments, relevant ministries overseeing the environment and infrastructure, and private sector stakeholders, including companies actively participating in green investments. This collaboration helped identify the current status and key challenges of Indonesia's green investment support and regulatory systems.

To draw lessons from Korea's experience and develop tailored policy recommendations, insights were gathered from experts in various fields and organizations, including the Ministry of Economy and Finance, the Financial Services Commission, the Ministry of Environment, and the Ministry of Land, Infrastructure, and Transport. Their contributions provided valuable input on green transition strategies, investment support policies, and carbon reduction measures.

As the largest economy in Southeast Asia and a rapidly growing emerging market, Indonesia can benefit significantly from Korea's experience in responding to the climate crisis. Korea's green transition policies offer useful guidance for Indonesia in developing a more targeted green transition strategy, creating effective policy tools, and revising relevant legislation. Strengthening green investment strategies in this way can deepen bilateral cooperation and revitalize economic cooperation through the sharing of Korea's expertise.

This paper is organized as follows: Section 2 examines Korea's green transformation policies and regulations, analyzing success factors and challenges. Section 3 assesses Indonesia's current landscape of green investment, energy transformation policies, and legal frameworks, identifying challenges that need to be addressed. Section 4 analyzes Korea's case study to recommend specific policy measures and legal improvements for Indonesia, along with practical implementation proposals. Finally, Section 5 presents the conclusions.

2. Korean Experiences on Green Transition

This section outlines Korea's experience with green transition efforts to help inform the development of a strategy for improving Indonesia's regulatory system for green investment. It also examines the success factors and challenges encountered during Korea's implementation process, including the establishment of key committees and the enactment of related legislation.

2.1. Overview of Roadmap and Policy Framework for Green Transition

In 2008, Korea announced “Low Carbon, Green Growth” as its vision for mid-to-long-term development (2009–2050). The strategy is a combination of mid to long-term planning over a period between 2009 and 2050, punctuated by five-year plans for green growth, the first of which was developed for the period between 2009 and 2013. This inaugural FYP reflected a strong political commitment and provided a detailed blueprint for government actions, containing specific budget earmarks and detailed tasks assigned to line ministries and local governing entities.

The Green Growth Five-Year Plan (2009–2013) focused on three core strategies: (1) climate change mitigation and energy independence; (2) creation of new growth engines; and (3) improvement of quality of life and national standing. Distinct from climate change policies of many developed countries, Korea's approach was framed a comprehensive economic development strategy that aimed to achieve sustainable growth. A notable feature was its emphasis on "green" economic growth by transforming existing manufacturing sectors—particularly the heavy and chemical industries that had previously driven Korea's rapid growth—while simultaneously fostering new, environmentally friendly industries.

To coordinate and promote these policies, the Green Growth Committee was established in February 2009 under the direct authority of the President. The enactment of the Framework Act on Low Carbon Green Growth in 2010 provided the legal basis for the Committee's operations. Article 15 of the Framework Act assigned the Committee to oversee the following:

- Setting the overall direction of green growth policies
- Formulating, revising, and implementing the national green growth strategy;
- Leading climate change responses, energy policy, and sustainable development planning;
- Coordinating green growth initiatives at both central and local government levels;
- Developing green growth-related legal frameworks;
- Securing financial resources; and
- Promoting international cooperation.

Between 2009 to 2014, Korea focused on laying the groundwork for its climate change response and green growth policies. From 2015 to 2019, Korea moved into an expansion phase, during which

it revised its 2030 national greenhouse gas reduction target from a 30% reduction (relative to a 2020 business-as-usual [BAU] scenario) to a 37% reduction (relative to a 2030 BAU scenario). During this period, Korea also developed two 20-year Basic Plans for Responding to Climate Change (published in 2016 and 2019), which outlined climate projections, mitigation and adaptation strategies, and other long-term measures.

Since 2020, Korea has made significant institutional progress toward achieving carbon neutrality. The 2050 Carbon Neutrality Strategy, announced in 2020, marked a shift from an “adaptive reduction” approach—primarily focused on reducing greenhouse gas (GHG) emissions—to a more proactive and preemptive “proactive response” strategy. This new strategy aims to achieve carbon neutrality, economic growth, and improved quality of life simultaneously. It is built around three main policy directions: (1) low-carbonisation, (2) fostering new industries, and (3) transitioning to a fair economy. It also emphasises strengthening the institutional foundations for carbon neutrality through reforms in fiscal policy, the promotion of green finance, expansion of green technology R&D, and enhanced international cooperation. The three core policy areas of the strategy include:

(1) Transition to a Low-Carbon Economy

- Accelerating the energy transition by shifting from fossil fuels to renewable energy sources such as wind and solar power, and improving energy efficiency.
- Promoting innovation in high-emission industries, such as steel, petrochemicals, and cement, to reduce GHG emissions through technological advancements.
- Transforming the transport sector by promoting eco-friendly vehicles (e.g., electric and hydrogen-powered) and developing a sustainable transportation system.

(2) Creating a Low-Carbon Industrial Ecosystem

- Fostering high-potential industries and reinforcing growth engines in sectors such as renewable energy, battery technology, and eco-friendly materials.
- Building an innovative ecosystem by supporting eco-friendly ventures and startups through green technologies and innovation incentives.
- Implementing a circular economy to reduce environmental impact by increasing waste recycling and improving resource efficiency.

(3) Transition to a Carbon-Neutral Society

- Supporting vulnerable industries and workers through retraining programs and transition support to help them adapt to the new low-carbon neutrality economy.
- Developing region-specific carbon neutrality strategies, taking into account local characteristics and empowering local government initiatives.
- Raising public awareness of carbon neutrality through education and outreach programs aimed at building public understanding and support.

In September 2021, the Framework Act on Carbon Neutrality and Green Growth for Coping with Climate Crisis (hereinafter referred to as the “Carbon Neutrality Basic Act”) was introduced, replacing the Basic Act on Low Carbon Green Growth. Enacted in March 2022, this legislation established a clear vision for achieving carbon neutrality by 2050 and updated Korea’s Nationally Determined Contribution (NDC) target, raising the 2030 national GHG reduction target to 40% below 2018 levels. The 2050 Carbon Neutral and Green Growth Committee was subsequently established in October 2022, succeeding the former Green Growth Committee, in accordance with the new law.

In April 2023, the government unveiled the National Strategy for Carbon-Neutral Green Growth alongside the First National Basic Plan. Article 10 of the Carbon Neutrality Basic Act mandates the development of a national master to guide the transition to a carbon-neutral society, setting out mid-to-long-term targets and implementation strategies.

The development of the plan involved the following activities:

- In October 2022, the Carbon-Neutral Green Growth Promotion Strategy was established.
- A technical working group operated from August 2020 to March 2023, involving 72 experts across 10 subcommittees and holding 80 meetings.
- Stakeholder meetings were held with various associations, organizations, businesses, and local governments (20 meetings in total).
- Public hearings were also conducted to gather wider input.

The final draft of the plan aimed to achieve carbon neutrality, stimulate green growth, and strengthen Korea’s role as a global leader. It focused on three strategic directions:

(1) Responsible Carbon-Neutral Practices

Promoting carbon neutrality through technological development and regulatory reform across all major sectors—power generation, industry, buildings, and transportation. A systematic monitoring system was proposed to ensure accountability and measurable results, going beyond the setting of targets.

(2) Orderly Transition to a Carbon-Neutral Society

Encouraging policy frameworks that promote local solutions, public consensus, and bipartisan cooperation—ensuring that political transitions do not disrupt long-term climate goals.

(3) Innovation-Driven Carbon Neutrality

Using the transition as a platform for industrial innovation, strengthening Korea’s existing industrial ecosystem while fostering low-carbon, green industries as new growth engines. This includes developing and commercializing “Korean-style” carbon-neutral technologies tailored to the country’s specific context—such as its GHG-intensive industrial structure and limited renewable energy share.

<Table 1-1> summarizes the directions and special features of the major plans for green transition in Korea.

<Table 1-1> Summary of Major Basic Plans for Green Transition

Basic Plan	Policy Direction	Special Features
Gestation: Green Growth 5-Year Plan (2009)	<ul style="list-style-type: none"> Climate change mitigation and energy independence Creating new growth engines Improving quality of life and strengthening the national prestige 	<ul style="list-style-type: none"> Comprehensive economic development policies aimed at sustainable growth, beyond climate change mitigation alone
Expansion: 2050 Carbon Neutrality Strategy (2020)	<ul style="list-style-type: none"> Building a low-carbon economic structure Creating a low-carbon industrial ecosystem Advancing toward a carbon-neutral society 	<ul style="list-style-type: none"> Shift from “adaptive reduction” (focused on GHG reduction) to a “proactive response” Simultaneous pursuit of carbon neutrality, economic growth, and improved quality of life Strengthening institutional foundations: fiscal policy reform, promotion of green finance, expansion of green technology R&D, and enhanced international cooperation.
Leap Forward: National Strategy for Carbon-Neutral Green Growth and the First National Basic Plan (2023)	<ul style="list-style-type: none"> Practicing responsible carbon neutrality across the economy and society Ensuring an orderly transition to carbon neutrality through communication, empathy, and cooperation Driving innovation-led green growth by fostering a low-carbon industrial ecosystem 	<ul style="list-style-type: none"> Korea became the 14th country to enact a basic law on carbon neutrality, formally establishing the 2050 carbon neutrality vision as law. The National Strategy for Carbon-Neutral Green Growth and the First National Basic Plan were developed under the Carbon-Neutral Basic Act. Emphasis was placed on facilitating an orderly transition to a carbon-neutral society through communication, empathy, cooperation, and the creation of an innovative industrial ecosystem.

Sources: Korean Government Joint Ministries (2009, 2020, 2023).

To achieve these objectives, the strategy included policy guidelines and detailed action plans for various stakeholders. This integrated framework resulted from collaboration among numerous governmental agencies, research institutions, and civil society groups, including:

- **Ministries:** Ministry of Environment (MOE), the Ministry of Trade, Industry, and Energy (MOTIE), the Ministry of Economy and Finance (MOEF);
- **Legislative body:** Legislation & Judiciary Committee of the National Assembly;
- **Research institutions:** GHG Inventory & Research Center of Korea (GIR), Korea Environment Institute (KEI)
- **Other stakeholders:** Local governments, Global Green Growth Institute (GGGI), Korea Energy Management Corporation (KEMPCO), Korea Environment Corporation (KECO), Korea Forest Promotion Institute (KOFPI), Korea Transportation Safety Authority (TS), Korea Chamber of Commerce & Industry (KCCI), and Korea Exchange Inc. (designated for emission permits trading).

2.2. Regulatory Framework for Green Transition

Since the establishment of the Green Growth Committee, experts from both the government and the private sector have collaborated to develop a legal framework for promoting green growth. This

led to the enactment of numerous laws. The Framework Act on Low Carbon Green Growth, enacted in 2010, was replaced in 2021 by the Carbon Neutrality Basic Act, which now serves as the primary legal basis for Korea's energy transition.

The Act mandates the formulation of a national strategy and policy direction to achieve carbon neutrality by 2050, including the development and implementation of a National Carbon Neutrality and Green Growth Basic Plan. This 20-year plan is reviewed and updated every five years. The Act also outlines Korea's national vision, GHG reduction targets, trends in domestic and international climate change, annual and sectoral-specific reduction measures, adaptation measures, a just transition framework, support for green technology and industries, revitalization of green finance, and international cooperation.

During the initial phase (2009-2014) of policy development on climate change response and green growth, multiple laws and regulations were enacted. Key developments include:

- Act on the Allocation and Trading of Greenhouse-Gas Emission Permits (2012), following the Framework Act on Low Carbon Green Growth (2010).
- Laws supporting green land use, transportation, and energy systems, including:
 - Sustainable Transportation Logistics Development Act (2009);
 - Smart Grid Construction and Utilization Promotion Act (2011); and
 - Green Buildings Construction Support Act (2012).

A 2012 government initiative reviewed and amended 72 laws to support green growth, aligning them with the Framework Act on Low Carbon Green Growth, the National Strategy for Green Growth, and the Five-Year Plan for Green Growth (see <Appendix 1-1> for a complete list of legislative reforms). Key revisions included:

- **Energy and Industry:** Support for energy efficiency and greenhouse gas emission reduction in small and medium-sized enterprises (SMEs), along with support for green technology development in vulnerable industries concerned about competitiveness issues related to greenhouse gas emission regulations.
- **Transportation:** Tax incentives for environmentally friendly vehicles, coupled with reduced urban railway bond purchases when registering electric vehicles.
- **Green Living:** Development of safe and convenient cycling infrastructure, including designated bike lanes, considering traffic volume and road safety standards.
- **Marine Environment:** Requirements for ship owners to calculate energy efficiency according to technical standards, ensuring that energy efficiency meets regulatory requirements to reduce greenhouse gas emissions from ships.
- **Logistics:** Government support and incentives to encourage voluntary participation in greenhouse gas reduction efforts by logistics companies, including evaluation of greenhouse gas reduction plans, certification of green logistics companies, and provision of administrative and financial support through a dedicated green logistics council.

- **Resource Circulation:** Requirements for manufacturers and importers of solid fuel products made from waste to clearly label product quality to improve transparency for consumers, reduce pollution from manufacturing and use of solid fuels, and strengthen facility management through regular inspections.

Subsequent strategies, including the 2050 Carbon Neutral Promotion Strategy and the National Strategy for Carbon Neutral Green Growth with the First National Basic Plan, have spurred additional legal reforms supporting carbon neutrality and green transformation. The following sections will examine two core legal foundations in more detail: the Carbon Neutrality Basic Act and the Act on the Allocation and Trading of Greenhouse-Gas Emission Permits.

2.2.1. Carbon Neutrality Basic Act

To strengthen Korea's green growth policy, the Framework Act on Low Carbon Green Growth and its enforcement decree were enacted in 2010. In 2024, this law was expanded and renamed the Carbon Neutrality Basic Act. This Act, comprising 11 chapters, covers the National Strategy for Low Carbon Green Growth, the establishment of the Green Growth Committee, promotion of low-carbon green growth, the realization of a low-carbon society, and the pursuit of green growth and sustainable development (see <Appendix 1-2> for a summary).

The Act addresses the national vision and GHG reduction targets and mandates the establishment and implementation of strategic plans. It also establishes the 2050 Carbon Neutral Green Growth Committee. Furthermore, the Act outlines the creation and operation of the Climate Response Fund, including its establishment, funding via transfers from the general account, and systems for management, accounting, and settlement.

2.2.2. Act on the Allocation and Trading of Greenhouse-Gas Emission Permits

Article 46 of the Framework Act on Low Carbon Green Growth led to the enactment of the Act on the Allocation and Trading of Greenhouse Gas Emission Permits in 2012 and its enforcement decree, thereby establishing Korea's GHG emissions trading system. Although the Kyoto Protocol did not bind Korea, it voluntarily committed to a national reduction target of 30% below 2020 BAU emissions, as announced in 2009. This Act demonstrates Korea's commitment to reducing GHG emissions.

The 2024 revision added specific standards for allocating emission credits, promoting market revitalization, linking with international carbon markets, and supporting measures to meet reduction targets, reflecting both domestic and international policy and environmental developments. This Act also stipulates criteria for identifying regulated companies, credit allocation methods, trading management, and the implementation of the emissions trading system in 2015 (see <Appendix 1-3> for a summary).

2.2.3. Other Laws Supporting Carbon-Neutral Green Growth

Various laws and regulations support carbon-neutral green growth across sectors. Key examples include:

- Act on the Promotion of Development, Use and Diffusion of New and Renewable Energy;
- Energy Use Rationalization Act;
- Act on the Promotion of the Conversion to an Environmentally-Friendly Industrial Structure;
- Act on Promotion of Transition to Circular Economy and Society; and
- Act on the Creation and Development of Financial Hubs.

For a full summary, see <Appendix 1-4>.

2.2.4. Financial Investment and Public Institution Management Laws

Government investment in carbon-neutral green growth is guided by laws, including:

- National Finance Act;
- Public Capital Management Fund Act;
- State Credit Management Act;
- State Bond Act; and
- Act on Public-Private Partnerships in Infrastructure.

State-owned enterprises and public institutions play a key role and are governed by the Act on the Management of Public Institutions. Energy conversion projects are implemented through energy public corporations, including:

- Korea Electric Power Corporation;
- Five power generation companies;
- Korea Electric Power Corporation KDN;
- Korea Water Resources Corporation;
- Korea District Heating Corporation;
- Korea Oil Corporation;
- Korea Gas Corporation;
- Korea Mine Rehabilitation and Mineral Resources Corporation;
- Korea Coal Corporation; and
- Korea Energy Corporation.

The Ministry of Trade, Industry, and Energy (MOTIE) oversees financial soundness, operational efficiency, carbon neutrality efforts (through non-carbon energy use), and stable energy supply.

Laws promoting foreign investment (not specifically green growth) include:

- Foreign Investment Promotion Act;
- Special Act on Designation and Management of Free Economic Zones;
- Act on the Creation and Development of Financial Hubs;
- Act on Real Name Financial Transactions and Confidentiality;
- Foreign Land Law; and
- Foreign Exchange Transactions Act.

See <Appendix 1-5> for a summary of major financial investments and relevant laws and regulations.

2.3. Supporting Green Investment and Finance

Korea's financial investment plan for carbon neutrality and energy transition provides funding for sectoral GHG reductions, climate change adaptation, green industry growth, just transition support, and community-based carbon neutrality initiatives. Key components include: large-scale investments in energy infrastructure such as energy storage systems (ESS) and smart grids, expansion of renewable and nuclear energy, industrial sector investments, tax credits for low-carbon production technologies, process improvements, and supporting carbon-neutral transition project financing to revitalize green finance.

According to the National Strategy for Carbon Neutral Green Growth and the First National Basic Plan (April 2023), over KRW 89.9 trillion in investment is projected for the five-year (2023-2027), allocated as follows: KRW 54.6 trillion for sector-specific emission reductions; KRW 19.4 trillion for climate change adaptation; and KRW 6.5 trillion for green industry growth. This translates to an average annual growth rate of approximately 11.5%, exceeding the 8.0% average yearly growth of the national budget over the past five years. Investment allocations may be adjusted based on fiscal conditions and project feasibility (see <Table 1-2>).

<Table 1-2> Financial Investment Plan to Support Carbon-Neutral Green Growth

(Unit: KRW 100 million, %)

Category	2023	2024 to 2027	Total	Average Yearly Growth Rate
Total	133,455	765,738	899,193	11.54
Medium- and long-term reduction measures by sector	79,480	466,283	545,763	11.48

Category	2023	2024 to 2027	Total	Average Yearly Growth Rate
Climate change adaptation measures	29,856	164,213	194,068	9.43
Growth of the green industry	10,459	54,453	64,912	7.34
Just transition	2,366	19,837	22,203	37.57
Local carbon neutrality and green growth	4,602	30,319	34,922	25.36
Training and raising awareness	5,999	26,881	32,881	2.11
International cooperation	693	3,751	4,444	1.59

Source: Korean Government Joint Ministries (2023).

In March 2024, the Financial Services Commission (FSC) announced the “Plan for Expanding Financial Support to Respond to the Climate Crisis,” outlining the following key support measures.

First, the role of policy financial institutions—including the Industrial Bank of Korea, Export-Import Bank, Korea Credit Guarantee Fund, and Korea Technology Finance Corporation—was enhanced to better address the climate crisis. A total of KRW 420 trillion in policy financing was allocated through 2030. While these institutions had already been supporting low-carbon process conversion and green projects using their own resources and climate response funds, significantly greater funding will be required by 2050 to achieve carbon neutrality. To meet this rising demand, the government restructured the paradigm of policy finance by increasing the annual average green fund supply from these institutions by 67%, from the previous five-year average, KRW 36 trillion, to 60 trillion won annually.

Second, a new “Future Energy Fund” was created, leveraging KRW 9 trillion in bank investment to support the KRW 160 trillion in financing needed for expanding renewable energy facilities. The total estimated funding required to develop renewable energy generation by 2030 is KRW 188 trillion, with approximately KRW 160 trillion representing the financial demand. To secure the necessary funds, an estimated KRW 54 trillion in venture capital (including subordinated loans and equity investments) was sought, with KRW 23 trillion jointly provided by policy financial institutions and commercial banks to bridge the funding gap.

Third, approximately KRW 9 trillion was invested in climate technology for food systems development. Recognizing the significant growth potential of this sector (estimated at an average annual rate of 24.5%), but acknowledging its limited short-term economic feasibility for such projects, the Korea Development Bank and five private banks (Kookmin, Shinhan, Hana, Woori, and Nonghyup) invested KRW 1.05 trillion (262.5 billion won from the KDB and KRW 157.5 billion from each private bank). This investment attracted an additional KRW 1.95 trillion in private funds, creating a KRW 3 trillion “Climate Technology Fund.”

Fourth, systems were developed to stimulate private financial support for climate action. This included efforts to establish “Green Credit Management Guidelines” (tentative name) to support the application of the Korean Green Classification System for credit assessments and facilitate private sector green assessments. Simultaneously, climate risk management within the financial sector was strengthened through on-site inspections and climate risk symposiums.

In March 2024, the Ministry of Environment announced the “Plan to Expand Green Investment to Accelerate the Transition to a Low-Carbon System,” outlining the following key priorities.

First, the scope of the Korean Green Classification System was upgraded and expanded to refine the principles and standards governing green economic activities. The Korean Green Classification System Guidelines—first issued in December 2021 and revised in December 2022—underwent a further update in December 2024 to promote green investment and prevent greenwashing. The revisions align with domestic and international standards and address four key environmental goals: water management, circular economy, pollution prevention, and biodiversity conservation. Additional revisions are scheduled for December 2025 to improve adaptability and usability, in line with the three-year revision cycle and ongoing stakeholder engagement across the industrial and financial sectors.

Second, measures were introduced to revitalize green investment by addressing uncertainties faced by companies and financial institutions, particularly those concerned about greenwashing or lacking technical expertise. These measures include the development of standardized guidelines for calculating GHG emissions in corporate climate disclosures and the potential integration of the environmental industry's special classification system with the Korean green classification system to facilitate financial-sector investment. The government also plans to enhance private sector capabilities by training specialists in green finance to improve climate crisis responsiveness.

Third, a significant expansion of support for green bonds and loans was planned to increase private green investment to KRW 30 trillion by 2027. This includes support for issuing Korean-style green bonds (KRW 3 trillion annually), interest subsidies for corporate green investment loans (KRW 2 trillion annually), and the development of additional green financing measures. A dedicated green export fund was established to support Korean companies undertaking overseas green projects. Additionally, a “green industry technology guarantee” project, in conjunction with the technology guarantee fund, aims to help companies developing innovative green technologies that face challenges in securing loans due to market limitations.

Fourth, the emissions trading system (ETS) was reinforced through the development of a fourth basic plan, designed to achieve national GHG reduction targets. The plan aims to revitalize the ETS market by gradually introducing financial investments that allow third-party indirect investment, thereby promoting more rational pricing and higher trading volume. The plan also included introducing consignment trading to improve trading convenience and expand third-party participation.

2.4. Success Factors and Challenges

Korea's green growth strategy has significantly influenced both industrial development and public awareness of climate change. As part of its global climate commitments, Korea adopted a 2050 carbon neutrality target, raised its 2030 national GHG reduction goal, enacted a foundational carbon neutrality law, and implemented various supportive policies—such as reducing reliance on fossil fuel-based power generation and launching a national emissions trading system. In addition to core legislation, Korea established complementary systems to address the climate crisis, including the establishment of the Carbon Green Committee, the Climate Response Fund, a GHG reduction

budget system, and special zones for facilitating a just transition. This long-term perspective was adopted to build a strong foundation for implementing carbon-neutral green growth.

The centralized governance structure—initially managed by the Presidential Committee on Green Growth and later delegated to relevant ministries—proved effective in facilitating inter-ministerial coordination. Reintroducing the five-year planning approach within the green growth strategy successfully enabled the alignment of long-term vision with specific short- and medium-term goals, offering a replicable model for countries pursuing similar transitions.

Korea's green growth efforts extended globally, emphasizing international cooperation and development assistance. The establishment of the Global Green Growth Institute (GGGI) supports Korea's commitment to supporting green growth in developing countries. Korea also strengthened its collaboration with the OECD through joint research and ongoing communication, and actively collaborated with both the EU and OECD to advance ETSs. The key success factors of Korea's strategy include:

- **Strong political commitment and leadership:** Driven by presidential leadership and reinforced through legislative and institutional reforms.
- **Emphasis on infrastructure and capacity building:** Signaled by substantial public investment.
- **Supportive legal and regulatory framework:** Exemplified by the establishment of the ETS Act.
- **Alignment with national development priorities:** Integrating energy security and leveraging early leadership in green technologies and industries.
- **Ongoing public-private collaboration:** Achieved through continuous national coordination and consultation among industry, government officials, and experts.

Despite these efforts, the initial implementation phase of Korea's green growth strategy revealed key shortcomings. GHG emissions continued to rise, leading to pressure from the international community. The major challenges included:

- **Implementation management:** Insufficient policy specificity and inadequate implementation management resulted in continued increases in national greenhouse gas emissions until 2018. While goals were established and implementation plans developed, the absence of a robust monitoring system hindered emission reductions.
- **Public participation and communication:** A lack of societal involvement and policy consistency characterized the largely top-down approach. This resulted in limited cooperation from local governments, insufficient stakeholder engagement, and a lack of public participation. Inconsistent messaging on climate policy priorities further contributed to public confusion.
- **Proactivity and innovation:** Korea lacked sufficient proactivity and innovation in responding to changing international dynamics and economic conditions. It played a largely follower rather than a first-mover role in international negotiations (such as the Kyoto Protocol and the Paris Agreement) and green growth market development. Furthermore, a strategy for fostering innovative technologies and industries was absent, hindering efforts to overcome domestic challenges such as the greenhouse gas-intensive industrial structure and low renewable energy penetration.

3. Green Transition in Indonesia

3.1. Climate Change Roadmap and Policy Framework

As a signatory of the United Nations Framework Convention on Climate Change (UNFCCC), Indonesia has steadily developed its climate policy framework to align with both global commitments and national development priorities. Over the past three decades, Indonesia has enacted key regulations, established climate-focused institutions, and integrated low-carbon development into both its National Medium-Term (Rencana Pembangunan Jangka Menengah Nasional, RPJMN) and Long-Term (Rencana Pembangunan Jangka Panjang Nasional, RPJPN) Development Plans (Bappenas, 2020).

A significant turning point was the 2011 introduction of the National Action Plan for Greenhouse Gas Emission Reduction (Rencana Aksi Nasional Penurunan Gas Rumah Kaca, RAN-GRK), which institutionalized sectoral emission reduction targets (Bappenas, 2018). Later, the Paris Agreement (2015) and the Long-Term Strategy for Low Carbon and Climate Resilience (LTS-LCCR 2050) further solidified Indonesia's commitment to achieving net-zero emissions by 2060. This section explores the evolution of Indonesia's climate governance, including institutional transformations, policy frameworks, and the integration of climate action within national development planning.

3.1.1. Institutional Development and Early Climate Policies (1992–2007)

Indonesia ratified the UNFCCC through Law No. 6/1994, requiring it mandatory for the country to monitor GHG emissions and incorporate climate action into national policies (KLHK, 2022). Indonesia later ratified the Kyoto Protocol in 2004 (Law No. 17/2004), allowing it to participate in global carbon trading mechanisms such as the Clean Development Mechanism (CDM) (UNFCCC, 2007).

To centralized climate policy, Indonesia established the National Council on Climate Change (Dewan Nasional Perubahan Iklim, DNPI) in 2008 under Presidential Regulation No. 46/2008. DNPI played a key role in:

- Coordinating Indonesia's climate strategies across ministries;
- Facilitating carbon trading and REDD+ (Reducing Emissions from Deforestation and Forest Degradation) initiatives; and
- Representing Indonesia in UNFCCC climate negotiations.

However, institutional overlaps and limited enforcement powers led to DNPI's dissolution in 2015, with its functions transferred to the Directorate General of Climate Change Control (DGCC) under the Ministry of Environment and Forestry (KLHK) (KLHK, 2022).

While climate action was initially separate from Indonesia's development planning, RPJMN 2005–2009 began incorporating environmental sustainability measures. By RPJMN 2010–2014, climate mitigation and adaptation strategies were explicitly included as part of Indonesia's green growth agenda (Bappenas, 2020).

3.1.2. RAN-GRK and Strengthening Climate Policies (2011–2015)

In 2011, the National Action Plan for Greenhouse Gas Emission Reduction (RAN-GRK) was issued via Presidential Regulation No. 61/2011, setting clear GHG reduction targets of 26% domestically and 41% with international support by 2020 (Bappenas, 2018). To ensure decentralized implementation, Provincial Action Plans (RAD-GRK) were launched in all 34 provinces, requiring local governments to integrate low-carbon development and climate adaptation measures (KLHK, 2021). These plans aligned with RPJMN 2015–2019, which emphasized climate resilience as a national development priority (Bappenas, 2020). To support RAN-GRK, the government introduced the following:

- Presidential Regulation No. 71/2011 on the National GHG Inventory System (SIGN-SMART), ensuring standardized emissions reporting.
- National Action Plan for Climate Change Adaptation (RAN-API, 2014), integrating climate risk management into economic planning (Bappenas, 2018).

Despite these policies, challenges in funding, monitoring, and enforcement prompted Indonesia to adopt a longer-term, legally binding climate strategy.

3.1.3. Paris Agreement and the Green RPJMN (2016–2020)

Indonesia ratified the Paris Agreement under Law No. 16/2016, thereby making its Nationally Determined Contributions (NDCs) legally binding (KLHK, 2021). The first NDC (2016) committed to reducing GHG emissions by 29% (domestic) and 41% (international support) by 2030. For the first time, the RPJMN 2020–2024 was formally branded as a "Green RPJMN," prioritizing:

- Low-Carbon Development Initiative (LCDI), integrating climate action into economic planning.
- Renewable energy transition, targeting 23% renewable energy by 2025.
- Climate budget tagging, ensuring financial transparency in green projects (Bappenas, 2020).

These policies formed the foundation for Indonesia's Long-Term Strategy for Low Carbon and Climate Resilience (LTS-LCCR 2050), which outlined pathways toward net-zero emissions.

3.1.4. Recent Developments and Long-Term Strategies (2021–2024)

Following the Glasgow Climate Pact (2021), Indonesia submitted its Enhanced NDC in 2022, raising its targets to 31.89% domestically and 43.2% with international support by 2030 (UNFCCC, 2022). Key regulatory developments included:

- Presidential Regulation No. 98/2021: Establishing a national carbon pricing and trading system.
- Presidential Regulation No. 112/2022: Accelerating coal phase-out and renewable energy expansion.
- Indonesia Carbon Exchange (IDX Carbon, 2023): Facilitating carbon credit trading (OJK, 2023).

Launched in 2024, the National Long-Term Development Plan (RPJPN) 2025–2045 positions sustainability and climate resilience as core components of national planning (Bappenas, 2024). Key priorities include:

- Achieving net-zero emissions by 2060.
- Green infrastructure development.
- Scaling up climate finance through sovereign green bonds and private sector investments.

Indonesia’s climate policy framework has evolved from early international commitments to a well-integrated national strategy. The dissolution of DNPI and the transfer of responsibilities to DGCC under KLHK reflect efforts to streamline governance and strengthen enforcement. Recent policies—such as carbon pricing, energy transition plans, and the LTS-LCCR 2050—demonstrate Indonesia’s commitment to aligning climate goals with national development priorities. Moving forward, the effective implementation of the RPJPN 2025–2045 and the expansion of climate finance mechanisms will be crucial to achieving long-term sustainability and resilience. <Table 1-3> summarizes **Indonesia’s climate change policy framework since 1992**.

<Table 1-3> Indonesia’s Climate Change Policy Framework

Period	Key Policies and Regulations	Institutional Developments	Main Strategies and Commitments	RPJMN & RPJP Integration
1992 to 2007	<ul style="list-style-type: none"> • UNFCCC ratified (Law No. 6/1994) • Kyoto Protocol ratified (Law No. 17/2004) • Bali Roadmap (2007) introduced at COP 13 	<ul style="list-style-type: none"> • National Council on Climate Change (DNPI) established (2008) 	<ul style="list-style-type: none"> • Participation in international climate negotiations • Introduction of Clean Development Mechanism (CDM) and carbon trading 	<ul style="list-style-type: none"> • Climate change integration in RPJMN 2005–2009, focusing on environmental sustainability
2008 to 2015	<ul style="list-style-type: none"> • Presidential Regulation No. 61/2011 (RAN-GRK) • Presidential Regulation No. 71/2011 (GHG Inventory System) • National Action Plan for Climate Change Adaptation (RAN-API, 2014) 	<ul style="list-style-type: none"> • DNPI dissolved in 2015, functions transferred to KLHK 	<ul style="list-style-type: none"> • GHG reduction target: 26% (domestic) and 41% (international support) by 2020 • Decentralized climate action with RAD-GRK (regional action plans) 	<ul style="list-style-type: none"> • Climate resilience and low-carbon growth integrated into RPJMN 2010–2014 and RPJMN 2015–2019

Period	Key Policies and Regulations	Institutional Developments	Main Strategies and Commitments	RPJMN & RPJP Integration
2016 to 2020	<ul style="list-style-type: none"> Paris Agreement ratified (Law No. 16/2016) Presidential Regulation No. 77/2018 (Environmental Economic Instruments) Indonesia Climate Change Trust Fund (ICCTF) expanded 	<ul style="list-style-type: none"> Climate governance shifted to DGCC under KLHK 	<ul style="list-style-type: none"> First NDC: 29% (domestic) & 41% (international support) by 2030 Low Carbon Development Initiative (LCDI) introduced 	<ul style="list-style-type: none"> RPJMN 2020–2024 adopted "Green RPJMN", emphasizing low-carbon economy and climate resilience
2021 to 2024	<ul style="list-style-type: none"> Presidential Regulation No. 98/2021 (Carbon Pricing & Trading) Presidential Regulation No. 112/2022 (Renewable Energy Transition) Enhanced NDC (2022): 31.89% (domestic) & 43.2% (international support) by 2030 Indonesia Carbon Exchange (IDX Carbon, 2023) launched 	<ul style="list-style-type: none"> Just Energy Transition Partnership (JETP) launched (2022) 	<ul style="list-style-type: none"> Energy transition roadmap for net-zero emissions by 2060 Strengthened climate finance mechanisms, including carbon trading and green sukuk issuance 	<ul style="list-style-type: none"> RPJPN 2025–2045 finalized, ensuring long-term climate adaptation and low-carbon development

Sources: Authors (2025).

3.2. Regulatory Framework for Green Transition

Indonesia's regulatory framework for green transition has evolved significantly over the past three decades. It has been shaped by global climate agreements, domestic policies, and economic strategies focused on reducing GHG emissions, expanding renewable energy, and promoting sustainable development. The Kyoto Protocol (2004), Paris Agreement (2016), and Indonesia's Enhanced Nationally Determined Contribution (ENDC) (2022) have each driven regulatory reforms, supporting Indonesia's shift toward a low-carbon economy (World Bank, 2023a).

3.2.1. Early Climate Commitments and Regulatory Foundations (1992–2015)

Indonesia ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1994 (Law No. 6/1994) and later the Kyoto Protocol in 2004 (Law No. 17/2004). These international commitments provided the basis for the development of domestic climate regulations. Key regulatory developments during this period included:

- Presidential Regulation No. 61/2011 on RAN-GRK: The National Action Plan for Greenhouse Gas Emission Reduction introduced binding sectoral emission reduction targets, requiring national and regional governments to develop climate mitigation strategies (KLHK, 2023a).
- Presidential Regulation No. 71/2011 on National GHG Inventory: Created the Sistem Registri Nasional (SRN), Indonesia's national emissions monitoring system, ensuring transparency and accountability in emissions tracking (KLHK, 2023b).

- Introduction of Climate Finance Mechanisms: The government launched the Indonesia Climate Change Trust Fund (ICCTF) to support mitigation and adaptation projects (World Bank, 2023b).

These early regulations laid the groundwork for more comprehensive climate policies following Indonesia's ratification of the Paris Agreement in 2016.

3.2.2. Strengthening Regulations under the Paris Agreement (2016–2020)

The ratification of the Paris Agreement (Law No. 16/2016) legally bound Indonesia to implement Nationally Determined Contributions (NDCs), which set ambitious emissions reduction targets of 29% (unconditional) and 41% (conditional on international support) by 2030 (KLHK, 2023a). Key regulatory developments included:

- **Presidential Regulation No. 77/2018:** Established environmental economic instruments, including carbon pricing and incentives for green investments.
- **Presidential Regulation No. 98/2021:** on Carbon Pricing – Introduced cap-and-trade mechanisms and laid the groundwork for Indonesia's carbon market (KLHK, 2023a).
- **Integration into RPJMN 2020–2024:** Indonesia's first Green RPJMN emphasized renewable energy expansion, energy efficiency, and sustainable land use (World Bank, 2023c).

3.2.3. Recent Regulatory Developments and Green Transition Strategies (2021–2024)

Between 2021 and 2024, Indonesia accelerated its green transition efforts, implementing policies aimed at carbon pricing, renewable energy, and climate finance.

- Carbon Pricing and Trading Mechanisms
 - Launched in 2023, the Indonesia Carbon Exchange (IDX Carbon), enables carbon credit trading and encourages corporate emissions reductions (KLHK, 2023b).
 - Presidential Regulation No. 98/2021 established Indonesia's carbon tax framework, aligning with the Paris Agreement's Article 6 on carbon markets (KLHK, 2023b).
- Energy Transition and Renewable Energy Regulations
 - Presidential Regulation No. 112/2022 mandates a gradual coal phase-out while prioritizing investments in renewable energy (World Bank, 2023c).
 - The Just Energy Transition Partnership (JETP, 2022) secured \$20 billion in international funding to accelerate Indonesia's transition from coal to renewables (World Bank, 2023d).
- Climate Finance and Green Investment Policies
 - Expansion of Green Sukuk (Islamic Green Bonds) to finance sustainable infrastructure and renewable energy projects.
 - Badan Pengelola Dana Lingkungan Hidup (BPDLH) was enhanced to administer climate finance for mitigation and adaptation projects (KLHK, 2023b).

- Carbon Capture and Industrial Regulations
 - Ministerial Regulation No. 2/2023 introduced guidelines on Carbon Capture, Utilization, and Storage (CCUS), targeting reductions in industrial emissions (World Bank, 2023b).

<Table 1-4> summarizes the regulatory framework of Indonesia's climate policy.

<Table 1-4> Regulatory Framework of Indonesia's Climate Policy

Policy Framework	Regulatory Framework	Implementation & Impact
UNFCCC Ratification (1994)	Law No. 6/1994 (Ratification of UNFCCC)	Established Indonesia's commitment to climate action, requiring GHG reporting and adaptation planning.
Kyoto Protocol (2004)	Law No. 17/2004 (Ratification of Kyoto Protocol)	Enabled Indonesia's participation in carbon markets through Clean Development Mechanism (CDM).
National Action Plan for GHG Reduction (RAN-GRK, 2011)	Presidential Regulation No. 61/2011 (RAN-GRK)	Set sectoral GHG reduction targets, requiring national and regional action plans (RAD-GRK).
National GHG Inventory System (2011)	Presidential Regulation No. 71/2011 (GHG Inventory)	Established Sistem Registri Nasional (SRN-PPI) for emissions monitoring and verification.
Paris Agreement (2016)	Law No. 16/2016 (Ratification of Paris Agreement)	Legally bound Indonesia to Nationally Determined Contributions (NDCs), targeting 29% to 41% emissions reduction by 2030.
Low Carbon Development Initiative (LCDI, 2017)	Integrated into RPJMN 2020–2024	Introduced low-carbon economic growth, aligning climate action with national development.
Enhanced Nationally Determined Contribution (ENDC, 2022)	Presidential Regulation No. 98/2021 (Carbon Pricing)	Established carbon tax and cap-and-trade mechanisms, paving the way for Indonesia Carbon Exchange (IDX Carbon, 2023).
Just Energy Transition Partnership (JETP, 2022)	Presidential Regulation No. 112/2022 (Renewable Energy)	Mobilized USD 20 billion for coal phase-out and renewable energy expansion.
Long-Term Strategy for Low Carbon and Climate Resilience (LTS-LCCR 2050)	Ministerial Regulation No. 2/2023 (CCUS Guidelines)	Established carbon capture and storage regulations for industrial emissions reduction.

Sources: Authors (2025).

3.3. Supporting Green Investment and Finance

3.3.1. Financing Needs for Green Investment in Indonesia Based on BUR Reports

Indonesia's Biennial Update Reports (BURs) highlight the growing financial needs for green investment, particularly for mitigation and adaptation actions. To achieve its Nationally Determined Contribution (NDC) targets, the government estimates that IDR 4.52 quadrillion (USD 310 billion) will be required by 2030. However, the available public funds cover only about one-third of this cost, emphasizing the need for private sector participation, international funding, and climate finance mechanisms (KLHK, 2023b). Between 2018 and 2020, Indonesia allocated IDR 102.6 trillion from its national budget to emission reduction projects, equivalent to 4.1% of total state expenditure.

Despite these efforts, financing gaps remain, particularly in renewable energy, climate adaptation, and forestry conservation (Bappenas, 2023a). <Table 1-5> lists the investment needs for climate mitigation and adaptation in Indonesia.

<Table 1-5> Investment Needs for Climate Mitigation in Indonesia

(Amounts in Trillion IDR)

Sector	2 nd BUR ¹	Roadmap NDC Mitigation	3 rd BUR
Forestry and Land Use	77.82	93.28	309.01
Energy and Transportation	3,307.20	3,500.00	3,500.00
IPPU	40.77	0.92	0.93
Waste	30.34	181.40	185.27
Agriculture	5.18	4.04	7.23
Total	3,461.31	3,779.63	4,002.44

Sources: Ministry of Environment and Forestry (2018), Ministry of Environment and Forestry (2021a), Ministry of Environment and Forestry (2022).

3.3.2. Role of Fiscal and State Budgets in Addressing Climate Change in Indonesia

As climate change increasingly affects global economies, nations should take strategic financial measures to mitigate its impacts and enhance resilience. Indonesia, one of the world's most vulnerable countries to climate change, has integrated climate-related expenditures into its State Budget (APBN) to support mitigation and adaptation efforts. The government has implemented tax incentives, climate budget tagging (CBT), regional fiscal transfers, and innovative financing mechanisms to ensure sustainable development. This section explores how Indonesia's APBN contributes to climate financing, focusing on budget allocation, regional transfers, and green financial instruments.

Fiscal Incentives for Climate Action (Tax and Customs Facilities)

To encourage investment in renewable energy (EBT) and clean technology, the Indonesian government provides tax and customs incentives for climate-friendly industries. These incentives include:

- Tax exemptions, including tax holiday and tax allowances for renewable energy projects, such as solar, wind, and bioenergy investments (Ministry of Finance, 2023a).
- Import duty reductions on clean technology and energy-efficient equipment to lower production costs.

¹ BUR = Biennial Update Report

Through fiscal incentives, the government seeks to foster a market-driven approach to reducing emissions and promoting green investments.

Climate Budget and Sectoral Budget Allocation

Indonesia has adopted Climate Budget Tagging (CBT) to track climate-related expenditures across ministries and agencies. The system allows the government to monitor and optimize funding for mitigation and adaptation efforts.

Key sectors receiving APBN climate funding include:

- Energy transition and renewable energy development to decrease reliance on fossil fuels.
- Forestry and land use programs, including deforestation prevention and forest conservation initiatives.
- Disaster risk reduction and climate adaptation, particularly for coastal protection, agriculture resilience, and public health (Indonesia Third Biennial Update Report, 2023).

As of 2022, approximately IDR 89 trillion (USD 6 billion) had been allocated to climate-related programs, reflecting the government's commitment to integrating climate action into national planning (Ministry of Finance, 2023b).

Regional Climate Finance Through Fiscal Transfers

Indonesia's fiscal decentralization policy ensures that local governments receive financial support for climate action through Transfer ke Daerah dan Dana Desa (TKDD). These regional transfers are essential in enabling subnational governments to implement local climate resilience programs.

Physical and Non-Physical Special Allocation Funds (DAK): The Special Allocation Fund (DAK) is a key mechanism for funding climate-related projects at the regional level. It consists of:

- DAK Fisik (Physical DAK) finances climate-sensitive sectors such as food security, health, environmental protection, and forestry.
- DAK Non-Fisik (Non-Physical DAK), which supports waste management programs and sustainable infrastructure development.

The government has expanded DAK funding for climate adaptation, particularly in disaster-prone areas to enhance community resilience against floods, droughts, and sea level rise (Ministry of Home Affairs, 2023).

Fiscal Incentives for Regional Governments: To encourage climate-friendly policies at the local level, Indonesia has introduced Dana Insentif Daerah (DID), a performance-based grant for regional governments that achieve key environmental and climate targets. Regions that show progress in green energy adoption, emission reduction, and waste management qualify for additional fiscal incentives.

Village Fund (Dana Desa) for Low-Carbon Development: The Village Fund (Dana Desa) is an essential tool for integrating climate action into rural development programs. This fund is increasingly directed toward:

- Renewable energy projects in rural areas, such as micro-hydro and solar panel installations.
- Sustainable agriculture initiatives to enhance food security while reducing environmental impacts.
- Coastal and marine conservation projects, including mangrove restoration, to protect against rising sea levels.

In 2022, more than 8% of Dana Desa funds supported climate resilience programs in over 20,000 villages nationwide (Ministry of Villages, 2023).

3.3.3. Innovative Financing for Sustainable Development

Recognizing the financing gap, Indonesia has pioneered green financial instruments to fund climate-related projects. These include:

Green Sukuk for Climate Projects

Indonesia was the first country in the world to issue a Green Sukuk—an Islamic bond dedicated to financing environmentally sustainable projects. Since 2018, Indonesia has issued over USD 5 billion in Green Sukuk, funding projects such as:

- Renewable energy infrastructure (solar, hydro, and wind power plants).
- Sustainable transportation (electric vehicle incentives and public transit expansion).
- Climate resilience programs in disaster-prone areas (Otoritas Jasa Keuangan [OJK], 2023).

The success of Green Sukuk demonstrates the potential of Islamic finance to mobilize climate investment within Shariah-compliant principles.

SDG Bonds and Blue Bonds for Sustainable Development

In addition to Green Sukuk, Indonesia has launched SDG Bonds and Blue Bonds to address broader sustainability goals:

- SDG Bonds finance projects aligned with the United Nations Sustainable Development Goals (SDGs), such as education, healthcare, and environmental protection.
- Blue Bonds support marine and coastal conservation, aiming to protect Indonesia's vast ocean resources from climate threats.

These innovative instruments diversify Indonesia's climate finance portfolio, attracting investors committed to environmental, social, and governance (ESG) principles (World Bank, 2023d).

3.4. Key Challenges in Indonesia's Green and Energy Transition

Indonesia is making significant strides in its **green and energy transition**, aiming to achieve **net-zero emissions by 2060** or earlier while ensuring sustainable economic growth. The government has introduced a range of **policies, regulations, and financial mechanisms** to support renewable energy development and carbon reduction efforts. However, as with any major transition, several **challenges must be addressed** to ensure a smooth and effective shift toward a greener economy (World Bank, 2023a). By identifying these obstacles and implementing **adaptive solutions**, Indonesia can continue to strengthen its progress toward a sustainable energy future.

One important area for improvement is **regulatory and policy alignment**. While Indonesia has made progress—such as **Presidential Regulation No. 112/2022**, which encourages a transition from coal to renewables—some policies remain misaligned or fragmented, potentially slowing momentum for renewable energy investment (KLHK, 2023a). Additionally, streamlining **permitting processes and tariff structures** for renewable energy projects could attract **greater participation from the private sector and international investors** (IEA, 2023). Strengthening **policy coordination across ministries and between national and regional governments** will further ensure the consistent implementation of climate and energy goals.

Securing adequate **financing for green investments** is another critical challenge. Indonesia's climate and energy transition is projected to require **USD 310 billion by 2030**, with **public funds currently covering about one-third of this amount** (Bappenas, 2023b). While initiatives such as **Green Sukuk (Islamic green bonds)**, the **Just Energy Transition Partnership (JETP)**, and the **Indonesia Carbon Exchange (IDX Carbon)** have been introduced, further steps are needed to mobilize **private sector involvement and improve access to green finance** (World Bank, 2023b). Developing **stronger financial incentives and risk-sharing mechanisms** could encourage businesses and investors to take a more active role in Indonesia's transition toward clean energy.

Infrastructure development also plays a crucial role in supporting the **green transition**. Indonesia's **electricity grid** is currently optimized for **conventional fossil fuel-based energy**, and integrating **variable renewable energy sources such as solar and wind** remains a technical challenge (IEA, 2023). Expanding **grid interconnections between islands**, upgrading transmission systems, and investing in **energy storage technologies** are essential for improving grid flexibility and enabling higher shares of **renewables** (KLHK, 2023a). With continued investment and technological advancements, these challenges can be addressed to create a more **resilient and efficient energy infrastructure**.

Finally, **human capital and institutional capacity** are key elements of a successful energy transition. Developing a highly **skilled workforce** in renewable energy, energy efficiency, and low-carbon industrialization will be essential for long-term success (Bappenas, 2023a). **Regional governments also play an important role in policy implementation**, and continued support

through **capacity-building programs, technical assistance, and knowledge-sharing initiatives** can enhance their effectiveness (World Bank, 2023c). Encouraging research, innovation, and investment in **green technology development** will also contribute to Indonesia's **sustainable growth and energy security**.

While Indonesia has made remarkable progress in its energy transition, continued efforts in policy coordination, financing, infrastructure upgrades, and human capital investment are needed to ensure long-term success. By addressing these opportunities for improvement, Indonesia can further strengthen its leadership in sustainable energy development and create a greener, more resilient future.

4. Policy Recommendations

This section identifies legal provisions in Indonesia that require revision or supplementation, referencing the case of Korea. It presents corresponding measures for enhancement and implementation plans. The analysis actively draws on Korea's policy limitations and successes while assessing the feasibility of applying these policies given the differences in governance and financial conditions between Korea and Indonesia.

Developed and developing countries are formulating various development and growth plans to sustain economic progress. However, if these plans rely on traditional development models, they are unlikely to ensure sustainable growth. Economic growth often leads to environmental degradation, which in turn restricts further development, forming a self-reinforcing cycle. Therefore, growth strategies should be designed in an environmentally friendly manner to mitigate threats to economic sustainability, such as resource depletion and environmental degradation.

Green transition policies have emerged as vital tools for advancing sustainable development. While these policies are not a substitute for sustainable development—nor can they achieve it alone—they are crucial for overcoming the limitations of traditional growth strategies. It is essential to address social conflicts and promote inclusive development that may emerge during the growth process.

Korea has been one of the most proactive countries in implementing green transition policies. These policies include climate change strategies, green technology promotion, industrial transformation, and quality of life improvements—all contributing to sustainable development. However, green transition policies do not automatically result in social development; they must also actively address social development issues, including absolute and relative poverty, income inequality, capacity building, and social integration. When these aspects are considered, green transition policies can effectively contribute to achieving sustainable development.

The following sections propose policy improvement measures categorized into two main areas: governance and legal framework reforms, and public investment and green finance. These measures are designed to ensure the successful implementation of the government's green transition policies and to promote green investment and finance.

4.1. Improving Regulatory Framework: Governance and Legal System

4.1.1. Establishment of a Control Tower to Oversee Green Transition

In many countries, when green transition policies are led by a specific ministry, conflicts of interest may arise during the decision-making process, complicating practical implementation. Examples from developed countries demonstrate that confusion can occur even within ministries regarding

green growth policies, underscoring the need to reconcile tensions between environmental and economic objectives. This transformation is essential not only between the government and the private sector but also within the government itself, shifting toward a framework of coexistence.

In Korea, the key body responsible for promoting green transition policies was the Green Growth Committee, which operated directly under the President. This committee oversaw the development of the Five-Year Green Growth Plan, shared the results of green growth policy initiatives, monitored implementation progress, and discussed future tasks. Since the establishment of the Green Transition Committee and the initiation of the Five-Year Green Transition Plan, related follow-up actions and measures have been continuously enacted. Operating under the direct authority of the President and independent of individual ministries, the committee has been able to offset vested interests across departments partially. For example, the Green Growth Committee, in collaboration with relevant ministries, has enacted various laws and regulations governing the green transition, including the Framework Act on Low Carbon, Green Growth.

In Indonesia, the institutional design of a climate governance body should be carefully planned, informed by past experiences with inter-agency coordination. The closure of the National Council on Climate Change (Dewan Nasional Perubahan Iklim, or DNPI) in 2015 highlights the importance of ensuring coherence in institutional roles and legal mandates. Although DNPI was initially created to spearhead international climate negotiations and national coordination, its effectiveness was constrained by overlapping responsibilities—especially with the MoEF—and by insufficient regulatory authority (Setiawan, 2017). These factors limited its operational effectiveness and ability to mobilize resources, ultimately resulting in its integration into existing ministerial structures.

To improve institutional alignment, the government subsequently established the Directorate General of Climate Change Control (DGCC) under the MoEF to lead climate policy coordination and implementation. This reorganization aimed to enhance administrative efficiency and ensure policy continuity. Since its establishment, the DGCC has taken on a central role in compiling national climate reports, operating the national climate registry, and supervising mitigation and adaptation programs (Ministry of Environment and Forestry, 2021b). In the absence of a top-level coordinating institution with broad authority, integrated government-wide climate action may remain constrained. Without a high-level coordinating body with overarching authority, whole-of-government climate action may remain limited. Therefore, future committee arrangements could benefit from being anchored to institutions with strong convening power, a clear legal mandate, and proximity to strategic decision-making processes, such as the Office of the President or a leading coordinating ministry (Asian Development Bank, 2022).

4.1.2. Ensuring the Sustainability of Green Transition

To ensure the sustainability of green transition policies, it is essential that subsequent governments continue to promote these initiatives. Green conversion should not be limited to the agenda of a single administration; environmentally conscious economic strategies must remain a consistent priority for future governments.

In Korea, the strategy for responding to the climate crisis has been continuously advanced. Notable initiatives—such as the 2050 Carbon Neutral Promotion Strategy, the Carbon Neutral Green

Growth National Strategy, and the First National Basic Plan (2023)—mark key milestones in Korea's green transition progress. This progress was facilitated by the establishment of the Green Growth Committee in 2009, which was later reorganized as the Carbon Neutral Green Growth Committee under the Framework Act on Carbon Neutrality and Green Growth to address the climate crisis. The establishment of the Carbon Neutral Committee further solidified the legal foundation for this committee.

Additionally, by implementing five-year plans in 2009 and 2023, the strategies remain valid despite changes in government, thereby ensuring policy continuity. Accordingly, Indonesia should consider enacting foundational legislation that defines and mandates a green transition in response to climate challenges. This should include the establishment of a permanent governmental committee to comprehensively manage these efforts, along with the external announcement of a multi-year implementation plan spanning approximately five years.

4.1.3. Enactment and Revision of Laws and Regulations for Green Transition

Given the nature of the legislative and policy implementation process, relevant laws and regulations must be enacted or revised to promote new policies sustainably. Even when a policy is urgent, delays in legislative backing can erode the groundwork and diminish the momentum required for its effective rollout. Such delays increase the likelihood that the policy will be questioned regarding its sustainability, especially with a change in government. To ensure continuity of green transition policies across political cycles, it is vital to build robust legal and institutional structures.

In Korea, the primary legal framework governing the energy transition is the Framework Act on Carbon Neutrality and Green Growth, which addresses the climate crisis. The Act requires the formulation of national strategies and policy directions geared toward achieving carbon neutrality by 2050. The government uses this framework to formulate and implement the "National Carbon Neutrality - Green Transformation Basic Plan." This long-term plan, mandated by law, spans 20 years and includes provisions for review and revision every five years to ensure adaptability.

To address similar challenges in Indonesia, it is essential to minimize the gap between policy formulation and implementation. One approach would be to delegate quasi-legislative authority to leading green transition bodies, empowering them beyond mere coordination and advisory roles. However, it is important to recognize the potential downside of concentrating too much power within a single governing body, as governance for the green transition is strengthened. It is therefore necessary to design mechanisms that avoid excessive concentration of authority while still ensuring leadership and coherence.

4.1.4. Governance Improvement for Stakeholder Engagement

To promote effective green transition governance, it is essential to improve the facilitation of meaningful discussions and deliberations with various stakeholders during the pre-implementation stage of projects. This need is well-illustrated by comparing two major cases from Korea: the Four Major Rivers Restoration Project and the Cheonggyecheon Stream Restoration Project.

The Four Major Rivers Restoration Project faced substantial criticism regarding its effectiveness because it was executed without adequate discussion and deliberation with stakeholders during the preparation phase. Conversely, the Cheonggyecheon Stream Restoration Project benefited from in-depth consultation with stakeholders, which significantly contributed to its success.

Throughout its economic development, the Korean government established numerous policies driven primarily by government initiatives. However, mechanisms to systematically incorporate public and stakeholder input into planning and implementation have remained underdeveloped.

For policies such as green transition initiatives—which require long-term implementation and have wide-ranging impacts across economic, social, and environmental sectors—a governance framework should be established. Such a governance system should support ongoing dialogue with stakeholders from the early planning stages through execution. Furthermore, it is essential to ensure that the outcomes of these discussions are adequately reflected in the actual project plans and their execution.

4.2. Improving Regulatory Framework: Government Investment and Green Finance

4.2.1. Expanding Green Investment through the Public Sector

Indonesia should consider implementing various measures to expand green investment by leveraging state-owned financial institutions. This includes increasing the ratio of support provided by these institutions for the green sector and establishing new green-specialized financing and guarantee programs. Strengthening the roles of policy financial institutions—such as the Korea Development Bank, the Export-Import Bank, the Industrial Bank, the Credit Guarantee Fund, and the Technology Finance Corporation in Korea—is essential for addressing the climate crisis and providing effective policy finance.

Proposals have been made to strengthen these institutions' green finance capacity by establishing dedicated green finance units within each organization. In Korea, the Korea Development Bank, the Export-Import Bank, and the Korea Industrial Bank have established such organizations, which systematically support policy planning and promote green finance initiatives. Furthermore, it is important to periodically assess and improve the effectiveness of green finance efforts by forming a consultative body among policy and financial institutions to share strategies for green finance support and strengthen collaboration.

Additionally, consideration should be given to creating a new, provisionally named energy fund, sourced from investments by the banking sector, to facilitate the smooth procurement of financial resources related to the expansion of renewable energy facilities in the market.

As Indonesia advances its commitment to sustainability and decarbonisation, public investment policy is increasingly viewed as critical to supporting national development goals. Government Regulation (PP) No. 63/2019 on Government Investment provides a crucial legal framework for managing state investments. To ensure stronger support for Indonesia's shifting

priorities in climate action, the regulation may require adjustments to better align with the green transition agenda.

One potential area for strengthening the regulation is in acknowledging investments that contribute to environmental objectives—such as renewable energy, sustainable infrastructure, climate-resilient agriculture, and nature-based solutions—as strategic sectors. By integrating such priorities, the regulation could help mobilise greater public and private financing towards climate-aligned projects, while reinforcing existing efforts under initiatives like the Low Carbon Development Indonesia (LCDI) and the Energy Transition Mechanism (ETM).

Additionally, updating the investment eligibility criteria to reflect environmental, social, and governance (ESG) considerations—alongside references to the national green taxonomy—could provide a helpful framework for assessing project sustainability. Gradually introducing impact reporting requirements would enhance transparency and foster greater public confidence in the effectiveness of green public investments.

Finally, enhancing coordination between key institutions—including MOF, MoEF, and technical ministries—could further align investment decisions with climate and development policies. Such improvements could both amplify the impact of public investments and align them more closely with national planning frameworks and global sustainability commitments.

In this regard, reviewing and gradually strengthening the provisions of PP No. 63/2019 could represent a timely and constructive step toward a more integrated and forward-looking public investment strategy that supports Indonesia's green transition (see <Table 1-6>).

<Table 1-6> Opportunities to Strengthen PP No. 63/2019 through Green Financing Integration

Key Contents	Gap	Improvement Measures	Priority
Objectives and Scope	Green or sustainable investment.	Add sustainability and low-carbon goals as investment objectives.	High
Eligibility Criteria	ESG or climate-related screening.	Include ESG and green taxonomy references.	High
Investment Instruments	More on conventional instruments approach.	Add green bonds, sukuk, and blended finance options.	Medium
Institutional Coordination	Agency collaboration.	Enhance coordination with MOEF, OJK, Bappenas, etc.	Medium
Monitoring & Evaluation	Focuses on financial metrics.	Add climate and environmental indicators.	High
Transparency	Disclosure on sustainability impacts.	Encourage public reporting on green impacts.	Low to Medium
Policy Alignment	Alignment with climate strategies.	Ensure consistency with NDC, LCDI, and SF roadmap.	Medium

Sources: Government of Indonesia (2019).

4.2.2. Expansion of Foreign Private Capital and International Development Finance Attraction

When Korea declared its Green Growth policy in 2008, the country had already achieved a per capita income exceeding USD 20,000. Although the government initially played a facilitative role, the policy approach gradually shifted toward one led by market forces and the private sector. The private sector's competitive edge drove this transition in terms of investment capacity and organizational capabilities. However, due to the high-risk and long-return nature of green investments, continued government involvement is necessary to sustain policy momentum. Therefore, Korea's green transition policies have not been led solely by the government but have progressed through the government's support for a private sector-driven economy.

In less economically developed countries, the private sector often lacks international competitiveness and sufficient investment resources, making government-led policy implementation necessary. In particular, due to limited financial resources, advanced countries should actively support developing nations through international cooperation mechanisms, such as foreign aid or international climate finance. This stems from the recognition that advanced economies bear greater historical responsibility for the climate crisis due to their cumulative emissions since the Industrial Revolution. Addressing climate change as a global issue, therefore, requires a shared commitment to collaborative solutions.

For Indonesia, mobilizing foreign private capital and international finance is critical to bridging the gap between the demand and supply of climate and infrastructure funding.² In this context, the role of Development Finance Institutions (DFIs) is significant. To advance climate-related projects, Indonesia collaborates with major DFIs including the Asian Development Bank (ADB), the Asian Infrastructure Investment Bank (AIIB), the German Development Bank (KfW), the French Development Agency (AFD), the Islamic Development Bank, and the World Bank.

These DFIs play two key roles in mobilizing private capital for green infrastructure projects. First, they support the growth of green bond markets by acting as anchor investors, facilitating market development, and building institutional capacity. Second, DFIs can help mitigate the high risks and substantial upfront costs associated with initial subnational green infrastructure projects, thereby lowering market entry barriers for private capital participation.³

4.2.3. Establishment of a Tax Support System to Encourage Private Sector Participation

In Korea, the initial stages of the green conversion policy were primarily driven by government initiatives, while efforts to stimulate private sector investment were relatively inadequate. As the private sector was initially hesitant to invest in green industries, the government played a central role

² According to Indonesia's Medium-Term Development Plan, the country will require 6,444 trillion rupiah (approximately 45.1 billion dollars) in infrastructure funding between 2020 and 2024. However, the national budget can only cover 37% of this total, with the remaining funds expected to be sourced from state-owned enterprises and the private sector.

³ DFIs can achieve this by providing risk mitigation instruments such as blended finance, credit enhancement mechanisms, viability gap funding, first loss reserves, and conditional and A/B loans. These tools collectively reduce risk exposure and strengthen market incentives for investors. Additionally, DFIs can serve as a platform to attract private capital and encourage more private actors—both international and domestic—to invest.

in launching and sustaining the transformation. Although private companies recognize that investing in the green sector could yield long-term benefits, they hesitate to increase their current investments because they perceive the associated risks—such as costs and market uncertainty—as too high in the short term.

To overcome this, the government should foster a favourable investment climate that allows the private sector to commit to long-term, voluntary investments. Green technology and industry, which are central to the green transformation, have the potential to generate significant profits in the long run, but they also involve considerable risks. As a result, financing pathways must be improved and tax incentives strengthened to support the growth of green technology and industries. While direct government investment is important, a variety of policies should be implemented to cultivate an inviting investment environment.

The tax system should be revised to support green objectives—offering incentives for climate action, energy efficiency, and increased private sector engagement. In this restructuring process, it is essential to design the tax system for simplicity to avoid unnecessary complexity and to consider linking environmental taxes, such as those from the greenhouse gas emissions trading system, greenhouse gas and energy target management, and carbon taxes. Tax relief measures—such as exemptions or preferential tax rates for GSS bond investments—could serve as additional incentives to attract green capital. Furthermore, investments in green bonds can be encouraged by mitigating the perceived risks associated with GSS bond investments in the credit evaluations conducted by financial institutions.

4.2.4. Incentive System Development for Promoting Private Finance

Strong government-led leadership may lead to significant problems if the costs of government inefficiency outweigh the benefits, especially as the competitiveness and capabilities of the private sector improve. With continued economic growth, leadership in policy implementation should progressively shift from government dominance to private sector engagement. Policy implementation should focus on enhancing private sector participation by revitalizing market functions. Government leadership should guide policy discourse and ensure the timely implementation of national strategies while simultaneously fostering private sector autonomy and participation. Furthermore, effective communication between the government and private sector experts should be maintained throughout the policy proposal, formulation, and implementation processes.

The following policy measures could be considered to revitalize private investment and finance:

- **Activation of Green Finance at the Government Level:** The government should considerably scale up its support for green bonds, loans, and other instruments, including offering interest subsidies for corporate green finance. Additionally, it should develop and broaden financing measures across various green sectors. Green-issued green bonds, which fund environmental improvement projects, serve as a market signal for green finance when issued by the government.

- **Public-Private Joint Fund Management:** Expanding public-private joint funds is essential for channelling investment into sustainable sectors. Funds supporting sustainable industries, such as hydrogen funds and green industry export funds, should be established and developed to facilitate capital flows toward eco-friendly sectors.
- **Promotion of Green Bond Issuance:** MOE will support companies by clarifying issuance standards and bridging information gaps between bond issuers and evaluators through updated Green Bond Guidelines.
- **Interest Subsidy Support Program:** MOE will provide financial benefits to issuers by covering part of the issuance costs through interest subsidy programs for green bonds.
- **Expansion of Green Finance for SMEs:** Financial support is essential for the green transition of small and medium-sized enterprises (SMEs). State-run and private financial institutions should develop tailored ESG models to better assess and finance SME green projects.
- **Green Export Funds and Technology Guarantees:** A dedicated Green Export Fund will back overseas ventures by green firms, boosting their competitiveness and financial resilience. Additionally, a “Green Industry Technology Guarantee” program will be launched in collaboration with the Technology Finance Corporation to support companies with excellent green technologies that struggle to secure loans due to their small scale.
- **Green Finance Model Standards:** Sector-wide green finance model standards should be introduced to guide financial support protocols and risk management. A plan should be formulated to introduce green finance promotion organizations within financial companies.
- **Climate Change Stress Testing:** Financial institutions should be required to implement plans for managing climate-related risks and the implications of transitioning to a low-carbon economy. Stress testing should be conducted to analyze the impact of these risks on the economic health of institutions.

4.3. Implementation Plan for Improving Regulatory Framework

Sections 4.1 and 4.2 outline the governance and legal frameworks necessary to advance the green transition, alongside policy recommendations aimed at enhancing government investment and activating green finance. Realizing these reforms requires targeted amendments to existing laws and regulatory mechanisms. It is equally important to prioritize these initiatives and adopt a phased, systematic approach for their execution.

Turning the interim policy directions into reality calls for clear, actionable implementation strategies (see <Table 1-7>). In contrast, the Green Transition agenda presents a comprehensive framework that includes fiscal reforms, financial mobilization, and multi-stakeholder participation. The conversion of these high-level policy proposals into actionable initiatives hinges on the clarity of institutional mandates, financing modalities, regulatory alignment, and measurable outputs.

Past reform efforts in Indonesia have shown that inadequate coordination, fragmented resources, and inconsistencies in planning and budgeting systems frequently hinder policy success. Therefore, embedding these proposed measures within national strategic documents—such as the RPJMN

and LCDI framework—is critical for ensuring institutional integration and coherence among agencies. To provide clarity and accountability, each strategy should outline timelines, lead and support institutions, projected costs, financing options, and performance indicators.

Indonesia's historical experience in climate governance highlights the risks associated with insufficient coordination mechanisms. The dissolution of the DNPI in 2015 exemplifies the challenges posed by unclear institutional roles and weak authority. Currently, the DGCC within the MoEF serves as the primary body for climate-related regulation and international reporting; however, its scope is largely technical and sector-specific. Essential elements of the green transition—including climate finance, carbon pricing, and just transition frameworks—lie within the jurisdictions of the Ministry of Finance, the Financial Services Authority (OJK), and state-owned enterprises, necessitating more cohesive leadership.

To mitigate institutional fragmentation, the establishment of a National Green Transition Council under the President's Office is proposed. This body would act as a central coordinating authority tasked with setting strategic priorities, aligning policy instruments across ministries, and overseeing implementation progress, drawing parallels to Korea's Presidential Committee on Green Growth or Vietnam's National Steering Committee on Climate Change.

Moreover, each policy area within the Green Transition framework requires an actionable and technically sound plan. Foreign capital mobilisation will depend on a Green Investment Framework that provides legal clarity, risk buffers, and unified project standards. The formulation of a national green taxonomy and a centralized green project pipeline, coordinated by the Ministry of Finance and OJK, will facilitate investor engagement and enhance project transparency. Implementing green loan guarantees will require coordinated design efforts from fiscal authorities, public financiers, and development agencies.

Public participation strategies should be actively implemented through targeted engagement mechanisms, capacity building at the subnational level, and transparent feedback systems. Without these strategies, the likelihood of stalled policies and execution failures increases significantly. Consequently, the Green Transition should evolve not merely as a normative agenda but as a meticulously planned and institutionally supported process of transformation.

<Table 1-7> Implementation Plan for Improving Regulatory Framework

Improvement Measures	Key Contents	Indonesia	Gap/Necessary Actions	Priority
Governance and Legal System				
Establishment of a Control Tower to Deliberate on the Green Transition	Centralized decision-making body to oversee and coordinate green transition policies	Fragmented institutional responsibilities across multiple ministries, leading to inefficiencies	Establish a National Green Transition Council under the President's Office to streamline decision-making (following Korea's Presidential Committee on Green Growth)	Immediate
Ensuring the Sustainability of Green Transition	Integrating green policies into long-term national development plans	Green economy is included in RPJMN 2020-2024, but long-term continuity is uncertain	Enact a Green Growth and Climate Resilience Law, similar to Korea's Framework Act on Low Carbon Green Growth (2010)	Moderate
Enactment and Revision of Laws and Regulations for Green Transition	Strengthening legal frameworks for climate action and energy transition	Various sectoral regulations exist, but lack a comprehensive framework	Enact Roadmap of Energy Transition	Moderate
Governance Improvement for Stakeholder Engagement	Enhancing multi-stakeholder collaboration between government, private sector, and civil society	Engagement with the private sector is increasing but remains inconsistent	Institutionalize Green Business Roundtables, similar to Korea's Green Growth Alliance, to ensure regular dialogue with industries and investors	Immediate
Government Investment and Green Finance				
Expanding Green Investment through the Public Sector	Increasing government-led investments in renewables and green infrastructure	Public investment is rising, but budget allocations remain limited	Increase public green investment to at least 2% of GDP, as Korea did under its Green New Deal (2020)	Less
Expansion of Foreign Private Capital and International Development Finance Attraction	Attracting international green finance and FDI for sustainability projects	Limited access to global climate funds and blended finance mechanisms	Strengthen regulatory certainty through a clear Green Investment Framework and tax incentives to attract FDI in renewable projects	Moderate
Establishment of a Tax Support System to Encourage Private Sector Participation	Providing tax breaks and incentives for green businesses and sustainable investments	Some tax incentives exist (e.g., tax holidays for renewables), but they are not comprehensive	Introduce Green Tax Credits (modeled after Korea's Carbon Neutral Tax Policy) to incentivize clean energy investments	Moderate
Incentive System Development for Promoting Private Finance	Creating financial instruments to encourage private green investments	Green Sukuk and IDX Carbon exist, but private participation is still low	Develop Green Loan Guarantees and Blended Finance Mechanisms, similar to Korea's Green Finance Mobilization Strategy	Moderate

Sources: Authors (2025).

5. Concluding Remarks

This study offers policy recommendations aimed at revitalizing green investment in Indonesia by examining existing efforts and the business environment. These recommendations incorporate examples from Korea, guidelines from international organizations, and best practices from donor countries. We have outlined a roadmap and policy framework for regulating green transformation, focusing on energy transformation, and proposed improvements to the legal and regulatory system for implementing green investment, as well as fiscal policies and systems to support energy transformation. Given the broad themes of the roadmap and policy framework—such as regulating green transformation and fiscal mechanisms—our research has focused specifically on the regulatory system, including relevant legal provisions.

Korea established a Five-Year Green Transition Plan in 2009, marking the formal launch of its green transition policies. The plan aimed to address climate change, foster new growth engines, improve quality of life, and enhance Korea's international competitiveness. This initiative was solidified in 2010 with the enactment of the Low Carbon, Green Growth Act, which provided the legal foundation for the movement. It subsequently expanded into a nationwide campaign through the active efforts of the Presidential Green Transition Committee, local Green Transition Committees established by regional governments, and related organizations responsible for formulating and implementing follow-up policies.

Initially, there was considerable skepticism regarding the Green Transition Policy. However, public awareness of the need to address climate change, reduce oil dependency through enhanced energy independence, green the manufacturing sector, and promote sustainable land use, transportation systems, and eco-friendly lifestyles has gradually increased nationwide. While Korea's Green Transition Policy achieved significant results, the implementation process also revealed numerous challenges. Drawing on these lessons, this paper concludes with the following key considerations for Indonesia's green transition efforts:

Firstly, although the green transition policy aims for sustainable development, it is essential to balance the three pillars of sustainable development—economic, environmental, and social development. Crucially, the green transition policy on its own is not sufficient to achieve comprehensive sustainable development. Korea's initial green growth policies focused heavily on economic and environmental goals, while comparatively overlooking the social dimension. Issues such as increasing poverty, worsening social inequality, and social exclusion—critical factors determining social development—were not sufficiently considered in these policies. Therefore, to distinguish the green transition policy from traditional economic development models and truly position it as a sustainable strategy, greater attention to social development is imperative.

Secondly, the concept of “justice” in a Just Energy Transition refers to the fair distribution of benefits and costs, the inclusion of all stakeholders in the decision-making process, and the recognition and respect for social, cultural, racial, and gender differences. As an environmentally oriented growth strategy, green transition inherently entails development projects. However, it is critical to assess the environmental impacts of such projects and minimise potential harm during their execution. Effective communication involving diverse stakeholders is essential throughout the development process. By adequately considering environmental impacts, development projects can be promoted in a truly sustainable manner. Therefore, in Indonesia’s case, a thorough and inclusive consultation process should be ensured during the formulation and implementation of energy transition plans.

Thirdly, establishing a legal and institutional foundation for promoting green conversion policies is necessary. In Korea, the Low Carbon, Green Growth Act provided the legal basis for implementing policies such as the Five-Year Green Transition Plan. Subsequent enactments and revisions of related laws and regulations allowed these policies to be pursued within a legitimate legal framework. However, the Green Growth Committee—despite being the top-level policy body—operated largely as an advisory entity with limited capacity for deliberation, coordination, and enforcement. It lacked the authority to effectively coordinate the opinions of various government ministries and enforce policy initiatives. Although concerns about excessive centralisation remain, it is imperative to enhance the authority of the top-level agency within the green transition governance structure to ensure the effective nationwide application of new national strategies and economic development paradigms.

Finally, regarding funding, Indonesia should secure Just Energy Transition Partnership (JETP) funds through a combination of subsidies, concessional loans, market-rate loans, guarantees, and private investments. Although donor countries have pledged support, most of the funding will come in the form of market-rate loans, with only a limited share provided as direct subsidies. Consequently, the interest payments on these loans could potentially exceed the amount of subsidies received.

In other words, the JETP—designed by historically high-emitting developed countries to assist developing nations—paradoxically places a heavier financial burden on those very developing countries. Furthermore, Indonesia’s JETP process does not adequately ensure public participation. Given that developed countries, which have not fully addressed their historical responsibilities for climate change, impose significant financial burdens on developing nations through climate finance, this raises questions about whether this can truly be considered a plan for a just transition.

To address these challenges, Indonesia should strengthen its position in international development cooperation and financial markets. In particular, global and regional geopolitical dynamics play a significant role in shaping Indonesia’s financial flows, particularly in securing sustainable funding for green investments. These dynamics manifest through shifting trade relations, energy security challenges, and evolving international climate finance commitments, each presenting distinct challenges and opportunities for policymakers. Indonesia’s ability to secure sustainable funding hinges on navigating geopolitical complexities while capitalizing on its unique strategic advantages. Policymakers should prioritize diversifying economic partnerships, accelerating renewable energy projects, and strengthening institutional readiness to access international finance. Aligning domestic reforms with international climate objectives will position Indonesia to mitigate risks and establish itself as a frontrunner in the global green economy.

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Act on the Creation and Fostering of Green Convergence Clusters (Act No. 18469, amended on September 24, 2021, effective March 25, 2022)

Act on the Management of Public Institutions (Act No. 20400, partially amended on March 26, 2024, effective September 27, 2024)

Act on the Promotion and Support of Water Reuse (Act No. 20115, partially amended on January 23, 2024, effective July 24, 2024)

Act on the Promotion of Development, Use and Diffusion of New and Renewable Energy (Act No. 19040, partially amended on November 15, 2022, effective November 15, 2022)

Act on the Promotion of Environment-Friendly Agriculture and the Fisheries and the Management of and Support for Organic Foods (Act No. 18445, amended on August 17, 2021, effective January 1, 2023)

Act on the Promotion of Saving and Recycling of Resources (Act No. 19963, partially amended on January 9, 2024, effective July 10, 2024)

Act on the Promotion of the Conversion into Environment-Friendly Industrial Structure (Act No. 19208, amended on December 31, 2022, effective January 1, 2024)

Act on Promotion of Transition to Circular Economy and Society (Act No. 19208, completely amended on December 31, 2022, effective January 1, 2025)

Act on Public-Private Partnerships in Infrastructure (Act No. 20409, amended on March 26, 2024, effective March 26, 2024)

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Smart Grid Construction and Utilization Promotion Act (Act No. 12154, amended on January 1, 2014, effective January 1, 2014)

Special Act on the Installation and Operation of Public Waste Resource Management Facilities and Resident Support (Act No. 20385, amended on March 19, 2024, effective January 1, 2025)

Special Act on Designation and Management of Free Economic Zones (Act No. 19952, partially amended on January 9, 2024, effective January 9, 2024)

State Bond Act (Act No. 19327, partially amended on April 11, 2023, effective May 12, 2023)

State Credit Management Act (Act No. 16957, amended on February 4, 2020, effective August 5, 2020)

Sustainable Transportation and Logistics Development Act (Act No. 11801, amended on May 22, 2013, effective May 22, 2013)

Appendix

<Appendix 1-1> Laws for Legislative Reform Related to the Green Transition

Ministry in Charge	Number of Laws	Name of the Law
Ministry of Environment	18	Act on the Promotion of Saving and Recycling Resources, Wildlife Promotion and Management Act, Water Supply and Waterworks Installation Act, Act on the Improvement of Water Quality and Support for Residents of the Han River Basin, Act on Water Management and Residents Support in the Nakdong River Basin, Act on Water Management and Resident Support in the Geum River Basin, Act on Registration and Evaluation of Chemical Substances, Clean Air Conservation Act, Enforcement Decree of the Act on resource Circulation of Electrical and Electronic Equipment and Vehicles, Enforcement Decree of the Water Supply and Waterworks Installation Act, Enforcement Decree of the Natural Parks Act, Enforcement Decree of the Natural Environment Conservation Act, Enforcement Decree of the Environmental Impact Assessment Act, Special Act on the Improvement of Air Quality in the Seoul Metropolitan Area, Act on Water Management and Resident Support in the Yeongsan River and Seomjin River Basins, Enforcement Rule Of The Water Supply And Waterworks Installation Act, Enforcement Rule Of The Natural Environment Conservation Act, Enforcement Rule Of The Environmental Impact Assessment Act
Korea Forest Service	6	Enforcement Decree of the Forest Protection Act, Enforcement Decree of the Special Act on Management of Mountainous Districts North of the Civilian Control Line, Enforcement Decree of the Forest Education Promotion Act, Enforcement Rule Of The Forest Protection Act, Enforcement Rule of Act On The Creation And Furtherance Of Arboretums And Gardens, Enforcement rule of Special Act on Management Of Mountainous Districts North Of The Civilian Control Line
Ministry of Knowledge Economy	9	Aerospace Industry Development Promotion Act, Act on the Promotion of Development, Use and Supply of New and Renewable Energy, Energy Use Rationalization Act, Foreign Investment Promotion Act, Weights and Measures Act, Enforcement Decree of the Act on the Promotion of the E-Learning Industry, Enforcement Decree of The Act on Promotion And Sophistication Of Ppuri Industries, Enforcement Rules of the Act on the Promotion of the E-Learning Industry, Enforcement Rule of The Act on Promotion And Sophistication Of Ppuri Industries
Ministry of Land, Transport and Maritime Affairs (2013) Ministry of Oceans and Fisheries	12	National land Planning and Utilization Act, Motor Vehicle Management Act, Groundwater Act, Marine Environment Management Act, Framework Act on Logistics Policies, Urban Traffic Improvement Promotion Act, Enforcement Decree of the Urban Development Act, Enforcement Decree of the National Land Planning and Utilization Act, Enforcement Decree of the Framework Act on the National Land, Enforcement Decree Of The Urban Railroad Act, Enforcement Rules Of The Urban Railroad Act, Regulations on the Certification of Energy Efficiency Grades for Buildings
Ministry for Food, Agriculture, Forestry and Fisheries (2013) Ministry of Agriculture, Food and Rural Affairs	14	Act on the Promotion of Science and Technology for Food, Agriculture and Forestry, Enforcement Decree of the Pesticide Control Act, Overseas Agricultural Development Cooperation Act, Enforcement Decree of the Act on Development and Support of Urban Agriculture, Enforcement Decree of the Support for Diet Education Act, Enforcement Decree of the Act on the Conservation, Management, and Utilization of Agricultural Genetic Resources, Enforcement Decree Of the Salt Industry Promotion Act, Enforcement Rules of the Pesticide Control Act, Enforcement Rules of the Act on Development and Support of Urban Agriculture, Enforcement Rules of the Act on the Conservation, Management, and Utilization of Agricultural Genetic Resources, Enforcement Rules Of The Salt Industry Promotion Act, Standards for the Safety Management and Disposal of Agricultural Materials Related to Urban

Ministry in Charge	Number of Laws	Name of the Law
		Agriculture, Standards for the Production, Management, and Quality Control of Superior Sea Salt, Standards for the Production, Management, and Quality Control of Eco-Friendly Sea Salt
Ministry of Education, Science and Technology (2013) Ministry of Science, ICT and Future Planning Ministry of Education	1	Space Development Promotion Act
Ministry of the Interior and Safety	1	Act on the Promotion of Bicycle Use
Ministry of Health and Welfare	2	Enforcement Decree of the Special Act on Fostering and Support of Pharmaceutical Industry, Enforcement Rules Of The Special Act On Fostering And Support Of Pharmaceutical Industry.
Defense Acquisition Program Administration	1	Defense Acquisition Program Act
National Emergency Management Agency National Fire Agency	2	Countermeasures Against Natural Disasters Act, Enforcement Decree of the Countermeasures Against Natural Disasters Act
Korea Meteorological Administration	5	Weather Observation Standardization Act, Weather Act, Weather Industry Promotion Act, Enforcement Decree of the Weather Act, Enforcement Rules of the Weather Act

Source: Ministry of Government Legislation of Korea (2012) Promoting the enactment and revision of a total of 74 laws to realize the national vision of "green growth": Establishing the 2012 Green Law Legislation Plan.

<Appendix 1-2> Structure and Main Contents of Carbon Neutrality Basic Act

Structure	Main Contents
Chapter 2: National Vision and Greenhouse Gas Reduction Targets, etc.	<ul style="list-style-type: none"> • Matters related to national vision and national strategy • Matters related to mid- to long-term national greenhouse gas reduction targets • Matters related to the establishment, revision, and review of national strategy every five years
Chapter 3: Matters concerning the establishment and implementation of plans by cities, provinces, and cities, counties, and districts	<ul style="list-style-type: none"> • Matters related to the establishment and implementation of the National Carbon Neutral Green Growth Basic Plan • Matters related to the establishment and implementation of plans by cities, provinces, cities, counties, and districts
Chapter 4: 2050 Carbon Neutral Green Growth Committee, etc.	<ul style="list-style-type: none"> • Matters concerning the composition and operation of the 2050 Carbon Neutral Green Growth Committee • Matters concerning the functions of the Committee and the composition of its subcommittees • Matters concerning the composition and operation of local Carbon Neutral Green Growth Committees
Chapter 5: Measures to Reduce Greenhouse Gas Emissions	<ul style="list-style-type: none"> • Matters concerning the implementation and review of climate change impact assessments • Matters concerning the greenhouse gas reduction budget system and the greenhouse gas emissions trading system • Matters concerning the greenhouse gas target management of the public sector and management companies • Matters concerning the designation of carbon-neutral cities and support for regional energy transition • Matters concerning the expansion of green buildings and the promotion of green transportation • Matters concerning the creation of carbon sinks and the development of carbon capture, utilization, and storage technologies

Structure	Main Contents
	<ul style="list-style-type: none"> Matters concerning the promotion of international reduction projects and the establishment of a comprehensive greenhouse gas information management system
Chapter 6: Realization of Green Life and Sustainable Development	<ul style="list-style-type: none"> Matters concerning the monitoring and prediction of the climate crisis Matters concerning the establishment, implementation, and inspection of national climate crisis adaptation measures Matters concerning public institutions and local climate crisis response and adaptation projects Matters concerning water, green land, and agriculture, forestry, and fisheries management Matters concerning the designation and evaluation of national climate crisis adaptation centers
Chapter 7: Justifiable Conversion	<ul style="list-style-type: none"> Matters concerning the establishment of a social safety net for the climate crisis Matters concerning the designation of the Just Transition Special District Matters concerning support for minimizing the risk of business transformation and asset loss Matters concerning support for ensuring public participation and revitalizing cooperatives Matters concerning the establishment and operation of the Just Transition Support Center
Chapter 8: Green Growth Policy	<ul style="list-style-type: none"> Matters concerning the fostering and support of green economy and green industry, the promotion of green management by companies, and the research and development and commercialization of green technologies Matters concerning support, special cases, and standardization certification for green technologies and green industries Matters concerning the creation of green technology and green industry clusters and complexes Matters concerning information and communication technology and service policies, and the revitalization of the green economy
Chapter 9: Transition to a carbon-neutral society and the spread of green growth	<ul style="list-style-type: none"> Matters concerning the formation of the Carbon Neutral Local Government Alliance, etc. Matters concerning the transition to a carbon-neutral society and the spread of a production and consumption culture for green growth. Matters concerning the support of the green life movement, education and promotion, and the establishment of a carbon-neutral support center.
Chapter 10: Establishment and Operation of the Climate Response Fund	<ul style="list-style-type: none"> Matters concerning the establishment and use of the Climate Response Fund Matters concerning the transfer of funds from the general account and securing of resources Matters concerning the operation of the fund, management system, accounting, and settlement
Chapter 11: Supplementary Provisions	<ul style="list-style-type: none"> Matters related to the promotion of international cooperation and compliance with standards Matters related to the preparation of national reports and reporting to the National Assembly and local councils Matters related to the designation of the Officer in Charge of Carbon Neutrality Implementation and the hearing process Matters related to the delegation and consignment of authority and the application of the civil service agenda Matters related to the imposition of fines

Source: Framework Act on Carbon Neutrality and Green Growth for Coping with Climate Crisis (Act No. 20514, partially amended on October 22, 2024, effective October 22, 2024).

<Appendix 1-3> Structure and Main Contents of the Act on the Allocation and Trading of Greenhouse-Gas Emission Permits

Structure	Main Contents
Chapter 2: Establishment of the Basic Plan for the Emissions Trading System	<ul style="list-style-type: none"> • Matters concerning the mid- to long-term policy goals and basic direction of the emissions trading system • Matters concerning the establishment of the national emissions trading system and the allocation committee
Chapter 3: Designation of Allocated Entities and Allocation of Emissions Permits	<ul style="list-style-type: none"> • Matters concerning the designation of companies subject to allocation and the management and operation of the emission allowance register • Matters concerning the allocation, application, notification, additional allocation, cancellation, and reserve of emission allowances
Chapter 4: Emissions Trading	<ul style="list-style-type: none"> • Matters concerning the registration of emissions trading accounts, reporting of transactions, and stabilization of exchanges and trading markets
Chapter 5: Reporting, Verification, and Certification of Emissions	<ul style="list-style-type: none"> • Matters concerning the reporting of emissions, verification procedures, verification agencies, and verification auditors • Matters concerning the emission certification procedure and the establishment of a certification committee
Chapter 6: Submission, Carryover, Borrowing, Offsetting, and Expiration of Emissions Permits	<ul style="list-style-type: none"> • Matters concerning the submission, carryover, borrowing, and offsetting of emission permits and the management of the offset and offset registration book • Matters concerning the certification of greenhouse gas reduction from external projects, the imposition of fines, and the disposition of delinquent payments
Chapter 7: Supplementary Provisions	<ul style="list-style-type: none"> • Matters concerning financial and tax support, activation of emissions trading, and linkage with the international carbon market • Matters concerning fact-finding investigations, hearing procedures, appeals, and fee charges • Matters concerning the delegation and consignment of authority and the application of the civil service agenda
Chapter 8: Penalties and Fines	<ul style="list-style-type: none"> • Matters concerning violations, penalties, joint and several liability provisions, and fines

Source: “Act on the Allocation and Trading of Greenhouse-Gas Emission Permits” (Law No. 20172, Amended by Other Laws on January 30, 2024, Effective January 30, 2024).

<Appendix 1-4> Main Carbon Neutral Green Growth-related Laws

Name of Law	Main Contents	Ministry in Charge
Sustainable Transportation Logistics Development Act	This law was established to promote the reduction of greenhouse gases and energy conservation in the transportation and logistics sector, which had been a major source of greenhouse gases and environmental pollution, and to create a foundation for the development of sustainable transportation and logistics through this. In particular, this law covers matters related to the promotion of the transition to a sustainable transportation and logistics system and the revitalization of carbon-free transportation methods.	Ministry of Land, Infrastructure and Transport
Smart Grid Construction and Utilization Promotion Act	This law was established to foster related industries, actively respond to climate change, create a low-carbon green growth-oriented future industrial base, and innovate the energy use environment and develop the national economy through the construction and promotion of the use of intelligent power grids. This law covers the management of businesses for the construction and promotion of the use of intelligent power grids, support for investment costs, certification and standardization, designation of base areas, designation of industrial promotion support organizations, and other related matters and the management of related information.	Ministry of Trade, Industry and Energy

Name of Law	Main Contents	Ministry in Charge
Green Buildings Construction Support Act	The purpose of this law is to contribute to the realization of low-carbon green growth and the improvement of national welfare by reducing greenhouse gas emissions from buildings and expanding green buildings through the provision of matters necessary for the creation of green buildings. The law promotes the establishment of a basic plan for green buildings and matters related to the construction of green buildings, measures for managing building energy and greenhouse gas emissions, matters related to the implementation of a green building grading system, matters related to green remodeling, and the development and dissemination of new renewable energy technologies.	Ministry of Land, Infrastructure and Transport
Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy	The purpose of this law is to contribute to sustainable development and the promotion of national welfare by achieving diversification and stable supply of energy, environmentally friendly energy conversion, and greenhouse gas emission reduction through the promotion of technology development and dissemination of new and renewable energy. The law covers matters related to the establishment and implementation of a basic plan for new and renewable energy, technology development and dissemination projects for new and renewable energy, certification and management of new and renewable energy facilities, and mandatory use of new and renewable energy and supply certification systems.	Ministry of Trade, Industry and Energy
Energy Use Rationalization Act	The purpose of this law is to promote the stable supply and rational and efficient use of energy, reduce environmental damage caused by energy consumption, contribute to the sound development of the national economy and the promotion of national welfare, and minimize global warming. The law includes provisions on the establishment and measures of the Basic Plan for Rational Use of Energy, implementation of energy audits, consultation and review of energy use plans, and support for energy conservation specialist companies.	Ministry of Trade, Industry and Energy
Act on Promotion of Transition to Circular Economy and Society	This law aims to contribute to the creation of a sustainable recycling-based economy and society by efficiently utilizing resources in all stages of a product's life cycle, including production, distribution and consumption, and by minimizing waste generation and promoting the recycling of waste. The act includes the establishment of a basic plan for a recycling-based economy, measures to promote a recycling-based economy, the promotion of the use of recycled resources and recycled resource certified products, special regulations for new recycling-based economy technologies and services, and matters related to the creation and support of a recycling-based economy infrastructure.	Ministry of Environment
Act on the Creation and Fostering of Green Convergence Clusters	This law aims to contribute to strengthening national competitiveness and developing the regional economy by promoting the accumulation, fusion and combination of green industries and green-related industries, supporting related research and development and commercialization, and creating advanced technologies. The act includes the establishment and operation of green fusion clusters, the establishment and revision of basic plans, the designation and support of green innovation industries and green innovation companies, support for resident companies, the designation of specialized research institutes, international exchange and research and development support, etc.	Ministry of Environment

Name of Law	Main Contents	Ministry in Charge
Act on the Promotion of the Development and Diffusion of Environmentally Friendly Vehicles	<p>This law aims to formulate comprehensive plans and measures to promote the development and spread of environmentally friendly vehicles, and to contribute to the national economy by promoting the sustainable development of the automobile industry and improving the living environment of the people.</p> <p>The law includes the establishment of a basic plan for the development and popularization of environmentally friendly vehicles, technological development and infrastructure development, the installation and support of charging facilities, support for purchasers and owners, the obligation of public institutions to purchase, international technical cooperation projects, support for related companies and companies moving into the area, the installation and operation of parking areas for environmentally friendly vehicles, the imposition of fines for acts that interfere with charging, and funding support and financial procurement plans.</p>	Ministry of Trade, Industry and Energy
Act on the Promotion of Saving and Recycling of Resources	<p>The purpose of this law is to promote environmental conservation and the sound development of the national economy by reducing waste generation, promoting recycling, and using resources in a cyclical manner. The law includes measures for saving and recycling resources, sorting and collecting waste, and promoting the recycling of resources.</p>	Ministry of Environment
Act on the promotion of the Conversation into Environment-Friendly Industrial Structure	<p>This law aims to conserve energy and resources, actively promote low-carbon and environmentally friendly industrial activities, and protect the environment and achieve sustainable development of the national economy. The act includes the formulation of comprehensive measures, the development of clean production technology, the promotion of green management, and the revitalization of the circular economy.</p>	Ministry of Trade, Industry and Energy
Act on Resource Circulation of Electrical and Electronic Equipment and Vehicles	<p>This law aims to protect the environment and promote the sound development of the national economy by reducing the use of hazardous substances, promoting recycling, and establishing a resource recycling system. The act includes provisions on imposing recycling obligations on manufacturers and retailers, registering and managing recycling businesses, setting recycling targets, and imposing surcharges for non-compliance with obligations.</p>	Ministry of Environment
Act on the Promotion of Purchase of Green Products	<p>This law promotes the sustainable development of the national economy by stimulating the purchase of green products, preventing the waste of resources and environmental pollution, and contributing to the reduction of greenhouse gases. The act includes the obligation of public institutions to purchase green products, the establishment and operation of a Green Purchasing Support Center, the establishment of a basic plan to promote the purchase of green products, and the imposition of surcharges.</p>	Ministry of Environment
Enforcement Decree of the Environmental Technology and Industry Support Act	<p>This law aims to promote environmental conservation and sustainable economic development through the development and dissemination of environmental technology and the fostering of environmental industries. Its main provisions include certification of new technology, designation of green companies, registration of environmental consulting companies, operation of green environmental support centers, and international cooperation.</p>	Ministry of Environment
Act on the Promotion of Environment-Friendly Agriculture and Fisheries and the Management of and Support for Organic Foods	<p>This law aims to protect the environment in the process of agricultural and fishery production, support farmers and fishermen who produce environmentally friendly agricultural products and organic foods, and create a sustainable agricultural ecosystem. The main activities include operating</p>	Ministry of Agriculture, Food and Rural Affairs, Ministry of Oceans and Fisheries

Name of Law	Main Contents	Ministry in Charge
	an environmentally friendly agricultural certification system, supporting the production and distribution of organic materials, and providing education and technical support for environmentally friendly agriculture.	
Act on Promotion and Support of Water Reuse	This law aims to improve citizens' quality of life by revitalizing water reuse, promoting the efficient use of water resources and reducing water pollution, and ensuring the sustainable use of water resources. The act includes establishing a basic plan for water reuse, establishing and managing water reuse facilities, approving projects for the reuse of treated wastewater, and developing technology and financial support for water reuse.	Ministry of Environment
Special Act on the Installation and Operation of Public Waste Resources Management Facilities and Resident Support	This law aims to prevent damage to public health and property caused by waste resources, to promote sustainable environmental conservation through the speedy and environmentally friendly establishment and operation of public waste resource management facilities, and to improve the quality of life of citizens. The Act includes the establishment of a basic plan for public waste resource management facilities, the establishment and operation and management of facilities, support for residents and the sharing of benefits, strengthening of environmental management, and penal provisions for violations of the Act.	Ministry of Environment

Sources: Applicable legal provisions mentioned in the table.

<Appendix 1-5> Major Financial Investments and Laws and Regulations Related to Public Institutions

Name of Law	Main Contents	Ministry in Charge
1. Laws related to national finance		
National Finance Act	This law aims to establish efficient and transparent financial management and a sound financial foundation by stipulating matters such as the national budget, funds, financial statements, performance management, and government bonds.	Ministry of Economy and Finance
Public Capital Management Fund Act	This law establishes a public fund management fund to efficiently manage the issuance and redemption of government bonds, etc., by integrating the management of surplus funds, such as funds, and utilizing them for public purposes, such as financial loans, and stipulating the matters necessary for their operation and management.	Ministry of Economy and Finance
State Credit Management Act	The purpose of this is to ensure the proper management of government bonds by setting standards for the management organization, management procedures and changes to and exemptions from the content of government bonds.	Ministry of Economy and Finance
State Bond Act	This is to ensure the stable management of the government bond market and the efficient execution of government bond-related operations by setting basic matters concerning the issuance and registration of government bonds and the repayment of principal.	Ministry of Economy and Finance
2. Law related to the Management of Public Institutions		
Act on the Management of Public Institutions	The purpose of this law is to contribute to the improvement of public services by public organizations by establishing the basic matters concerning the	Ministry of Economy and Finance

Name of Law	Main Contents	Ministry in Charge
	operation of public organizations and the matters necessary for the establishment of autonomous management and a responsible management system, and by streamlining management and increasing the transparency of operations.	
3. Laws related to private and foreign investment		
Foreign Investment Promotion Act	This presidential decree specifies the matters delegated to it by the "Foreign Investment Promotion Act" and the detailed provisions necessary for its implementation in order to promote and manage foreign investment. This enforcement decree comprehensively deals with matters such as the investment criteria, procedures, restrictions, support policies, and post-investment management of foreign investors.	Ministry of Trade, Industry and Energy
Special Act on Designation and Management of Free Economic Zones	This law aims to promote foreign investment and attract businesses by improving the business environment for foreign-invested companies and domestic companies returning to the country, as well as the living environment for foreigners, through the designation and operation of economic free zones. It also aims to strengthen national competitiveness and achieve balanced regional development.	Ministry of Trade, Industry and Energy
Act on the Creation and Development of Financial Hubs	The purpose of this law is to contribute to the development of the national economy by strengthening the competitiveness of the financial industry and advancing the financial market, by stipulating the matters necessary for the creation and development of a financial center.	Financial Services Commission
Act on Real Name Financial Transactions and Confidentiality	The purpose of this law is to realize economic justice and promote the sound development of the national economy by conducting financial transactions using real names and guaranteeing the confidentiality of those transactions.	Financial Services Commission
Foreign Land Law	The purpose of this law is to regulate matters related to the acquisition of land by foreigners in the territory of the Republic of Korea.	Ministry of Land, Infrastructure and Transport
Foreign Exchange Transactions Act	The purpose of this law is to guarantee the freedom of foreign exchange transactions and other foreign transactions, to revitalize market functions, to facilitate foreign transactions and to achieve balance in the international balance of payments and stability in the value of the currency, and to contribute to the sound development of the national economy.	Ministry of Economy and Finance
Monopoly Regulation and Fair Trade Act	The purpose of this law is to prevent the abuse of a dominant market position and excessive concentration of economic power by business operators, to regulate unfair joint activities and unfair trade practices, and to promote fair and free competition, thereby creating creative corporate activities, protecting consumers, and promoting the balanced development of the national economy.	Fair Trade Commission
Act on Public-Private Partnerships in Infrastructure	The purpose is to contribute to the development of the national economy by promoting private investment in social infrastructure to expand and operate creative and efficient social infrastructure.	Ministry of Economy and Finance

Sources: Applicable legal provisions mentioned in the table.

02

Chapter

Expanding Investment Instruments, Investor Participation, and Incentives for Energy Transition

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Keywords:

Energy policy, Government support, Public-private partnership, Private sector engagement

Expanding Investment Instruments, Investor Participation, and Incentives for Energy Transition

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1. Introduction

The transition to a low-carbon energy system requires not only technological and regulatory preparedness but also substantial, sustained financial mobilization. Both Indonesia and Korea face significant financing needs to achieve their energy transition and broader climate goals. These needs are expected to increase further as both countries commit to more ambitious targets under their respective Nationally Determined Contributions (NDCs). The main sources of financing—government budgets, public agencies and policy banks, blended finance structures, private capital, and international financial assistance through development finance institutions and official aid—remain insufficient to bridge the widening financing gap.

This raises critical questions for policymakers and market participants: What obstacles hinder financing the energy transition? What funding sources are accessible? Which mechanisms most effectively mobilize capital flows? What policy frameworks can encourage private investment in renewable energy? How can key stakeholders within the energy transition ecosystem be identified, coordinated, and engaged?

This financing gap arises from several interrelated factors. First, many countries, including Indonesia, lack a sufficiently robust legal and regulatory foundation to support and accelerate investment in renewable energy and low-carbon infrastructure. Second, fiscal space is constrained, especially in emerging economies where competing social and economic demands limit the government's ability to allocate additional resources. Third, private and international investors remain hesitant due to profitability concerns, long-term revenue uncertainties, price volatility, and other financial or political risks.

A vast body of literature from international organizations, academics, and experts also provides detailed insights on regulations, policy frameworks, support measures, and various financial instruments used to mobilize energy transition finance. To achieve tangible results from ambitious climate goals, this chapter highlights key policy parameters for the energy transition, including:

- **National Targets and Strategies for Climate Goals:** Clear, long-term national commitments and action plans designed to meet climate objectives, such as reducing greenhouse gas

emissions, increasing renewable energy capacity, and achieving net-zero targets. These targets provide a roadmap for both public and private sector efforts in the energy transition.

- **Legal and Regulatory Frameworks and Compliance Obligations:** Policies and regulations that govern climate-related activities, including green taxonomies, mandatory disclosures, and processes for obtaining permits and licenses for renewable energy projects. These frameworks ensure transparency, standardization, and accountability in climate finance and project development.
- **Funding Sources:** Various channels for financing energy transition projects, including public funds (e.g., government subsidies), private investments (e.g., venture capital, green bonds), multilateral financing (e.g., development banks), and blended finance combining public and private resources. Access to diverse sources of capital is essential to scale up renewable energy deployment.
- **Support Mechanisms for Renewable Energy Development:** Financial and non-financial incentives to promote the growth of renewable energy, such as feed-in tariffs (guaranteed payments for renewable power), tax incentives, grants, and renewable energy credits. These incentives reduce financial risks for investors and accelerate the transition to cleaner energy sources.
- **Technological and Environmental Factors for Renewable Projects:** The availability and advancement of renewable energy technologies (e.g., wind turbines, solar panels, battery storage) and the natural conditions required for their success (e.g., solar radiation, wind speeds, geothermal resources). These factors shape the feasibility and efficiency of renewable energy projects in different regions.
- **Electricity Market Design and Grid Access:** The structure and regulations of electricity markets, including how energy is traded, access to power grids, and rules for dispatching renewable energy. A transparent market design with open grid access is crucial for integrating renewable energy into the energy system and ensuring a reliable electricity supply.

Chapter 1 of this report addressed the legal and institutional constraints that contribute to the financing gap in Indonesia's energy transition—such as regulatory uncertainty, limitations in fiscal capacity, and the challenges of attracting international and private capital, while Chapter 3 focuses on risk-related issues—particularly the factors that deter private investment in renewable energy projects. In this context, this chapter narrows its focus on addressing how investment resources for Indonesia's energy transition can be mobilized under such constraints. This chapter prioritizes tools that the Indonesian government can most effectively operationalize in the short to medium term. It examines practical approaches to financing through public budgets, the role of policy financial institutions, and indirect institutional mechanisms that can incentivize and crowd in private capital, despite inherent risks and long payback horizons.

Investment tools and financing mechanisms for energy transition are diverse and well-documented in international guidelines and country-level policy documents.¹ Rather than offering a comprehensive overview of all financing pathways, this chapter explores concrete mechanisms and

¹ NAP Global Network, *Inventory of Innovative Financial Instruments for Climate Change Adaptation* (accessed May 26, 2025), <https://napglobalnetwork.org/innovative-financing/>; UNCTAD (2023); and Qadir et al. (2021).

approaches through which Indonesia can operationalize the financing of its energy transition agenda under the current institutional and fiscal context. It centers on three primary components: (1) the catalytic role of public budgets in initiating high-risk, long-horizon investments; (2) the use of policy financial institutions and public agencies to deploy green capital and enable blended financing; and (3) the design of incentive systems—such as renewable portfolio standards (RPS), renewable energy certificates (REC), and power purchase agreements (PPA)—to attract and de-risk private capital. These mechanisms are presented as part of a broader, indirect regulatory framework designed to provide market signals and financial predictability for clean energy investments.

By contrast, financing through domestic capital markets or international private placements is only briefly addressed in this chapter. This is due to the significant contextual disparities between Korea and Indonesia in terms of the levels of market development and depth, credit ratings, and investor base composition. Given these structural differences, the Korean experience in capital markets offers limited practical lessons for Indonesia at this stage. It is treated as a background reference rather than a replicable model.

The structure of the chapter begins with a review of Korea's own policy experiences in green investment financing, highlighting both its achievements and its challenges. In several areas, Korea's short implementation track record precludes strong claims of success; in such cases, the chapter identifies early lessons and pitfalls that Indonesia may wish to avoid. In other areas, particularly in the use of government-led green investment funds and policy financial institutions, Korea's institutional arrangements provide potentially valuable models for Indonesia's consideration.

The Indonesian section then evaluates the country's current practices in mobilizing transition finance, including the use of government allocations, the Climate Response Fund, PT SMI's role in infrastructure finance, and existing public-private financing instruments. Finally, the chapter offers three key policy recommendations that draw on both countries' experiences: (1) expanding the Limited Concession Scheme—currently focused on transport and water infrastructure—into the renewable energy sector; (2) upgrading PT SMI into a full-fledged policy bank with a more active mandate to mobilize long-term climate finance; and (3) developing a decentralized energy system capable of accommodating increased renewable energy generation.

In short, this chapter focuses on public financial strategies and institutional mechanisms that can bridge Indonesia's investment gap in the energy transition, either by taking direct leadership through public budget spending or by indirectly incentivizing private investment through carefully designed regulatory tools. While capital market financing is an important long-term objective, the emphasis here remains on practical, near-term pathways that reflect Indonesia's current financing realities and institutional capacities.

2. Korea's Experiences

2.1. Background

Korea is confronted with unique constraints, making it more challenging to generate, transmit, and distribute renewable electricity. For example, Zissler et al. (2023) mention four hurdles: suboptimal natural conditions, relatively high generating costs, subsidized retail electricity prices, and social opposition.

South Korea covers approximately 0.1 million square kilometers, making it 1/20th the size of Indonesia, which spans over 1.9 million square kilometers. With a population of 52 million, it translates into a population density of 500 people per square kilometer, the highest among OECD countries. Hence, harnessing renewable energy potential is more challenging than in other countries, even though it is estimated that potentially 614 TWh of electricity per year can be generated cost-competitively, accounting for technical constraints and realistic government support (Korea Energy Agency, 2021).

Regarding generating costs, Korea faces among the world's highest levelized costs of electricity (LCOE) for new solar PV, onshore, and offshore wind. Consequently, in stark contrast to the global trend where renewables are often the cheapest option, renewable energy in Korea remains a less economically competitive electricity source (KEEI, 2024).

The retail price of electricity in Korea has remained below wholesale prices, which is economically unsustainable for small-scale solar PV to reach socket parity and severely weakens the financial position of KEPCO, hindering its ability to make significant investments in infrastructure.

Power grid expansion is often delayed or subject to cancellation because of strong social opposition from local communities and environmentalists.

Given these national circumstances, policymakers must develop innovative and complex solutions. Existing support mechanisms are designed to accommodate various technologies, taking into account site conditions, fuel types, performance levels, and system sizes. For example, solar PV projects—including ground-mounted, rooftop, floating, and forest-based installations—are all eligible for incentives, which vary based on project characteristics. A similar approach is applied to wind power, where onshore wind, coastal offshore wind (within tidal flats and seawalls), and maritime offshore wind each receive differentiated incentives tailored to their specific conditions.

In the following sections, we examine the solutions that are planned or executed by the government, policy financial institutions, private companies, and local communities.

2.2. Government's Incentives and Mechanisms to Support Energy Transition

According to the IEA (2024), over the past five years (2018 to 20203), 48% of energy investment decisions have been driven by private corporations, 37% by governments, and 15% by households. In terms of financing sources, 74% is commercial, 25% public, and only 1% comes from direct foreign investment (DFI). The government can play both a direct and indirect role in shaping capital flows toward the energy transition.

2.2.1. Government Budget

Korea's Green Public Financial Management (PFM) system integrates climate-conscious considerations into public financial decision-making, allocates funds, and designs policies that prioritize environmental sustainability, including investments in renewable energy, green infrastructure, and carbon reduction initiatives.

Green Budgeting

Korea introduced the Green Budgeting framework in 2022, categorizing budget items based on their environmental impact and allocating more funds to green projects. It now facilitates informed, evidence-based discussions on climate change goals during the budget process. Starting with the 2023 fiscal year, the Korean government has submitted the GHG Reduction Cognitive Budget to the National Assembly as an annex to the budget and fund management plan.

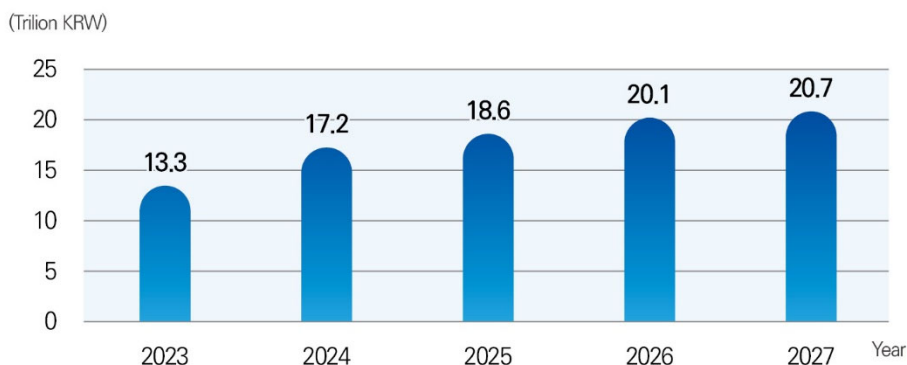
The system is still in its early stages in Korea, given the limited time for GHG reduction budget preparation, insufficient review periods, and a lack of empirical data to apply quantitative analysis. To prevent overestimating the greenhouse gas reduction budget size, the methodologies for evaluation and classification require further refinement, elaboration, and standardization. Once fully developed, the system can be reintegrated into the budgeting and accounting process to help achieve NDC and Net Zero goals.

A practical challenge is that there is no clear definition of what constitutes a green budget, making it unclear whether the green budget refers to: (1) the Climate Response Fund, (2) GHG Reduction Cognitive Budget, (3) Ministry of Environment's (MOE) budget, (4) the carbon neutrality projects budget within Ministry of Economy and Finance (MOEF). It remains unclear whether all budgets with the words "climate" or "carbon neutrality" should be included, or only projects that demonstrably reduce or contribute to carbon emissions reduction. If the budget for climate adaptation is included, the classification system becomes even broader.

In Korea, the National Basic Plan is a government strategy that outlines strategies to maintain fiscal sustainability and establish budget allocation priorities across different sectors from a mid-term perspective, usually five years. The first version of it, published in 2023, indicated a significant expansion of the expenditure in the environmental sector in accordance with the 2050 Carbon Neutrality Declaration and the upward adjustment of the 2030 NDC target. It requires a total of KRW 89.9 trillion over five years (2023 to 2027), averaging KRW 18 trillion per year. Although only the

annual amount is disclosed, the 11.5% average yearly growth rate of the climate budget (2023 to 2027) exceeds the 8.0% annual growth of the total government budget in the preceding five years.

[Figure 2-1] Green Budget Allocation in the National Basic Plan 2023-2027



Source: Parliamentary Policy Seminar Information (2024).

The expenditure consists of sector-specific reduction measures (KRW 54.6 trillion), climate change adaptation strategies (KRW 19.4 trillion), and green industry growth (KRW 6.5 trillion); however, no details of projects are disclosed.

Since the climate budget excludes basic subnational government budgets, adding the plans of metropolitan and provincial governments could bring the total to approximately KRW 29 trillion per year on average. This is equivalent to 1.1% of Korea's nominal GDP of KRW 2,650 trillion over the five years (2024-2028). According to the International Energy Agency (IEA), approximately 5% of global GDP must be invested to respond to climate change (IEA 2024). The United Nations Framework Convention on Climate Change (UNFCCC) states that public funds must account for 30% of this investment (UNFCCC, 2023). Under this scenario, Korea would need KRW 132.5 trillion per year to address climate change, requiring an additional KRW 39.8 trillion in public investment to meet its carbon neutrality goals.

<Table 2-1> 2023 Financial Plan

Category	'23	'24 ~ '27	Total	Annual Average Growth Rate
Total	133,455	765,738	899,193	11.54
Sector-specific Long-term Reduction Measures	79,480	466,283	545,763	11.48
Climate Change Adaptation Measures	29,856	164,213	194,068	9.43
Green Industry Growth	10,459	54,453	64,912	7.34
Just Transition	2,366	19,837	22,203	37.57
Local Carbon Neutrality & Green Growth	4,602	30,319	34,922	25.36

Category	'23	'24 ~ '27	Total	Annual Average Growth Rate
HRD Development & Awareness Raising	5,999	26,881	32,881	2.11
International Cooperation	693	3,751	4,444	1.59

Source: National Basic Plan (2023).

Comparing the green budgets for fiscal years 2023 and 2024, the GHG reduction budget decreases, while the number of projects increases in 2024. The proportion of quantitatively measurable projects increases from approximately 53% in 2023 to 57% in 2024. The projected total GHG reduction is 3.4 million tons of CO₂ equivalent in 2023, increasing to 4.4 million tons in 2024.

<Table 2-2> Green Budget for FY 2023 and FY 2024²

Project Type		2023 FY	2024 FY
Quantitative	# of project	70	81
	Budget (bil. ₩)	6,286 (52.9%)	6,241 (57.4%)
Qualitative	# of project	62	74
	Budget (bil. ₩)	3,836 (32.3%)	3,074 (28.3%)
R&D	# of project	156	139
	Budget (bil. ₩)	1,761 (14.8%)	1,562 (14.4%)
Total	# of project	288	294
	Budget (bil. ₩)	11,883 (100.0%)	10,878 (100.0%)

Source: 2050 Carbon Neutrality Commission (2024).

Green Budget Tagging

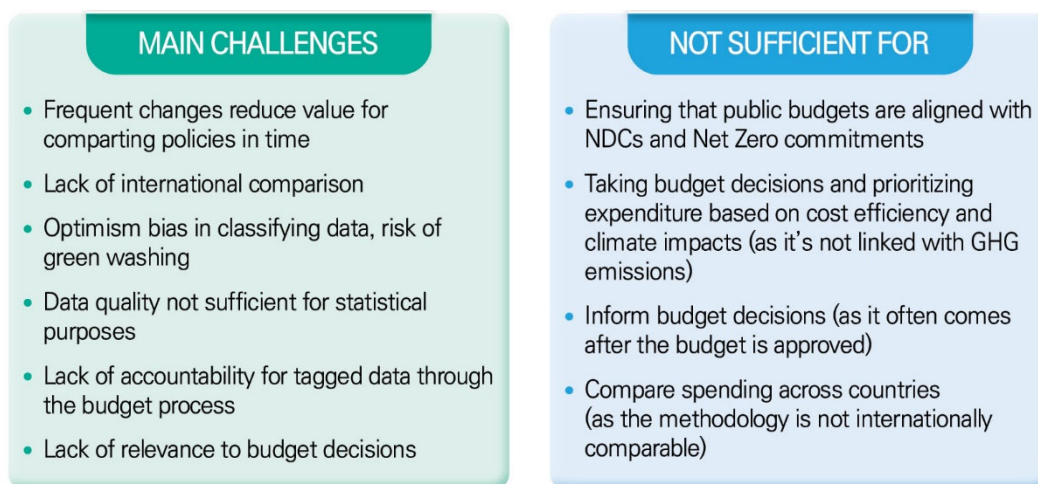
Green budget tagging refers to the practice of labeling specific budget measures as "green" to enhance transparency regarding their environmental impact. Although Indonesia has implemented green budget tagging since 2016, Korea has yet to adopt it, though several pilot studies have been conducted.

² 'Quantitative projects' refer to environmental initiatives where the impact or outcomes on sustainability outcomes can be measured precisely using clearly defined metrics that allow for tracking progress and assessing the effectiveness of green initiatives, like the number of solar panels installed, the amount of greenhouse gas emissions reduced, energy saved, or renewable energy generated. In contrast, qualitative improvements such as increased public awareness, promotion of eco-friendly behaviour, or improved environmental quality, while crucial, are more difficult to quantify. By relying on quantifiable data, policymakers can make informed decisions about allocating funds to projects with the highest potential impact (Weon and Park, 2025).

Lessons learned from those programs and experience from other countries include:

- Green budget tagging is insufficient for informing budget decisions, as it is often applied after budgets have been approved.
- Green budget tagging is not directly linked with GHG emissions, as expenditure decisions are often based on cost-efficiency, on broader climate goals that may not align with emissions reduction.
- Cross-country comparisons of green budget spending are difficult due to the lack of a universally accepted methodology.

[Figure 2-2] Lessons Learned from Green Budget Tagging Experiences



Source: OECD (2024a).

2.2.2. Partial Privatization

In the 1980s and 1990s, many countries experienced a wave of reforms to state-owned enterprises (SOEs) or government-invested enterprises (GIEs), particularly through privatization, including the radical policies implemented in the United Kingdom under Prime Minister Margaret Thatcher. Although the core of privatization involves changes in ownership and control, it varies in degree and form, from complete or partial sale of shares to the privatization of public service delivery, reduction of subsidies, and the introduction or increase of user charges (Kwon and Kim, 2017). Advocates of privatization justify it on the grounds of increased economic efficiency, attraction of foreign direct investment, and the inflow of funds, which alleviates fiscal pressures on cash-strapped governments.

In Korea, shares of Electric Power Corporations (KEPCO)—a vertically integrated monopoly managing the generation, transmission, distribution, and sale of electricity—were listed on the Korea Stock Exchange in August 1989. The government sold 21% of KEPCO's shares to the public as part of the "people's share" mass privatization program (Lim, 2003). In November 1992, foreign investors were permitted to acquire KEPCO shares, and in October 1994, KEPCO American Depositary Receipts (ADRs) were listed on the New York Stock Exchange. As of 2024, the government and the

Korea Development Bank together hold a majority stake in KEPCO. As of 2023, 20,202,746 KEPCO ADRs were listed on the NYSE, equivalent to 10,101,373 ordinary shares, or 1.57% of total shares.³ Under the Financial Investment Services and Capital Markets Act, the total limit on acquisition of KEPCO shares for foreign individuals, corporations, and other entities is capped at 40%.⁴

[Figure 2-3] Shareholder Structure of KEPCO as of 4Q 2024



Note: Investor presentation, 2024 4th quarter, p.6.
Source: KEPCO (2025)

In 2007, a KEPCO subsidiary—KEPCO Korea Plant Service & Engineering (KEPCO KPS)—was listed in the Korea Exchange (KRX), raising KRW 119.7 billion (USD 129.2 million).⁵ KEPCO KPS provides comprehensive maintenance and customized services for nuclear power plants, as well as 80% of Korea’s thermal and gas power plants.⁶ Numerous efforts to list other KEPCO subsidiaries on the KRX over the past two decades have failed due to strong opposition from labor unions and political parties.

2.2.3. Climate Response Fund

The Climate Response Fund was established in 2022 under the Framework Act on Low Carbon, Green Growth (Articles 69-74), which provides the legal basis for the fund’s creation, mandate, and operational structure in Korea to secure the necessary resources for effectively addressing the climate crisis and promoting the transition to a carbon-neutral society and green growth. This public climate finance instrument is managed at the national level, while local governments also operate their climate response funds (Article 69, Paragraph 4). The MOEF is the designated management

³ Korea Electric Power Corporation (KEPCO), <https://home.kepco.co.kr/kepco/EN/C/htmlView/ENCCHP001.do?menuCd=EN030301>

⁴ Enforcement Decree of the Financial Investment Services and Capital Markets Act, Article 187 (Limits on Acquisition, etc., of Securities or Exchange-Traded Derivatives by Foreigners), Clause (1)2: “The total limit on acquisition for foreigners, foreign corporations, etc., by issue: 40 percent of the total number of equity securities of the relevant issue.”

⁵ “S. Korea’s KEPCO unit to raise \$129 million in Dec. 14 IPO,” Reuters, <https://www.reuters.com/article/markets/companies/skorea-kepco-unit-to-raise-129-mln-in-dec-14-ipo-idUSSEO98111/>

⁶ KEPCO and Korea Plant Service & Engineering investor information, <https://home.kepco.co.kr/kepco/EN/G/htmlView/ENGCHP00205.do?menuCd=EN07040205>; <https://www.kps.co.kr/invest/brochure/boardList.do?url>

entity responsible for the fund's operation and oversight. It receives project proposals, approves funding, and oversees overall fund management. Other ministries apply for and implement projects within their respective domains. Local governments and public institutions carry out the funded projects. The Korea Environment Corporation (K-eco) is the entrusted agency supporting MOEF's fund management operations.⁷

The fund's annual budget fluctuates around KRW 2.5 trillion, representing approximately 20% of the overall national carbon neutrality budget. The primary funding sources for the fund include: (1) auction revenues from the Emissions Trading Scheme, (2) transfers from the Transportation, Energy, and Environmental Tax, (3) deposits from public funds, and (4) transfers from other funds or accounts.

In terms of fund governance, the entities managing the fund are distinct from those implementing the projects. While this can leverage the expertise of various ministries, it can also lead to unclear accountability. The operation and management involve securing and executing funding for specific projects. The fund supports multiple initiatives related to achieving carbon neutrality. Rather than supporting industry, local funds are primarily oriented toward projects that benefit residents, such as renewable energy expansion and energy efficiency improvements (Lim et al., 2024; Kim, 2024).

The mandates and key priorities of the fund are focused on four main areas:

- **GHG Reduction:** Supporting corporate GHG reduction activities, improving energy efficiency in cities and regions, and expanding carbon sinks. This area receives the largest share of funding.
- **Just Transition:** Providing support for the transition of industries, labor forces, local economies, and vulnerable groups in response to the climate crisis, while also promoting public awareness of carbon neutrality. The proportion of the total budget for just transition is increasing annually.
- **Carbon Neutrality Foundation:** Supporting key technology development and policy frameworks for GHG reduction.
- **Low-carbon Ecosystems:** Fostering the development of emerging low-carbon industries.

Regarding access eligibility and utilization, the fund supports a range of activities aimed at GHG reduction and carbon neutrality. Private sector involvement is intended to be facilitated through financial support for transitioning private investment in facilities, with growing suggestions to shift from a government-dominated green finance system to one that blends public and private funding, enabling private capital to play a key catalytic role. There is also a need to expand financial support to areas such as transition finance.

Several critiques of the Climate Response Fund have emerged, including: (1) an unclear purpose and lack of differentiation from other funds or accounts, (2) a dual governance system leading to unclear accountability, (3) resource instability due to the reduction and volatility of primary revenue sources, and (4) marked uncertainty in project planning, difficulties in assessing and reflecting on project performance, and limited impact on GHG emissions reduction.

⁷ Kim (2024), "Evaluation of the Korea Climate Action Fund," p. 7. See diagram of the operational governance structure. Published November 13, 2024.

2.2.4. Empowering the Government in Modernizing Energy Infrastructure

In 2022, the Ministry of Trade, Industry and Energy (MOTIE) noted that while the deployment of renewable energy had increased, it also brought unintended consequences, particularly the uncoordinated expansion of small-scale solar power systems.⁸ The government identified several contributing factors to this rapid proliferation: (1) a renewable energy certificate (REC) system that disproportionately favored small-scale generation, (2) the implementation of a Korean-style feed-in tariff (FIT), (3) unrestricted grid access for installations under 1 MW, and (4) overly generous subsidies from central and local governments, covering up to 80% of private solar project costs.

In response, the government shifted its policy approach and introduced the Renewable Energy Policy Improvement Plan to address changes in the energy environment. The plan outlines four key objectives to ensure more sustainable and efficient renewable energy development: (1) promoting a more structured and planned supply framework, (2) ensuring grid capacity and community acceptance, (3) enhancing oversight and management of renewable energy businesses, and (4) reinforcing the competitiveness of the domestic renewable energy industry. Part of this policy direction was legislated through three bills in 2025.

The Energy Trifecta Bill, passed by the South Korean National Assembly on February 27, 2025, was approved at the Cabinet meeting on March 18 and is expected to take effect in September 2025. The bill comprises three key legislative components: the Special Act on the Expansion of the National Electricity Network, the Special Act on Promotion of Offshore Wind Power Distribution and Industry Development, and the Special Act on High-Level Radioactive Waste Management. These laws empower the Korean government to modernize its energy infrastructure and are likely to significantly promote private investment in renewable energy, particularly offshore wind and solar. Key drivers include enhanced grid infrastructure and streamlined regulations. These measures reduce risks, improve project profitability, and attract both domestic and foreign investors.

A Robust Grid Infrastructure

A robust grid is essential for integrating variable renewable energy sources such as solar and wind, which require reliable transmission infrastructure to deliver power from remote generation sites (e.g., offshore wind farms) to urban and industrial load centers. Concerns have been raised regarding the decline in local acceptance of power networks, leading to disruptions in connecting zero-carbon power sources or supplying electricity to advanced industries, highlighting the need for legislation. The Electricity Network Expansion Bill authorizes the government to take the lead in developing a national core power grid. With the enactment of the Special Act on Power Networks, the government will establish a National Power Network Expansion Committee under the Prime Minister—comprising representatives from central and local governments, as well as experts—to mediate conflicts related to the construction of the national grid. It will also stipulate the expansion of resident compensation and support for local governments.

⁸ MOTIE (2022), *Improvement of Renewable Energy Policy in Response to Changes in the Energy Environment*, pp. 2–5. <https://www.korea.kr/common/download.do?fileId=197066287&tblKey=GMN>

Additionally, measures to prevent delays related to ancillary businesses, such as access roads and work areas, will be introduced, accelerating the implementation process. Improved grid reliability and capacity make renewable energy projects more financially viable, encouraging private capital to flow into solar, wind, and other renewable projects. Private developers of large-scale solar and wind projects, previously hindered by grid stagnation, will benefit from streamlined connections, potentially increasing project profitability and attracting foreign direct investment (FDI).

Promotion of Offshore Wind Power

The Special Act on the Promotion of Offshore Wind Power Distribution aims to streamline the permitting process for offshore wind projects by introducing a government-led “planned site system.” This approach is intended to reduce uncertainties that arise when developers independently handle site selection, community engagement, and permit acquisition. The Act also includes measures to support the fisheries industry, promoting coexistence between offshore wind projects and traditional marine users, such as fishermen. To coordinate efforts, the government will form an “Offshore Wind Power Committee” under the Prime Minister and establish a joint “Offshore Wind Power Promotion Team” involving relevant ministries. The MOTIE, along with the Ministry of Oceans and Fisheries, will create a data-sharing system for wind power sites and identify candidate areas based on wind conditions, fishing activities, vessel routes, and environmental considerations. Development zones will be officially designated after public-private consultations, environmental assessments, and committee approval. Operators for these zones will be selected through a competitive bidding process, and once approved, their permits will be processed accordingly. Additionally, the government will support offshore wind technology development, industry supply chains, demonstration projects, workforce training, and the construction of necessary ports and infrastructure. Revenues from shared water and EEZ usage fees will be allocated to the Fisheries Development Fund, in line with the Basic Law on Fisheries and Rural Development, to aid communities affected by offshore wind expansion.

2.3. Mobilizing Public Entities and Blended Financing

2.3.1. Policy Financial Institutions

Major policy financial institutions in Korea are actively increasing their annual green fund supply to support climate-friendly projects. For example, in March 2024, FSC and the Ministry of Environment unveiled a set of measures intended to boost green investment, speed up the low-carbon transition, and develop climate technologies (FSC 2024). First, FSC announced plans to strengthen the role of policy financial institutions to support businesses in transitioning to a low-carbon economy. By 2030, five major policy financial institutions plan to raise their annual green financing by an average of approximately 67%, reaching a cumulative total of around KRW 420 trillion. Additionally, the financial sector will take an active role in supporting the development of renewable energy infrastructure. To this end, a new Future Energy Fund totaling KRW 9 trillion will be established with contributions from the banking industry and will operate through 2030. This fund aims to supply sufficient venture capital to meet the estimated KRW 160 trillion in clean energy facility

investment demand. Furthermore, a separate Climate Technology Fund of KRW 3 trillion will also be launched, backed by banking sector contributions, to support the growth of high-potential climate technology firms. This demonstrates the collective effort made by the government, policy financial institutions, and commercial banks.

In 2025, the Special Infrastructure Fund for Private Investment Projects was launched with KRW 200 billion, contributed by KDB and Korea Credit Guarantee Fund.⁹ It is intended to operate as an equity investment vehicle for private projects. It is expected to support the rapid advancement of approximately KRW 13 trillion worth of private investment projects that have been delayed or never started due to a lack of capital, ease the financial burden compared to typical revenue-generating private investment projects (Build-Transfer-Operate), and serve as a catalyst for rental-type private investment projects (Build-Transfer-Lease) where the recruitment of financial investors has been delayed.

The Future Energy Fund (KRW 160 trillion), which supplies venture capital to crowd in private investment, and the Climate Technology Fund (KRW 3 trillion) were both established with contributions from banks.

2.3.2. Public-Private Partnership

Three characteristics can be combined in various ways to create a spectrum of PPP contracts: the type of asset involved, what functions the private party is responsible for, and how the private party is paid. (PPIAF 2025)

PPPs frequently involve either the development of new infrastructure—known as greenfield projects—or the improvement and operation of existing assets, referred to as brownfield projects. A defining characteristic of PPPs in both cases is the focus on output-based specifications. This means the desired outcomes or performance standards are defined, rather than prescribing the specific methods or processes for delivering them (World Bank, n.d.). Korea previously maintained a positive list system for eligible PPP assets before revising the Act on Public-Private Partnerships in Infrastructure to adopt a negative list system in 2020.

A defining feature of PPP contracts is the integration of multiple project phases or functions into a single agreement. However, the specific responsibilities assigned to the private sector vary depending on the nature of the asset and the service being provided. Typical functions include: design, build/rehabilitate, finance, maintain, and operate.

Regarding payment structures, the private party may be compensated through user fees, government payments, or a combination of both. Regardless of the source, a key element is that payments are performance-based. The choice of payment mechanism typically aligns with the scope of responsibilities undertaken by the private partner, either through direct user charges or government-funded compensation.

⁹ Ministry of Economy and Finance (MOEF) Press Release, <https://english.moef.go.kr/pc/selectTbPressCenterDtl.do?boardCd=N0001&seq=6090>

These three features can be mixed and matched to form a broad spectrum of PPP contract types. These arrangements lie along a continuum between fully public and fully private infrastructure provision, with progressively greater responsibilities and risks being shifted to the private sector.

In Korea, the Act on Public-Private Partnerships in Infrastructure¹⁰ limits eligible modes of implementation (Article 4). All the solicited or unsolicited proposals go through the Public and Private Infrastructure Investment Management Center (PIMAC), which assesses the feasibility, viability, and strategic alignment of PPP projects, ensuring they offer value for money and meet public sector needs. Final approval is granted by the PPP Review Committee, which operates under MOEF (Article 5).

This year, the government is making various efforts to boost PPP projects.¹¹ First, the guarantee limit of the Infrastructure Credit Guarantee Fund will be raised from KRW 1 trillion to KRW 2 trillion to reduce financing uncertainty in large PPP projects and expand the benefits of lower borrowing rates. Second, the risk weight for bank investments in revenue-based PPP projects will be lowered (BTO from 400% to 250%, BTO_MCC to 100%), thereby increasing investment capacity. In addition, the government plans to amend the Act on Public-Private Partnerships in Infrastructure to promote public offering funds by easing borrowing limits from 30% to 100%, expanding the scope of eligible assets, and allowing a new type of infrastructure fund with no maturity and no redemption limit.

2.4. Private Finance for Transition

2.4.1. Financial Mechanisms

Accelerating the energy transition requires significant private sector participation, particularly in renewable energy, energy efficiency, and low-carbon technologies. To encourage this investment, countries employ a range of fiscal and financial incentives designed to reduce risk, enhance returns, improve project viability, and cater to investors' appetite in the energy sector. Developing countries tend to prefer tax incentives, whereas developed economies favor more targeted and complex policy instruments.

Fiscal Incentives

Fiscal incentives are critical in creating a more favorable investment environment for energy transition projects. Budgetary incentives can be categorized into four different types: profit-based, expenditure-based, production-based, and indirect taxes or duties (UNCTAD, 2023). These mechanisms help lower operational and capital costs, improve project economics, and attract long-term private capital.

¹⁰ Korea Development Institute (KDI), *Act on Public-Private Partnership in Infrastructure 2024*, https://www.kdi.re.kr/kdidata/departments/pimac/act_on_ppp_in_infrastructure_2024.pdf

¹¹ Ministry of Economy and Finance (MOEF) Press Release, <https://english.moef.go.kr/pc/selectTbPressCenterDtl.do?boardCd=N0001&seq=6090>

Profit-based incentives such as reduced corporate income tax rates, tax holidays, and loss carry-forward provisions are commonly used to enhance the profitability of clean energy ventures. By allowing companies to retain more of their earnings or defer tax liabilities, these incentives enhance cash flow and improve overall project bankability, key concerns for investors in capital-intensive renewable energy infrastructure. Expenditure-based incentives target specific investment behaviors by allowing firms to recover costs more quickly. Accelerated depreciation and investment allowances reduce taxable income in the early years of a project, making upfront investments in renewable technologies more attractive. Similarly, R&D tax incentives and tax credits encourage innovation in clean energy technologies, from storage solutions to smart grid development, by directly reducing tax obligations tied to research expenditures. Production-based tax credits link tax benefits to energy output, providing a performance-based incentive structure. These are particularly effective for renewable energy developers, as they reward operational efficiency and sustained energy generation from sources such as wind, solar, or biomass. Incentives through indirect taxes and duties—such as exemptions from VAT on capital goods or the removal of import duties on renewable energy equipment—help lower the cost of deploying essential technologies. These measures are especially important in emerging markets, where cost barriers remain high for solar panels, wind turbines, and energy-efficient components.

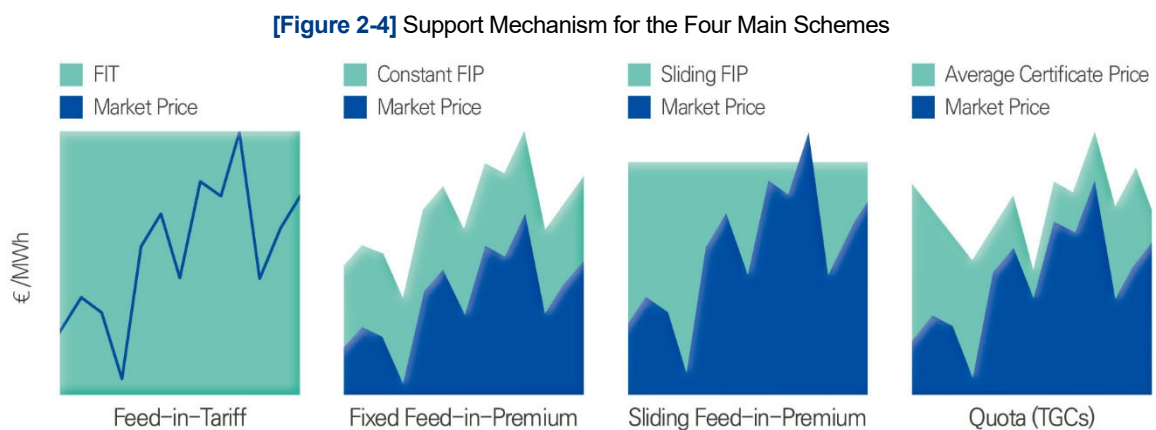
In addition to tax-based support, direct financial mechanisms play a pivotal role in mobilizing investment in clean energy. Grants and subsidies are often used to bridge funding gaps, especially in the early stages of project development or for high-risk pilot initiatives. These non-repayable funds can cover a portion of capital expenditures, production costs, or even marketing and awareness campaigns for clean technologies, reducing the upfront investment burden for private firms. Subsidized loans and concessional finance provide affordable financing terms for energy transition projects that may not yet attract commercial funding. By offering below-market interest rates, longer repayment periods, or partial government guarantees, these tools de-risk investments and improve access to capital for both large-scale developers and small-scale clean energy entrepreneurs.

Other Investment Promotion Schemes

Besides fiscal incentives, various support schemes have been developed and implemented globally. These schemes can be categorized as economic, financial, regulatory (either focused on investments or generation), administrative, direct (either focused on investment or generation), indirect (environmental taxes), and voluntary (green tariffs, agreements, contribution shareholders programs). For example, between 2005 and 2015, EU countries implemented over 1,300 support measures—ranging from economic and financial to regulatory and administrative—to promote the development of renewable energy. (Banja et al., 2019).

Various approaches have been employed to categorize support schemes for renewable energy promotion, but the most widely used distinction is between price-based and quantity-based mechanisms. Price-based approaches include feed-in tariffs (FIT), fixed and sliding feed-in premiums, often delivered through grants, bonuses, or premiums. In contrast, quota systems fall under quantity-based mechanisms. Tendering or auction schemes, while not a separate category of support, serve as tools to allocate funding across renewable technologies and to set support levels for other schemes through competitive bidding (Banja et al., 2019).

The effectiveness of these support schemes depends significantly on their design. Price-based schemes are mainly determined through administrative procedures based on key indicators such as deployment targets and renewable generation costs. FIT/FIP schemes with support levels based on the levelized cost of energy have been widely used and very successful in scaling up renewable energy deployment. Premium schemes awarded on top of energy market prices expose producers to market risks but can promote greater market integration. Renewable auctions have emerged as faster and more flexible mechanisms than administrative procedures in adjusting support levels to cost reductions. However, their design features must be tailored to specific market contexts to meet a country's policy goals.



Source: Banja et al. (2019).

A key challenge in designing effective support mechanisms is balancing incentives and disincentives to boost investment in the energy transition. This challenge often manifests as a principal-agent problem, where a principal (typically a public entity) relies on agents (such as private companies) to carry out tasks on its behalf. Greater autonomy for agents, less stringent regulations, and higher project profitability can attract more participation and investment, but may compromise transparency and institutional integrity. Conversely, tighter controls may enhance accountability but discourage private investment. Developing well-conceived incentive structures to address this principal-agent problem is essential to provide a secure environment for investors while fostering sustainable growth in energy transition projects.

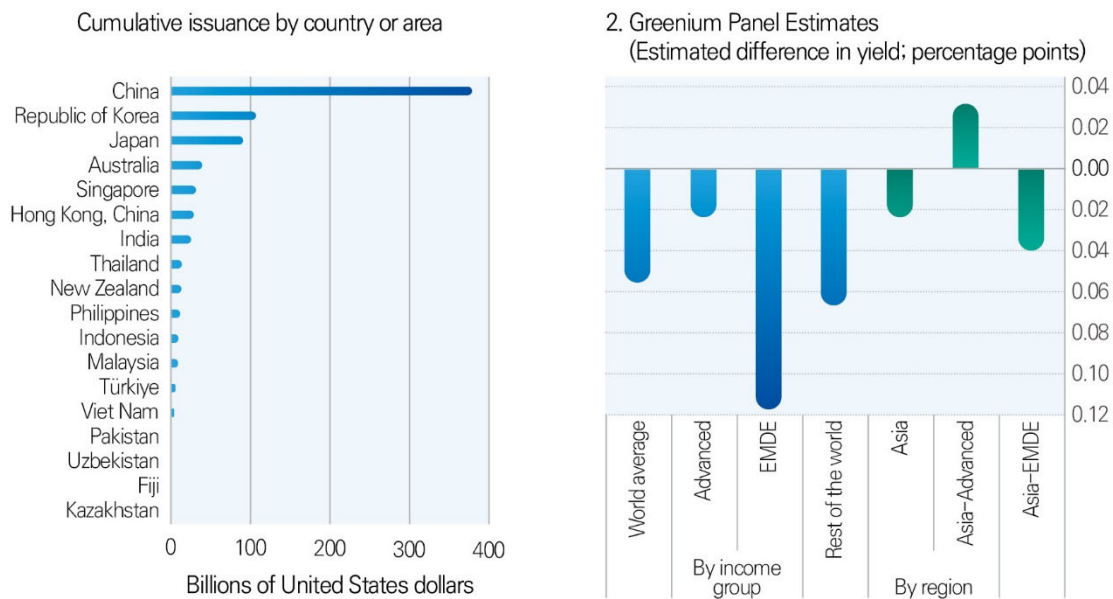
Financing Instruments

Sustainable debt instruments—such as green bonds, transition bonds, sustainability bonds, sustainability-linked bonds, and social bonds—are primarily issued by a limited number of countries. As shown in [Figure 2-5], emerging markets and developing economies (EMDEs) experience a significant "greenium," with an average yield difference of about 12 basis points, indicating that sustainable bonds generally yield less than conventional ones (ESCAP, 2023; IMF, 2024). Among sovereign issuers in Asia, EMDE bonds exhibit a smaller greenium compared to the global EMDE average. While the presence of a greenium suggests that investors are willing to accept lower returns to support green activities, the benefit to sovereign issuers in terms of reduced borrowing costs is

modest, equivalent to an annual coupon saving of around USD 60,000 on a USD 1 billion bond (IMF, 2024).

While institutional investors are active in equity and debt markets, direct investment by these capital market players is lagging other investments in Asia-Pacific's climate finance ecosystem due to high perceived risks, transaction costs, asset allocation rules, and factors like corporate disclosures and ESG rating methodologies (ESCAP, 2023; IMF, 2024).

[Figure 2-5] Debt Instruments and Greenium



Source: ESCAP (2023); IMF (2024).

[Figure 2-6] illustrates the spectrum of financing approaches available for energy transition funding, arranged as a continuum from public to commercial financing based on market maturity. At the bottom of the ladder, where the level of market maturity is lower, public financing predominates through mechanisms like grants and budget financing, often accompanied by co-financing requirements. As the market matures, moving upward on the ladder, financing options expand to include utility (on-bill) financing, energy efficiency revolving funds, and services offered by public or super energy service companies. The middle range includes credit lines provided by development banks and commercial banks, as well as partial risk guarantees that help bridge the gap between public and purely commercial financing. At the highest level of market development, more sophisticated commercial funding becomes available, including commercial financing and bonds, vendor credit and leasing arrangements, and advanced commercial or project financing structures.



Source: ESCAP (2023).

This progression demonstrates how the availability of financing options is directly tied to the development stage of the local financial ecosystem, suggesting that different policy approaches and support mechanisms are needed depending on the market's position along this ladder. The framework applies not only to energy transition financing but also to broader efficiency improvements across economic sectors.

2.4.2. Incentivizing Corporate Commitment for Renewable Energy Investment

K-Taxonomy and Climate Disclosure

The Korean government has implemented various green finance schemes, including green taxonomy, environmental information disclosure systems, and emissions trading schemes, to encourage green investments.

In March 2024, the Ministry of Environment introduced new initiatives to accelerate green investment, aiming to advance the transition to a low-carbon economy. These initiatives include: (1) upgrading the Korean Green Taxonomy (K-Taxonomy), (2) establishing foundations to promote green investment, (3) increasing private sector green investment to KRW 30 trillion by 2027, and (4) enhancing the emissions trading scheme (Ministry of Environment, 2024).

K-ETS

The Korean Emissions Trading Scheme (K-ETS), launched in 2015, is one of Asia's most comprehensive carbon markets. It was designed as a market-based mechanism to help Korea meet its GHG reduction targets. The K-ETS is operated under the authority of the Ministry of Environment and administered by KRX, which serves as the official trading platform.¹² Although institutionally advanced and covering a broad share of national emissions, the K-ETS has thus far fallen short in mobilizing large-scale private investment in renewable energy.

This shortfall stems from limited market participation, low and volatile carbon prices, and weak policy coordination. In practice, many regulated entities opt to reduce emissions through relatively low-cost measures such as improving energy efficiency or switching to lower-carbon fossil fuels rather than through investing in new renewable energy generation assets. Moreover, the carbon prices in Korea have remained too low and unstable to shift capital flows away from conventional energy sources and toward renewables. This has weakened the market's ability to serve as a meaningful driver for clean energy investment. A further key challenge lies in the lack of integration between the K-ETS and complementary climate or energy policies, particularly the renewable portfolio standard (RPS). The RPS has been a more powerful policy tool in Korea for expanding renewable energy deployment, as it mandates power producers to acquire a set portion of their electricity from renewable sources, often through the purchase of Renewable Energy Certificates (RECs). As a result, the K-ETS has played a secondary, supplementary role in advancing decarbonization.

In many cases, project developers and energy companies focus more on RPS compliance or on obtaining government-backed power purchase agreements than on responding to carbon price signals. In addition, the Korean policy landscape is marked by fragmentation and overlapping policy instruments, which undermine the predictability and coherence needed to foster investor confidence. The absence of a clear and stable linkage between carbon pricing and renewable energy support mechanisms has hindered the K-ETS from becoming a central pillar of the clean energy transition.

RPS and REC

One of the major renewable energy regulations currently in force in Korea is the RPS, introduced in 2012. The RPS mandates that energy generators with a capacity over 500MW produce a designated proportion of their electricity from renewable sources. This requirement applies not only to the largely state-owned KEPCO and its subsidiaries but also to major private power generation companies such as POSCO Energy, SK E&S, and GS Power. In December 2021, the MOTIE announced that the State Council had approved an increase in the renewable energy quota in 2022 to 12.5%, up from 9% in 2021, with a subsequent increase to 25% targeted for 2026.

Within the RPS framework, various energy sources are classified as renewable, each assigned different weightings. Solar energy and offshore wind receive the highest weighting, while other sources such as biogas, landfill gas, and waste-to-energy are also included. While the RPS initially

¹² Refer to Chapter 3, Section 2.2.2 for details on the Korea Emissions Trading Scheme (K-ETS).

contributed to the expansion of domestic renewable energy supply, recent challenges—such as regulatory complexity, REC price volatility, and insufficient management systems—have led many obligated power companies to rely more on purchasing RECs rather than investing directly in renewable infrastructure. Consequently, more than 90% of new renewable energy facilities have been concentrated in small-scale solar power, while investment in other sources, such as wind energy, remains slow-paced.

Additionally, rising REC spot prices—driven by increased corporate demand for RE100 compliance and REC supply-demand imbalances—have raised concerns over corporate competitiveness and consumer electricity costs. In contrast, many other countries have transitioned to government-led competitive bidding systems as their renewable energy markets have matured. Korea introduced competitive bidding within the RPS framework in 2017 to foster domestic industries and enhance distribution efficiency. To further strengthen resource security and enhance export competitiveness under the Special Act on National Resource Security, enacted in February 2024, a bill has been proposed to amend the Act on Promotion of Development, Use, and Distribution of New and Renewable Energy (the Renewable Energy Act), effective as of February 24, 2025. The proposed amendment seeks to fully replace the existing RPS system with a unified, government-led competitive bidding system.

The proposed revision aims to streamline renewable energy procurement by centering it on competitive bidding and to reform how power generation companies fulfill their obligations. This change is expected to promote a cost-effective expansion of renewable energy, alleviate public financial burdens, and align new projects with national renewable energy targets and corporate initiatives like RE100. Should the amendment pass, power generators will need to meet their obligations through direct investment and participation in competitive bidding, leading to significant shifts in the market structure and incentive schemes. The following section provides an overview of the legislative intent, key provisions, and projected implications.

K-RE100 and Voluntary Commitment

In January 2021, MOTIE announced the launch of a “Korean RE100 (K-RE100)” initiative. The initiative was launched in response to the global RE100 campaign led by The Climate Group and the Carbon Disclosure Project (CDP), in which companies commit to procuring 100% renewable electricity. The K-RE100 policy widens the options for companies to purchase renewable electricity within Korea, including the introduction of third-party power purchase agreements without going through KEPCO, the purchase of REC, and on-site generation.

As of 2024, the overall renewable energy usage rate among the 36 domestic companies registered as global RE100 members (excluding Korea Water Resources Corporation) reached 24%, marking a 1.2 percentage point increase from the previous year’s 22.8%. However, this shift was primarily driven by operations at overseas business sites rather than within Korea. The renewable energy usage rate was only 12% at domestic sites, compared to 59% at overseas sites, indicating that domestic companies continue to prioritize renewable energy conversion abroad (CDP, 2025).

Hydropower remained the predominant renewable energy source among these companies across all locations, accounting for 48.76% of usage, while REC purchases were the dominant

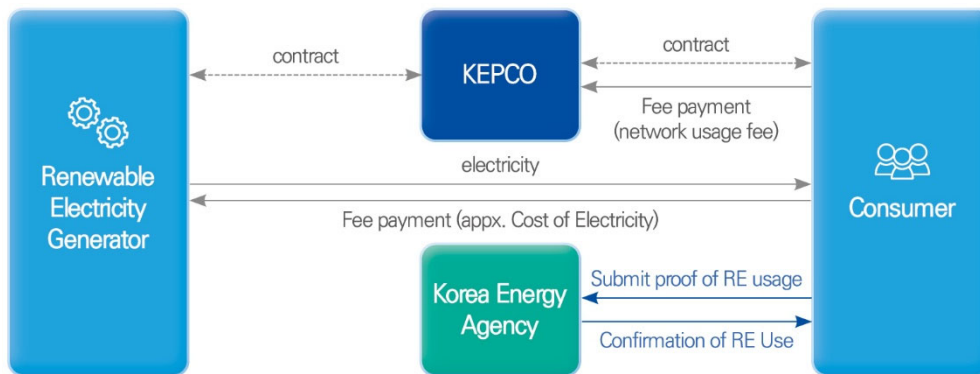
procurement method, making up 67%. This trend reflects the practices of manufacturing-oriented firms with high electricity demand, which often rely on hydropower and REC-based electricity, particularly at overseas facilities.

Corporations attribute environmental and structural constraints as the primary barriers to RE100 implementation within Korea. In 2023, RE100 member companies consumed 66,161 GWh of electricity at their domestic sites, yet domestic renewable energy generation stood at only 63,200 GWh, falling short of demand. This supply-demand gap highlights the fundamental challenge: the domestic renewable energy supply remains insufficient to support the electricity needs of these business sites.

PPA

In Korea, two principal types of PPAs are recognized: trilateral PPAs and direct PPAs, differing in intermediary involvement. MOTIE is the government agency responsible for overseeing regulations related to PPAs in Korea.

[Figure 2-7] Trilateral PPA Mechanism in Korea



Source: Cai (2024).

Trilateral PPAs involve KEPCO as the intermediary, with contract pricing negotiated privately, often combining the system marginal price (SMP) and the energy attribute certificates (EAC) Price. Trilateral PPAs impose additional costs on buyers, including transmission, distribution fees, and miscellaneous charges, approximately 45% of the regular tariff. Double-counting of network usage charges remains an issue, and the use of SMP as a benchmark keeps prices influenced by higher-cost power sources. Renewable energy generators need only submit a filing with MOTIE in order to supply power to consumers via third-party PPAs. Previously, an approval by MOTIE was required. Electricity consumers who may utilize a third-party PPA are either general power or industrial power consumers of at least 300kW. Previously, the threshold was 1,000 kW.

A direct PPA denotes a contractual arrangement whereby a company procures electricity generated from renewable energy sources, like solar or wind power producers, bypassing the traditional electricity market, reducing intermediary fees (Cai, 2024). This practice has been facilitated by amendments to the Electric Utility Act in Korea, which was passed by the Korean National Assembly in 2021.

While PPAs are gaining traction, the Korean market still faces challenges like high ancillary costs, complex network usage fees, and a somewhat monopolistic electricity market structure. Notably, in the Korean PPA process, surplus electricity can be certified and sold to external parties, per the Electric Utility Act of 2023, which aims to transition the power system from centralized generation to a more dispersed energy model, where electricity is produced closer to where it is consumed. Renewable energy generators utilizing Third Party PPAs are now able to sell power generated in excess of time-based consumption to the electricity market. Previously, they could sell power to the electricity market only in cases where the electricity consumer could not purchase power due to circumstances beyond the control of such consumer. Also, electricity consumers are now permitted to enter into a multi-party agreement with renewable electricity generators. Accordingly, multiple generators may enter into a PPA with one electricity consumer (N:1), or one renewable electricity generator may enter into a PPA with multiple consumers (1:N). Previously, such multi-party agreements were not allowed. However, transactions between numerous generators and various consumers (N: N) are still not permitted under the amended guidelines.

Distributed Energy and VPP

Amidst Korea's rapidly evolving energy transition centered on renewable energy, the necessity to shift from the existing centralized power system based on large-scale power plants and transmission lines to a new power and supply utilization system based on distributed energy resources was raised. Following the government's 2020 carbon neutrality declaration, the "2050 Carbon Neutrality Promotion Strategy," jointly announced by relevant ministries, presented a plan to support the energy transition to a nationwide distributed system. This set a goal of moving away from adaptive reduction to proactive response and creating an environment for the activation of small-scale distributed energy adoption. In June 2021, the MOTIE announced the "Distributed Energy Activation Promotion Strategy," outlining the basic direction for the definition of distributed energy, the power grid impact assessment system, specialized zones, and the virtual integrated power plant (VPP) system (MOTIE, 2021). The distributed energy generation target was set at 30% by 2040, which was already presented in the Third Energy Basic Plan in 2019 (before the carbon neutrality declaration).

In response to calls for the reform of existing energy-related legislation and systems to facilitate the transition to a distributed demand-supply system, the Decentralized Energy Activation Special Act (the Distributed Energy Act) was enacted and promulgated on June 13, 2023, and enforced from June 14, 2024. The Distributed Energy Act aims to induce the decentralization of the energy system and provide a policy foundation for achieving the distributed energy supply target through systematic management and support of distributed energy. It is also expected to foster a carbon-neutral implementation environment led by the private sector, resolving social conflicts, and systematizing cost allocation. The main contents of the Distributed Energy Act include the definition of distributed energy, mandatory usage, obligations for distribution system operators, the power grid impact assessment, specialized zones, regional electricity rates, and the integrated power plant system.

As part of efforts to integrate distributed resources into the grid, Korea is introducing a VPP system to establish a market system that integrates and operates various small-scale distributed resources. In August 2023, the Korea Power Exchange (KPX) revised the electricity market operation rules. It launched a wholesale market-type VPP pilot project in Jeju Island and plans to expand it nationwide

in the future. Through this, small-scale solar power, ESS, and demand resources will be combined as a single power plant and participate in the electricity market. If necessary, output adjustment orders can be issued by the central government. The Act enables the designation of specialized distributed energy zones where businesses can sell electricity directly to consumers, potentially easing regulations related to power trading and expanding the business scope of VPP operators.

Furthermore, to regulate the uncoordinated grid connection of distributed power sources, a power grid impact assessment system was introduced starting in 2024. When a large-scale power consumption facility is newly built in a grid-saturated area, such as a metropolitan area, the impact of the demand on the surrounding power grid must be assessed in advance and submitted to MOTIE. The system is expected to mitigate blackout risks arising from grid saturation and disperse the locations of large-scale data centers. In addition, the government plans to introduce a regional differential electricity rate system, which will induce regional dispersion of power plants and loads through price signals, such as setting lower electricity rate increases in areas with less transmission congestion. The Act also empowers the Minister to mandate that large energy consumers use a certain percentage of their energy from distributed sources. Distribution system operators are responsible for installing and managing appropriate facilities for distributed energy operators, ensuring fair access to the grid, and maintaining network neutrality. They may also implement output control measures to ensure grid stability.

3. Assessment of Indonesian Experience in Energy Transition

3.1. Overview of Indonesia’s Policies on Energy Transition Mechanisms

3.1.1. Indonesia’s Commitment to Reducing Greenhouse Gas Emissions

Indonesia ratified the Paris Agreement through Law No. 16 of 2016, which endorsed the Paris Agreement under the United Nations Framework Convention on Climate Change. This ratification reflects Indonesia's commitment to taking appropriate measures to limit global warming and address climate change. The country aims to keep the global temperature rise below 2°C above pre-industrial levels, reduce vulnerability to climate change, enhance climate resilience, and promote sustainable development. The government of Indonesia has outlined concrete steps in its Nationally Determined Contribution (NDC) document. The current NDC, known as the Enhanced NDC (ENDC), builds on the previous version.

The ENDC underlines Indonesia’s strong commitment to achieving the Paris Agreement’s objectives. Despite numerous challenges such as economic slowdowns, rising energy costs, food security concerns, and the need to ensure decent living standards, the government has set more ambitious greenhouse gas (GHG) emission reduction targets. The ENDC targets a 31.89% reduction in GHG emissions through independent efforts (unconditional) and a 43.20% reduction with international support (conditional). These targets represent a 3-percentage-point increase compared to the first NDC.

<Table 2-3> GHG Emission Reduction Targets

Condition	1 st NDC	Enhanced NDC (2 nd)
Unconditional (Counter Measure1, CM1)	29%	31.89%
Conditional (Counter Measure2, CM2)	41%	43.20%

Source: Ministry of Environment and Forestry (2022).

The GHG emission reduction targets are divided into sectoral targets, including energy, agriculture, forestry, and other land uses (FOLU), waste, and industrial processes and product use (IPPU). The largest share of emission reductions under the unconditional scenario (CM1) comes from the FOLU sector (17.4%), followed by the energy sector (12.5%). The remaining reductions are from waste (1.5%), IPPU (0.3%), and agriculture (0.4%).

<Table 2-4> GHG Emission Reduction Sectoral Target

Sector	GHG Emission Level 2010 (MTon CO2eq)	GHG Emission Level 2030			GHG Emission Reduction				Annual Average Growth BaU (2010-2030)	Average Growth 2000-2012
		MTon CO2-eq			MTon CO2-eq		% of Total BaU			
		BaU	CM1	CM2	CM1	CM2	CM1	CM2		
Energy	453,2	1.669	1.311	1.223	358	446	12,5	15,5	6.7%	4.5%
Waste	88	296	256	253	40	43.5	1.4	1.5	6.3%	4.0%
IPPU	36	69.6	63	61	7	9	0.2	0.3	3.4%	0.1%
Agriculture	110.5	119.66	110	108	10	12	0.3	0.4	0.4%	1.3%
FOLU	647	714	214	-15	500	729	17.4	25.4	0.5%	2.7%
Total	1.33	2.87	1.95	1.63	915	1.24	31.89	43.20	3.9%	3.2%

Source: Ministry of Environment and Forestry (2022).

The energy sector is Indonesia's primary focus in its emission reduction efforts, as GHG emissions from this sector are projected to grow by 6.7% annually until 2030 compared to 2010 levels. According to the European Commission (2024), 59% of Indonesia's GHG emissions in 2023 came from energy-related activities, including fuel exploitation, power generation, and transportation. Power generation alone accounted for 22.7% of total GHG emissions, with a 192% increase compared to 2005 levels.

Efforts to reduce emissions in the energy sector have begun even before Indonesia ratified the Paris Agreement in 2016. In 2014, the government issued Government Regulation No. 79 concerning the National Energy Policy (KEN) and Presidential Regulation No. 22 of 2017 on the National Energy General Plan (RUEN). These regulations provide the legal framework for energy management in Indonesia, aiming to ensure national energy resilience and support sustainable development. One of the key aspects of KEN is the diversification of renewable energy (RE) sources, with a target of achieving a 23% share of RE in the primary energy supply by 2025.

<Table 2-5> Primary Energy Mix Targets under Government Regulation No. 79 of 2014

Energy Sector	2025 Target	2050 Target	Description
Renewable Energy	≥23%	≥31%	Increase the use of renewable energy to reduce reliance on fossil fuels.
Oil	≤25%	≤20%	Reduce the use of oil as a primary energy source.
Coal	≥30%	≥25%	Continue coal use but with cleaner technologies.
Natural Gas	≥22%	≥24%	Use natural gas as a transitional energy source with lower emissions.

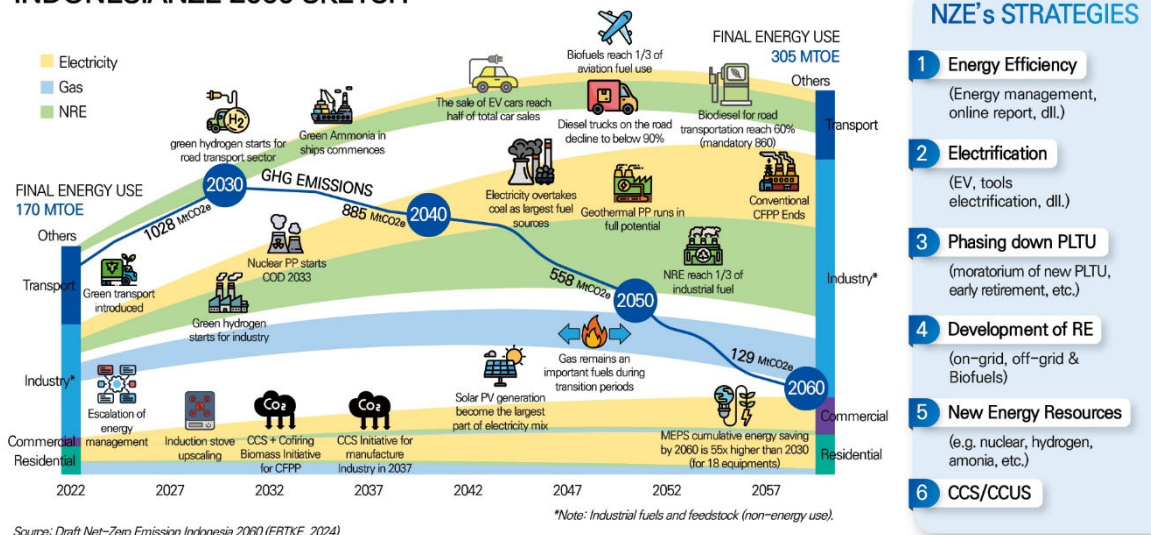
Source: Ministry of Energy and Mineral Resources (2024).

Indonesia is currently developing a roadmap to achieve net-zero emissions by 2060, with more ambitious targets and concrete steps. The roadmap includes six strategies, which are energy efficiency, electrification, low-carbon energy sources—including a moratorium on new coal-fired

power plants and early retirement of existing ones—renewable energy development, new energy sources, and carbon capture, utilization, and storage (CCUS). These measures aim to reduce GHG emissions gradually, from 1,028 MTCO₂e in 2030 to 129 MTCO₂e by 2060.

[Figure 2-8] Indonesia's Roadmap on Net-Zero Emission (NZE) Target

INDONESIANZE 2060 SKETCH

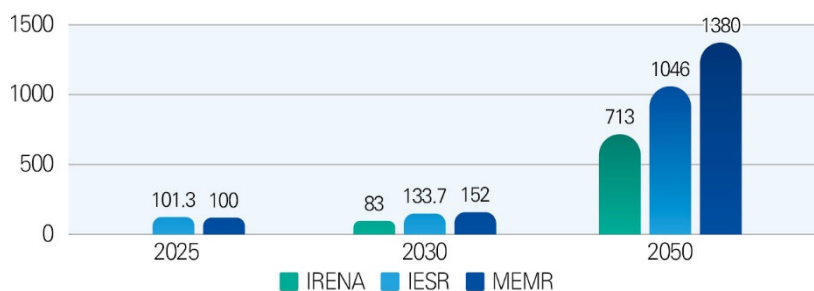


Source: Ministry of Energy and Mineral Resources (2024).

Financing Needs for Energy Transition Mechanism (ETM)

Efforts to reduce GHG emissions will require substantial financing from a range of investors and funding sources. Indonesia has undertaken several simulations to estimate the financing requirements for achieving its GHG emissions reduction targets. The Second Biennial Update Report (BUR2), published in 2018, estimated the cost of reducing GHG emissions from 2018 to 2030 at USD 247 billion. In 2019, this estimate was revised to IDR 4,520 trillion (equivalent to USD 322.86 billion). The Third Biennial Update Report (BUR3) in 2021 provided a more detailed projection—estimating the cost at USD 281 billion under the unconditional scenario and USD 285 billion under the conditional scenario. Of this total, USD 245 billion is allocated to the energy sector.

[Figure 2-9] GHG Emissions Reduction Investment/Financial Needs



Source: Ministry of Energy and Mineral Resources (2024).

While the projected financial requirements to meet the 2030 target are substantial, achieving NZE by 2060 will require an even greater amount of investment. The Ministry of Energy and Mineral Resources (MEMR) estimates that achieving NZE by 2060 will require USD 1 trillion—significantly exceeding the estimates outlined in BUR3. A key driver of this increase is the planned early retirement of coal-fired power plants (CFPPs). Coal currently accounts for 63% of Indonesia's electricity generation. Retiring these plants will require significant financing for both decommissioning and the development of new renewable energy capacity.

The early retirement for CFPPs also has implications for financing requirements related to the construction of renewable energy-based power plants to ensure the availability of an electricity supply. Data from MEMR indicate that investment needs for power plant construction vary by energy source. The largest investment requirement applies to geothermal-based power plants, with each megawatt (MW) requiring USD 4.4 million. By contrast, solar power plants (PLTS) require the lowest investment—USD 0.96 million per MW. MEMR estimates that developing renewable energy-based power plants with a combined capacity of 7.6 gigawatts by 2030 will require USD 15.9 billion in investment.

3.2. Review of Current Policies, Strategies, and Incentives for Supporting Investments

Policies supporting energy transition financing in Indonesia have been codified through regulatory frameworks. Two key regulations serve as the legal foundation for energy transition funding: Presidential Regulation No. 112 of 2022 on the Acceleration of Renewable Energy Development for Electricity Supply, and Minister of Finance Regulation No. 103 of 2023 on Fiscal Support through Funding and Financing Frameworks for Accelerating Energy Transition in the Electricity Sector. Presidential Regulation No. 112 of 2022 constitutes the primary legal basis for Indonesia's energy transition. It outlines strategies for transforming the electricity sector, including preparation of the Electricity Supply Business Plan (RUPTL), the energy transition roadmap, and criteria for early retirement of CFPPs. Additionally, the regulation delineates the government's role in facilitating the energy transition.

Indonesia's energy transition is guided by the RUPTL—developed by the state-owned electricity company PLN—and the roadmap for accelerating CFPP retirement, prepared by MEMR. Presidential Regulation No. 112 of 2022 mandates that the RUPTL be formulated with due regard to renewable energy development targets, the supply-demand balance in electricity, and the economic feasibility of renewable energy projects. The RUPTL is closely aligned with the CFPP retirement roadmap, which includes targets for GHG emissions reduction, early decommissioning strategies, and policy alignment. Accelerating CFPP retirement aims to increase the share of renewable energy in the electricity mix. This initiative applies not only to CFPPs owned by PLN but also to the termination of power purchase agreements (PPAs) with CFPPs operated by independent power producers (IPPs). The implementation of early CFPP retirement considers factors including plant capacity, operational age, utilization rates, GHG emissions, economic viability, availability of financing, and technological support.

3.2.1. Fiscal Incentives and Financial Mechanisms to Support Energy Transition

To facilitate energy transition mechanism programs, the government provides both fiscal and non-fiscal incentives under Presidential Regulation No. 112 of 2022. Fiscal incentives include tax concessions (e.g., income tax, import duties, and property tax), direct financing for renewable energy development, and guarantee mechanisms. Non-fiscal incentives encompass simplified licensing processes, regulatory support, and assistance from central and local governments. Regarding financial support, the regulation stipulates that the government may extend fiscal assistance through financing frameworks, including blended finance sourced from the state budget (APBN) or other authorized sources.

(1) Climate Budget Tagging

Climate budget tagging (CBT) refers to the identification of budget allocations used to finance outputs targeted at climate change mitigation and adaptation (Maulidiyah and Akhmadi, 2024). Indonesia has emerged as a pioneering nation in institutionalizing CBT, a fiscal policy mechanism designed to track climate-related expenditures across national and subnational budgets. Since its inception in 2014, CBT has been systematically applied across multiple thematic areas, encompassing education, health, climate change adaptation and mitigation, infrastructure development, South-South and Triangular Cooperation, gender-responsive budgeting, and stunting reduction programs. Between 2016 and 2021, cumulative CBT allocations amounted to USD 34 billion, demonstrating a consistent annual growth rate of 12.2% over this period.

Initially, CBT focused solely on mitigation strategies (2016 to 2017), but its scope was broadened in 2018 to incorporate adaptation measures. Mitigation priorities include interventions in forestry and land management, energy and transportation systems, sustainable agriculture, industrial processes and product use (IPPU), and waste management. Conversely, adaptation efforts emphasize resilient infrastructure and settlements, food security, biodiversity conservation (particularly in forested, coastal, and small island ecosystems), and research and development. A discernible increase in the number of ministries and agencies adopting CBT underscores the growing institutional engagement in climate-resilient fiscal planning, reflecting an enhanced commitment to addressing climate vulnerabilities through targeted budgetary allocations. Although a dedicated CBT code for energy transition has not yet been established, it currently includes the energy sector and waste-to-energy (WTE) facilities among its priority thematic areas.

(2) Subsidiary Loan Agreement (SLA)

Indonesia utilizes Subsidiary Loan Agreements (SLAs) to channel foreign development loans (ODA) from the Ministry of Finance to state-owned enterprises (BUMNs), regional governments, and local public entities (BUMDs). These agreements provide concessional interest rates and extended tenors, enabling affordable financing for infrastructure and development projects not fully supported by domestic budgets. Governed primarily by PMK No. 108/PMK.08/2016 (revised in 2019), SLAs require feasibility studies, parliamentary approval under Law 17/2003, and full compliance with lender procurement rules. The framework ensures fiscal rules regarding accountability, separation, and connection among the central budget, local government budgets, and state-owned enterprises

as separate entities outside the government budget. Another fiscal mechanism is automatic deductions from regional transfers (Dana Alokasi Umum/General Transfers Fund and Dana Bagi Hasil/Revenue Sharing Fund) in case of repayment defaults by local governments.

The SLA, as a two-step loan mechanism, operates within Indonesia’s sovereign debt management structure under PP No. 10/2011, requiring the MoF to act as the sole foreign borrower while on-lending through negotiated agreements. Indonesia’s Geothermal Renewable Energy Market (GREM) Project, supported by a USD 300 million World Bank loan via a Subsidiary Loan Agreement (SLA), exemplifies how on-lending mechanisms accelerate the development of geothermal power plants that are perceived as high-risk investments by private investors. The SLA enables PT Pertamina Geothermal Energy (PGE) to access concessional financing (1.5% interest, 30-year tenor) for exploration, while adhering to World Bank procurement and environmental safeguards. However, challenges such as exploration risks and discrepancies between local content rules (TKDN) and international bidding requirements have hindered the performance of renewable energy developments financed through SLA.

Beyond geothermal, SLAs underpin critical energy transition projects, such as ADB-funded solar mini-grids in Eastern Indonesia and JICA’s Batang Toru hydropower plant, all structured with similar concessional terms. These projects align with Perpres 112/2022 on RE Acceleration but face recurring performance constraints, including currency exposure risks, such as JPY-denominated loans, and subnational permit bottlenecks. The SLA framework’s success hinges on balancing lender conditionalities with domestic regulatory compliance—a lesson vital for scaling up Indonesia’s renewable investments.

(3) Fiscal Instruments (Taxes, Pricing, and Subsidies)

In addition to state budget (APBN) allocations, the Indonesian government has introduced a range of regulations to provide tax incentives, subsidies, and fiscal relaxations aimed at accelerating renewable energy project development. These measures are critical, as renewable energy initiatives heavily rely on private sector investment as a cornerstone of green industry development. Key fiscal mechanisms—including subsidies, tax incentives, and pricing schemes—are summarized in the table below:

<Table 2-6> Incentives in the Indonesian Renewable Energy Sector

Type of Incentives	Regulation	Description
Tax Allowances & Holidays	Government Regulation No. 78/2019	Reduced corporate income tax for renewable energy investors
VAT & Import Duty Exemptions	MoF Regulation No.6/2021	0% VAT on renewable energy machinery and equipment; import duty exemptions for renewable energy technologies.
Subsidies & Price Incentives	<ul style="list-style-type: none"> MEMR Regulation No.28/2016 (Amended by No.10/2022) MEMR Regulation No.50/2017, No.26/2021, No.4/2022, No.2/2023, No. 1/2024 	<ul style="list-style-type: none"> Discounted electricity tariffs for renewable energy consumers (e.g., 65% of standard tariff for rooftop solar PV users; 10% to 15% reduction for biomass/geothermal power buyers)

Type of Incentives	Regulation	Description
		sourcing more than 30% renewable energy). <ul style="list-style-type: none"> Long-term fixed electricity prices guaranteed for renewable energy producers (Feed-in Tariff).
Carbon Tax & Trading	<ul style="list-style-type: none"> Law No.7/2021 MEMR Regulation No.16/2023 	<ul style="list-style-type: none"> Tax rate in approx. USD 2.10/ton CO₂e. Mandates carbon caps and trading for 40 coal-fired power plants.
Green Bonds/Sukuk Framework	<ul style="list-style-type: none"> MoF Regulation No.78/2019 Fiscal Policy Agency Regulation No.18/2021 OJK Regulation No.60/2017 	<ul style="list-style-type: none"> 10% tax discount for green bond issuers. Guidelines for green bond issuance. Requirements for corporate green bonds.
Simplification of business licenses and permits	Law No. 11/2020	To enhance the ease of doing business; applicable across all industry sectors.
Reduction of net income tax as many as 30% of investment	MEMR Regulation No. 1/2015	

Source: OECD (n.d.) and Rahman et al. (2023)

Limited Concession Scheme (LCS)

The Limited Concession Scheme (LCS) in Indonesia is a strategic asset recycling mechanism formally established under Presidential Regulation No. 66 of 2023 on the Optimization of Infrastructure Assets Owned by State-Owned and Regionally-Owned Enterprises. Under this scheme, operational rights to brownfield public infrastructure are transferred to private investors for a limited period, while public ownership is retained. Since its introduction, LCS has been implemented in major infrastructure projects, particularly in the transport and water sectors. Notable implementations include the 25-year concession of Kualanamu International Airport to GMR Airports Consortium in 2022, valued at over USD 6 billion, and the partial monetization of the Cikopo–Palimanan toll road by PT Jasa Marga. These projects demonstrate the role of LCS in attracting private investment and enhancing infrastructure efficiency.

Although regulated under Presidential Regulation No. 66 of 2023, the application of LCS in green infrastructure and the energy transition remains limited. Indonesia’s Energy Transition Mechanism (ETM), targeting the early retirement of 9 GW of coal-fired power plants by 2030, has primarily utilized blended finance models involving concessional loans and equity, without formally adopting LCS. Structural challenges, including uncertain asset valuations and limited post-retirement cash flows, have hindered its application in fossil asset decommissioning. Nevertheless, LCS presents latent potential for energy transition financing, particularly through the managed concession of legacy power infrastructure. State-owned enterprises such as PLN—which plans to retire 5.5 GW of coal capacity by 2040—could utilize LCS to recycle capital into renewable energy development. Financial institutions such as PT SMI and the Indonesia Investment Authority (LPI), both mandated to structure climate-aligned infrastructure investments, are well-placed to adapt LCS instruments to support just transition goals under Indonesia’s net-zero pathway.

Indonesia's Green Bond/Sukuk

Indonesia has emerged as a global frontrunner in the integration of Islamic finance with sustainable development objectives through its Green Bond and Green Sukuk Initiative. Since issuing the world's first sovereign green sukuk in 2018—raising USD 1.25 billion to finance climate-aligned projects—the government has continued to leverage this instrument to support its environmental commitments. The 2024 issuance of USD 2.35 billion, including a USD 600 million 30-year green tranche, underscores Indonesia's strategic use of long-term, Sharia-compliant financing to advance its climate policy agenda. Green sukuk refers to a Sharia-compliant bond through which 100% of proceeds are exclusively allocated to finance or refinance environmentally sustainable projects that support climate change mitigation, adaptation, and biodiversity preservation. The initiative operates under a robust Green Bond and Green Sukuk Framework, which outlines nine eligible sectors and mandates transparency in fund allocation, third-party verification, and public disclosure. The framework has received a "medium green" rating from CICERO, a second opinion provider in the green bond market related to the S&P Global Ratings. This reflects credible environmental intent within a structured investment approach.

Governance and accountability mechanisms are central to the credibility of Indonesia's green sukuk model. The Ministry of Finance maintains a dedicated register of projects, monitors the disbursement of proceeds, and publishes annual reports detailing both financial allocations and environmental outcomes. Between 2018 and 2023, the total value of Indonesia's green sukuk issuances reached approximately USD 9.59 billion, encompassing instruments issued in the global market as well as those targeted at the domestic retail and wholesale sectors. As of 2024, total proceeds mobilized through green sukuk exceeded USD 3.9 billion, supporting mitigation and adaptation efforts across renewable energy, energy efficiency, and sustainable transportation. Notably, the expansion into retail green sukuk has expanded participation, enabling domestic investors to support the national climate transition directly. Indonesia's experience offers a replicable model for emerging markets seeking to align Islamic capital markets with climate finance and presents a compelling case for incorporating green sukuk instruments into national sustainable finance strategies.

(4) Mobilizing Public Entities and Blended Financing

The government has allocated budgets for both mitigation and adaptation actions since 2016. However, fiscal support alone is insufficient to meet the investment needs of the energy transition. According to an IESR study (2024a), the gap between required investment and government budget allocations amounts to USD 7 billion, or 76.9% of the total investment needs. To bridge this gap, the government should involve external parties to participate in energy transition financing. This approach aligns with Article 9 of the Paris Agreement, which calls on developed countries to provide climate finance to developing nations and lead the mobilization of funding from diverse sources, instruments, and channels. To achieve this goal as part of fiscal tools, MoF has sought to utilize vehicles through PT SMI (an SOE under MoF control) and the Indonesia Environment Fund (a quasi-government agency). By utilizing these vehicles, the government gains greater flexibility beyond conventional fiscal constraints. This flexibility is essential for achieving overarching goals while minimizing bureaucratic challenges.

Environmental Fund Management Agency/Indonesia Environment Fund (BPD LH)

BPD LH serves as Indonesia's pivotal financial mechanism for environmental sustainability, established through Presidential Regulation No. 77/2018. Operating as an innovative funding platform, it consolidates and channels financial resources from diverse sources, including national and local government budgets, international climate finance (e.g., Green Climate Fund, World Bank), private sector contributions (CSR and impact investments), and revenues generated from sustainable natural resource management. The agency plays a critical role in addressing Indonesia's pressing environmental challenges by strategically allocating funds to priority areas such as climate change mitigation (renewable energy, REDD+), biodiversity conservation (protected area management), ecosystem restoration (peatland and mangrove rehabilitation), and community-based green economic development.

BPD LH is instrumental in climate finance management, serving as Indonesia's dedicated environmental funding institution mandated to bridge financing gaps in the national climate and sustainability agenda. As the world's third-largest rainforest nation and a significant carbon sink, Indonesia requires robust financial mechanisms to meet its enhanced NDC targets (31.89% unconditional emissions reduction by 2030) and net-zero commitments. BPD LH addresses this need through its structured financial instruments—including blended finance mechanisms, results-based payments, and revolving funds—while ensuring accountability and transparency through rigorous monitoring and independent third-party audits. By effectively mobilizing and deploying climate finance at scale, BPD LH not only strengthens Indonesia's environmental governance but also serves as a model for tropical forest nations in implementing Article 6 of the Paris Agreement and achieving Sustainable Development Goals.

BPD LH currently manages multiple funding streams to support Indonesia's environmental and climate goals, including: (1) Domestic allocations from national and local government budgets (APBN/APBD); (2) International climate finance such as the Green Climate Fund (GCF), Indonesia Climate Change Trust Fund (ICCTF), and Tropical Forest Financing Facility (TF3); (3) Private sector contributions through CSR programs and impact investments; (4) Natural resource revenues from sustainable forestry and ecosystem services; and (5) Carbon market mechanisms, including results-based payments under REDD+ and emerging voluntary carbon market mechanisms.

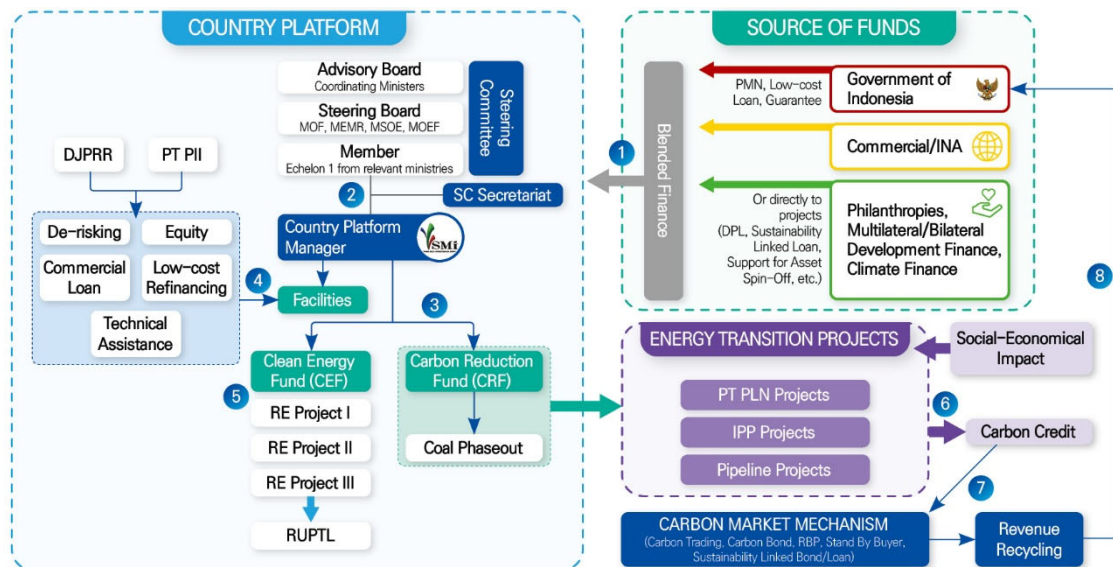
PT SMI as the Energy Transition Mechanism (ETM) Country Platform

To mobilize funding from diverse sources, the government has appointed PT Sarana Multi Infrastruktur (PT SMI) as the Country Platform Manager for ETM. In support of PT SMI's role, the Ministry of Finance issued Regulation No. 103 of 2023. This regulation provides for the establishment of an Energy Transition Platform, which is a mixed financing mechanism designed to accelerate the phase-out of CFPPs and promote the development of renewable energy sources. The Energy Transition Platform aims to enhance energy infrastructure and expedite the transition to clean energy with the ultimate objective of achieving net-zero emissions, while ensuring equity and affordability. To achieve a sustainable and cost-effective energy transition in Indonesia, it is essential to mobilize both public and private financing, tapping into a mix of commercial and non-commercial funding sources. The government extends fiscal support to PT SMI in various instruments, including

government investment, guarantees, KPBU (Public-Private Partnership) support, and additional assistance.

The primary goal of the energy transition platform is to secure and facilitate financing from international financial institutions and various governmental and non-governmental entities for the energy transition initiatives. This includes leveraging government fiscal support while enhancing the platform's performance to advance energy transition initiatives effectively. The platform is designed to support critical projects such as the expedited cessation of CFPP operations, the early termination of CFPP PPAs, the advancement of renewable energy technologies, and the enhancement of the electricity grid to accommodate renewable energy integration. The operational mechanisms for leveraging the facilities of the energy transition platform can be illustrated in the accompanying diagram.

[Figure 2-10] ETM Country Platform Overview



Note: The content has been modified.
Source: Institute for Essential Services Reform (2024).

3.3. Trajectory of Achievement

The GHG emissions reduction in the energy sector serves as a key indicator for evaluating progress toward the Enhanced Nationally Determined Contribution targets. The Indonesian government has established specific mitigation strategies aimed at achieving a substantial reduction in GHG emissions from this sector. These strategies encompass five key components: the expansion of renewable energy sources, enhancements in energy efficiency, the adoption of low-carbon fuels, the deployment of environmentally sustainable coal and gas power technologies, and improvements in post-reclamation practices. These mitigation initiatives represent Indonesia's strategic approach to transitioning its energy systems in order to meet its GHG reduction objectives. According to MEMR reports (2024), the established target for GHG emissions reduction in the energy sector is set at 358.00 MtCO₂e by the year 2030, integrated into an annual framework. In

2023, Indonesia notably exceeded its interim emissions reduction target, achieving a decrease of 123.22 MtCO₂e against a target of 116.45 MtCO₂e, thereby demonstrating significant progress in its climate action endeavors.

<Table 2-7> Realization of GHG Emission Reduction in Energy Sector by Mitigation Actions

No	Mitigation Actions	2023		Target 2030	% Achievement of 2030 Target
		Target	Achievements		
1.	Energy Efficiency	29.14	31.87	132.25	24.1
2.	Renewable Energy	51.00	51.29	181.45	28.3
3.	Low Carbon Emitting Fuels	15.92	15.55	16.83	92.4
4.	Clean Coal Technology and Gas Power Plant	16.54	13.33	21.53	61.9
5.	Other Activities	3.95	11.18	5.84	191.4
Total		116.45	123.22	358.00	34.4

Source: Ministry of Energy and Mineral Resources (2024).

Despite consistently surpassing annual GHG emission reduction targets, the cumulative achievement still aligns at only 34.4% of the 2030 target set for the energy sector, which is to reduce emissions by 358.00 MtCO₂e. A critical area necessitating intensified focus is the renewable energy sector's mitigation strategies, particularly aimed at diversifying the energy mix of power generation sources. The enhancement of this energy mix is essential for effective GHG reduction in alignment with the primary energy mix policy established under Government Regulation Number 79 of 2014, which outlines the National Energy Policy. However, as of 2023, data indicate that progress in diversifying the primary energy mix remains inadequate, underscoring the necessity for more robust initiatives to meet the stipulated targets.

<Table 2-8> Primary Energy Mix Targets under Government Regulation No. 79 of 2014

Energy Types	Target		Achievement
	2025	2050	2023
Renewable Energy	23%	31%	13.29%
Oil	< 25%	<20%	29.91%
Coal	30%	25%	39.69%
Natural Gas	22%	24%	17.11%

Source: Government of Indonesia (2014); MEMR (2024).

The latest data on Indonesia's primary energy mix, as reported by MEMR (2024), indicates that renewable energy accounts for only 13.29% of the total mix. This figure falls significantly short of the target of a minimum 23% contribution from renewable sources by 2025. Additionally, the proportions of natural gas and oil are not aligning with the anticipated 2025 targets, although their current

trajectory suggests that these goals remain achievable. While the National Energy Council's annual report asserts that the government has made strides in maintaining energy supply resilience, the persistent reliance on fossil fuels has resulted in substantial energy subsidies and fiscal compensation costs over the years. The IESR analysis below highlights that unaccomplished targets across various sectors have significantly hindered the integration of renewable energy into Indonesia's primary energy mix (IESR, 2024b).

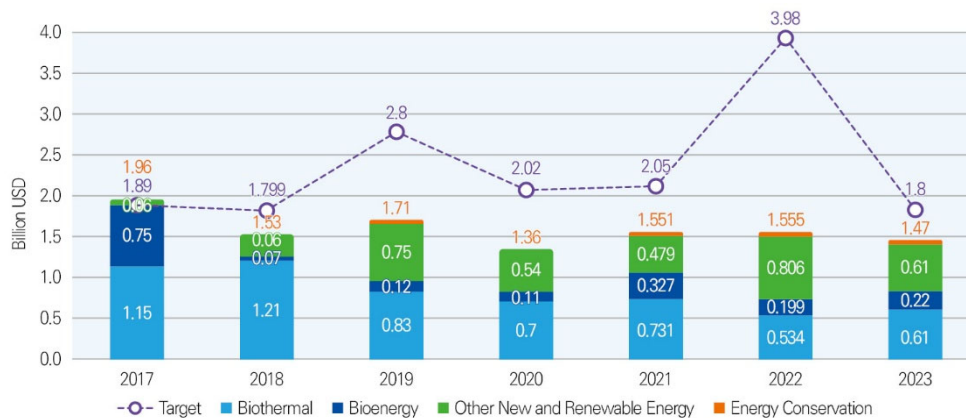
[Figure 2-11] Sectoral Progress towards National Energy Policy Compliance

Sectors	Aspects	2025 Projection	2023 Realization
Power	% RE share	31.8%	18.9%
	% Direct RE	12.8%	13.5%
Transportation	% Electrification	0.3%	0.1%
	% Direct RE	11.4%	4.5%
Industry	% Electrification	24.1%	12.7%
	% Direct RE	1.9%	1.6%
Commercial & Households	% Electrification	72.3%	59.8%

Source: IESR (2024).

In 2023, the actual capital inflow for new and renewable energy initiatives, including energy efficiency measures, amounted to USD 1.47 billion, falling short of the MEMR target of USD 1.8 billion for the year (IESR, 2024). Since 2017, the investment realizations in the new and renewable sector have consistently failed to achieve the established annual targets. The MEMR has identified several factors contributing to this shortfall: a lack of accessible data from various state-owned enterprises, suboptimal project financial viability, project execution delays, as well as technical, social, and legal challenges—particularly in the geothermal sector—that impede project development.

[Figure 2-12] Investment Realization in New Energy, Renewable Energy, and Energy Conservation



Source: Anis and Maswan (2024).

One of the Indonesian Government's initiatives to accelerate funding for renewable energy projects is through the assignment of PT SMI as the country manager of the energy transition platform, as stipulated in the Minister of Finance Decree No. 275/KMK.010/2022. Since 2022, PT SMI has established collaborations with various international financial institutions, achieving significant financing milestones, as outlined below:

1. PT SMI secured financing facilities from the Asian Development Bank (ADB) and the Agence Française de Développement (AFD), each amounting to USD 150 million. These funds are allocated to finance renewable energy projects and initiatives that support the achievement of the Sustainable Development Goals (SDGs).
2. PT SMI also received grants and technical assistance from international partners, totalling USD 7.4 million. These funds have been utilized to support three mini-hydro power plant (PLTM) projects, as well as other activities such as feasibility studies and project due diligence.

<Table 2-9> Financing from ADB and AFD

No.	Partner	Loan Agreement Date	Facility (USD)	Drawdown (USD)	Draw down (%)	Interest Rate	Government Support	Use of Proceed	Renewable Energy Projects
1	Agence française de développement (AFD)	20-May-20	150,000,000	150,000,000	100%	SOFR + 131 bps	None (B2B)	RE and SDG	1. PLTP Ijen 2. PLTM Rahu 3. PLTM Tomoni 4. PLTM Maiting Hulu 2
2	Asian Development Bank (ADB) SDG Indonesia One Green Finance Facility – Stage 1	06-Jun-22	150,000,000	33,812,859.15	22.5%	SOFR + 84 bps	Guarantee (2 step loan)	RE and SDG	1. PLTMh Karai 7 2. PLTMh Karai 13 3. PLTMh Melesom 2 4. PLTMh Titab 5. PLTMh Pandan duri

Source: ADB (2022); PT SMI (2020)

In total, since its assignment in 2022, PT SMI has disbursed financing for 14 renewable energy projects. These include two solar power plant (PLTS) projects, ten mini-hydro power plant (PLTM) projects, one biomass power plant (PLTBm) project, and one geothermal power plant (PLTP) project. Total committed financing amounts to IDR 3.05 trillion and USD 70 million, respectively. Additionally, as part of risk mitigation (de-risking) efforts, PT SMI, in collaboration with its partners, has provided investment grants for three PLTM projects.

3.4. Hurdles, Barriers, Gap Analysis, and Directions for Improvement

3.4.1. Political and Regulatory Factors Creating Uncertainties

Political and regulatory factors remain significant impediments to Indonesia's energy transition. The absence of a comprehensive high-level policy framework for the energy transition indicates a notable gap in political commitment. Currently, PR 112/2022 is the only policy document referencing “energy transition”; however, its ambiguity—particularly the allowance for new CFPP—undermines its effectiveness. Although the draft of the KEN includes energy transition and decarbonization as stated objectives, its proposed trajectory remains misaligned with the 1.5 °C global climate target, and is projected to exhaust Indonesia's carbon budget between 2035 and 2040. Moreover, the inability to execute planned initiatives such as the carbon tax and adjustments in electricity pricing, alongside the failure to meet prior objectives like achieving 23% renewable energy by 2025, underscores a lack of firm commitment and a fragmented approach among policymakers regarding the enforcement of energy transition measures.

Inconsistencies in legal targets and regulatory frameworks undermine investor confidence and stakeholders, potentially undermining confidence in the Indonesian Government's dedication to advancing energy transition initiatives and embracing renewable energy sources. This is particularly evident in the adjustments to Indonesia's primary energy mix as outlined in the Draft Revision of Government Regulation Number 79 of 2014, which pertains to the National Energy Policy. A significant change in this regulatory update involves the downward adjustment of the renewable energy target, which was originally set at 23% by 2025. It has now been revised to a range of 19-21% to be achieved by 2030. Additionally, the policy changes include reduced electricity consumption targets and new emissions intensity benchmarks. Although these adjustments align with Indonesia's Paris Agreement commitments—including a net-zero emissions (NZE) goal by 2060 or earlier—the relaxation of short-term targets may hinder progress during the critical initial phase of the energy transition. These revisions primarily respond to delays in renewable energy infrastructure development.

3.4.2. The Monopolistic and Centralistic Institutional Arrangement in Indonesia's Power Sector

Indonesia's power sector is currently regulated by Law 30/2009 on electricity (the 2009 Electricity Law). It allocates roles and responsibilities to the institutions and market players, and establishes the rules for licensing, tariff setting, and sectoral planning. The 2009 Electricity Law designates PLN, a state-owned vertically-integrated utility, as responsible for power generation, transmission, distribution, and retail. Several attempts have been made to restructure and unbundle the electricity sector, but these have been unsuccessful. In 2015, the Indonesian Constitutional Court (MK) ruled that unbundling electricity business activities was unconstitutional. Specifically, they deemed the unbundling scheme, which involves separating generation, transmission, distribution, and sale of electricity into different business entities, to be against the 1945 Indonesian Constitution, which emphasizes that electricity supply for the public interest must remain under state control to ensure reliability and efficiency (Constitutional Court, 2015).

Several IPPs are allowed to participate by selling energy directly to PLN, which acts as a single buyer. Under the 2009 Electricity Law, private businesses may be given the right to provide electricity for public use through the electricity business licenses or Izin Usaha Penyediaan Tenaga Listrik (IUPTL), especially for renewable energy projects or those with construction or fuel supply risks. In the Java-Bali system, the generation capacity from IPPs in 2025 will be about 19 GW, accounting for a 54% share. However, several IPPs reported difficulties in terms of inconsistent application of regulations as well as lack of transparency and clarity in PLN's rules for procuring electricity from power plants, resulting in limited private participation and, consequently, constrained development of renewable energy.

3.4.3. Financial Risk

From a financial perspective, Indonesia's sovereign risk profile is often perceived as unfavorable by banks and investors, leading to restraint in capital allocation for renewable energy initiatives. The inherent risks of these projects are compounded by a convoluted regulatory landscape and insufficient institutional capacity, which further heighten investor uncertainty. Consequently, private investors generally tend to favor debt financing mechanisms over equity investments, as the former offer greater security and predictability regarding return on investment. Moreover, the limited engagement from Multilateral Development Banks (MDBs) such as the Asian Development Bank (ADB) and the World Bank has placed a disproportionate financial burden on private investors. This situation, characterized by oscillating policies and inconsistent support in the climate financing framework—exemplified by the government's mixed signals regarding coal market obligations and ongoing fossil fuel subsidies against the backdrop of ambitious energy transition goals—has resulted in diminished confidence among private financiers. Such uncertainty over future revenue streams discourages investment in the renewable energy sector.

3.4.4. Policy Recommendation for Improvement of Green Investment

Global climate finance achieved its target of USD 100 billion annually in 2022. However, only 5% of these funds were allocated to Southeast Asia. This significant disparity highlights the urgent need for targeted efforts to direct climate finance to the region, ensuring equitable access to resources for both mitigation and adaptation strategies. In 2021, Indonesia received USD 2.5 billion in international climate finance, with over half of this allocation focused on mitigation initiatives. Despite this support, Indonesia's considerable climate finance requirements necessitate enhanced fund mobilization, particularly to further its Energy Transition Mechanism (ETM) commitments, including grants that exceed mere technical assistance. The Just Energy Transition Partnership (JETP) has made notable strides toward its 2024 financing objective, having secured an initial equity investment of USD 30 million from Invested Partner Group (IPG) countries for renewable energy development and securing loan commitments exceeding USD 500 million from Development Finance Institutions for sustainable development projects, including renewable energy initiatives under the JETP framework. Nevertheless, these figures remain modest in comparison to the USD 21.6 billion commitment, with full program execution slated to commence in 2025.

Subnational governments in Indonesia, despite their limited jurisdiction, play a vital role in the nation's energy transition through their authority to issue permits, grant incentives, and manage land availability for renewable energy projects. However, these efforts are complicated by their constrained fiscal capacity and limited powers. As of 2023, approximately 39% of local governments in Indonesia exhibit low or very low fiscal capacity, highlighting the challenges they face in independently meeting energy transition targets. This situation emphasizes the necessity for enhanced national-level support. To effectively fund ETM projects in underdeveloped regions, enhanced financial mechanisms for subnational governments are essential. Moreover, fostering robust collaboration between national and subnational entities, coupled with improved national support in establishing more viable financial frameworks for local governments, is critical for the successful implementation of ETM initiatives in Indonesia.

Fossil fuels dominate the private investment landscape in Indonesia's energy sector, claiming 73.4% of the total portfolio, which amounts to approximately USD 10.8 billion during the 2019-2020 timeframe. In stark contrast, renewable energy attracted only 26.6% or USD 3.8 billion. This disparity underscores the substantial potential for private investment in the renewable energy sector, highlighting the necessity to diversify from limited public funding sources. However, key barriers persist, as perceived risks and concerns surrounding project bankability pose significant challenges for private financial institutions, including domestic banks, which often favor the established fossil fuel sector over the nascent renewable energy market. To capitalize on this investment potential, it is imperative to engage national banks more effectively in the renewable energy sector, which is essential for augmenting private financing flows. Notably, total investment in renewable energy development has exhibited an upward trajectory, mobilizing IDR 29.6 trillion (approximately USD 1.9 billion) in 2024. Despite this positive trend and an increasing interest from banking entities, developers of renewable energy projects continue to face challenges in accessing financing. These challenges are often tied to elevated credit risk associated with renewable energy projects. Additionally, banks adhere to a conservative lending framework, assessing projects primarily on the sponsor's profile and credibility rather than the inherent validity of "green" projects, such as those in the renewable energy domain.

To address the challenges of project financing in the renewable energy sector, innovative funding mechanisms must be implemented to facilitate the achievement of Indonesia's emission reduction targets by increasing the share of renewables in the primary energy mix. Key measures include the introduction of competitive pricing for renewable energy and the strategic phase-out of coal-fired power plants, which will help mitigate project risks and attract diverse investment sources. Government guarantees can serve as vital incentives for stakeholders willing to invest in renewable energy initiatives, offering essential support to mitigate sustainability-related risks. Additionally, relaxations on regulatory requirements for the use of domestic materials in electricity infrastructure development may be warranted, especially given the current limitations in the availability of requisite materials within Indonesia. To harness the full potential of all stakeholders—donor institutions, the private sector, and local governments—comprehensive policy reforms in government policy are required at the national level. These reforms will facilitate greater investment in the renewable energy sector, in alignment with the goal of achieving net-zero emissions by 2060.

Comparative analysis suggests alternative models could address the inefficiencies in Indonesia's power industry without sacrificing equity. Vietnam's hybrid approach—retaining state control over

transmission while liberalizing generation—has yielded lower consumer prices (Rp1,200/kWh vs. Indonesia’s Rp1,467/kWh) and faster renewable adoption (25% renewable penetration vs. 13% in Indonesia) (IEA, 2022). Norway’s unbundled system demonstrates how separating transmission ownership from generation/retail can improve efficiency while preserving public policy goals. For Indonesia, selective liberalization—particularly in renewable energy generation and industrial-scale distribution—could alleviate fiscal pressures and accelerate the energy transition. This step is particularly important as reforming institutional arrangements in the electricity sector could enhance efficiency through increased competition in power generation, distribution, and retail services. Increasing efficiency would further increase marginal returns in many electricity projects that will attract private investors. However, such reforms would require cautious sequencing to avoid disrupting existing service provision. This consideration suggests a phased approach aligned with the Just Energy Transition Partnership (JETP) roadmap.

4. Policy Recommendations

Indonesia's climate finance landscape is both complex and evolving, reflecting the multifaceted challenges associated with financing diverse energy transition needs to achieve its NDC targets. The country utilizes a diverse range of funding sources, including public funds, private investments, international grants, concessional loans, payments for services, and innovative instruments such as green sukuk and carbon trading.¹³ This complexity is further compounded by hybrid financing models designed to enhance private sector participation.

Addressing these financial challenges requires exploring innovative mechanisms beyond traditional public and private financing, implementing de-risking mechanisms, enhancing the capacity of banking and financial institutions, and reassessing pricing structures.¹⁴ This section focuses on securing substantial financing, strengthening the institutional capacity of existing entities, and fostering a market environment that incentivizes private investments.

While global best practices in energy transition financing offer valuable insights, significant variations in economic, cultural, political, and environmental contexts exist across countries. Consequently, strategies effective in one context may not produce similar outcomes in another. Accordingly, Indonesia must exercise caution in adopting global best practices, ensuring that strategies are appropriately adapted to national circumstances to maximize effectiveness and mitigate unintended consequences. One viable strategy to address the significant financing gap hindering Indonesia's energy transition and climate goals is to leverage the country's own accumulated experiences and expertise in financing infrastructure in the past, while drawing lessons from Korea's policy innovations and relevant global best practices. While Korea is not yet regarded as a leading example in the energy transition, its extensive efforts—along with its iterative process of adapting global standards—offer practical insights for countries like Indonesia navigating similar challenges.

4.1. Extend LCS to Renewables

Indonesia has demonstrated strategic foresight and innovation in utilizing asset recycling to finance crucial infrastructure development. The asset recycling model, particularly through long-term concessions mechanisms, has successfully attracted private sector investment and operational expertise into infrastructure projects. This approach not only mobilizes funding but also contributes to improved efficiency and service delivery. When implemented effectively, asset recycling supports fiscal sustainability by reducing the immediate burden on the state budget and optimizing the utilization of existing public assets.

¹³ Darana (2024), *Climate Finance Landscape in Indonesia*, https://uclg-aspac.org/wp-content/uploads/2024/09/2024_Climate-Finance-Landscape-Indonesia.pdf

¹⁴ Energy Transition Partnership (2023).

Indonesia has effectively identified and monetized existing, mature infrastructure assets to generate upfront capital. This demonstrates a resourceful approach to funding development needs without solely relying on traditional budgetary allocations or incurring excessive debt. By recycling capital from operational assets, Indonesia has unlocked funding for greenfield infrastructure projects and network expansion. This forward-looking strategy addresses current needs while simultaneously investing in future growth and connectivity. Indonesia's exploration of various asset recycling models demonstrates its capacity to adapt global best practices to national legal and economic contexts.

The LCS, a powerful yet underutilized mechanism in Indonesia's infrastructure financing framework, offers a promising opportunity for advancement. Currently applied to sectors such as transport and water, the LCS enables the government to monetize brownfield infrastructure assets by granting temporary operating rights to private investors. This asset recycling model helps unlock the value of mature public assets, redirecting capital to build new infrastructure.

Indonesia's success with asset recycling infrastructure financing provides a solid foundation for its potential application in energy transition financing. Extending the LCS to include renewable energy projects would allow Indonesia to utilize this proven mechanism to accelerate clean energy deployment while minimizing fiscal pressures. By proactively addressing anticipated challenges in applying LCS to energy projects—through robust policies and financial instruments—Indonesia can unlock substantial capital and accelerate its transition to a sustainable energy future.

4.1.1. Benefits and Challenges

The LCS model, as outlined in Regulation 32 and expanded under Regulation 66, explicitly includes electricity/power and renewable energy as eligible infrastructure types. Theoretically speaking, this makes assets like renewable energy power plants (e.g., solar, wind, geothermal, and hydropower) and state-owned power infrastructure, such as the Cirata Floating Solar PV Plant, eligible for LCS arrangements. Regulation 66 (2024) broadens the scope of LCS assets and introduces government support to enhance project feasibility, thereby encouraging greater adoption in the renewable energy sector. For instance, the regulation allows private entities to propose LCS projects for state-owned assets, similar to unsolicited PPP projects.

Benefits

Integrating renewables into the LCS framework would serve several strategic goals, particularly if the challenge of stable income streams for these projects is adequately resolved.

The energy transition requires significant upfront investment in renewable energy projects, grid modernization, and other clean energy infrastructure. LCS would provide a structured and attractive vehicle to unlock substantial domestic and potentially international private investment in the renewable sector. By leveraging existing state-owned renewable energy assets—such as hydropower plants, geothermal fields, and early-stage solar farms—Indonesia can generate upfront revenue that can be reinvested into new clean energy projects. By channeling proceeds from established infrastructure into energy transition projects, the government can potentially de-risk these investments, making them

more attractive to private investors. Extending LCS to renewables can also develop a robust pipeline of renewable projects under the asset recycling framework. This approach can create a continuous cycle of infrastructure development, where mature assets fund the growth of new, sustainable energy infrastructure. Such an approach strengthens the project pipeline and conveys a clear signal of policy continuity and innovation to the investor community.

Challenges

However, as of April 2025, no specific publicly documented cases have been found that have adopted the LCS model in Indonesia's power or renewable energy sectors. The fact that no specific cases can be found may reflect implementation challenges. The LCS model is relatively new, and its uptake may be slowed by regulatory complexities, asset valuation and procurement, PLN's dominance, and the need for clearer fiscal incentives. Investors may hesitate due to unclear fiscal support mechanisms, as Regulation 66 excludes typical PPP fiscal incentives like viability gap funding. Also, the process of valuing state-owned assets (via government or public appraisers) and procuring LCS entities may delay projects. PLN's dominant role as the sole electricity off-taker and asset owner may complicate private sector involvement.

Future cases are likely as the government seeks to monetize assets to fund renewable energy development. The key to successfully applying asset recycling to energy transition lies in creating an enabling environment that mitigates the perceived risk of unstable income streams compared to traditional infrastructure like toll roads and provides confidence to investors about the long-term financial viability of energy transition projects.

We can think of many strategies to address this perceived risk. Long-Term Power Purchase Agreements (PPAs) are one easy way to secure a stable income stream. These contracts should have clear pricing mechanisms and risk allocation frameworks. We can also use government guarantees and subsidies in a way that the government provides partial revenue guarantees or offers initial subsidies to make renewable energy projects financially viable in their early stages, thus enhancing their attractiveness for asset recycling. We can explore tariff designs that ensure cost recovery for renewable energy projects while remaining affordable for consumers. This might include feed-in tariffs, net metering, or other incentive-based mechanisms.

Carbon pricing mechanisms can supplement the LCS. RPS and adequate emissions trading schemes can create a predictable revenue stream for low-carbon energy projects, making them more attractive for investment through asset recycling. Setting up a virtual power plant and bundling smaller renewable energy projects into larger portfolios can diversify risk and create more attractive investment opportunities for asset recycling.

Implementing LCS expansion could face resistance from established interests in conventional energy sectors. Additionally, careful governance structures would be needed to ensure that recycled assets maintain performance standards and align with long-term climate objectives. This includes developing regulatory frameworks to safeguard service quality, environmental compliance, and equitable access.

4.1.2. Comparison with Alternatives

The benefits and risks of LCS can be compared with three alternative financing models, Project Finance (Non-Recourse), Partial Privatization as Public-Private Partnership (PPP), and Full Privatization, based on six criteria including risk to private sector, public debt impact, capital mobilization, implementation easiness and speed, sovereignty safeguards, and other considerations.

The Limited Concession Scheme (LCS) poses moderate risks to private investors by exposing them to operational risks but not construction risks, while minimizing public debt impact by generating upfront revenue without borrowing. It enables significant capital mobilization through asset leases and offers moderate implementation speed for brownfield assets. Sovereignty is strongly safeguarded as the state retains ownership, and it promotes efficient asset use to support the energy transition.

Project Finance (Non-Recourse) involves high risks for private investors, especially for greenfield projects, and minimal public debt impact unless guarantees are provided. It mobilizes high levels of capital but is complex and slow to implement. Sovereignty safeguards are moderate, relying on regulatory oversight, and they encourage innovation, though they face challenges from high financing costs.

Partial Privatization as PPP moderately shares risks between government and private sector, with moderate public debt impacts due to possible guarantees. It enables significant capital mobilization, combining public and private funds, but has a slow and complex implementation. Sovereignty is moderately protected, and while it fosters collaboration, it adds an administrative burden through complex contracts.

Full Privatization places high risks on private investors by transferring all operational and market risks, achieves the lowest public debt impact through one-time payments, and enables significant immediate capital inflow without funding new projects. It is relatively quick to implement but can be slowed by political resistance, offers weak sovereignty protection, and prioritizes short-term revenue at the risk of public backlash and strategic asset loss.

In summary, the LCS offers a balanced approach, with moderate private sector risk, low public debt impact, significant capital mobilization, and strong sovereignty safeguards, making it suitable for monetizing existing power assets in Indonesia without relinquishing control. Compared to **project finance**, it is less risky and faster, but mobilizes less capital for greenfield projects. Against **PPPs**, LCS is simpler and preserves more state control, but may attract less private investment. Compared to **full privatization**, LCS avoids permanent asset loss and public backlash but generates less immediate revenue.

<Table 2-10> LCS vs Other Financing Alternatives

Criteria	Limited Concession Scheme (LCS)	Project Finance (Non-Recourse)	Partial Privatization as PPP	Full Privatization
Risk to Private Sector	Moderate: Operational risks for brownfield assets; upfront fee increases exposure but no construction risk.	High: Bears construction, operational, and market risks for greenfield projects; no recourse to sponsor's assets.	Moderate: Shares risks with government; construction and market risks mitigated by guarantees.	High: Assumes all operational, market, and regulatory risks with full ownership.
Public Debt Impact	Low: Generates upfront revenue without borrowing; no guarantees needed.	Low: Minimal impact unless guarantees create contingent liabilities.	Moderate: Guarantees or subsidies may increase contingent liabilities.	Lowest: One-time payment eliminates liabilities but loses future revenue.
Capital Mobilization	Significant: Upfront fees from asset leases fund new projects; limited by asset value.	High: Mobilizes private debt and equity for new projects; ideal for greenfield.	Significant: Combines private and public capital; may require incentives.	Significant: Immediate funds from sales; no direct new project financing.
Implementation Easiness and Speed	Moderate: Fast for brownfield assets but slowed by valuation and approvals.	Low: Complex and slow due to feasibility studies and lender due diligence.	Low: Complex negotiations and approvals delay implementation.	Moderate: Quick for liquid assets but slowed by political resistance.
Sovereignty Safeguards	Strong: State retains ownership and control over strategic assets.	Moderate: Regulatory oversight but private control of new assets.	Moderate: Government stake ensures oversight, but private involvement raises concerns.	Weak: Permanent loss of asset control to private sector.
Other Considerations	Efficient asset use; supports energy transition; limited by PLN dominance and nascent stage.	Encourages innovation; high financing costs; needs stable policies.	Fosters collaboration; complex contracts increase administrative burden.	Maximizes short-term revenue; risks public backlash and strategic loss.

Source: Authors (2025).

4.1.3. Implementation

To reduce the risks and address challenges, boost investors' confidence, and attract private capital, the LCS framework needs to be tailored to Indonesia's power sector and renewable energy goals:

- Develop detailed, sector-specific LCS guidelines for power facilities, clarifying asset valuation, competitive bidding procedures, and contract terms. Standardize asset valuation methodologies for power facilities using independent appraisers and market-based benchmarks. Introduce risk mitigation instruments, such as a cap-and-floor model, to guarantee minimum income, thereby reducing investor risk while limiting excessive profits. Reform PLN's mandatory partnership schemes to permit greater private sector control in LCS projects without requiring PLN subsidiaries as majority shareholders. Establish a dedicated LCS unit within PLN to manage asset transfers, similar to Infrastructure NSW in Australia. The Ministry of Energy and Mineral Resources (MEMR) and the Ministry of Finance should issue a joint regulation specifying LCS processes for PLN assets, with transparent timelines and fiscal incentives (e.g., tax exemptions, concessional loans).

- Create a dedicated fund to channel LCS revenues into grid upgrades and renewable projects, reducing curtailment risks and supporting NRE goals. Ensure the transparent reinvestment of LCS proceeds into renewable projects in coal-dependent regions to mitigate job displacement and address environmental concerns.
- Promote engagement of local governments and communities in LCS project planning. Mandate community consultations as part of LCS contractual obligations and allocate a portion of concession revenues to local development funds, as recommended by the OECD for enhancing regional engagement (OECD, 2020).

4.2. Convert PT SMI into a Policy Bank

PT SMI is a non-bank financial institution (Lembaga Keuangan Bukan Bank, LKBB), established in 2009 as a state-owned enterprise under the supervision of MoE and serving as a Special Mission Vehicle (SMV). PT SMI plays a role and has a mandate as an agent of sustainable development. PT SMI has three business pillars, namely commercial financing and investment for infrastructure projects, public financing, and project development and advisory services.

Since its inception, PT SMI has served as a catalyst for infrastructure development in Indonesia. It has various functions and unique products and features to support the acceleration of infrastructure development, which functions not only as a financing entity but also as an enabler through the implementation of the Government and Business Entity Cooperation (KPBU) scheme, involving various financial institutions, both private and multilateral. PT SMI actively supports the implementation of PPP and encourages the acceleration of infrastructure development in the regions through regional loan products.¹⁵

As a designated Country Platform Manager for the Energy Transition Mechanism (ETM) since 2022, it has been tasked with accelerating Indonesia's shift from fossil fuels to renewable energy by mobilizing commercial and non-commercial funding support from international partners, including multilateral, bilateral, philanthropic, and private sector entities. To date, PT SMI has received support from 18 partners, including grants, financing, technical, and investment partners. PT SMI also manages the SDG Indonesia One (SIO) platform, which is a platform that combines public and private funds through blended finance to be allocated for infrastructure projects related to the Sustainable Development Goals (SDGs). This blended finance scheme has successfully supported several strategic projects.

The total value of projects financed by PT SMI has reached IDR 1,153 trillion. This has resulted in a multiplier effect of 7.75 times relative to total commitments and 37.79 times relative to paid-up capital.

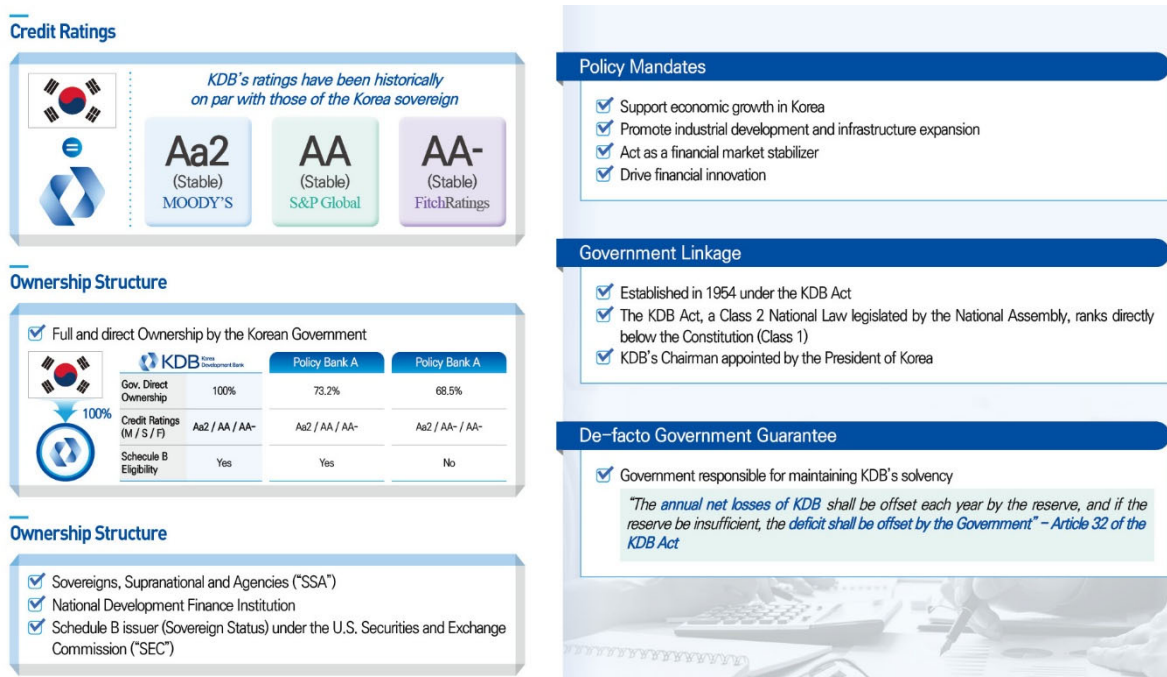
¹⁵ PT SMI (2025), *16 Years of PT SMI: Driving Growth Through Impactful Development*, published February 26, 2025, <https://www.ptsmi.co.id/16-years-of-pt-smi-driving-growth-through-impactful-development>.

4.2.1. Strengths and Limitations

PT SMI's capacity to integrate government, multilateral, and private funding through platforms such as the ETM and SDG Indonesia One is critical to closing the financing gap in Indonesia's energy transition. Collaborations with global institutions provide access to concessional loans, grants, and technical expertise, thereby enhancing project bankability. As an SMV under the Ministry of Finance, PT SMI aligns with national priorities and benefits from direct government backing for energy transition initiatives. Its three business pillars—commercial financing, public financing, and advisory services—enable PT SMI to finance, advise, and develop projects, making it well-positioned to address a wide range of energy transition needs. In summary, PT SMI is well-positioned to serve as a central actor in Indonesia's energy, leveraging its blended finance expertise, government support, and international partnerships to secure substantial project funding on an annual basis.

However, PT SMI's current financial capacity remains modest relative to the massive investment needs of NDC. As a result, it relies heavily on international partners, which may introduce conditionalities or delays, unlike a self-sustaining policy bank with greater capital reserves. While its operational scope is versatile, it lacks the financing capacity of institutions such as KDB, which holds assets of around USD 250 billion (KRW 372.6 trillion) and ranks as the second largest G2 currency issuer after ADB among APAC SSA institutions as of 2024. KDB supports R&D, technology development, and portfolio diversification with significant financial autonomy, without straining the fiscal capacity of the government. These constraints collectively underscore the need to transform PT SMI into a larger and more versatile institution.

[Figure 2-13] KDB Overview




Source: KDB (2024)

[Figure 2-14] Active Foreign Currency Funding Activity of KDB



Source: KDB (2024)

[Figure 2-15] G2 Currency Issuer among APAC SSA as of November 2024

Rank	Issuer	Issuance Amount (USD mn)
1	ADB	22,014
2	 KDB Korea Development Bank	11,067
3	AIIB	5,832
4	KEXIM	5,036
5	JBIC	4,041
6	DBJ	2,761

Note: Investor Presentation in December 2024.
Source: KDB (2024).

4.2.2. Transformation

PT SMI is currently in the early stages of transforming into a Development Finance Institution (DFI) to function like a ‘mini world bank’ that more actively supports local governments with the aim of generating a greater impact on the economy and society of the regions (PT SMI, 2025).

Indonesia hosts several national DFIs, each exhibiting differing levels of engagement and commitment to the climate finance agenda. The country relies on various state-owned investment and guarantee entities to support the development of different sectors and business activities, including infrastructure and micro, small, and medium enterprises (MSMEs). In addition to PT SMI, in 2009, the Indonesian Government formed PT Penjaminan Infrastruktur Indonesia (Persero, PT PII) as a State-Owned Enterprise (BUMN) or SMVs under MoF. PT PII is mandated to provide guarantees for government infrastructure projects developed under the PPP scheme.¹⁶ PT Permodalan Nasional Madani (Persero), hereinafter referred to as PT PNM (Persero), was established under the Government Regulation of the Republic of Indonesia No. 38 of 1999 dated May 25, 1999, concerning the State Equity Participation of the Republic of Indonesia for the Establishment of a Limited Liability Company (Persero) to support the development of cooperatives and SMEs. The purpose and objective of establishing PT PNM (Persero) are to provide financing services, including program credit and management services for the development of cooperatives, small, and medium enterprises.

¹⁶ PT PII, *Company History and Milestones*, <https://www.ptpii.co.id/milestone>.

Since 2015, PT SMI has participated in regional financing following the transfer of assets and responsibilities from Pusat Investasi Pemerintah, the former local government financing institution.¹⁷ It has now become a strategic partner of the regional government through regional loan facilities. As of December 2024, PT SMI has financed 94 climate-related projects with a cumulative commitment of IDR 33.45 trillion and a project value of IDR 174.8 trillion.

Expanding PT SMI's role from a limited "mini World Bank" for local governments into a full-fledged policy bank with an enhanced mandate and strengthened governance could help overcome its current financing constraints and limited policy scope. Successful policy banks such as KDB, Germany's KfW, and Brazil's BNDES play critical roles in their respective countries' energy transitions by providing specialized financing instruments and risk mitigation.

Converting PT SMI into a policy bank presents several legal challenges and may require a substantial capital injection. There is also potential for political interference.

One approach to aligning existing legal frameworks with the mandate, operational flexibility, and risk management of a policy bank is to enact a dedicated law that formally defines PT SMI's policy bank mandate, governance structure, and accountability mechanisms. At present, there is no specific law that mandates PT SMI's transformation into a DFI. Instead, the transformation is occurring through a multi-pronged approach, including government approval of long-term plans, strategic partnerships, and the establishment of the SMI Institute. Compared to regulation by presidential decrees, embedding the mandate in statutory law could offer greater advantages by providing legal certainty for foreign investors and formally anchoring a broader mandate across sectors and investment areas. Regulations regarding PT SMI as the ETM manager (MoFR No. 103/2023), including clarification on funding allocation, cost-recovery mechanisms, and renewable targets, are needed.

As for capitalization, a small portion of the government-owned PLN (Perusahaan Listrik Negara) equity can be injected as a contribution in kind into the policy bank to boost its capital and make it a larger and more versatile development bank. As of 2024, PLN's assets are valued at approximately USD 101.5 billion (IDR 1.67 quadrillion). While PLN's equity value is not publicly listed, it is substantial. Transferring a minority stake of 5% to 10% could be valued at approximately USD 5.1 to 10.15 billion. Such a capital contribution could reduce reliance on external funding, support bond issuance, and enhance PT SMI's financial autonomy.

Compared to alternative strategies such as capital expansion alone, retaining PT SMI's current structure, or creating a new green bank, transforming PT SMI into a policy bank presents an optimal solution. It balances legal feasibility, institutional experience, and risk mitigation, while leveraging existing frameworks. A capital expansion strategy would require minimal legal amendments but would constrain operational flexibility. Establishing a *de novo* green bank would demand fresh legislation, staffing, and systems, increasing setup time and costs. The absence of pre-existing institutional capacity would also require additional time to develop technical expertise.

¹⁷ PT SMI (2023), *14 Years of Service*, published March 3, 2023.

<Table 2-11> Comparison of Alternative Strategies for Energy Transition Financing

Criteria	Policy Bank Conversion	Capital Expansion only	De Novo Green Bank
Ease	Moderate	High (no structural change)	Low (new legislation required)
Legal feasibility	High(streamlined frameworks)	Moderate (constrained mandate)	Low (regulatory complexity)
Expertise leverage	High (16-year track record)	High	None (startup phase)

Source: Authors

4.3. Promote Decentralized Power Grids

Although Korea and Indonesia differ in terms of economic scales and power industry structures, both face common challenges in advancing energy transition and activating decentralized energy systems. In particular, a paradigm shift towards a decentralized energy era can be achieved with consistent policies and strong government commitment.

Indonesia's archipelagic and mountainous geography presents physical challenges to grid development, resulting in supply imbalances. Some regions (e.g., Java-Bali, Sumatra) experience oversupply, while others continue to face undersupply (Thomas et al., 2025). Renewable energy development is constrained by limited resource availability and land scarcity near demand centers. These geographical separations adversely affect voltage and frequency stability. Indonesia's continued reliance on large, inflexible fossil fuel power plants complicates the balancing of supply and demand, particularly given the variable nature of renewable energy. The predominantly radial grid structure is cost-effective but lacks the efficiency, resilience, and flexibility required to integrate distributed energy sources. Essential services—such as frequency regulation and capacity control—are not appropriately monetized, with PT PLN solely responsible for grid stability. PT PLN maintains full ownership and control of the national transmission system, thereby limiting investment and expansion options. While current regulations restrict partnerships with private investors, alternative models such as BOT, BLT, and power wheeling are under consideration.

In developing a sustainable and decentralized energy system in the future, Korea's experience may provide useful implications for Indonesia—particularly when adapted to the national context through legal reforms, pilot initiatives, and enhanced private sector participation.

For example, provisions under Korea's Special Act on Distributed Energy are anticipated to stimulate private sector investment by improving market attractiveness, enhancing the business environment, and reducing investment risks.

The legislation aims to lower the high entry barriers of the existing energy industry and create an environment that facilitates the adoption of small-scale distributed energy. This, in turn, provides more opportunities for private businesses to participate in renewable energy projects. Clarifying the definition of distributed energy and establishing generation targets supports long-term market growth and enhances legal certainty for relevant businesses, thereby reducing investment risks. Mandating usage allocation and other obligations ensures a stable demand base, attracting private investment. The introduction of a power grid impact assessment system aims to secure grid stability while establishing reasonable criteria for distributed energy deployment, creating a predictable investment

environment. Authorizing direct power transactions within designated zones can promote the diversification of VPP business models and revitalize private investment. Differentiated regional electricity rates can increase the economic feasibility of distributed energy production regions, attracting investment. Electricity rates in densely populated demand areas may generally become higher than in supply-intensive areas, with the specific level of differentiation depending on the grid topology (KIER, 2023).

Drawing on Korean experience, the following policy recommendations are proposed for Indonesia:

- Clearly incorporate the concept of distributed energy in the draft New Renewable Energy Law (Patinggi et al., 2024), and introduce provisions for support and obligation of regional distributed resources. For example, mandatory installation of renewable energy facilities in new developments exceeding a specified threshold could be considered. Selected island regions could also be designated as energy self-sufficient zones, with accompanying regulatory exemptions.
- Pilot innovative models in selected areas by engaging willing local governments and promoting demonstration projects for distributed energy. Regulatory sandboxes—such as exemptions from PLN’s monopoly, liberalized tariff schemes, and allowances for private network operation—should be employed. Korea’s distributed energy special zones and Jeju Island’s VPP pilot offer instructive examples.
- Partial opening of the electricity trading structure is necessary to meet the renewable energy procurement needs of companies. Initial efforts should adopt safeguarded models—for example, power sharing among firms within industrial complexes and preferential green tariffs for electricity sourced from designated renewable energy zones—followed by gradual expansion. Such measures would support multinational corporations in meeting RE100 commitments and promote additional renewable energy investments.
- The effective implementation of distributed energy systems and grid transition initiatives will require targeted technical knowledge and skills. Many of these skills are new for government stakeholders and technical personnel at the national and sub-national levels. Capacity building of human resources is therefore essential. Capacity—through formal, informal, and vocational education—should be planned and implemented by a clearly articulated transition roadmap to foster the expertise required to establish and operate distributed energy plans.
- Finally, a phased implementation roadmap should be developed, synthesizing the above recommendations. Short-term milestones could include the operationalization of regulatory sandboxes and initial investments in key island networks. In the long term, nationwide distributed energy obligations and the gradual introduction of competitive electricity market structures should be pursued. Given Korea’s successful use of five-year basic plans to manage such transitions, adopting a similar planning system would enhance policy continuity and implementation momentum in Indonesia.

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Appendix

<Appendix 2-1> Action Plan to Expand Investor Participation and Incentives for Energy Transition

Improvement Measures	Key Contents	Indonesia	Gap/Necessary Actions	Priority
LCS Guidelines for Power Facilities	Clarifying valuation, competitive bidding, and contract terms	Unclear fiscal support mechanisms for LCS model in energy sector	Creating enabling environment that mitigates the perceived risk of unstable income streams, e.g. i) exploring tariff designs that ensure cost recovery for renewable energy projects and ii) implementing Renewable Portfolio Standards	Immediate
Creating a Dedicated Fund for energy transition LCS	A vehicle for transparent reinvestment of LCS funds	No specific publicly documented cases adopting LCS model in power or renewable energy sectors	Setting up a vehicle to channel LCS revenues into renewable projects and grid upgrades	Immediate
Legislation to Convert PT SMI into a Policy Bank	Transformation of PT SMI into a larger, more versatile, and autonomous institution	Several national DFIs, each exhibiting differing levels of engagement, capacity, and commitment to climate finance agenda	Enacting a dedicated law to define PT SMI's policy bank mandate, governance structure, and accountability mechanisms	Moderate
Leveraging Government-owned PLN equities	Boost the capital base of PT SMI by injecting small portion of PLN equity as a contribution in kind	Currently modest level of financing capacity compared to the massive investment needs to achieve NDC goals	Addressing PT SMI's constrained financing capacity, while preparing for the transformation into a full-fledged policy bank	Moderate
Mandating the installation of renewable energy facilities and power grid impact assessment in new development projects of a certain size	Create a predictable investment environment	Need to build a sustainable and decentralized energy system overcoming the physical barriers to grid development	Introducing obligations to warrant a stable demand base for renewables and secure grid stability	Moderate
Discovering an innovative way to accelerate energy efficiency that are suitable in the Indonesian context	Experimenting various models or projects in limited areas or archipelagoes	Growth in energy demand is projected to continue at high rates	Investment in R&Ds and efficient technologies, tariff price reform, and development of energy efficiency plan at national and local government levels	Immediate

03

Chapter

Enhancing the Risk Governance Framework in the Energy Transition Sectors

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Keywords:

Energy transition, Investment incentive, Green finance

Enhancing the Risk Governance Framework in the Energy Transition Sectors

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1. Introduction

Indonesia has set an ambitious global climate change response goal of achieving net-zero carbon by 2060, but is facing various practical limitations. First of all, around 60% of Indonesia's electricity production is still generated from coal-fired power plants. Coal power has become the country's primary source of electricity, supported by Indonesia's long history with and abundant reserves of coal. As a result, the high carbon emissions from coal-fired generation pose a major obstacle to achieving climate goals, especially when the share of renewables in the energy mix remains low.

In addition, Indonesia lacks the financial resources to drive its own energy transition. With limited capacity for financing through the national budget and financial markets, the government is looking to international financial institutions such as the Asian Development Bank (ADB) for support. However, Indonesia is currently maintaining an excess production system that exceeds its electricity demand, reducing existing fossil fuel power generation more important than building large-scale renewable energy infrastructure through overseas aid.

In other words, Indonesia's key challenge is not only a lack of financial resources needed to expand renewable energy infrastructure, but also the difficulty of reducing the coal-fired power plants that play an important role in the country's electricity supply, while managing supply and demand efficiently. Although international financial support is expected, given the current overcapacity, improving the efficiency of existing fossil fuel plants and gradually reducing their operation is a higher priority than building new renewable energy infrastructure.

As such, while Indonesia is committed to achieving a global energy transition and carbon neutrality, the transition to achieve these goals is complicated by practical limitations, such as the coal-dependent electricity structure, financial constraints, and excess power supply. To address these issues, the Indonesian government is exploring various policy alternatives, such as improving fossil fuel efficiency, expanding renewable energy, and integrating power grids. However, accelerating the transition will be difficult without fundamental financial support and international cooperation.

Indonesia has abundant renewable energy resources such as solar, hydro, and geothermal energy. If effectively utilized, these resources have the potential to greatly increase energy self-

sufficiency and create a stable and eco-friendly power supply network. Given Indonesia's archipelagic geography, these resources could serve as the basis for a super grid power grid that connects different regions, enabling efficient distribution and stable supply of electricity.

However, coal-fired power plants remain the leading source of Indonesia's greenhouse gas (GHG) emissions and continue to play an important role in electricity generation. At the same time, the country's power system is marked by overcapacity, making the reduction of existing fossil fuel power plants more pressing than the development of new renewable energy facilities. Coal-fired power plants not only generate high levels of carbon emissions and pollute the environment, but also maintain an inefficient energy system based on already overproduced electricity, which is likely to undermine the country's energy security and environmental sustainability in the long term.

Therefore, the Indonesian government and relevant policymakers should actively seek opportunities to advance the energy transition and improve self-sufficiency by utilizing the country's abundant renewable energy resources. To achieve this, the first step should be the gradual decommissioning of coal-fired power plants, which will lead to significant reductions in GHG emissions and lessen environmental impacts. In place of the closed coal-fired power plants, renewable energy infrastructure must be expanded, and advanced power grid systems such as super grids developed. This transition will go beyond simply adding new power generation capacity and will enhance the overall efficiency of the energy system and secure the long-term sustainability of the national economy.

Ultimately, Indonesia's abundant renewable energy potential and the goal of building a power grid connecting the islands provide great opportunities in and of themselves. However, the most pressing issue is the rapid reduction of coal-fired power generation, which remains the primary contributor to carbon emissions. By prioritizing this, Indonesia can reduce the environmental and economic burdens of the energy transition and lay the foundation for a clean energy-based society for future generations.

In Indonesia, financial constraints remain a major obstacle to promoting the transition to renewable energy. In particular, the early closure of coal-fired power plants, which form the backbone of the country's electricity supply, has caused the issue of not being able to recover the huge investment capital that has already been invested. Indonesia's state-owned power company, Perusahaan Listrik Negara (PLN), has long signed power purchase agreements (PPAs) with private power producers (PPPs) for 20 to 30 years to ensure a stable power supply and long-term profit generation through the operation of coal-fired power plants. These contracts allow independent power producers (IPPs) to recover their investments by providing a predictable return over the power plant's lifespan. Early termination of these contracts due to plant closures would result in lost income for IPPs and trigger demands for compensation.

This will result in unexpected financial burdens on PLN, potentially affecting the country's overall fiscal health. Consequently, even though the closure of coal-fired power plants is necessary from an environmental or climate change perspective, implementation is hindered by long-term contractual obligations and investment recovery issues.

In response, the Indonesian government is attempting to facilitate the early closure of coal-fired power plants through the Energy Transition Mechanism (ETM) program led by the ADB. However,

direct compensation or financial support through this program has yet to be realized. While international aid can support renewable energy infrastructure development, using it to compensate for the early closure of coal-fired power plants remains difficult due to structural issues such as overcapacity in the power supply. Therefore, to increase the share of renewable energy and improve energy self-sufficiency, Indonesia must first solve the compensation challenges related to the early closure of coal-fired power plants.

2. Korea's Experiences on Energy Transition

This section outlines Korea's experience to inform the development of a plan to improve Indonesia's regulatory system for energy transition. It also analyzes the success factors and challenges Korea faced during implementation, including policy incentives and legislative enactments.

2.1. Role of State-owned Enterprises Conducting Green Investment

As a state-owned company, KEPCO is responsible for managing power infrastructure and plays an important role in research and development (R&D) and green investment to support national energy transition and climate change response. It has been able to promote large-scale R&D from a long-term perspective in line with the government's policy direction, and its structure prioritizes public interest over profitability, allowing KEPCO to undertake high-risk, long-term investments that are difficult for private companies to take on.

In particular, it has actively taken the initiative in developing technologies to expand renewable energy and ensure the stability of the power grid. It has led research and development related to various energy sources, including wind, solar, hydrogen, and next-generation nuclear power. It has played a leading role in the process of demonstrating and commercializing them. These renewable energy sources help reduce reliance on fossil fuels and lower carbon emissions. This effort aligns with the government's energy transition policy and the 2050 carbon-neutral goal.

(1) Renewable Energy Purchase of REC Credits through the Renewable Energy Portfolio Standard (RPS)

KEPCO is actively implementing the government's Renewable Portfolio Standard (RPS). The RPS is a system that requires power suppliers to produce or purchase a certain percentage of renewable energy, and KEPCO is using it to promote the growth of the renewable energy market. KEPCO is obliged to purchase electricity from renewable energy producers. This guarantees investment stability for renewable energy businesses and encourages further expansion. KEPCO is steadily increasing its annual renewable energy purchases to achieve the RPS targets set by the government. This supports faster integration of renewable energy into the power grid and the gradual reduction of fossil fuel-based power generation.

(2) Improving the Power Grid Infrastructure and Building a Smart Grid

Improving the power grid infrastructure is essential for the expansion of renewable energy. KEPCO is focused on introducing smart grid technologies and modernizing the grid to enable efficient integration of renewable energy. A smart grid is a system that manages electricity supply

and demand in real time by incorporating information and communication technology (ICT) into the power grid. KEPCO uses smart grids to address the intermittency of renewable energy and to improve the stability of the power grid. As renewable energy facilities increase, KEPCO is expanding grid capacity and continuously upgrading infrastructure for smooth transmission. For example, KEPCO has introduced high-voltage direct current (HVDC) transmission technology to compensate for renewable energy variability and enable efficient power transmission and distribution.

(3) Introduction of Energy Storage Systems (ESS)

KEPCO has introduced energy storage systems (ESS) to improve the efficiency of renewable energy generation and reduce the impact of power fluctuations on the power grid. As the amount of power generated by renewable energy fluctuates depending on weather conditions, ESS is essential to compensate for these variations. KEPCO is actively introducing ESS to support a stable supply of renewable energy. KEPCO is installing ESS alongside renewable energy power plants. This enhances the stability of the power supply by storing the power generated by renewable energy and releasing it when needed. KEPCO is also investing in related technologies to increase the efficiency of ESS. In particular, it is developing technologies that support large-capacity ESS and long-duration energy storage. Its power generation subsidiary, Korea Hydro & Nuclear Power (KHNP), is also focusing on the development and deployment of ESS to ensure the stability of the national electricity supply and expand the distribution of renewable energy. Specifically, KHNP is developing technologies and infrastructure centered on pumped storage power generation and battery-based storage systems, which are the main pillars of ESS.

(4) Stable Supply of Investment Funds

One of KEPCO's most important roles as a state-owned company has been securing stable funding for the development of green technologies and infrastructure. In cooperation with the government, KEPCO has enabled large-scale investment by utilizing policy financing and issuing green bonds, alleviating the financial burden during the R&D process. This structure supported the long R&D cycle from technology demonstration to commercialization and provided a foundation for private sector participation.

As a result, KEPCO has continued to invest with a long-term perspective aligned with national energy policies and environmental goals, rather than short-term profitability. This has played a key role in advancing Korea's energy transition and contributing to global efforts to combat climate change.

(5) As an Intermediary, Wholesale Power Demand Monopoly, Retail Power Supply Monopoly Role

KEPCO is not a direct supplier under the RPS system but plays an important role in the trading of Renewable Energy Certificates (RECs). The RPS requires power generators with facilities of 500 MW or more capacity to supply a certain percentage of their total power generation with renewable energy. To meet this requirement, suppliers must either build their renewable energy facilities or purchase RECs externally.

KEPCO operates a green premium system for the purchase of renewable energy. Under this system, KEPCO purchases RECs from RPS-compliant generators and transfers the renewable energy usage rights to the end consumers. This allows companies to be certified for using renewable energy, with KEPCO acting as an intermediary for REC transactions.

As the exclusive power grid operator, KEPCO also plays an important role in direct PPAs between power generators and consumers. Companies entering into direct PPAs must use KEPCO's grid and pay a usage fee. The government is expanding its support for KEPCO's grid fees to promote the adoption of direct PPAs.

(6) Imposition of a Climate Charge

The inclusion of climate change in KEPCO's electricity bill is a key policy measure to secure the financial sustainability of the energy transition, raise consumer awareness, and promote energy efficiency. Given Korea's energy mix, power generation is still heavily dependent on fossil fuels, and additional costs are incurred to achieve carbon neutrality and expand renewable energy. To transparently and systematically reflect these costs, a climate charge fee is being introduced.

In the past, Korea's electricity prices directly reflected power generation costs. However, as renewable energy expanded and carbon emission reduction policies strengthened, the need to reflect climate-related costs incurred as a result of power production increased. As a result, the government is adding climate costs to electricity prices to secure the resources needed to respond to climate change and to pass on the costs of the energy transition process gradually. This system can also help consumers understand the link between their electricity use and climate change, encouraging more efficient energy consumption.

The climate charge includes the following major components:

- **Renewable Energy Expansion Costs:** Additional investment is required to deploy renewable energy, such as solar power and wind power, which generally involves higher initial investment costs than fossil fuels.
- **Fine Dust and Carbon Emissions Reduction Costs:** These include expenses to restrict the operation of coal-fired power plants and promote the transition to environmentally friendly energy, which is an essential measure for reducing air pollution and carbon emissions.
- **Energy Efficiency and Low-income Support Costs:** These include programs to improve energy efficiency and subsidize electricity for vulnerable households.

Including these items in KEPCO's electricity bills carries important policy significance. First, it allows consumers to clearly recognize the relationship between electricity use and climate change response. This can lead to reduced energy use and changes in consumption patterns, and in the long term, contribute to building public consensus for carbon neutrality.

It also plays an important role in securing funding for the energy transition. Historically, the government has promoted renewable energy and carbon reduction policies through financial support, but growing costs have made this increasingly unsustainable. By shifting a portion of the costs to

households and businesses through electricity tariffs, the policy becomes more financially sustainable, with gradual and manageable cost transfers.

Similar systems can be found in overseas cases. Germany's Renewable Energy Surcharge (EEG-Umlage) and France's Climate and Energy Contribution (CSPE) gradually pass the costs of renewable energy and carbon reduction onto consumers through electricity pricing. Korea is also reflecting this international trend by transitioning from a generation-cost-only pricing to a more comprehensive electricity tariff structure that reflects environmental and social costs.

2.2. Preliminary Investment Feasibility Decisions of Energy Transition Projects

2.2.1. Social Cost of Carbon (SCC) Concept Applied to Carbon Reduction Per Ton

When making preliminary investment decisions on green projects, it is necessary to consider not only financial returns but also environmental and social impacts. In this process, the concept of the Social Cost of Carbon (SCC) per ton of carbon reduction is used as an important analytical tool. The SCC represents the social loss caused by carbon emissions—that is, the economic and environmental damage from climate change expressed in monetary terms—allowing the external effects of carbon emissions to be internalized (Lee and Yu, 2025).

When evaluating the economic feasibility of green investment projects, it is necessary to closely examine the various costs and benefits associated with the energy transition. This includes investment costs for renewable energy facilities, cost savings from operation and maintenance, environmental benefits such as reduced GHG and improved public health, and positive external effects on society. By calculating the net present value (NPV) of a project while accounting for these factors, business justification and social value can be secured beyond simple financial returns.

From a business perspective, this analysis process requires a strategic approach that considers both short-term profitability and long-term social cost savings. For example, even if the initial investment cost is high, the decision may be justified by expectations of simultaneous financial and environmental benefits, driven by stricter future carbon emission regulations, rising carbon prices, and increased government support. In this process, it is important to systematically manage risks by monitoring changes in government policies, international carbon market trends, and technological developments, while conducting sensitivity analyses across multiple scenarios.

Ultimately, introducing the SCC into the green investment decision-making process is essential to clarify the social cost of carbon emissions and comprehensively evaluate all costs and benefits related to the energy transition. Based on this, indicators such as NPV can be calculated, and investment strategies aligned with government control mechanisms and policy support can be established, demonstrating that green investment offers long-term socio-economic benefits beyond environmental protection alone.

However, it is important to note that there are various views on SCC. In international research and policy cases, each country's carbon cost is often used in cost-benefit analyses. Still, methodologies vary depending on factors such as economic structure, climate risk, and social acceptance. The

following explains why, in practice, the theoretical SCC is often implemented through price indicators generated by quantity mandates such as ETS and RPS.

First, the theoretical SCC—“the present value of all future damages caused by emitting one ton of carbon dioxide”—is politically contentious and highly sensitive to assumptions about damage functions, discount rates, and uncertainty assumptions.

Second, quantity mandates like ETS avoid challenges of setting a direct price by capping total emissions and allowing markets to determine carbon prices based on firms' marginal abatement costs, offering a practical proxy for societal costs.

Third, similarly, the RPS mandates utilities to supply a certain percentage of electricity from renewable sources, and REC trading naturally produces price signals reflecting the cost premium over fossil fuels. Thus, quantity-based systems offer policy certainty, flexibility, and cost efficiency, providing a practical way to implement the SCC.

2.2.2. Green Investment Feasibility Judgment Process Using Price Indicators

Businesses considering green investments should carefully analyze the price indicators formed by the RPS and the ETS to assess feasibility. This is because the key factors that determine the profitability of renewable energy generation are the price of RECs and the electricity market price (SMP, System Marginal Price). In contrast, the price of carbon emission credits, in Korea Allowance Units (KAUs), plays a role in adjusting the competitiveness of fossil fuel-based power generation.

1) Analysis of the Volatility and Profitability of REC Prices in RPS

Under RPS, renewable energy producers can earn additional revenue by selling RECs in addition to the electricity they generate. While higher REC prices improve business feasibility, prices are highly volatile depending on market supply and compliance rates.

- The RPS sets a minimum share of electricity that must come from renewables. Utilities can comply by building green plants or buying RECs. Trading pushes the REC price up to cover the extra cost of renewable generation, making it financially equivalent to investing or purchasing certificates. Higher mandates reduce fossil fuel proportionality.
- REC prices fluctuate with supply and demand. While prices tend to rise when the RPS mandatory ratio increases, they may drop if renewable energy power generation capacity surges and causes oversupply.
- If REC prices decline, the investment payback period may become longer, and business viability may weaken. Conversely, rising prices may signal new investment opportunities.
- Policy risk must be considered, as changes in the government's RPS policy, such as raising the mandatory supply ratio or changing the REC weighting, affect the REC price.
- Businesses should account for REC price volatility and avoid overreliance on short-term fluctuations, while seeking stable profits through long-term PPAs.

2) Consideration of SMP (System Marginal Price) Volatility

In addition to REC, renewable energy providers must secure profitability through the SMP.

- The SMP is affected by fossil fuel costs, especially LNG and coal, and recent volatility in international energy prices has led to significant SMP fluctuations.
- If the SMP remains low, high REC prices may not be sufficient to ensure profitability. Conversely, high SMP levels can sustain business operations even if REC prices fall (Lee and Yu, 2022).
- As the share of solar and wind power generation increases, the “duck curve phenomenon,” where daytime SMP drops, may intensify, potentially reducing the profitability of renewable energy companies.

Taking these variables into account, operators should analyze the correlation between SMP and REC prices and develop a contract structure that can adapt to market volatility.

3) Analysis of the Role of ETS Prices and Their Competitiveness with Fossil Fuel Power Generation

In the ETS, the price of carbon emission rights, in units of KAUs, increases the cost of coal and LNG power generation and increases the relative competitiveness of renewable energy.

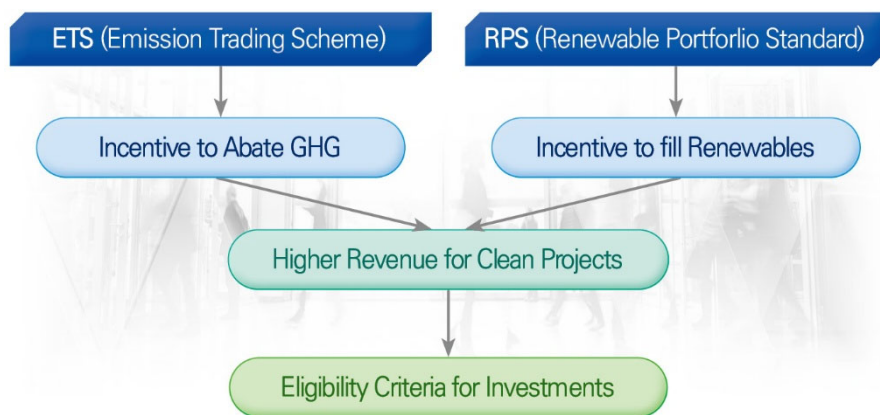
- The ETS caps total emissions and allows firms to trade permits, letting a market price per ton of carbon emerge organically. This price functions as a moving “fossil-fuel surcharge”: If it rises, reducing emissions becomes cheaper than burning carbon, so companies retrofit and switch fuels. If it falls, it indicates the collective cap is being met. The cap ensures emissions reduction, while the price guides firms to the most cost-effective solution.
- As the price of carbon emission rights rises, the unit cost of fossil fuel-based power generation also increases, which can have a positive impact on the profitability of renewable energy operators (Lee and Yu, 2022b).
- However, if the price of carbon emission rights is low, coal and LNG power generation may become more cost-competitive, reducing the economic viability of renewable energy.
- As companies introduce policies such as RE100 (aiming for 100% renewable energy use), rising demand for carbon neutrality is expected to raise carbon credit prices, which could favor renewable energy.

Businesses should monitor the price trends of the ETS market and formulate long-term investment strategies, taking into account the competitiveness of renewable energy as the price of carbon increases.

In determining the feasibility of a project using RPS and ETS price indicators, market and policy risks must be considered thoroughly.

- **Government Policy Changes:** Adjustments to REC weights, RPS mandatory ratios, or carbon allowance allocation methods can significantly impact the feasibility of renewable energy projects.
- **Financial and Investment Environment:** Higher interest rates may increase the financing costs for renewable energy projects, reducing business viability. On the other hand, the revitalization of green finance can be expected to reduce investment costs.
- **Technological Advancement and Competitive Environment:** The development of energy storage systems (ESS) may change SMP and REC pricing structures, while intensified competition could drive down REC prices.

[Figure 3-1] How ETS and RPS Enhance Clean Energy Project Profitability



Source: Authors (2025).

Taking these factors into account, businesses should establish long-term strategies to respond to REC, SMP, and ETS price volatility and make investment decisions based on various scenario analyses. In other words, green investors should look beyond current RPS and ETS price indicators and assess long-term market prospects and policy shifts to determine the optimal investment timing and portfolio composition.

- Establish long-term PPA contracts to reduce REC and SMP price volatility; consider ETS price increases in long-term investment strategy.
- Diversify renewable energy technologies (solar, wind, ESS, etc.) to reduce government policy risk.
- Reduce investment costs and secure stable returns through green finance long-term contracts in renewable energy projects.

Ultimately, feasibility assessments using RPS/ETS price indicators require a strategic approach that goes beyond simple numerical analysis and accounts for policy, market, and technology. To ensure the feasibility of green investment, decisions should be based on long-term growth potential rather than short-term price fluctuations.

2.2.3. Micro-level Policy to Share Business Risks and Enhance Feasibility

This strategy is to utilize various policy tools and systems to systematically share risks, clarify the roles of the government and the private sector, reduce the uncertainties of green investment projects, and promote the participation of private investors. The following provides a detailed explanation of how the public and private sectors share risks, with specific examples for each case.

First, in renewable energy projects based on PPP, the government and private sector clearly divide their roles and share the initial burden and risks of the project.

Second, the RPS guarantees power generators a certain amount of electricity through fixed-price contracts, which greatly improves profitability for private investors. Under the RPS, power generators can either enter fixed-price contracts through bidding or choose between receiving the SMP or REC. For example, selecting a REC price guarantee can offer partial protection against REC market price fluctuations. Alternatively, selecting an SMP guarantee can secure a stable level of revenue even when the market price falls.

Third, renewable energy financial support programs are key policy tools for reducing the financing risks associated with renewable energy projects. The Korea Energy Agency (KEA) and related government agencies offer low-interest loans and financial guarantee programs for renewable energy projects. For example, the KEA subsidizes a portion of loan interest rates for large-scale solar or wind power projects and offers credit guarantees to financial institutions, helping private investors mitigate risks from rising financing costs and financial market volatility.

Finally, the Feed-in Tariff (FIT) system is especially useful for small-scale solar power generators. The FIT system purchases electricity at a fixed price over a set period, eliminating sales price volatility for small-scale power generators producing 100 kW or less. Small-scale businesses are particularly sensitive to market price fluctuations; however, the FIT system removes this uncertainty and increases investment appeal by securing fixed electricity sales prices.

2.3. Risk-Sharing Mechanisms of Energy Transition Projects

2.3.1. Green Bond Usage

Green bonds are effective financial instruments for raising funds for energy transition projects such as renewable energy generation, energy efficiency improvements, and low-carbon infrastructure construction.

First, there is the funding structure and issuance mechanism. Green bonds have the same characteristics as fixed-income securities as ordinary bonds, but they are characterized by the fact that the use of funds is strictly limited to green projects. The use of proceeds is clearly defined at issuance to allocate funds to projects directly related to energy transition, such as renewable energy facilities, power grid modernization, and energy storage system construction. This transparency in fund allocation can increase investor confidence through external verification and post-reporting systems to drive lower borrowing costs (greenium) than ordinary bonds.

Second, it is a mechanism for risk diversification and credit enhancement. Energy transition projects often involve large initial investment costs and long periods of technology development and infrastructure construction, which often involve relatively high risk. Green bonds play a role in diversifying risk when issued in conjunction with government support, policy financing, and PPP. For example, in a structure where the government or a public institution participates in the provision of land and infrastructure and a private company is responsible for the construction and operation of power generation facilities, the funds raised through green bonds are supported by government guarantees or policy financing, which strengthens their credibility. This enables investors to expect more stable returns than with traditional energy projects and helps lower the overall cost of funding.

2.3.2. Industrial Structure Transformation Support Project

The Korean government, especially the Ministry of Employment and Labor (MOEL), has established a multifaceted support system to help workers facing employment crises during the industrial structure transition smoothly shift to new growth drivers such as new and renewable energy and eco-friendly industries. This support project is carried out in two main ways: first, strengthening capabilities through job training, and second, creating transitional jobs.

First, MOEL has established and is operating the "Industry Structure Response Specialized Training" to help employees who worked in existing high-carbon and labor-intensive industries (e.g., internal combustion engines and coal-fired power generation plants) transfer to jobs in future growth industries. This training program does not stop at the acquisition of skills but also provides incentives to receive specialized training while guaranteeing a stable income during employment using the long-term paid leave system. In addition, systematic and practical training support is being provided by partnering with private training providers, identifying customized training needs through on-site monitoring, and establishing joint training centers specialized in labor transition. Through this, workers will be able to acquire the job skills required for low-carbon and digital new industries such as renewable energy and future vehicles, and quickly adapt to the new industrial environment.

Second, the MOEL is also working to help workers who have completed job training and retraining transition to new industries and maintain stable employment after the transition. The Korean government operates a matching program to connect retrained workers with jobs at companies in the new and renewable energy sector, and provides various financial and institutional support measures such as recruitment subsidies, incentives, and customized consulting to ensure that companies hire retrained workers. Along with this, the Industrial Labor Transition Analysis Center has been established to monitor employment changes and transition demand in each industry continuously and lay the groundwork for rapidly launching reemployment support and job transfer programs in case of unexpected restructuring periods.

2.3.3. Support for Special Industrial Transition Zones

Korea is implementing special policy support in the form of support for industrial transition special zones to mitigate local economic decline and job insecurity resulting from coal-fired power plant closures. This policy aims to contribute to the revitalization of the local economy and job stability by

creating new renewable energy complexes in affected areas or transforming coal-dependent industrial structures into new industrial clusters.

For example, the national and local governments work together to promote alternative industries, such as the distribution of renewable energy and the creation of RE100 industrial complexes, in regions where coal-fired power plants are to be phased out in order to address regional economic contraction that may arise from the phased closure of coal-fired power plants (Kim et al., 2025). This bill is not just about leaving the site of a closed power plant empty, but about reconfiguring it into a complex where various renewable energy facilities such as wind, solar, and small hydro power can be installed or creating a new industrial cluster in the area to provide new growth drivers and solve the employment uncertainty caused by the closure at the same time.

Support for industrial transition zones goes beyond financial aid and includes infrastructure overhauls, technical and human resource retraining, and creation of new jobs through public-private partnerships. For example, in areas surrounding coal-fired power plants that are scheduled to be shut down, new renewable energy power generation facilities are being built using existing power plant facilities. In connection with this, plans are being developed to foster renewable projects. These transition efforts support residents and workers with re-training opportunities and a smooth transition to new industries. They are promoted in collaboration between public institutions and private companies to revitalize the local economy.

2.3.4. Energy Voucher System

The Korean government is operating an energy voucher system for low-income households to alleviate the burden of electricity bill increases that occur during the transition to renewable energy. This system is part of a social safety net that helps economically vulnerable households use energy stably even in a situation where electricity bills are rising gradually, and helps to subsidize electricity costs partially.

The energy voucher system is a government program that provides electricity vouchers to households that meet certain income and household size criteria. The amount of the voucher varies depending on the number of household members and the season, and is divided into summer and winter vouchers. For example, vulnerable households receiving basic income support are selected based on income criteria, and a portion of their electricity bills is automatically deducted through vouchers.

The fundamental purpose of this system is to ensure equality of energy use by preventing the increase in initial costs due to the transition to renewable energy from being transferred to low-income households. While renewable energy power generation enables an environmentally friendly and sustainable energy supply, the cost of power generation may be relatively high due to initial investment costs and technical limitations. If this results in an increase in the overall electricity bill, especially for households with low incomes, they will have to bear a heavy burden in energy use. Energy vouchers partially offset this burden, preventing the financial hardship from rising electricity bills, and contribute to a stable lifestyle.

In addition, the energy voucher system goes beyond simple financial support and has a systematic management system to ensure transparency and efficiency in support delivery. The government is increasing the reliability of the system by selecting eligible households, calculating the amount of subsidies, and providing thorough management of voucher usage details, as well as establishing a process for evaluating and reporting the results of voucher usage through external agencies. This will help low-income households minimize the economic impact of rising electricity bills and help cushion the social cost burden of the transition to renewable energy.

2.3.5. Korean-style Just Transition Fund

The concept is included in the Green Growth and Carbon Neutrality Act enacted in 2021, and it is positioned as a key policy measure to minimize social and economic inequality and regional harm during the government's promotion of carbon neutrality and green growth. The fund focuses on regions that are particularly overly reliant on the coal industry, such as Taebaek or Samcheok in Gangwon-do, where coal-related industries have traditionally made up the main staple of the local economy.

These regions are at high risk of experiencing negative impacts such as job insecurity and regional economic stagnation, along with a rapid transition in the industrial structure due to the closure of coal-fired power plants and the promotion of coal-free policies. The Korean Just Transition Fund aims to create new growth engines for the regional economy and mitigate the employment and social damage that occurs during the transition process by supporting renewable energy projects and the development of new industries in these situations. To this end, the government has established financial support programs tailored to each region. It is promoting various support projects, including introducing renewable energy facilities, developing new technologies, and creating jobs.

In addition, the fund goes beyond simple financial support and has as its core principle the formation and operation of a consultative body, including workers, local communities, and companies. Such participatory platforms allow each party to collaborate and participate in the policy formulation and implementation process in a substantial way to maximize the effects of a just transition. The consultative body focuses on ensuring fairness and inclusiveness throughout society by developing transition strategies tailored to local contexts and transparently managing the allocation of resources and the execution of projects.

3. Energy Transition in Indonesia

3.1. Role of State-owned Enterprises Conducting Green Investment

General Role of SOEs

Indonesia has significant potential for green investment due to its abundant natural resources (geothermal, solar, wind, and hydropower), strategic location, and growing environmental awareness. The country is making strides in sustainability, particularly in renewable energy, conservation, and eco-friendly infrastructure. The Indonesian government has set ambitious green energy targets, including achieving 50% of its energy mix from renewables (B50) by 2026 and net-zero emissions by 2050, advancing the previous goal by a decade. However, challenges persist, requiring coordinated efforts from the government, private sector, and international investors (Institute for Essential Services Reform, 2024).

State-owned enterprises (SOEs) play a key role in driving green investment in many countries, including Indonesia. They help bridge the gap between public policy and private sector capabilities, especially in large-scale, high-risk, or capital-intensive investments. Their involvement in green investment is essential for achieving sustainability goals, reducing carbon emissions, and fostering economic growth.

Indonesia's SOEs often act as government arms, translating policies like the National Energy Policy into actionable projects. They align their operations with national commitments, such as the Paris Agreement and Indonesia's net-zero emissions target by 2050. They operate in areas with high risk, where the private sector is reluctant to invest.

High upfront costs and concerns over financial sustainability pose challenges for green investment. Many green projects, such as renewable energy plants, require substantial capital, often resulting in higher consumer prices than coal plants. This situation makes balancing profitability with sustainability goals challenging, especially in subsidized sectors like electricity.

The Indonesian government offers financial incentives to help SOEs overcome green investment challenges, such as state capital injections, soft loans, tariff subsidies, risk-sharing mechanisms, international funding, and a robust policy framework. These measures ensure that SOEs can effectively support the country's energy transition and sustainability goals.

The Role of PT SMI in Conducting Green Investment

To reduce the impact of increasing GHG emissions, the government has ratified the Paris Agreement through Law No. 16 of 2016 on the Ratification of the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC). As a follow-up to the ratification, the government has set a target to reduce GHG emissions by 31.89% with independent efforts or

43.20% with international assistance and a net-zero emission target by 2060 (Government of Indonesia, LTS-LCCR 2050, 2021).

To achieve that target, the Government of the Republic of Indonesia, through the Ministry of Finance, established the country platform for the Energy Transition Mechanism (ETM Country Platform) on November 14, 2022, during a series of G20 Side Events. The ETM Country Platform is a framework to provide necessary financing support to accelerate the national energy transition by mobilizing commercial and non-commercial funding sources sustainably.

The Ministry of Finance has appointed one of the SOEs, PT SMI, as the ETM Country Platform Manager to develop the financing and investment framework for the ETM program in Indonesia. The Ministry of Finance requested the Bogor Agricultural Institute (IPB) to analyze the eligibility of PT SMI to implement the ETM program. Based on the assessment conducted by IPB, PT SMI was deemed suitable as the ETM Country Platform Manager based on several criteria, including (1) investment governance, (2) risk management, (3) information technology and investment implementation, (4) organizational structure and tools, and (5) credentials.

The investment governance assessment is conducted based on several factors, namely policy quality, completeness of Standard Operating Procedures (SOPs), and SOP quality. Regarding policy quality, PT Sarana Multi Infrastruktur (PT SMI) has established policies related to the investment cycle as outlined in the Board of Directors Regulation. The Bogor Agricultural Institute (IPB) considers this policy to be robust, as all existing policies have been approved by the General Policy Committee for Financing Provision and are reviewed every two years through stages that adhere to the Policy Preparation Guidelines.

Regarding the completeness of SOPs, IPB considers that PT SMI already has a comprehensive set of SOPs covering the Infrastructure Sector Company Capital Participation Procedure and the Infrastructure Financing Capital Participation Procedure. These include principles, ethics, risk guidelines, general investment provisions, and regulations related to the origination, monitoring, and management of capital participation and divestment. In terms of quality, IPB considers that PT SMI has high-quality SOPs related to the investment cycle. The availability of high-quality SOPs is evidenced by the involvement of the Approval Committee in the SOP development process (including shareholder tiering), the regular review process conducted every two years, and the adherence to stages that comply with the Policy Preparation Guidelines.

The second criterion of the Institutional Eligibility assessment is Risk Management. This criterion encompasses several assessment elements, including implementing risk management, targets, risk management principles, the risk management framework, and the lines of defense.

IPB finds that PT SMI has effectively implemented its risk management. This is supported by the established Risk Management Implementation, as outlined in the PT SMI Board of Directors Regulation. PT SMI has clearly stated its risk management objectives in the Company Work Plan and Budget. Moreover, all directors have approved the KPIs for each division.

In implementing the principles of risk management, PT SMI has adhered to the principles outlined in the General Policy on Risk Management, which includes: "Adequate Capital," "Accountability," "Independence," "Accuracy," "Measurability," "Continuous Improvement," "Diversification," and "Risk Transfer."

For the risk management framework, PT SMI has developed a framework in the General Policy on Risk Management that aligns with ISO 31000:2018. The components of the risk management framework include the following: (1) Active supervision by the Board of Directors, Board of Commissioners, and Sharia Supervisory Board (DPS); (2) Adequacy of risk management policies and procedures, along with the application of risk limits; (3) Adequacy of processes for identifying, measuring, controlling, and monitoring risks, as well as a Management Information System (MIS); (4) A comprehensive internal control system.

The next assessment element pertains to the three lines of defense: first, second, and third. The first line of defense relates to the risk owner. PT SMI has a risk-taking division responsible for overseeing and executing the company's business activities. The second line of defense consists of a unit responsible for risk management and compliance. The third line of defense is the internal audit unit. These three lines of defense ensure that the company's risk management process is effectively implemented and aligned with the General Risk Management Policy.

The information technology criteria for investment implementation consist of three elements: availability, reliability, and security.

- **Availability:** PT SMI's core activities, including loan and equity financing, are supported by the IT platform provided by LOS Arium. This platform accommodates financing and investment data input and supports computerized administrative recording.
- **Reliability:** PT SMI's applications are considered robust, with an ICT Index score of 91.98, a Data Availability System uptime of 99.802%, and compliance with ISO 27001:2013 standards for the development and operation of the Company's IT applications.
- **Security:** PT SMI ensures adequate application security, guided by regulatory standards in the Technical Instructions for Information Security Management Systems. These include guidelines for information asset management, physical and environmental security management, operational security management, capacity management, and information security incident management.

Under the Institutional Feasibility - Organizational and Tools criteria, IPB assessed several elements, including institutional structure, divestment/reinvestment mechanisms, human resources adequacy, and ESG implementation. PT SMI's institutional structure is considered appropriate, having fulfilled the provisions in PMK 53/2020, which consists of several units that have the functionality of the Finance Division, Investor Relations Division, Treasury and Asset Management Division, and Capital Investment Division.

The next assessment concerns the divestment/reinvestment mechanism. PT SMI has an Infrastructure Investment Procedure that includes arrangements related to periodic monitoring, annual valuation, and divestment of capital participation, so it is therefore considered feasible and appropriate. Regarding human resources, PT SMI is deemed adequate, as several employees hold investment expertise certifications, including CFA (5), FRM (5), PFM (6), and CAPM (2).

Regarding the implementation of Environment, Social, and Governance (ESG), PT SMI has already adopted ESG principles in every infrastructure project financing and all of its activities.

Furthermore, to support ESG implementation, PT SMI has formed several strong partnerships with ESG-related organizations, including the Association of Development Financing Institutions in Asia and the Pacific (ADFIAP), the Association of Development Financing Institutions of Member Countries of the Organization of Islamic Cooperation (ADFIMI), the International Development Club, and others. As of December 2023, PT SMI has financed 70 climate-related projects with a cumulative commitment of IDR19.6 trillion and a project value of IDR 92.9 trillion. Of the total 70 projects, 38 project samples have been calculated, and the result is an avoided GHG reduction potential of 6.1 million tons CO₂-Equivalent and carbon credit equivalent potential of USD 13 million.

The credential criteria are assessed based on experience and instrument diversity. PT SMI has invested in and/or managed funds over the past five years. PT SMI has had some experience in direct investment, including with PT Indonesia Infrastructure Finance in 2009, PT Jasamarga Pandaan Malang in 2016, PT Waskita Toll Road in 2017, PT Jasamarga Semarang Batang in 2021, PT Cinere Serpong Jaya in 2021, PT Cimanggis Cibitung Tollways in 2022, and so on. In addition, since October 2018, SMI has been appointed by the Minister of Finance to be the Implementing Agency for the Sustainable Development Goals (SDG) Indonesia One Platform, which allows PT SMI to receive and channel funds received from investors (from various types of investments such as commercial, developmental and donors) to be directed toward projects aligned with the SDG objectives. Renewable Energy, Waste Management, Health, and Water are the most recent ongoing programs. In the PMN sector, PT SMI received a total of IDR 26.5 trillion between 2015 and 2019. In 2015, SMI received PMN of IDR 2 trillion, and IDR 18.4 trillion was the transfer of PIP assets (PP No. 95 of 2015). In 2016, the amount was IDR 4.1 trillion. In 2017, PT SMI received IDR 2 trillion. The PMN has been used to support infrastructure development in various sectors.

The final credential criterion is instrument diversity. PT SMI has several fund management instruments, including banking deposits; government-issued instruments; Bank Indonesia instruments; corporate debt securities; repurchase agreement (repo); reverse repurchase agreement (reverse repo); mutual funds; fund management contract (discretionary fund); FX option; forward; and FX spot.

Based on the two conditions above, PT SMI is considered to have fulfilled the credential criteria.

3.2. Preliminary Investment Feasibility Decisions of Energy Transition Projects

General Preliminary Investment Feasibility Studies Conducted by SOEs

SOEs play a critical role in energy transition projects by conducting preliminary feasibility studies to evaluate these initiatives' potential benefits, risks, and viability. This involves systematically aligning the projects with financial, technical, environmental, and policy considerations. SOEs assess energy transition projects by examining the following areas:

- 1) Strategic goals and objectives;
- 2) Market and demand analysis;
- 3) Technical feasibility;

- 4) Financial and economic feasibility;
- 5) Environmental and social impact assessment;
- 6) Stakeholder engagement;
- 7) Pilot projects and prototypes; and
- 8) Decision-making and approval.

SOEs conduct comprehensive feasibility studies to ensure energy transition projects are viable, sustainable, and aligned with national goals. By leveraging their resources, expertise, and government support, SOEs act as catalysts for advancing large-scale energy transition initiatives. However, overcoming challenges such as financing gaps, policy uncertainty, and technological constraints is crucial to success.

Laws and regulations do not explicitly define project feasibility criteria, but the General Policy and Strategic Plans for Government Investment (KURS IP) provide guidelines based on benefits, objectives, and goals. From the perspective of benefits, an investment is considered feasible if it allows for economic, social, or other advantages.

In terms of objectives, an investment is feasible if it can catalyze financial markets and attract private investors to government projects with strong governance that enhances investment value.

In terms of targets, an investment is feasible if it supports government investment targets such as diversifying portfolios, advancing government programs, and increasing the roles of foreign and private investment. The investment feasibility guidelines in KURS IP also align with PT Danareksa's suggested investment principles for assessing project feasibility:

- 1) Socio-economic impact;
- 2) Catalyst and urgency of the project;
- 3) Financial feasibility; and
- 4) Exit plan.

Investment Feasibility Assessment on the Early Retirement Project PLTU Cirebon-1

As Country Platform Manager, PT SMI has proposed government investment in the PLTU Cirebon-1 early retirement project, valued at IDR 250 billion (equivalent to USD 15.2 million). This funding will be used to provide equity participation to PT Cirebon Electric Power (CEP), the owner of PLTU Cirebon-1, for 11 years until 2035, after which the plant will be decommissioned by 2042.

IPB University assisted the Ministry of Finance in assessing the project's investment feasibility using several criteria: (1) financial feasibility, (2) economic feasibility, (3) business model, (4) urgency, (5) economic, social, and environmental benefits, (6) investment objectives, and (7) fiscal benefit. Based on data provided by PT SMI, the project is expected to yield an IRR of 9.39%, excluding transaction costs. All transaction costs will be covered by partner grants, resulting in no financial burden to PT SMI. With an IRR above PT SMI's required rate of return of 8.5%, this project is

considered financially viable. Similarly, the project's economic IRR is 11%, which exceeds the estimated economic discount rates of 6% (STRP) and 9% (SOCC), indicating strong economic viability.

The business model assessment considered three indicators: value proposition, value chain, and investment mechanism clarity. The project's value proposition is highly beneficial to the community, as it contributes to GHG emission reductions. This emission reduction provides significant economic benefits, particularly when examined from the perspective of the carbon price. In April 2024, the market price of carbon was USD 3.79 per ton. However, according to "An Energy Sector Roadmap to NZE in Indonesia," the carbon price is projected to rise to USD 40 per ton by 2030 and USD 110 per ton by 2040. This suggests that the economic value of GHG emission reductions will increase over time, offering strong financial incentives for investment in such projects.

PT SMI's value chain in executing this project is highly efficient. It involves the relevant parties in a PPA with PT PLN, which is being amended to expire in 2035. The efficiency is reflected in the PPA and related agreements, which allocate costs and risks to the parties best equipped to manage them.

The investment mechanism is considered clear, as it is based on the negotiated refinancing transaction and the purchase of shares from the previous owner by a joint venture formed by INA, PT SMI, and GEAPP. The joint venture company will acquire a partial shareholding and retain ownership of PT CEP until the plant's retirement in 2035. Additionally, investment will be limited to a power plant company that already holds a PPA with PT PLN through 2035, which supports a strong assessment of investment clarity.

The project is deemed highly urgent as it aligns with Indonesia's National Medium-Term (RPJMN) and Long-Term (RPJP) Development Plans, particularly in advancing energy transition and achieving GHG emission reduction targets. This transition involves a shift to cleaner and more sustainable energy use, helping to achieve the emission reduction targets set by the government in various national development plans. In other words, the investment supports Indonesia's national strategy to achieve greener and more sustainable development.

In assessing the economic and social benefits, the reduction of GHG emissions from 2036 to 2042 is expected to yield substantial environmental, economic, and societal advantages. One key benefit is improved air quality, as lower GHG emissions reduce harmful pollutants from coal-fired power plants. Consequently, respiratory diseases and other health issues decline, enhancing public health and overall quality of life. Additionally, income distribution may become more equitable as the workforce shifts from fossil fuel industries to the clean energy sector, supporting low-carbon economic development. This transition could also stabilize inflation, as the power sector becomes less dependent on volatile fossil fuel prices, which are often influenced by geopolitical factors. Furthermore, accelerating the early retirement of coal-fired power plants would expedite the transition to renewable energy, reinforcing sustainability goals. Thus, reducing GHG emissions and advancing clean energy adoption not only mitigates environmental harm but also fosters economic stability and social well-being.

The investment objectives are closely aligned with the concept of green investment, even if not directly framed as such. By shutting down electricity production from retired power plants between 2036 and 2042, there is an opportunity to replace the electricity with energy provided by renewable

sources. This transition supports the goal of green investment, as replacing any fossil energy with renewable energy contributes to reducing carbon emissions and promotes environmental sustainability. In other words, while the investment may not directly target renewable energy, its impact supports the shift to cleaner, greener energy in line with green investment principles aimed at reducing environmental harm and improving energy efficiency.

The potential state revenue from this program is categorized as moderate—while not exceptionally high, it remains significant. This revenue comes from investment returns with a rate of return of 4.8% per year. Although the rate of return is modest, it still contributes additional revenue that can support other development initiatives.

3.3. Risk-Sharing Mechanisms of Energy Transition Projects

There are no specific regulations governing the risk-sharing mechanism of energy transition projects in Indonesia. As previously mentioned, the Indonesian government provides various financial incentives to address the economic challenges of green investments, including state capital injections, soft loans, tariff subsidies, risk-sharing mechanisms, and international funding. From the perspective of the central government, risks are minimal when support is provided through subsidies, PMN, or international grants. The main concern with these three types of financial incentives is ensuring the effectiveness and efficiency of the programs.

The risk of default is significantly high in soft loans and international funding schemes structured as subsidiary loan agreements (SLAs). To mitigate these risks, financing schemes often involve multiple parties and strategies, including the following:

(1) Government and Business Entity Cooperation (KPBU)

Government and Business Entity Cooperation (KPBU) is a partnership model between the government and businesses for developing and managing infrastructure and strategic projects. KPBU can help share project risks and costs and improve project efficiency and effectiveness.

In the context of Indonesia's energy transition, KPBU can be used to develop renewable energy projects such as wind, solar, and hydropower plants. KPBU can also be used to build energy infrastructure, such as energy transmission, distribution, and storage. Advantages of KPBU include:

- a) Sharing project risks and costs;
- b) Improving project efficiency and effectiveness;
- c) Increasing investment in the energy sector; and
- d) Enhancing community involvement in energy projects.

Examples of KPBU in the energy transition in Indonesia are:

- a) Sidrap Bayu Power Plant Project;
- b) Java-Sumatra Energy Transmission Project; and
- c) Renewable Energy Technology Development Project.

(2) Public-Private Partnerships

PPPs in Indonesia's energy transition projects can help share risks and costs while improving project efficiency and effectiveness. The following are examples of PPPs:

- a) **Renewable Energy Projects:** The government works with private investors to develop renewable energy projects such as wind, solar, and hydropower plants.
- b) **Energy Infrastructure Development:** The government works with private investors to develop energy infrastructure such as energy transmission, distribution, and storage.
- c) **Energy Technology Development:** The government works with private investors to develop energy technologies, such as waste treatment, energy-saving, and renewable energy technologies.
- d) **Human Resource Development:** The government works with private investors to develop human resources in the energy sector through training, education, and research.

The benefits of PPPs include:

- a) **Sharing Risks and Costs:** PPPs help share project risks and costs.
- b) **Increase Efficiency and Effectiveness:** PPPs improve project efficiency and effectiveness.
- c) **Increase Investment:** PPPs attract greater investment in the energy sector.
- d) **Increase Community Involvement:** PPPs promote community involvement in energy projects.

Examples of PPPs are as follows:

- a) **Wind Power Project:** The government and private investors are working on developing a wind power project in Sidrap, South Sulawesi.
- b) **Energy Transmission Project:** The government and private investors are working on developing energy transmission infrastructure in Java and Sumatra.
- c) **Energy Technology Development Project:** The government and private investors are working on developing energy technologies, such as waste treatment and energy efficiency technologies.

4. Policy Recommendations

4.1. Basic Directions

Given Indonesia's current situation, there is a need to establish an environment in which energy transition financing is driven naturally by market principles. The early retirement of the Cirebon coal power plant offers a clear example: securing funds to compensate existing shareholders for the accelerated shutdown—along with additional capital to develop new renewable power facilities—has largely relied on non-market methods such as foreign financing. However, as the ADB has experienced when providing loans for Cirebon's early retirement, these non-market approaches are hindered by numerous political and non-political factors, including energy security, public welfare, the need to protect shareholder interests, the volatility of renewable energy, and grid connectivity.

To address these complexities more effectively, rather than relying on individual or case-by-case solutions (e.g., handling Cirebon separately), it is essential to create a policy system that directly incentivizes investors to incorporate these factors into their own market-based decisions. By establishing clear market signals and aligning investment incentives with long-term goals for coal phase-out and renewable energy deployment, Indonesia can facilitate a smoother, more sustainable energy transition without being hindered by the challenges of ad hoc, non-market interventions.

4.2. Role of State-owned Enterprises Conducting Green Investment

Korea has implemented a "climate environment fee" system that separates a portion of the energy transition cost from standard electricity rates and transparently itemizes it for consumer bills. This mechanism enables the government to transition-related expenses directly to households and businesses in a financially sustainable and politically transparent manner, while promoting shared responsibility for cleaner energy adoption.

The climate environment fee covers a wide range of decarbonization and air pollution improvement costs, including:

- Additional cost of renewable energy generation;
- Operational restrictions on coal-fired power plants to reduce emissions;
- Energy efficiency programs; and
- Targeted subsidies for low-income households.

This structure not only helps maintain the political viability of increasing electricity costs but also improves the long-term economic feasibility of renewable energy investments.

As of 2023, the climate environment fee for residential (low-voltage) electricity users stands at approximately 9 KRW per kilowatt-hour (kWh). This amount reflects, in part, the cost of carbon credits under Korea's Emissions Trading System (KETS)—priced between USD 10 and USD 20 per metric ton of CO₂—and RECs, which average USD 30 and USD 50 per megawatt-hour (MWh). By clearly itemising these charges on electricity bills, the policy aims to raise public awareness, encourage more efficient energy use, and support sustained investment in renewable energy infrastructure.

<Table 3-1> Benchmarking KEPCO's Role in Energy Transition

KEPCO Case (Korea)	Recommended Policy Direction (Indonesia)	Core Principles and Linkage
Climate Charge System	Establishing Market-Based Investment Framework Introducing Climate Charge	Transparently transfer energy transition costs to consumers, thereby incentivizing market-driven investments.
RPS and REC Trading	Enhancing Renewable Energy Investment Incentives Strengthening Carbon Market	Stabilize renewable energy investment returns and internalize fossil fuel costs.
Smart Grid and ESS	Enhancing Renewable Energy Investment Incentives	Modernize grid infrastructure and introducing ESS reduce technical risks and facilitate renewable integration into the grid.
Stable Green Bond Issuance and Financing	Green Bond Mobilization through PLN-Backed Securitization	Utilize state-owned enterprise credibility for capital mobilization, reducing initial investment risks and financing burdens.
Industrial Transition Support (Retraining and Diversification)	Coal Sector Just Transition and Industrial Diversification	Promote local economies and workers through retraining, industrial diversification, and job security amid coal phase-out.
Energy Voucher System for Low-Income Households	Low-Income Household Electricity Voucher Policy	Ensure social equity in electricity rate increases and maintaining energy consumption efficiency through targeted support.

Source: Authors (2025).

4.3. Preliminary Investment Feasibility Decisions of Energy Transition Projects

The Indonesian government aims to incorporate non-financial externalities—such as health impacts, loss of ecosystem services, biodiversity reduction, and extreme weather events—into the foundation of energy policy and project planning. These externalities are included in the concept of the SCC per ton of GHG reduction, enabling a more comprehensive perspective on climate change beyond emission mitigation alone.

However, directly applying these externalities to individual projects presents methodological complexities and administrative burdens. Additionally, externalities may not be fully quantifiable or actionable at the individual project level. Therefore, applying the SCC framework at the macro-policy level—such as in setting Nationally Determined Contributions (NDCs) or carbon market parameters—can more effectively incentivize and coordinate investments across multiple projects.

In other words, by embedding non-financial factors into the national policy framework, individual businesses can align with consistent guidelines, fostering shared investment criteria between government and private stakeholders. This approach will support a more coordinated and effective implementation of Indonesia's national energy transition and climate change response plan.

4.3.1. Carbon Market

The Indonesian carbon market's low pricing and weak incentive structure have limited its ability to reduce coal reliance or guide low-carbon investment decisions meaningfully. This is largely due to opaque emissions cap-setting, including the opacity of the emission cap, policies focused on selling overseas carbon reduction performance, and the political burden of coal-fired power generation and electricity rate increases. To enhance the credibility and pricing of its carbon market, Indonesia should adopt stricter, more transparent emissions cap allocation rules, strengthen alignment with NDCs, and expand domestic reduction incentives (Yu et al., 2017; Lee and Yu, 2017).

1) Uncertainty of NDC Linkage and Possibility of Over-Allocation Risk

Indonesia's Emissions Trading System (ETS) lacks clear alignment with its NDC targets, raising concerns about cap stringency. Overly generous allocation or lenient caps suppress carbon prices, weakening the market's ability to drive emissions reductions. As a result, emitters—particularly coal-based generators—face little pressure to transition, undermining the market's fundamental purpose.

2) Export-Oriented Use of Carbon Credits

Indonesia's focus on exporting carbon credits rather than developing a robust domestic market further compounds the issue. Higher international credit prices reduce incentives to activate or improve domestic pricing mechanisms. Ultimately, the domestic carbon market remains underdeveloped, providing minimal carbon cost signals to high-emission sectors.

3) Political Sensitivity of Coal Power and Electricity Tariffs

Given the dominant role of coal in Indonesia's energy mix, a carbon price increase is likely to lead to higher electricity prices. These tariff increases are politically sensitive due to their impact on household expenses, making it difficult for the government to enforce strong carbon pricing policies. This political constraint often results in lax emissions pricing and diluted reduction mandates, limiting the market's effectiveness.

4.3.2. Low Business Feasibility and Limitations of Renewable Energy Power Generation in Indonesia

Despite Indonesia's abundant renewable energy resources, such as solar, hydro, and geothermal power, the economic viability of renewable energy power generation remains low. These projects

currently fail to offer sufficient investment incentives to replace coal-fired power generation (Yu and Lee, 2022). This challenge stems from a complex interplay of institutional, economic, and political factors.

Three major issues are driving the limited business feasibility of renewable energy generation in Indonesia: (1) fixed and low tariffs for renewable power, (2) higher levelized cost of electricity (LCOE) relative to conventional thermal power, and (3) political resistance to increasing electricity prices. This weakens the incentive to invest in renewable energy to replace coal-fired power generation effectively, and it also constrains the government's ability to set high emission reduction targets or implement strong carbon pricing. To turn the abundance of renewable energy resources into actual investment, a comprehensive approach is essential, including a review of the generation cost, increased investment in infrastructure, and social and political consensus on electricity prices and subsidy policies.

1) Fixed and Low Renewable Energy Power Generation Tariff

Presidential decrees currently set renewable energy tariffs at fixed rates that are often too low to ensure investor profitability. For example, projects using solar, hydro, or geothermal sources struggle to recover upfront capital and operational costs, including maintenance and parts replacement. As a result, renewable energy companies find it difficult to invest in renewable energy projects, and as a result, large-scale projects to replace coal-fired power generation remain limited.

2) Persistently High Levelized Cost of Electricity for Renewable Energy

In the Indonesian power market, the LCOE of renewable energy continues to be higher than that of conventional thermal power generation. Although the potential for renewable energy is abundant, the costs of expanding the infrastructure required for the actual commercialization process, the cost of introducing technology, and the regional variations in resource location all combine to make it less cost-competitive than existing power sources such as coal-fired power generation. This makes it difficult for investors to actively enter the renewable energy sector without additional financial support measures such as carbon markets or government subsidies, which in turn leads to a vicious cycle of failing to reduce the share of coal-fired power generation significantly.

3) Political Pressure to Raise Electricity Prices

As the share of renewable energy generation increases, the unit cost of electricity production will initially rise, which is likely to lead to higher electricity prices. The Indonesian government is faced with the very sensitive political challenges of bearing the cost of living for its people and stabilizing prices, making it difficult to push through an increase in electricity prices easily. This political burden makes it difficult to drive policies to expand renewable energy strongly. At the same time, there are concerns that the operation of the carbon market could lead to a high carbon price and rising electricity prices, allowing room for the system to be designed and operated in a way that does not provide sufficient incentives for reduction.

4.4. Risk-Sharing Mechanisms of Energy Transition Projects

4.4.1. Low-income Power Voucher Policy

As the era of carbon neutrality approaches, the expansion of renewable energy generation and the implementation of carbon pricing are expected to result in higher electricity rates, which may place a significant burden on lower-income households. Therefore, governments need to adopt balanced measures that protect the basic livelihoods of energy-vulnerable populations while preserving the price signal function of carbon pricing and the renewable energy transition. In this context, a policy tool known as the “Low-Income Household Electricity Voucher” has been introduced as a targeted measure to address affordability concerns.

Unlike direct subsidies that artificially lower electricity rates, the electricity voucher system maintains the existing rate structure while providing targeted financial assistance to vulnerable households. This approach ensures that the price signal embedded in electricity rates remains intact. In other words, households receiving vouchers are protected from higher electricity costs. At the same time, general consumers and businesses continue to absorb the costs associated with renewable energy expansion and carbon pricing, thereby maintaining incentives for energy efficiency investments and conservation.

To implement this program effectively, society as a whole must bear some portion of increased electricity rates, with direct financial support reserved only for low-income households. In practical terms, the government identifies eligible recipients based on criteria such as income levels and energy vulnerability. It determines a voucher amount according to each household’s average monthly electricity consumption. At the same time, the amount of the voucher should not exceed the anticipated increase in electricity rates, ensuring that energy-saving motivations remain intact. Additionally, establishing a transparent and efficient administrative process is vital—this may include linking electricity consumption data to voucher distribution systems, as well as streamlining procedures for identifying beneficiaries, adjusting voucher amounts, and handling appeals.

Ultimately, the Low-Income Household Electricity Voucher represents a means of addressing the reality of rising electricity rates without simply ignoring or suppressing them. By selectively compensating only the most vulnerable households, governments can secure social acceptance of increasing electricity costs driven by carbon pricing and the broader expansion of renewable energy infrastructure. This approach minimizes distortions in electricity pricing while playing a critical role in promoting more efficient energy consumption and transitioning the power generation mix.

4.4.2. Financing Energy Transition through Green Bonds

Accelerating the energy transition in emerging economies such as Indonesia requires substantial investment capital. In this context, Green Bonds—specialized bonds whose proceeds are explicitly allocated to eco-friendly projects—offer investors a clear sense of purpose and social responsibility, and provide issuers or project developers an opportunity to secure funding at relatively favorable rates. Of particular note in Indonesia is an approach that securitizes receivables from long-term PPAs between the state-owned power company, such as PLN, and IPPs, while linking the issuance of Green Bonds to conditions such as phasing out coal-fired power and protecting workers.

With PLN's strong credit rating, IPPs can issue asset-backed securities (ABS) or similar instruments against future revenues from PLN over a set period (e.g., 10 to 25 years). Investors who purchase these securities gain a relatively secure investment underpinned by PLN's (and by extension, the state's) payment capacity. At the same time, IPPs receive an upfront lump sum of capital, which can be used to develop renewable energy projects or to retrofit and decommission existing coal-fired plants. By securitizing future income streams, IPPs can expedite their investments, while investors benefit from stable cash flows.

To qualify as Green Bonds, proceeds must be allocated to environmentally sustainable or low-carbon initiatives—hence the requirement to reduce or retire coal-fired capacity and potentially implement worker retraining programs. These conditions support “energy transition” goals by lowering the share of coal and boosting renewables, while also helping coal-sector workers shift to clean energy or energy-efficiency industries, thereby easing social conflict. Moreover, under recognized guidelines such as the ICMA Green Bond Principles, issuers are required to regularly disclose the use of funds and environmental outcomes, building investor confidence in ESG-related investments and reducing the risk of “greenwashing.”

This model of securitization and Green Bond issuance allows for a simultaneous reduction in coal use and expansion of renewable energy, effectively improving the national energy mix and maximizing greenhouse gas reductions. With PLN's payment obligations serving as a credit enhancement, IPPs are likely to access lower-cost financing, creating a virtuous cycle that channels significant capital into domestic green projects. Moreover, if worker retraining and job transition support are included, local economies can mitigate potential downturns or job losses stemming from coal-plant closures, thereby amplifying the broader socio-economic benefits.

Ultimately, securitizing power purchase agreement receivables through Green Bonds utilizes the creditworthiness and institutional frameworks of Indonesia's state-owned power company to rapidly fund IPP-led renewable energy investments, while addressing the challenges of coal-fired power reduction and worker protection. Such a combination of financial and policy innovations can ease the fiscal and social burdens of transitioning to a low-carbon economy and, by offering credible green investment opportunities to domestic and international investors, significantly accelerate the country's energy transition.

4.4.3. Transformation of the Coal Business

Indonesia possesses abundant coal reserves and has developed strong industries around mining, distribution, and exports. As a result, any reduction in coal-fired power could cause these coal-related industries to contract rapidly. To sustain local economies, protect jobs, and stabilize the national budget while moving toward a low-carbon future, a comprehensive set of measures is essential.

One priority is to diversify the industrial base in coal-mining regions by leveraging existing infrastructure. Attracting new industries—such as the manufacturing of renewable energy equipment, biomass, or advanced materials—can help workers from coal operations transition into emerging fields. Similarly, taking advantage of local ecological or cultural resources to develop tourism and service sectors can broaden the foundation of regional economies.

A just transition for workers is also crucial. Large-scale retraining or upskilling programs can equip coal-industry workers with the skills needed for jobs in renewable energy, green construction, or energy efficiency. Moreover, government support in the form of low-interest loans, subsidies, and technical consulting can encourage smaller companies—previously linked to coal—to transition into clean energy or environmentally conscious services.

In cases where an immediate total phase-out of coal is not feasible, Indonesia might introduce carbon capture, utilization, and storage (CCUS) technology. By capturing and repurposing—or safely storing—carbon dioxide emissions, CCUS can serve as a transitional solution to reduce emissions. Additionally, transitioning from using coal solely as a fuel to producing high-value coal-based chemical products—such as carbon black or activated carbon—may add value and shift the coal sector toward high-end materials industries.

To support these changes, the government can establish a dedicated transition fund—financed by carbon taxes or revenue from an emissions trading scheme—to support retraining, reemployment, and business conversion for coal-industry workers. Effective governance will require coordination among agencies responsible for energy, industry, labor, and the environment, as well as collaboration between national and local governments to ensure that policies are tailored to regional needs.

Ultimately, Indonesia’s move toward an eco-friendly, low-carbon energy framework may bring significant industrial realignments and job shifts. Minimizing disruptions will depend on integrating diversification, workforce retraining, CCUS adoption, and institutional support measures. Taken together, these efforts can mitigate the local impacts stemming from coal-sector decline and, at the same time, secure long-term economic and environmental sustainability.

<Table 3-2> Summary of Expected Outcomes from the Action Plans

Policy Recommendations	Key Expected Outcomes
Market-based Investment Framework	Enhances investor confidence, reduces political constraints, and accelerates coal phase-out and renewable energy expansion via market mechanisms.
Institutional Learning (Climate Charge System)	Raises consumer awareness, integrates transition costs transparently into electricity pricing, improves energy efficiency, and ensures financial sustainability.
Integration of SCC	Accurately reflects climate change externalities, provides consistent policy signals, reduces administrative burdens, and aligns private and governmental objectives.
Carbon Market Strengthening	Provides strong economic incentives for emission reductions, increases carbon-price reliability, and facilitates the shift from coal to clean energy.
Renewable Energy Investment Incentives	Improves financial viability of renewable projects by increasing fixed tariffs and competitiveness, accelerates power-sector decarbonization, and boosts renewable energy investments.
Protection of Vulnerable Populations	Maintains price signals while alleviating electricity rate impacts on low-income groups through targeted vouchers, enhancing social equity and energy conservation incentives.
Green Bond Mobilization	Facilitates low-cost financing for renewable projects via state-backed securitization, supports rapid coal phase-out, promotes ESG investments, and accelerates decarbonization.
Coal Sector Just Transition & Diversification	Ensures economic stability and employment security in coal-dependent regions by promoting industrial diversification, retraining, and adoption of CCUS technologies.

Source: Authors (2025).

5. Concluding Remarks

Indonesia faces significant challenges in achieving its ambitious goal of carbon neutrality by 2060, including heavy reliance on coal-fired power plants, financial constraints, and power overcapacity. The priority should be on gradually reducing coal dependence while optimizing the existing power plant efficiencies rather than focusing solely on expanding renewable infrastructure. Strategic measures such as the early retirement of coal plants through structured compensation mechanisms, exemplified by the ETM, are vital. Enhancing energy sustainability requires leveraging abundant renewable resources, such as solar, hydro, and geothermal, through the development of advanced grid systems, including super grids.

Korea's experiences in the field offer valuable lessons: state-owned enterprises like KEPCO play a pivotal role through strategic investments in renewable energy, smart grids, and energy storage systems, supported by stable funding structures such as green bonds. Adopting policy frameworks similar to Korea's climate change system, which incorporates transparent pricing and cost-sharing strategies, can enhance public engagement and financial sustainability.

Ultimately, a successful energy transition in Indonesia depends on combining financial innovations, policy reforms, and international cooperation—prioritizing renewable energy investments, robust risk-sharing mechanisms, and socio-economic support for communities dependent on the coal sector.

<Table 3-3> Action Plan for Green Transition

Improvement Measures	Key Contents	Indonesia	Gap/Necessary Actions	Priority
Establishment of a Market-Based Investment Framework	Align investor incentives with coal phase-out and renewable uptake	Ad hoc, donor-driven projects like Cirebon dominate the landscape	Develop integrated, market-based policies that provide long-term signals to investors	Immediate
Institutional Learning from International Models	Apply Korea's climate fee structure to improve transparency and cost-sharing	No distinct separation of renewable costs in electricity pricing	Introduce itemized "climate fee" to share costs transparently with households and firms	Immediate
Policy Integration of SCC	Use SCC for macro-level guidance in climate policies	SCC rarely incorporated into national frameworks	Embed SCC in NDC target-setting and ETS design to reflect environmental externalities	Moderate
Carbon Market Strengthening	Address permit overallocation and pricing issues	Weak domestic ETS with low price signals and unclear linkage to NDC	Tighten cap, increase domestic reduction incentives, restrict over-reliance on international offsetting	Moderate
Renewable Energy Investment Incentivization	Improve LCOE competitiveness and tariff schemes	High LCOE, low fixed tariffs, and political price resistance hinder investment	Reform tariff policy and increase investment in renewable infrastructure	Moderate
Protection of Vulnerable Populations	Use electricity vouchers instead of subsidies	Limited policies to shield low-income households amid rising rates	Implement data-driven low-income electricity voucher programs	Immediate
Green Bond Mobilization through State-Backed Securitization	Leverage PLN-backed receivables to raise capital	Green bond issuance exists but lacks broad use in transition funding	Institutionalize securitization model with Green Bond Principles, tied to coal exit and job protection	Moderate
Coal Sector Just Transition and Diversification	Retraining, CCUS, and high-value coal use	Economic dependence on coal with limited diversification	Establish national transition fund and industry retraining programs to soften impacts of coal exit	Immediate

Source: Authors (2025).

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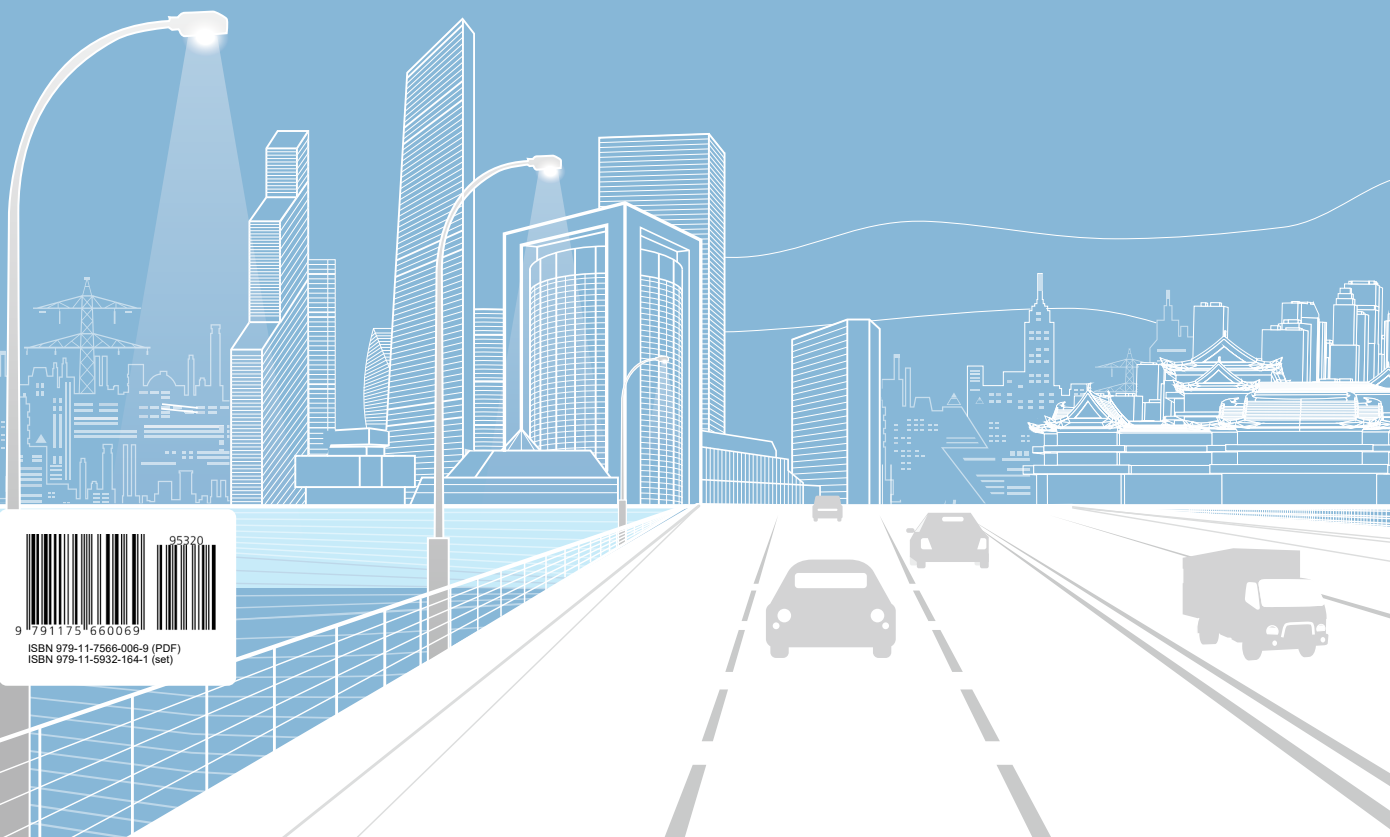
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9 791175 660069
ISBN 979-11-7566-006-9 (PDF)
ISBN 979-11-5932-164-1 (set)