# Implementation of Green Sukuk in Financing Renewable Energy Projects in Indonesia

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**Abstract**
This study aims to examine the implementation of Green Sukuk in financing renewable energy projects in Indonesia. The research method used is descriptive qualitative with a documentation approach to government regulations and policies, reports on green sukuk in 2023-2025, and recent scientific studies. The results of this study indicate that the implementation of Green Sukuk for renewable energy projects supports the achievement of the national energy mix target of 23% by 2025. Including renewable energy innovation projects with the impact of clean energy transfer and increasing local capacity and energy independence, Bioenergy and Biomass which have an impact on reducing environmental pollution, Solar Energy has an impact on reducing CO2 emissions aligns with Indonesia's commitment under the Paris Agreement to independently reduce greenhouse gas emissions by 29% by 2030 and electricity cost efficiency, energy conversion programs in government buildings with an impact on energy efficiency and reduced operational costs. However, in its implementation there are still challenges, namely expensive and complicated issuance procedures, audits and impact reporting are not optimal, private issuers have difficulty meeting project criteria & scale and other challenges. Overcoming these obstacles requires integrated coordination between regulators, public, market players, policy incentives, and adaptive global standards.

## 1. Introduction

Indonesia's energy needs continue to increase in line with population growth, industrialization, and economic development. Based on the National Energy General Plan (RUEN), Indonesia's primary energy demand is projected to nearly double by 2050 (International Renewable Energy Agency, 2023). However, more than 80% of the current national energy mix is still dominated by fossil fuels such as coal, oil, and natural gas, which produce high greenhouse gas (GHG) emissions. This dependence on fossil fuels not only has an impact on the global climate but also poses a risk to global energy price fluctuations (ADB, 2022). The increasing need for financing the clean energy transition in Indonesia is expected to continue to increase in line with the government's target of achieving a renewable energy mix of 23% by 2025 (International Renewable Energy Agency, 2023). The existence of Green Sukuk is expected to accelerate the achievement of this target, using a transparent, sustainable, and sharia-compliant financing mechanism.

The challenges and limitations of conventional financing instruments are their lack of adherence to sharia principles and sustainability. To address this challenge, Indonesia became the first country in the world to issue Green Sukuk in 2018 (Climate Bonds Initiative, 2023a). Green Sukuk are sharia-

compliant government securities (SBSN) whose funds are allocated specifically to finance environmentally friendly projects, in accordance with regulations established by the Indonesian Ministry of Finance. This increasing energy demand has also increased the financing of Indonesia's clean energy transition. Demand is expected to continue to rise in line with the government's target of achieving a 23% renewable energy mix by 2025 (UNDP, 2023). Therefore, the Green Sukuk energy demand initiative is expected to accelerate the achievement of this target, utilizing transparent, sustainable, and sharia-compliant financing mechanisms.

By 2024, Indonesia had issued Green Sukuk with a total value of more than USD 6 billion, making it one of the largest issuers in the global market (Climate Bonds Initiative, 2023b). The Green Sukuk Allocation and Impact Report shows that the funds have contributed to the reduction of millions of tons of $CO_2$ emissions, increased access to electricity in the 3T (disadvantaged, frontier, outermost) regions, and supported the achievement of the Sustainable Development Goals (SDGs), especially goal 7 (Affordable and Clean Energy) and goal 13 (Climate Action) (Ministry of Finance Of the Republic of Indonesia, 2024)).

However, the implementation of Green Sukuk in Indonesia still faces challenges, including the limited number of eligible green projects, the need to enhance the technical capacity of implementing agencies, and strengthen the monitoring and reporting system for green project outcomes (ADB, 2022). On the other hand, there is potential for development through retail Green Sukuk issuances, which could involve direct community participation and expand the domestic investor base (UNDP, 2023). Several previous studies have largely stated that Green Sukuk as a financing tool for sustainable development has focused solely on its conceptual framework or global issuance trends, while its practical implementation and measurable impact remain elusive. This creates a research gap in understanding how effectively Green Sukuk contribute to financing renewable energy projects and achieving national sustainability goals.

Based on the above description, research on the implementation of Green Sukuk in financing renewable energy projects in Indonesia is relevant and important. This research is expected to provide a comprehensive overview of the effectiveness, challenges, and prospects of Green Sukuk as an innovative financing instrument that integrates environmental sustainability aspects based on Islamic financial principles.

## 2. Research Method

This study adopts a qualitative research approach employing a library research method to examine the implementation of green sukuk in financing renewable energy projects in Indonesia. The qualitative approach is selected to achieve an in-depth understanding of the conceptual foundations, policy orientations, and practical applications of green sukuk within the framework of Islamic finance and sustainable development. The study relies on secondary data obtained from academic textbooks, peer-reviewed journal articles, and official government publications, particularly reports issued by the Ministry of Finance and the Financial Services Authority (Otoritas Jasa Keuangan/OJK). In addition, publications from international institutions such as the World Bank and the International Renewable Energy Agency (IRENA), as well as relevant laws and regulations in Indonesia, are utilized to ensure analytical rigor and normative accuracy.

The data are analyzed using a descriptive-analytical technique by systematically reviewing and synthesizing the collected literature to identify the regulatory framework, issuance mechanisms, and implementation dynamics of green sukuk in Indonesia. The analytical process involves thematic categorization and critical evaluation of the challenges and opportunities associated with the development of green sukuk as a sustainable financing instrument. Through this approach, the study aims to provide a structured and comprehensive assessment of the strategic role of green sukuk in supporting renewable energy financing and advancing sustainable development objectives in Indonesia.

## 3. Results and Discussions

### Criteria and Mechanisms of Indonesian Green Sukuk

The Indonesian government issued Green Sukuk to support and create environmentally friendly projects and generate renewable energy through innovative financing instruments in Indonesia. Since its first issuance in 2018, the Indonesian Green Sukuk framework has adhered to the Green Bond Principles issued by the International Capital Market Association (ICMA) and is aligned with Sharia principles (DJPPR, 2023). Meanwhile, the Financial Services Authority (OJK) plays a role in overseeing compliance with Sharia capital market and financial regulations. Furthermore, international institutions such as the World Bank and the Islamic Development Bank (IsDB) are also frequent technical partners and purchasers of prospective Indonesian green sukuk (Fitrah, R., & Soemitra, 2024).

According to the Green Sukuk Framework (DJPPR, 2023), projects eligible for financing through Green Sukuk must fall within the green sector category, meet Sharia and be environmentally friendly. These categories include: 1) Renewable energy (solar, wind, geothermal, bioenergy), 2) Energy efficiency (modernization of energy distribution systems, energy-saving technologies), 3) Waste and wastewater management, 4) Sustainable transportation, 5) Sustainable natural resource management and 6) Climate change adaptation and mitigation. Contribution to renewable energy projects is a priority because it significantly reduces carbon emissions, in line with Indonesia's target to achieve Net Zero Emissions by 2060 (Araminta et al., 2022).

The Green Sukuk issuance mechanism is regulated in the Minister of Finance Regulation No. 103/PMK.08/2023 concerning the issuance of Government Securities (SBSN) for project financing. The green sukuk issuance mechanism must go through several stages, including: First, Project Creation and Selection. Ministries or Institutions propose projects that meet green criteria to the Ministry of Finance, then an evaluation is conducted to ensure that the framework meets the Green Sukuk criteria. Second, Sharia Feasibility Evaluation. The evaluation is based on sharia feasibility criteria, where all projects must comply with DSN-MUI Fatwa No. 70/DSN-MUI/VI/2008 concerning sovereign sukuk. Third, the Government issues Sukuk. Green Sukuk issuance in the domestic and global markets. The instruments issued can be retail sukuk or global sukuk using certain currencies. Fourth, Fund Management and Distribution. Funds distributed from the sukuk issuance are used to finance projects approved through the State Budget (APBN). Fifth, Reporting and Transparency. Government reporting must include allocation reports and environmental impact reports on a regular basis each year. This reporting must comply with international standards for transparency and accountability (Yulitasari et al., 2022). Allocation and impact reports contain detailed information on the amount of funds used, project implementation status, and environmental impacts, such as the amount of $CO_2$ emissions avoided. For example, a 2023 report noted that renewable energy projects funding Green Sukuk have contributed to emission reductions of more than 4.2 million tons of $CO_2$ equivalent (DJPPR, 2023).

### Implementation of Green Sukuk in Financing Renewable Energy Projects

The implementation of Green Sukuk to implement renewable energy projects not only supports the Indonesian government's energy mix target of 23% by 2025, but also aligns with Indonesia's commitment under the Paris Agreement to significantly reduce greenhouse gas emissions by 29% by 2030. Furthermore, financing using sukuk provides a sustainable funding alternative based on Sharia principles, thereby creating opportunities to meet investor needs and increasing green financial literacy in the Sharia capital market (Grahesti et al., 2022).

Funding from Green Sukuk has been used to finance several renewable energy projects, focusing on generating clean energy that reduces dependence on fossil fuels in various regions of Indonesia. These projects include Hydroelectric Power Plant Development, Solar Power Plant Development

(PLTS), Bioenergy and Biofuel Projects, Energy Efficiency Programs, and Green Transportation Projects.

Geothermal Power Plant Development and Rehabilitation (PLTP) projects are financed to increase clean energy capacity, including drilling new wells and modernizing facilities at the Kamojang (West Java) and Lahendong (North Sulawesi) PLTPs. These projects directly contribute to reducing carbon emissions and increasing the national renewable energy mix (International Renewable Energy Agency, 2024). he Hydroelectric Power Plant Development (PLTA) Project includes the construction and upgrade of hydroelectric power plants in Asahan (North Sumatra) and Kayan (North Kalimantan). These projects support sustainable electricity supply by harnessing river potential while creating jobs in remote areas (Fahlevi, M. F., & Wirdyaningsih, 2024).

The Green Sukuk-funded Solar Power Plant Development (PLTS) project covers eastern Indonesia, such as Sumba, Papua, and East Nusa Tenggara. This implementation aims to address electrification limitations and support the Sustainable Development Goals (SDGs) related to clean energy (Araminta et al., 2022). The Bioenergy and Biofuels Project includes financing provided to companies to facilitate the production of sustainable palm oil-based biofuels in Sumatra and Kalimantan. This biofuel is used to reduce emissions from the transportation and industrial sectors (Primambudi, 2023). Fifth, the Energy Efficiency and Green Transportation Program. Part of the funds are allocated to modernize the electricity transmission network and utilize energy-efficient technologies in public facilities, as well as the development of low-emission public transportation systems, such as electric bus rapid transit (BRT) in major cities (Yulitasari et al., 2022).

**Impacts Generated**

Green Sukuk directly contributes to national economic growth through 1) Job Creation in funded projects, such as the Likupang Solar Power Plant (21 MWp) and the Sidrap Wind Power Plant (75 MW), which can employ thousands of local workers from the construction to operational stages (International Renewable Energy Agency, 2023). 2) Increasing Sustainable Investment, attractive investments for global investors focused on Environmental, Social, and Governance (ESG) instruments, thereby expanding the financing base and lowering the country's borrowing costs. 3) Diversification of Financing Sources can reduce dependence on conventional debt and increase financing options for green infrastructure. 4) Energy cost efficiency with the use of renewable energy can reduce fossil fuel imports and reduce the burden of energy subsidies.

Green Sukuk significantly supports the 2060 Net Zero Emissions (NZE) target by achieving 1) $CO_2$ Emission Reduction in financed projects has reduced emissions by more than 11.3 million tons of $CO_2$ per year (Annisa Dinda Rahmasari, 2024). 2) Increasing renewable energy capacity in increasing renewable energy power generation capacity to 500 MW by 2023, equivalent to providing electricity for more than 800,000 households. 3) Environmental Conservation in Financing mangrove and protected forest rehabilitation projects, which function as natural carbon sinks. 4) Improved air quality due to the transition from coal-fired power plants to green power plants reduces air pollution, especially in the project area.

The implementation of Green Sukuk also has broad social impacts, including electricity access for remote areas, improved public health, local community empowerment, and increased environmental awareness. Electricity access for remote areas through plug-in solar power plants (PLTS) and micro-hydro power plants (MHP) financed through green sukuk expands access to clean energy for villages in remote, frontier, and outermost (3T) areas, thereby increasing community productivity. Improves public health by reducing fossil fuel combustion and reducing respiratory illnesses caused by pollution. Empowers local communities through workforce involvement and technical skills training in the renewable energy sector. Increased environmental awareness through educational and outreach programs related to the importance of clean energy use as part of the green sukuk project.

**Challenges and Opportunities in Development**

Although green sukuk have gained international recognition as a successful green financing innovation, the development of green sukuk in Indonesia faces several challenges. The primary challenge is the lack of a domestic retail investor base. More than 70% of Indonesian green sukuk investors to date are institutional and foreign investors, while domestic retail investors account for less than 20% of total participation (Ministry of Finance Of the Republic of Indonesia, 2024). This contrasts with Malaysia, where the share of domestic investors in similar Islamic green instruments exceeds 60%. This is due to limited public engagement in Indonesia, largely due to low financial literacy regarding green sukuk investments and the perception that sukuk investments are only for large investors (Grahesti et al., 2022).

A second challenge is the relatively expensive and administratively complex issuance procedures and certification requirements for green sukuk. Compared to conventional bonds, green sukuk issuance costs are estimated to be 15–20% higher, considering external factors, verification, and alignment with the Green Bond Principles (Lee et al., 2025). For developing countries, these issuance costs can reduce financing efficiency and discourage private sector issuers. A third challenge is the suboptimal audit mechanism and implementation of impact reporting. Although the Indonesian Ministry of Finance publishes an annual Allocation and Impact Report, only 60% of green sukuk-funded projects have complete data on emissions reductions and project impacts (OECD, 2024). However, in green bond reporting, countries such as the UK and France have achieved disclosure rates of over 90% (Initiative, 2024)

A further challenge is data limitations and a lack of standardized measurement frameworks, which limit the credibility of Indonesian reporting. For the private sector, the challenge is even greater due to the difficulty of meeting the criteria and project scale. Therefore, many companies in Indonesia, especially medium-sized ones, lack the financial capacity or sufficient projects to meet the requirements for Green Sukuk issuance. Consequently, the role of private sector issuers remains very limited compared to that of the government (Fitrah, R., & Soemitra, 2024). Another challenge is the risk of greenwashing, the potential for projects to be labeled green but not have a significant impact on environmental sustainability. This could undermine global investor confidence in the Indonesian Green Sukuk market if the government does not address it through strict regulation and verification.

Given all these challenges, integrated coordination is needed between regulators such as the Ministry of Finance, the Financial Services Authority (OJK), and the Indonesian Ulema Council (DSN-MUI), along with public education, market players, policy incentives, and the implementation of adaptive global standards. With these steps, green sukuk is expected to develop more inclusively, be more competitive, and make a real contribution to the economy, the environment, and society.

Despite these complex challenges, Green Sukuk also presents strategic opportunities for Indonesia. First, global demand for green financial instruments continues to increase, as evidenced by data showing Indonesia as the world's largest Green Sukuk issuer, with total issuance reaching USD 6.9 billion since 2018, placing Indonesia in a highly strategic position in the global market. Second, Green Sukuk aligns with the national agenda of achieving Net Zero Emissions (NZE) by 2060 and supports the achievement of the Sustainable Development Goals (SDGs). This demonstrates that this instrument functions not only as financing but also as a policy tool that encourages a green energy transition (DJPPR, 2023).

Third, the issuance of Green Sukuk serves as an instrument that can help diversify government financing sources, attracting not only Sharia-compliant investors but also other investors, such as international ESG (Environmental, Social, and Governance) investors, thereby strengthening Indonesia's fiscal stability. Another opportunity is that green sukuk enjoys international collaboration support from global financial institutions such as the World Bank, the Islamic Development Bank (IsDB), and the Asian Development Bank (ADB). This provides an opportunity to enhance the credibility of Indonesia's Green Sukuk among international investors and expand the green financing network (Fahlevi, M. F., & Wirdyaningsih, 2024).

## 4. Conclusions

Green Sukuk is an innovative Sharia-based financing instrument with international standards to support sustainable development projects. Since 2018, Green Sukuk has funded renewable energy and green projects by reducing dependence on fossil fuels, reducing $CO_2$ emissions, and expanding electricity access, while generating economic, environmental, and social benefits for communities, particularly in project areas. Despite facing challenges such as limited domestic investors, high and complicated issuance costs and certification requirements compared to green bonds, and suboptimal impact reporting, opportunities exist, as demonstrated by the increasing global demand for green financing coupled with strong international support, placing Indonesia in a strategic position. With stricter regulations, broader participation, and effective implementation, Green Sukuk can serve not only as a financing tool but also as a policy instrument to accelerate the green transition, increase economic resilience, and promote long-term community welfare. Policymakers are expected to strengthen monitoring and evaluation mechanisms to increase transparency in project reporting, thereby expanding the allocation of sukuk funds to sectors with high sustainability impacts. Strengthening international collaboration and investor education are also crucial to increasing global trust and market participation in Indonesian Green Sukuk.

## References

ADB. (2022). *Green Infrastructure Investment Opportunities in Indonesia*.

Annisa Dinda Rahmasari. (2024). *Green Sukuk sebagai Bentuk Komitmen Indonesia untuk Perubahan Iklim*. https://www.djppr.kemenkeu.go.id/greensukuksebagaibentukkomitmenindonesiauntukperubahaniklim

Araminta, D. V., Qudziyah, Q., & Timur, Y. P. (2022). The role of green sukuk in realizing the sustainable development goals 2030 agenda. *Journal of Islamic Economics and Business*, *8(2)*.

Climate Bonds Initiative. (2023a). *Green Infrastructure Investment Opportunities – Indonesia Green Recovery. Climate Bonds*.

Climate Bonds Initiative. (2023b). *Sustainable Debt Market: Summary Q1 2024*. https://www.climatebonds.net/

DJPPR. (2023). *Green Sukuk Allocation and Impact Report 2023*.

Fahlevi, M. F., & Wirdyaningsih, W. (2024). Analisis tantangan dan peluang perkembangan Green Sukuk di Indonesia. *Syntax Literate: Jurnal Ilmiah Indonesia*, *9(10)*. https://doi.org/10.36418/syntax-literate.v9i10.16847

Fitrah, R., & Soemitra, A. (2024). Green Sukuk For Sustainable Development Goals in Indonesia: A Literature Study. *Jurnal Ilmiah Ekonomi Islam*, *8(1)*, 231–240.

Grahesti, A., Nafii"ah, dzul fahma, & elyana pramuningtyas. (2022). Green Sukuk: Investasi Hijau Berbasis Syariah Dalam Mewujudkan Ketahanan Terhadap Perubahan Iklim Di Indonesia. *JIEI: Jurnal Ilmaiah Ekonomi Islam*, *8*(3).

International Renewable Energy Agency. (2023). *Socio-economic footprint of the energy transition: Indonesia*.

International Renewable Energy Agency. (2024). *World Energy Transitions Outlook 2024: 1.5 °C pathway (Summary)*.

Lee, E., Kim, J. Y., & Lee, Y. (2025). A comparative analysis of green sukuk and green bonds. *Emerald Publishing*, *18*(6), 1353–1373.

Ministry of Finance Of the Republic of Indonesia. (2024). *Indonesia report highlighting the positive*

*impacts of certain funds*.
OECD. (2024). *Survei Ekonomi OECD Indonesia*. https://www.oecd.org/content/dam/oecd/id/publications/reports/2024/11/oecd-economic-surveys-indonesia-2024_e3ab8960/9d9fdbd2-id.pdf
Primambudi, G. (2023). Financing biofuel through green sukuk corporate: Stage, potential, and maturity. *JEJAK: Jurnal Ekonomi Dan Kebijakan, 16(1).*
UNDP. (2023). *No Title*.
Yulitasari, L., Tresiana, N., & Ekawati, E. (2022). Development of state green sukuk as a government effort to realize green environment. *DINAR (Jurnal Ekonomi Dan Keuangan Islam)*.
Kementerian Energi dan Sumber Daya Mineral Republik Indonesia. (2019, 2 September). PLTB Sidrap: Proyek energi untuk masyarakat, pemerintah dan investor. Direktorat Jenderal EBTKE.
Kne Publishing. (n.d.). The Role of Green Sukuk (Islamic Bonds). KnE Social Sciences. knepublishing.com
Kurnia, F., & Suwita, L. (2024). Analisis peran dan kontribusi green sukuk terhadap implementasi sustainable development goals (SDGs) di Indonesia. Jurnal Menara Ekonomi, 10(2), 118–125.
MDPI. (2024). Advancing Renewable Energy in Indonesia: A Comprehensive Analysis. Sustainability, 17(5), 2216.
Ministry of Finance, Republic of Indonesia. (2023). Green Sukuk Allocation and Impact Report 2023. DJPPR, Kementerian Keuangan RI.
Nugroho, A. P., Firdaus, R. A., Rizkiana, R., Ulfa, D. K., & Salsabila, M. S. (2023). Renewable Energy in Indonesia: Current Status, Potential, and Future Development. Sustainability.
Primambudi, G. (2023). Financing biofuel through green sukuk corporate: Stage, potential, and maturity. *JEJAK: Jurnal Ekonomi Dan Kebijakan, 16(1).*
ResearchGate (Conference Paper). (n.d.). The Evolution of Green Sukuk in Indonesia. ICIEB.
Romadhon, M. R., & Mutmainah, S. (2023). Harnessing Green Sukuk for Sustainable Development in Indonesia. International Research Journal of Economics and Management Studies, 2(2), 343–351.
UNDP. (2018). Indonesia's Green Bond & Sukuk Initiative. UNDP. https://www.undp.org/sites/g/files/zskgke326/files/migration/id/INS-UNDP-Indonesia-Sustainable-Development-Financing.pdf.
UNDP. (2023). *No Title*.
Yulitasari, L., Tresiana, N., & Ekawati, E. (2022). Development of state green sukuk as a government effort to realize green environment. *Dinar: Jurnal Ekonomi Dan Keuangan Islam*.
Yusrifalda, A., & Nurcahyo, B. (2025). Exploring the Chances and Challenges of Green Sukuk in Indonesia: TOWS Method Analysis. Journal of Law, Administration, and Social Science, 5(1), 68–76. https://doi.org/10.54957/jolas.v5i1.1202
World Bank. (2023). *No Title*.