CASE
for Southeast Asia

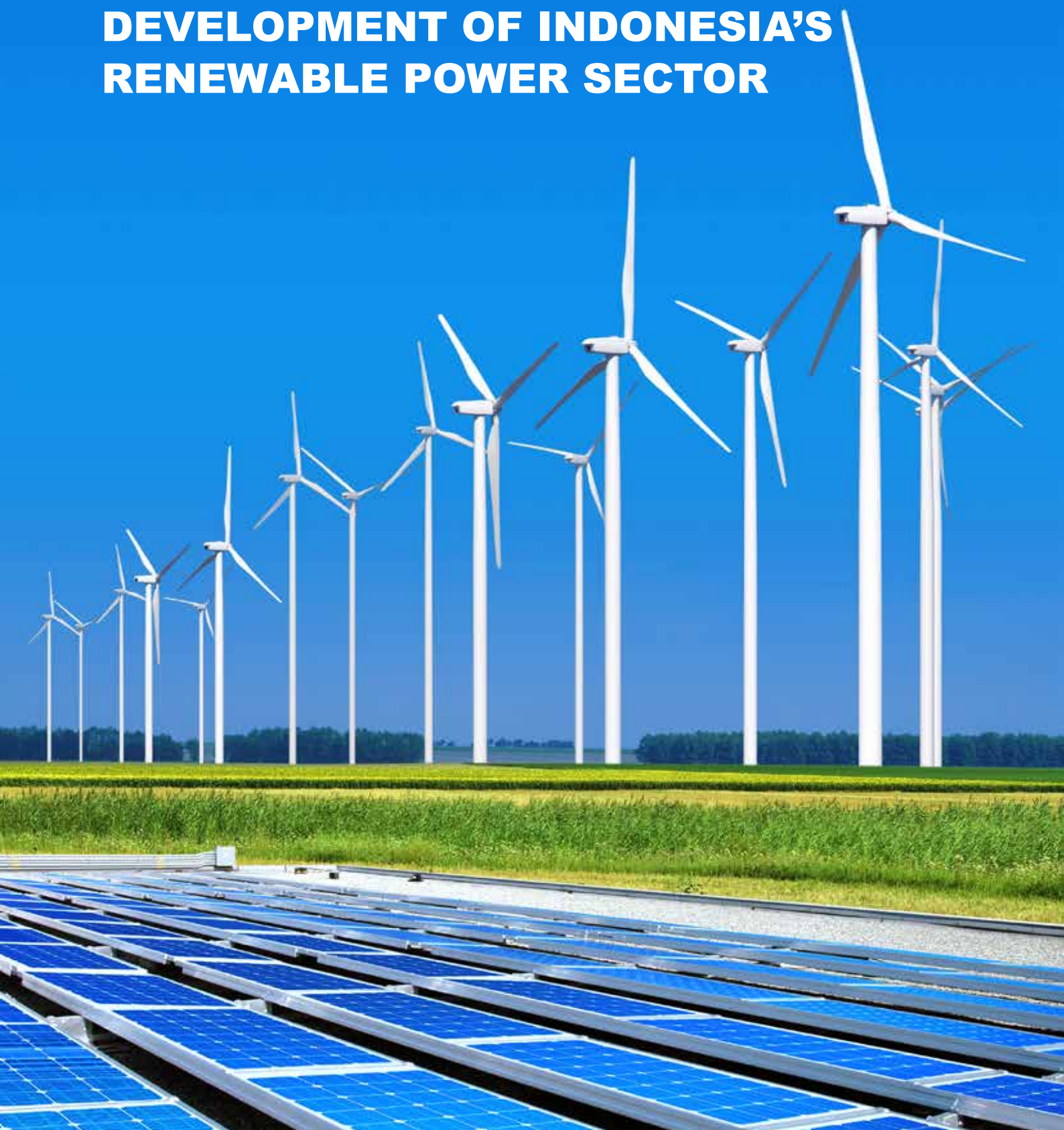
On behalf of:

Federal Ministry
for the Environment, Nature Conservation,
Nuclear Safety and Consumer Protection

of the Federal Republic of Germany

STUDY REPORT

DE-RISKING FACILITIES FOR THE DEVELOPMENT OF INDONESIA'S RENEWABLE POWER SECTOR



Acknowledgement

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Table of Contents

List of Figures

List of Tables

I. Introduction

Fossil sources are still the primary driver of Indonesia's energy sector. In 2020, the country ranked 5th in the world's coal production and 15th in the world's gas flaring volumes (IEA, n.d.; World Bank, 2021). In 2020, fossil fuels dominated Indonesia's national energy source at 85.55% of the total energy supply (Ministry of Energy and Mineral Resources [MoEMR], 2021). Coal constituted the highest percentage of all energy sources at 37.09%, followed by petroleum at 31.65%, and natural gas at 16.82%, leaving only 14.45% for energy supplied from renewable sources (MoEMR, 2021). Indonesia's abundant natural resource reserves and the constraints of developing the renewable sector have contributed to the dominance of fossil fuels in the country's energy supply.

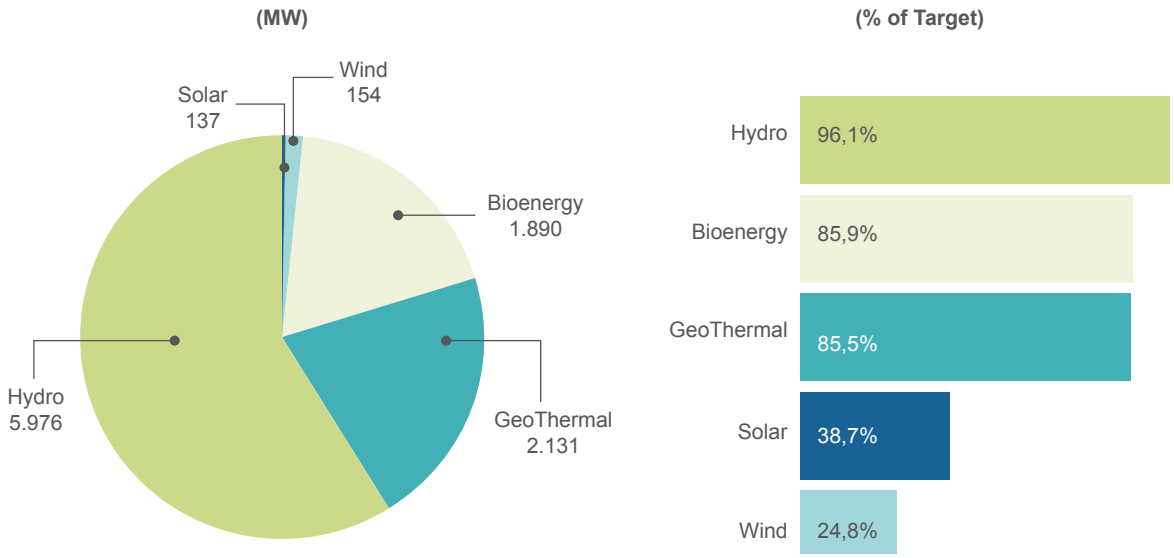

Figure 1. Indonesia's Renewable Power Generation (2019)
Source: Ministry of Energy and Mineral Resources (2020)

Additionally, in 2019, the production of all renewable power types achieved less than their initial targets (See Figure 1). While Indonesia's hydropower generation has the highest level of progress towards realisation (5,976 MW, around 96% of target), solar and wind generation are among the sources of renewable energy with the lowest realisation-to-target progress (137 MW ~39% of target & 154 MW ~25% of target, respectively). Overall, utilisation of renewable power sources amounts to only 1.76% of potential, with the highest being geothermal (7.48%) and hydropower (5.49%). Despite having the highest potential (207.8 GW), solar energy is among the least utilised at only 0.06% (See Table 1).

Table 1. Indonesia's RE Potential, Installed Capacity, and Utilisation Rate

Renewable Type	Potential* (GW)	Installed Capacity** (2020, MW)	Utilisation Rate (%)
Hydro	94.3	5,176.29	5.49%
Geothermal	28.5	2,130.7	7.48%
Bioenergy	32.6	169.12	0.52%
Solar	207.8	123.84	0.06%
Wind	60.6	153.83	0.25%
Ocean	17.9	0.0	0%
Total	**441.7**	**7,753.78**	**1.76%**

Source: *National Energy Council (2019), **Ministry of Energy and Mineral Resources (2021), Authors' Analysis (2021)

Indonesia's Nationally Determined Contributions (NDCs), first issued in 2017, indicated a future renewable energy contribution target of 23% of the national energy supply mix by 2025 and 31% by 2050. This target was further incorporated into the country's national development plan under the National Energy Policy (KEN) framework. Additionally, with the issuance of Presidential Regulation No.22/2017 in 2017, Indonesia launched the National Energy General Plan (RUEN), which outlines the energy management plan between 2017 and 2050 relating to energy policy application and implementation across all sectors to achieve the KEN. The RUEN serves as the document reference for developing the General Plan of National Electricity (RUKN), the Electricity and Supply Business Plan (RUPTL), and national and local government planning documents.

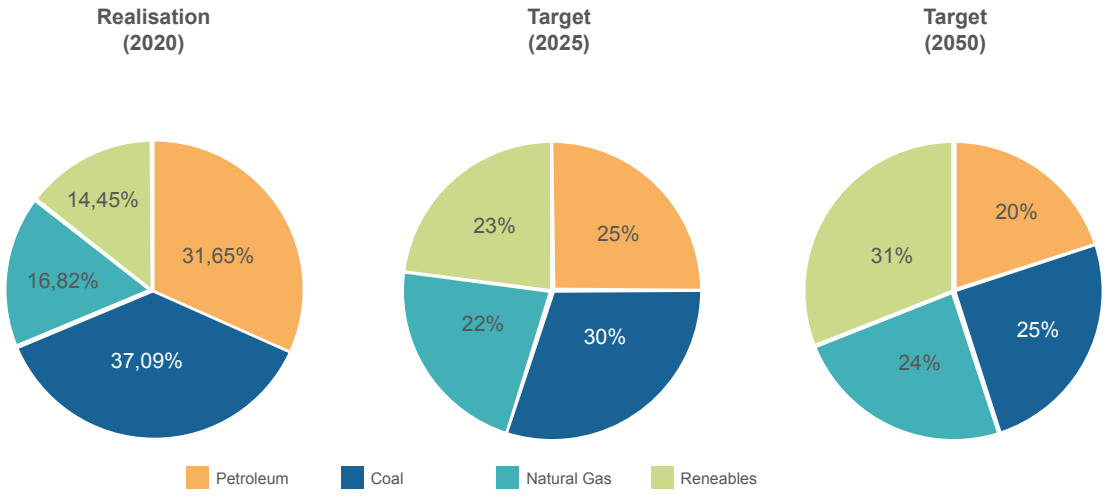

Figure 2. National Energy Target according to National Energy Policy (KEN)
Source: Government of Indonesia (2016)

Recently, Indonesia issued an update to the country's NDCs document. The renewable energy contribution target to national energy supply mix remained at 29% independently and 41% with international support by 2030. Despite not outlining new changes to the energy supply mix target, the updated NDCs document includes improved strategies to achieve the energy supply mix target. Additionally, Indonesia submitted the Long-term Strategy on Low Carbon and Climate Resilience (LTS-LCCR 2050) to the United Nations Framework Convention on Climate Change (UNFCC) (Ministry of Environment and Forestry [MoEF], 2021). The LTS-LCCR 2050 sets adaptation pathway goals to reduce the climate change impact with national GDP loss by 3.45% in 2050 by increasing resilience in four basic necessities (water, food, environmental health, and energy). The pathway to lowering carbon emissions in the energy sector includes investing in climate resources, such as wind, solar radiation, rainfall, and geothermal, for electricity generation.

Additionally, the Indonesian Ministry of Development Planning has established the Low Carbon Development Indonesia (LCDI), which outlines climate-resilient development policy between 2020 and 2025. Regarding the energy sector, the LCDI recommends the transition to renewable energy and the reduction of coal consumption to increase the contribution of renewable energy to the national energy supply mix by 23% in 2030 and, in addition, by 30% in 2045. In the power sector, Indonesia has also recently revised the RUPTL, which sets guidelines for the state-owned utility company PT Perusahaan Listrik Negara (PLN). Under the new 2021 – 2013 RUPTL, the country aims to increase the renewable power proportion to at least 48%, increasing from 30% in the 2019 – 2028 RUPTL. The efforts to achieve this target include converting diesel power plants into renewable plants and retiring old electricity plants. As part of the efforts to achieve carbon neutrality by 2060, PLN also plans to retire coal-fired power plants gradually.

While Indonesia's carbon policies other than the RUEN are yet to receive further improvement, almost all of them encourage more ambitious targets for carbon reduction. Given the increasing urgency of these policies, drives for the energy sector should move towards the phasing out of fossil fuels and a faster transition to renewable energy. Despite this rising drive for renewable energy, however, challenges in developing the sector remain. Several factors still cause the relative price of renewable energy to be higher than brown energy, despite the declining global prices of renewables. In addition, the risks particularly associated with the renewable sector also prevent investment in financing the sector. In light of this stagnancy, de-risking instruments may help overcome this barrier and provide a way to secure financing for renewable energy. This report analyses the barriers associated with renewable energy in Indonesia and the potential de-risking measures to address the barriers and enable renewable energy financing.

II. Analysing the Barriers to Indonesia's Renewable Energy Development

In Indonesia, the price of several renewable energy sources is still relatively higher than brown energy. While subsidies for brown energy has been a long-time reason for this, another contributing factor is the high cost of establishing renewable energy in Indonesia, as is the case in many developing countries. Figure 2 illustrates the higher cost of renewable energy in developing countries as compared with developed countries. While the operational costs in developing countries can be lower due to the generally cheaper goods and labour prices, equity and debt-based investment and financing costs can be significantly higher.

The higher cost of investment in renewable energy for the power sector in developing countries is primarily driven by structural problems such as the lack of infrastructure needed to establish renewable energy power-generation sites, the higher cost of providing or procuring technology that is less accessible in developing countries, and inefficiency and uncertainty in the permit and procurement system, as well as unattractive pricing schemes. In terms of financing cost, financial instruments tailored to address the risks specific to renewable energy projects are relatively less available and less developed. These conditions limit project developers' financing choices for renewable energy, eventually leading to higher financing costs. Additionally, the transaction costs in financing smaller projects, which are relatively common in Indonesia, can further increase the total financing cost for such small projects. The higher relative cost of establishing renewable energy in Indonesia has meant the sector is less competitive than brown energy.

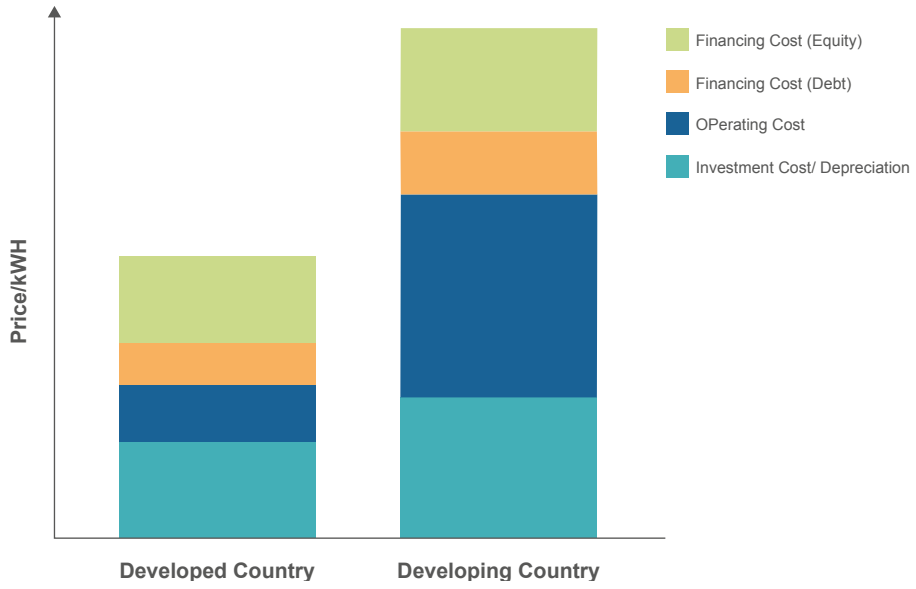

Figure 3. Illustration of renewable energy cost structure in developed and developing countries
Source: Adopted and modified from UNDP (2013)

Additionally, financing renewable projects is also difficult due to the underlying risks associated with the renewable sector, preventing financiers and developers from channelling or receiving funds to develop the sector. Most renewable energy projects in the power sector can be divided into three phases: development, construction, and operational. Three types of risks persistently exist in all three stages of renewable energy projects. These risks are related to the technical, commercial, and regulatory aspects of the projects. Additionally, other risks not classified into the three risk types are also present. In the development phase, the risks relate to the technical aspects that project developers face, including unfavourable findings of

energy resource assessments, inappropriate site locations, and failures in project design and technology development. These factors contribute to the high level of risk in the development phase, making the risk level in the phase the highest among the three phases. Once they materialise, the technical risks may mean the funds that project developers allocate to development activities become losses that are often unrecoverable.

Commercial and regulatory aspects also contribute to the risks that project developers face in the development phase. Changes in rules relating to the off-take agreement and grid connections often contribute to uncertainty in the commerciality of renewable energy projects. The bureaucratic process to acquire business permits and conduct legal administration is often complex and lengthy, which results in higher administrative costs and legal uncertainty. This is very significant, especially as developers must also comply with environmental and social safeguard requirements, which often involve many administrative tasks. In addition, legal records regarding land ownership are often disputed, complicating the land-acquisition process faced by project developers.

In the development phase, the risk financiers face mainly comes from asymmetric information issues in obtaining and understanding an accurate picture of project risk profiles. Given the highly technical nature of renewable projects, most financiers need to rely on the assessment results of outsourced consultants to build the risk profile of renewable projects. However, financiers have expressed concerns about the reliability and integrity of outsourced consultants. Additionally, small developers often do not have access to outsourced consultants, making it hard for potential financiers to understand the risk profiles of small renewable projects. The asymmetric information issues often result in unanticipated risks, such as land-acquisition problems, social resistance, and geographical issues. They, therefore, affect the risk level of the succeeding project phases.

The construction phase is beset by medium to high risk, especially in the early transition from the development phase. The risks in the construction phase often result from poor risk management during the development phase– risks may continue to the construction phase if not appropriately managed during the development phase. The construction phase also requires the highest amount of capital, making the materialisation of risks in this phase very costly. In technical aspects, developers often face challenges such as the unsuitability of available equipment to local conditions, unpredicted changes in natural conditions, and characteristics of the project sites that were not anticipated in the development phase. Additionally, the same unpredictable nature of risks also usually occurs with the social aspect of the projects. Developers often face local resistance issues in project construction, such as difficulties in land acquisition. The materialisation of these risks often delays projects, which disrupts the project process. In many extreme cases, projects that face high complexity problems are held up and can only continue with significant financial assistance through means such as selling the projects to new investors.

Similar to the development phase, risks are also present in the commercial and legal aspects of the construction phase. Developers' project management and the engineering, procurement, and construction (EPC) track record may influence the commercial risk level of renewable energy projects. Developers' expertise and level of experience significantly affect whether the construction process runs smoothly with

minimum disruption. However, even with high expertise and experience, developers are also not immune to sudden or unusual changes of nature and other potential disruptions that may affect the construction process. In the legal aspect, the construction phase experiences the risk of potential construction activity disruption due to regulatory changes. There is also regulatory uncertainty due to the legal aspects of multi-layered regulations, high complexity, a long sequence of processes to obtain permission and licensing, and unsynchronised requirements. From the financiers' perspective, there is a possible risk of asset loss due to the materialisation of risks faced by project developers. Financiers also face the problem of asset illiquidity, as in the construction phase funding is usually already used by developers for project operation.

Table 2. Renewable Project Risks Across Phases

Risk Bearer	Development Phase (Medium to High-Risk Level)	Construction Phase (High to Medium-Risk Level)	Operational Phase (Low-Risk Level)
Developers	• Unfavourable findings of energy resource assessments, inappropriate site locations, and failure in project design and technology development • Lengthy and uncertain bureaucratic processes for permits and legal administration • Changes in rules related to the off-take agreement (incl. pricing policy) and grid connections • Resistance and disputes related to land-acquisition process and societal issues	• Unsuitable actual site conditions and equipment • Changes in natural conditions, including disasters • Resistance and disputes related to land acquisition process and societal issues • Construction accidents • Unreliable engineering, procurement, and construction (EPC) partners • Changes, uncertainty, length, and complexity in regulatory processes	• Changes in economic and energy policies affecting the marketability of renewables • The high uncertainty and the complex structure of regulatory frameworks and bodies in Indonesia • Technical failures and their hazards • Disruptive industrial and market trends
Financiers	• Asymmetric information in the understanding of project risk profile, such as: • Lack of quality assurance of outsourced consultants' project assessment • Unanticipated land-acquisition issues • Unanticipated societal resistance	• Asset loss due to the materialisation of risks faced by developers • Asset illiquidity	• Repayment failures of developer

Source: Halimatussadiah et al. (2020), Authors' Analysis (2021)

In comparison with other phases, renewable energy projects face a relatively lower risk level in the operational phase. Nevertheless, there are still several issues that may contribute to risks in this project phase. The most significant risks in this phase are related to regulatory and commercial aspects. As seen persistently from earlier phases, renewable projects still face risks from the high uncertainty and the complex structure of regulatory frameworks and bodies in Indonesia. Commercially, renewable energy projects also face challenges from the possible issuance of policies that do not favour the renewable sector. The projects also

face potential disruptions due to industrial and market factors. Additionally, there are also risks related to the technical aspects of the renewable sector in the operational phase, such as accidents, equipment reliability, and natural hazards that may affect the tangible assets of the renewable energy projects. These risks, in turn, may also affect financiers as they may affect the ability of project developers to repay the funding they have already received.

In addition to the risks associated with renewable energy projects in general, different renewable energy types also face different risks typically unique to the renewable energy sector. These risks typical to renewable energy occur in all project phases. Table 3 summarises the typical risks according to each renewable energy type.

Addressing the barriers explained in this chapter is essential in developing renewable energy, especially to allow funds to flow into the sector. As discussed in the next chapter, de-risking instruments may serve as the tools to overcome this barrier and develop Indonesia's renewable energy.

Table 3. Project Risks According to Renewable Power Types

Renewable Power Type	Development Phase	Construction Phase	Operational Phase
Solar	• Extensive installation areas • Problems in land acquisition and obtaining location permit • Specific location requirement–areas with high sunlight intensity	• Resistance from local communities	• Expensive energy storage • Inconsistent weather reliability • Waste toxicity
Wind	• Problems in land acquisition and obtaining location permit • Specific location requirement–areas with high wind intensity	• Safety hazard and nuisance to nearby populations • Resistance from local communities	• Expensive energy storage • Inconsistent weather reliability • Hazards to local wildlife (birds) and nearby populations
Hydropower	• High upfront capital investment • Complicated processes to undergo to ensure minimum environmental impacts • Possible problems in land acquisition and obtaining location permit	• Structural failures • Local community resistance • High interconnection cost • Construction delay and cost overrun	• High interconnection cost • Structural failures • Susceptibility to droughts
Geothermal	• High upfront capital investment • High project development costs	• Surface instability effects • Harmful gas hazards • High interconnection cost • Construction delay and cost overrun	• High interconnection cost • Safety hazards – harmful gas leaks, earthquakes
Bioenergy	• Feedstock distance to grids • Land use expansion risk from virgin feedstock use		• Disruption in the availability of bioenergy feedstocks

Source: Authors' Analysis (2021)

III. Potential De-risking Instruments for Indonesia's Renewable Power Sector Development

De-risking instruments seek to address the risks related to renewable energy to make the sector more attractive for investments and thus allowing more funding sources to flow. This report adopts the distinction of two different types of public de-risking instruments according to the UNDP (2013). Policy de-risking instruments address sectoral risks in renewable energy projects by removing the underlying barriers that are the root causes of the risks with policy and programmatic interventions to mitigate risks. Meanwhile, financial de-risking instruments transfer investment risks from financing institutions to other actors, such as public institutions and development banks. This, in turn, reduces the risks borne by the financing institutions and enables a more attractive investment environment for renewable energy.

III.A. POLICY DE-RISKING INSTRUMENTS

III.A.1. Improving Renewable Energy Target Clarity & Policy Coherence

While Indonesia has set up many renewable sector development plans, most of them still have inconsistencies with each other (IESR, 2018). While the RUPTL was set up with a bottom-up approach (energy targeting based on power plant development), other plans are set up with top-down approaches (energy targeting based on macro indicators such as economic development and consumption needs). As a consequence, the modelling and the assumptions employed in each plan are different. Plans with top-down approaches, such as the RUEN (and thus the RUKN, as the RUEN is the main reference document for energy development in Indonesia), often involve over-optimistic assumptions on economic growth, demand, and capacity additions (IESR, 2018). Changes to the RUPTL also occur annually and concerns about its sufficiency to serve as legitimate planning for the Indonesian power sector have been raised (IESR, 2018).

Policies in renewable energy are also evolving. Recent developments in renewable policies, such as the newly updated NDCs, LTS-LCCR 2050, and the launch of the LCDI, instil the need to ensure alignment of the new policies with existing ones. Additionally, a lack of clarity still exists in defining the role, the responsibility, and the involvement of different stakeholders, such as government bodies, developers, and financiers, in implementing the existing energy and renewable energy plans. Therefore, there is a high need to revisit Indonesia's existing energy policies to ensure clarity, consistency, coherence, and credibility. Investigation into whether the current energy policies are aligned is essential. Moreover, it is also important to outline a clear and detailed implementation plan in national energy policies that includes all relevant information such as stakeholder engagement plans, specific geographical mapping of potential projects, and the risks in implementing the policies.

III.A.2. Reforming Pricing & Subsidy Policies

To minimise PLN's costs while also aiming to reduce subsidies and maintain the company's health, the Government of Indonesia issued one critical regulation to govern renewable energy pricing. Permen ESDM 50/2017, as amended by Permen ESDM 53/2018 and later by Permen ESDM 4/2020, regulates that renewable energy power prices are negotiated by PLN and the developer and

approved by the Ministry of Energy and Mineral Resources. One significant point of the regulation concerns when a renewable energy project is located in an area where the regional cost of electricity production (BPP) is more than the national average. In that case, the negotiated price is limited to only between 85% (e.g. solar PV, wind) to 100% (e.g. hydro) of the regional BPP, effectively creating a ceiling price for renewable power. If the regional BPP is below the national average, no price cap shall apply. Due to affordability concerns, however, the Government of Indonesia has also aet a fixed electricity tariff at which PLN can sell. The tariff to the consumer is below the 'economic tariff' (it cannot cover the cost of producing and distributing the electricity) and has not changed since 2017. In practice, this disincentivises PLN to contract power, other than at the lowest financial cost (ADB, 2020b).

Under the current power generation, brown energy is mostly cheaper and thus may become PLN's preferred source of power (ADB, 2020b). The ceiling price policy and the ensuing policies that further enforce its effect prevent renewable developers from supplying power at a profitable rate, thus limiting their potential participation in the market. In addition, pricing policy and implementation are at times inconsistent, which raises questions and causes confusion among investors and project developers (IESR, 2019). In line with the concerns above, it is essential to reform pricing policies to allow developers to sell renewable power at profitable prices and ensure transparency and consistency in pricing policy implementation.

Another potential policy to address the gap between cost and renewable energy pricing is through the reform of subsidies. While Indonesia has been consistently subsidising brown energy, there are relatively few incentives for renewable energy compared with fossil fuels (IESR, 2018). Oil and gas pricing at below-market prices and tax incentives for the sector has increased fossil fuel consumption (MoEMR & Ministry of Finance [MoF], 2019). Reducing subsidies for conventional energy and redirecting incentives to renewable energy sources can help reduce consumption of conventional energy sources and encourage the transition to renewable energy. Finding the right opportunity to implement this policy by reducing the subsidy of conventional energy in times of low prices can be crucial (MoEMR & MoF, 2019). Subsidies for renewable energy can also help close the gap between the cost and renewable energy pricing. Another possible policy to consider is implementing a carbon tax, which makes fossil energy sources less attractive, encourages the transition to renewable energy, and provides a potential source of revenue to fund the development of renewable energy sources.

III.A.3. Creating Effective and Efficient Permit & Procurement Processes

While there have been considerable efforts towards increasing efficiency, there still exists the need to streamline the permit process for renewable energy projects in Indonesia. In projects requiring extensive land, such as solar PV or in sensitive areas (e.g. high conservation value areas) such as hydropower and geothermal, project developers must undergo lengthy bureaucratic procedures, impact studies, and land-acquisition processes. As a result, project developers often face delays and financing obstacles, leading to higher permit-acquisition costs in the initial project development phase. In some cases, troubles may still arise after project permits are issued due to the ineffective

rule of law and institutional capacities. For example, some project developers may still encounter land use disputes with residents due to legal unclarity over land ownership. Thus, it is essential to streamline the permit process for renewable energy projects, enforce transparent practices, fraud avoidance mechanisms, and corruption control, and ensure effective legal and institutional capacity.

On the other side, it is imperative to ensure that procurement frameworks are well-designed, given Indonesia's single-buyer structure of power procurement. The Asian Development Bank (ADB, 2020c) describes several criteria to define a well-designed procurement framework: (1) there is a linkage between investment plan and procurement process with a more detailed future procurement activity (2) there is a clear identification of the scope for competition in the procurement process (3) it includes licensing terms, which are commonly drafted before the procurement process to ensure the company engaging in the procurement process is deemed reliable and capable (4) it includes procurement contracts that commonly cover direct assignment, bilateral negotiation, feed-in tariffs, and competitive tenders, and are applied based on conditional needs (5) there is a clear and consistent power purchase agreement, and (6) it includes prudence reviews to evaluate whether an asset has been developed according to the initial proposal.

In Indonesia, procurement assessment can be time-consuming, cumbersome, and less reliable for independent power producers (IPPs), therefore incurring high administration costs and erecting significant barriers to entry. There are several factors to explain this situation. First, there is no standard for power purchase agreement (PPA) contracts. PPAs are usually customised based on negotiations between PLN (at central and regional level) and IPPs, which may put small-scale IPPs at a disadvantage due to their limited bargaining power. PPA contracts have also been lacking, with developers expressing their views about the few procurement opportunities compared to the RUPTL's power generation plan. This also indicates the lack of reliable and impartial resolution of conflicts between IPPs and PLN (ADB, 2020c). Therefore, several policy instruments need to be applied to address this situation. Consistency in PPA contracts (at least for small-scale projects) should be improved to create an efficient assessment process. More opportunities for procurement contracts should be provided, with most developers expecting more tender bid opportunities with supportive pricing policies. In addition, certainty about impartial conflict-resolution mechanisms between IPPs and PLN should be further improved.

III.A.4. Increasing Project Risk Management Quality by Providing Standards, Ratings, & Technical Support

Given the niche market nature of Indonesia's renewable power sector, there is as yet no formal standard of project development, resulting in asymmetric information problems in the industry. As financiers are often unable to understand the credibility of renewable power projects, developers also have difficulty informing potential financiers of their project's actual risk levels fully and transparently. While difficulty in conducting project risk assessment processes contributes to the issue, investors also often have lower confidence in outsourced assessment consultants, therefore expressing the need for tools to verify their credibility. Two different types of rating may help to overcome this issue. First, establishing project ratings for renewable energy projects may help increase the projects' risk

transparency for investors to evaluate. Secondly, creating ratings or any other form of evaluation for outsourced assessment consultants may help investors assess the credibility of assessment results carried out by such consultants.

In addition to improving transparency, increasing the risk management quality of renewable projects can also be done by providing technical assistance to developers and investors. Smaller project developers may benefit from accessibility improvement of project management aspects that were previously hard to attain. Additionally, general investors and developers may benefit from the quality and availability enhancement of the technical assistance that addresses the materialisation of unanticipated risks. Unanticipated issues such as land acquisition, social and political resistance, and natural disasters, for example, especially often occur. Ensuring the availability of relevant public institutions in providing technical support during risk assessment and mitigation and strong and coherent coordination across institutions at national and sub-national levels can help investors and developers improve their risk management. Another form of technical assistance that may also help is the establishment of pilot models to mitigate different risks. For example, models for community involvement at project sites for community consultations for in-kind services (such as energy access, local employment) and equity stakes in renewable energy projects may help to address social resistance risks.

III.A.5. Enhancing Project Feasibility & Credibility by Facilitating Research, Project Development, and Capacity Building

Developers often face the highest level of risk during the development phase when a development attempt is unsuccessful, turning allocated funds into sunken costs. Additionally, project development research is essential but often too costly for private developers to conduct on their own. There are several ways to facilitate research in the renewable sector. The establishment of centres for renewable energy research or supporting already existing ones may encourage scientific innovation. The Government of Indonesia may also provide fiscal incentives by increasing public funding for renewable energy research and development (R&D) and technical support, including access to public research equipment, instruments, and personnel. R&D may also be encouraged by improving research infrastructure, such as providing access to specialised knowledge and supporting the training of scientists and engineers in universities and other institutions of the education sector to enhance the human capital that R&D facilities require.

Additionally, the Government of Indonesia might also adopt other strategies to encourage business innovation. This includes introducing instruments to reduce financial risk related to R&D, such as tax incentives, personnel subsidies, project grants, and project loans (including conditional loans, loan guarantees, royalty grants, and stock option grants). Project development research may also include government-supported exploration projects, disseminating national research findings to renewable energy communities, and adopting the findings to national renewable development plans. Besides providing sufficient conditions for R&D activities to grow and avoiding the hefty costs project developers face, R&D facilities may also help the renewable sector innovate and maintain its competitiveness.

Meanwhile, project development facility and capacity building complement R&D facilities in addressing the risks of project development such as inaccuracies in the early-stage assessment of renewable energy resources, uncertainties related to availability and costs of resources, and risks associated with developer capacity such as sub-optimal plant design, lack of skills for the renewable sector, and the lack of understanding of information on quality, reliability, and cost of hardware. Project development facilities mainly include development financing and technical assistance. Capacity-building may consist of conducting and supporting industry training, establishing apprenticeship programmes, industry conferences, and university programmes to build skills in the renewable sector (planning, construction, and operations and marketing).

III.B. FINANCIAL DE-RISKING INSTRUMENTS

III.B.1. Guarantee Provision

One financial de-risking instrument is the provision of guarantees where the entities can provide a guarantee for the renewable energy project or even for the financing in case of default. Such guarantees play an important role in financing renewable energy projects as most renewable projects have underlying risks from the project itself to the financial and regulatory risks (EIU, 2011). Furthermore, in developing countries, one of the fundamental risks of renewable energy projects is asymmetric information, especially for foreign investors. Thus, guarantee provision can be an insurance against the default risks of renewable energy projects.

To classify the type of guarantee as a financial de-risking instrument, we divide the guarantee by the object of guarantee and guarantee providers. First, guarantee provision can manifest in the form of a project guarantee, in which the guarantee provider provides a buffer should any event take place that would impact the renewable energy project development. Such events could include the materialisation of institutional risks, weather risks, or natural risks, among others. On the other hand, another type of guarantee is a financial guarantee. This type of guarantee will ensure that in the event of any disruption in the payment capacity of a renewable energy project developer, the guarantee provision will ensure the payment obligation will still be met to creditors, wholly or partially.

In addition, we also define the guarantee by the type of guarantee provider, which is the government or a non-government body. Any type of independent (non-government) body can provide guarantees to the bondholders or investors for the underlying risks embedded in green projects. The guarantee can be provided under an insurance scheme, where the bondholders pay a guarantee fee to the independent body for some specific projects. There are several types of guarantees, such as partial risk guarantees and partial credit guarantees. Partial risk guarantees cover private-sector lenders against the risks of a public entity failing to perform its contractual obligations to a private-sector project. Other risks that can be guaranteed among renewable energy projects are institutional issues, permits, and licenses of the projects, regulations and institutional issues, and greenwashing risks. As a de-risking instrument, a partial credit guarantee can also be provided, which is used primarily in

poorer countries, to support commercial borrowing for public investment projects by partially covering private lenders against the risk of debt service default by the public sector. One type of guarantee that is has little probability of thriving is the provision of financial guarantees by the government as they lack the aspect of independence, and if issued, will not be likely to attract any normal investors.

Table 4. Types of Guarantee Provision

		Guarantee Providers	
		Government	Non-Govt. Guarantors
Object of Guarantee	Project	V	V
	Financial	X	V

Source: Authors' Analysis (2021)

III.B.2. Performance-Based Lending

Performance-based lending is a type of financing instrument where the disbursement of funds is linked to certain agreed criteria, such as results, rather than to upfront expenditure. The most common type of performance-based lending is result-based lending, which links the disbursement to a specific goal. The aims of this financial de-risking instrument are to increase projector accountability and to incentivise them to deliver good and sustainable outcomes. Therefore, it can increase the effectiveness of the project as well as its efficiency. The key players of the instrument are lenders (usually private donors) and incentivised agents (usually the national government). When the results of the projects have been verified by an independent body, the lenders will provide the projectors with the loan or grant.

This lending was first introduced in March 2013, the ADB approved result-based lending as a new financing method for an initial six years. In 2019, the performance-based lending type became a regular ADB financing modality. The ADB performance-based lending provides lending especially for developing countries for government-owned projects, particularly for renewable projects. In Indonesia, the ADB performance-based lending proposed USD 600 million in a result-based loan programme to support the development of electricity distribution to enhance life quality in Eastern Indonesia through sustainable access of electricity (ADB, 2020a). As the ADB performance-based lending only provides loans for government projects, such financial de-risking instruments can also be implemented for private-owned renewable projects to further develop the renewable energy in Indonesia.

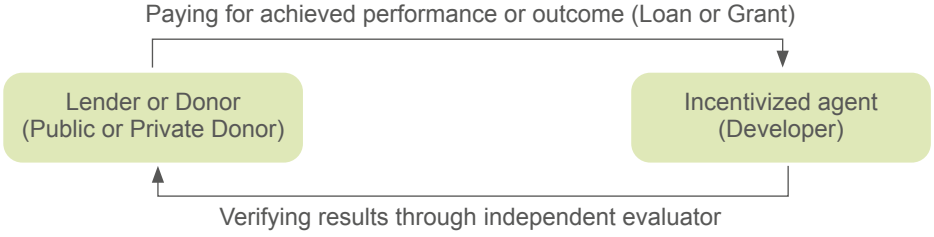

Figure 4. Performance-Based Lending
Source: World Bank, 2018

III.B.3. Asset Securitisation

Asset securitisation is an instrument that transforms an illiquid asset or a group of assets and aggregates them through financial engineering into liquid assets in the form of a security. The assets of individual projects and private company investments are aggregated into liquid assets. Asset securitisation can lower the liquidity risk of renewable energy and can increase investors' appetite for investing in such projects. Asset securitisation allows project sponsors to issue individual securities featuring a variety of ratings, risks, and returns to correspond to different investment preferences.

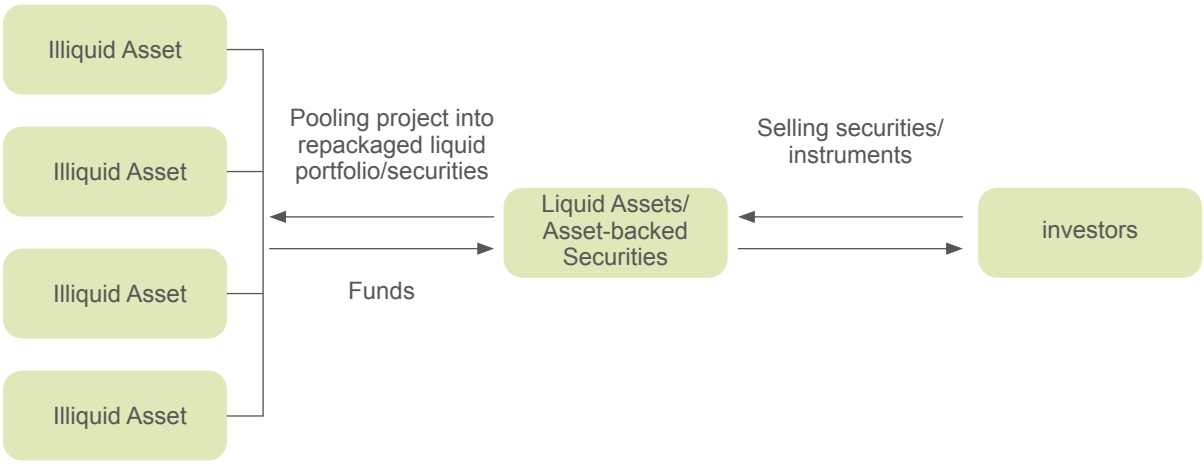

Figure 5. Asset Securitisation
Source: Authors' Illustration (2021)

Asset securitisation in Indonesia has been deployed by PT Sarana Multigriya Finansial to finance infrastructure projects. The state-owned Indonesian financier made an asset-backed securitisation worth Rp 500 billion in August 2016 (PT SMI, 2016). However, financing through asset securitisation has not been used for renewable energy projects in Indonesia. Therefore, such financing schemes could become one of the potential financial de-risking instruments for financing renewable energy projects in Indonesia.

III.B.4. Green Bonds

Green bonds are also considered a method of financial de-risking. They serve as an alternative instrument that can facilitate and bridge the capital in the financial market with renewable energy projects. In principle, green bonds are quite similar to conventional bonds. The only difference is the use-of-proceeds of the funds gathered from the bond issuance. One of the issues of green bond development is that the green bond market is still relatively small compared with conventional bonds. However, compared with the green bond market in 2014, the number of green bonds issued in 2019 had increased seven times amounting to around USD 247 billion (Climate Bonds Initiative & UniCredit, 2020). The development of the green bond market can increase the accessibility of renewable energy projectors to a bigger pool of funds. In order to improve the green bond market, especially in developing countries, its development as alternative financing for renewable energy

projects must be supported by other initiatives such as a credible rating agency for renewable energy projects and guarantee agencies to increase the appetite of investors for purchasing green bonds.

The key players in green bond financing are the green bond issuers (companies, municipalities, etc), investors, and also the green bond issuance support system, such as green bond consulting firms, external review entities, and regulators. In Indonesia, the Financial Services Authority (Otoritas Jasa Keuangan, OJK) has issued Regulation No. 60/POJK.04/2017 on the issuance and terms of green bonds. Since then, the domestic green bond market has increased in Indonesia. However, the green bond market in Indonesia still lacks participation by private and foreign players as it is still dominated by the government with almost 70% of total green bonds issued by the Ministry of Finance and PT SMI (a government-backed entity).

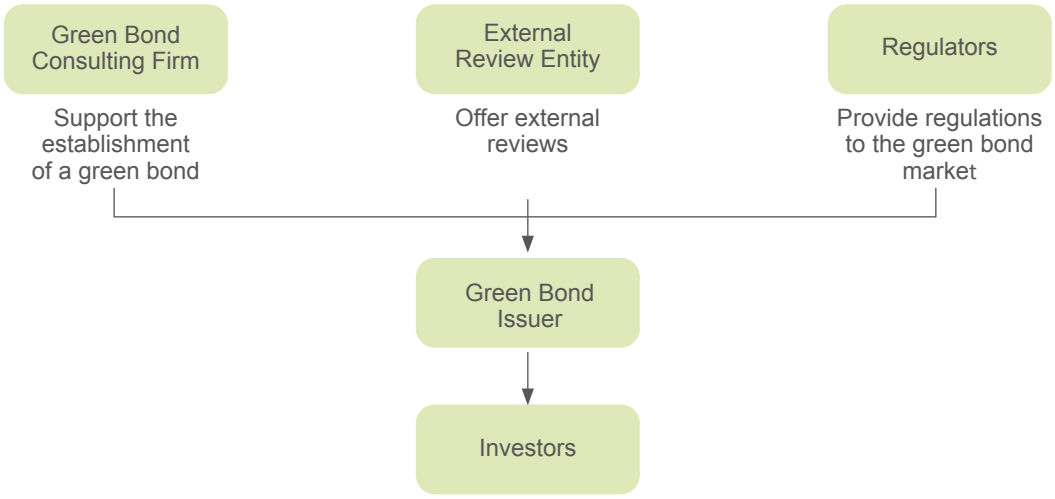

Figure 6. Green Bonds

Source: Authors' Illustration (2021)

III.B.5. Seed Capital

The provision of a certain amount of initial investment in a renewable energy project to spur private investment and capital raising is referred to as seed capital. Seed capital is money used for the initial investment in a project or start-up company, for proof-of-concept, market research, or initial product development (ADB, 2007). Seed capital is usually provided by governments or multinational development banks (MDBs). Thus, governments or MDBs are the key players in the provision of financial de-risking instruments and granting funds to project developers. An example of seed capital is UNEP's Seed Capital Facility which addresses investment gaps in the early stages by providing financial support on a cost-sharing and co-financing basis. In 2020, the UNEP also launched a Restoration Seed Capital Facility with initial capitalisation of EUR 25 million aimed at boosting the contribution of private finance to renewable energy, such as forest restoration, climate adaptation and mitigation, conservation of biodiversity, and provision of sustainable livelihoods (UNEP, 2020). Seed capital can increase the development of renewable energy projects because it can fill the investment gap in the initial stage of such projects.

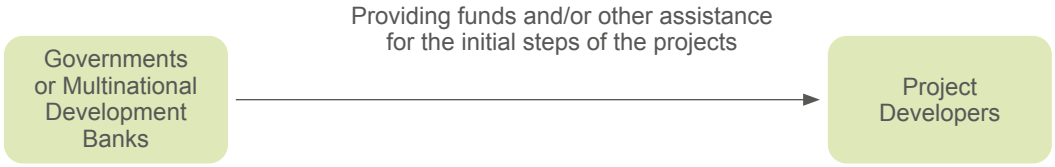

Figure 7. Seed Capital

Source: Authors' Illustration (2021)

III.B.6. Convertible Grants

Convertible grants are grants that are usually provided by the government or public finance institutions, that can be converted into a loan. This instrument specifically targets the high risk of exploration drilling and provides a safety cushion for projects to buffer against unsuccessful drills (GGGI, 2019). Governments and public finance institutions usually provide convertible grants to renewable energy projectors. For example, the Geothermal Development Facility in Latin America offers convertible grants for the entire value chain of exploratory drilling. If exploratory drilling turns out to be successful, the grant is converted into a loan and the project has to repay 80% of the funds received. However, if it is unsuccessful, there is no financial commitment to repayment and the grants are not converted to loans.

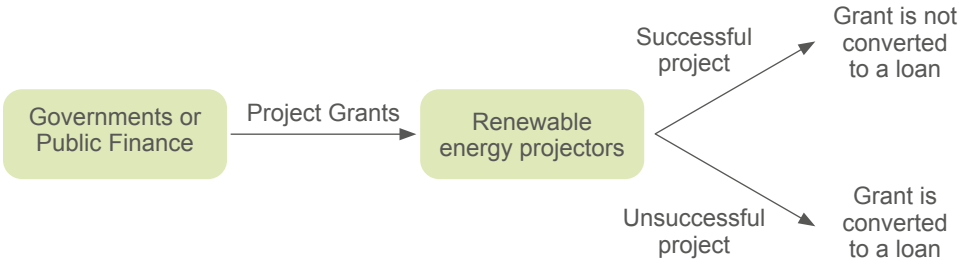

Figure 8. Convertible Grants

Source: Authors' Illustration (2021)

III.B.7. Asset Aggregation

Renewable energy sources tend to vary in terms of size, while the transaction and due diligence costs tend to be similar for all project sizes, creating a disadvantage for smaller-scale projects. Aggregating smaller-scale renewable energy assets can help scale up the investment volume and reduce due diligence costs per project for institutional investors. Building a replicable aggregation model that can be scaled up requires strong support and commitment from governments as well as consensus on specific terms of standardisation from industry stakeholders. The key players in this instrument are the small-scale renewable energy projectors, government entities, and institutional investors or lenders (such as banks).

Aggregation in the renewable sector is not limited to financial aggregation, but also demand aggregation, project aggregation, and information aggregation. Aggregating renewable energy

projects can be in the form of communities for renewable energy projectors and standardising the information of the projects for the investors (IIED, 2017). Through the aggregation of renewable energy projects, risk and the cost of finance of the projects can be reduced and increase investors' appetite for renewable energy projects through risk diversification of various projects. Moreover, it can also improve the projects' reliability while also ensuring high penetration levels of renewable resources (Obi, Slay, & Bass, 2020). For example, aggregation approaches in Australia have resulted in over AUD 800 million worth of investments in more than 5,500 small-scale projects across Australia (Green Bank Network, 2019).

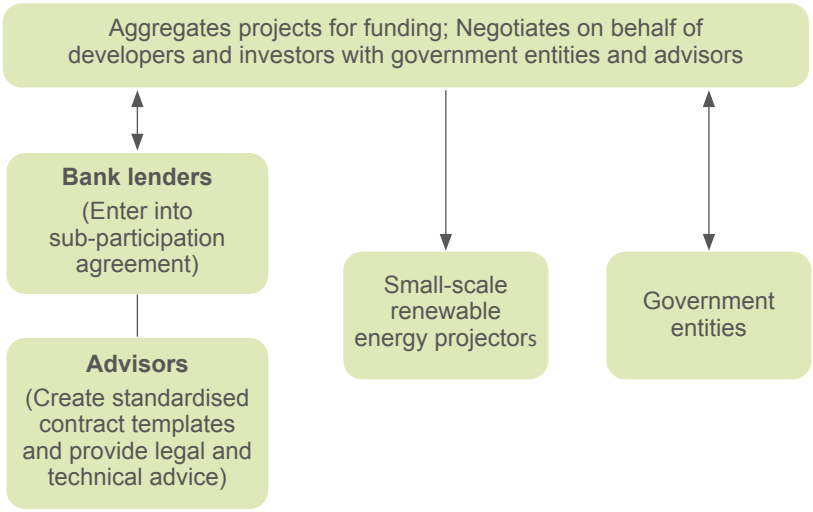

Figure 9. Asset Aggregation
Source: GGGI (2019)

III.B.8. Mezzanine Financing

Through mezzanine financing instruments, the lender can convert a hybrid of debt and equity financing into an equity interest in the company in case of default, this usually happens after venture capital companies and other senior lenders are paid. Mezzanine financing is frequently associated with acquisitions and buyouts, for which it may be used to prioritise new owners ahead of existing owners in case of bankruptcy. In terms of risk, mezzanine financing or loans carry more risk than debt but lower than equity financing or ownership in the company (Justice, 2009). Although the risk is higher than debt, mezzanine financing pays a greater return to the lender. The benefits include the fact that the providers of mezzanine capital are often long-term investors in the company. This makes it easier to obtain other types of financing since traditional creditors generally view a company with long-term investors in a more favourable light. Some renewable energy projectors seek mezzanine financing when bank debt is insufficient to finance the whole project. The partners in this type of instrument are institutional investors.

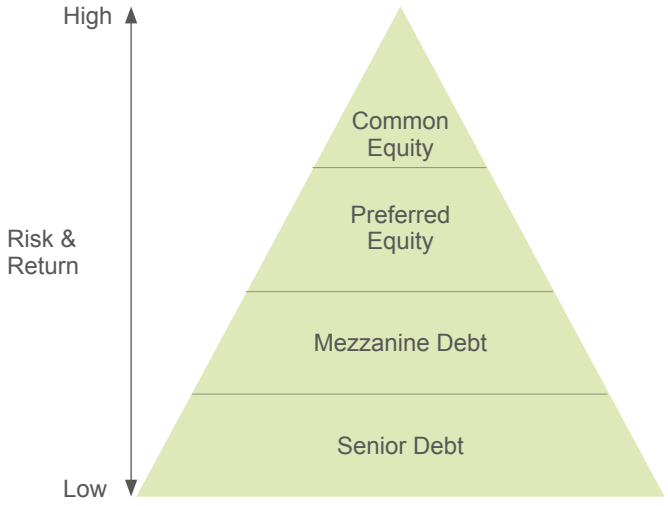

Figure 10. Mezzanine Financing
Source: Authors' Illustration (2021)

Mezzanine financing was developed in the US and European financial markets in the 1980s. Since then, this type of funding has grown significantly but the development is still low in Asia and emerging markets. According to the ADB, some developing countries that are facing climate problems need an enormous amount of funds to finance their climate projects. Mezzanine financing can be a de-risking instrument for renewable energy development and mezzanine financing has also become one of the more effective vehicles for developers and it bridges the financing gaps in the renewable sector. The ADB has proposed multi-project facilities, particularly for countries in Asia and emerging markets, in terms of mezzanine financing as an additional financing for their energy projects.

III.B.9. Concessional Debt

Concessional debt is a debt instrument which provides borrowers with upfront funding in exchange for repayment based on predetermined timeframes and interest rate terms. The concessional debt includes special features like no or low interest rates, extended repayment schedules, and interest rate modifications during the life of the loan. Institutions which provide the concessional debt are usually development finance institutions like the ADB. In Indonesia, the ADB provides financial assistance for Indonesia's geothermal power project at Muara Laboh in terms of a USD 70 million loan, a USD 20 million parallel loan from the Lending Asia's Private Sector Infrastructure Fund, and a USD 19.25 million concessional loan from the Clean Technology Fund (CTF) (ADB). The concessional loan or debt from the ADB can motivate renewable energy developers to complete their projects and fill the financing gaps of the projects.

Table 5. Summary of Financial De-risking Instruments Availability

No	Financial De-risking Instruments	Availability in Indonesia	Potential
1	Guarantee Provision	Currently not available in Indonesia	High potential to provide guarantee to investors
2	Performance-based Lending	Currently available in Indonesia ADB PBL proposed USD600 million result-based loan programmes to support the development of electricity distribution for sustainability in Eastern Indonesia.	High potential and can expand the loan to private-owned renewable energy projects
3	Asset Securitisation	Currently not available in Indonesia	High potential for renewable energy projects
4	Green Bonds	Currently available in Indonesia The market is still small and lacks participation of private and foreign players. The bonds are still dominated by the government (70% of total green bonds issued)	High potential, needs to increase private and foreign investor participation to achieve deeper green bond market
5	Seed Capital	Currently not available in Indonesia	High potential, especially for small-scale project developers
6	Convertible Grants	Currently not available in Indonesia	Potential to be applied in renewable energy projects
7	Asset Aggregation	Currently not available in Indonesia	High potential for small-scale renewable energy projectors
8	Mezzanine Financing	Currently not available in Indonesia	Potential to be applied in renewable energy projects especially when bank loans are insufficient
9	Concessional Debt	Currently available in Indonesia From MDBs like the ADB, which provides financial assistance for Indonesia's geothermal project power project at Muara Laboh	Potential to increase motivation of renewable energy projectors to complete their projects and fill the financing gaps of the projects

III.C. Implementing Potential De-risking Instruments in Indonesia

Indonesia is in the critical juncture of energy transition. With the increasing need for renewable energy to substitute energy generation from the brown sector, the urgency is more pressing than ever. Indonesia's current energy-generation structure, with heavy reliance on non-renewable fossil fuels, poses energy security risks. According to BP (2020), Indonesia's oil production (including natural gas liquids) has steadily declined over the last 10 years, with 2019 output at 781,000 barrels per day. With a reserves-to-production ratio of 8.7, it is estimated that Indonesia's proved oil reserves would be depleted by 2027-2028 if production is maintained at the 2019 level. It is important to note that this limited fuel is also shared by other sectors, such as transportation and cooking fuel. To fulfil excess domestic demand, the country has to import oil, widening Indonesia's current account deficit. In 2019 (pre-pandemic situation), the oil and gas balance of the trade deficit was USD 10.3 billion, which was almost a third of the current account deficit (Bank Indonesia, 2021).

On the other hand, coal also poses problems in the constellation of Indonesia's energy profile. Indonesia has large proven reserves of coal at 39.9 billion tons, which BP (2020) estimated might be depleted by 2084-2085. Indonesia's production had grown 8.8% per annum between 2008 and 2018, to the point where the country's output reached 15.05 exajoules by 2019 (equivalent to 9% of global production). In 2019, Indonesia exported 9.18 exajoules of coal, becoming the world's second-largest exporter (after Australia) with a share of 26%. However, the commercial feasibility of using coal as a source of power is contingent on its volatile price, in which the coal reference price has reached as high as USD 127/ton and as low as USD 49/ton in the last 10 years. Low prices reduce the economic value of coal extraction while high prices increase power generation costs, which in turn increases energy subsidies (LPEM FEB UI and Greenpeace, 2019). To protect local power producers from price hikes, the Ministry of Energy and Mineral Resources (MoEMR) released a Domestic Market Obligation rule in 2018. This rule mandated coal producers to sell 25% of their total production to local power plants, with the price capped at USD 70/ton and adjusted according to their calorific value. Such an obligation reduces the costs for coal-fired power plants when global coal prices are high, at the expense of coal producers and renewable energy developments (IISD, 2019).

With mounting pressure from the environmental perspective and Indonesia's commitment to tackle climate change, a more enabling environment for renewable energy in Indonesia is non-negotiable to achieve its agenda and this can be done through more progressive regulation and policies. Based on the analysis of various de-risking instruments, policy de-risking is more critical and urgent as policy and regulation challenges are still considered the main bottleneck of renewable energy development in Indonesia. While financial de-risking instruments have a massive potential to further catalyse the renewable sector, without a more growth-friendly environment for the renewable sector that can be achieved from regulatory and policy aspects, financial de-risking instruments will have little efficacy and have a suboptimal impact. In addition, despite financial de-risking instruments serving as relevant tools to spur renewable energy growth, the underlying risks in the renewable sector are still substantial and are preventing the opportunity for the renewable sector to develop.

In the broader picture, the development of the renewable sector in a country takes place in stages from its infancy until later on in its maturity. Indonesia is still at a relatively early stage, during which the improvement of policy and regulatory aspects through policy de-risking instruments must materialise first. Therefore, we recommend the prioritisation of policy de-risking instruments over financial de-risking instruments in Indonesia for now. Among the numerous elements to consider in formulating policy de-risking instruments are solving several key issues in the renewable sector such as effective and relevant policy de-risking, permit processes, incentives, procurement processes, project support, and R&D. To substantially reduce risk in the renewable energy, policies related to the sector need to be clear and well-defined as to bring certainty in understanding for the players and developers. Furthermore, the regulations relating to renewable energy issued by numerous ministries and institutions and across all regulations must be consistent. Also, all the regulations need to be coherent from the highest-level regulations and laws to their derivatives. Lastly, the improvement of policy aims to serve as de-risking instruments should include the credibility aspects. More credible policy in terms of implementation and enforcement will provide certainty and security for all the stakeholders involved, which could increase the appetite of investors for financing renewable energy.

Furthermore, one of the main impediments hampering the growth of renewable energy projects in Indonesia is the permit process. Going forward, permit processes need major improvements to be clearer in terms of mechanism, enforcement, the key government institutions involved, and the need to constitute well-defined property rights for the players and investors in the renewable sector. Incentive mechanisms in the renewable sector, which still pose a challenge, also can be improved in the form of better pricing policy and more definitive incentives that can be understood better by the players involved in the sector.

In terms of market structure, one improvement that would play a major role is the procurement process. So far, the procurement process in the renewable sector in Indonesia is still regarded as relatively unfair for developers and needs to be more competitive. Also, the government could enhance further the development agenda of renewable energy progress in Indonesia by providing support to developers in several forms such as technical assistance and the provision of project development facilities. To advance the current renewable energy sector in Indonesia, support for research and development is also crucial. The government could contribute further by providing fiscal and nonfiscal incentives to encourage business innovations. The government could also push forward the agenda of more available and transparent environmental data to support the growth of renewable energy in Indonesia.

The development of the renewable sector in Indonesia is still in its early phase. While the current priority should go to policy de-risking instruments, financial de-risking instruments need also to be developed in parallel. This is important to create a momentum in which once the policy de-risking instruments reach a stage of adequate “enabling environment” to facilitate the expansion of renewable energy projects at a rapid pace, the financial instruments have to be ready to serve as a channel for the funds to finance the growth of renewable energy from potential investors. All of the agenda mentioned above needs to be formulated and implemented in a pertinent and timely manner. This needs a massive commitment from all stakeholders involved, including governments, developers, the financial sector, MDBs, and others.

IV. Conclusion and Recommendations

Indonesia needs to quickly step up its priorities and lay out concrete actions for renewable energy generation capacity so it can make up for Indonesia's commitment to fighting climate change. This is by no mean an easy task. In 2020, Indonesia ranked 5th in the world's coal production and 15th in the world's gas flaring volumes. In 2020, fossil fuels dominated the source of Indonesia's national energy, accounting for 85.55% of the total energy supply. Coal constituted the highest percentage of all energy sources at 37.6% percent, followed by petroleum at 31.65%, and natural gas at 16.82%, leaving only 14.55% for energy supplied from renewable sources. The country's abundant reserves of natural resources and the constraints of developing the renewable sector have contributed to the dominance of fossil fuels in the country's energy supply.

To shift the current degrading trajectory of its energy profile, Indonesia faces various challenges. The UNDP (2013) identifies two types of instruments that serve as pertinent tools to address the issue of renewable energy development, namely policy de-risking instruments and financial de-risking instruments. While both have been proven effective in many countries to improve the rate of the development of renewable energy, this study suggests that currently Indonesia needs to prioritise policy de-risking instruments over financial de-risking instruments. The prioritisation of policy de-risking instruments is needed because the current issues faced by the renewable sector are in the regulatory aspects. Thus, a better regulatory framework and business environment that is friendly for the growth of renewable energy projects could lay solid ground for the expansion of the sector. Such conditions can be met through the implementation of policy de-risking instruments including (1) improving renewable energy targets and policies in terms of their clarity, consistency, credibility, and coherence; (2) reforming incentives and pricing policies, especially in pricing policy and subsidy; (3) creating effective and efficient permit and procurement processes to provide security and certainty to investors; (4) increasing project risk management quality by providing standards, ratings, and technical support; and (5) enhancing project feasibility and credibility by facilitating research, project development, and capacity building.

Furthermore, while the need for prioritisation of policy de-risking is of utmost importance, we also suggest that the development of financial de-risking instruments should not wait until the policy and regulatory framework achieves its optimum shape. Financial instruments should also in parallel be developed such that once the regulatory environment has achieved its "growth enabling" state, financial de-risking instruments can take the growth and development progress of the renewable sector further. The financial de-risking instruments that have been identified in this study are (1) guarantee provision; (2) performance-based lending; (3) asset securitisation; (4) green bonds; (5) seed capital; (6) convertible grants; (7) asset aggregation; (8) mezzanine financing; and (9) concessional debt.

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About CASE

The programme "Clean, Affordable and Secure Energy for Southeast Asia" (CASE) is jointly implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and international and local expert organisations in the area of sustain-able energy transformation and climate change: Agora Energiewende and New Climate Institute (regional level), the Institute for Essential Services Reform (IESR) in Indonesia, the Institute for Climate and Sustainable Cities (ICSC) in the Philippines, the Energy Research Institute (ERI) and Thailand Development Research Institute (TDRI) in Thailand, and Vietnam Initiative for Energy Transition (VIET) in Vietnam. Funded by the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV), CASE aims to support a narrative change in the region's power sector towards an evidence-based energy transition, in the pursuit of the Paris Agreement goals. The programme makes use of available research initiatives while generating new evidence grounded in local realities that can influence economic managers, power sector decision makers, industry leaders and electricity consumers to support early, speedy, and responsive strategic reforms in the power sector. To reach this objective, the programme applies a joint fact-finding approach involving expert analysis and dialogue to work towards consensus by converging areas of disagreement.

Furthermore, CASE is an aligned programme of the Energy Transition Partnership (ETP), an alliance of international donors, philanthropies, and partner governments established to accelerate energy transition and to support sustainable development goals in Southeast Asia.

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