

Opportunities and Challenges for New and Renewable Energy Development in Indonesia: Towards Net Zero Emission

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ABSTRACT

New and renewable energy must be developed in various countries, including Indonesia. In addition to supporting national energy resilience, new and renewable energy development is needed to drive net zero emissions. This study has two things to discuss: first, the opportunities and challenges of new and renewable energy development in Indonesia; second, efforts to optimize the energy transition in Indonesia to realize net zero emissions. Using doctrinal research methods and methods of qualitative data analysis, it was concluded that, first, behind the abundant potential of new and renewable energy in Indonesia, there are challenges ranging from licensing, spatial planning, regulation, financing, geographical challenges, and other factors. Secondly, to support the acceleration of the energy transition, it is necessary to reformulate regulatory aspects and include them in the spatial planning plan to facilitate investment licensing, strengthening of international collaboration and cooperation, cooperation schemes and partnership with local communities for the development of renewables and new energy in the small islands, and the need for accuracy of data and development research-and-development in fresh and renewing energy.

Keywords: New and Renewable Energy, Climate, Net Zero Emission.

INTRODUCTION

In December 2015 the Paris Agreement was signed. This agreement is a joint commitment of countries in the world to reduce greenhouse gas emissions which have an impact on global warming. Indonesia has ratified the Paris Agreement into Law Number 15 of 2016. The consequence of Indonesia's ratifying the Paris Agreement, based on the principle of *pacta sunt servanda*, is that Indonesia has become part of the international community. Indonesia is legally bound by the Paris Agreement (**Herawan, 2021**). Countries that participate in ratifying the provisions of the Paris Agreement must take climate change mitigation action to reduce greenhouse gas emissions. As part of the countries that signed the Paris Agreement, Indonesia must take several climate change mitigation actions, one of which is through an energy transition from fossil energy to new and renewable energy. Implementing climate change mitigation actions also fulfills the thirteenth Sustainable Development Goals ("SDGs") regarding handling climate change.

Indonesia is committed to meeting the greenhouse gas emissions reduction target outlined in the Nationally Determined Contribution (NDC). The target for reducing greenhouse gas emissions is 29% with the business-as-usual scheme and can increase to 41% by 2030 with international cooperation (**Syahrani, Alfitras, 2020**).

Dependence on energy consumption which is still dominated by fossil energy, especially coal, oil, and natural gas, has resulted in at least 3 (three) serious threats, namely: 1) the increasing depletion of fossil energy reserves, especially since fossil energy is categorized as non-renewable energy, 2) instability which will affect price increases due to the increasing rate of demand for fossil energy, and 3) greenhouse gas pollution due to burning fossil fuels. The resulting CO₂ emissions will influence global warming and climate change. Meanwhile, the existence of new and renewable energy is still considered an alternative energy and has not yet become a priority for development in various countries, including Indonesia (**Lestari, 2021**).

On the one hand, Southeast Asian countries, including Indonesia, have huge potential for new and renewable energy resources, most of which have not been utilized optimally. For example, the best potential for micro-hydro power generation in the world is in Indonesia, Myanmar Laos, Cambodia, and Vietnam. Furthermore, there are significant reserves of geothermal energy potential, especially in Indonesia and the Philippines. Apart from that, marine energy potential has great potential to be developed, especially for archipelagic countries such as Indonesia, Malaysia, the Philippines, and Singapore (**Ahmad, Wibowo, Anam, 2022**). This opportunity should be utilized optimally by countries in Southeast Asia, including Indonesia. As a form of Indonesia's commitment to reducing the use of fossil energy, the government issued Presidential Regulation Number 22 of 2017 to establish a General National Energy Plan by increasing the use of new and renewable energy (EBT) in the national energy mix to 23% in 2024 and to 31% in 2050. (**Permana, 2023**). Currently, the government has accelerated the transition to new and renewable energy, especially solar, wind, hydro, geothermal and ocean current energy. Indonesia is also accelerating the development of biodiesel, bioethanol, and bioavtur.

Apart from answering the need for energy security, the use of new and renewable energy can contribute to achieving net zero emissions, the aim of which is to save the earth's sustainability not only for the current generation but also for future generations. This is the essence of intergenerational justice which must be taken into account by the government as a policy maker.

However, despite the potential for new and renewable energy and the various government initiatives to achieve net zero emissions, this does not mean there are no challenges or obstacles. The complexity of regulations and permits from the government to implement various renewable energy policies is seen as one of the concrete obstacles found in the field. Besides, many new and renewable energy potentials in Indonesia have not been accommodated in the spatial planning plan. Next, such a high-cost factor is a special challenge for investors who want to invest in the new and renewable energy sector. Not to mention that from a geographical perspective, Indonesia is an archipelagic country that has more than 17,000 large and small islands. There is a lot of new and renewable energy potential spread across the country, including small islands and peripheral areas, while demand is concentrated on certain islands and big cities such as Java.

Research Questions

Departing from the research background above, there are 2 (two) problem formulations to be discussed in this article, namely:

1. What are the opportunities and challenges for developing new and renewable energy in Indonesia to realize the net zero emission target?
2. What efforts can be made to optimize the energy transition in Indonesia to realize net zero emissions?

RESEARCH METHODOLOGY

The form of research used in this research is doctrinal research, which focuses researchers on doctrine, which is a synthesis of regulations, principles, norms, and values (Ishawara Bhat, 2019). The results were compiled systematically and developed into descriptive analysis. This research analyzes and answers each problem formulation related to the opportunities and challenges of developing new and renewable energy in Indonesia. The results of this study can formulate a solution or alternative solution to answer the research problem. It is hoped that the goal of achieving net zero emissions as mandated by the Paris Agreement and the thirteenth Sustainable Development Goals (“SDGs”), namely dealing with climate change, can be achieved.

The research typology that will be used in this research is prescriptive, namely by analyzing a problem and formulating a solution to a problem (Muhaimin, 2020). Furthermore, the type of data used in this research is secondary data that is relevant to the form of doctrinal research (Abudlkadir, 2004). In this research, data collection was carried out indirectly, namely through a literature study to look for legislation, legal theory and several expert opinions in the environmental and energy fields. The types of legal materials used are secondary legal materials with primary legal materials including statutory regulations, and secondary legal materials in the form of books or journal articles. Meanwhile, this research uses qualitative data analysis methods by analyzing various secondary data and primary legal materials and secondary legal materials.

RESEARCH RESULTS AND DISCUSSION

A. Opportunities and Challenges for Indonesia’s Development of New and Renewable Energy

New and renewable energy as a strategic natural resource contained within the territory of Indonesia is a national wealth controlled by the state, as stated in Article 33 paragraph (3) of the Constitution, namely the 1945 Constitution of the Republic of Indonesia, which confirms that earth, water, and natural resources are contained therein and are controlled by the state and used for the greatest prosperity of the people. The people collectively give the mandate to the state to implement policies (*beleid*), management actions (*bestuursdaad*), regulation (*regelendaad*), management (*beheersdaad*), and supervision (*toezichthoudensdaad*) to create justice and prosperity for all Indonesian people (Ma’ruf, 2014). This concept is hereinafter referred to as public trust. The concept of trust is inherent in itself without any written agreement between the state and society (Rahmawati and Cetera, 2020). This doctrine has been implemented in various countries, one of which is the United States, as stated in the National Environmental Policy Act of 1969, which emphasizes the state’s responsibility to protect the environment between generations: “Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations” (U.S. Code § 4331).

In the context of Indonesia, as a country that has abundant new and renewable energy potential, it is appropriate for the state as a trustee or trustee to optimize these resources for the greatest prosperity of the people. Management of new and renewable energy is in addition to meeting national energy security and ensuring that the people as trustees benefit from existing resources.

Furthermore, don’t forget that the meaning of the state’s right to control natural resources as stipulated in Article 33 paragraph (3) must also take into account the provisions of Article 33 paragraph (4) and Article 28H paragraph (1) of the Constitution, which require that the use of natural resources must be environmentally friendly. This is because a good and healthy living environment is part of everyone’s human rights, which is the state’s responsibility to implement. Apart from that, in the explanatory provisions of Article 2 of Law Number 32 of 2009 concerning Environmental Protection and Management, it is

stipulated that what is meant by the principle of state responsibility is:

“The state guarantees that the use of natural resources will bring great benefits to the well-being and quality of life of the people, both present and future generations. The state guarantees the right of citizens to a good and healthy living environment, and the state prevents natural resource exploitation activities that cause pollution and/or damage to the living environment”.

This optimization of new and renewable energy is important and has a direct impact on the protection of the living environment. Based on studies of 130 countries in the world, increasing the proportion of renewable energy consumption can accelerate reductions in per capita carbon emissions before a certain threshold of the total rental of natural resources (**Qiang Wang, et al, 2023**).

Indonesia has a great opportunity to develop new and renewable energy sectors in the spirit of an energy transition that is expected to reduce greenhouse gas emissions. According to data from the European Commission, Indonesia’s greenhouse gas volume by 2022 will reach 1.24 gigatonnes of carbon dioxide equivalent (Gt CO₂e), about 2.3% of the total global greenhouse gas emission. This data covers emissions from the power generation sector, energy combustion for industry, fossil fuel exploitation, and industrial processes, including energy burning for non-industrial buildings and waste sectors (**Kata Data, 2023**).

As for the development of new and renewable energy sectors, an analysis by the International Renewable Energy Agency (IRENA) states that Indonesia’s renewable potential can reach 3,686 gigawatts (GW). Indonesia has a very abundant potential for new energy, consisting of ocean currents, earth heat energy, bioenergy (bioethanol, biodiesel, biomass), wind energy, water energy, and solar energy that can be utilized in every region of Indonesia. But behind that potential, new and newly utilized renewable energy is still very low at ±12.55 GW (**Ministry of Energy and Mineral Resources Indonesia, 2023**).

Renewable Energy Resource	Estimated Potential (in GW)	In Use/Tapped Potential (in GW)
Solar	3,295	0,27
Wind	155,0	0,15
Hydro	95,0	6,69
Bioenergy	57,0	3,09
Geothermal	24,0	2,34
Total	3.686	12,55

(Data source: Energy and Mineral Resources Minisrty, Estimated Potential of Renewable Energy Sources in Indonesia, 2023)

Behind the potential that exists does not mean the development of new and renewable energy without finding challenges.

1. Regulation Aspects

Southeast Asian countries such as Thailand and the Philippines have shown greater success in terms of the implementation of renewable energy through regulatory support that facilitates. The Philippines, for example, has implemented the Renewable Energy Act, which provides various incentives and support for the development of renewable energy, including in remote island areas. Meanwhile, in Indonesia, new and renewable energy regulations are now regulated and regulated in various legislative regulations. However, the regulations are not considered mutually reinforcing and so dynamic because they are often changed so

that they are not a strong, comprehensive legal foundation and bring a sense of justice and certainty. Therefore, a separate regulation in the law is necessary so that it can later be a reference to the provisions of the legislation below. *“a clear and comprehensive legal policy in the form of a law is needed to regulate the development and utilization of new and renewable energy”*.

New and Renewable Energy Bill Act is expected to regulate comprehensively the development and use of new and renewable energy in Indonesia. Not to mention, in the region, the implementation of the use and development of new and renewable energy has not been supported by clear regulations, for example, in the form of the Regional Regulations. It is therefore necessary to reformulate legislative regulations that respond to the needs of new and renewable energy development. Most of the threat of climate change is real, and the impact is felt. Laws must be progressive in the sense that laws must be dynamic in responding to growing needs, including when the world is facing the threat of climate change. Then laws should be able to respond to those challenges and needs (Rahardjo, 2007).

2. License and Spatial Planning Aspects

Permission in administrative law is a manifestation of the granting of legality to a person or perpetrator of a particular business or activity (Siti Kotijah, 2020). An attempted activity cannot be carried out without prior permission; hence, permission is usually referred to as an instrument in administrative law to guide the behavior of citizens (Hadjon, 1993). The lengthy and bureaucratic licensing process also hampers the development of new and renewable energy projects. Not to mention the frequently changing policies have led investors to rethink investing in Indonesia. Compared to regional and international policy, Indonesia still faces challenges in terms of varied regulations and licensing and inadequate implementation of a rule or policy. Examples are the licensing process for the construction of new and renewable energy Power Plant Poso 2 in Poso District, Central Sulawesi, and Power Plant Malea in Tanah Toraja District, South Sulawesi. Despite the immediate concern of the President and Vice President, the process of licensing and negotiation takes five (5) years (Nina Susilo, 2020). The President has instructed to make improvements to the licensing bureaucracy so that investors do not stumble in investing in Indonesia and hinder the development of new and renewable energy needed for the energy transition.

The next one of the challenges of developing new and renewable energy is the spatial planning aspect. Spatial planning is a guideline for development and an investment gateway. The issue is that behind the new and renewable energy potential that is so abundant in Indonesia, many are not yet accustomed to spatial patterns. Besides, the elaboration of a detailed spatial planning plan that could include an area that could be developed for the new and renewable energy sector is still limited. Of the 2,000 targets of Detailed Spatial Planning (RDTR), currently until August 2024, the newly established area regulations/regulations of the head of the district are 508 Detailed Spatial Planning. (Ministry of Agrarian Affairs and Spatial Planning, 2024). The momentum of spatial planning revisions and the elaboration of detailed spatial planning plans must be optimized to accommodate the potential of new and renewable energy into spatial planning that can drive increased investment in new and regenerative energy. Moreover, investors in the new and renewable energy sectors are still very limited, so a number of facilities should be provided by the government to those who want to develop new and regenerative energy. However, in the process, we must still pay attention to the procedure and sustainability of the living environment.

3. Financing New and Renewable Energy Transitions

Behind the desire to accelerate the energy transition from fossil to new and renewable energy, the financing factor has become one of the crucial factors. The problem in the development of new and renewable energy is related to pricing, where the price of energy is higher than the actual price. This is felt directly by developing countries such as Indonesia, which require huge funding to accelerate the energy transition. At the agenda of the 28th World Climate Action Summit in Dubai, the President stated that the funding needed

for the energy transition to absorb all carbon produced was \$1 trillion to reach net zero emission by 2060, which is about Rs (Kurnia, 2024).

Answering this question, it is necessary to cooperate in terms of funding to accelerate the energy transition. One of the efforts is through low-interest funding schemes and incentive schemes, as well as strengthening cooperation to obtain international funding.

4. Geographical conditions of Indonesia

Indonesia is an island state with more than 17,000 large and small islands, and some of the islands in Indonesia are uninhabited. The territory of Indonesia extends over 3,977 miles between the Indian Ocean and the Pacific Ocean. Indonesia has a land area of 1,922,570 km² and a water area of 3,257,483 km². Despite this, Indonesia, as an island country, has a renewable energy potential as large and as vast as wind, sun, bioenergy, and sea that can be used as renewables. Large islands such as Papua, Kalimantan, and Sumatra have huge hydroelectric potential, while small islands in eastern Indonesia, such as Nusa Tenggara and Maluku, have significant solar and wind energy potential (Bakamla, 2019). The spread of new and renewable energy potential in the islands, especially the smaller islands, will have consequences on energy development and much higher costs because the issue of distance and road access and subsequent processing and distribution of energy will require much more complex efforts.

During this time, a lot of small islands have been unable to obtain energy, such as electricity; if any, then their use is restricted. For example, in Kaledupa, Wakatobi district, Southeast Sulawesi province, where electricity is only on at night, it uses diesel. It therefore requires the use of appropriate technology for local conditions, such as solar panels, turbines, small antennas, and efficient biomass systems.

5. Other factors

In addition to the three (three) inhibitory factors outlined earlier, there are other challenges in the development of new and renewable energy, such as the issue of human resources with competence and capacity in managing new and regenerable energy, still low research/research in the field of new energy and renewed energy, the constraints of the new energy technologies and the renewables are still in the stage of development, the lack of supporting infrastructure such as energy storage facilities and distribution systems is still limited, and still low public perception and awareness regarding the importance of new energies and regenerative energy.

B. Efforts in the Development of New and Renewable Energy: Towards Net Zero Emission

1. Reformulation of Regulatory Aspects

The New and Renewable Energy Bill is expected to be a step to give confidence to funding and investment in new and renewable energy in Indonesia. But the fact is that the process of drafting the bill is going on a lot in parliament. It is natural for the discussion of a bill to be substantially strategic for the development of investments that are going well. It cannot be denied that various interests are potentially involved in the process of dealing with a bill of laws and that it is a political product (Mahfud MD, 1998). This means that when creating a desired law such as the Draft Law on New and Renewable Energy (*ius constituendum*) it will be influenced by political conditions (Isharyanto, 2016). One of the deadlock loading materials is the proposal for a power wheeling scheme that licensed private parties to build power plants and could sell them directly to the public through PLN transmission networks so that PLN does not become a single multiple buyer. There are concerns that power wheeling will eventually reduce the level of state rule as enshrined in Article 33, Paragraph 3, of the Constitution.

In essence, there is a crucial provision in the New and Renewable Energy Bill that supports the energy transition in Indonesia, through the carbon economy value mechanism in the energy sector. This scheme can be a trigger mechanism for entrepreneurs to develop low-carbon business activities so that it can support a reduction in greenhouse gas emissions. Article 56 of the Bill also stipulates that governments are obliged to mobilize new and renewable energy funds to national energy policy targets by focusing on the development of new and regenerative energy, one of which can be optimized from the carbon trading fund.

Furthermore, there are generally some records of regulatory aspects that need to be reformulated or strengthened in their implementation in promoting the transition to new and renewable energy in Indonesia, as follows:

- a. The need to strengthen arrangements related to cooperation schemes, in particular international cooperation in promoting the development of new and renewable energy in Indonesia. Innovative funding schemes and mutually beneficial technology transfers need to be strengthened. Examples of rules that should be governed by their implementation are the 2022 Renewable Energy Acceleration Regulation No. 112, which mandates ministers, heads of institutions, or local governments to provide support for the development of power plants that utilize renewable energy sources. For example, the Minister of Investment should provide assistance related to the granting of licensing facilities and facilities for raising capital in renewable development. These regulations should be regulated to the level of technical guidelines to ensure ease of procedure/licensing in the new and renewable energy sectors.
- b. Strengthening regulations is needed to ensure the protection of the rights of people affected by new and renewable energy projects. Governments must protect and ensure meaningful participation of the communities affected by the project, including indigenous communities. Don't let people's rights be sacrificed, even if they're not involved in the process. Examples are the demonstration carried out by people living at the foot of Mount Gede Pangrango, Banten Province, in July 2024 over plans for the development of the earth's heat energy, which is concerned will deprive people of living space and water resources around Mt. Further, the project area is in the National Park conservation area, which is concerned threatens the conservation of the National Park area. The largest amount of land used for new and renewable energy development projects is 3,180 ha (**Ilona/Tempo, 2024**).
- c. The need for a sustainable energy management setting that takes into account the environmental sustainability aspects through the consideration of the supporting and circularity aspects for the construction of new and renewable energy projects to be truly sustainable. The environmental aspect of living becomes an important substance that needs to be reinforced in the New and Renewable Energy Bill.
- d. It needs to be clarified and emphasized regarding the division of authority between central and regional governments as well as matters in the new and renewable energy sectors that require cooperation between the central and local governments.

2. Accommodate Potential Areas in the New and Renewable Energy Sector into Spatial Planning

Currently, the National Spatial Planning is entering the revision phase. One of the revised materials refers to the direction of the policy of the long-term development plan for 2025-2045 that promotes the energy transition. As for the spatial planning policy direction, one promotes enhanced connectivity between the growth center and its development region, including the energy system.

All regions in Indonesia have a very abundant new and renewable energy potential consisting of sea-stream energy, earth-heat energy, wind bioenergy, water energy, solar energy, and others. Of the potential, the total energy that can be utilized is 3,686 gigawatts. (GW). An example is Flores, East Nusa Southeast Province, where in 2017 the government designated Flores as a geothermal island under ESDM Ministerial Decree

No. 2268 K/30/MEM/2017. This establishment is based on studies that have discovered so great a global heat potential on Flores Island that it reaches almost 1,000 megawatts that can continue to be developed when given special attention from the government. (Kornelis, 2023). With all the potential, the government responded by incorporating the new and renewable energy potential into the spatial planning.

Spatial planning can play an important role by including areas with new and renewable energy potential into the space planning plan. Moreover, areas with potential for developing new and new energy can be designated as national strategic areas from the perspective of economic growth interests.

So the concrete step is for the Ministry of Energy and Mineral Resources, in cooperation with the regional government, state-owned enterprise agencies, academics, and the community, to immediately carry out inventory and identification of all areas in Indonesia that have new and renewable energy potential. Furthermore, it needs to be coordinated with the Ministry of Agrarian Affairs and Spatial Planning so that the areas with such potential can be accommodated in the spatial planning plan and designated into the National Strategic Area (KSN). This will make it easier for investors to invest in the new and renewable energy sectors.

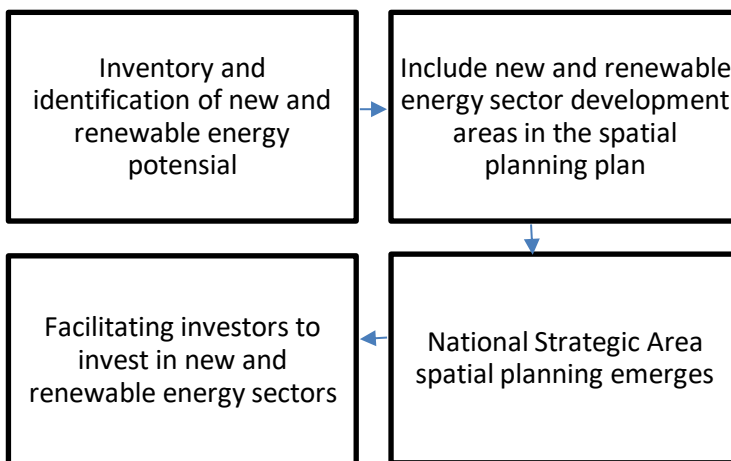


Image. Spatial planning business processes in the development of new and renewable energy sectors

3. Promote Investment Facilitation in the New and Renewable Energy Sector

Responding to the challenge of financing such huge new and renewable energy investments, it is necessary to reconsider investment schemes that can facilitate and trigger investors through incentive policies. As long as the policy of incentives for investments in the fossil energy sector remains high, the demand for investors to invest in the new energy sector will be low.

Next, we need to optimize the fiscal incentive scheme to reduce government debt to support the development of new and renewable energy sectors. As for incentives that governments can give, such as funding schemes and technical support, Programmes such as People's Enterprise Credit (KUR) for renewable energy and funding from the Indonesian Export Financing Institute (LPEI) are examples of financial support available to renewables projects.

During this time, the Indonesian government has been providing various fiscal support to the effort to decarbonize (mitigate climate change), one of them through carbon tax schemes and taxation facilities as well as customs, the establishment of the Environmental Fund Management Agency (BPDH) to be optimized, the mobilization of funding through the green climate fund, and others (Ministry of Finance, 2024). Meanwhile, several tax incentives for the development of new and renewable energy are carried out

through: tax holidays, for example, for companies producing electricity from new and new energy sources (**Regulations of the Minister of Finance No. 130/PMK/010/2020**), tax allowance policies for geothermal enterprises (**Government Regulations Number 78 of 2019**), value-added tax incentives for new and renewable energy sources, and a series of other incentives. This policy must be well socialized to investors so that investors are interested in developing new and renewable energy sector ventures to support net zero emissions.

4. International Collaboration and Cooperation

The scheme of international cooperation is crucial for the development of renewable energy in Indonesia. With international cooperation schemes, Indonesia's emission reduction could rise from 29% to 41% by 2030. Through partnerships with other countries, including international organizations, Indonesia can acquire advanced technology, knowledge, and resource support, including the financial support needed to accelerate the energy transition. For example, collaboration with Germany through the Energiewende program has helped Indonesia in developing innovative and efficient renewable energy projects (**Ajzen Icek, 1991**).

Indonesia has also sought to cooperate in funding through the Just Energy Transition Partnership (JETP) funding scheme, which is carried out with developing countries such as Senegal, Vietnam, and South Africa. Since the scheme was in place, Indonesia has earned about 7 billion United States dollars, or the equivalent of 338.8 trillion. The funds earned were mostly loans on soft terms rather than grants. Despite this, there is a weakness because lenders usually have their policies that must be followed by the country that lends the funds.

In addition, the Asian Development Bank (ADB) is ready to collaborate in support of energy transition funding with the energy transition mechanism scheme to drive the energy shift from fossil to environmentally friendly energy (**Hidranto, 2024**). Future governments should be more active in promoting international cooperation in the development of new and renewable energy in Indonesia. Hopefully the energy transition will be faster than the business-as-usual scheme.

5. Development of New and Renewable Energy in Small Islands

With Indonesia's geographical situation in the form of islands and a majority of small islands, specific strategies are needed to meet the energy needs of communities. New and renewable energy development could use collaborative schemes and partnerships between government agencies and private and local communities for the development of new and renewed energy. Governments need to optimize the local workforce to build technological capacity.

Although the power of energy management is largely in the hands of the central government, regional governments with the principle of regional autonomy remain free to regulate and manage energy resources, including renewable energy. This must be optimized in the context of the development of new and renewable energy in remote regions. Several governments have encouraged the region to start from the scope of the village government to develop renewable energy programs that are tailored to the local potential, one through the "Energy Independent Village" program. Self-energy villages are villages that are capable of leveraging local energy sources based on new and renewables such as solar, micro-hydro, garbage, and earth heat to supply more than 60% of the energy needs of both electricity and fuel for the needs of a village (**Masterplan Desa, 2023**). Central Java Province has become a national model in the field of energy independence. By the end of 2023, there will be 2,353 energy-independent villages in Central Java. The development of self-energy villages like Central Java should be implemented in island areas, in particular remote areas, to support the energy needs of pro-environmental communities. For example, implemented in the provinces of the islands such as the province of Nusa Tenggara East that developed the

village of Independent Energy, for example, in the village Kamanggih in Kahaungu Eti district, Sumba East district, through the development of micro-hydro power plants (PLTMH) that can improve economic productivity (Rosary, 2020).

Besides, the government also needs to strengthen international cooperation. The cooperation that has been built up with international organizations such as the United Nations Development Programme (UNDP) and the Asian Development Bank (ADB) to provide funding and technical assistance for the development of renewable energy projects in remote areas is positive and must continue to be encouraged to create extortion and justice for all Indonesians, including those living on small islands, border areas, and suburbs with equal rights (World Bank, 2018).

6. Increased Data Accuracy and R&D

Through this time, the data on new and renewable energy potential that is a source of reference for investors has not been completely up-to-date and truly accurate, so it is not assessed to be maximum in support of increased private investment in the field of new and renewable energy. Cross-sectoral coordination needs to be enhanced to support the achievement of the new and renewable energy contribution target in the national energy mix.

In addition, governments need to commit to providing budgetary support and resources for increased research or research in the field of new and renewable energy. Research has become one of the keys to the success of new and renewable energy development, in particular in finding technologies that can be used for the supply and use of new renewables more optimally. Governments need to make policies and legislative regulations governing the governance of new and renewable energy research ecosystems, covering aspects of planning, research management, institutional, human resources, and research funding schemes. Such efforts can be carried out through research grant schemes, collaborative research schemes (government and academics, including students), rewards for researchers who publish their scientific work in the field of new and renewable energy development, and others.

Through this time, the government has been working to develop super income tax deduction incentives to boost research and development. For example, incentives for vocational activities that provide facilities for work practices and human resource sharing based on a specific competence is one competence of renewable energy engineering such as solar, hydro, and wind engineering and biomass energy technology, then there is a policy of reduction of gross income up to 200% of the amount of expenditure spent on work practice, exchange, and/or learning activities (The Regulation of the Minister of Finance Number 128/PMK.010/2019). These measures are very good and need to be continuously improved so that they can stimulate the interest of researchers in developing research in the field of new and renewable energy.

CONCLUSION AND RECOMMENDATIONS

New and renewable energy is important to develop. In addition to supporting national energy resilience, new and renewable energy development is needed to drive net zero emissions. Indonesia has an enormous new and renewable energy potential, consisting of solar, wind, hydro, bioenergy, and geothermal. Indonesia's total renewables potential can reach 3,686 gigawatts (GW). But behind that potential, there are many challenges in the development of new and regenerative energy. First, there is still a legal vacuum in the regulation related to the development of the new and new energy sectors. The existing rules are considered to be irrelevant and need to be adapted to the need to accelerate the energy transition in Indonesia. Secondly, the licensing aspects are still overlapping and overlapping. Furthermore, the potential for new and renewable energy in various regions of Indonesia has not been fully integrated into the spatial planning plan, which could hinder investors from investing in the new and regenerative energy sectors. Third, the challenge of financing and investing in the development of new and renewable energy that is so expensive to reach the

net zero emission target by 2060. Fourthly, the geographical challenge is that Indonesia is an island state with more than 17,000 islands dominated by small islands that hold a lot of new and renewable energy potential to develop. Fifth, other factors such as limited human resources, still low research/research in new and renewable energy, technology constraints, supporting infrastructure, and low shared awareness of the importance of new and sustainable energy.

Concerning the efforts that can be made to optimize the energy transition in Indonesia to realize net zero emissions, this can be done by: first, reformulating regulatory aspects in a comprehensive one by encouraging the approval of legislation related to new and renewable energy to support the transition of energy through carbon economy value mechanisms in the energy sector. Further regulation of the setting up of the new energy sector and renewed energy sectors needs to ensure guarantees of protection of the rights of the people affected by the project, the setting of sustainable energy management taking into account sustainability and environmental stability, as well as the affirmation of division of authority central and regional. Secondly, it is necessary to incorporate new and renewable energy potential across the Indonesian territory into the spatial planning plan to facilitate investors willing to invest. Thirdly, we need to encourage investment facilities in the new and renewable sectors through fiscal incentive schemes and other schemes such as tax holidays, tax allowances, and so on. The scheme, he hoped, would encourage investors to move from investing in the fossil energy sector to renewable energy. Fourthly, strengthening international collaboration and cooperation. With this scheme, the emission reduction target is expected to be raised from 29% to 41% by 2030. The fifth is the development of new and renewable energy in small island regions with schemes of cooperation and partnership between government agencies and private and local communities. Six, the need to improve data accuracy and research and development in the field of new and renewable energy with government-funded research support.

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