Legal Frameworks for Sustainable Development in Nusantara: Circular Economy Blueprint

Dama Rifki Adhipramana[1], Farhani Agistya Mahendra[2]

[1,2]Faculty of Law, Universitas Gadjah Mada, Indonesia
damarifkiadhipramana@mail.ugm.ac.id

Abstract. Nusantara is envisioned as a model for Indonesia's sustainable, low-carbon, and climate-resilient city. The development aims to transition and reorient the economy of East Kalimantan from coal production to a circular economy. Nusantara's strategic blueprint for circular economics consists of four pillars: (1) resource management, (2) energy management and digitalization, (3) smart forest and green management, and (4) carbon stock and emission monitoring. This article examines the existing laws in Nusantara related to sustainable energy and environmental management to foster coherence and consistency in the development of Nusantara. Using existing study cases from Reykjavik and Stockholm, the descriptive analysis method focuses on three legal elements—substance, structure, and culture—as the basis for discussion. Ultimately, Nusantara requires a robust legal framework that accommodates substantial law, strengthens current structures, and is collaborative with interdisciplinary stakeholders. Therefore, Nusantara serves as a pilot city for the urban developments in Indonesia, showcasing sustainable practices and innovative legal frameworks.

Keywords: New and Renewable Energy, Smart City, Circular Economy.

1 Introduction

Indonesia possesses vast potential for new and renewable energy (NRE) sources, including solar, wind, hydro, bioenergy, geothermal, and marine energy. However, the country's electricity supply remains heavily reliant on coal, which accounts for 64% of national energy needs. Despite this, Indonesia is making significant strides in developing NRE, reaching 66% of its annual target for generating capacity. Hydropower and solar energy dominate the NRE sector, with geothermal and bioenergy also showing growth. Investments in the NRE sector have risen to USD 0.565 billion, supported by government policies and increasing public awareness. Despite these advancements, infrastructure and regulatory constraints remain significant challenges, with projections for NRE growth capped at 13-14% by 2025[1]. In response, regulations must be prepared to support these development goals while awaiting the completion of supporting infrastructure.

Nusantara, Indonesia's new capital city, is positioned as a key player in the country's transition toward sustainable energy. With the potential to generate 34,105

GW of energy from diverse sources, including hydro, solar, wind, and geothermal, Nusantara aligns closely with Indonesia's Sustainable Development Goals (SDGs)[2]. The city aims to become the world's most sustainable urban center, symbolizing Indonesia's national identity and serving as a future economic driver. The vision for Nusantara focuses on achieving low-carbon emissions, resilience, and technological innovation in both governance and economic development[3]. As part of the Smart City Blueprint, Nusantara will transition East Kalimantan's economy from coal production to a circular economy, promoting job creation, sustainable economic cycles, and green energy management[4]. The city's framework incorporates six domains, with a particular focus on smart natural resources and energy, which will underpin the achievement of a circular economy.

In analyzing the legal structures supporting circular economy in Nusantara, this article applies Lawrence Meir Friedman's approach to substance, structure, and culture, drawing insights from Reykjavik and Stockholm. Sweden's circular economy model is a valuable reference for Nusantara due to its emphasis on cross-sector collaboration, innovation, and transparency, fostering a sustainable economy through integrated policies[5]. Both Stockholm and Reykjavik offer leadership in sustainable urban planning, leveraging technological innovation and comprehensive policy frameworks to balance economic growth with environmental preservation. By adapting these strategies, Nusantara may serve as a pilot city for urban developments in Indonesia, showcasing sustainable practices and positioning itself to meet its SDG targets while advancing Indonesia's energy transition.

2 Method

This research utilized qualitative approaches using a descriptive-analytic methodology. The qualitative technique is a research methodology employed in certain contexts to analyze phenomena, aiming to explore what happens, why it happens, and how it happens. To support its investigation, this article uses secondary data from literary studies. This article aims to analyze the process that is examined by presenting pictures, subjects, or study objects like people, organizations, and groups to explain Indonesian legal frameworks for the circular economy through textual data from journals, books, news, reports, and other sources[6].

3 Result and Discussion

3.1 Indonesian Legal Substance for Energy Circular Economy

The Nusantara Smart City Blueprint encompasses digitalized natural resource and energy management to promote efficiency and sustainability. In the energy sector, initiatives such as the Smart Grid System enhance electricity distribution efficiency through data analysis and cybersecurity monitoring, while the Smart Energy Market System facilitates peer-to-peer energy trading. Other solutions, such as Vehicle-to-X

Ecosystems and Energy Storage Systems, enable energy utilization from electric vehicles and storage of renewable energy sources to ensure sustainable energy availability. In resource management, technologies like the Smart Waste Management System assist in monitoring, sorting, and efficiently transporting waste, as well as improving waste recovery through robotics. Smart water management systems utilize Smart Metering and Water Supervisory Control and Data Acquisition (SCADA) to monitor drinking water quality, distribution, and wastewater treatment, including the reuse of greywater and rainwater management for sustainable water usage. Green environment management includes forest fire monitoring using Geographic Information System (GIS) and climate sensors, as well as biodiversity protection through ecosystem monitoring. Additionally, solutions like the Carbon Stock and Emissions Monitoring System support carbon emission management, while the Precision Farming System integrates technology to optimize food cultivation, agroforestry, and efficient use of agricultural resources in Nusantara[4].

To integrate the principles of an optimized legal system with the management of resources and sustainability, it becomes essential to align the synergy of legal substance, structure, and culture. This ensures that legal mechanisms not only regulate but also facilitate sustainable development and adaptive solutions for emerging challenges. Optimizing the national legal system requires the synergy of substance, structure, and legal culture. Legal substance relates to written law and legal norms, while legal structure relates to elements of law enforcement. This is different from legal culture, where these are patterns that are formed in society and reflect directly on the legal system at work. By observing the legal culture that is formed in society then it is possible to identify the workings of the legal system in certain dimensions[7].

The legal substance of the issue, particularly in terms of Indonesia's political will, is central to the development of a robust legal framework for sustainable energy. Political will in Indonesia has been inconsistent when it comes to pushing forward with progressive regulations for renewable energy[8]. The government has shown support for optimizing NRE through Government Regulation No. 79 of 2014 on the National Energy Policy (KEN) and Government Regulation No. 22 of 2017 on the National Energy General Plan (RUEN). However, the government's commitment to transitioning to NRE has yet to be supported by a legal framework that can comprehensively regulate the acceleration of this transition. Currently, NRE is governed by seven laws, three government regulations, three presidential regulations, and 22 ministerial regulations. Regulations on NRE are already outlined in Law No. 30 of 2007 on Energy. However, this law is still focused on conventional energy, and thus NRE has not yet become a priority in Indonesia. A legal framework is needed that specifically prioritizes NRE and supports the Net Zero Emission target, given the difference that Indonesia needs to consider in terms of supply, production, and consumption of energy that does not harm the environment, compared to conventional energy regulations. The limitations within Law No. 30 of 2007 highlight the need for adopting progressive and responsive regulations that address the need for sustainable energy.

The current state of NRE business development in Indonesia is still not optimal. Aside from Law No. 30 of 2007, which only generally regulates the economic aspect and is considered insufficiently responsive to the development needs of NRE, other

regulations are also seen as inadequate. Government Regulation No. 79 of 2014 on National Energy Policy (KEN) does not regulate the share of fossil energy, including policies related to pricing, subsidies, and incentives, which are only required once economic feasibility is achieved. Meanwhile, Presidential Regulation No. 22 of 2017 on the National Energy General Plan (RUEN) sets clearer targets for NRE and begins to consider environmental aspects. However, the fragmentation of regulations still creates uncertainty for the private sector[9].

Other than assessing existing law at a national level, other regulations can be discussed. In the context of the existing laws in Nusantara related to sustainable energy and environment, other regulations such as Presidential Decree No. 63 of 2022 concerning Details of the Nusantara Capital Master Plan: Presidential Decree No. 63 of 2022 divides the preparation, construction, and relocation of IKN into five stages: Phase 1 (2022-2024), Phase 2 (2025-2029), Phase 3 (2030-2034), Phase 4 (2035-2039), and Phase 5 (2040-2045). The decree emphasizes Key Performance Indicators (KPIs), including achieving 100% renewable energy supply for Nusantara. To support this, specific provisions are outlined:

1. Land Provision for Renewable Energy Development: Allocating land for constructing renewable energy power plants, including solar farms and rooftop solar panels, along with transmission and distribution networks connected to the Kalimantan Power System.
2. Substation and Distribution Land Allocation: Providing land for substations and distribution facilities to ensure interconnection with the Kalimantan Power System.
3. Energy Storage Development: Allocating land for energy storage facilities, including hydrogen and battery systems, to ensure sustainable energy management.
4. Smart Grid Implementation: Developing smart grids to facilitate two-way electricity and data flow, enabling efficient energy distribution and integration of renewable sources[10].

Although the KPIs outlined in Presidential Decree No. 63 of 2022 reflect an ambitious vision, the fragmented regulatory landscape hinders their practical implementation. Nusantara's phased development offers a unique opportunity to pilot comprehensive and integrated legal frameworks for renewable energy and circular economy practices.

3.2 Legal Structure and Culture in Indonesia for Energy Circular Economy

Legal structures are legal institutions that support the upholding of the legal system. It includes the legal order, legal institutions, law enforcement officials and their authority, legal instruments, and their processes and performance in implementing and enforcing the law. Meanwhile, legal culture can be defined as habitual patterns and ways of thinking of humans in certain communities regarding law and all issues that are closely related to law. There are two scenarios for the formation of legal culture: (1) from the intersecting elements of legal structure with legal substance and (2) born in its society which then forms certain patterns of habits[11].

In this case, the legal structure that applies in Indonesia for energy development is quite progressive because it aims to remain relevant. After Indonesian independence, the regulations that emerged were still limited to the initial regulations for state control of energy, the nationalization of Dutch-owned electricity and gas companies, and the establishment of PLN (state electricity company) and PGN (state gas company). Then in the New Order, the REPELITA (Five Year Development Plan) regulations emerged which began to show the desire for an energy transition from dependence on petroleum with the formation of BAKOREN (Energy Coordinating Body) and KUBE (General Policy in the Energy Sector) therefore, the Kamojang PLTP - the first geothermal power in Indonesia power plant was established. After the reform, various kinds of regulations began to be formed and then the Ministry of Energy and Mineral Resources issued regulations for energy implementation and conservation[10].

In the context of legal culture, public participation is important to ensure the legislative process runs well. There are three reasons, including the following: (1) community participation will increase the legitimacy of the policies made and minimize conflict ; (2) community participation will have a major influence on the quality of policymaking and contribute to the systematic identification of problems and their causes, as well as the finalization of considerations and assessments of strategic alternative options; and (3) community will become aware of the environmental problems faced by the community and change their behavior through participation[12].

The concept of public participation reflects the involvement of the community in the government decision-making process and can be measured through the levels of power, tokenism, and non-participation as formulated by Arnstein. In the non-participation category, the community is only involved manipulatively through ceremonial activities or given therapy aimed at diverting attention from the core issues without really paying attention to their rights or interests. Tokenism reflects the government's efforts to provide limited participation space, such as through one-way information, surveys, or consultations that are often symbolic without real influence on decisions. At the highest level, namely citizen power, participation achieves a true partnership between the community and the government, with an equal distribution of power through joint negotiation, to full control by citizens over certain policies and programs, including veto rights to ensure accountability and transparency[13]. Community Participation in the transition to renewable energy is stated in the NRE Bill, especially in Chapter XII on Community Participation in Article 59: (1) The community has the right to participate in the implementation of NRE; (2) Forms of participation include providing input in determining the direction of NRE policy, submitting approval for the implementation of NRE regulations or policies, carrying out individual initiatives or cooperation in the use of NRE, and starting the implementation of NRE regulations or policies; (3) The community has the right to obtain information related to NRE business through the central and regional governments, obtain benefits from NRE business activities, and obtain employment opportunities from NRE business activities.

3.3 Reykjavik and Stockholm: Energy Circular Economy

As Nusantara transitions toward a circular economy, valuable lessons can be drawn from global leaders like Reykjavik and Stockholm. These cities have demonstrated the potential of legal frameworks and public-private partnerships in achieving sustainable energy transitions so that Nusantara can adapt to its unique socio-economic and environmental conditions. Reykjavik's geothermal energy development exemplifies a resource-efficient approach central to the circular economy, transforming natural geothermal reserves into sustainable energy while minimizing waste. Similarly, Stockholm's biogas initiatives showcase how waste streams can be converted into valuable energy resources, reducing emissions and promoting resource regeneration. Building on the legal framework outlined for Nusantara, Reykjavik and Stockholm provide actionable insights into how robust policies and innovative practices can accelerate the shift to a circular economy. The success of Reykjavik and Stockholm underscores the importance of integrating renewable energy, eco-efficient transport, and resource management into Nusantara's circular economy strategy. By tailoring these proven approaches to local contexts, Nusantara can achieve sustainable growth while addressing its unique challenges.

An Icelandic business delegation is heading to COP29 in Baku, Azerbaijan, to share its proven expertise in 100% renewable energy for electricity and heating as well as carbon capture, utilization and storage (CCUS) technologies. Led by Green by Iceland – a platform for public-private partnerships to address climate change[14]. Working with the Icelandic Ministry of Environment, Energy and Climate, the Green by Iceland delegation aims to foster global partnerships to accelerate the green energy transition and support climate resilience. The role of the private sector has long been evident in Iceland. Alongside Green is Reykjavik Geothermal (RG) – a geothermal development company founded in 2008. The company focuses on developing geothermal resources for utility scale electricity production. RG specifically identifies and targets locations where quality geothermal resources can be efficiently utilized to meet local electricity demand and provide reliable clean energy. Iceland has made several policy amendments related to geothermal development as a renewable energy. Some of these include:

1. National Renewable Energy Action Plan 2020 and Geothermal Energy Forecast 2014- 2050: In 2012, Iceland adopted Directive 2009/28/EC for its 2020 strategy, which encourages the use of geothermal energy. The target for geothermal energy use for heating is set to increase by 20% from 28.1 PJ in 2014 to 34 PJ in 2020, while geothermal electricity generation is projected to increase by 12%, from 5.24 TWh to 5.8 TWh.
2. Market Development and Stimulation: Geothermal exploration and utilization in Iceland have been encouraged since the 1940s, continued by the Orkustofnun or National Energy Authority since 1967, with a focus on research for economically profitable geothermal utilization.
3. New Project Master Plan: Energy development in Iceland focuses not only on providing energy needs but also on environmental impacts, cultural heritage, and sustainable land use.

Within the legal framework, several steps have been taken, especially in establishing regulations:

1. The Resources Act regulates the extraction of resources from the ground, riverbeds and sea, including the supervision of air power for electricity, and regulates every element that can be extracted.
2. The Electricity Act requires a license from Orkustofnun for power plants with a capacity of more than 1 MW that are included in the distribution or national grid.
3. The Nature Protection Act aims to maintain Iceland's ecosystem by managing human interactions and minimizing environmental impacts through Environmental Impact Assessments (EIA).
4. The Official Monitoring Act regulates public welfare, safety, environmental protection and consistency of monitoring between institutions.

The amendments clarify the rules on resource ownership and production sharing and strengthen the efficiency of resource management by Orkustofnun as the licensing administrative body. Geothermal energy plays a vital role in providing Iceland with clean and sustainable energy, a cornerstone of the country's economy and well-being. This broad legal framework, which includes derivative regulations, supports long-term resource security through effective policies and monitoring.

The Icelandic government plays a key role in creating a business environment conducive to renewable energy through strong policy support, a clear legal framework and effective public-private collaboration. With transparent regulations and incentives that encourage research and development, the government makes it easier for the private sector to invest and innovate in renewable energy. On the other hand, laws such as the Resources Act and the Electricity Act provide legal certainty for private companies to conduct energy exploration efficiently and sustainably. Collaboration with government agencies, such as Orkustofnun, facilitates the transfer of technology and expertise and encourages the private sector to adopt new technologies and meet energy needs in a more economical way[15]. Subsequently, Stockholm – Sweden's greenhouse gas emissions declined by a third relative to 1990. In 2016-2020, the Swedish government focused on the municipal government and local businesses to achieve the maximum emission reduction[16]. The strategy tackles both sector-based emissions and consumption-based emissions. It is divided into three target areas: (1) sustainable energy use; (2) eco-efficient transport; and (3) resource-efficient natural cycles.

The city partners with energy companies, hospitals, and other stakeholders to gradually transition from fossil oils to renewable fuels, aiming to meet peak energy demands. Progress on this initiative was scheduled for reporting in 2017, overseen by the Group Board. The city also advocates laws and regulations that support the adoption of fossil-free energy, with the City Executive Board taking responsibility. Additionally, a district heating system has been implemented, aiming to cut emissions by at least 240,000 tonnes of CO2 equivalent by 2020, under the joint supervision of the Group Board and Fortum Värme. To further promote energy efficiency, the city has set an energy consumption limit of 55 kWh/m² Atemp for new buildings on municipally allocated land, with an ambition to achieve 45 kWh/m² Atemp. This

initiative aims to reduce emissions by approximately 25,000 tonnes and is managed by the Development Committee.

The city has proposed an action plan to achieve a fossil-free road transport sector, including an investigation into banning the sale of fossil fuels by 2040, with an interim target for 2030. A report containing actionable recommendations was planned for release by the end of 2017, under the City Executive Board, with support from the Environment & Public Health Committee and Traffic Committee. Efforts to decrease road traffic aim to cut CO2 equivalent emissions by at least 80,000 tonnes, a task assigned to the Traffic and City Planning Committees. Additionally, measures to reduce fossil fuel use in road transport are expected to eliminate at least 140,000 tonnes of emissions, overseen by the Environment & Public Health Committee in collaboration with the City Executive Board and Traffic Committee.

The city is assessing ways to lower the number of fossil-based plastics in incinerated waste, considering the impacts on health, chemicals, and the environment alongside climate effects. A report with proposed actions was planned for submission by the end of 2017, coordinated by the Group Board in collaboration with Stockholm Vatten & Avfall and Fortum Värme. Efforts to increase biogas production aim to achieve a CO2 equivalent reduction of approximately 20,000 tonnes, with responsibility given to the Board of Stockholm Vatten & Avfall[17].

3.4 Lesson for Nusantara: Circular Economy Blueprint

Drawing from the experiences of Reykjavik and Stockholm, Nusantara can develop a robust framework for its circular economy blueprint, focusing on the legal substance, structure, and culture, Recommended to develop a unified energy law that encompasses renewable energy development, resource management, and environmental protection, similar to Iceland's Resources Act and Electricity Act, Recommended to introduce specific laws promoting circular economy principles, including waste-to-energy initiatives and resource efficiency, inspired by Stockholm's approach to sustainable energy use and resource-efficient natural cycles, Recommended to strengthen EIA regulations to ensure all energy projects undergo rigorous environmental scrutiny, mirroring Iceland's Nature Protection Act, Recommended to create an institution similar to Iceland's Orkustofnun to oversee energy resource management, licensing, and monitoring of circular economy initiatives, Recommended to develop a legal framework that facilitates collaboration between government and private sector in renewable energy projects, similar to Iceland's Green by Iceland platform, Recommended to enact laws that give municipal governments more authority in implementing circular economy strategies, following Stockholm's model of involving local authorities in emission reduction efforts, Recommended to strengthen laws on public participation in energy and environmental decision-making processes, building on Indonesia's existing NRE Bill provisions on community involvement, Recommended to implement legal requirements for public education on circular economy principles and sustainable energy practices, fostering a culture of environmental consciousness, and Recommended to develop a legal framework for incentives that encourage businesses and individuals to adopt circular economy practices, similar to Stockholm's initiatives for sustainable energy use in buildings.

By focusing on these areas, Nusantara can create a comprehensive legal ecosystem that supports its transition to a circular economy, adapting successful strategies from global leaders while addressing Indonesia's unique context and challenges.

4 Conclusion

A thorough legislative framework is necessary to support Nusantara's circular economy plan and help it become a sustainable, low-carbon city in Indonesia. The article analyses current legislation about sustainable energy and environmental management in Nusantara, using insights from successful case studies in Reykjavik and Stockholm. The examination centers on three fundamental legal components: substance, structure, and culture. Essential findings underscore the necessity of incorporating resource management, energy efficiency, intelligent forest management, and carbon monitoring within Nusantara's legislative framework. Explicit rules governing renewable energy development, especially geothermal energy, exemplified by Iceland's success, are essential. The significance of public -private partnerships and community involvement in promoting sustainable development, shown by Reykjavik and Stockholm, is paramount. Environmental impact assessments and monitoring systems are crucial for ensuring sustainable development. Nusantara can effectively transition to a circular economy model by resolving Indonesia's unique socio-economic and environmental conditions and adapting successful strategies from global leaders. Implementing these lessons and concentrating on establishing a resilient legislative framework would foster sustainable growth and environmental conservation in Nusantara, establishing a new benchmark for eco-friendly urban development in Indonesia and beyond.

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