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# Ibu Kota Nusantara (IKN) as a Future Oriented Renewable Clean Energy-Based Transformation Effort

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**Abstract**

Ibu Kota Nusantara (IKN) is Indonesia's ambitious project to create a new capital city based on clean and renewable energy. It is a constructive step towards a sustainable and environmentally friendly future. The development of the Ibu Kota Nusantara (IKN) is an effort to develop sustainable infrastructure, which includes a pledge to reduce carbon emissions. When comparing renewable energy with conventional energy sources such as coal or petroleum, carbon emissions are usually much lower or even non-existent. This is because the production of renewable energy sources such as solar, wind and hydropower do not produce greenhouse gases or other pollutants. Through the utilization of renewable energy sources such as solar, wind, and geothermal power, IKN can be an example for other cities in Indonesia in the implementing green and sustainable technology.

**Keywords**: IKN; transformation; carbon emissions; renewable energy

## 1. Introduction

The Republic of Indonesia's President, Joko Widodo, has declared that Kalimantan will become the country's new capital in 2019 instead of Jakarta. Jokowi said that the population of Jakarta has outgrown its capacity, necessitating the transfer of the capital to Kalimantan. Population density that exceeds capacity will cause environmental damage, this also applies to the capital. Based on data from the Bureau of Statistics, also known as BPS, it is reported that the population of DKI Jakarta is 15.938 people per km, with a total population above 10 million people. Jokowi further explained that the development and construction of the Ibukota to the East Coast of the Republic of Indonesia was carried out in response to the general economic slowdown throughout the country.

The relocation of the National Capital (IKN) from Jakarta to East Kalimantan Province (Kaltim) feels increasingly real. This is supported by various preparations that have been made up to now, as evidenced by the issuance of the IKN Law and the selection of the head of the authority body to carry out IKN development in the future. However, it needs to be understood that the development of the National Capital is not merely about relocating the capital from Jakarta to East Kalimantan, but it requires a special design regarding the issue of future IKN development. Such as emphasizing socio-economic, cultural, and environmental conditions (disaster resilience).

East Kalimantan was selected as the site for the new National Capital (IKN) for a number of reasons, according to Bappenas. These reasons include: (1) having a large amount of government-owned land designated as Production Forest and Plantation areas; (2) being located along Indonesia's Maritime Axis II (ALKI II), which crosses the Sulawesi Sea, Makassar Strait, Flores Sea, and Lombok Strait; (3) being safe and comparatively free from disaster threats; (4) having high accessibility to major cities, close to the two large cities of Balikpapan and Samarinda; (5) existing main infrastructure (Balikpapan-Samarinda toll road and Trans Kalimantan road, airports in Balikpapan and Samarinda, Kariangau Balikpapan container terminal port, and Semayang Samarinda port); (6) the availability of raw water from three existing reservoirs, two planned reservoirs, four rivers, and four River Basin Management Areas (DAS); (7) moderate land suitability for building construction; (8) defense can be supported by the Army, Navy, and Air Force; and (9) heterogeneous and open population structure, resulting in low conflict potential (Ministry of National Development Planning/Bappenas, 2020).


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## 2. Literature Review

Sustainable tourism has become a hot topic in many parts of the world. The United Nations World Tourism Organization (UNWTO) defined sustainable tourism as "tourism that takes full account of its current and future economic, social, and environmental implications, addressing the requirements of visitors, the industry, the environment, and host communities" (UNWTO, 2021). Sustainable tourism means that tourism needs for the present but still does not reduce or sacrifice the needs for future generations (Obot & Setyawan, 2019).

The decision to relocate the National Capital to Kalimantan is based on several reasons, including ensuring even development and reducing pressure on Jakarta as the economic center. Jakarta's current position is regarded as one of the most important gateways for Indonesian society.

West Java Province is one of the most densely populated regions in Indonesia after DKI Jakarta. Based on the results of the 2015 Population Census (SUPAS), the population in West Java is 46 million, and this number continues to increase each year. Therefore, the relocation of the national capital is being undertaken to reduce population density in West Java.

Jakarta is now considered one of the most important gateways for Indonesian society, and therefore, the center of everything, making it highly attractive to people from all over Indonesia. Residents from outside the city are drawn to Jakarta due to job opportunities, education, and many other facilities. As a result, both due to natural growthand migration, the population of the Jakarta Metropolitan Area (Jabodetabekpunjur) continues to increase every year. West Java Province is one of the most densely populated regions in Indonesia after DKI Jakarta. Based on the results of the 2015 Population Census (SUPAS), the population in West Java is 46 million, and this number continues to increase each year. Therefore, the relocation of the national capital is being undertaken to reduce population density in West Java.

West Java is one of the most populous regions in Indonesia, second only to DKI Jakarta. According to the results of the 2015 Population Census (SUPAS), the population of West Java reached 46 million and continues to increase every year. Therefore, the decision to relocate the National Capital to Kalimantan is based on several reasons, such as ensuring even development and reducing pressure on Jakarta as the economic center. Currently, Jakarta is seen as one of the most important gateways for Indonesian society. People from outside the city are attracted to come to Jakarta because they can find jobs, schools, and many other facilities. As a result, both due to natural growth and migration, the population of the Jakarta Metropolitan Area (Jabodetabekpunjur) continues to increase every year.


Figure 1. Population projection of Ibukota Nusantara

The increasing urbanization is driven by the attractiveness of political, economic, and governance elements, which must be balanced with the city's ability to meet the needs of all its residents. The more people living in the world, the more space and facilities are needed. Pollution and environmental degradation are becoming increasingly uncontrollable, and the need for housing, infrastructure, and amenities such as clean water is becoming more challenging in Jakarta.

It is hoped that relocating the capital from Jakarta to Kalimantan will reduce population density and decrease poverty rates in Indonesia. Designed and built to new standards, the new capital of this country will be of high quality, adaptive, innovative, gender-equal, sustainable, and dignified. One of the significant breakthroughs made by the government is the relocation of the National Capital (IKN) from Jakarta to East Kalimantan. It's remarkable that the Nusantara Capital has been designed from the outset with the concept of a "green city", emphasizing sustainability and environmental friendliness. Additionally, the "green city" concept will be integrated with the concepts of smart, forested, sustainable, and blue cities, meaning that the Nusantara Capital will implement the utilization of renewable energy.

The government, through the Ministry of Investment/BKPM (Investment Coordinating Board), is planning supporting projects around the buffer city, which are included in the Investment Opportunity Map (PPI) to accelerate the development of the

national capital. One of them is renewable energy infrastructure (EBT) using waste materials for the chemical industry in Balikpapan, East Kalimantan, as a Regional Investment Potential (PIR). It is projected that 75% of the world's energy sources will come from renewable energy or EBT by 2050.

Technology will be the key to new energy, no longer fuel. This is stated in the World Energy Transition Outlook issued by the International Renewable Energy Agency (IRENA). The report mentions that electricity will become the primary energy source, meeting more than 50% of consumption by 2050. Renewable energy-based systems are characterized by high electrification and efficiency, complemented by green hydrogen and sustainable biomass. According to the International Renewable Energy Agency (IRENA), to accelerate the energy transition, Indonesia needs short-term investments totaling US$ 14.5 trillion or around 5000 T during the period 2018-2030. This investment is significant, considering Indonesia's GDP is only around 18,000 T, or approximately nearly one-third of its GDP. Renewable energy is being utilized as a sustainable alternative to fossil fuels. Some countries have made progress in generating renewable energy.

Countries with the highest renewable energy use:

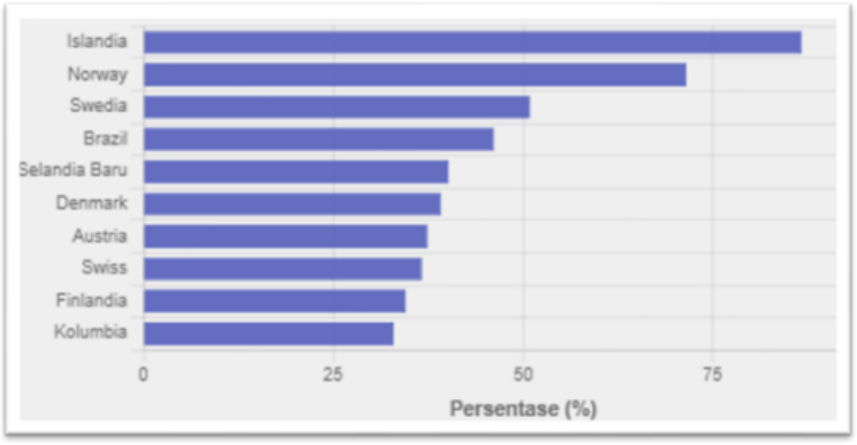


Figure 2. Renewable energy usage percentage per countries (Source: Wisevoter)

According to Wisevoter, Iceland ranks first in the use of renewable energy with 86.87%. This is due to the abundance of natural resources in the country, including wind, water, and geothermal energy. Geothermal energy, for example, allows Iceland to generate most of its electricity sustainably. Similarly, Norway's large capacity of hydropower plants enables the country to rely on renewable resources. Countries like Brazil, New Zealand, and Denmark also make the list because of their commitment to using renewable energy. However, Indonesia only utilizes 10.39% of renewable energy worldwide, ranking 43rd.

The opportunity for Indonesia to build the National Capital City (IKN) in EastKalimantan presents a chance for the country to achieve its carbon emission-free target.Puguh mentioned that the IKN will be introduced as a city of the future, which could serve as Indonesia's new face on the global stage, through the introduction andimplementation of green technology concepts at the IKN. This will support theutilization of Renewable Energy (EBT) to achieve Indonesia's carbon emission-free target.

ADB supports the development of the Nusantara Capital City (IKN) with zero carbon emissions. On Sunday, December 3, 2023, at the COP28 climate conference in Dubai, ADB launched the Zero-Carbon Strategy, also known as the Net Zero Strategy. According to Winfried Wicklein, Director General of ADB for Southeast Asia, this strategy serves as a "compass" for the Nusantara Capital City Authority (OIKN) to develop and manage the Nusantara Capital City to achieve carbon neutrality by 2045.

The Nusantara Capital City Authority and ADB have launched five focus areas to achieve this goal. Firstly, forestry and other land use, including reforestation as a replacement for deforestation. Secondly, energy-related issues involving the cessation of fossil fuel use in energy, electricity, and transportation. Thirdly, about the manufacturing and use of products, with an emphasis on green building design and materials. Fourthly, managing waste by promoting a circular economy approach through the Reduce, Reuse, and Recycle system. Lastly, the agricultural sector, which involves creating climate-friendly agriculture and promoting regenerative farming practices to reduce greenhouse gas emissions.

To achieve the zero-emission scenario, the use of renewable energy (EBT) will be the main source of energy supply, especially in the electricity sector. To meet the goal of achieving zero emissions by 2050, the renewable energy mix in the electricity sector should approach 100%. Renewable energy is a crucial part of the government's vision to build sustainable and environmentally friendly cities to reduce the impact of global warming. Through the ratification of the Paris Agreement with the National Determined Contribution (NDC) document, Indonesia has committed to reducing emissions. Indonesia has raised its emission reduction target to 31.89 percent by 2030 according to the latest NDC. To achieve this target, the government has set a national energy mix target of 23.89 percent by 2025 and 31.89 percent by 2050. Conversely, the development of the National Capital City (IKN) is undertaken in an effort to achieve carbon-neutral goals.

Renewable energy is a crucial part of the government's vision to build sustainable and environmentally friendly cities to reduce the impact of global warming. Through the ratification of the Paris Agreement and the latest National Determined

Contribution (NDC) document, Indonesia has set a target to reduce emissions by 31.89 percent by 2030. To achieve this target, Indonesia has set a national energy mix target of 23% by 2025 and 31% by 2050. Conversely, the goal of developing the National Capital City (IKN) is to achieve a carbon-neutral city by 2045. This goal includes the complete production of electricity from new and renewable sources. According to Bambang Susantono, Head of the National Capital City Authority (OIKN), the OIKN is currently completing the RLDC (Regional Leadership Development Council) study.

In addition to harnessing renewable energy, the OIKN is also committed to preserving, protecting, and restoring approximately 65 percent of its area as beneficial tropical forests for absorbing carbon emissions. Transitioning to renewable energy in the IKN's electricity system can help reduce carbon emissions, decrease reliance on limited fossil fuels, and promote sustainability while reducing negative environmental impacts. According to Law Number 3 of 2022 concerning the National Capital City, the Master Plan of the National Capital City (IKN) states that renewable power plants, such as solar power plants or solar farms, and rooftop solar power plants, will provide one hundred percent of the annual electricity needs of the National Capital City.


Figure 3. Masterplan IKN electricity production

According to data from the Ministry of Energy and Mineral Resources (ESDM), solar power plants have become pioneers in renewable energy power generation in the National Capital City area. Jokowi stated that solar power plants can generate 93 gigawatt-hours of green energy annually and have the capacity to reduce emissions by 104,000 tons of CO2e per year. This is crucial for building a reliable electricity system based on renewable energy because the National Capital City is conceptualized as an environmentally friendly and green city in the forest.

Overall, there is significant potential for solar energy in Indonesia and in the development area of the National Capital City. In efforts to harness this potential, a Solar Power Plant (PLTS) with a minimum capacity of 50 megawatts (MW) will be built in the Planning Region 3 of the National Capital City (WP 3) to adopt renewable energy as part of the city's transformation into a sustainable and eco-friendly environment.

In addition, the concept of green buildings will be implemented in the National Capital City (IKN) through the installation of solar panels on rooftops, which will then be integrated with various buildings in the IKN area. Constructed simultaneously, Electric Vehicle Charging Stations (SKLPU) will be built in public, commercial, and residential areas to assist users in charging their electric vehicle batteries. Solar power plants, rooftop solar panels, solar street lighting panels, and floating solar panels are some of the resources that form the IKN electricity system. Therefore, the network must be able to distribute electricity supply from the generators to always meet the electrical needs.

A smart grid is a network system that enables two-way electricity and data flow through digital communication technology to detect, react, and proactively adjust to changes in usage and various issues. The IKN intends to utilize this technology. Head of the National Capital Integrated Coastal Development (NCICD) Authority Bambang Susantono outlined plans for the implementation of green energy in the NCICD. The electricity system designed with green energy sources is developed in three phases. In the short term (2022-2023), PV Rooftop, EV Support in public and commercial areas, residential, industrial, and charging stations. In the medium term (2024-2025), a 70 MW Wind Farm in 2024 and a 50 MW Solar Farm in 2025. In the long term (2026-2045), a hydroelectric power plant with a capacity of 910 MW will be built by 2028.

Investment in green energy usage in the NCICD significantly impacts the success of development. Efforts to attract investment and promote economic growth in the Republic of Indonesia require initiatives to attract the interest of potential investors and make their investments easier to conduct in Indonesia. The National Capital Integrated Coastal Development (NCICD) Authority has fulfilled investment commitment of Rp41.4 trillion in three groundbreaking phases, from Phase 1 to Phase 3. This investment

amount indicates that investors are increasingly confident in the prospects of NCICD development. The significant increase in investment realization demonstrates investor confidence, indicating that NCICD development is proceeding as planned. NCICD Head Bambang Susantono stated that the NCICD is not just a new city; it is a symbol of Indonesia's transformation towards a new and sustainable civilization.

The NCICD Authority released details of the list of investors who have contributed to the development of the NCICD. Deputy of Finance and Investment of the NCICD Agung Wicaksono stated that a total of 23 pioneering investors have entered the NCICD, with a total investment value of Rp 41 trillion. We certainly welcome the interest shown by a number of foreign investors in investing in the NCICD. For instance, the United Arab Emirates Association (UAE) is interested in exploring investments in the development of new renewable energy (EBT). There are several reasons why investors from foreign countries are interested in investing in the NCICD. One of them is because the NCICD implements concepts such as green economy, green energy, smart transportation, and effective and efficient governance.

## 3. Research Method

### *3.1. Types of Research*

This research is designed to investigate the role of the National Capital Integrated Coastal Development (NCICD) in the effort of future-oriented transformation based on clean and renewable energy. The research methodology used encompasses a series of systematic steps to collect relevant data, analyze it, and interpret it in-depth. In conducting this research, a mixed-method approach of qualitative and quantitative methods is employed to obtain comprehensive insights.

### *3.2. Research Approach*

This research adopts a mixed-method approach to obtain a holistic understanding of the concept of the National Capital Integrated Coastal Development (NCICD) and its impact on the transformation of clean and renewable energy. Qualitative approach is used to understand the social context, policies, and subjective views of stakeholders related to NCICD. Meanwhile, quantitative approach is employed to explore statistical data related to energy consumption, greenhouse gas emissions, and other environmental indicators.

### *3.3. Data Sources*

Data for this research are obtained from various sources including scholarly literature, government policy documents, industry reports, official statistical data, as well as databases and other relevant information sources. By utilizing diverse data sources, this research aims to ensure depth and diversity in analysis.

### *3.4. Data Collection Techniques*

Data collection is conducted through comprehensive literature review, analysisof policy documents, and exploration of relevant statistical data. Information about theconcept of NCICD, energy policies, and clean energy-related projects are gathered from pertinent sources.

### *3.5. Research Produces*

The research process begins with an in-depth literature analysis to formulate a strong conceptual framework. Data are then collected, filtered, and systematically analyzed according to the established approach. Careful interpretation of research findings is conducted to identify relevant trends, patterns, and implications. By adopting an integrated mixed-method approach and engaging diverse data sources, this research is expected to make a significant contribution to our understanding of the transformation of clean and renewable energy in the National Capital Integrated Coastal Development.

## 4. Results and Discussion

Pembangunan Ibu Kota Nusantara (IKN) From the outset, the National Capital Integrated Coastal Development (NCICD) was designed to unlock Indonesia's economic potential as a whole, drive growth, create job opportunities, and establish it as a development hub that brings multiplier effects beyond Java Island.To generate energy, the NCICD will utilize Smart Grid technology, which will generate electricity from sunlight rather than coal. This will reduce carbon dioxide levels and enable energy distribution adjustments during peak hours using underground cable networks.

Additionally, the utilization of green buildings is characterized by increased energy efficiency, the use of energy-saving and environmentally friendly equipment, renewable energy utilization, reduction in material and water consumption, improvement in health and environment, and the use of natural lighting systems. Based on Presidential Regulation Number 63 of 2022 concerning the Detailed Plan of the National Capital Integrated Coastal Development, the development of the NCICD and environmental preservation are expected to proceed smoothly by utilizing the forest city concept as a nature-based solution. Furthermore, the forest makes the NCICD a livable city, offering numerous economic, social, and environmental benefits. The development of the NCICD as a Forest City is part of the goal to achieve Net Zero Emissions by 2060. One example is emission-free vehicles and

public transportation allowed to enter the urban areas of the NCICD, gradually implemented until 2045.

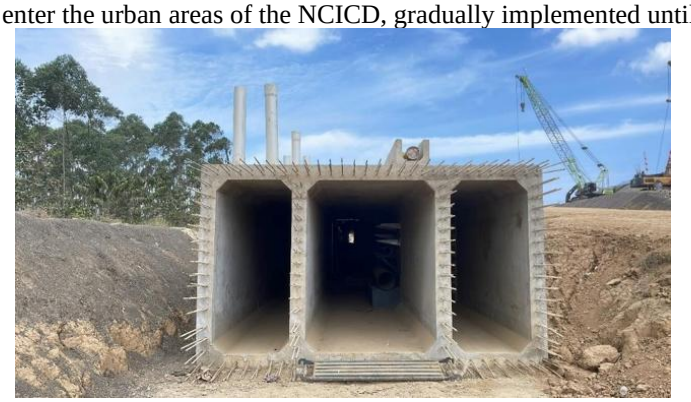

Figure 1. Underground Cable Network Development in IKN (Source: https://fin.co.id)

Figure 2. Fossil Fuel Vehicles Prohibited from Entering IKN (Source: https://tirto.id/)

The NCICD is being constructed over the long term and is projected to be completed by 2045. The government is financing the NCICD primarily through cooperation and private investment. Meanwhile, funding from the state budget (APBN) is allocated at only 20 percent of the total funding requirement. On Friday (1/12), the NCICD Authority (OIKN) invited the Ministry of Finance (Kemenkeu), the Ministry of Investment, and the Investment Coordinating Board (BKPM) to attend a public consultation forum together with the Indonesian Chamber of Commerce and Industry (Kadin) to discuss and consult on regulations related to ease of doing business and investing in the NCICD.

Figure 3. Deputy for Funding and Investment of OIKN Agung Wicaksono at the IKN Investment Opportunities event (Source: https://www.antaranews.com/)

Based on Law Number 3 of 2022 concerning the National Capital Region, the government conducts funding synergy from the state budget and other legitimate sources in accordance with the provisions of the legislation to support the preparation, development, relocation, and special governance of the NCR. This collaboration is crucial to maintain fiscal sustainability and optimize the use of innovative funding programs while ensuring accountability. Funding sources include the state budget and

participation schemes of enterprises wholly or partially owned by the state. Additionally, international funding support schemes can also be utilized, receiving funds from bilateral and multilateral institutions through grants and/or loans. This will support the development of a green and smart NCR.

## 5. Conclusion

The government is striving to promote inclusive economic growth through the development of the Nusantara National Capital (IKN), which extends the magnet of new economic growth beyond the island of Java. The Nusantara National Capital serves as a symbol of national identity, green economy, green energy, smart transportation, and effective and efficient governance as part of Indonesia's grand transformation in the future. At the Climate Summit (COP 26), which President Jokowi personally attended, Indonesia's commitment to low-carbon development was reinforced. President Jokowi declared his commitment to halt the pace of global warming. One of the strategies is to undergo an energy transition, gradually reducing the use of fossil fuels to replace them with renewable energy sources such as geothermal energy, solar energy, and wind energy.

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