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IDENTIFICATION OF THE IMPACT OF OIL REFINERY INCREASE ON GREEN ECONOMIC GROWTH IN INDONESIA

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Abstract

The increasing population in Indonesia is also followed by an increase in national energy consumption. The energy needs of the population are not met due to the insufficient energy production capacity, requiring the government to import energy. The purpose of this study is to determine the impact of the problems when the government addresses the increasing energy consumption of the Indonesian population by increasing oil refineries and to describe the impacts that occur in increasing oil refineries that affect the environment which is not in accordance with the concept desired by Indonesia, namely implementing green economic growth. This research method is descriptive qualitative analysis by collecting literature from several sources. Based on the results of this study, there are several main points that can be concluded that when the energy consumption of the Indonesian population is met by the government which will increase oil refineries in Indonesia, it has several benefits, namely increasing state revenue, increasing national energy independence, and increasing the welfare of the Indonesian population. However, increasing oil refineries also has a negative impact on environmental pollution so that it will affect increasing global warming and climate change. Increasing oil refineries must also pay attention to environmental aspects so that green economic growth can run smoothly in Indonesia.

Keyword: Energy consumption, Oil refinery, Green economy, Green growth.

Introduction

Indonesia is ranked fourth in the world in terms of population, which is one of the many countries with the largest population in the world. The Central Statistics Agency (BPS) reported that population growth in Indonesia significantly exceeded 1%. Even from 2018 to 2019, Indonesia's population increased by 1.33%, with only a slight decrease of 1.31% occurring in 2019. According to figures from the Central Statistics Agency (BPS), it is known that Indonesia's population has increased to 2,889,616.2 million in mid-2023 and this number is greater than 275,773.8 million in 2022.

With the increasing population, there is also an increase in energy consumption. Energy is a necessity for the population in any country, including the needs of the entire population of Indonesia. However, as long as the population of Indonesia continues to increase, it will result in an increase in energy use. Secretary General of the National Energy Council, Djoko Siswanto, thinks that even though the Indonesian population only needs 130 tons equivalent to meet its energy needs until 2022, there will still be an increase in energy needs of 137 tons equivalent in 2023 due to population growth that increases every year. And also because of the existence of non-renewable energy, so that energy needs will undoubtedly continue to increase faster than economic growth.

Indonesia will continue to rely on non-renewable energy sources in 2023 as a result of the more dominant transportation sector in energy consumption and the use of Fuel Oil (BBM) which is a commodity of natural resources of oil and gas extracted from petroleum. BBM is very useful in all areas of life, including in households, businesses, and the transportation sector. In fact, the use of petroleum throughout the country is around 670,000 barrels per day in 2023 and has increased from only 635,000 barrels per day in 2022. Every year there will be growth in the Indonesian population which will be accompanied by an increase in fuel productivity.

The energy needs of the community must be met by requiring a sufficient level of domestic energy production to avoid the threat of oil shortages, which can result in reduced foreign exchange due to imports, fuel shortages, rising fuel prices, and the cessation of industrial activities. The daily activities of the population can be disrupted by these threats. It is very important to meet the oil needs of the Indonesian population. If something like this happens, Indonesia needs to import oil so that its needs can be met. The need for energy security to realize a fair and equitable energy transition for the entire population which aims to achieve improvements in socio-economic aspects and equitable development.

The need for policy initiatives for energy security can be in the form of actions taken by related parties who develop technology policies related to energy-related issues. The use of new and renewable energy is also a top priority for the Indonesian government due to low energy reserves and increasing energy consumption. This requires the involvement of related parties, such as long-term energy related parties who need to have integrated and sustainable energy resource planning with a guarantee of Indonesia's long-term energy availability and prevent problems that can be obstacles for Indonesia.

The concept of energy security in Indonesia is intended to consider the country's dependence on oil as an energy source and the impact of rising oil prices. Due to the population's dependence on oil, the government is considering enacting a law relating to the use of alternative energy sources to achieve energy security in Indonesia as a way to counter the threat to the country's energy security. The government's concern is also in the threat of national energy security to the provision of fuel needs, namely that Indonesia needs to increase the production of the domestic oil refinery industry. This is needed as a provision for the energy needs of the Indonesian population which increases with each availability. Therefore, strategic steps are needed so that national energy security can be achieved or even increased, such as for example policies to build new oil refinery industries *(Grass Root Refinery/GRR)* and increase oil refinery capacity *(Refinery Development Master Plan/RDMP)*, as well as increase oil production. and gas.

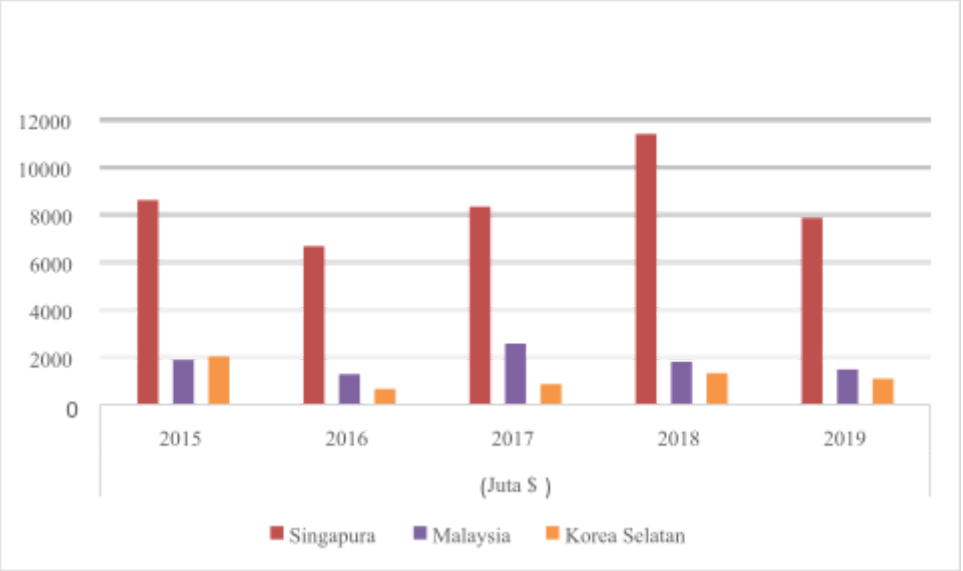

Figure 1.
Countries That Support Indonesia's Processed Petroleum Product Imports
Source: UN Comtrade, 2021

Based on the data table above, Indonesia does need to import processed petroleum products. Singapore holds the first rank as Indonesia's destination for importing processed oil. The dependence of the Indonesian population on fuel oil continues to increase, which was initially caused by a decrease in production capacity and also the existing oil refinery industry which could force the country to import. In addition, instead of overcoming the problem of dependency, the government actually thinks it is better to import. This is because producing fuel oil produced from domestic oil refineries requires a lot of money. This is what makes Indonesia import petroleum products to Singapore because the price is cheaper.

Indonesia's energy security and sovereignty will be threatened if it continues to rely on imports. According to the Indonesian Energy & Economic Statistics Handbook (HEESI), the Ministry of Energy and Mineral Resources (ESDM) released in 2022, there will be a 31% growth in energy consumption to 1,113 million BOE, the highest in the last ten years. In 2022, the highest energy demand per sector is the industrial sector (43.21%), followed by the transportation sector (38.49%), the household sector (12.97%), the commercial sector (4.34%), and other sectors (0.9%). With almost 40% of the country's energy used for transportation, Indonesia imports 104.7 million barrels of oil annually. The increase in national production, which is intended to meet domestic and foreign needs, is an indication of good

economic growth (Helmi and Gusti, 2022). To meet the consumption needs of the population and improve welfare, it is important to increase production capacity.

Therefore, a policy is needed to address the risks to Indonesia's energy security, such as the expansion of oil refineries. The main plan of the Oil Refinery Development Master Plan (RDMP), one of the main missions of concern in President Jokowi's administration for a sustainable future (Epriilia, 2022). With the increasing number of oil refineries projected to be built in various places to meet the country's energy needs, this infrastructure development project is considered an effective way to prevent a decline in the country's energy security. However, the increasing number of oil refinery developments also has a significant impact on the environment. The products produced by the oil refinery industry have an impact on the surrounding environment, such as in several cases where oil spills from one of the oil refinery industries operating polluted rivers and pollution from oil spills also caused negative impacts on human safety in the surrounding area considering that water is very much needed for the daily lives of the population. The construction of oil refineries also reduces land for farmers which becomes infertile and air pollution. The construction of this oil refinery industry is very inconsistent with the concept of green economic growth in Indonesia.

Economic growth related to the environment is known as the "Green Economy" system. This means that strong economic growth must be sustainable, inclusive of all social groups, and environmentally friendly. The existence and welfare of all Indonesian people, which are directly related to natural resources and the environment and depend on green economic growth. Sustainability is a state in which nature and humans can play the necessary roles in mutually beneficial harmony, which allows for the fulfillment of social, economic, and other needs for the present and the future. Therefore, sustainability is very important because it ensures that there will always be water, materials, and resources available to maintain the life of the environment and the entire population. After implementing strategic policies in overcoming various threats to energy security in Indonesia. The government as a related party must be able to resolve existing threats so that things like scarcity or depletion of energy will not occur in the future. However, the policy implemented by the government in addressing the increasing population consumption needs for energy, namely the construction of oil refineries, has a very negative impact on the environment. This is not in line with the desired concept that the importance of the concept of green economic growth for Indonesia. Based on the explanation that has been explained, the author is interested in analyzing the impact of the establishment of an oil refinery that is not in line with the concept of green economic growth in Indonesia. This article uses a descriptive qualitative method approach, where in conducting research that aims to explain phenomena and describe reality with relevant analysis. Thus the purpose of this study is to identify the impact of oil refinery development activities on the environment that do not support the concept of green economic growth in Indonesia.

Methods

This study applies a descriptive qualitative analysis method with a case study approach to major oil refineries in Indonesia. The data collection obtained is the result of analysis of documents and literature that discuss the influence of the increase in oil refineries in Indonesia so that it has an impact on the green economy in Indonesia. Thematic data analysis techniques are carried out to identify patterns and relationships between the variables studied. This approach allows researchers to gain an in-depth understanding of the relationship between energy infrastructure development and sustainability principles. Data were collected through in-depth interviews with key stakeholders, including government officials, energy industry actors, environmental experts, and local communities. Additionally, a literature review and policy document analysis related to energy and green economy were conducted. The analysis focuses on three main aspects: economic impact, environmental sustainability, and social impact. The results of this qualitative analysis are expected to provide a comprehensive overview of the challenges and opportunities arising from increased refinery capacity and offer policy recommendations to support the transition to a green economy in Indonesia. This method is deemed appropriate as it uncovers the complex dimensions of the interaction between economic development and environmental conservation.

Result and Discussions

Oil Refinery Improvement Helps Indonesian Economy

Based on data taken from the Ministry of Energy and Mineral Resources (ESDM), it can be seen that compared to 2021, Indonesia's energy supply increased to 1,739 million barrels of oil equivalent (BOE) in 2022. Fuel contributed 25.95% of total energy consumption, or 235.95 million BOE, making it

the type of energy with the highest consumption. Oil refineries in Indonesia are unable to meet domestic demand along with economic growth. Fuel imports account for 35% of all domestic demand over the past five years. So that Indonesia's trade balance is affected by this situation.

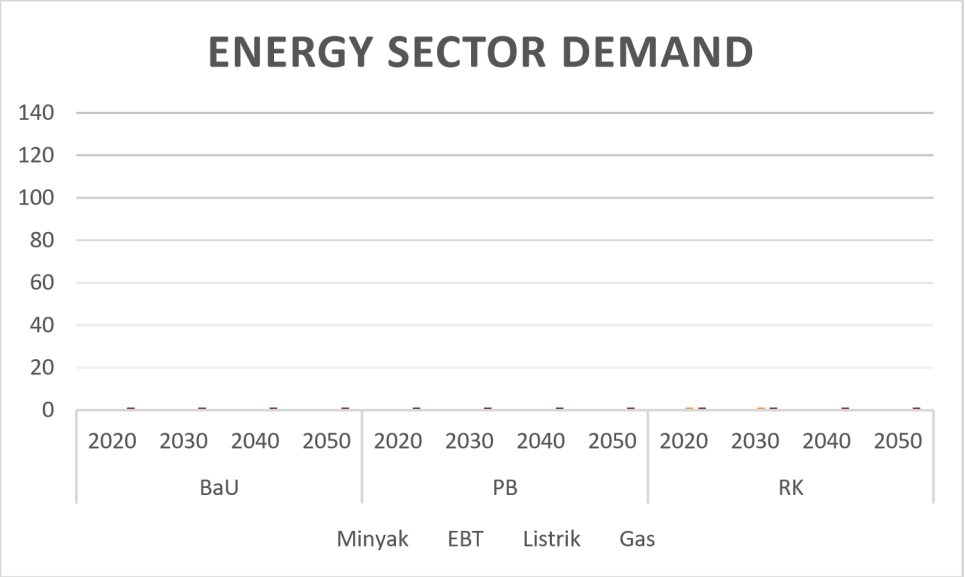

Figure 2.
Energy Sector Demand
Source: Ministry of Energy and Mineral Resources

By looking at the following data, data from the Ministry of Energy and Mineral Resources is evidence to show that the largest demand for energy in the transportation sector is fuel which is needed by Indonesian people who have vehicles. Even in the next few years it will still be the largest. To reduce fuel consumption in the transportation sector, the government must meet the needs of the community through imports that affect the country's economy which will later cause other problems. As one of the sectors that contributes a very important role to the Indonesian economy, the policy of increasing the oil refinery industry, apart from the aim of meeting the energy consumption needs of the Indonesian population, also has several benefits or positive impacts on the Indonesian economy, including:

1. Increased State Revenue
   One of the main industries that significantly increases state revenue is the oil refinery industry. The Indonesian government is highly dependent on gas and oil exports to fund the implementation of its development programs. In 2020, many sectors were affected by Covid-19. However, the oil refinery sector managed to show quite good performance so that it could still contribute to the national economy in the form of taxes, dividends, and PNBP in sufficient amounts.
2. A Very Important Energy Source
   The oil refinery industry is an energy source that is very necessary for the lives of all humans. Pertamina as one of the national oil refinery industries has an important role in meeting Indonesia's energy needs. Pertamina produces and distributes oil and gas products, such as fuel oil (BBM) which will later be used to drive vehicles, and various other energy needs.
3. Increasing National Energy Independence
   The increase in the oil refinery industry also contributes to increasing national energy independence. By managing oil and gas resources in Indonesia, such as Pertamina, Indonesia can start to not depend on or not import energy and will increase domestic energy production.
4. Increasing Investment and Infrastructure Development
   The Indonesian oil refinery sector has the potential to increase infrastructure development and investment in addition to increasing state revenues. Investors can be encouraged to invest in Indonesia through policies that facilitate investment in the oil refinery sector. In addition, the development of gas and oil distribution networks and processing facilities can increase overall infrastructure growth.
5. Increasing Community Welfare.

Increasing community welfare is an additional benefit of the Indonesian oil refinery sector. This sector can also provide greater benefits to the community economically and socially by managing resources effectively. In addition, this sector also has the potential to increase employment prospects and increase the utilization of oil and gas resources by the community. Oil refineries play an important role in the welfare of the community around the oil refinery industry. Since the oil refinery was opened, rural communities have received many benefits, especially in the fields of health and education, as evidenced by the increase in their income from previously only being farmers to workers in oil refineries (Sadiyah, 2020). The upstream oil and gas industry has been proven to have created a significant effect in improving the economy of local communities through local work, to the social responsibility carried out by each KKKS in the work area (Purnama, 2022). However, not all areas with oil refinery industries receive positive approval from local residents. Sometimes there is also a lot of rejection from residents because they do not agree that their agricultural land which has been passed down from generation to generation is eliminated (Manaqib, 2020). This also depends on the response of the oil refinery industry to overcome it.

The oil refinery industry must be improved in order to obtain fuel and raw materials for further processing into high-value petrochemical goods. This is because the expansion of oil refineries integrated with petrochemicals will provide higher added value. The conclusion is that the development of the oil refinery industry in Indonesia has a number of positive economic impacts, including greater employment opportunities, high incomes, increased business activity, prioritizing and absorbing local workers, increasing economic growth in the community, and increasing local income. Therefore, the growth of the oil refinery industry will continue to encourage economic equality in the industrial area, generate energy exports abroad, and act as an economic catalyst.

Oil Refinery Construction Influences Green Economic Growth

Green growth is an attempt to overcome short-term economic strategies that only pursue profits and have left many pressing issues that need attention. However, broad support is needed for initiatives aimed at advancing a green economy such as low carbon policies to boost the economy. Economic development strategies that incorporate environmental and ecological considerations into the economic paradigm need to be created, especially to influence government economic policies that support environmental conservation.

Previously, people may not have seemed too concerned about dirty fuels (high carbon), they turned a blind eye and accepted that the health of the ecosystem would inevitably be sacrificed in the name of economic expansion, with the extinction of many species acting as an impact of economic activities. However, the presence of clean energy, will realize all of us that economic progress depends on a healthy ecology because otherwise the damage and lack of adequate natural resources will prevent us from enjoying the growth itself.

The concept of "Green Economy" was introduced along with the implementation of sustainable development to achieve sustainable development progressively. This concept encourages economic expansion while still prioritizing social justice and environmental protection at every stage of consumption, from individuals to companies, and also at the production stage (eg the energy sector). The implementation of a green economy is still far from projections, especially in the energy sector where there is still a large dependence on fossil fuels such as coal, oil, and natural gas. This occurs at the mining stage, fuel processing and its use, thus increasing overall emissions such as CO2 emissions.

To achieve sustainable development in stages, the concept of "Green Economy" needs to be formed along with the implementation of sustainable development. The existence of this concept encourages economic growth while still prioritizing environmental preservation at every level of consumption, from households to large companies, and also at all stages of production (eg the energy industry). From the previous implementation, the green economy would be very difficult, especially in the energy sector where fossil fuels such as oil and natural gas are still widely used. This increases total emissions such as CO2 emissions in fuel processing and its use. The existence of an oil refinery industrial area in Indonesia that produces products that are less environmentally friendly can have a significant impact on climate change because it causes greenhouse gas emissions and carbon dioxide (CO2) pollutant gases to pollute the air, water, and soil. This is becoming a major global issue and concern for the whole world (Rany et al., 2020).

Indonesia ranked tenth among countries producing CO2 emissions in 2020, according to data collected by the Emission Database for Global Atmospheric Research (EDGAR). CO2 emissions in the energy sector will increase in Indonesia if Indonesia continues to use fossil fuels which should use

renewable energy sources and energy consumption efficiency. However, the long-term impact of coal and oil consumption on CO2 emissions is expected to be lower in Indonesia compared to its short-term impact due to the impact of implementing cleaner energy production and reducing oil supplies and reducing coal consumption (Allifah et al., 2022). However, Indonesia's energy intensity tended to increase between 2013 and 2020. Energy subsidy programs for fuel and electricity, which cause energy waste due to suboptimal use, and the growth of the industrial sector, which contributes to high energy intensity, are some of the reasons for this condition. In 2020, it still has a strong dependence on fossil fuels.

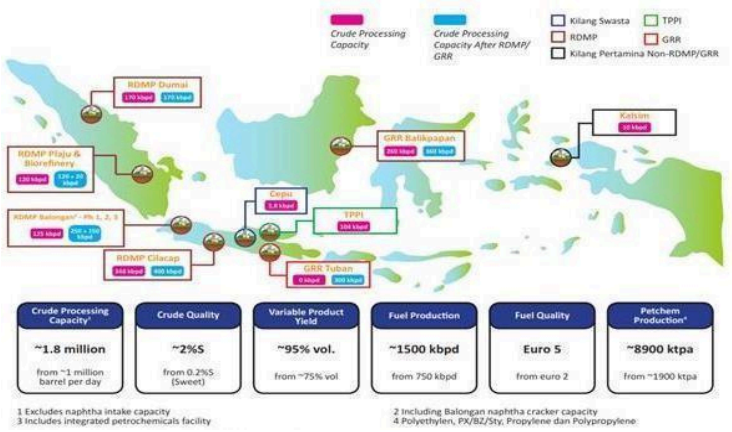

Figure 3.
Distribution of Oil Refinery Industry in Indonesia

In western Indonesia, 90% of oil and gas reserves have also been exploited and only left holes with high water cut content or oil composition that is not comparable to the composition of water (Setyono & Kiono, 2021). Therefore, the data indicates that the government wants to expand the oil refinery sector in various locations rather than relying on refineries that are no longer operating or whose output is not optimal. Indonesia hopes to eliminate fuel imports by 2025 by implementing the distribution of oil refineries in various locations in Indonesia.

According to data from the Central Statistics Agency (BPS), in reality there was inflation of 0.28% in July 2018, with the two main commodities contributing to inflation in the transportation, communication, and financial services group being the increase in gas prices and cellphone credit rates. However, this kind of inflation is only temporary. Before issuing a policy, the government must evaluate its impact on the environment, society, and the economy in the long term, as well as the short term. According to a study, the use of high-octane fuel will benefit the environment by reducing the amount of carbon dioxide emissions produced by motor vehicles because of global warming, rising sea levels, severe weather, increased mortality rates, and diseases such as cancer and asthma, all of which can be caused by carbon dioxide emissions.

While other countries are preparing to pass laws to reduce exhaust emissions by banning the use of oilfueled motor vehicles, the Indonesian government stated in 2017 that it would again require the distribution of low-octane fuel, such as Premium throughout the country which is low octane. The restriction of Premium distribution in Java and Bali is in line with other regulations aimed at reducing air pollution and other environmental problems.

According to official policy, it is the government's duty to control all companies and operations to prevent environmental pollution, especially in the transportation sector which requires the use of environmentally friendly fuels. Pertamina, one of the oil refining companies in Indonesia, has a policy to preserve the environment and reduce the negative impacts of its activities (Pangestu and Soesanto, 2023). Strict environmental monitoring, effective waste and emission control, and adoption of environmentally friendly technologies and production techniques are part of this environmental protection.

In order to achieve energy efficiency, Bappenas and the Ministry of Energy and Mineral Resources (ESDM) have established the Green Economic Growth Program, which is used in the renewable energy subsector. This energy program is used to increase the share of renewable energy (EBT) to 23% by 2025 to meet the country's energy needs (Nufus, 2023). The Green Economic Growth Initiative facilitates the transition of energy projects to bankable status and helps them build the necessary relationships to increase funding flows, which in turn will attract more green investment. To encourage industry and

society to adopt more environmentally friendly and low-emission economic practices, the government has implemented a carbon tax (Pratama et al., 2022). In fact, the government is making significant efforts to achieve clean emissions by 2050, therefore this restriction is necessary.

The gas emission criteria for fuel oil in Indonesia have not been met; it should be euro 4 with a minimum octane rating of 92. On the other hand, fuel oil with an octane rating of 88 such as premium and also pertalite with an octane rating of 90 is actually more common in Indonesia. Thus, anthropogenic global climate change (caused by increased human activities), which increases greenhouse gas levels, is the main reason for gas emission restrictions (Agus Efendi et al., 2018). In an effort to comply with international exhaust emission standards, the Oil and Gas Governance Reform Team has issued a number of recommendations, such as increasing the amount of locally produced gasoline from 88 to 92 octane and stopping importing Premium and other low-octane fuels and having to replace them with 92 octane Pertamax.

High-octane fuel is superior in terms of long-term economic effects because it is more environmentally friendly. When drafting Presidential Regulation No. 43/2018, it should take into account the long-term process such as fuel savings. When considering fuel savings over the life of a vehicle, the cost of designing and manufacturing an engine suitable for high-octane fuel is negligible. Direct cost savings are also anticipated as a result of the use of high-octane fuel. The industry as mentioned shows that the long-term impacts on the environment, society, and economy are not considered when implementing Presidential Regulation No. 43/2018. This is demonstrated by the government's decision to restore the mandate for premium distribution throughout the country and to thwart the implementation of Euro 4 standards for cars in Indonesia. It is time for the Indonesian government to fulfill its promise to reduce the use of environmentally damaging energy.

Non-renewable energy sources will continue to be the majority of Indonesia's primary energy supply until 2020. This realization depends on the Indonesian government's adoption of the concept of evidence-based policymaking in the policy-making process, with the aim of identifying the most environmentally friendly policy formulations. Switching to more renewable and environmentally friendly energy sources is one of them. New forms of renewable energy are still very rarely used for the time being. If this problem is not addressed, the current state of energy availability will worsen. To reduce the use of non-renewable energy, long-term energy development is needed. So far, the government has implemented energy security to maintain the availability of energy reserves and reduce the negative impacts of energy use on the environment through policies related to the purchase of transportation equipment, especially in this case electric cars (Putra et al., 2020).

The transition from fossil fuels or oil-based energy to new renewable energy sources must be pursued and accelerated. One of these energy sources is the development of nuclear power, which can simultaneously meet the enormous demand for electricity and the shortage of fuel. The use of nuclear energy is very important because it can help solve future problems related to clean water, food, health, and energy scarcity as well as the shortage of fuel oil and electricity (Al Hakim, 2022). However, Indonesia has a large untapped capacity for sustainable energy sources, such as wind, hydropower, and biofuels. Therefore, the concept of sustainable energy, or green energy, needs to be practiced to reduce dependence on non-renewable fuels.

Conclusion

Indonesia's increasing energy needs must require government policies that reduce the level of energy imports and focus on developing the oil refinery sector. In order for Indonesia to earn more foreign exchange, the oil refinery sector must develop. In addition, the expansion of this sector can contribute to the welfare of the population, equitable development, higher wages, and improved quality of life, all of which are the goals of developing the oil refinery industry.

The Indonesian economy will benefit from the expansion of the oil refinery sector which is planned to be built in various locations. Macro and micro economic development will be influenced by industrial development, especially oil refineries. In particular, as a form of availability of labor services that affect the unemployment rate in the macro economy. This has an impact on reducing production costs in the micro economy. However, the expansion of oil refineries has an impact on pollutants in the environment and has a significant impact on how the Indonesian government implements green economic growth.

Given the increasing number of uncontrolled environmental damage due to various advances that have a negative impact on the environment, green economy-based development is very important. The development paradigm needs to shift from a paradigm that is too dependent on fossil fuels and lacks

social inclusion to a paradigm based on a green economy that is sustainable and environmentally friendly. The development of a green economy in Indonesia has not gone according to plan so far, even though it has become the mainstream of economic thinking. This is because the government and the oil refinery industry are still not firm and focus on products that are less environmentally friendly. As a result, the idea of a "Green Economy" has not fully become a reference in the regional development process in several regions.

To anticipate this, the government should have prepared a solution to overcome the impact when the population's energy needs increase accompanied by an increase in oil refineries, where the increase in oil refineries actually has a negative impact on environmental pollution which will increase global warming. Therefore, the suggestion given from this study is the need for the government's role to explore renewable energy to become reserve energy and also the firmness regarding government regulations in regulating the oil refinery industry in Indonesia, such as firmness in giving instructions to industries to improve the quality of the output produced so as not to pollute the environment so that it is hoped that green economic growth can be implemented in Indonesia.

Limitations Of Study

- The research relies primarily on secondary data and literature review, which may limit the depth of current insights into the problem.
- The study focuses mainly on economic and environmental impacts, potentially overlooking other important aspects of oil refinery development.
- The qualitative nature of the research may not provide precise measurements of the environmental impact of oil refineries.
- Limited primary data from stakeholders and affected communities may restrict the understanding of social impacts.

Suggestions

1) Policy Recomendation
   - Develop a comprehensive transition plan that gradually shifts from oil refineries to renewable energy sources
   - Implement stricter environmental regulations for existing and new oil refineries
   - Create incentives for green technology adoption in the refinery sector
2) Future Research
   - Conduct quantitative studies to measure the exact environmental impact of oil refineries
   - Research alternative green technologies that could be implemented in existing refineries
   - Study successful cases of green energy transition in other countries for potential adaptation
3) Implementation Strategies
   - Establish better monitoring systems for environmental impacts of refineries
   - Develop collaborative frameworks between government, industry, and environmental groups
   - Invest in research and development of cleaner refining technologies
4) Balance Approach
   - Create a roadmap for sustainable energy development that balances economic needs with environmental protection
   - Increase investment in renewable energy infrastructure while maintaining energy security
   - Strengthen environmental impact assessment procedures for new refinery projects

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