

# The Role of Fiscal Policy to Increase Energy Security: Indonesian Case Study

Purwoko and Tri Wibowo

**Abstract**—In a simple language, energy security is maintaining the availability of national energy supply at affordable prices. Some energy resources are used in Indonesia, such as petroleum, natural gas, coal, and renewable energy. In line with increasing the population and growing the economy of Indonesia, the demand for petroleum is increasing. Meanwhile, petroleum production and reserves are declining. 2004 was a turning point for Indonesia, from the petroleum exporter country to the petroleum importer country, and since then the volume of petroleum imports increases every year. Depending petroleum supplies from imports is very risky for Indonesia's energy security. Limited stock or rising petroleum prices on global markets can have a negative impact on the sustainability of national petroleum supplies, economic growth and government budgets. This research is intended to look for policies that can increase energy security in relation to the decline in petroleum production. Descriptive exploratory method is used, to explain the phenomena related to energy security issue in Indonesia.

Bioethanol, one of renewable energy, is expected to substitute the imported petroleum. Bioethanol can be produced by the community. However, the economic price of bioethanol is more expensive than that of petroleum, that make people prefer to use the petroleum rather than bioethanol. Fiscal instruments can be used to promote bioethanol as a substitute for petroleum. The use of petroleum causes air pollution, so it deserves as excise object. A portion of the excise proceeds can be earmarked to provide subsidies for bioethanol production, that will make bioethanol prices more competitive. This policy will add a little burden to community, but provide several benefits, such as having better energy security, reducing dependence on petroleum imports, improving the economy and creating jobs with the bioethanol industry, and creating cleaner environment.

**Index Terms**—Bioethanol, energy security, fiscal policy, petroleum.

## I. INTRODUCTION

Using the Energy Trilemma Index, the World Energy Council announces the energy security ratings of countries in the world in 2018. Three variables were used to determine the ranking in this index, namely security of energy supply, energy equity, and environmental sustainability. In this index, Indonesia ranked 75th out of 125 countries surveyed, lower than Thailand which ranked 74th, and the Philippines ranked 70th [1]. Two variables were the cause of Indonesia's low ranking, namely the problem of security of energy supply, in this case petroleum that is dependent on imported supplies,

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and the low quality of the environment due to high levels of greenhouse gas emissions [2].

In the 1970-1980 decade, oil contributed the most to Indonesia's revenue. Production and export of petroleum was carried out on a large scale, as if petroleum reserves could not be depleted if it is drained continuously. However, in line with increasing population and economic growth in Indonesia, demand for petroleum continues to increase. Until one day, in 2004, domestic petroleum production was no longer able to meet the national petroleum needs. To meet the shortcomings, Indonesia had to import petroleum. The gap between petroleum consumption and production widened in the following years, making Indonesia more dependent on petroleum imports [3].

The magnitude of Indonesia's dependence on petroleum energy can be seen from the realization of the energy mix in 2006, where the use of petroleum reached 52% of the total national energy use. Meanwhile, the use of natural gas was only 29%, coal 15%, and new and renewable energy 4% of the total national energy consumption [4]. In 2006 the government adopted Perpres No. 5 of 2006 concerning the National Energy Policy, which mandates optimal primary energy use targets for 2025 as follows: petroleum no more than 20%, natural gas at least 30%, coal at least 33% and new energy and renewable at least 17% [5].

In 2014, the achievement of the national energy mix became as follows: 41% petroleum, 23% natural gas, 30% coal and 6% new and renewable energy [4]. Using Government Regulation No. 79 of 2014, the government revised the energy mix target for 2025, as follows: petroleum a maximum of 25%, natural gas at least 23%, coal at least 26% and new and renewable energy at least 23%. Whereas the 2050 target is as follows: petroleum is maximum 20%, natural gas is at least 24%, coal is at least 25% and new and renewable energy is at least 31% [6].

At the end of 2018, the realization of Indonesia's energy mix was as follows: 46% petroleum, 23% natural gas, 26% coal, 5% new and renewable energy [4]. Thus, in the period 2018-2025 the government must strive to reduce the use of petroleum by 21% and natural gas by 1%, and to increase the use of coal by 4% and new and renewable energy by 18%. Two targets need to get serious attention from the government, namely reducing the use of petroleum by 21%, and increasing the use of renewable energy by 18%.

This study aims to find policies that can be used to increase national energy security related to petroleum production which continues to decline. The energy mix target for 2025 can be a guide to produce the right policy, which is focus to reduce the use of petroleum and to increase the use of renewable energy.

II. LITERATURE REVIEW

A. National Energy Security

Energy security is the government's effort to provide energy supplies needed by the community in a sustainable manner, at a place and at an affordable price for its users. Energy is an important component for the life and economy of modern society. Disruption of energy supply can disappoint the community and disrupt the economy. For this reason, the government must strive to ensure that the availability of energy needed by the public is guaranteed. According to Azmi, Riza and Amir Hidayat, a country's energy supply is considered safe if it is enough to meet the needs of people at least 90 days [7].

The government is aware that the shortage of petroleum products will increase in the following years. To realize national energy security in the future, the Government issued Perpres no. 5 of 2006, which established the National Energy Mix policy for 2025. Table I provides an overview of the energy mix situation in 2006 and the energy mix target to be achieved by 2025.

TABLE I: THE 2006 ENERGY MIX REALIZATION AND THE 2005 ENERGY MIX TARGET

Type of Energy	Realization of 2006	Target of 2025
Petroleum	52%	Maksimum 20%
Natural Gas	29%	Minimum 30%
Coal	15%	Minimum 33%
New and Renewable energy	4%	Minimum 17%

Article 6 of this regulation states that the government can provide facilities and incentives to developers of certain alternative energy resources determined by the Minister of Energy and Mineral Resources.

To get more realistic targets, through Government Regulation of the Republic of Indonesia Number 79 of 2014 the Government revised the energy mix target as described in Table II.

TABLE II: ENERGY MIX TARGET OF 2025 AND 2050

Type of Energy	Realization of 2014	Target of 2025	Target of 2050
Petroleum	41%	Maksimum 25%	Maksimum 20%
Natural Gas	23%	Minimum 22%	Minimum 24%
Coal	30%	Minimum 30%	Minimum 25%
New and Renewable energy	6%	Minimum 23%	Minimum 31%

In this Government Regulation, the target for petroleum is relaxed from a maximum of 20% in 2025 to a maximum of 25% in 2025, then continued to a maximum of 20% in 2050. The natural gas target is reduced from a minimum of 30% in 2025 to a minimum of 22% in 2025, then increased to a minimum of 24% in 2050. The coal target is reduced from a minimum of 33% in 2025 to a minimum of 30% in 2025, then again reduced to a minimum of 25% in 2050. Meanwhile, the target for new and renewable energy increases from a

minimum of 17% in 2025 to a minimum of 23% in 2025, then continued to a minimum of 31% in 2050. Fig. 1 provides an overview of the progress of the energy mix realization for 2006, 2014 and 2018, and the energy mix target for 2025 and 2050.

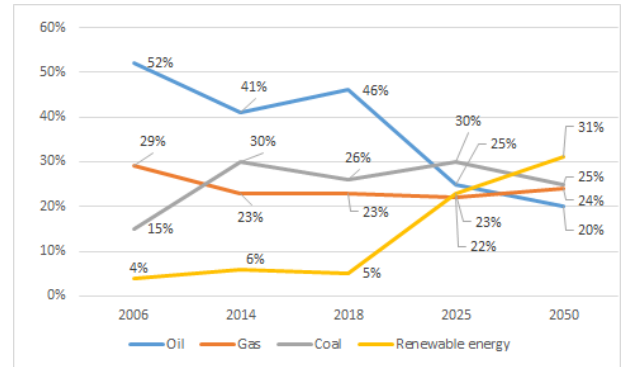


Fig. 1. The progress of Indonesia's energy mix realization in 2006, 2014, 2018 and the target of Indonesia's energy mix in 2025 and 2050.

By comparing the realization of the energy mix in 2018 and the target of the energy mix in 2025, efforts that can be made by the government in 2018-2025 are reducing petroleum usage from 46% to 25%, reducing gas usage from 23% to 22%, increasing electricity usage from 26% to 30%, and increasing the new and renewable energy usage from 5% to 23%.

B. Petroleum Production and Consumption

In the decade 1970-1980 Indonesia had become a petroleum exporting country. Petroleum production was excessive, while domestic demand for petroleum was low, so petroleum has become a reliable export commodity. But since 2004, the situation has reversed. From the net petroleum exporter country, Indonesia became the net petroleum importer country. This is due to petroleum consumption which continues to increase from year to year, while its production actually decreases. Because of increasing public income, and the low quality of public transportation, people started buying and using private motorized vehicles. The impact, oil consumption continues to increase from time to time, air pollution increases sharply. If this condition is left alone without any special effort from the government, it is feared that future national energy security will be disrupted. Fig. 2 provides an overview of Indonesia's oil production and consumption [3].

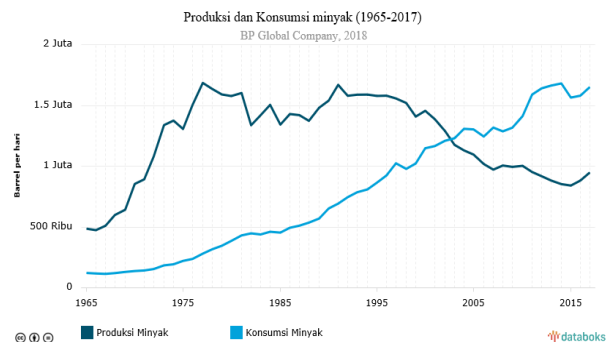


Fig. 2. Petroleum production and consumption in Indonesia.

Astra explained that chemical energy in fossil fuels can be converted into heat, mechanical, or electricity through

combustion. Thus, the use of fuel in motor vehicles can be a cause of air pollution. Issued pollutants are usually grouped into hydrocarbons (HC), nitrogen oxides (NOx), and carbon monoxide (CO). These pollutants are the biggest factors that cause smoke, acid rain, global warming and climate change [08].

To reduce the rate of fuel consumption, Purwoko advised the Indonesian government to impose an excise tax on petroleum, because its availability is limited, and the use of petroleum pollutes the environment. This policy is expected to change people's behavior, from using private cars to using public transportation [9].

### C. Biofuel Production and Consumption

There are several types of new and renewable energy that can be used in Indonesia, including hydro power, geothermal energy, solar power, and biofuels. Biofuel is a fuel sourced from biomass, mainly from vegetable matter. Two types of biofuels that are widely used in the world today are biodiesel and bioethanol. Biodiesel is used for diesel engines, while bioethanol is used for gasoline engines. The use of biodiesel has been applied in Indonesia as a diesel mixture. In 2013, the government announced the use of biodiesel mixed with diesel using 10% biodiesel and 90% diesel, known as B-10. In September 2018 the composition of biodiesel was increased to 20%, known as B-20. In 2019, the use of biodiesel started at 30% or B-30. If successful, the B-30 will be marketed in 2020.

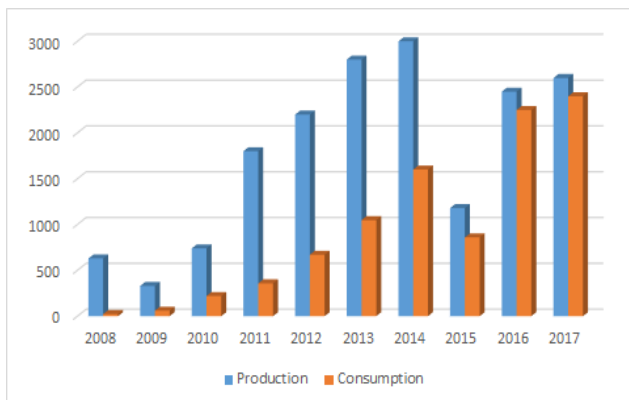


Fig. 3. Indonesian Biodiesel Production and Consumption (In million liters)

Fig. 3 provides an overview of the production and consumption of biodiesel in Indonesia. The biodiesel usage provides a significant contribution to the realization of new and renewable energy usage in Indonesia.

In a national seminar, Sutrisman explained several advantages of using biodiesel, including increasing energy security, being environmentally friendly, and absorbing labor [10]. Indonesia's biodiesel production in 2017 amounted to 2.57 million kilo liters, capable of replacing imported petroleum equivalent to 16.17 million barrels. The use of biodiesel in 2017 can reduce greenhouse gas emissions by 6.7 million tons of CO<sub>2</sub>. Biodiesel is made from plant raw materials, so it can be produced sustainably. To produce 2.57 million kilo liters of biodiesel requires the involvement of 186,000 farmers in the upstream sector.

Somewhat different from biodiesel, bioethanol has not been produced and sold massively in the Indonesian market.

The problem is that the price of bioethanol is more expensive than the price of petroleum. For an illustration, to produce one liter of bioethanol requires 3.4 kg of molasses. If the price of molasses Rp.5,066 per kg, then it takes Rp.17,224 to purchase the raw material for one liter of bioethanol. Meanwhile the premium price is only Rp.5,600 per liter. In such a situation, producers do not want to produce bioethanol because they will lose money, while consumers prefer to choose petroleum fuels that are cheap.

In fact, bioethanol has a higher octane value than petroleum octane. According to Faisal [11], bioethanol has an octane rating of 117, while premium only has an octane value of 88. Therefore, the use of bioethanol will produce lower carbon dioxide emissions than petroleum.

### D. Biofuel Production and Consumption

Excise is a state levy imposed on certain goods which have the characteristics stipulated in the Act. In Law number 37 of 2007 on Excise, it is stated that the characteristics of goods worthy of excise are, goods whose consumption needs to be controlled, goods whose distribution needs to be monitored, goods whose use can cause negative impacts on the community or the environment; or goods whose use requires the imposition of state levies for justice and balance.

The use of petroleum produces carbon dioxide emissions which pollute the environment, and are harmful to public health. The use of petroleum fuels meet the third criterion of the characteristics of the goods can be subject to excise duty, ie goods that use can have negative impacts for society or the environment, hence the use of fossil fuels worthy subject to excise [9].

The revenue of excise tax can be earmarked, to reduce the negative impact of the use of goods subject to excise. Cashin, Ceril, and Bloom defined earmark as follows: "Allotment involves separating all or part of total income - or income from taxes or tax groups - and setting it aside for its intended purpose" [12]. The earmark policy has also been applied to tobacco excise tax in Indonesia. Two percent of tobacco excise revenue is distributed to tobacco producing provinces, to fund the improvement of the quality of raw materials, industrial development, social environmental development, socialization of excise provisions, or eradication of illegal excisable goods [13].

Sitepu, EMP, however, criticized the regulation, stating that the intended use of earmark funds from tobacco excise tax was less focused on the main objective of overcoming negative externalities due to smoking, and therefore needs to be redesigned [14].

## III. RESEARCH METHOD

The method used in this research is the study of literature and analyzed using qualitative descriptive analysis. The data used in this study include data on oil and gas consumption and consumption, biodiesel production and consumption, as well as the target and realization of the national energy mix.

#### IV. ANALYSIS

##### *A. The Need for Biofuel Development*

Biofuels are fuels made from vegetable raw materials. Biofuel raw materials, such as palm oil, molasses, and corn can be produced domestically in a sustainable manner. Supply of raw materials for biofuels can involve the wider community, especially farmers. Biofuel production technology is quite simple. Its production capacity is very diverse, ranging from home industries to large industries. The government's policy to increase the use of biofuels will provide business opportunities for farmers as suppliers of raw materials, for entrepreneurs as producers of biofuel producers, and other related parties.

Biofuel, made from vegetable raw materials, can be produced in various regions in Indonesia. Biofuel production can lead to economic activity in the surrounding areas. The biofuel produced can be used in areas where production activities are carried out, so that the transportation costs of biofuels from producers to consumers will be cheaper than the transportation costs for petroleum. This means that for remote areas or small islands the supply of biofuel energy can be produced in the region or the island itself.

##### *B. Strategy to Reduce Petroleum Consumption*

Since 2004, Indonesia has become a net importer of petroleum. The volume of imports tends to increase in the following years. This happens because oil consumption continues to increase, while production tends to decline. This dependence on petroleum imports is a weak point for Indonesia's national energy security. If there is a shortage of oil or an increase in oil prices on the global market, it will have a negative impact on energy security and the Indonesian economy.

One of the strategies the government can undertake to reduce the use of petroleum, in order to achieve the national energy mix target of 2025, is the substitution of petroleum with biofuels. If the substitution policy goes well, this strategy can reduce the use of petroleum significantly, so that dependence on imported petroleum can be reduced or eliminated. This policy is in line with the national energy security goals set in 2006 and 2014, to reduce the use of petroleum and increase the use of renewable energy. The problem faced is the economic price of biofuels which are more expensive than the price of petroleum, so consumers are reluctant to use biofuels.

Thus, earmarks from petroleum excise can be used to subsidize bioethanol products so that the price of bioethanol will go down. Biofuel producers deserve subsidies because they are able to reduce carbon dioxide emissions. The price of petroleum will go up because of the added excise, while the price of bioethanol on the market will go down because producers get subsidies.

By using a simple economic model, excise tax rates and the amount of subsidies can be simulated, so that the price of petroleum plus excise is not significantly different from the price of bioethanol minus subsidies. The price of bioethanol can be made equal to or lower than the price of petroleum, so consumers will be interested in buying bioethanol, and producers will get the desired price, and are interested in

producing bioethanol.

One important point of the substitution of petroleum with biofuels policy is that the government does not need to allocate a biofuel subsidy budget in the state budget (APBN). Funds for biofuel price subsidies will be funded from the proceeds of petroleum excise earmark. This policy will reduce oil imports, increase national energy security, and improve the Indonesian economy.

##### *C. Fiscal Policy to Increase Energy Security*

Excise is a fiscal instrument that can be used to solve the problem of price differences between bioethanol and petroleum. The framework of thought is that the use of petroleum produces carbon dioxide emissions that negatively affect public health and the environment, so it deserves to be subject to excise duty. In accordance with the theory, the revenue of excise taxation can be earmarked to reduce the negative impact of the use of products subject to excise. In this case, the results from the earmark excise tax on petroleum can be used to reduce carbon dioxide emissions. The policy of substituting petroleum with bioethanol can reduce carbon dioxide emissions, because bioethanol has higher octane, resulting in lower emissions than petroleum.

#### V. CONCLUSIONS AND RECOMMENDATIONS

Since 2004, Indonesia has turned from a net exporter to a net Importer of petroleum. Petroleum imports grew in the following years, in line with Indonesia's increasing petroleum consumption and the declining petroleum production. To maintain national energy security, in 2006, Indonesia set an energy mix target for 2025, which was then revised in 2014.

The evaluation results of the energy mix 2018 realization show that there are two types of energy whose performance is still far from the target of 2025, namely petroleum and new and renewable energy. The use of petroleum energy must still be reduced by 21%, and the use of new and renewable energy must still be increased by 18% of the total national energy consumption

Substitution of petroleum with bioethanol is one of the strategies that can be used to achieve the energy mix target in 2025 and at the same time increase national energy security, but there are problems with economic prices. The economic price of bioethanol is more expensive compared to the price of petroleum. This causes consumers to choose to use petroleum because it is cheaper, and producers are reluctant to produce bioethanol because they do not want to lose

Excise tax instruments can be used to resolve the price difference problem. Petroleum that produces high carbon dioxide emissions is eligible for excise. The results of excise tax can be earmarked to reduce carbon dioxide emissions. The use of bioethanol is feasible to get subsidies from earmark funds because it is able to reduce carbon dioxide emissions. The tariff of excise tax and the amount subsidy can be simulated using a simple model, so that the price of petroleum plus excise does not differ significantly from the price of bioethanol minus the subsidy.

This policy will reduce the volume of imported petroleum and replace it with bioethanol which can be produced domestically in a sustainable manner. This policy will reduce

dependence on imported petroleum, increase energy security, increase people's income and national economy, and make the environment cleaner.

Further studies are recommended to create an economic model for determining the amount of excise tax rates for fuel so as not to overburden users, and the right amount of subsidy for bioethanol to be attractive enough for investors to become bioethanol producers.

#### CONFLICT OF INTEREST

This article is the opinion of the authors and does not represent the policy views of the institution where the author works. This article can be a reference for the institution in making policies, but the policies made can be different from the opinions of the authors in this article. The author states there is no conflict of interest in writing this article with any party, including the institution where the author works.

#### AUTHOR CONTRIBUTIONS

This article is mostly done by Purwoko, starting from ideas to writing articles. Tri Wibowo's contribution was mainly in library research and research methodology. Both authors have read and agreed to the final version of the article.

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