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Review

A PESTLE Policy Mapping and Stakeholder Analysis of Indonesia's Fossil Fuel Energy Industry

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Abstract: Indonesia has a long-standing history of reliance on fossil fuels, which reflects the country's vast reserves of crude oil, natural gas, coal, and other resources. Consequently, the potential of Indonesia's fossil energy industry is both complex and multi-layered. This paper aims to carry out a policy mapping and stakeholder analysis of Indonesia's fossil energy industry, adopting a PESTLE (Political, Economic, Social, Technology, Legal, and Environmental) approach, which allows identification of multidisciplinary stakeholders and underlying relationships across the sector. The outcomes from the analysis indicated the importance of strategically aligning the stakeholders' policies to the needs of other relevant stakeholders. Furthermore, the central and regional governments need to work closely in order to better sense if there is a change in the policy, be receptive to anticipating the potential impacts, and to avoid policies being executed in an isolated manner.

Keywords: PESTLE; stakeholder analysis; fossil energy industry; Indonesia

1. Introduction

Indonesia has energy resources which, if utilized appropriately, can ensure national energy security and independence. These reserves consist of 3.6 billion barrels of crude oil and 100.3 TSCF (trillion standard cubic feet) of natural gas, or between 0.2 and 1.5 percent of total global reserves, respectively [1]. Taking into account the production level of oil at 288 million barrels, and the production of natural gas at 2.97 TSCF, these figures are approximately equivalent to 13 years of oil production and 34 years of gas production. In addition, Indonesia has an estimated 28 billion tons of coal reserves, or 3.1 percent of total global reserves [2]. Indonesia also has potential Coalbed Methane (CBM) reserves of approximately 300 to 450 TSCF, dispersed in 11 coal basins in various locations in Indonesia, such as Sumatera, Java, Kalimantan, and Sulawesi [3].

Indonesia's domestic oil consumption has increased from 1.2 million barrels per day in 2003 to 1.6 million barrels per day in 2013, and is projected to increase by 5–6 percent per year until 2030 [4]. This is partly due to the rising electrification requirements, from 90 terawatt-hours (TWh) in 2003 to 190 TWh in 2013, although many of the electric power generators in Indonesia rely on coal. Nonetheless, with the current patterns of coal consumption and export, if no new reserves are discovered, it is estimated that there will be a deficit of coal in 2046 [5], and thus, it is estimated that Indonesia will be a net importer of energy in 2029 [6]. Up-to-date figures on the evolution of fossil fuels supply and demand can be found in Reference [7].

There is a sharp disparity between the rate of consumption and the meagre reserves of energy resources, generating ubiquitous energy crises, such as power blackouts in a number of regions, shortages of oil fuels in outlying regions, and a lack of gas reserves for the industry sector as inducers of regional economic growth [8]. This has the potential to be a serious threat for future national

energy security, unless long-term strategic planning is considered. The lack of more accessible, cheaper, and cleaner energy sources will impede industrial growth and development of the manufacturing sector in Indonesia, preventing the country from achieving the same performance as its neighbors [9]. To this end, further investigation into the utilization of both conventional as well as sustainable energy technologies appears to be pertinent for further development and the economic growth of Indonesia [10–12].

In order to support rising domestic energy demands, Indonesia has formulated a National Energy Policy (Kebijakan Energi Nasional/KEN) as a guide for energy management in order to strengthen energy security and independence as a supporting mechanism for long-term development processes. The National Energy Policy, declared through the Indonesian Government Regulation No. 79 of 2014, contains four aspects of primary policies for managing national energy including, among others, the utilization of domestic energy in order to fulfil national demand and support energy diversification and conservation, taking into account environmental ramifications [13]. This Regulation also mandates the fulfilment of optimal primary energy composition by 2025: crude oil composition at less than 25 percent, natural gas at a minimum of 30 percent, and coal at a minimum of 30 percent. The regulation also mandates that in 2050, the composition of crude oil be at less than 20 percent, natural gas at a minimum of 25 percent, and coal at a minimum of 24 percent [14].

Since signing (and later ratifying) the Paris Agreement at the 21st Conference of the Parties of the United States Framework Convention on Climate Change in 2015, Indonesia's national energy policies began to reflect its international commitments on climate action and mitigation. The prevailing instrument of commitment is the Nationally Determined Contribution (NDC), which elucidates a quantitatively objective national target for emissions reduction encompassing five major sectors: energy, waste, industrial processes and product use (IPPU), agriculture, and land use, land-use change and forestry (LULUCF). The core of Indonesia's NDC is a pledge to unconditionally reduce greenhouse gas emissions by 29% by 2030, or 41% with international assistance. All subsequent regulations and roadmaps on energy are expected to reflect Indonesia's NDC and pledge; an expectation that necessarily entails a synergic and multi-sectoral approach among all stakeholders.

In 2013, the International Energy Agency (IEA) alongside the Economic Research Institute for ASEAN and East Asia (ERIA) released a brief titled "Southeast Asia Energy Outlook: World Energy Outlook Special Report." Their findings include the fact that the ten members of ASEAN—along with China and India—are pulling the "center of gravity of the global energy system towards Asia." In ASEAN, Indonesia is listed as the dominant producer of energy resources. Many of the key questions faced by Indonesia's fossil energy are also mirrored by those in neighboring ASEAN countries. Issues of fossil fuel subsidy reform, investment in energy infrastructure, energy efficiency, and renewables development are sweeping across the board. Given the geographic and geopolitical similarities among ASEAN member states, a full-fledged stakeholder analysis of Indonesia's fossil fuel industry may assist further research in revealing similar intricacies in other Southeast Asian countries. Relevant literature on the industrial developments in ASEAN countries can be found in [15–17].

This paper aims to carry out a policy mapping and stakeholder analysis of Indonesia's fossil fuel energy industry through a PESTLE approach, with the ultimate goal of identifying various obstacles that potentially hinder the attainment of the above targets and utilize Indonesia's dispersed fossil fuel energy resources. The stakeholders may include agencies, institutions and parties that play important roles in the fossil energy production at both upstream and downstream levels. This review mainly focuses on reviewing and presenting legislations and internal national communications as relevant critical literature is currently limited.

2. Research Approach

The approach adopted in the research follows the so-called PESTLE analysis, a framework or tool typically used in business and management to analyze the environment they are operating in or are planning to launch new operations in, or monitor the macro-environmental (external) factors that have

an impact on that environment. PESTLE analysis consists of the following individual components: political, economic, social, technological, legal and environmental, hence PESTLE. It is expected that this framework will facilitate understanding of the dynamics of the problem and it could be used to provoke further research directions. The individual aspects of the analysis are briefly presented below and in Reference [18].

Political: These factors usually determine the extent to which a government may influence the economy or a certain industry sector, for instance the enforcement of environmental penalties for polluting industries. Political factors may include tax policies, fiscal policy, trade tariffs, etc., which may significantly affect the business or economic environment.

Economic: These factors directly impact on the economic performance of an organization, market, industry sector or even a country, and have resonating long-term effects. For example, an increased inflation rate would affect the way organizations modify the pricing structure of their products, influencing the purchasing power of consumers, and eventually changing the level of demand and supply for that economy. Economic factors typically include inflation rate, interest rates, foreign exchange rates, economic growth patterns, etc.

Social: These factors examine the social environment of the industry sector, economy, or market that impacts on other factors such as demographics, cultural trends, population analytics, etc. An example of this can be social perception of certain technologies with associated impacts and incentives which could increase or diminish acceptability from the local public.

Technological: These factors are related to the technological innovation that may affect the operations of an organization, industry sector or market, be they favorable or unfavorable. This includes automation, R&D, and the technological awareness that exists in the organization or market.

Legal: These factors take into account both policies and laws that affect the industry/organization from these angles and then map out the strategies in light of these legislations. These include safety standards, labor laws, consumer protection laws, etc., that affect the business performance due to maintaining certain policies or adhering to certain directives.

Environmental: These factors include all those that are influenced or are determined by the surrounding environment. Environmental factors are certainly critical for the energy sector. Environmental factors include climate, weather, geographical location, global changes in climate, environmental offsets, etc.

A similar approach has been indicatively applied in the analysis of industrial sectors of interest, such as the renewable [18–21] and conventional [22] energy industries. PESTLE analysis has often been used to analyze various problems more holistically, for example in identifying economic issues and the challenges that arise, specifically concerning the impact of fossil fuels on the environment, or the formulation of legal frameworks for the fossil fuel industry. By using PESTLE analysis, aging policies that are ineffective or inefficient can be identified more comprehensively, whereas new strategic policies can be formulated to help the development of the fossil fuel industry.

3. PESTLE Analysis

This section will discuss the detailed PESTLE analysis of the fossil energy industry. Stakeholders are hereby referred to as individuals, groups or institutions that have interests or concerns in the state of affairs within an organization or industry, and typically can affect or be affected by the organization's actions, objectives or policies.

3.1. Political

3.1.1. Policies Related to Coal Mining

Indonesia's policies have a significant effect on the development of the fossil fuel industry due to the dynamic nature of demand and supply [23–25]. An example of this was felt when the

Indonesian House of Representatives and the government, represented by the Ministry of Energy and Mineral Resources, together agreed to and enacted Law No. 4 of 2009 on Mineral and Coal Mining [26], which mandated that obligations for value-adding activities should be done by spurring the development of domestic mineral smelters. The primary aim of this law is to add value to mineral outputs produced in Indonesia. For example, the bauxite commodity can yield 30 times added value when converted from raw materials into a final product; 19 times for nickel; 11 times for copper; and 12 times for lead (value chain optimization).

In the Appendix to the State Speech of the President of the Republic of Indonesia during the 71st commemoration of the country's proclamation of independence, the President expounded on a policy course focused to fulfil domestic needs and increase the added value of mining products, as well as optimize the principles of mining conservation through various strategies. These strategies include perfecting Domestic Market Obligation (DMO) (DMO is an obligation for producers to sell a portion of their domestic production at a predetermined price (not the market price)) and Domestic non-DMO (D non-DMO) patterns, in which the government restricts the export of strategic mining products in order to ensure the sustainability of raw material supplies; forming an aligned consensus between the expansion of the industry for the processing of mining resources and the expansion of the manufacturing industry; and the geographical expansion of strategic mining product-based industries. In ensuring and supervising the implementation of national development plans, specifically in the energy and mineral resources sector, the President is assisted by the National Development Planning Agency.

In an attempt to attain energy security and independence, the Ministry of Energy and Mineral Resources, as the institution in charge of the sector, has requested coal producers to reserve a certain amount of their production for domestic consumption. In addition, the government uses export taxes imposed by the Directorate-General of Customs and Excise of the Ministry of Finance to reduce coal exports, (i.e., currently at 80 percent of the total coal production). This is implemented through the Letter of Decree of the Directorate-General of Mineral and Coal Number 1118/36/DJB/2014 [27], which changes DMO policies for supply obligations in accordance with prevailing contracts; in the event of a shortage of domestic coal supplies, there will be an assignment of suppliers.

This has implications for coal production which in 2015 was 393 million tons, (i.e., less than the year before (2014) at 458 million tons). However, the reduction of national coal production is a result of a control attempt, so that domestic utilization could increase proportionately. The allocation of domestic coal utilization in 2015 reached 20 percent, or approximately 79 million tons, with the following average DMO needs: 64 percent for PLN (National Electricity Company); 17 percent for Independent Power Producers (IPP); 2 percent for non-PLN and non-IPP power plants; 16 percent for cement, fertilizer, etc.; and 1 percent for the metallurgy industry [28]. This allocation of domestic coal use was higher than in 2014, which only reached 17 percent or around 76 million tons.

The policy to increase DMO and necessitate domestic processing and refinery has induced conflicting opinions among investors. On the one hand, it gives domestic industries the chance to benefit from multiplier effects, on the other hand, business players feel burdened due to lower domestic prices compared to selling abroad.

In addition, several problems occur in the down-streaming of mining activities: firstly, there is still a limited mastery of processing and refinery technologies; and limited infrastructure in energy and transportation is also an obstacle [7]. Apart from that, the domestic downstream industry is still not sufficiently developed to be able to absorb semi-final and final mining products. The decline in mineral commodity prices causes the economy of refinery development projects to be unattractive and impeding financial support from investors or banks is also a hindering factor. There are also other problems, such as unlicensed mining, which reduces the overall quality of mining products, environmental degradation due to poor mining and processing practices, and soaring mining permit numbers due to the poorly regulated implementation of regional autonomy and decentralization.

3.1.2. Policies Related to Oil and Gas Production

In the oil and gas industry, the Ministry of Energy and Mineral Resources is the regulator for both the upstream and downstream sectors. In conducting its task as regulator, in the upstream sector, the Directorate-General of Oil and Gas (Ditjen Migas, Jakarta, Indonesia) is assisted by the Special Task Force for Upstream Oil and Gas Business Activities (SKK Migas, Jakarta, Indonesia); whereas in the downstream sector, Ditjen Migas is assisted by the Regulatory Body for Downstream Oil and Gas (BPH Migas, Jakarta, Indonesia), which is also tasked to determine the quotas for subsidized fuel for each region according to their needs. Pursuant to President Regulation No. 9 of 2013 [29] on the Implementation of the Management of Downstream Oil and Gas Activities (Perpres SKK Migas), as well as Regulation of the Minister of Energy and Mineral Resources No. 9 of 2013 [30] on the Organization and Working Procedure of the Special Task Force for Upstream Oil and Gas Business Activities, SKK Migas implements the conduct of management for upstream oil and gas activities [31]. In undertaking its task, SKK Migas reports its results to the President through the Minister of Energy and Mineral Resources, as well as to the House of Representatives. In 2015, SKK Migas reported to the House of Representatives that crude oil production reached 788 thousand barrels per day, or 95 percent of the target agreed on by the government and Commission VII of the House of Representatives, amounting to 825 thousand barrels of oil per day (BOPD). Meanwhile, in 2015 natural gas production reached 1194 thousand barrels of oil equivalent per day (BOEPD), or 97 percent of the target of 1221 thousand BOEPD [32]. In 2015, the allocation of domestic natural gas utilization reached 59 percent or approximately 705 thousand BOEPD. This figure is higher than the previous year, which only reached 56 percent or approximately 829 thousand BOEPD.

To achieve the lifting target agreed by Commission VII of the House of Representatives and the government in a budget meeting, Contractors of Oil and Gas Cooperation Contracts (KKKS) face several obstacles: the global factor, namely a sharp decline in oil prices in early 2014 after being relatively stable at USD 100 per barrel for 3.5 years, triggered by oversupply and a stagnation of the global economy, has induced postponement of investments. KKKS also faces geological problems, wherein there is a sharp natural decline rate of approximately 29 percent [33]. KKKS is also hampered by several subsurface difficulties, such as operational difficulties, difficulties in land-clearing and permits, difficulties in procurement, low domestic absorption of gas purchases, and difficulties in managing working areas (Wilayah Kerja/WK), especially for working areas that are approaching the end of their contract periods.

With regard to the low domestic absorption of gas purchases, the government released Economic Policy Package Volume III [34] targeting a reduction of natural gas prices for industries through a President Regulation on the determination of natural gas prices, in effect since 1 January 2016 [35], which asserted that: the Minister of Energy determines the price of natural gas for the domestic market in the event that natural gas prices according to the existing economic conditions do not fulfil the economic requirements of gas-utilizing industries, and the price of gas is higher than USD 6/MMBTU, and the mechanism for price reduction is implemented through a reduction of non-tax state revenues from sales of natural gas. Lastly, price reduction will also be implemented through the regulation of gas prices by the Directorate-General of Oil and Gas and BPH Migas at the downstream side, through the determination of a tariff for natural gas distribution which encompasses liquefaction, compression, transport through transmission and distribution pipes (the majority of which are owned by state-owned enterprises), the transport of liquefied natural gas and compressed natural gas, storage, regasification, and/or commerce and acceptable margins. This government policy has the potential to reduce gas prices by up to 30 percent [33], make the operational upstream more efficient, review the profit sharing system in order to adapt to the fluctuation of global oil prices, and reduce multiple prices due to the control of gas allocation by traders who do not necessarily have an infrastructure.

In addition, KKKS Contractors face obstacles when dealing with Provincial and Regency Governments, represented by regional Communication Forums for oil and gas producers regarding

differences in oil and gas lifting calculations, which has consequences for the Profit Sharing Fund determined by the Ministry of Finance.

The analysis presented above concerns political stakeholders related to fossil energy; however an enhanced network of relevant stakeholders has been formed for alternative fuels [36–38]. Further discussion can be found in the literature on the need for a further energy policy strategy [8].

3.2. Economic

3.2.1. Contribution of Fossil Fuels to Economy

The mining sector contains commodities that provide significant revenues to the state and economy. From 2010 to 2015, the mining sector still dominated the economy with an average contribution of approximately 28 percent per year, followed by the agriculture sector with an average of 14.9 percent per year, and the manufacturing sector with an average of 13.2 percent per year [39]. Overall, the contribution of the energy and mineral resources sector towards Indonesia's Gross Domestic Product (GDP) in 2015 was 1402 trillion rupiah, or 12.1 percent of Indonesia's total GDP (11,541 trillion rupiah) [40].

Meanwhile, its contribution towards the state budget can be seen in Indonesia's State Budget [41]. In 2014, non-tax state revenues from the mineral and coal subsector reached Rp 35.5 trillion, whereas mineral and coal investment reached USD 7.4 million. In 2015, non-tax state revenues from mineral and coal increased to Rp 55.2 trillion, whereas investment decreased to USD 5.2 million. The investment decline was caused by a decline in mining commodity prices, as well as the diminishing global investment climate over the previous few years [42].

Law No. 4 of 2009 on Mineral and Coal Mining [26] which mandates obligatory processing and refinery has spurred 67 development plans of processing and refinery facilities for various mineral types, with a total investment plan of USD 6.5 billion [43]. Up to June 2016, investment had reached USD 3.8 billion. It is estimated that by the end of 2016, there were 27 finished refinery units, comprised of 8 nickel, 2 bauxite, 1 manganese, 11 zircon, 1 lead and zinc, and 4 kaolin and zeolite facilities [44].

On the other hand, the oil and gas sector has contributed Rp 78.6 trillion of total state revenues within the 2016 State Budget (Rp 1822.5 trillion). Over the past several years, non-tax state revenues from the oil and gas resources sector experienced a downward trend due to falling global oil prices. In the 2016 State Budget, global oil prices were assumed to be USD 50 per barrel; however, early 2016 witnessed lows of approximately USD 30 per barrel.

The government continuously attempted to increase state revenues from the oil and gas sector in 2017, through five strategies that have been prepared by the government in order to stimulate state revenues from oil and gas: first, the monitoring of on-stream field expansion projects in 2017 in order to achieve predetermined timeframes (there are currently six projects ready); second, the attempt to increase oil and gas lifting; third, supporting the optimization of effective and efficient upstream oil and gas activities; fourth, the optimization of natural gas utilization for stakeholders; and fifth, the policy implementation of natural gas prices based on the policy package decreed in a Government Regulation in order to spur domestic industrial growth and recuperate the investment climate [45].

3.2.2. Impact of Global Crude Oil Prices

The investment climate for the national upstream oil and gas sector is influenced by global crude oil prices. This can be seen throughout 2010 to 2013, when the oil prices were around USD 100 per barrel, and the investment trend for the upstream oil and gas sector crept upwards to 71.8 percent or USD 18.9 billion. However, when oil prices fell in mid-2014, the investment value of the upstream oil and gas sector fell by 1 percent, becoming USD 18.7 billion and by 2015, it had fallen 20.8 percent, becoming USD 14.8 billion [46].

Meanwhile in 2016, in which the Indonesian Crude Price (ICP) for the year's first quarter reached only USD 36.16 per barrel, or lower compared to last year's USD 54.85 per barrel, oil and gas

investments fell to USD 5.65 billion. This figure is comprised of USD 5.51 billion for block exploitation, and USD 141 million for block exploration. Block exploration is then divided again into USD 107 million for exploration activities, and USD 34 million for administrative activities.

However, the fall of oil prices actually helped Indonesia's trade balance. The Ministry of Trade, as the regulator of Indonesian export and import, issued a press release in March 2015, stating that "the export total for the month of February 2015 reached USD 12.3 billion while imports reached USD 11.6 billion. Therefore, a USD 738.3 million was achieved" [47]. This surplus was caused by the fall of imported oil and gas by up to 18.7 percent (month to month), whereas oil and gas exports only fell by 8.8 percent (month to month) [48]. In its attempt to supervise the export and import of oil and gas and to realize national energy management, transparency, and eradication, the Ministry of Trade released Regulation of the Minister of Trade Number 03/M-DAG/PER/1/2015 [49] dated 5 January 2015. This regulates stringency and supervision in logging and documenting incoming and outgoing oil and gas, by necessitating registration for exporters and importers in order to obtain Listed Importer and Listed Exporter status, as well as to obtain recommendations from the Ministry of Energy and Mineral Resources, to be submitted to the Ministry of Trade in order to receive Letters of Export/Import Approval.

3.2.3. Cost Recovery and Resource Reserves

The upstream oil and gas sector is also acquainted with the term "cost recovery," which is a return of operational costs from exploration and exploitation activities in the upstream oil and gas mining sector that have been approved by SKK Migas, after KKKS has submitted their annual Authorization for Expenditures (AFE) and Plan of Development. These SKK Migas-approved figures then need to receive the approval of the House of Representatives, namely from both Commission VII and the Budget Committee. For the 2016 Revised State Budget, the Budget Committee determined a cost recovery budget or return of operational costs for upstream oil and gas activities of USD 8 billion. This figure is 30 percent lower than that allocated in the original 2016 State Budget (USD 11.4 billion). The cost recovery budget cutback was part of an attempt to reduce a deficit in the state budget.

This reduction could impact on the volume of oil and gas produced by contractors; with shrinking budgets, there will be a consequent reduction of exploration and exploitation activities in the upstream oil and gas sector, when in fact exploration is urgently needed in order to increase oil and gas reserves and production. This is even more so given the fact that Indonesia is currently experiencing a deficit in oil and gas production with regard to fulfilling national needs.

The lack of discovery of any new domestic oil and gas sources has caused oil and gas reserves to dwindle. Through the first quarter of 2016, oil reserves amount to only 7018 million stock tank barrels (MSTB). Gas reserves have also fallen. In the first quarter of 2015, gas reserves were recorded at 151 trillion standard cubic feet (TSCF). However, the first quarter of 2016 saw it fall to 148 TSCF.

Well drilling explorations by KKKS also show an annual decline. The Ministry of Energy and Mineral Resources recorded that in 2011, the number of exploration well drillings amounted to 107 wells. This then fell to 106 wells in 2012 and 101 wells in 2013. This figure continued to decline to 83 wells in 2014, and a mere 52 wells in 2015. Up until April of 2016, drillings only amounted to 10 wells.

3.2.4. Economic Policy Instruments

As a result of the circumstance where state revenues from the oil and gas sector have continued to decline as a result of falling oil production and prices, the government undertook a bold step by completely abolishing oil fuel subsidies, specifically the "premium" grade of oil fuel, within the 2015 Revised State Budget, from a previous subsidy of Rp 276 trillion. Oil fuel subsidies were still allocated for kerosene; there is also a special fixed subsidy for diesel fuel. In the 2016 State Budget, energy subsidies amounted to Rp 102.1 trillion, which were comprised of Rp 63.7 trillion for kerosene and

diesel fuel, 3 km liquefied petroleum gas (LPG) canisters, liquefied petroleum for vehicles (LGV), as well as Rp 38.4 trillion for electricity subsidies [50].

Several years earlier, the State Budget was heavily allocated for subsidizing the energy sector. In the 2014 State Budget, subsidies for oil fuels and electricity reached the highest figure ever recorded in State Budget history, namely Rp 350.3 trillion, which consisted of Rp 246.5 trillion for oil fuel subsidies and Rp 103.8 trillion for electricity subsidies. These subsidies were a heavy burden on the State Budget's position. Meanwhile, capital expenditure budgets were considered to be negligible, particularly for infrastructure, thus affecting investment levels in the real sectors.

This was caused by significant potential ramifications from changes in oil prices. For example, in the transportation sector, a 16 percent reduction in diesel fuel prices will cause a 5–10 percent fall in transportation costs, whereas a 16 percent increase in diesel fuel prices will cause a 20–30 percent increase in transportation costs. In the logistics and food sector, a 3.5 percent decrease in oil fuel prices will cause the price of basic commodities to decrease by 0.1 percent, whereas a 16 percent decrease in diesel fuel prices will cause a 1–2 percent decrease in logistical costs. However, an 8 percent increase in oil fuel prices will cause basic commodity prices to increase by 2 percent; an 8 percent decrease in oil fuel prices will cause a 0.04 percent deflation, whereas an 8 percent increase in oil fuel prices will cause a 2.8–3 percent inflation [51].

3.2.5. Investments in the Energy Supply Sector

As the central bank, Bank Indonesia is also a stakeholder within the oil and gas industry. In 2015, Bank Indonesia released a Regulation of Bank Indonesia (BI) Number 17/3/PBI/2015 [52] on Obligations on the Use of Rupiah in Territories of the Unitary State of the Republic of Indonesia. However, BI made an exception for transactions of goods and services in upstream oil and gas activities. Working contracts between oil and gas companies and domestic vendors are still permitted to use foreign currency; however, payment must be done in rupiah. In this case, SKK Migas cooperated with three national state-owned banks to provide exchange rate transaction services for payment contracts between oil and gas companies and vendors.

In the electrification sector, the Directorate-General of Electricity and Energy Utilization recorded that in 2015, the national electrification ratio reached 87.5 percent; a 4 percent increase from 2014, which was at 84.1 percent. Furthermore, electricity consumption per capita increased by 843 kWh from that of 2014. Meanwhile in 2015, increases in power plant capacity reached 2464 MW, higher than 2014, which was at 2320 MW. The results of these developments were part of an infrastructure development acceleration program devised by the government. This acceleration program is aimed to increase competency, as well as fulfil rising electricity supply needs. This program is comprised of the construction of 7.4 GW ongoing power plants and 35.5 GW of new power plants, as well as related transmission and distribution networks, targeted for completion between 2015 and 2019. An interesting case study on costs of electricity investments for Indonesia can be found in Reference [53].

Throughout 2015, the electricity sector dominated investment plans that went to the Investment Coordinating Board (BKPM). BKPM recorded Rp 707.37 trillion of principle license applications in the electricity, gas, and water sectors throughout 1 January–28 December 2015, or 37.51 percent of total incoming investment plans during that period (Rp 1886 trillion); this figure increased 45.29 percent from principle license applications in 2014, reaching Rp 1298.1 trillion [54]. The high figure of investment plans in the electricity sector attests to enthusiasm among investors in embracing the government programme to build 35,000 MW in the next five years. In the long run, investment in the electricity sector could support the expansion of investments in other sectors, through the availability of electricity resources and adequate infrastructure.

The 35,000 MW megaproject, to be supplied by coal, gas, and renewable energy sources, requires at the least USD 73 billion of investment funds, not including budget requirements for land clearing, interest during construction as well as taxes. If consistently implemented, the 35,000 MW programme could have multiple effects, such as being able to directly absorb a 650 thousand workforce,

and indirectly a 3 million workforce. Domestic component levels could also rise by 40 percent out of total investments, or USD 29.2 million [55].

One attempt to spur investments in the electricity sector is to increase coordination between stakeholders such as related ministries and institutions, specifically the Ministry of Energy and Mineral Resources, and PT PLN (the State Electricity Company) as the electricity off-taker for the public. Licensing reforms have started to bear fruit. BKPM and other ministries have succeeded in cutting back permits in the electricity sector, from 49 permits requiring 923 days for administrative handling, to 25 permits in 256 days. In addition, the government also gives tax allowance facilities for investment in the electricity sector, with a guaranteed 28 days in processing requirements and time through the Central One-stop Integrated Service (PTSP Pusat) at BKPM. Apart from the Ministry of Energy and Mineral Resources, the Ministry of Agrarian Affairs and Spatial Planning has also interactively coordinated with BKPM on the Central One-stop Integrated Service, in order to mitigate obstacles to incoming investments in the real sectors. Some interesting work on business models for the development of energy investments in Indonesia can be found in [56]. It is important to state that for the evaluation of different investments, systematic life cycle costing models should be employed such as the one presented in [57].

3.3. Social

3.3.1. Impacts of Fossil Energy Extraction

Fossil energy extraction in Indonesia has had significant impacts on the Indonesian people, especially around areas of operation. For example, in 2015, South Kalimantan's economic growth rate decreased from the previous year, from 4.85 percent to 3.84 percent. This growth rate is lower than the national growth rate, which reached 4.84 percent in 2015 [39]. South Kalimantan's deteriorating economic growth was caused, among others, by impacts from stagnating global economic growth, especially in China, as well as the decline of several commodities in the international market, including mineral and coal prices. These also directly caused the growth rate of the mining sector to register negative figures.

In addition, fossil energy extraction can potentially instigate problems, including large-scale deforestation [58], air pollution, concession conflicts with local and indigenous communities, as well as adverse health impacts from coal dust. In addition, many cases of conflict occur in regions of small-scale miners, such as in Bangka-Belitung, Kalimantan, and Maluku Utara; these cases are usually related to the ambivalent understanding of small-scale mining itself. Consequently, all forms of mining activities are undertaken by communities; any region with active, whether simple or heavy, machinery can claim to be locations of small-scale mining enterprises.

3.3.2. Initiatives for Further Social Development

In the upstream oil and gas industry, based on Law No. 22 of 2001 on oil and gas [59], the implementation of oil and gas business activities are aimed to, among others, create job opportunities, increase levels of public welfare and wealth that are both fair and equitable, as well as continue to safeguard biodiversity. This can be seen in data from SKK Migas, which shows that absorption of the Indonesian workforce has continued to increase concurrently with an increase in the number of Contractors of Oil and Gas Cooperation Contracts (KKKS) who conduct explorations in new and existing oil and gas working areas. Up until the end of 2014, the upstream oil and gas sector absorbed 32,292 members of the Indonesian workforce, compared to 1165 foreign workers (3.6 percent). This means that percentage-wise, the number of national workers in the upstream oil and gas industry has reached 96.4 percent [60]. Regarding the utilization of foreign workers, KKKS need to consult and comply with prevailing regulations concerning labor standards from the Ministry of Labor and SKK Migas.

3.4. Technological

In order to optimally harvest and convert energy from fossil sources, employing state-of-the-art technologies and engineering practices stands as a necessary condition. This section presents in a generic way the relevant methods, namely clean coal and enhanced oil recovery.

3.4.1. Clean Coal Technologies

Considering the environmental impacts from gas emissions from coal usage, as well as the unavoidable utilization of coal to fulfil rising energy needs, the implementation of technology to reduce pollutants from coal usage needs to be considered. This technology is usually referred to as Clean Coal Technologies (CCT). A comprehensive presentation of CCT can be found in Reference [61]. This technology can be classified based on the level of energy production processes in its implementation, which encompasses technology for pre-combustion, combustion, post-combustion, and coal conversion. In pre-combustion technologies, coal needs to first be cleaned; the primary aim of this cleaning process, which occurs before combustion, is to reduce or remove waste, especially sulphur contents which are organically unbounded to coal. Coal cleaning can also improve the amount of heat recovered, thus increasing heat generation efficiency. Traditionally, pre-combustion coal cleaning technologies consists of two methods, namely physical cleaning and chemical cleaning. Meanwhile, new methods for coal cleaning encompass biological cleaning, which are developed concurrently with advances in microbe and enzyme techniques in order to release sulphur and ash from the coal [62].

Combustion technologies encompass techniques which also prevent pollutant emissions during the combustion process. Coal cleaning during combustion removes emissions from coal when the coal is being combusted. This can be achieved through control of combustion parameters such as fuel, air or oxygen, and temperature. Several techniques are used to remove SO_2 emissions or to limit NO_x during combustion, which concurrently can improve heat efficiency. There are several technologies available, such as Furnace Sorbent Injection (FSI) and Pressurized Fluidized Bed Combustion (PFBC). Meanwhile for post-combustion technologies, waste gas released from the boiler is given treatment to reduce pollutant contents. All new implemented post-combustion technologies, such as gas cleaning to reduce SO_2 and NO_x emissions, as well as dust particles (in several cases) simultaneously from smokestacks, are still being developed. These CCT encompass, among others, Flue-gas Desulfurization (FGD), Regenerable Flue-gas Desulfurization Systems and Selective Catalytic Reduction (SCR). Lastly, coal conversion is the conversion of coal into a gas or liquid form which can be cleaned and used as fuel. Other CCT are coal conversion technologies which first convert coal from its solid form into other forms such as gas or liquid. These technologies are still in the trial and development phase. Technologies for developing the coal conversion process encompass, among others, Integrated Gasification Combined Cycle (IGCC) and Integrated Gasification Fuel Cell (IGFC) [63]. An interesting case study of coal substitution for a specific industry in Indonesia can be found in Reference [64].

Concerning global implementation of technologies for coal liquefaction, South Africa is ranked as number one—much of this can be observed in R&D for indirect coal liquefaction; currently, South Africa supplies approximately a third of its domestic liquid fuel needs from coal (Coal to Liquid, CTL). China is also experiencing growth in coal liquefaction as a technique to utilize overabundant coal reserves and reduce its dependency on imported oil [65].

3.4.2. Enhanced Oil Recover

In the oil and gas industry, Indonesia's oil production has taken place for almost a century and a quarter since the first drilling discovery at the Number 1 Telaga Tunggal well in 1885, at the concession area in Telaga Said, Tanjung Pura, Sumatera Utara. Indonesia experienced its peak productions in 1977 and 1995. Peak production in 1977 was the highest level of production from primary recovery, whereas peak production in 1995 was the result of the implementation of the EOR (enhanced oil recovery) method through steam injection at the Duri field by a KKKS, namely Chevron. This project's

field-scale development started in 1985. From 1995 to 2010, Indonesia's oil production continued to decline. Starting from 2007, the rate of decline managed to be mitigated due to contributions from new fields, namely Banyu Urip by Exxon and the state-owned Pertamina. This is in accordance with basic principles introduced by King Hubbert in the 1950s, which stated that production will gradually continue to rise until the highest attainable peak, at which point production will decline until resources run out [66]. This indicates that increasing Indonesia's oil production, or attaining the third Hubbert cycle, is only possible with massive implementation of EOR technology, or with adequately large discoveries of new oilfields.

The EOR method is classified into four main categories; first is chemical flooding. Chemical fluids which are most often used are polymer, surfactants, and alkaline, or a mixture of two or three of these chemicals. In polymer injection, a typical solution of hydrolyzed polyacrylamide with water formation in concentrations of several hundred to thousand ppm of polymer is injected to push oil into production wells. The second method is miscible gas injection; miscible gas injection is a process of oil displacement by fluids which will mix with oil to form a special condition at the reservoir. The third method is the thermal method. The process of oil recovery through the thermal method is primarily applied in reservoirs which contain heavy oil with high viscosity. Heat can be supplied from outside the reservoirs through steam injection or hot water, or can be generated inside the reservoir itself through combustion. Well-recognized external thermal injections are hot water injection or steam injection; these two injections primarily serve to reduce oil viscosity in order to improve the oil's mobility [67]. The last method used is microbial enhanced oil recovery (MEOR); this method is an EOR technology that does not require large investments. Unfortunately, the credibility of this technology has not been fully acknowledged by the oil industry due to technical and economic reasons [68].

3.4.3. Other Technologies

Energy storage technology is another sector of oil and gas technology that is sorely needed to ensure energy security. In Indonesia, this is inevitably tied to its energy policy: Indonesia does not currently have a strategic petroleum reserve and only has enough fuel to last 21 days. A strategic petroleum reserve would potentially boost Indonesia's fuel reserves to more than 40 days. Within the current stakeholder framework, a strategic petroleum reserve would possibly involve Pertamina, the state oil company. Pertamina would then have to construct and utilize storage tanks with the specific purpose of stockpiling for its petroleum reserve. Further comparative studies must be undertaken in this field in order to acquire both technical and political know-how from countries who have already succeeded in implementing strategic petroleum reserves, such as the United States with its 713.5 million barrel-capacity strategic petroleum reserve in underground salt caverns. Further up-to-date literature on industrial applications of energy storage can be found in References [69–71].

Although this section has focused on relatively conventional technologies, it should be noted that increased demand and energy security will be achieved from a mix of technologies taking advantage of the great potential of Indonesia. This includes advanced technological developments in the biofuels sector [72,73] as well as utilization of the geothermal energy [74] potential, where Indonesia is among the countries with the highest recovery potential globally.

3.5. Legal

The 1945 Constitution of the Republic of Indonesia, Article 33, paragraphs (2) and (3) [75], asserts that sectors of production which are important for the country and affect the life of the people shall be under the powers of the state and shall be used to the greatest benefit of the people. Oil and gas, being strategic non-renewable natural resources that are vital commodities affecting the life of the people, must therefore be controlled and managed optimally by the state, in order to provide the largest benefits for the well-being and welfare of the people.

3.5.1. Legislation on Mineral and Coal Mining

The mandate of the Mineral and Coal Mining Law, which includes processing and refinery, is also regulated in the Industry Law, wherein the construction of every smelter must possess an Industrial Business License; this is compliant with the mandate contained in Article 101, paragraph (1) of the Industry Law [76], which states: "Every industrial business is required to possess an Industrial Business License". These businesses encompass small, medium, and large industries. To date, the requirement for processing and refinery industries to possess a Mining Business License Exclusively for Processing and/or Refinery has bewildered investors in the processing and refinery of minerals and coal, due to overlapping authorizations between the Ministry of Energy and Mineral Resources and the Ministry of Industry. Therefore, there needs to be a One-stop Integrated Service (PTSP) to elucidate and simplify this licensing process.

With regard to share divestment, Article 3, letter (d) of the Law on Capital Investment [77] states that the implementation of capital investment is based on the principles of equal treatment and does not discriminate based on national origin, which is strengthened further in Article 6 paragraph 1 of the aforementioned law, which states that the government provides equal treatment to all investors. The matter of sovereignty and independence certainly has a strong influence in relation to equal treatment between domestic and foreign investors; the potency of foreign capital clearly affects competition for the control of businesses. On the other hand, this term gives legal assurance and guarantees for foreign investors to freely participate in capital investments, which are realized in various businesses, including oil and gas. However, in Article 7, paragraphs 1 and 2, the Law on Capital Investment is still open to the possibility for returning foreign shares through nationalization or acquisition of the ownership rights of investors. This is related to Article 79 letter (y) of the Law on Mineral and Coal Mining [78], which necessitates Special Production Business Licenses to accommodate divestment. Article 112 of the Law on Mineral and Coal Mining furthermore reasserts that after five years of production, businesses that possess Production Business Licenses and Special Production Business Licenses and whose shares are foreign-owned must divest their shares to the central government, regional government, state-owned enterprises, regionally-owned enterprises or national private businesses.

The policing of mining activities continues to be undertaken, and since 2014 the Corruption Eradication Commission has cooperated with the Ministry of Energy and Mineral Resources in coordinating and supervising the management of mineral and coal mining. Based on coordination and supervision activities, up to May 2016 there have been 10,378 Mining Business Permits issued in the entirety of Indonesia (6790 mineral mining permits and 3588 coal mining permits). From this figure, 6790 Mining Business Permits have Clean and Clear status (61.25 percent of total Mining Business Permits), whereas the rest are still problematic with regard to overlapping areas and administrative issues. This attempt has provided a breakthrough for state revenues. From the first quarter of 2014 to October 2014 in the Mineral and Coal Coordinating and Supervision action, there has been an increase in non-tax state revenues by Rp 7 trillion, and as many as 1254 Mining Business Permits have been revoked in 22 provinces [79].

3.5.2. Legislation on Oil & Gas Production

Given their status as natural resources that can be used for the greatest benefit of the people, the management of oil and gas also complies with the system of the organization of the national economy, which is conducted on the basis of economic democracy upholding the principles of togetherness, efficiency with justice, continuity, environmental perspective, self-sufficiency, and keeping a balance in the progress and unity of the national economy, as elucidated in Article 33, paragraph (4) of the 1945 Constitution of the Republic of Indonesia.

The Law on Oil and Gas has incited legal matters in its implementation. This law has been through three assessments at the Constitutional Court. The Constitutional Court's three decrees on this law represent two important issues in the 1945 Constitution; the first concerns the system of

implementation or management of oil and gas, whereas the second concerns institutions that manage oil and gas as implementation of the concept of state control. The Decision of the Constitutional Court No. 002/PUU-I/2003 [80] dated 21 December 2004 deals with the system of management for oil and gas, which, according to the Court, conflicts with the 1945 Constitution; there is also the Decision of the Constitutional Court No. 36/PUU-X/2012 [81] concerning institutions for the management of oil and gas.

The Decision of the Constitutional Court No. 002/PUU-I/2003 [80] overrules Article 2 paragraph (3), Article 22 paragraph (1), and Article 28 paragraphs (2) and (3) of the Law on Oil and Gas [82], due to their conflicting with Article 33 paragraphs (2) and (3) of the 1945 Constitution; thus, the aforementioned overruled articles no longer have binding legal force. The Decision of the Constitutional Court No. 36/PUU-X/2012 has also overruled several articles and/or paragraphs within the Law on Oil and Gas. The Constitutional Court is influential in the disbandment of the state upstream oil and gas regulator (BP Migas). Based on this Decision, the Law on Oil and Gas requires amendments, especially concerning overruled articles as well as related articles that have implications for changes to the overruled articles.

Several terms within the articles overruled by the Constitutional Court in the Law on Oil and Gas place the state (government) in a weak position. The standing of the state upstream oil and gas regulator (BP Minyak dan Gas Bumi), as regulated in the Law on Oil and Gas, positions the government—in this case, BP Minyak dan Gas Bumi—as equal to upstream oil and gas businesses. This has given rise to legal relations between the government and businesses (Government to Business). It is this practice that the Constitutional Court viewed as demeaning the government's status.

The Law on Oil and Gas is perceived to have contributed to the mismanagement of Indonesia's natural resources, which has made the oil and gas industry fail to be the backbone of national energy security. This is marked by, among others, misdirected fiscal regulations, the establishment of a new and complicated chain of bureaucracy, inefficient operational costs (cost recovery) and corruption, the decline of nationalist self-esteem in oil contracts, as well as oil and gas policies that lack road maps. This, among others, has caused the decrease in oil and gas lifting, especially since 2004.

Some of the aforementioned problems call for the urgent need to revise the Law on Oil and Gas. One issue that is discussed in the revision of this Law is the form of business contract for oil and gas [83]. In oil and gas management from around the world, there are four types of business contracts that are typically used: Concession Contracts, Production Sharing Contracts, Service Contracts and Joint Operating Agreements. These business contracts are formulated to fulfil the interests of two parties, namely the State as the proprietor of energy sources, as well as contractors.

3.6. Environmental

In an attempt to support sustainable national development, one of the aims of oil and gas resource management is to ensure the utilization of oil and gas mining in a sustainable manner from an environmental, social and economic point of view [84]. In conducting environmentally sound oil and gas management, mining businesses must observe environmental sustainability. Literature presenting the current situation and supporting the formation of future strategies for Indonesia and neighboring countries has started to form a good body of knowledge as shown in [85–87].

3.6.1. Permits for Planning and Operation

Before commencing any mining business or activity, Mining Business Permit and Special Mining Business Permit applicants must conduct a study on the large and important ramifications of a business or mining activity, which is then proven through an Environmental Impact Assessment document. In operating a business or mining activity, Mining Business Permit and Special Mining Business Permit holders must undertake reclamation and post-mining activities, which are conducted throughout the entire mining business cycle, in order to organize, restore, and rehabilitate the quality of the environment and the ecosystem so that these can continue to function. After a portion or the entirety of a mining business is carried out, holders of Mining Business Permits or Special Mining Business

Permits must conduct post-mining activities which are planned, systematic and continuous, in order to restore environmental functions and social functions according to local conditions throughout the entire mining area.

In reality, mining permits are given without considering Strategic Environmental Assessments. This has implications for environmental degradation, which causes the loss of livelihood for communities that depend on the land (agriculture, fish farming) [88]. Environmental Impact Assessments are often copied from other Environmental Impact Assessment documents which do not depict accurate conditions on the ground. The publishing of these documents involves only specific people to legitimize them, giving rise to a purely ceremonial impression. Many communities around mines are unaware of the activities or ramifications of existing mining businesses. These problems occur due to a lack of supervision from the Regional Government regarding the publishing of Environmental Impact Assessments. There are few instances of attempts to ensure repercussions for companies that violate the conditions of these environmental licenses.

To date, the Environmental Impact Assessments have not been continuously monitored and evaluated. To strengthen Environmental Impact Assessments, there should be continuous monitoring and evaluation conducted in the form of environmental and social audits by mine inspectors, so that Environmental Impact Assessments are not merely administrative documents that are unassessed and without continuous supervision.

In the Appendix to the State Speech of the President of the Republic of Indonesia during the 71st commemoration of the country's proclamation of independence, the President urged an increase in strict supervision, especially concerning reclamation and post-mining activities, through the assignment of mine inspectors to monitor mining pursuant to Law No. 23 of 2013 on Regional Governments [89], wherein authorization for licensing was shifted from the regency government to the provincial government as the representative of central government.

3.6.2. Impact in Environmental Resources

Apart from problems with Environmental Impact Assessments, there is also contamination and environmental degradation, especially in open-access land, i.e., land that is openly accessible for other parties to exploit it illegally, thus having the potential to cause contamination and environmental degradation. Open access is due to inadequate supervision or even a lack of concern from various parties. One form of utilization of open access land is for unlicensed mining. There are thousands of unlicensed mining locations which involve approximately 2 million miners.

In Law No. 32 of 2009 on Environmental Protection and Management, Article 112 [90] regulates that every authorized official who inadvertently fails to conduct supervision on the compliance of accountable business actors, and/or on environmental activities and licensing, which then causes environmental contamination and/or degradation that causes loss of life, can be threatened with custody or a fine. In several regions, unlicensed mining has caused environmental contamination and degradation, social conflict and even fatalities.

In the upstream oil and gas industry, there are several forms of pollution; first is air pollution, for example hydrocarbon gas which occurs in oil and gas exploitation activities. Hydrocarbon gas consists of methane (CH_4), ethane (C_2H_6), propane (C_3H_8), isobutane (i-C_4H_{10}), butane (C_4H_{10}) and pentane (C_5H_{12}). Aromatic hydrocarbons, including benzene, toluene and xylene are generally found in crude oil. These gases generally originate in oil and gas wells from oil and gas exploitation activities, thus designating them as natural gases. These hydrocarbon gases have a carcinogenic nature, which means that they can induce cancer in humans. In addition, there is also hydrogen sulphide gas (H_2S) which is an associated gas that releases together with hydrocarbon gases from oil and gas wells, which emerges due to oil and gas exploitation activities. Hydrogen sulphide (H_2S) is a colorless gas that is heavier than air, extremely toxic, corrosive and pungent. Another example of gas is carbon dioxide (CO_2), an inert and associated gas that releases together with natural gases, that emerges due to oil and gas exploitation activities, also as an inert gas from geothermal activities. In addition, CO_2 is

a pollutant from emissions produced from fuel combustion, both industrial- and transportation-related. It is a colorless and odorless gas that can reduce the heating value of natural gases. If combined with the presence of water, it will form a corrosive molecule. Also, CO_2 is the primary contributor to global warming. A review of possible scenarios for CO_2 reduction in Indonesia can be found in Reference [91] while a review of policy and regulations has been performed in Reference [92].

Apart from air pollution, industrial activities have the potential to pollute water. This can occur from drilling waste, such as mud residues that are the result of oil and gas exploration. Drilling waste also has the potential to affect the quality of surface water near exploration areas. Water from mines or oil wells that is still mixed with crude oil and gas that is carried to the surface from strata that contain hydrocarbons throughout the extraction of oil and gas, have contained within them formation water, injected water and chemicals that are added for drilling or for the separation of oil and water.

3.6.3. Governance and National Targets

Article 40 of the Law on Environmental Protection and Management [93] states that permits are required by businesses carrying out activities that potentially impact on the environment. In the event that an environmental permit is revoked, business and/or activity permits are also revoked. If a business and/or activity undergoes a change, those in charge of the business and/or activity must renew their environmental permits.

In addition, there is the issue of government supervision over holders of Mining Business Permits. The government is not only authorized to release permits, but also to supervise previously released ones. Government supervision encompasses, for example, pressuring those in charge of businesses and/or activities to conduct environmental audits in order to increase environmental performance, as regulated in Article 48 of the Law on Environmental Protection and Management.

The central and regional governments are obliged to compile Strategic Environmental Assessments to ensure that the principles of sustainable development are fundamental and integrated into the development of a region and/or policy, plan and/or programme. For this reason, the central and regional governments must integrate Strategic Environmental Assessments into the formulation or evaluation of a regional spatial plan along with detailed plans, long-term development plans, and mid-term development plans for the national, provincial and regency/municipality levels, as well as for policies, plans and/or programmes that can potentially cause environmental impacts and/or risks (Article 15 of the Law on Environmental Protection and Management).

In its connection to air pollution, Indonesia's development is aimed towards a low carbon future. Currently, Indonesia's greenhouse gas emissions are estimated to be 1800 $MtCO_2e$, 400 $MtCO_2e$ higher than required by 2020 (SNC), with the following composition: 63 percent is derived from land-use change in peatlands and forest and land fires, whereas 19 percent is derived from the use of oil fuels. What needs to be noted is that in 2000, the energy sector contributed 30 percent of total greenhouse gases, rising to 35 percent in 2012 [94].

Responding to this, the President has decreed two presidential regulations, namely President Regulation No. 61 [95] of 2011 and President Regulation No. 71 [96] of 2011, and also determined a national target for greenhouse gas reductions at 26 percent (unconditional) and 41 percent (conditional) by 2020 as opposed to Business As Usual (BAU). The same was stated by the Minister of Environment and Forestry at COP-21, which became the Intended Nationally Determined Contribution (INDC), and is in the process of becoming the Nationally Determined Contributions (NDC).

4. Discussion

Southeast Asia, specifically the Association of Southeast Asian Nations (ASEAN) has put its mark on the map in regards to global energy supply and consumption. In the past 15 years, the ten member countries of ASEAN have seen their energy demand grow by up to 15%; the International Energy Agency forecast in "Southeast Asia Energy Outlook 2017" that Southeast Asia's energy demand will rise by two-third in the period to 2040. The report also highlighted that, collectively, the ten

member states of ASEAN are the world's seventh-largest economy and the fifth-largest destination for foreign investment in 2016. ASEAN's energy demand has increased by 70% since 2000, and the region currently contributes 5% of total global demand. Despite the various geographic and economic differences, ASEAN countries as a whole are united in the fact that they face a common challenge: secure, affordable, and sustainable energy.

The history of ASEAN's economic cooperation in the field of energy can be traced to 1997, when ASEAN countries adopted a vision on energy cooperation called ASEAN Vision 2020. Among others, the vision highlighted the need for improved energy cooperation through integrated energy infrastructure projects such as electric grid interconnections and transnational natural gas pipelines. In 1999, ASEAN then formulated an ASEAN Plan of Action for Energy Cooperation (APAEC) 1999–2004, which has since been updated with versions for 2004–2009 and 2010–2015. APAEC's primary objectives encompass energy security, accessibility, and sustainability for the ASEAN region. The latest version of APAEC (2010–2015) lists seven main energy cooperation program areas, namely: (1) The ASEAN Power Grid (APG); (2) The Trans-ASEAN Gas Pipeline (TAGP); (3) Coal and Clean Coal Technology; (4) Energy Efficiency and Conservation (EE&C); (5) Renewable Energy; (6) Regional Energy Policy and Planning; and (7) Civilian Nuclear Energy.

As an ASEAN member state, Indonesia plays a vital role in realizing regional energy security aspirations. For example, demand for natural gas in the ASEAN region is expected to increase by 60% by 2040 due to rising consumption in power generation and industry. Consequently, Indonesia's progress in securing the East Natuna natural gas field is pivotal for the region if, in accordance with APAEC provisions, more integrated natural gas infrastructure is expected to be developed. Further discussion on the context of energy supply security can be found in [97–99].

The stakeholders identified through the PESTLE analysis and who are involved in the fossil fuel industry are listed in Table 1. Knowledge of relevant stakeholders within the oil and gas industry can be used as a reference when formulating new policies, because it can enhance the understanding of the implications of new policies towards the stakeholders involved. For example, if the government, through the Ministry of Energy and Mineral Resources, decides to postpone down-streaming, this can cause investors who had previously planned to invest their capital in the construction of smelters to postpone their decisions. This is also an indication of the importance of stability and government consistency in policy implementation, so that investors can adjust their IRR with initial plans.

This can be achieved by creating a balance between the needs of regulators that represent the interests of the state, the mandate of the constitution as well as prevailing laws and regulations, and the needs of investors that can also open up new jobs and bring in technology that is mutually beneficial, given the need for investment in the energy sector, both in the construction of infrastructure and to increase the production of oil in order to attain energy security.

Stakeholder's policies can become problematic if these policies do not comply. An example is the authorization of the Ministry of Energy and Mineral Resources by the Ministry of Environment and Forestry concerning matters of land usage permits; this is because companies that receive Licenses to Operate from the Ministry of Energy and Mineral Resources are not necessarily ensured to obtain permits from the Ministry of Environment and Forestry.

Furthermore, there needs to be a paradigm shift from previously-held views that the management of fossil energy is in order to produce profit, to being an 'engine' of economic growth. The regulations will also need to be revised to embrace the transition from a fossil fuel economy to a non-fossil fuel economy, owing to Indonesia's dwindling fossil energy resources.

Utilizing the PESTLE-based topological overview as it is summarized in Table 1, it is possible to identify and map the involvement of stakeholders involved in the fossil energy industry in Indonesia. This map highlights all the relevant stakeholders and their influence in the six PESTLE-based sectors that constitute the fossil energy industry. In addition, to identify the extent of the stakeholder roles within the PESTLE framework, the table also serves to depict the importance of strategically aligning the stakeholders' policies to the needs of other relevant stakeholders.

Table 1. Stakeholders of the fossil energy industry in Indonesia.

Stakeholders	Political	Economic	Social	Technology	Environment	Legal
Commission VII of the House of Representatives of the Republic of Indonesia	√				√	√
Budget Committee of the House of Representatives of the Republic of Indonesia		√				
President of the Republic of Indonesia	√				√	
Ministry of Energy and Mineral Resources	√	√				
Ministry of Labor			√			
Ministry of Environment and Forestry					√	
Ministry of Agrarian Affairs and Spatial Planning		√				
Ministry of Transportation			√			
Ministry of Maritime Affairs and Fisheries					√	
Ministry of Finance		√				
Ministry of Trade		√		√		
Ministry of Industry	√					√
National Development Planning Agency	√					
Corruption Eradication Commission						√
Finance and Development Supervisory Agency						√
Supreme Audit Agency						√
Bank Indonesia (Central Bank)	√	√				
Constitutional Court						√
Investment Coordinating Board		√				
Special Task Force for Upstream Oil and Gas Business Activities	√		√			
Directorate-General of Electricity and Energy Utilization		√				
Directorate-General of Mineral and Coal	√					
Directorate-General of Oil and Gas	√					
Regulatory Body for Downstream Oil and Gas	√					
Directorate-General of Customs and Excise of the Ministry of Finance	√					
State-owned Enterprises	√	√				
Regionally-owned Enterprises	√	√				
National Banks		√				
Regency Government				√	√	
Provincial Government				√	√	
PLN (State Electricity Company)		√				
Contractors of Oil and Gas Cooperation Contracts	√		√	√	√	
Investors	√					
NGOs					√	
Communication Forum of Oil and Gas Producing Regions		√				
Natural Gas Traders	√					
Public			√			

While it is not institutionally limited in the scope of its sampling, the table represents the various government ministries and bodies, investors, NGOs, private contractors, business actors, traders, as well as the entire public. Thus, this allows an intervention into the question of who might be affected, either positively or negatively, from such policies relevant to the fossil fuel energy industry. It is, however, perhaps too early to tell the limits of its practical application in Indonesia; any integration or intervention using a PESTLE approach would entail having to first identify suitable enablers for policy formulation, particularly within the turbulent seas of market data and political forecasting. It should be noted that a limitation of application of this method in this paper, lies in the fact that review has been based mainly on review of regulations, academic papers and reports for Indonesia. At a next level, a series of structured interviews across the six macro-economic sectors could provide further insights on the actual application and applicability of the various policies that are in place.

Aside from the necessarily fundamental and crucial purpose of policymaking, further contextually-specific analyses can serve the interests of the general public in ways that go beyond the formalistic legal framework. NGOs and other elements of society concerned with the social or environmental issues associated with the fossil energy industry can also be formulated through a holistic plan of action. Lastly, private investors and business actors can also discover the extent of the web of stakeholders in order to better endorse the business process.

5. Conclusions

PESTLE analysis has been carried out in this paper in order to identify relevant stakeholders and their complex relationships within the fossil energy development sector and to map relevant existing policies. It also provides a clear picture of the environment and circumstances the stakeholders are operating in, enabling the monitoring of various factors that may have an impact. The identification of relevant stakeholders within the fossil energy sector is thus useful to support policy makers in formulating new energy policies and help recognize the implications of these new policies to the stakeholders involved.

PESTLE allows a more holistic analysis of various challenges faced by the fossil energy industry to be carried out. The multi-faceted approach can potentially reveal the policies that are ineffective and uphold the development of new strategic public policies.

From the political, economic, social, technology, legal and environmental aspects of the analysis, it is evident that the development of public policy in fossil energy in Indonesia requires a close collaboration between the central and regional governments. This is crucial as any irregularities and discrepancies as a consequence of a change in the policy would need to be quickly detected. The government also needs to be more receptive in anticipating the potential impacts of the policies in their entirety so as to prevent the policy being executed in stand-alone manner.

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