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Energy Security in Indonesia

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Abstract

The issue of energy security has been a subject of discussions in Indonesia for a long time. However, until the end of the 1990s, it had never been at the centre of the country's policy debates. The sharp depreciation of Rupiah during the 1997/98 Asian financial crisis and increase in the price of crude oil in the early 2000s made it very expensive to control domestic prices of fuel and electricity through subsidies. With approximately 43 percent of the country's energy sources derived from crude oil, the amount of government spending on energy subsidies increased from almost nothing in 1996 to approximately 21 percent of total government expenditure in 2005. Whether the government could guarantee Indonesia's energy needs at an affordable price, and how to achieve it, has therefore become one of the hottest policy issues. This paper probes reasoning behind the current energy security policies and discusses some of the main policy challenges, paying special attention to the emerging interest on climate change issues.

Keywords: energy, climate change and Indonesia.

JEL: Q40, Q54, O20

I. Introduction

Indonesia, spread over more than 17,000 islands and with a population of approximately 230 million in 2008, is the world's largest archipelago and the fourth most populous nation. It stretches along the equator for about six thousand kilometres, approximately the same distance as from San Francisco to New York in the United States, extending roughly from 6° N to 10° S and from 95° E to 142° E between the Indian and Pacific oceans and linking the continents of Asia and Australia. The country covers an area of approximately 7.9 million km² (including the Exclusive Economic Zone area), of which only approximately 1.9 million kms² is land. Indonesia is the largest member state of the Association of Southeast Asian Nations (ASEAN), accounting for nearly 40 percent of its population and 36.5 percent of its GDP (ASEAN, 2010).

Energy wise, Indonesia consumes the equivalent of as much as 191 million tons of oil annually and this is expected to increase along with economic growth (World Bank, 2010). The Indonesian government has placed energy security as one of its policy priorities. The Indonesian Ministry of Energy and Mineral Resources states that one of its missions is to provide energy security and ensure energy independence as well as increase energy's value added that takes into account environmental issues and present the greatest benefit to the welfare of the people (ESDM, 2010). Article 3 in the recently enacted law on energy (Law No. 30/2007) states that the ethos behind managing energy in the country is to support the country's national sustainable development and energy security. However the law does not exactly define energy security. The law does mention the goals of managing energy, which are as follows:

- a. Achieving independent energy management;
- b. Guaranteeing the availability of energy in the country, both through domestic and foreign sources;
- c. The availability mentioned above is for:
 1. Supplying domestic energy demand;
 2. Supplying intermediate inputs of domestic industries;
 3. Increasing foreign reserves;

- d. Guaranteeing optimal, integrated, and sustainable management of energy resources;
- e. Efficient use of energy in all sectors;
- f. Improving energy access for low income people and those living in remote areas to improve their welfare in an equal and just way by:
 - 1. Providing support to make energy available to people on low incomes;
 - 2. Building energy infrastructure in undeveloped regions, so reducing regional disparity;
- g. Developing autonomous energy industries and services and improving human professionalism; and
- h. Protecting the environment.

Based on these goals of energy management stated in the Law No. 30/2007, most Indonesian policymakers and energy analysts talk in terms of the 4 As (availability, accessibility, affordability, and acceptability); meaning the availability of energy at all times in various forms, in sufficient quantities, that can be accessible by most people at affordable prices, and obtained in a way that is not environmentally destructive (Indriyanto, 2010).

The issue of energy security has been the subject of discussion in Indonesia for a long time. However, until the end of the 1990s, it had never been central to the country's policy debates. The turning points were the sharp depreciation of the Rupiah during the 1997/98 Asian financial crisis and the increasing prices of crude oil in the early 2000s which made it very expensive to control the domestic price of fuel and electricity through subsidies. At that time, with approximately 43 percent of the country's energy sources derived from crude oil (ESDM, 2009),¹ the amount of government spending on the energy subsidy increased from almost nothing in 1996 to approximately 21 percent of total government expenditure in 2005. Whether the government could guarantee Indonesia's energy needs at an affordable price, and how to achieve it, has therefore become one of the hottest policy issues.

¹ 10 percent from coal, 16 percent from gas, and 31 percent from other sources, mostly wood.

The issue of energy security became even more complex when in 2005 for the first time in several decades, Indonesia became a net importer of oil and in the late 2000s with the emergence of climate change issues, as Indonesia is among the top 3–5 emitters of CO₂ as a result of deforestation and forest degradation; without this aspect, it is ranked 16th or lower (Sari et al., 2007).

The Indonesian government has reacted to this energy security issue and developed policies and programs to overcome the challenges associated with meeting this energy security target. This paper will review some of the main challenges and provide some understanding of the basis for current energy security policies. To achieve these goals, this paper will firstly review trends of the Indonesian economy and its development patterns since 1970s, to provide background information on the main drivers of energy demand. Second, this paper will discuss energy supply and demand, which face issues such as declining oil and gas production and rapidly increasing domestic demand. Third, the Indonesian government's energy policies, including petroleum and electricity subsidies, will be examined. Fourth, this paper will discuss climate change issues and how concerns regarding fossil fuel greenhouse gas emissions are influencing current energy security policies. This paper concludes with some final remarks related to energy security issues in Indonesia.

II. The Indonesian Economy

For the sake of simplicity, Indonesia's 17,000 islands can be roughly divided into 5 major island-groups: Java-Bali, Sumatra, Kalimantan, Sulawesi, and Eastern Indonesia. Indonesia shares the islands of Kalimantan with Malaysia, and Papua with Papua New Guinea (Resosudarmo et al. 2000). The Java-Bali island group dominates much of the Indonesian economy, accounting for 61 percent of the total population and 61 percent of GDP (Hill *et al.*, 2008) while only occupying 7 percent of the total land area.

Indonesia has 33 provinces, with the capital province Jakarta leading the regional income per capita. Inequality among provinces is widespread, with 50 percent of the national GDP contributed by the three big provinces of Java: Jakarta, West Java, and East Java. In 2004, the ratio of per capita GRP (gross regional domestic product) of the richest to poorest province was 15.9 and 11.3 for household expenditure (Hill *et al.*, 2008). Jakarta and the rest of Java-Bali is the centre for service-based, industrial

economic activity, while the rest of the country relies heavily on mining and natural resource extraction for their income.

In the 1970s, Indonesia grew at an average rate of above seven percent with earnings from oil exports as the main source of income. Indonesia was a net exporting country for oil until 2005 and the only Southeast Asian member of OPEC until 2008. Indonesia benefited from high oil prices in the 1970s but then suffered from the world oil price drop in the 1980s. Prices went from US\$ 37 per barrel in 1981 to US\$ 14 per barrel in 1986. To cope with the declining revenue and economic crisis at the time, the Indonesian government decided to diversify its economy by developing non-oil sectors. They argued that relying too much on the oil and gas sector for economic revenue was not sustainable given the volatile nature of world markets. Indonesia adopted policies with the goal of liberalising trade, providing incentives for increasing exports, and conducting structural changes within the local economy. This reform was a trendsetter that instigated Indonesia's current direction, i.e. developing the industrial and services sector that are mainly concentrated in the Java-Bali island group (Resosudarmo and Kuncoro, 2006).

The 1997–98 Asian financial crisis was a significant blow to the Indonesian economy. The Indonesian Rupiah collapsed from 2,300 to the dollar in June 1997 to more than 17,000 by January 1998. Inflation rose to 78 percent and overall GDP growth was approximately minus 13 percent. Since Indonesia controlled domestic fuel prices and wanted to maintain the pre-crisis price, the energy subsidy increased from almost nothing to approximately 17 percent of total government expenditure, creating a significant fiscal burden on the government (Hartono and Resosudarmo, 2008).

The economic reforms following the Asian crisis focused mainly on strengthening the banking system, liberalising trade and foreign investment, and promoting a better, more transparent government (Resosudarmo and Kuncoro, 2006). Reforms included an attempt to reduce the energy subsidy, which triggered huge riots, arson and mass looting in Jakarta. In May 1998, in the aftermath of the riots, under the threat of impeachment from no longer compliant leaders of parliament, Soeharto resigned from the presidency after 32 years in power: An important shift from Soeharto's authoritarian regime towards democracy took place. In 2001, the government enacted a new policy, namely decentralisation. It

vowed to increase the power of regional governments and change the centrist system of the Soeharto era. Before this decentralisation policy, the central government had the final say on nearly every issue, and regional powers did not have much say in their very own provinces. It was also a centrist economic system, where most revenues from the mining and natural resource extraction went to Jakarta, while only redistributing the rest of the earnings to regions. High-earning regions saw only a fraction of their revenue contribution redistributed back to them. Decentralisation aims to increase regional authority and the local economy, so that high-earning regions can enjoy their revenue and manage their own budget. These positive impacts, however, were not without their negative counterparts. The decentralisation policy caused increasing conflict between the central government and the regions; unprepared regional institutions caused more widespread corruption. These problems continue to affect the investment sector of Indonesia (Resosudarmo and Kuncoro, 2006).

During the early 2000s, along with the increasing world price of crude oil that also contributed to the costliness of the energy subsidy, the issue of energy security emerged. Various policy forums addressed the issue of whether Indonesia would be able to secure its people with the energy they need, and whether or not there would be enough energy to boost the country's industrial growth.

Despite all these problems, including those regarding the energy sector, Indonesian economy was able to recover. Since 2004, the Indonesian per capita income has returned to pre-crisis levels, the rupiah has stabilised, inflation has been under two digits, foreign reserves have been relatively abundant and the economy has been able to grow by more than five percent annually (Kuncoro and Resosudarmo, 2006). Table 1 shows that Indonesia's GDP has been growing at an average rate of approximately five percent in the last ten years. Furthermore, it is projected that Indonesia will be growing at the rate close to 6 percent throughout the next decade.

Table 1. Macroeconomic Indicators

	Unit	2000	2002	2004	2006	2008
GDP at 2000 prices	trillion Rp	1,390	1,506	1,657	1,846	2,082
(growth rate)	%	4.93	4.38	5.03	5.5	6.06
Population	million	206	212	218	222	229
(growth rate)	%	1.12	1.61	1.2	1.52	1.28
GDP per capita	thousand Rp	6,753	7,104	7,606	8,308	9,111

(growth rate)	%	3.77	2.71	3.83	3.85	4.73
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Source: ESDM (2009).

Besides the economy, the population has also been growing at an average rate of approximately 1.3 percent in the last decade or so, which is slightly higher than the world average, mainly due to the improvement in general health conditions. The infant mortality rate, as an important variable indicating general health conditions, dropped from 145 deaths per 1000 birth in 1971 to 47 in 2000.

In general, people’s welfare has improved significantly since the 1970s. Average schooling years rose from only 1.9 in 1971 to 5.4 in 2000 (Hill *et al.*, 2008). Poverty, measured by the percentage of people living below the country’s poverty line, dropped from approximately 30 percent in 1984 to 17 percent in 2004. Indonesia’s Human Development Index (HDI) has been rising since the 1970s and continues to do so in the 2000s. In the 2000s, the Indonesian HDI has risen by approximately 1.26 percent annually, from 0.673 in 2000 to 0.734 in 2007 (UNDP, 2009).

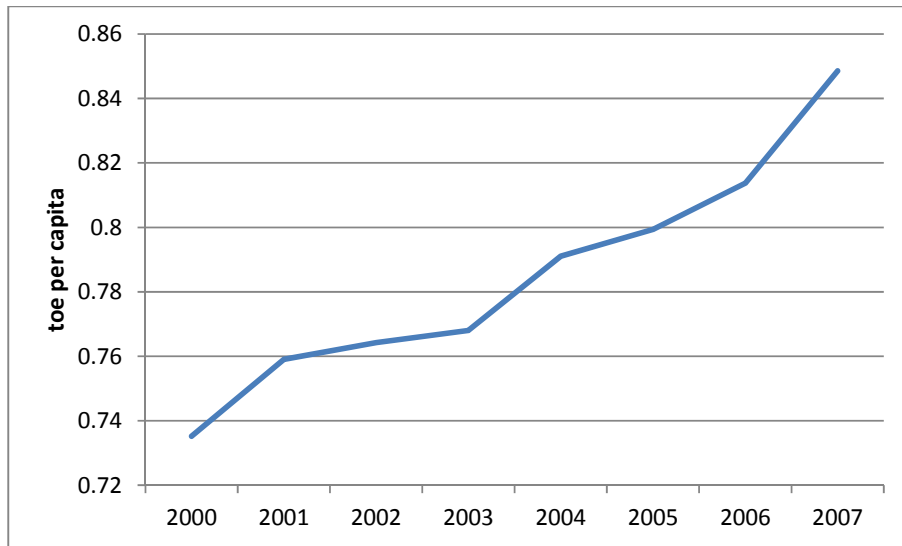
The growing economy, increasing population and improvement of welfare in Indonesia are the main drivers of the increasing consumption of energy. This is not surprising given the UNDP has shown that there is a positive correlation between a country’s HDI and its per capita energy consumption (UNDP, 2004). This means that energy security has become central to Indonesia’s policy debate.

III. Energy Demand and Supply in Indonesia

Indonesia consumed the equivalent of approximately 191 million tons of oil in 2007, making it the 13th largest total energy consumer in the world and the biggest in ASEAN. When calculated on a per capita basis, Indonesians consumed 0.85 tons of oil equivalent (toe) per capita in 2007, far below the world average of 1.82 toe per capita and even below the ASEAN average of 2.22 toe per capita (World Bank, 2010).

The energy consumption trend, however, has been increasing. From the year 2000 until 2008, the final energy consumption per capita has seen an increase of more than 15 percent, or approximately 2.1 percent annually, from the equivalent of 0.74 toe per capita in 2000 to 0.85 toe per capita in 2007 (Figure 1).

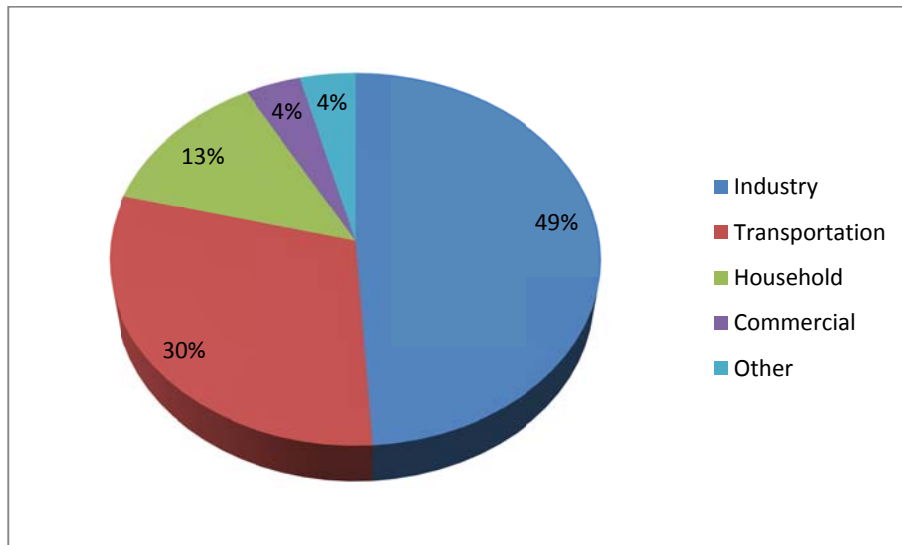
Figure 1. Indonesia Final Energy Consumption per Capita



Source: World Bank (2010).

Analysed by sector, the end-users are categorised into industrial, household, commercial, transportation, and other sectors, with the industrial sector leading Indonesia's energy consumption with nearly half of the total. Transportation is second, followed by the household sector (Figure 2). It can be inferred that the increase in energy consumption in the last two decades is mostly due to industrial sector growth.

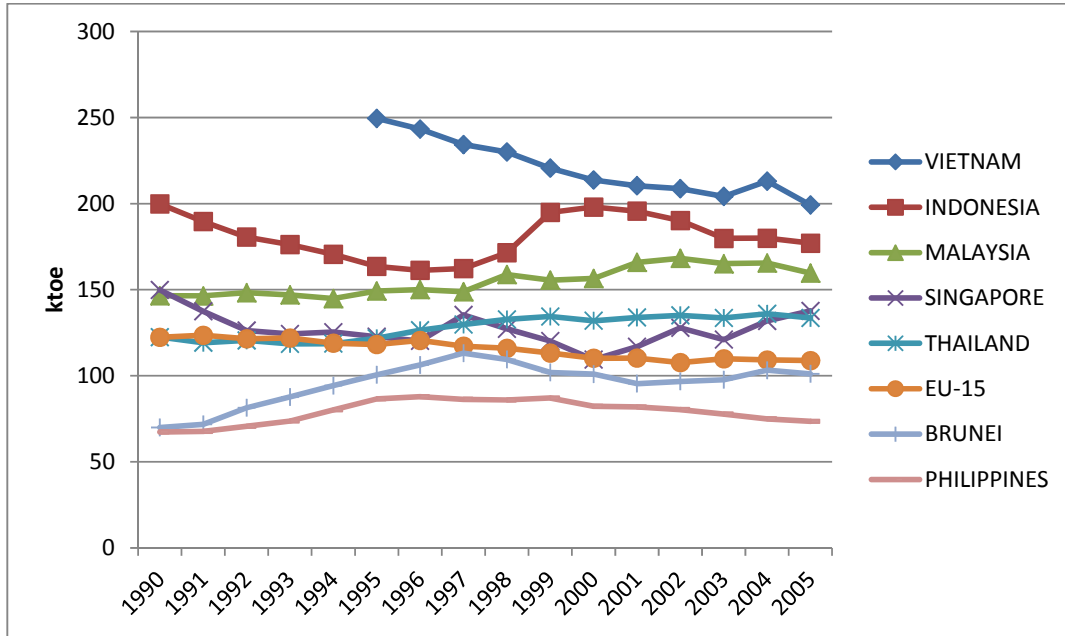
Figure 2. Share of Total Final Energy Consumption by Sector in 2008



Source: ESDM (2009).

Another characteristic of the high growth rate of Indonesia's energy consumption is that its consumption is not efficient, measured by the amount of energy used per GDP. It is common that, due to a technological gap, most developing countries have a higher energy intensity rate (i.e. less efficient use of energy) than developed countries. Industrialised countries tend to have access to better, more efficient technologies and cleaner fuel sources. However, Indonesia has an even higher energy intensity than several other developing countries, as shown in Figure 3. It is true, nevertheless, that Indonesia's energy intensity started to decline from 2001 onwards, after increasing in the period 1996–1999.

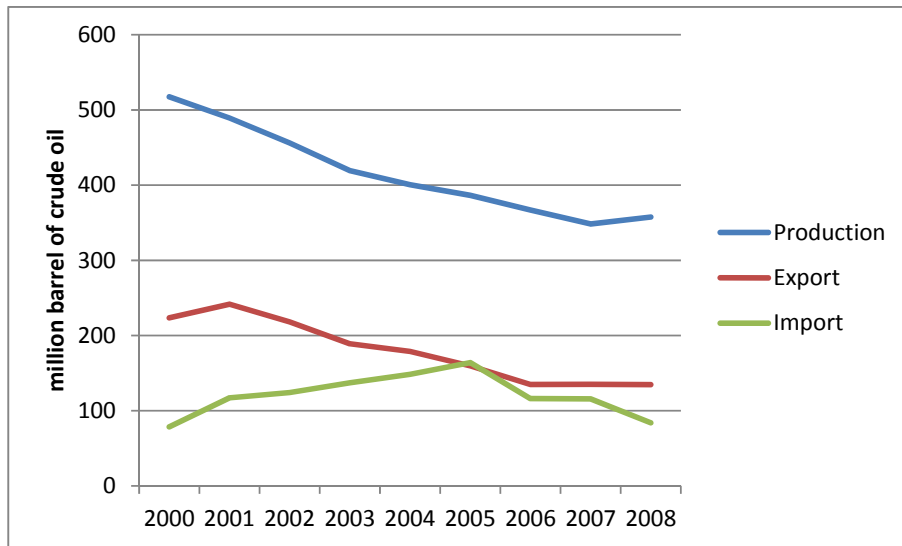
Figure 3. Energy Intensity for Several Southeast Asian Countries and EU-15



Source: IEA (2007a), IEA (2007b).

While the strong demand side growth reflects Indonesia’s economic growth—mainly due to the growth of the industrial sector—the domestic supply side has not seen a similar trend. Crude oil production on which Indonesia has traditionally relied for its energy needs and its domestic oil reserves has been consistently declining since 2000 (IIIEE Research Team, 2006). In 2000, Indonesia’s crude oil production was 517 million barrels, whereas in 2008 it dropped to only 357 million barrels (Figure 4). One of the main factors contributing to this decline is the location of new reserves, mostly in far-flung areas where exploration is technically challenging. In addition, there is relatively flat exploration expenditure by oil companies, lack of investment in new technologies, and no significant increase in refining capacity over the past decade (IIIEE Research Team, 2006).

Figure 4: Crude Oil Production, Export and Import



Source: ESDM (2009).

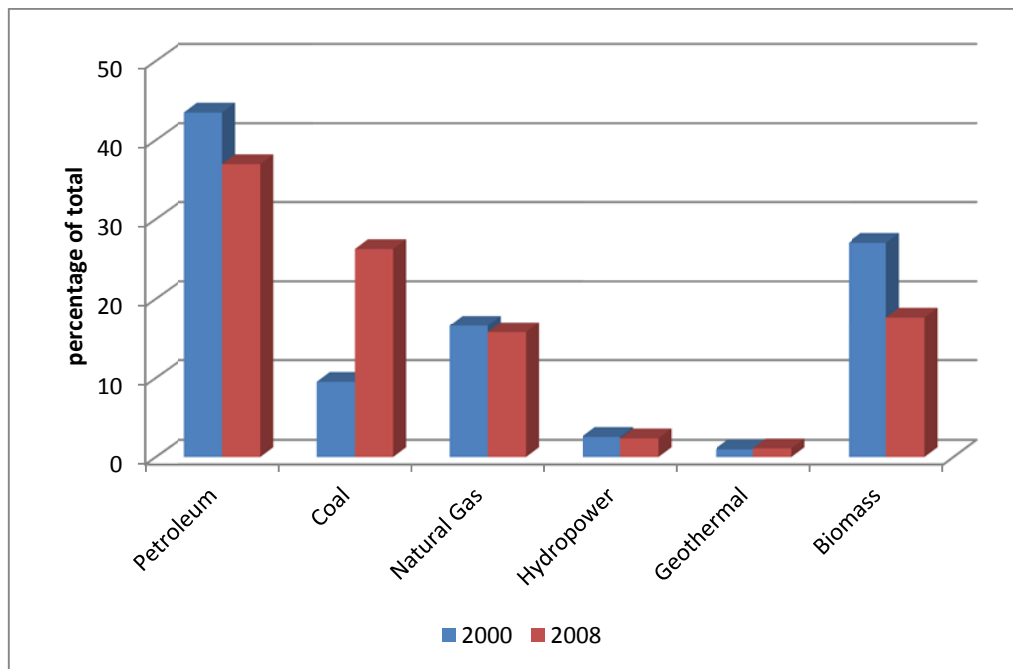
Flowing from production decline, Indonesian crude oil exports have declined in the last ten years or so as well. In 2005, Indonesia was even a net-importer of crude oil as the government decided to prioritise domestic crude oil consumption over exports. As a result of this, Indonesia enacted the Presidential Decree no 5/2006 on National Energy Policy in 2006— a policy that explicitly pushes the country to reduce its reliance on crude oil and seek other energy sources— and decided to withdraw from the Organization of the Petroleum Exporting Countries (OPEC) in 2008.

Imports, on the other hand, have increased along with increasing consumption and decreasing production in the first half of this decade. The Presidential Decree no 5/2006 has made it a priority to shift away from oil and increase coal and natural gas consumption, explaining the more recent decline in crude oil imports. While the government is trying to rely less on oil, it is still the main fossil fuel used throughout the country and, as with energy consumption, there is increasing demand for refined petroleum products such as gasoline. Lack of investment in additional domestic refineries made way for increases in imported refined fuels, thus increasing Indonesia's vulnerability to international oil price fluctuations (IIEE, 2005).

While oil is Indonesia's main energy commodity, coal and natural gas have also played an important role, especially in the last decade. Indonesia holds the 10th largest proven natural gas reserves

in the world as of January 2007 and was the second largest net coal exporter in 2004 (EIA, 2007). Figure 5 shows Indonesia's various primary energy sources and its percentage share of the total. Petroleum products outstrip other sources, but its share is decreasing. Coal, on the other hand, has seen a sharp increase. It is increasingly used in electricity generation, and had soared from virtually zero in 1984 to 47 percent of the state-owned PLN's fuel sources in 2008 (Resosudarmo *et al.*, 2008; ESDM, 2009).

Figure 5. Primary Energy Supply



Source: ESDM (2009).

By 2007, coal had probably become the most important mining operation in the country. Approximately 70 percent of an around USD 6 billion mining contribution to government revenue in that year was from coal production (US Commercial Service, 2007). Furthermore, since 2003, the export value of coal has been the highest among other mining commodities, reaching approximately USD 6 billion. An increase in coal production is expected to continue as the government has set a target of increasing coal's share of the primary energy supply to more than 33 percent by 2025, up from 26 percent in 2008; and at the same time, revenues from exporting coal are important for the government.

IV. Energy Security and Development Policies

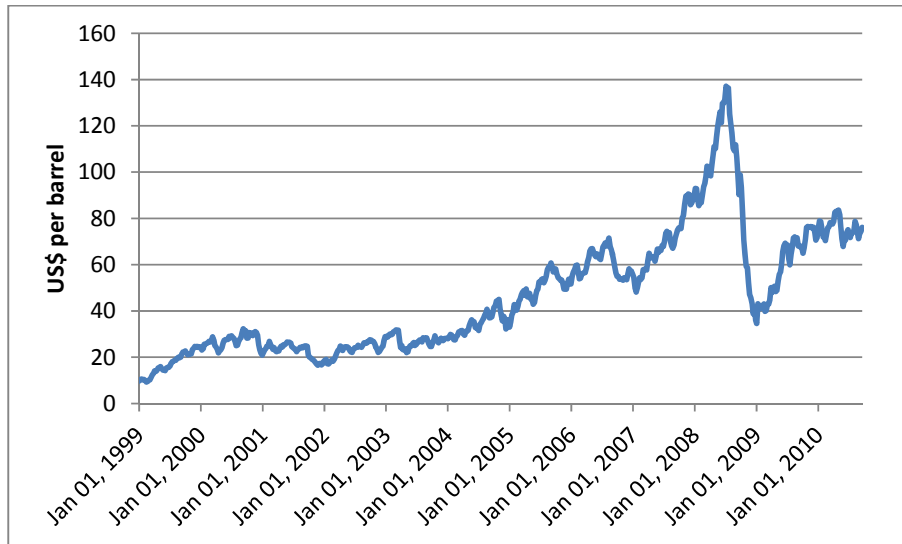
Since mid 2000s, energy security has been a priority for the government of Indonesia. Indonesians realise that, as a rapidly developing country, how the government manages its resources and enacts policies to balance domestic use and supply is critical. The state plays a prominent role in regulating and managing the country's energy and natural resources, as stated in the 1945 Constitution. The Ministry for Energy and Mineral Resources defines its first priority as ensuring energy security and independence, with an emphasis on domestic supply of energy sources.

Recent key energy security policy legislation consists of: Presidential decree No. 5/2006 on National Energy Policy, Law No. 30/2007 on Energy, Law No. 17/2007 on the Long-term National Development Plan 2005–2025 (RPJPN), and Law No. 5/2010 on the Medium-term National Development Plan 2010–2014 (RPJMN). All four of them present programs and policies connected to the availability of energy, development, and people's welfare (Indriyanto *et al.*, 2007).

The main goal of these recent policies is to diversify energy sources for Indonesia, to reduce its dependence on oil. As previously mentioned, Indonesia is vulnerable to the dynamics of the international oil market, juggling declining domestic production with increasing consumption and refined imports. The main challenge, however, is Indonesia's controversial but popular energy price subsidies. Indonesia's energy prices are controlled by the government and they are below the cost of supply as well as world prices, with the heaviest subsidies in place for kerosene, one of the nation's main cooking fuel and 'premium' gasoline (a non-subsidised version, 'pertamax', exists). This fuel subsidy is projected to cost the government approximately US\$ 9.78 billion in 2010, according to the revised 2010 state budget. In addition to petroleum products, the Indonesian government also controls the end-user price of electricity, which is currently lower than the production cost, and so subsidises electricity prices too. The state-owned National Electricity Company has a monopoly on electricity generation and distribution. The main energy source for power plants is oil. Hence, both fuel and electricity subsidies place a heavy burden on the government when crude oil prices are high (Indriyanto, 2008). For example, the total government subsidy of fuel and electricity amounted to approximately 23 percent of total government expenditure in 2008 during the period of high world prices of crude oil (Figure 6). In 2009, the world

price of crude oil declined and so the total subsidy on fuel and electricity went down to 10 percent. Increasing the domestic price of fuel and electricity typically creates social and political unrest and so it can only be implemented progressively. Other options are to increase energy intensity and divert the source of energy from oil to other sources.

Figure 6. Average World Price of Crude Oil



Source: US Energy Information Administration.

http://www.eia.doe.gov/dnav/pet/pet_pri_wco_k_w.htm; [accessed on 28 September 2010].

The Presidential Decree no 5/2006, explicitly lists two priorities for the national energy policy: reduce energy elasticity to lower than 1 by 2025, and supply the optimal primary energy mix by 2025. Energy elasticity refers to energy intensity per GDP, which is currently higher than most other ASEAN countries. The optimal energy mix policy aims to diversify the country's energy sources, with less reliance on oil and more on natural gas, coal, and renewable energy. It lists the optimal primary energy portfolio that needs to be achieved by 2025 as shown in Table 2.

In comparison to the 2008 primary energy consumption, the government will have to increase the share of natural gas and coal, and decrease the share of petroleum and biomass. Some experts have expressed concern that the targeted share of geothermal energy is too small, given the country's abundant potential in this area.

Table 2. Primary Energy Consumption

2008		2025 Target	
Petroleum	37%	Coal	33%
Coal	26%	Natural Gas	30%
Biomass	18%	Petroleum	20%
Natural Gas	16%	Biofuels	5%
Hydropower	2%	Geothermal	5%
Geothermal	1%	Other Renewables	5%
		Other Fossil Fuels	2%

Source: Presidential decree No. 5/2006.

With this policy in place, it is clear that the government is trying to steer the nation away from its oil dependence. Another regulation attempting to divert Indonesia energy sourcing is Law 5/2010 on the Medium-term National Development Plan 2010–2014 released by Indonesia’s National Planning and Development Agency (*Badan Perencanaan dan Pembangunan Nasional* or Bappenas). According to this law, energy is stated as the eighth National Development Priority. It aims to attain national energy security that ensures the continuity of national growth through institutional restructuring and optimises the widest possible utilization of alternative energy. Therefore, developing renewable energy is now a greater priority if correctly implemented (Bappenas, 2010). Article 3 of the legislation targets an increase in electricity generation capacity by an average of 3,000 MW per year starting in 2010. The ultimate target is to increase the spread of electricity, from an electrification ratio of 62 percent at present to 80 percent in 2014.

Despite the attempt to diversify energy sources, Indonesia still has to address the problem of how to eliminate its energy subsidies. It is true that the main goal for the subsidies is to enable low-purchasing power people to consume fuel, but the negative implications of this policy seem to be so obvious. Indriyanto *et al.* (2007) argued that subsidies tend to cause overconsumption of the resource, since the market price does not reflect the actual cost of producing one unit of petroleum product. They also discourage energy efficiency measures and the development of alternative or renewable energy sources by way of low electricity tariffs. The state budget is heavily burdened by this policy and in order to provide low-priced electricity, they are denying access to nearly half the population. This policy mostly

favours the urban population or those who are privileged enough to have access to electricity while forgoing the development of necessary new infrastructure needed to deliver electricity to those without it.

The issue of subsidies needs to be dealt with prudently, as it has become a highly political process and there have been riots in the past in response to price reforms. Because of this, the Ministry of Energy and Mineral Resources has developed a strategy to reduce the petroleum subsidies gradually (Table 3). The ultimate goal of this strategy is to eliminate petroleum subsidies entirely by 2025 (Sutijastoto, 2006). Whether or not they succeed in implementing necessary reforms remains to be seen.

Table 3. Policy on Petroleum Products Subsidy

Petroleum Product	Phase I	Phase II	Tentative					Consumers
			Phase III (2005)	Phase IV	Phase V	Next Phase		
Kerosene:Subsidised	R	R	R	R	R	NR	Poor households, Small enterprises	
Kerosene: Industry	R	R	R	NR	NR	NR	Industry	
Gasoline	R	R	R	R	NR	NR	Private vehicles,Public transport vehicles, Special vehicles, Army/Police	
ADO: Transportation	R	R	R	R	R	NR	NR	Private vehicles,Public transport vehicles, Ships, Special vehicles, Traditional fisherman boats
ADO: Industry	R	R	R	NR	NR	NR	NR	Industry, State-owned electric company, Mining industries, Army/Police
IDO	R	R	NR	NR	NR	NR	NR	Industry, State-owned electric company, Domestic and Foreign Ships, Mining
Fuel Oil	R	R	NR	NR	NR	NR	NR	Industry, State-owned electric company, Domestic and Foreign Ships, Mining
Avtur	R	NR	NR	NR	NR	NR	NR	Aviation Industry, Military
Avgas	R	NR	NR	NR	NR	NR	NR	Aviation Industry, Military

Note: R=Regulated: Prices fixed with subsidy in place; NR=Non-Regulated; i.e. subsidy no longer in place. End of phase IV is approximately 2010-2015 and phase V is 2020-2025
Source: Sutijastoto (2006)

V. Climate Change Issues

As an archipelagic developing country located on the equator, Indonesia is quite vulnerable to the effects of anthropogenic climate change. Sea Level Rise (SLR) brought on by melted glaciers and expanding seawater will affect Indonesian coastal areas greatly, and precipitation and rainfall pattern changes will hinder agricultural productivity, among other problems (Bappenas, 2010). Increasing volatility of seasonal patterns, and water shortage and flood problems are among the worst effects of climate change that could affect Indonesia as the globe continues to warm.

Although it is a developing country, Indonesia's greenhouse gas emissions are significantly high. In the mid 2000s, it is ranked 16th or lower globally when calculated without deforestation and forest degradation. It ranked in the top 3 to 5 when these two categories are included in the calculation (*Sari et al., 2007*). Emissions from the forestry sector gained most government and international public attention, since it contributed more than 85 percent of Indonesia's CO₂ emissions.

Emissions from the energy sector, however small, are rapidly growing. As mentioned, Indonesia is a fast emerging economy consisting of an increasingly affluent population which aspires to better living

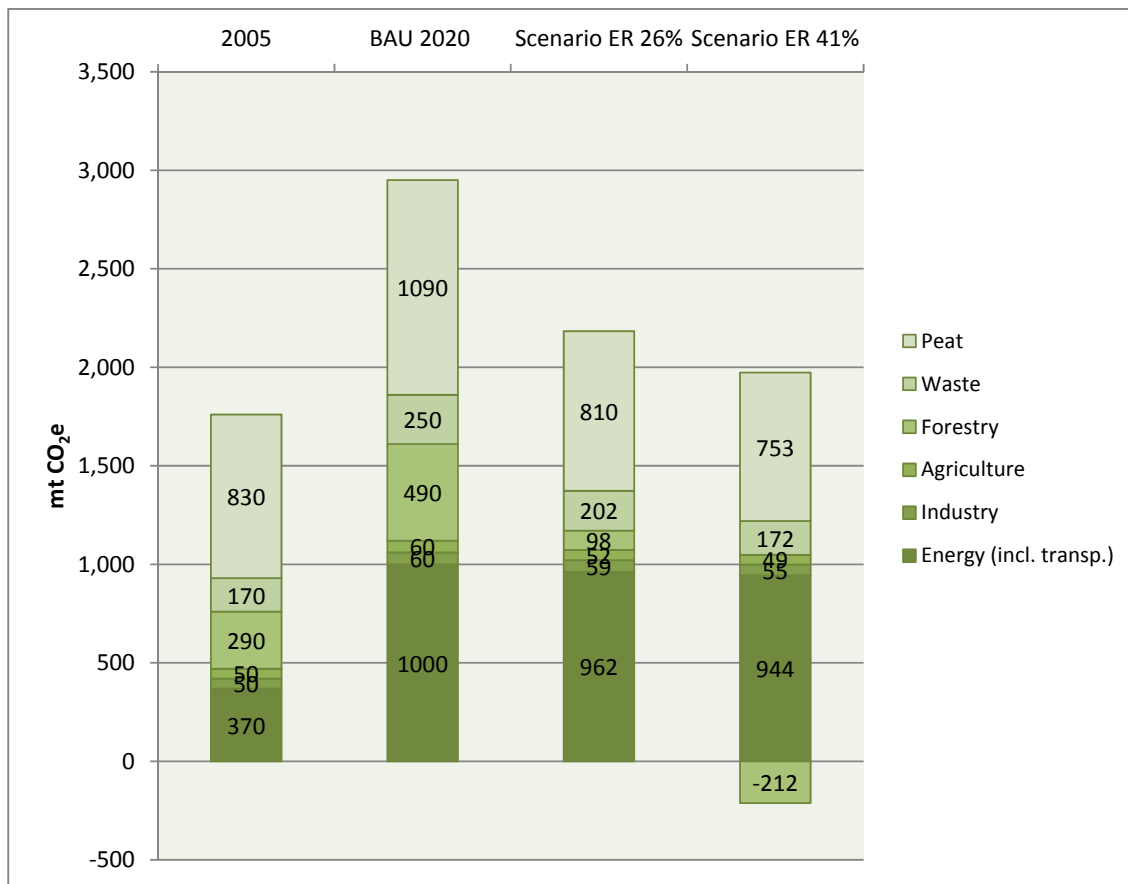
conditions and as a consequence, consumes more energy per capita. As the population continues to grow and becomes richer, energy use will also grow. It is expected that, at the current rate of consumption and fossil fuel use, emissions from the energy sector will at least triple from 0.3 Gt CO_{2e} in 2003 to more than 1 Gt CO_{2e} in 2030 (Sari *et al.*, 2007).

The CO₂ emissions from the energy sector must be managed as this sector is crucial to the development of the Indonesian economy, both for earning export/foreign exchange (forex) revenue and for fulfilling the need for domestic energy (Bappenas, 2010).

In line with the above concerns and the national development planning priorities, the Indonesian government will focus on a set of priority sectors. These priority sectors are divided into mitigation and adaptation priorities, with the energy sector falling into the mitigation category. In mitigating climate change in the energy sector, Indonesia needs to properly address its heavy reliance on fossil-based fuels. More than 79 percent of its energy comes from fossil fuels, and 26 percent of the total comes from coal. This coal-favouring policy for the power-generating sector is the main contributor of Indonesia's high energy intensity rate (Resosudarmo *et al.*, 2009). Coal is the dirtiest of the three main fossil fuels because it ejects twice as much carbon dioxide per unit of energy as natural gas (EIA, 1993). Its CO₂ emission factor is 0.963 kg of CO₂ per kWh of electricity generated (EIA, 2000).

During the 2009 G-20 meeting in Pittsburgh, Indonesia announced its national target of reducing greenhouse gas emissions by 26 percent below the Business As Usual (BAU) scenario by 2020 without the financial assistance of other countries, and by 41 percent with international assistance. Figure 7 illustrates Indonesia's sectoral emission in 2005. Quite obviously peatland, forestry, and energy make up the largest sectoral emitters of CO₂ in Indonesia. Under the Business As Usual (BAU) scenario, this composition will not change much by 2020. With continuing deforestation, the forest area in Indonesia will naturally decline by 2020 with a corresponding declining growth rate of CO₂ emissions from forest fires and less land clearing. The energy sector, on the other hand, is expected to grow continuously during this period, and thus its CO₂ emission grows at the fastest rate during this period, from approximately 375 Mt CO_{2e} in 2005 to approximately 1 Gt CO_{2e} in 2020.

Figure 7. Projection of 2020 GHG Emissions under BAU and Emissions Reduction Scenarios



Source: NCCC (2009).

Looking at the 26 percent reduction scenario, the forestry sector's emission share declines significantly. But under this scenario, Indonesia is able to maintain the size of its forest cover, as the primary reduction of CO₂ emission will come from the prevention of deforestation. This in turn will make the energy sector the largest sectoral emitter of CO₂ by 2020.

Table 4 lists Indonesia's overall plan of action to reduce CO₂ emission by 2020. With regard to the energy sector, Indonesia focuses on three aspects, namely demand side management, energy efficiency, and developing renewable energy. Demand side management primarily deals with end users and their energy consumption patterns. High fuel consumption coupled with low energy prices due to government subsidies are concerns that need to be addressed. On the supply side, energy efficiency with regard to electricity generation must also be improved. Using cleaner and more efficient, though not necessarily cheaper, energy sources should be explored. Aside from gas, renewable energy sources such

as micro-hydro and geothermal provide feasible alternatives to coal and oil. To be able to implement this, of course, reforms in the energy sector become much more important, though political willingness does not appear to be embedded in this policy.

Table 4. Indonesia's Emission Reduction Plan
(in Gt CO_{2e})

	BAU Emissions	Targeted Emissions Reduction		Action Plan
	2020	26%	Additional 15%	
	Gt CO _{2e}		(Total of 41%)	
Peatland	1.09	0.28	0.057	Improve peatland management, Peatland mapping, law enforcement, Generate alternative economic activities, Peat fire management
Waste	0.25	0.048	0.03	Implement MSW law, Enhance 3R, Encourage private sector investment, Landfill improvements
Forestry	0.49	0.392	0.31	Fire management, Combating Illegal Logging Preventing deforestation, Local Community Involvement, Land and Forest Rehabilitation
Agriculture	0.06	0.008	0.003	Improve water management programs, Plant rice varieties with less methane
Industry	0.06	0.001	0.004	Increase energy efficiency and access to better technologies
Transportation		0.008	0.008	Implement fuel efficiency standards, Enhance public transportation infrastructure, Traffic demand management
& Energy	1.00	0.03	0.001	Energy conservation, demand-side management Develop geothermal energy and other renewables
Total	2.95	0.767	0.422	

Source: National Council on Climate Change (2009)

Indonesia's on-going energy security strategy seems to present a conflict with the need to address climate change. On one hand, there is the diversification policy aiming for less oil reliance. Without environmental considerations, the answer to this is coal. By using coal, Indonesia achieves domestic energy security through maximising its large reserve so there is no, or limited, need to import. Since coal is more of a local commodity than oil, it also enjoys fewer price fluctuations on the international market. Ready-to-use technologies and government incentives make coal mining an even more financially viable choice as Indonesia's main energy source.

When we take climate change into consideration, the solution needs to be different. The coal-favouring situation conflicts with the solutions necessary to reduce energy sector emissions. Three solutions currently considered by the government to resolve this conflict are:

- 1) Electricity Reforms: To promote a significant shift away from coal and oil as primary fuel choices and utilise more natural gas, geothermal and other renewable energy sources such as hydropower.
- 2) Carbon Tax: A comprehensive tax that mainly targets the carbon-intensive coal industries. The carbon tax would be designed to have a larger impact on heavy industries and less on ordinary Indonesians, since most of the population still has low levels of energy consumption.
- 3) Eliminating Fuel Subsidies: A far more serious attempt to eliminate or decrease subsidies on kerosene, gasoline, and other refined fuel products remains a potential solution to drive down consumption and provide incentives to develop alternative energy sources. Decreasing subsidies for end user consumers, however, will affect ordinary Indonesians the most, who are still struggling with low purchasing power.

Therefore, with climate change taken into consideration, the direction of the on-going energy security strategy has to be redirected to take into account the energy reforms mentioned above in order to make way for a sustainable future.

Again, however, how far Indonesia will be diverted from its on-going energy strategy remains to be seen. First, currently Indonesia is implementing its crash program to build 10,000 MW of coal power plants within the next 5 years or so. One power plant has been finished and two more should be completed this year. Implementation of this program is certainly making it difficult for Indonesia to redirect its energy security strategy towards one that takes the climate change issue into consideration. Second, in an attempt to gain popularity, the president decided to lower the domestic price of fuel. It is true that world crude oil prices are low this year; however, this attitude really shows how reluctant the government is to adjust the domestic price of fuel in line with world prices.

VI. Final Remarks

The main goal of this paper is to describe the on-going energy security policies in Indonesia and to understand the underlying reasons for these policies. It also attempts to show how climate change issues affect the direction of these policies. From discussion in the previous sections it can be concluded that the main drivers of increasing energy consumption in Indonesia are, as in many other countries, the

steady growth of its economy as well as population and its welfare. There is probably nothing wrong with this phenomenon, except that energy intensity in Indonesia is relatively high, even when compared with other developing countries in the region, and the main source of energy in Indonesia has so far been oil, with its wildly fluctuating prices. Indonesia currently sets its domestic price of fuel and electricity much lower than world prices in an attempt to support the purchasing power of the majority of its people; so that when the world price of oil increases, the subsidies inflate and become a great burden on the government. These subsidies are popular policies. The government receives much criticism, in many cases followed by social unrest, whenever it tries to level domestic prices to the world price; and enjoys higher public support each time it reduces the price of domestic fuel. Hence, even if the government really wants to adjust the domestic price of fuel and electricity in line with the world price, it can only do so gradually. The other way to reduce the burden of this subsidy would be to diversify the country's energy source away from oil. The initial obvious option is coal. Indonesia's coal reserve is abundant and the technology needed to build coal power plants is relatively cheap.

Since 1990s, climate change due to greenhouse gas—mostly CO₂—emission has rapidly emerged as the top environmental problem worldwide. Indonesia found out that it has been among the top CO₂ polluters around the world, and reacted by making a commitment to reduce its level of CO₂ emission. The plan is to reduce its emission by as much as 26 percent compared to Business As Usual (BAU) by 2020 without the financial assistance of other countries, and by 41 percent with international assistance. Though this commitment mostly affects Indonesia forestry sector, it significantly forces Indonesia to rethink its energy sector policy, namely its energy security policy. First, Indonesia needs to actually implement its plan to reduce and eliminate its energy subsidies and if possible to reduce the time taken to eliminate these subsidies. Second, diverting its source of energy from oil to coal will increase Indonesia's CO₂ emission, since coal is a dirtier source of energy than oil. Indonesia needs to redirect this path away from oil, not to coal, but to a much cleaner energy source, such as geothermal, gas or other renewable energy sources. Indonesia has started developing plans to more seriously reduce and eliminate its energy subsidy as well as to create incentives for investments in utilising much cleaner

energy sources. The devil is in the details with regard to the implementation of this policy. Much stronger commitment is needed from the government.

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