

# Challenges and policies in Indonesia's energy sector



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## HIGHLIGHTS

- Indonesia's energy sector faces many regulatory, environmental and infrastructure hurdles.
- Indonesia's energy policy can be improved through greater use of renewables, especially geothermal.
- The gas sector should be further developed until more renewable energy come on line.
- Government control over the oil industry should be reduced to boost investment.
- Clarifying and simplifying regulations is key to attracting foreign companies and protecting the environment.

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## ABSTRACT

Fossil fuels are central to Indonesia's energy policy, and its main source of export revenues. However, insufficient investment, the lack of transport infrastructure and an unwieldy regulatory environment are inhibiting the sector from reaching its full potential. Looking ahead, growing environmental concerns combined with sharp falls in coal prices and the on-going shale gas revolution call into question the sustainability of an energy strategy based almost exclusively on fossil fuels. This viewpoint challenges Indonesia's current energy policy and proposes ways to increase its energy efficiency and use of renewables. In particular, its gas sector should be further developed to plug the gap until sufficient renewable energy, especially geothermal, comes on line. Government control over the oil industry via state-owned Pertamina should be gradually reduced. Clarifying, streamlining and publicising simple regulations in energy, especially regarding land rights and on-shore processing, and removing foreign-ownership restrictions will help bring much needed investment. The pressure on the environment of natural resource exploitation should also be addressed by properly defining property rights and regulations regarding forest land, and implementing a positive implicit carbon price.

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## 1. Introduction

Indonesia abounds with energy resources. It is the world's largest exporter of steam coal and possesses huge reservoirs of natural gas and oil. As a result Indonesia's top two exports have long been fossil fuels (coal and gas), with palm oil recently overtaking the latter (Fig. 1, Panel A). At the same time Indonesia also holds an estimated 40% of the world's geothermal energy reserves (IEA, 2015).

The energy sector faces several challenges, however. First, the rising share of coal and gas in Indonesian exports coincides with the rapid increase in commodity prices that took place between 2003 and 2011 (Panel B). As prices rose, the supply of steam coal more than quadrupled between 2002 and 2012 (but production of oil fell). Now that prices have fallen significantly, the sustainability of the expansion is in question. Second, Indonesia's energy sector faces a number of regulatory challenges. After years of stable mining legislation, Indonesia overhauled the legal framework with Law 4/2009 on Minerals and Coal Mining. It replaced Law 11/1967 and its widely used Contract of Work (CoW) scheme with mining business licenses, or *Izin Usaha Pertambangan* (IUPs). Among the most controversial aspects of this new law were divestment requirements for foreign firms and the replacement of CoWs with a dual exploration and exploitation license system (not to mention the mineral ore export ban coupled with a requirement for on-shore value added processing for most commodities). In addition, the 2009 law no longer protects companies from changes in

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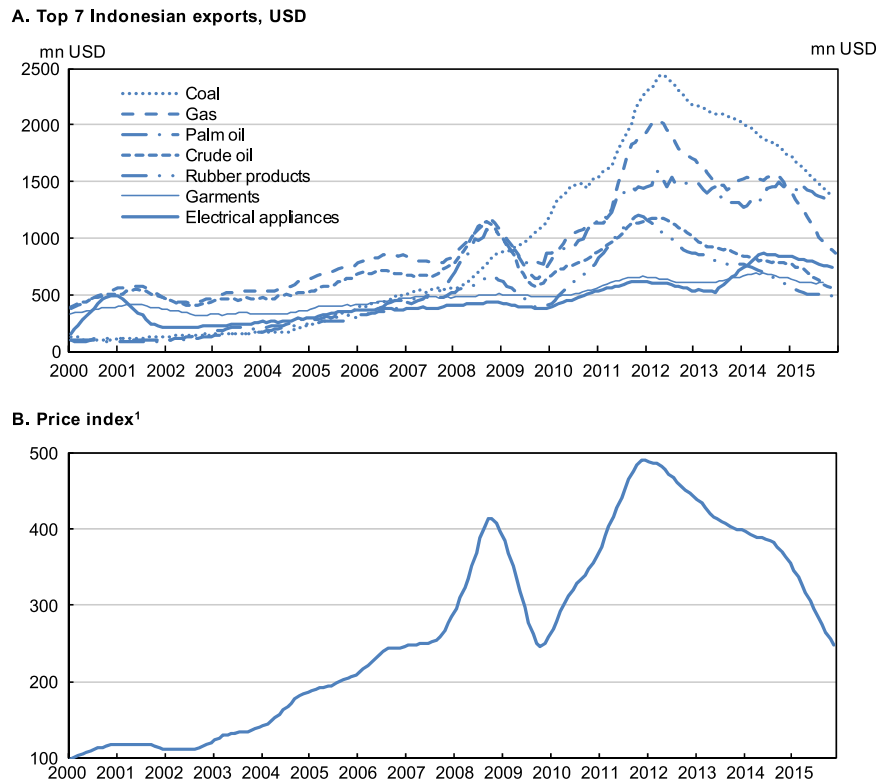


Fig. 1. Top exports and commodity prices. 1. Price index (2000=100) of Indonesia's top 5 exports in value in 2012 (cf. Panel A). Source: CEIC.

royalty rates (Gandataruna and Haymon, 2011). Also, the fact that the maximum timeframe for mineral exploitation of 30 years is now a decade shorter than under the 1967 law might also be dissuasive. Third, after decades of centralisation under Suharto's New Order, in the late 1990s Indonesia began a decentralisation process, giving the regions greater political autonomy and allowing resource-rich regions to retain a substantial share of the income generated. This process contributed to blurring the governance picture by handing additional powers, notably of taxation, to regional authorities eager to increase their revenues but lacking the capacity to handle their new responsibilities. Too many licenses were granted to unqualified businesses as a quick way to raise revenues. It also contributed to the development of illegal mining, as control by the central government diminished.

In the end the new regulatory environment for natural resources extraction is now less attractive to investors. In fact, under currently applicable Indonesian regulations, Indonesia's ranking in the Fraser Institute (2015) summary Policy Perception Index (which measures overall perceived policy attractiveness) is 91 out of 109 jurisdictions. Yet, when considering room for improvement, Indonesia jumps to 1st place in that ranking.

These problems are exacerbated by the issue of land rights. Land rights in Indonesia are very complex. The Basic Agrarian Law of 1960 (BAL, 1960) required that all land rights be registered, but no time limit was given at the time of its promulgation. Land registration (titling) is still ongoing, and during the last four decades the National Land Agency (BPN) has managed to register only around one-third of privately owned plots. Thus, most rural households have unregistered land rights usually acquired through inheritance. Although Article 56 of the Law recognises the continuing validity of rights, the right of the new holder cannot be fully recognised by the State until a new certificate is issued confirming that the land is not State land (USAID, 2010). The slow progress in land registration therefore creates an important barrier to consolidation in the sector. Despite further efforts to implement

the BAL, existing ambiguity over land rights remains one of the reasons for land conflicts. In 2012, the office of the President recorded 8305 land disputes, 2002 of which are likely to turn into violence (Jakarta Globe, 2012).

This article examines specific challenges and possible policies for each of the three fossil fuels central to the Indonesian economy, i.e. coal, oil and gas, and how they could benefit from a clearer, more streamlined regulatory environment. It also examines the (often dramatic) impact of fossil fuel exploitation on Indonesia's environment, what can be done about it, and how a better utilisation of Indonesia's renewable energy potential could help it achieve its CO<sub>2</sub> and pollution reduction targets.

## 2. The expansion of coal production is reaching its limits

Indonesia has abundant proven reserves of steam coal (Fig. 2, Panel A) with its share of the world's output and exports rising fast (Panel B). It is thus well placed to take advantage of growing coal demand as the five biggest coal importers in 2014 were all in Asia: China, Japan, India, Korea and Chinese Taipei, all of them buyers of Indonesian coal (Fig. 3). In 2014, Indonesia produced 471 Mt (million tonnes) of coal, placing it fifth for output but first for exports in terms of tonnage, as in the three previous years. Indonesia's coal is mostly steam coal used for heat and energy production.

With 400 million people still without electricity, ASEAN countries will rely increasingly on coal as a cheap way to generate electricity. It is hard to know, however, how long Indonesia will be able to take advantage of that growth, given talk of an Indonesian ban on low calorific value coal exports and the commitment of the new Chinese government to more efficient and sustainable growth. In addition, the transition of the US economy towards shale gas and light tight oil is taking place at the expense of coal, whose share in US power generation has collapsed. Given that the

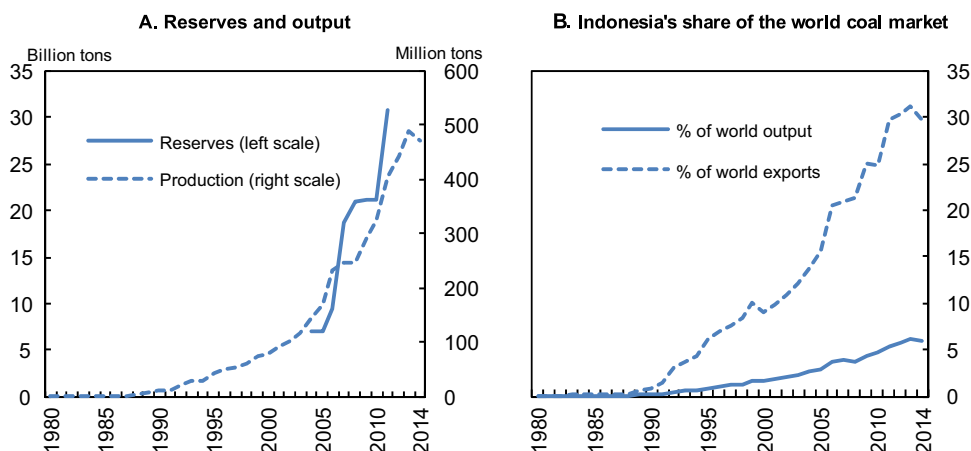


Fig. 2. Indonesia and the world coal market. Source: IEA Database and Ministry of Energy and Mineral Resources.

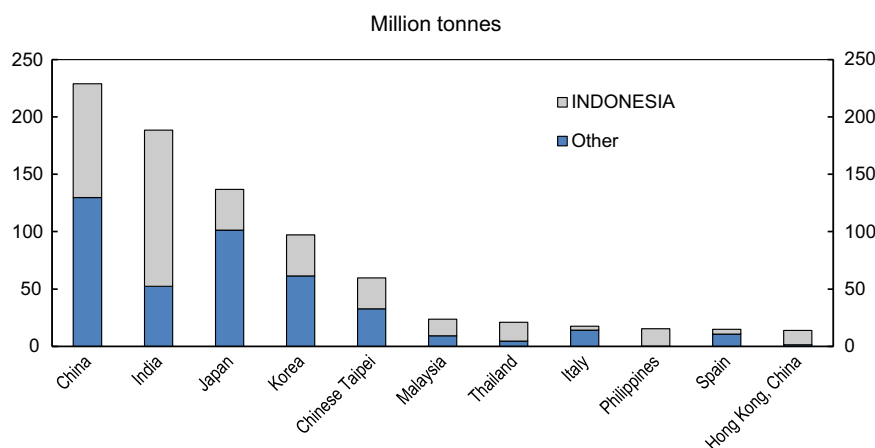


Fig. 3. Coal import sources, selected countries, 2014. Source: IEA Database.

United States was until recently the second biggest consumer of coal at about 1000 Mt per year, this change in the US energy market will reduce its demand for coal, increase its exports and weigh on world prices.

In Indonesia itself, more electricity generators are shifting to coal. Indeed, coal remains a cheaper option than gas for generating electricity in many provinces. However, Indonesia's coal-fired electricity generation efficiency is still lagging both by world and Asian standards (Fig. 4). Given the share that coal-fired electricity is going to play in its energy mix, improving energy efficiency should be a priority for Indonesia as it offers both significant fuel savings and lower CO<sub>2</sub> emissions, as coal-fired plants are where the largest potential gains lie. For instance, coal and other non-

gaseous fossil fuels can be converted into electricity in combined gas cycle if the fuel is gasified in advance. Encouraging FDI in the sector will be key to helping Indonesia alleviate such constraints and make the most of its coal endowments while containing its emissions.

The future of coal mining in Indonesia is also looking steadily towards low-rank, lignite-grade coals. This shift in quality means that the amount of tonnage being mined, trucked and barged will increase over time to maintain existing energy-equivalent levels. Given that all these operations are diesel-powered, the amount of diesel consumption in mining is expected to climb, exposing the industry to volatile fuel prices (Lucarelli, 2010). More and more mining companies are contemplating producing electricity on site

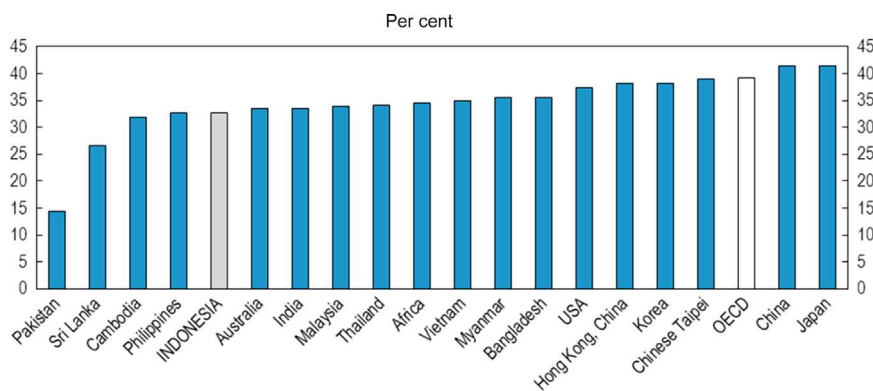


Fig. 4. Coal-fired heat and electricity generation efficiency, 2013. Source: IEA, Coal Medium-Term Market Report 2015, OECD/IEA Publishing.

via coal-fired power plants. In the end, there are physical, economic and environmental limits to the amount of coal Indonesia can mine, burn at home and supply to the world.

### 3. Revitalising the oil sector

Crude oil, together with natural gas liquids, refinery feedstocks and additives as well as natural gas, generate about one-fifth of Indonesia's consolidated budget revenue in the form of taxes, royalties, revenue-sharing contracts and the profits of the state-owned oil producer Pertamina. Yet, Indonesia is in dramatic need of an overhaul of its exploration and exploitation policy, as output and FDI have been falling. The critical oil sector is at risk of falling behind.

Indonesia has been active in the oil industry since 1885, when oil was first discovered in North Sumatra. It switched to become a net oil importer in 2006 (Fig. 5) due to growing domestic demand (4% annual growth over the last 15 years) alongside declining domestic output. Output has indeed been falling since the late 1990s in the face of maturing oil fields and decreasing exploration and investment (Fig. 6). The required increase in imports, together with skyrocketing prices in the mid-2000s, has been highly detrimental to Indonesia's economy, including contributing to the blowout in the current account deficit between mid-2011 and 2013.

Until recently, Indonesia had been subsidising fuel and electricity to keep energy affordable for the poor and to raise household purchasing power. In recent years fuel subsidies had been absorbing over 20% of government spending. But the subsidies did not work as intended, as 40% of subsidy benefits went to the top income decile and less than 1% to the poorest (World Bank, 2014). Subsidies also had unintended consequences in the form of increased demand, traffic congestion and environmental damage, whose deadweight loss has been estimated at USD 4–8 billion annually (Davis, 2014). Declining production from maturing oil fields (requiring more imports) add to the problem. Fuel subsidies were reduced in June 2013 and again in November 2014, bringing subsidised fuel prices closer to market prices (Fig. 7). Then, at the beginning of 2015, the government grasped the opportunity offered by falling world oil prices and scrapped its existing petrol and diesel price-setting regime. Both domestic petrol and diesel prices are now linked directly to world prices, with only diesel getting a fixed subsidy of IDR 1000 (USD 0.08) a litre. The 2015 budget originally contained fuel subsidies worth more than 13% of total government expenditure, but this has now been whittled down to only 1%.

Electricity subsidies remain an issue, and because most generation capacity takes the form of coal- and oil-fired power plants,

this is indirectly a fossil fuel subsidy. Electricity subsidies amount to around 8% of total government expenditure. The ongoing reforms in this area should continue, including gradual price reforms until electricity pricing fully recovers the ongoing costs of maintaining and improving Indonesia's electricity system. Indonesia should embrace an ambitious oil (and gas – see below) revival programme. It is well placed to take advantage of growing regional and world demand, but it needs to change the way it operates in the oil sector, as it is looking steadily less attractive to exploration companies. In addition to legal uncertainty following the controversial 2009 Mining Law, Indonesia's oil industry also suffers from excessive government control via Pertamina and overlapping regulations. The resulting lack of incentive to explore and develop upstream oil production capacity (increasingly located in the east and offshore) has contributed to falling output and revenues. In a series of interviews conducted with Indonesian policy makers and ministries Boyd et al. (2010) noted that resource nationalism, corruption (Indonesia ranks in 88th place out of 167 countries surveyed on the 2015 Transparency International Corruption Perceptions Index) and decentralisation have all contributed to the decline of Indonesia's oil industry. The recent reform of the Mexican oil energy sector and its corporate governance, including the establishment of autonomous regulators for licensing, safety and environmental protection and the fostering of greater competition, could be used as a model (OECD, 2015).

Several other policies could help, such as greater use of private-sector expertise in exploration and exploitation. It is also imperative for Indonesia to simplify land titling and resource licensing, and to better protect private investors' interests. It should streamline and advertise simple guidelines and, when involved, limit the number of interlocutors for private companies by creating, for instance, a one-stop shop that would handle the entire process. In the meantime greater co-ordination among the government agencies involved in the licensing process should be encouraged. The alternative is for Indonesia to become increasingly dependent on foreign oil at a time of rapid and sustained growth in its demand. Indonesia's fuel deficit is forecast to rise 5.3% to 640,000 barrels a day in 2015, to be compared to a domestic output of about 825,000 barrels a day (Bloomberg, 2014).

### 4. Using gas to bridge the gap until more renewable energy comes on line

Natural gas is set to become one of the three major sources of world energy, with a market share expected to double from 17.3% in 2000 by 2035, thanks to its widespread availability, competitive supply costs and environmental advantages over other fossil fuels (it releases about half as much carbon as coal). As of 2012, and for

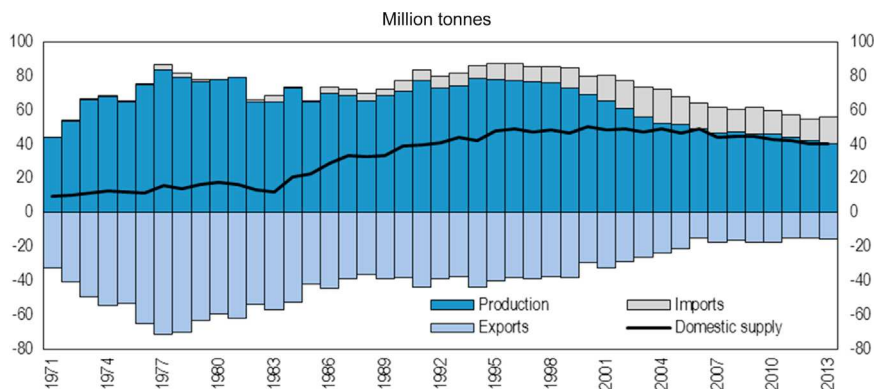


Fig. 5. Indonesia's oil balance. Source: IEA Database.

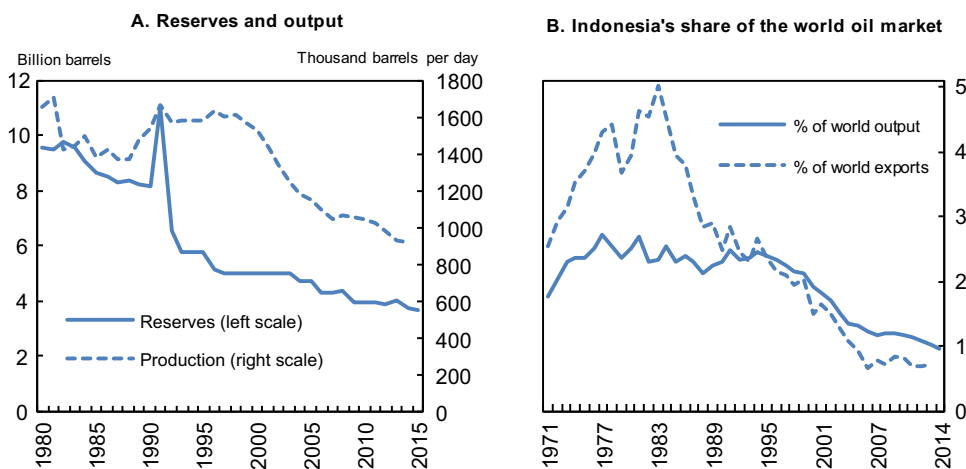


Fig. 6. Indonesia and the world oil market. Source: US Energy Information Administration (EIA) and IEA database.

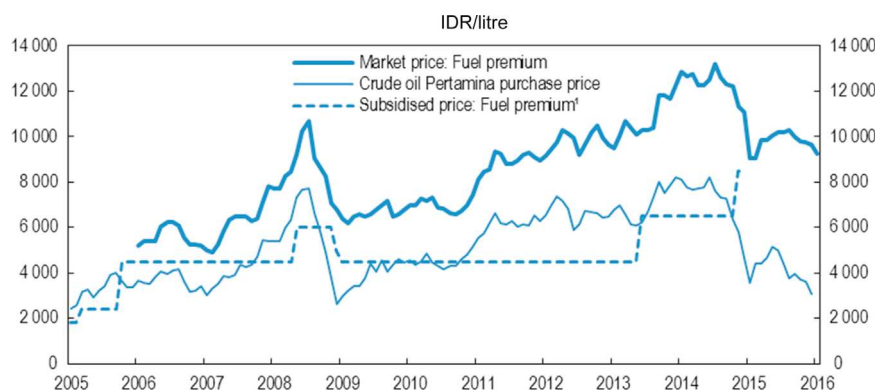


Fig. 7. Prices for oil and petrol. 1. Subsidies removed in early 2015. Source: CEIC.

the first time in history, Asia represented 46% of global international gas imports, ahead of Europe (45%). Currently the world's 10th largest gas producer and holding the largest reserves in Asia (Mujiyanto and Tiess, 2013), Indonesia is advantageously positioned to profit from Asian demand growth. China is now its fifth biggest market, and over 8% of its imports come from Indonesia. Gas represents only 5% of China's primary energy mix at the moment (still far below coal's share of about two-thirds) but its use is rising sharply.

However, the output of Indonesia's gas industry has steadily fallen from its 2010 peak, accelerating the trend decline in its share of world output and exports (Fig. 8). This fall reflects

domestic hurdles to increasing production, such as delays in field development or regulated domestic prices being too low to attract new investment. In 2012, Indonesia saw a decrease in both production revenues and volumes (–5% for the latter), yet demand increased by 1.5%. So Indonesia's oil and gas sectors face the same issues. The development of new production and export facilities should be accelerated by removing administrative barriers and hurdles. While Indonesia has been among the largest exporters of liquefied natural gas (LNG) for many years, it completed its first LNG importing facility in 2012 (the West Java floating storage terminal and regasification unit) and began to import LNG in 2013.

The future of Indonesian LNG exports is uncertain, however,

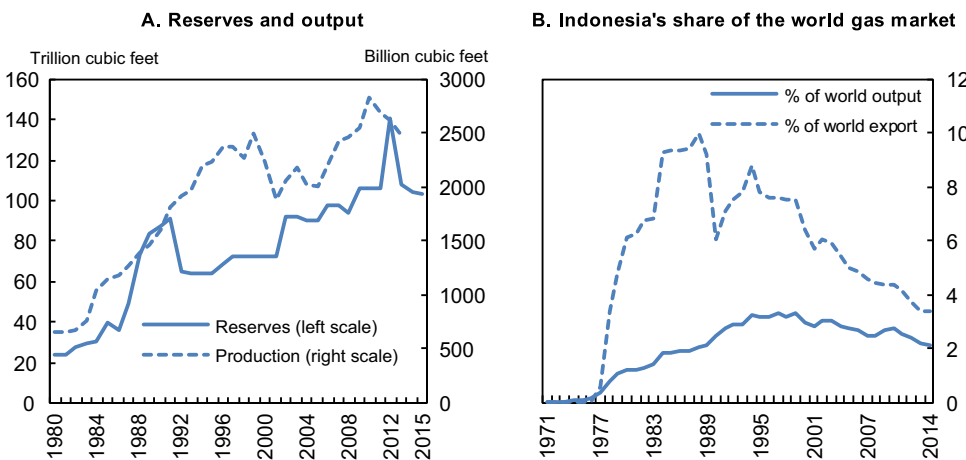


Fig. 8. Indonesia and the world gas market. Source: US Energy Information Administration and IEA Database.

due to competition from Asian countries with vast unexploited reserves, such as China (Aguilera et al., 2014), or from countries with a well-established gas industry, such as Russia. For instance, Russia and China have sealed a deal that would see Russian Gazprom supply China National Petroleum Corporation with 3.75 billion cubic feet a day for 30 years starting in 2018. China's current demand is about 16 billion cubic feet a day and rising fast. And there is more than 7 billion cubic feet a day of Australian LNG capacity due to come on-stream by 2017 (Wall Street Journal, 2014). Due to limited scope for pipeline development in the region, additional liquefaction and export terminals should be developed.

Indonesia will soon find it increasingly difficult to allocate its gas output between growing domestic and international demand. It will probably have to boost its supply, perhaps using unconventional sources such as horizontal drilling with hydraulic fracturing (fracking). However, given Indonesia's mixed record in terms of environmental protection, the development of fracking should be carefully monitored and tightly regulated. Five companies have actually already delivered a joint study regarding shale gas potential in northern Sumatra, and around 70 proposals to drill exploration wells have been submitted (IEA, 2013). While the risk for the environment is high, developing shale gas could help plug the gap until renewable energies gain in importance.

## 5. Protecting the environment through regulations and control of illegal extraction

Rapid economic growth combined with rising urbanisation has led to pressures on the environment. The joint ADB-ILO-IDB Environmental Performance Index positioned Indonesia 134th of 163 countries in 2010 and only 12th among the 13 Southeast Asian countries in terms of environmental sustainability and performance. As noted, one major issue is the growing role that fossil fuels are playing in Indonesia's energy mix.

### 5.1. Indonesia's record regarding GHG emissions and pollution is poor

Given the large and increasing role played by fossil fuels in Indonesia, it is not a surprise to see that its GHG emissions nearly doubled to 1.9 billion tonnes (bt) in 2012 up from 1.1 bt in 1990, making Indonesia the fifth biggest GHG emitter. China ranks first (10.8 bt) ahead of the United States (6.7), India (2.7) and Russia (2.5). While CO<sub>2</sub> emissions per unit of GDP (at PPP) is about average for Asia (but quite high compared to OECD countries), its record regarding CO<sub>2</sub> emissions per kWh of electricity and heat is poor, reflecting the dominant role played by coal.

Indonesia's energy strategy is laid out in the National Development Plan 2010–14, which supports an increased utilisation of renewable energy, including geothermal, generating electricity from phasing in solar power, micro-hydro and nuclear power. Following the Presidential Regulation on the National Energy Mix Target 2025, policies are also geared towards reducing carbon emissions through energy diversification and conservation. For the COP21 summit in Paris last year, the Indonesian government committed to reducing the country's carbon emissions by up to 29% by 2030 against a business-as-usual trajectory. While petrol subsidies are about to be removed completely, the heavy use of coal in electricity production is going to challenge Indonesia's commitment to greenhouse gas (GHG) reduction. In order to reduce demand for fossil fuels, the implicit carbon price of electricity in Indonesia should be brought back to positive levels by phasing out electricity subsidies. The Ministry of Energy and Mineral Resources announced that it plans to slash electricity subsidies by

June 2016, with only 4.2 million households qualifying for the subsidy after the reform versus 22 million currently.

### 5.2. Mining and environmental degradation

Mining contributes to environmental degradation, mostly through water pollution and damage to the ecosystem. As a result, Indonesia's record regarding organic water pollutants is also poor. For instance, most coal mining operations are open-cast and carried out in remote, pristine areas, increasing the risk of environmental damage. The Indonesian Coal Mining Association, an organisation comprising 130 of the country's most influential miners, has set out a plan to ensure that all coal mining operations are conducted responsibly. Several large coal mining companies, such as Adaro Energy, are pursuing rehabilitation programmes, which aim at restoring the environment to a state as close as possible to that which existed before mining activities started. But a lot of the mining-related pollution actually comes from smaller, often illegal mines that do not have the willingness or the means to repair the harm they do (see below). Illegal mining in Indonesia is known by the name of PETI (Penambangan Tanpa Izin, "Mining Without Permits"). Illegal coal mining is widespread in Kalimantan (while Java and Lombok host many illegal gold mining operations).

Prior to the introduction of reforms in 1999, the government exercised tight control over the nation's mining operations. It made it difficult for illegal mining operations to develop, despite the government's longstanding push towards smaller-scale mining ventures as a way to spread the mineral wealth. Since the end of the Soeharto administration, the government has been faced with the spread of illegal mining operations. As the 1997–98 crisis forced many laid-off workers back to their home provinces, looking for work in agriculture or mining, the shift to decentralisation at about the same time introduced several inconsistencies between central- and local-government policies and left holes in the mineral resource management framework, which were exploited. As illegal miners started to spread, they soon became politically influential, challenging the concessions given to larger, authorised companies. Local government officials often benefit from those operations by getting a share of their profits, receiving royalty payments and reclamation fees and absolving miners from environmental responsibility (Lestari, 2007). Importantly, demand for illegal mining products is fuelled by lower informal prices, up to 40% below the official market price in the case of coal, for example.

In addition to not following guidelines imposed on official mines, illegal mining produces degradation of its own: logging or burning the forest to clear the land (resulting in serious smoke haze); abandoned open pit sites filled with acidic run-off leaking into the surroundings and poisoning water bodies; and illegal coal-loading ports built with no regard for environmental safeguards (coal destined for domestic consumption is barged from one island to another). It was estimated that illegal coal mining amounted to 20 million tonnes in 2010 (Lucarelli, 2010). Better monitoring of illegal mining and stricter enforcement of existing regulations should be pursued. The requirement that mining companies deposit funds to ensure they carry out rehabilitation and reclamation programme should be a pre-requisite to starting operations.

## 6. Indonesia should tap its unique renewable energy potential

Indonesia's renewable energy potential is huge and can contribute to energy access in off-grid areas. Given the role of agriculture in Indonesia and the scattered population, developing biomass is a first option. Basically any agricultural by-product that

people currently cart away is biomass that can be used to generate power: potential liquid biomass includes biodiesel from palm oil and bioethanol from sugarcane and cassava. Yet, both carry threats to biodiversity and the forest. Potential solid biomass can come from palm shells from palm trees, coconut shells and fibre, bagasse from sugar refining, rice husks and corncobs. Several initiatives have already taken place, such as the signing of a memorandum of understanding between state-owned energy firms and General Electric for the development and deployment of biomass gasification systems.

In addition to biomass, Indonesia boasts an estimated 40% of the world's reserves of geothermal energy, an energy source that is expensive to develop, but clean, abundant and not subject to supply (and therefore price) volatility. Currently, Indonesia utilises less than 5% of its estimated potential (Mujiyanto and Tiess, 2013). In August 2014, the House of Representatives approved a revised geothermal law allowing for the exploitation of geothermal sources in the country's conservation forests. It also returns the power to issue permits or conduct tenders related to geothermal energy exploitation to the central government. As the new regulatory environment becomes operational, the government should accelerate the exploration and tendering of new geothermal projects. In order to attract investors the ceiling price for electricity generated from geothermal power plants should be raised. Other renewable energies include hydropower, the largest resources being located in Papua. Wind energy potential is limited due to the lack of wind along the equator. But its location makes solar resources significant, though it is still underdeveloped and appears mostly in the form of solar roof-panel systems. The rise in CO<sub>2</sub> emissions should be limited by reducing the share of coal in energy production and increasing its efficiency, and by increasing the share of gas, geothermal and other renewables in the energy mix as part of the push for more and better infrastructure.

On the investment side, restrictions on FDI in Indonesia are less severe for green investment than for the average sector. It is also much lower than in other ASEAN countries. While this favourable regime should be maintained, more support should be provided to international companies willing to enter the market. Rather than ad hoc ministerial decrees, a comprehensive and attractive regulatory framework for renewable energies should be created (GIZ, 2012). Indonesia also promotes organic farming and the transition away from chemical to organic fertilisers. For more than 30 years the government has sought to encourage greater fertiliser use by farmers as a way to enhance agricultural productivity. The gradual reduction of chemical fertiliser subsidies in favour of their organic counterparts would be appropriate.

## 7. Conclusion and policy implications

Indonesia possesses huge reserves of non-renewable coal, gas and oil. However, an unwieldy regulatory environment and lack of investment are impairing Indonesia's energy sector. At the same time, growing environmental concerns combined with sharply lower fossil fuel prices call into question the sustainability of an energy strategy based almost exclusively on fossil fuel. These challenges should be considered as an opportunity for Indonesia to increase its energy efficiency in non-renewables and develop its equally massive renewable energy sources, in particular geothermal. In the meantime gas could be used to plug the gap until sufficient renewable energy comes on line. In all instances, clarifying, streamlining and publicising simple regulations in energy, especially regarding land rights and on-shore processing, and removing foreign-ownership restrictions will help bring much needed investment.

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