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Potential of Oil Stockpiling at Oil Terminals in Southeast Asia

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Foreword

Oil demand in Southeast Asia is growing faster than the world average, but regional oil production is on a downward trend. This has created a rising import dependency, which is expected to continue in the long term, and has increased concern regarding oil supply security for many countries in Southeast Asia.

Southeast Asian countries have been considering institutionalised oil stockpiling and a regional emergency response system, especially since the turn of the century. Based on the Energy Cooperation framework of the Association of Southeast Asian Nations (ASEAN) + 3 (China, Japan, and the Republic of Korea), proposed by Japan in 2002, ASEAN+3 countries established the Oil Stockpile Working Group to draw up the Oil Stockpiling Roadmap. The energy ministers of ASEAN+3 countries approved the roadmap in 2010, and each country is working to achieve the roadmap targets. In 2013, ASEAN countries ratified the ASEAN Petroleum Security Agreement, which set a framework for oil sharing scheme in supply emergencies. While some ASEAN countries have significant oil stockpiling, the average stockpile in ASEAN countries is lower than the International Energy Agency (IEA) standard.

This study examines how Southeast Asian countries could expand oil stockpiling. The authors hope it will be of use, not only for the countries in this study but also for other countries in Southeast Asia, to help institutionalise oil stockpiling and enhance oil supply security in the region.

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List of Abbreviations

ADNOC = Abu Dhabi National Oil Company

ASEAN = Association of Southeast Asian Nations

EPU = Economic Planning Unit

ERIA = Economic Research Institute for ASEAN and East Asia

IEA = International Energy Agency

IEEJ = The Institute of Energy Economics, Japan

JOGMEC = Japan Oil, Gas and Metals National Corporation

kl = kilolitre

m^3 = cubic meter

mb/d = million barrels per day

MEMR = Ministry of Energy and Mineral Resources

MTI = Ministry of Trade and Industry

NEC = National Energy Council

OECD = Organisation for Economic Co-operation and Development

PTT = Petroleum Authority of Thailand

RAPID = Refinery and Petrochemical Integrated Development

Executive Summary

Southeast Asia will increasingly depend on oil imports because of rising demand and sluggish production. Rising import dependency – along with external factors such as geopolitical tensions in the Middle East, the major supplying region – is a concern for the supply security of oil in Southeast Asia.

Government intervention in oil stockpiling is justified since oil is the largest part of the energy mix in Southeast Asia and major supply disruption could have devastating economic, social, and political consequences for the region. However, oil stockpiling is inadequately institutionalised in Southeast Asia. None of the four countries in this study – Indonesia, Malaysia, Singapore, and Thailand – has government stockpiling. Indonesia and Malaysia do not have a stockpiling obligation, and the extent of stockpiling in Singapore and Thailand lags the International Energy Agency (IEA) standard.

Singapore pursues its oil supply security as the regional oil refinery and trading hub. The governments of Indonesia, Malaysia, and Thailand are aware of the need for stockpiling, but struggle to prioritise stockpiling over other policy issues. Since stockpiling alone does not create a commercial return, oil companies are often reluctant to accept a stockpiling obligation. As a result, these countries – especially Indonesia, with its lack of tank capacity and the largest demand in the region – are vulnerable to supply disruption.

Several stockpiling options are available. The traditional approach, which obliges industry to maintain stocks followed by institutionalised government stockpiling, will be the main path for stockpile development mainly because of national security concerns. However, low-cost options such as tickets and/or investments from third parties (tank companies and crude exporters) could expand tank capacity. Given domestic financial (budget) constraints, it is necessary to tap into the dynamics and capability of third parties by creating a favourable investment environment. It is critical for governments in the region to address oil stockpiling with a portfolio of traditional and low-cost approaches to expand storage capacity and institutionalise oil stockpiling.

Introduction

Oil demand in Southeast Asia has increased by 3% per year since 2000, which is faster than the world average. Regional oil production is struggling to keep up. This has resulted in dependency on oil imports from outside the region, reaching 44% in 2015. The import dependency is expected to be higher in the long term, raising concern for oil supply security in Southeast Asia.

Many Southeast Asian countries have been working on expanding oil stockpiling and introducing government stockpiling. While some countries have significant oil stockpiling, the stockpile in Southeast Asian countries is generally lower than the International Energy Agency (IEA) standard. A joint stockpiling scheme in the region is an even more distant target.

This study analyses the current status and future prospects of oil stockpiling in selected Association of Southeast Asian Nations (ASEAN) countries with considerable demand size and geographical proximity: Indonesia, Malaysia, Singapore, and Thailand. Chapter 1 describes the oil demand, supply, governance, and industry in these four countries. Chapter 2 examines the current status of oil stockpiling in these countries. Chapter 3 analyses various oil stockpiling options. Chapter 4 summarises the discussion and suggests the way forward.

Chapter 1

Oil in Southeast Asia

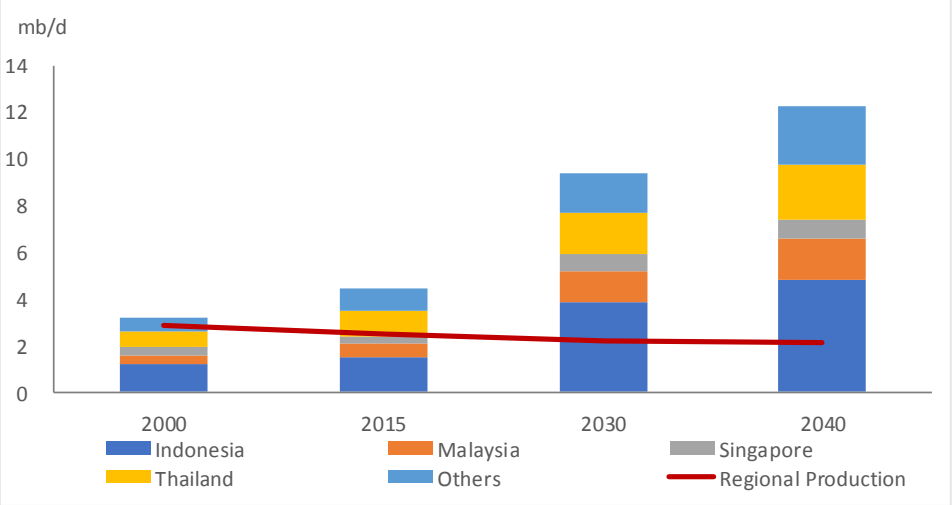
1.1 ASEAN

1.1.1 Demand and Supply

Oil demand in the Association of Southeast Asian Nations (ASEAN) is expected to grow rapidly for the foreseeable future. At 4.4 million barrels per day (mb/d) in 2015, oil demand in the region is projected to increase by 4.1% per year to reach 12.2 mb/d in 2040, according to the Economic Research Institute for ASEAN and East Asia (ERIA, 2016). The biggest growth will happen in Indonesia, where demand will increase by 4.8% per year to reach 4.8 mb/d in 2040. Thailand will see a steady increase in demand too, with an annual growth rate of 4.5% to reach 2.3 mb/d, while Malaysia will have annual growth of 3.0% to reach 1.7 mb/d in 2040. Singapore also shows strong demand growth, at 4.0% per year, though it will plateau at about 0.8 mb/d from 2030 onward. Demand in other countries in the region will grow significantly, but the share of these four countries will remain at about 80% until 2040.

By contrast, regional production is expected to decline steadily towards 2040. ASEAN countries produced 2.9 mb/d of crude in 2015. With 0.8 mb/d, Indonesia is the largest producer in the region, followed by Malaysia (0.7 mb/d) and Thailand (0.5 mb/d). ASEAN production, according to The Institute of Energy Economics, Japan (IEEJ) estimates, is likely to decrease to 2.1 mb/d in 2040. The region's import dependency was 44% in 2015, which is already significant, and it could rise to 83% in 2040 (Figure 1.1).

Figure 0.1. Oil Demand and Supply in ASEAN (2000–2040)



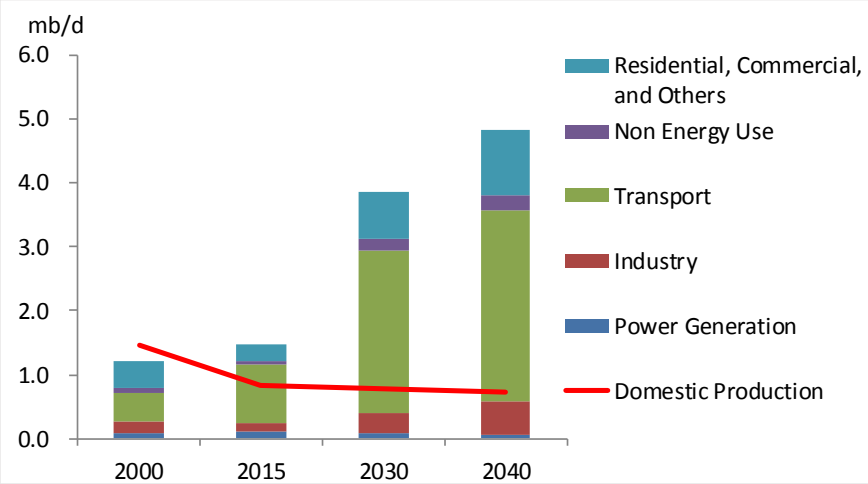
ASEAN = Association of Southeast Asian Nations; mb/d = million barrels per day.
Sources: ERIA (2016) and IEEJ (2017).

1.2. Indonesia

1.2.1 Demand and Supply

Indonesia is the largest consumer of oil in the ASEAN region, with demand growing steadily from 1.2 mb/d in 2010 to 1.6 mb/d in 2015. The increase is expected to accelerate in the future and ERIA (2016) predicts that demand will reach 4.8 mb/d in 2040. Most of the growth will happen in the transport sector. Although Indonesia is still the largest crude producing country in the region, production peaked in the early 1990s and the country produced 0.8 mb/d in 2015. (Figure 1.2) As a result, Indonesia has been a net importer since 2007, and import dependency in 2015 stood at 57%. The country is highly likely to become increasingly dependent on oil imports to satisfy its demand.

Figure 0.2. Oil Demand and Supply in Indonesia (2010–2040)

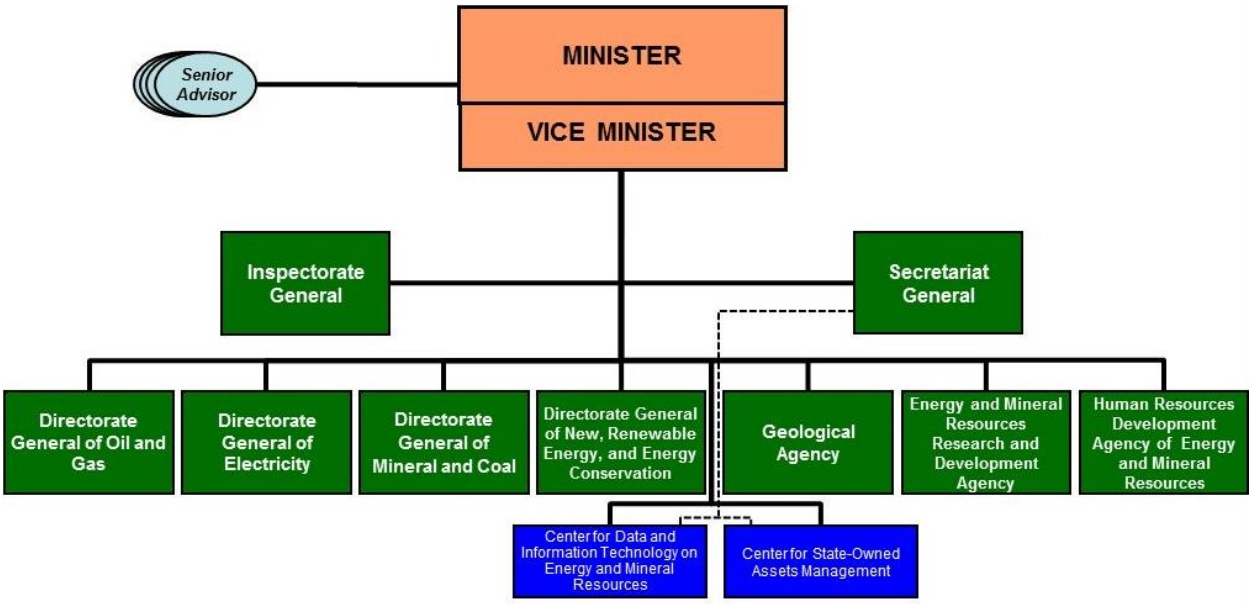


mb/d = million barrels per day.
Sources: ERIA (2016) and IEEJ (2017).

1.2.2 Governance and Industry

In Indonesia, the National Energy Council (NEC), established in 2007, is the main coordination body of energy policy. The NEC is cochaired by the President and vice president of Indonesia, and comprises ministers, industry executives, and academics. While the NEC outlines the basic energy policy, the Ministry of Energy and Mineral Resources (MEMR) executes energy and mineral resources policy. The MEMR is made up of seven main sections, including the Directorate General of Oil and Gas, which is the main body that implements oil and gas policy in Indonesia. (Figure 1.3)

Figure 0-3: Organisation Chart of MEMR



MEMR = Ministry of Energy and Mineral Resources.
Source: MEMR (2018a).

Other government agencies in the energy sector include the Special Task Force for Upstream Oil and Gas Business Activities (i.e. exploration and production) and the Governing Body for Downstream Oil and Gas (i.e. transportation and supply). The task force manages upstream oil and gas activities by signing and monitoring upstream development contracts, while the governing body regulates the downstream oil and gas sectors.

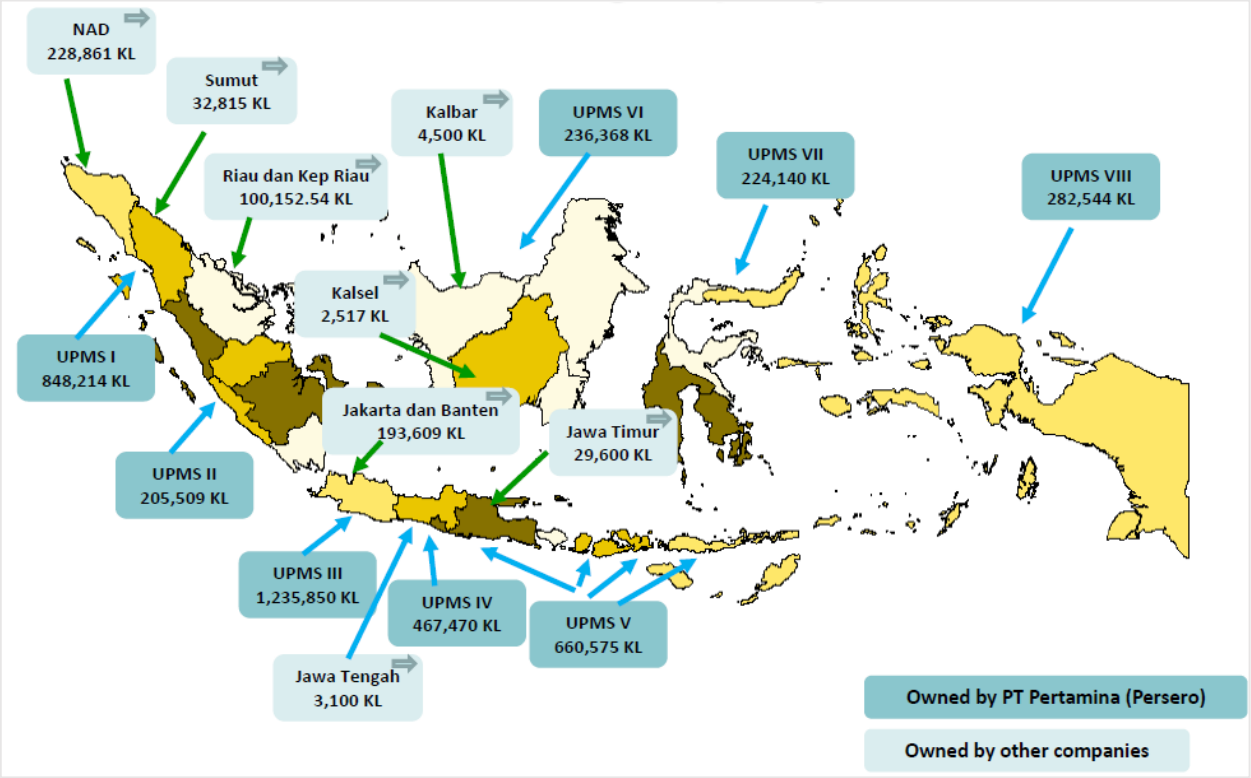
The oil and gas industry in Indonesia has long been dominated by state-owned Pertamina. Following Law No. 20 of 2001, Pertamina was reorganised as a public liability company without regulatory authority over the oil and gas sectors in Indonesia. The downstream sector is liberalised, and companies such as Shell and Petronas entered the retail business in 2004. Pertamina owns all six refineries in Indonesia, with a total capacity of 1.1 mb/d. Several plans are in place to upgrade or expand those refineries, and Pertamina is open to foreign partners. One of the partners is Saudi Aramco, which formed a joint venture with Pertamina to upgrade Cilacap refinery in Java. This upgrade is scheduled to complete in 2023 and increase capacity to 0.40 mb/d from 0.35 mb/d (Reuters, 2017).

1.2.3 Oil Stockpiling

According to the MEMR,[1] Indonesia has a total oil storage capacity of 4.8 million kilolitres (kl) or 30 mb. This is equivalent to 5% or 19 days of the annual demand in the country, which is probably the lowest ratio of the four countries in this study. Pertamina owns 87% of the capacity while other companies own the rest (Figure 1.4).

While over 40% of the capacity is in Java, which has the greatest demand, the Riau Islands close to Singapore have significant capacity growth. For example, Pertamina added 500,000 kl (3 mb) capacity in Sambu and Tanjung Uban in 2016. Foreign oil tank firms are already present in the area and adding more capacity because of the Special Economic Zone. Tank developments in the zone are not directly related to the government's oil stockpiling policy, but are primarily for commercial activities such as blending and trading, partly replacing the role of Singapore. Nevertheless, capacity additions are expected to contribute to Indonesia's oil supply security, albeit indirectly.

Figure 0.4. Oil Storage Capacity in Indonesia



MEMR = Ministry of Energy and Mineral Resources.
Source: MEMR (2018b).

[1] Direct communication with the MEMR.

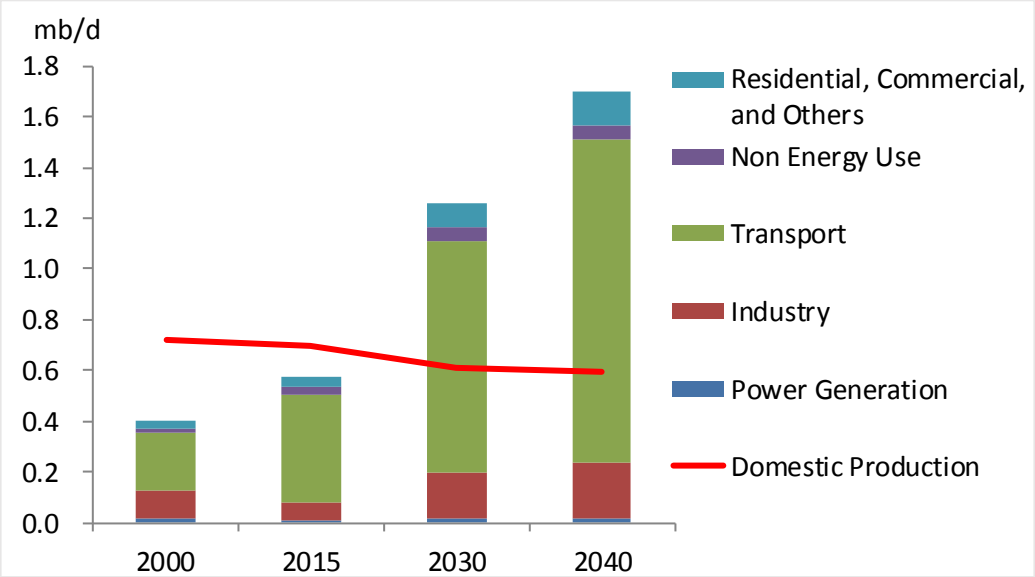
Indonesia imposes no oil stocking obligations. Pertamina holds 22 days of operational stocks based on domestic oil consumption. The MEMR is developing laws on stockpiling obligations for private companies (i.e. other than Pertamina) to hold 25 days of stock based on a ministerial decree, as well as government stocks of 30 days based on a presidential decree, although no specific target year has been set to enact the laws.

1.3 Malaysia

1.3.1 Demand and Supply

Malaysia is the fourth largest consumer and second largest producer of oil in Southeast Asia. Demand in 2015 was 0.6 mb/d, mostly for transport. As in Indonesia, demand growth is expected to accelerate, reaching 1.7 mb/d in 2040. (Figure 1-5) Malaysia is one of the few countries in the region with net oil exports since 2015. However, the country is expected to turn into a net importer around 2020 because of the robust demand growth and declining domestic production. Import dependency is expected to reach 65% in 2040.

Figure 0.5. Oil Demand and Supply in Malaysia (2010–2040)



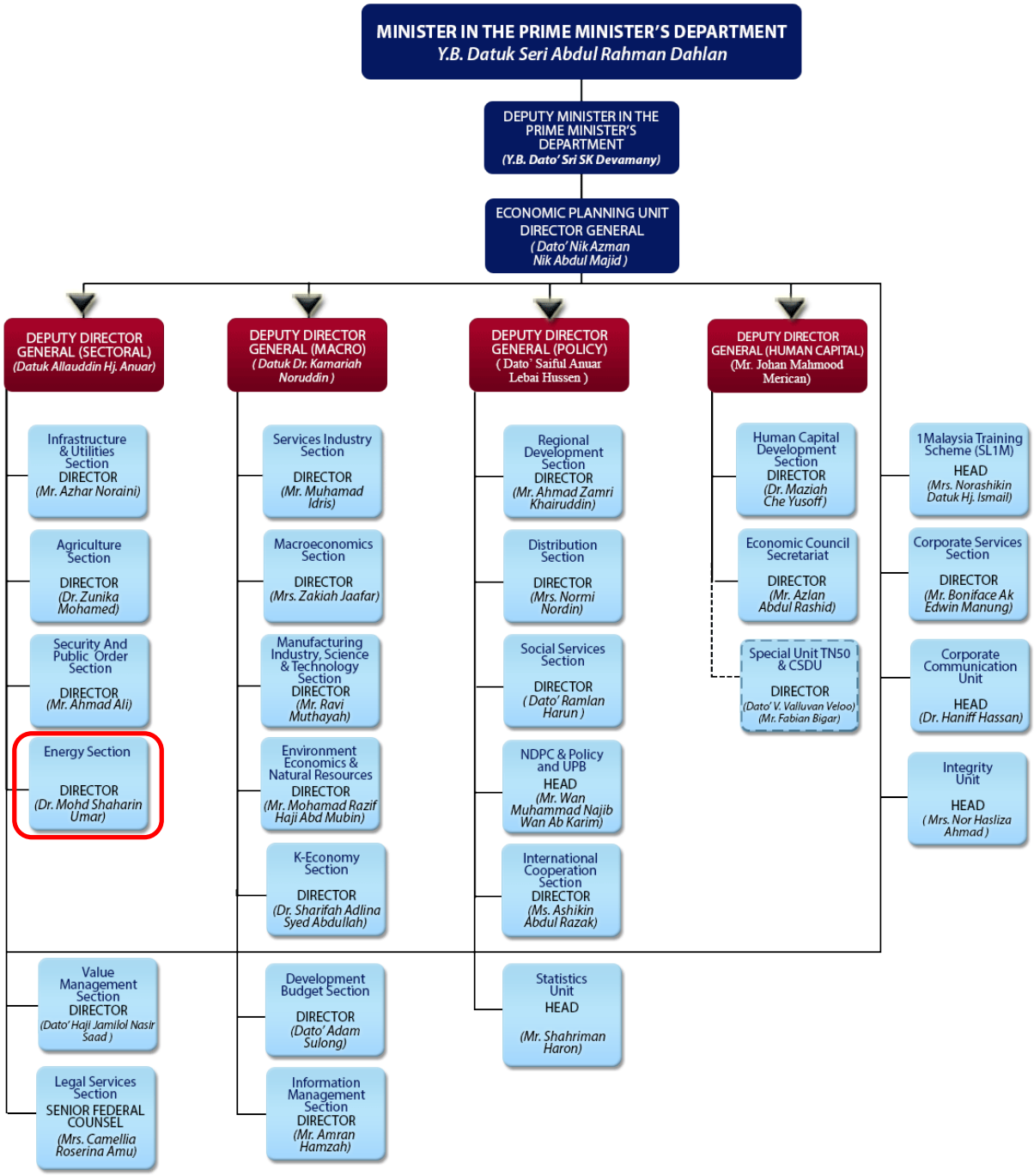
mb/d = million barrels per day.
Sources: ERIA (2016) and IEEJ (2017).

1.3.2 Governance and Industry

The Energy Section of the Economic Planning Unit (EPU), under the Minister of Economic Affairs, is responsible for most energy governance in Malaysia, especially in the oil and gas sectors (Figure 1.5). The key functions of the Energy Section are to (i) formulate policies and strategies for sustainable development of the energy sector; (ii) promote the development of the oil and gas industries; (iii) ensure

adequate, secure, quality, and cost-effective energy supply; and (iv) promote increased use of renewable energy and energy efficiency in the energy sector.

Figure 0-6: Economic Planning Unit Organisation Chart



Source: EPU (2018).

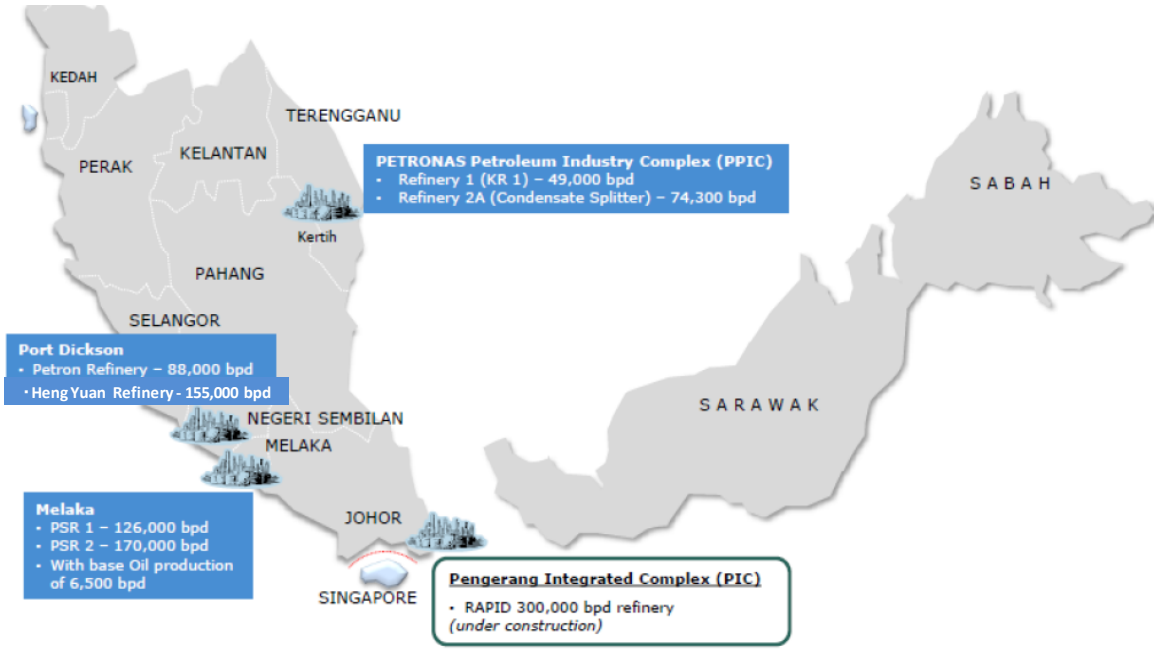
The Ministry of Energy, Green Technology and Water is mainly in charge of the power industry, renewables, and energy efficiency as well as water supply. The Energy Commission is an independent regulatory body responsible for the electricity and piped gas supply industries.

Established in 1974, Petronas, a wholly state-owned entity, has the authority to own, develop, and operate oil and gas resources and facilities. Although foreign investment in the upstream sector is subject to forming joint ventures with Petronas, downstream sectors (e.g. refinery and retail) are open to 100% ownership by foreign entities. Malaysia has eight refineries, with a total capacity of 0.72 mb/d. Petronas owns three of them, and is developing a major oil and petrochemical complex (Pengerang Integrated Complex) with Saudi Aramco in Johor. With refinery capacity of 0.3 mb/d, this is scheduled to commence operations in 2019.

1.3.3 Oil Stockpiling

Figure 1-7 depicts refinery profiles in Malaysia, but no official figures are available for oil storage capacity. Storage capacity for Johor could increase from 3.5 million cubic meters (m^3) to 10.0 million m^3 (22 mb to 63 mb) when Petronas Petroleum Industry Complex is fully developed (*Tank Storage Magazine* 2017). This means that the current capacity in Johor alone meets 10% of the annual demand of 2015.

Figure 0-7: Refinery Profiles in Malaysia



bpd = barrels per day.
Source: EPU (2017).

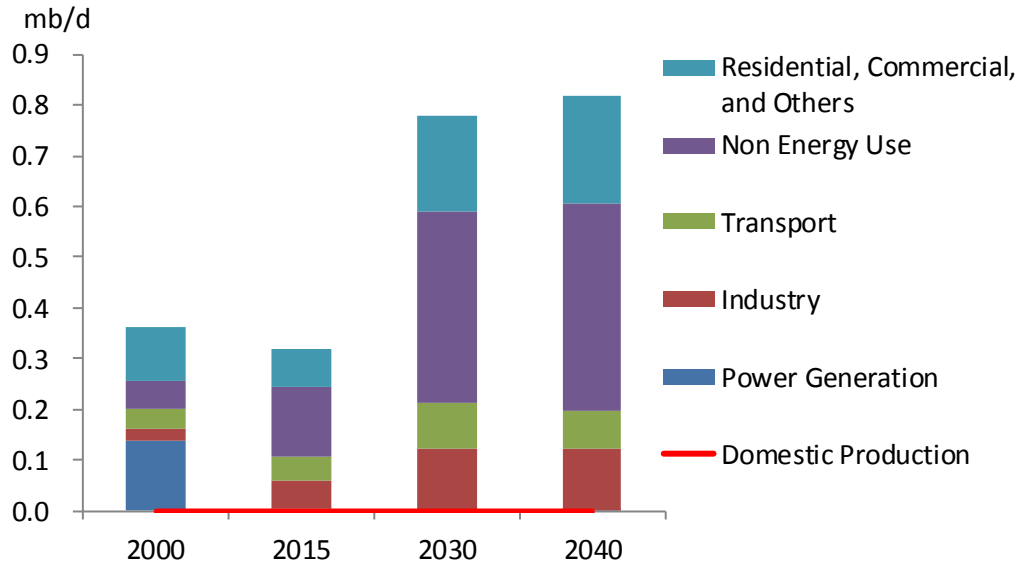
Malaysia has no oil stockpiling obligation. The government is aware of the need for the obligations, but it has given policy priority to the review of subsidies, modal shift, and demand control rather than oil stockpiling.

1.4 Singapore

1.4.1 Demand and Supply

Singapore is the third largest consumer of oil in the region. It is unique because it has no domestic production but has excess refinery capacity. Singapore has been the regional oil refining and trading hub for decades. Although demand decreased from 2000 to 2015 as natural gas replaced oil for power generation, Singapore's oil demand growth is forecast to be very strong in the future. ERIA (2016) projects demand to more than double by 2030, driven by non-energy use (i.e. mostly petrochemical feedstock). (Figure 1-8) However, this will depend on the expansion of petrochemical plants in the country.

Figure 0-8: Oil Demand and Supply in Singapore (2010–2040)

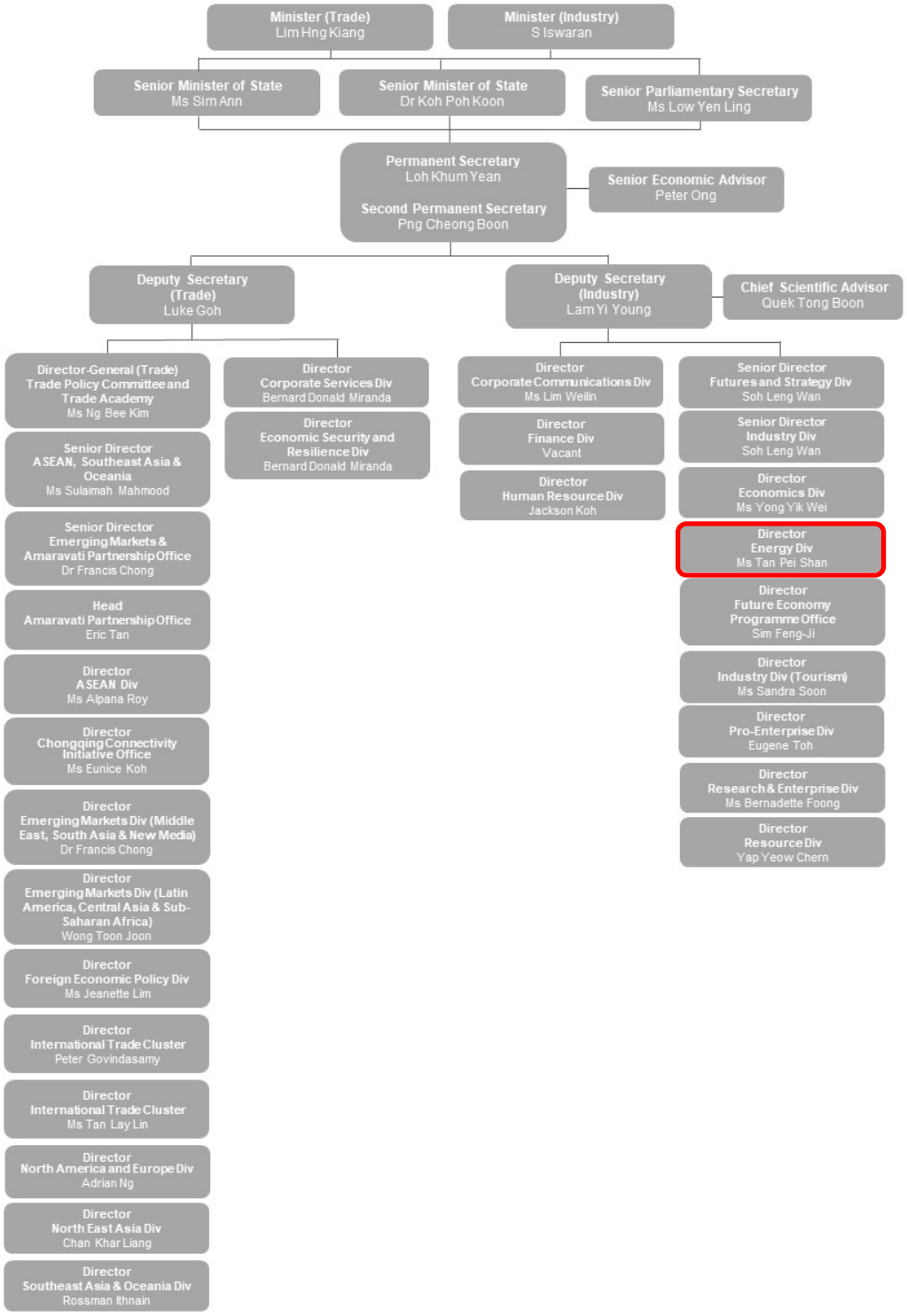


mb/d = million barrels per day.
Sources: ERIA (2016) and IEEJ (2017).

1.4.2 Governance and Industry

The Ministry of Trade and Industry (MTI) is the principal body for energy policy in Singapore. The Energy Market Authority is a market regulator tasked with ensuring competition in the power and gas supply industries. (Figure 1-9) Singapore has always been open for foreign investment in its energy sector. It has three refineries, owned by ExxonMobil, Shell, and Singapore Refining Company (joint venture of Singapore Petroleum Company and Chevron). The total refining capacity is 1.3 mb/d, which well exceeds domestic demand.

Figure 0-9: Organisation Chart of Ministry of Trade and Industry

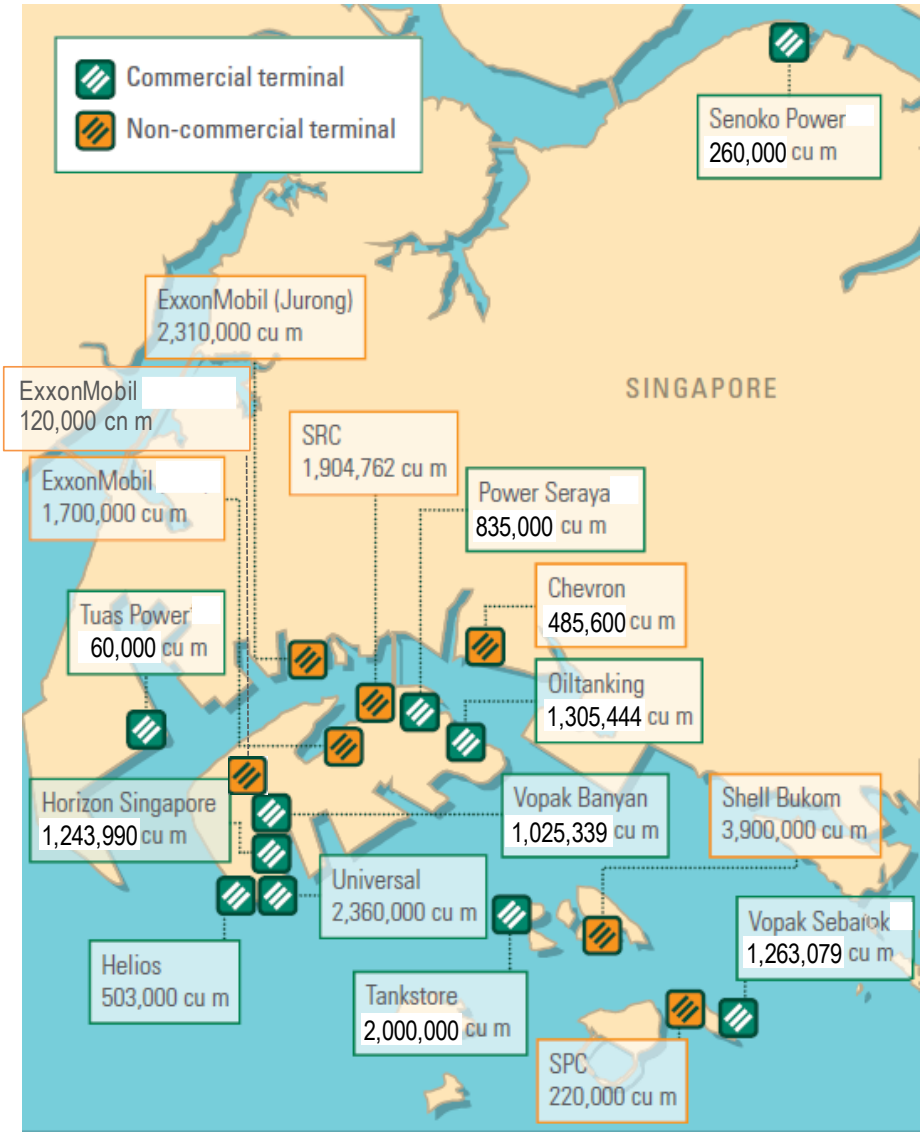


Source: MTI (2018)

1.4.3 Oil Stockpiling

As Asia's trading hub, Singapore has large oil storage capacity, at 21.5 million m^3 (135 mb) in 2018. (Figure 1-10) This is equivalent to 123% or 451 days of annual domestic demand, and has been mainly developed commercially by independent tank companies and refineries. Independent tank companies such as Vopak, Tankstore, and Helios Energy are particularly active in Singapore, providing capacity for blending and trading.

Figure 1-10: Oil Storage Capacity in Singapore



Sources: Platts (2014, 2018).

Singapore has no official oil stockpiling obligation, but electricity generators hold 90 days of back-up fuel to meet the generator license condition. Gas-fired power generates most electricity in Singapore, but it is very costly to store natural gas. Thus, generators install a dual fuel unit to burn natural gas and oil

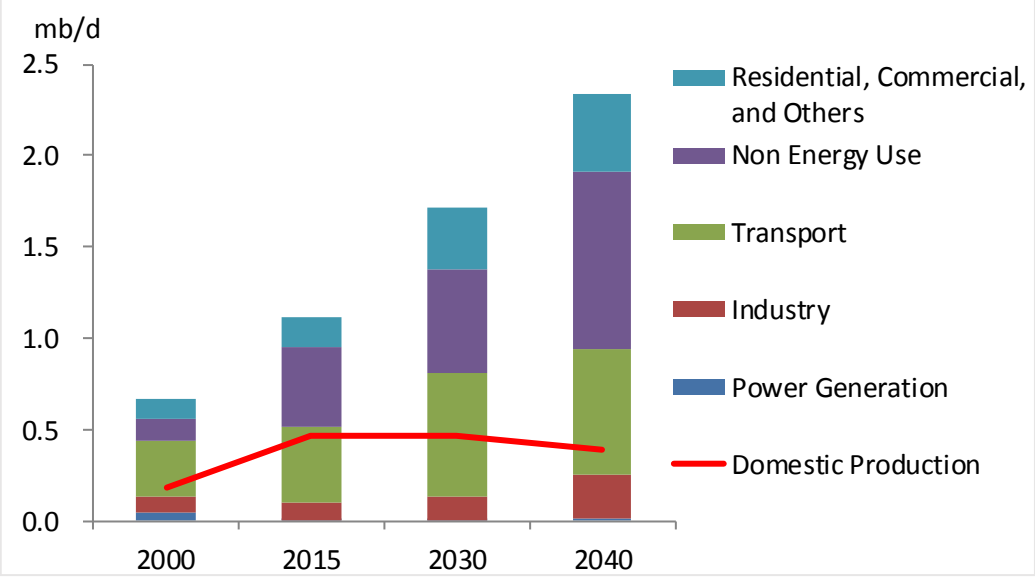
products, and oil products are the back-up fuel. However, this is different from the oil stockpiling in IEA member countries, which involves stockpiling obligations on oil companies and government stockpiling.\

1.5 Thailand

1.5.1 Demand and Supply

Thailand is the second largest consumer and the third largest producer of oil in Southeast Asia. It consumed 1.1 mb/d in 2015, mainly in transport and non-energy use (mostly petrochemical feedstock). According to ERIA (2016), demand is expected to increase steadily to reach 2.3 mb/d in 2040, with transport and non-energy use still the two biggest demand sectors. Domestic production in Thailand has increased, reaching 0.5 mb/d in 2015, almost all of which was consumed domestically. However, the IEEJ forecasts that production will start declining around 2030 and hover around 0.4 mb/d until 2040. (Figure 1-11) Thus, like Indonesia and Malaysia, rising import dependency is inevitable. Thailand's import dependency is expected to reach 83% in 2040.

Figure 0-11: Oil Demand and Supply in Thailand (2010–2040)



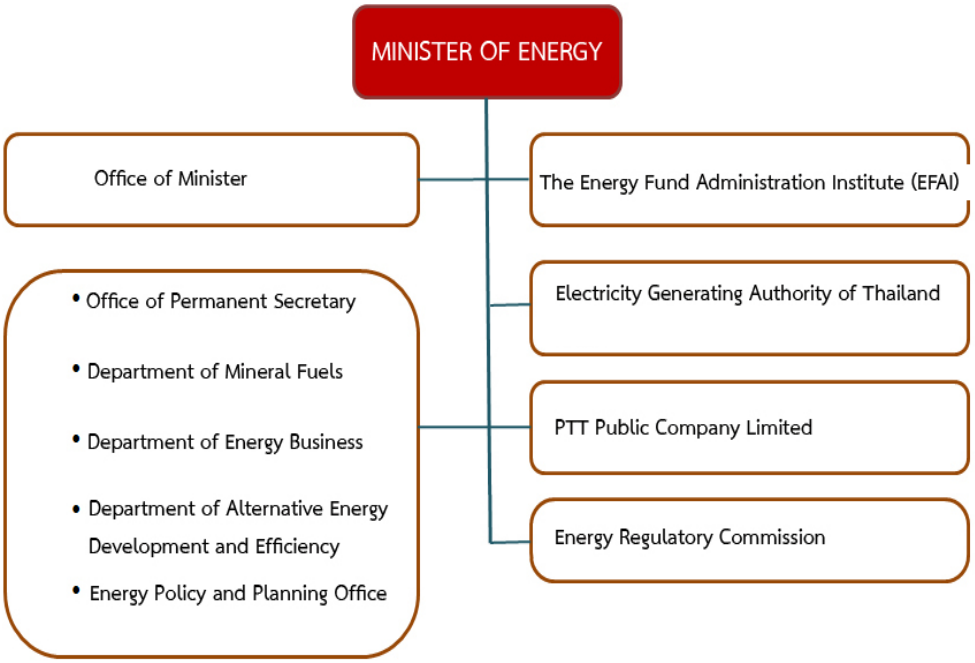
mb/d = million barrels per day.
Sources: ERIA (2016) and IEEJ (2017).

1.5.2 Governance and Industry

The Ministry of Energy formulates and executes energy policy in Thailand. It has four main sections: the Energy Policy and Planning Office, the Department of Mineral Fuels, the Department of Energy Business, and the Department of Alternative Energy Development and Efficiency. The Energy Policy and Planning Office has a wide range of functions, such as monitoring energy demand and supply, formulating and

evaluating energy policy, aligning with other ministries and industries, and managing the Oil Fund.[2] (Figure 1-12) The Department of Mineral Fuels has jurisdiction over upstream sectors, including signing contracts for exploration and production projects in Thailand. The Department of Energy Business regulates downstream activities – wholesale, retail, product quality, safety, and environmental management. The Department of Alternative Energy Development and Efficiency oversees renewable energy and energy efficiency.

Figure 0-12: Organisation Chart of the Ministry of Energy



PTT = Petroleum Authority of Thailand.
Source: Ministry of Energy (2018).

The Ministry of Energy has jurisdiction over two major energy companies: the Petroleum Authority of Thailand (PTT) and the Electricity Generating Authority of Thailand. PTT was partially privatised in 2001, but the government retains 51% of the company shares. Both the upstream and downstream sectors are open to foreign investment. Thailand has six refineries in operation, of which PTT controls five through its subsidiaries for an accumulated capacity of 1.2 mb/d.

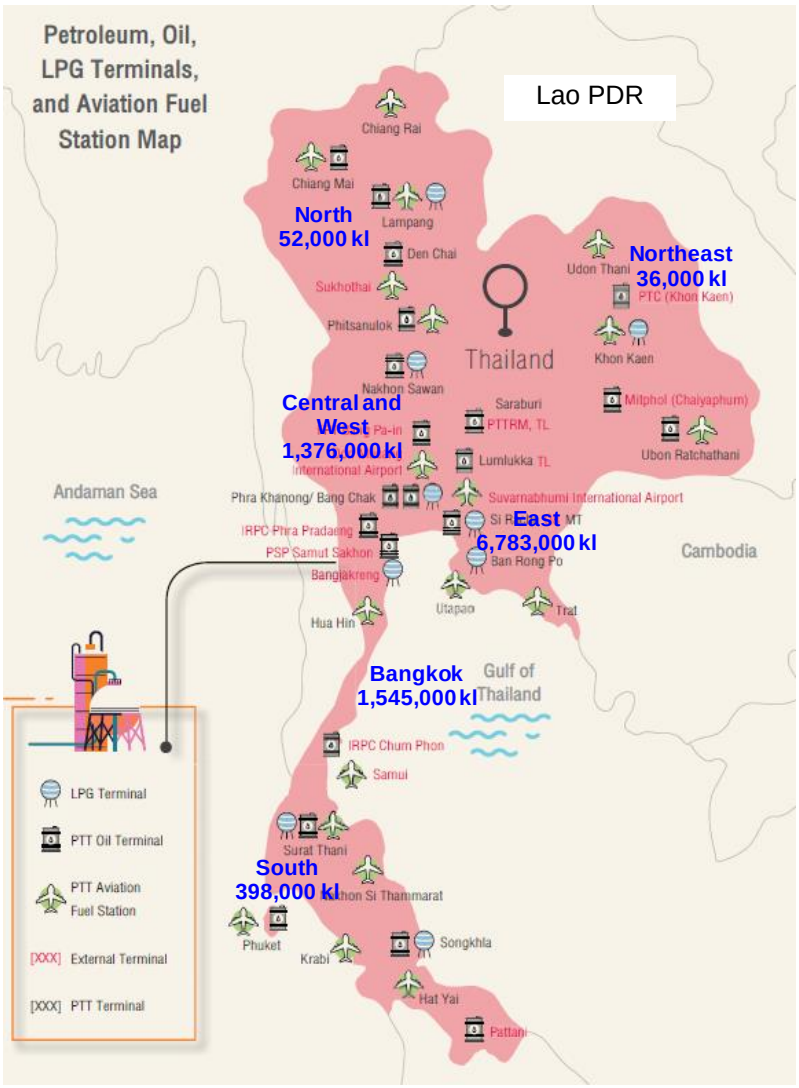
[2] The Oil Fund is aimed at stable domestic energy prices.

1.5.3 Oil Stockpiling

Thailand has ample oil storage capacity. According to the Ministry of Energy, the total capacity in the country is 10.2 million kl (64 mb), which is 13% or 46 days of the annual demand in 2015. (Figure 1-13) This study assumes that PTT owns most of the capacity, although no official information is available to confirm this. Other details – such as the share of storage capacity of oil terminals, refineries, or deposits – are not disclosed.

The government obliges refinery and oil traders to hold stocks. In the case of crude oil, refineries are required to hold 6% or the equivalent of 21.5 days of crude demand. Traders are mandated to hold 1% or 3.5 days of demand. The government is undertaking a study on oil stockpiling to decide whether to introduce government stockpiling. The study is expected to be completed by the first quarter of 2019.

Figure 1-13: Oil Storage Capacity in Thailand



kl = kilolitre.

Source: PTT (2018); storage capacity figures added by IEEJ.

Chapter 2

Oil Stockpile Options for Southeast Asia

2.1 Traditional Approach

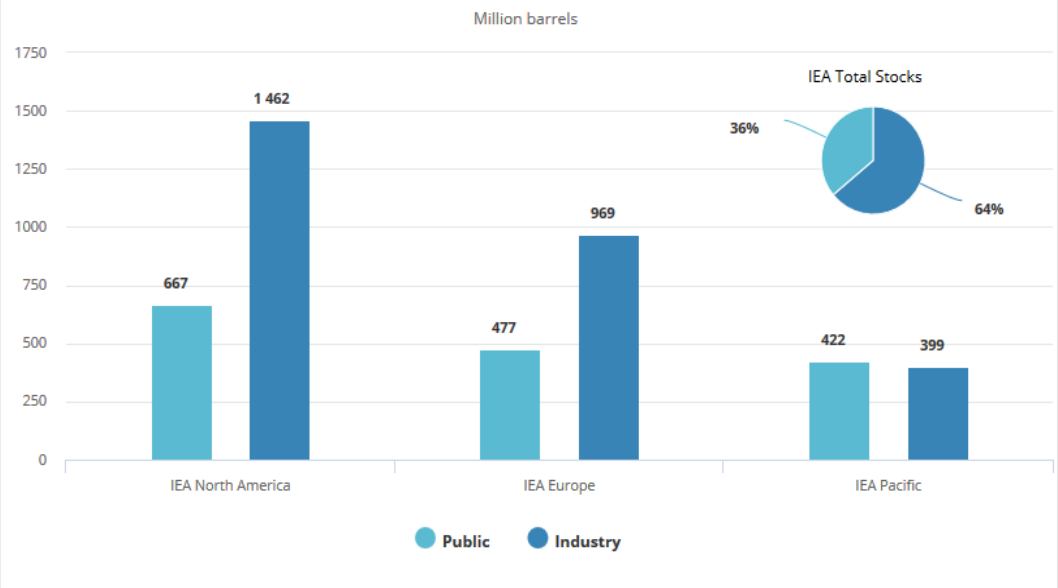
Holding stock is an indispensable part of the oil supply industry. Companies have always kept a certain amount as commercial stock to adjust demand and supply, irrespective of laws and regulations. However, in 1962, the Organisation for Economic Co-operation and Development (OECD) recommended that its member countries hold 60 days of stock in case of supply disruption because of growing concern over oil supply security since the Suez crisis in 1956. With the first oil crisis in 1973, OECD countries founded the IEA to coordinate energy security and policy among its members. Emergency response systems and oil stockpiling have been central to the role of the IEA, and holding 90 days' stock of net imports is a condition for IEA membership.

IEA member countries developed oil stockpiling based on industry stock. Japan initiated stockpile development in 1972 when the government recommended oil companies to hold 60 days of imports. In 1975, oil companies in Japan were obliged by law to hold 90 days of imports.

Government intervention in oil stockpiling was increasingly called for because of the oil crises of the 1970s, and several countries started to introduce government stocks. The United States established the Strategic Petroleum Reserve in 1975 and Japan followed in 1978. Many other IEA countries also introduced government stockpiling at different stages, but a significant number of counties do not have a government stockpiling scheme. Even in February 2018, industry stocks in IEA countries accounted for 64% of the total stock. (Figure 2-1)

Commercial stocks (and government stocks that use industry tanks) are usually located alongside oil supply logistics, such as import terminals, pipelines, refineries, and deposits. Government stocks are sometimes stand-alone, mainly because of security and land availability. For instance, the Shirashima stockpiling base in Japan is offshore, away from the country's refineries and import terminals. (Figure 2-2)

Figure 2-1: Oil Stocks in IEA Countries (February 2018)



IEA = International Energy Agency.
Source: IEA (2018).

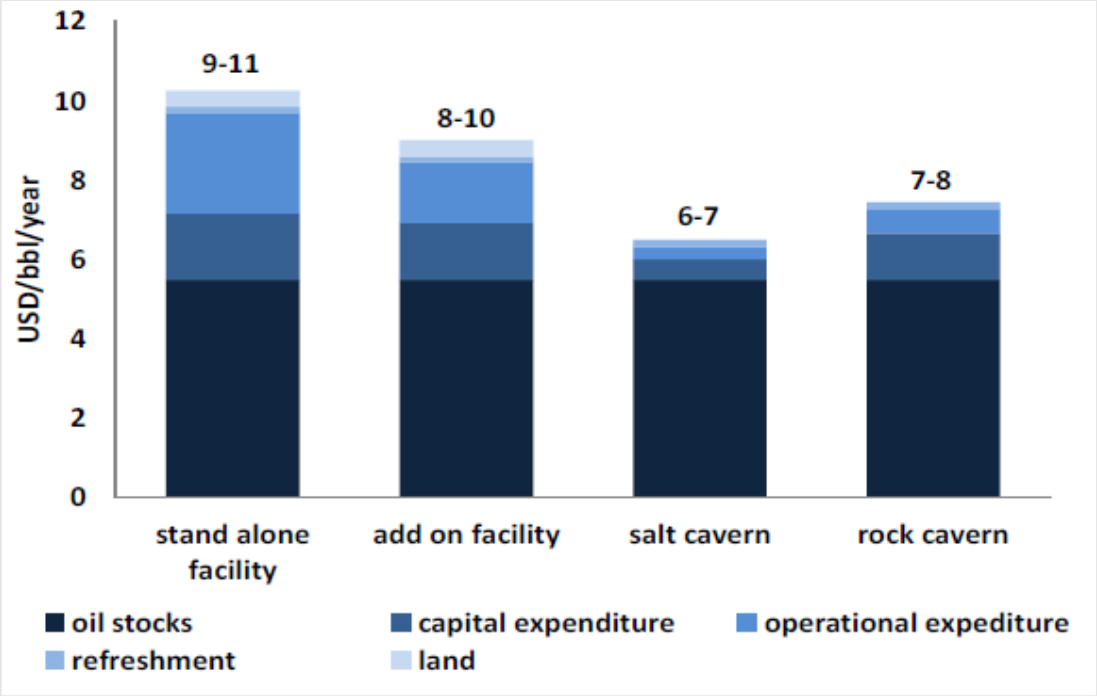
Figure 2-2: Shirashima Stockpiling Base

Source: JOGMEC (2018).

While the traditional approach, whereby stockpiling is institutionalised first through industry stocks and later through government stocks, is still viable for ASEAN countries, it carries a substantial financial burden. Figure 2-3 illustrates the stockpiling cost by facility type, which is $6–$11 per barrel per year according to the IEA. While oil stocks (crude purchase) share at least half of the total cost, capital and operational expenditures are also significant, especially for stand-alone and add-on facilities (i.e. onshore tank type in Figure 2-3).

Using the above cost range, Indonesia would have required as much as $290 million–$530 million in 2015 to meet the 30-day government stockpiling stipulation.[3] The total budget of the MEMR was Rp15 trillion or $1.1 billion in 2015 (MEMR 2018c). This shows the financial burden of oil stockpiling for Indonesia, and is likely similar in many other Southeast Asian countries.

Figure 2-3: Stockpiling Cost by Type (3% interest rate)



USD = United States dollar; bbl = barrel.
Source: IEA (2013).

[3] As mentioned in 1.2.3, the MEMR is preparing laws to oblige 30 days of government stocks as well as 25 days of commercial stock obligations.

2.2 Low-Cost Options

Financial constraints are common factors slowing down oil stockpiling in many countries in Southeast Asia. Since many governments in the region recognise the need for oil stockpiling, low-cost options should be identified to facilitate the process. Reducing costs, especially of crude purchase (oil stocks in Figure 2-3), is critical.

Stockpiling at existing oil terminals could lower the development cost of oil stockpiling, but lack of data and information prevents meaningful analysis. This section considers three options that could reduce or share the upfront cost (i.e. oil stocks and capital expenditure): (i) tickets, (ii) inviting tank operators, and (iii) joint stockpiling with crude exporters. Tickets are stockholding arrangements under which the seller agrees to hold (or reserve) an amount of oil on behalf of the buyer, in return for an agreed fee. The buyer of the ticket (or reservation) effectively owns the option to take delivery of physical stocks in times of crisis, according to conditions specified in the contract. Inviting private tank operators and joint stockpiling with crude operators could expand storage capacity, irrespective of institutionalised stockpiling, by using the financial and operational capacity of tank operators and/or crude exporters.

2.2.1 Tickets

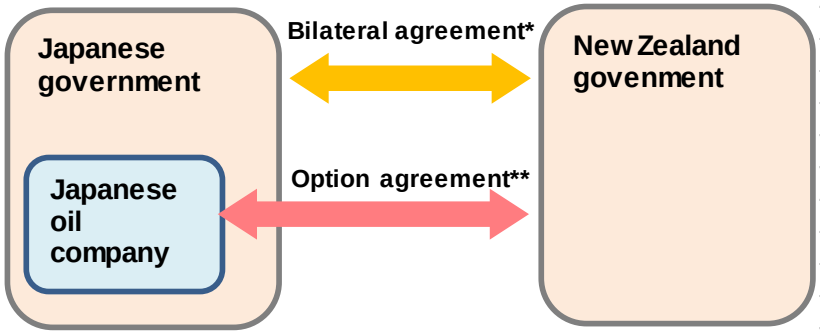
Ticket stockpiling refers to a scheme in which a country pays a ticket fee (charge for oil stockpiling) to count oil stock held by other countries as emergency oil stock. Tickets are instruments to outsource stockpiling to other countries. If the ticket stockpiling is conducted between two countries, both governments agree on the stockpiling of a specific amount of oil before agencies in the two countries make a contract. (Figure 2-4)

The ticket stockpiling system has been widely used in Europe. New Zealand has introduced the system in Asia and the Pacific. The governments of Japan and New Zealand made an agreement and a Japanese oil company and the Government of New Zealand subsequently made a ticket contract, under which New Zealand would pay a ticket fee and the Japanese oil company would promise to supply petroleum products to New Zealand in case of emergency.

Since entities that offer tickets already have storage and other infrastructure, ticket stockpiling does not require ticket buyers (those who use storage capacity) to bear capital expenditure. However, if conducted internationally, ticket stockpiling could evoke national security concerns because oil is stored in another country, especially if it is far away. Therefore, many countries set the upper limit of ticket stockpiling at 10% of the required oil stock.

Countries in Southeast Asia could establish a ticket stockpiling scheme to take advantage of the excess storage capacity of Singapore and Japan. However, ticket stockpiling may play a supplemental rather than mainstream role in Southeast Asia's stockpiling system because of national security concerns.

Figure 2-4: Ticket Stockpiling Scheme between Japan and New Zealand



***Bilateral agreement**
- Inventory for option contract is counted as stockpiling volume of New Zealand.
- When New Zealand exercises its option contract, Japan does not obstruct transportation of the stockpiling volume.

****Option agreement**
- New Zealand government purchases option to buy oil from Japanese oil company through option fee payment.

Source: IEEJ (2016).

2.2.2 Inviting Tank Operators

The traditional approach to stockpiling involves a company or government agency in one country as an investor in that country's stockpiling base. However, Southeast Asian countries can also invite independent tank operators to expand storage capacity. This is how Singapore has been successful in adding substantial capacity, especially since the 1980s. Companies such as Vopak, Tankstore, and Helios Energy own and operate most of the storage capacity in Singapore. These companies are already present in other countries in the region. Vopak, for instance, is a partner in Petroleum Industry Complex projects in Malaysia, and plans to develop 1.7 million m^3 (11 mb) capacity in 2019 alone (Vopak 2017).

Tank companies will not invest unless it is commercially viable, so governments must create a stable and favourable investment climate before inviting them to participate. Oil stockpiling alone does not have any commercial value, especially in stand-alone facilities, so governments need to align commercial viability and oil supply security policy. They could invite tank companies primarily for the commercial use of storage capacity and possibly integrate part of the capacity for institutionalised stockpiling later.

2.2.3 Joint Stockpiling with Crude Exporters

Joint stockpiling refers to an arrangement in which a crude exporter stores its crude in an importing country in exchange for giving the importing country first drawing rights in case of emergency.

The Republic of Korea (henceforth, Korea) pioneered joint stockpiling with crude exporters when it signed a deal with Kuwait to store 2 mb of crude at Korea National Oil Corporation's facilities in Korea. It signed another joint stockpiling deal in 2016 with Iran to store another 2 mb of crude. Japan followed, and stores Saudi and United Arab Emirates crude. India also has an agreement with the United Arab Emirates, and the first cargo for joint stockpiling arrived in May 2018 (ADNOC 2018). (Figure 2-5)

Figure 2-5: Joint Stockpiling Agreements between Crude Exporters and Asian Importers

Year of initial deal	Middle Eastern country	Asian country	Location of stockpile	Current volume (in MMbbls of stored crude oil)
2006	Kuwait	Rep. of Korea	n.a.	2
2009	UAE	Japan	Kiire	6.3
2010	Saudi Arabia	Japan	Okinawa	8.3
2012	UAE	Rep. of Korea	Yeosu	6
2016	UAE	India	Mangalore	6
2016	Iran	Rep. of Korea	Seosan	2

MMbbls = million barrels; n.a. = not available; UAE = United Arab Emirates.
Source: Kapsarc (2017).

Japan Oil, Gas and Metals National Corporation (JOGMEC) lends tank capacity to Saudi Aramco and Abu Dhabi National Oil Company (ADNOC) for free, and JOGMEC has the first right to access the crude in an emergency. Saudi Aramco and ADNOC use the facility for commercial purposes in ordinary times, and JOGMEC does not pay for the crude unless it uses it.

Joint stockpiling of this kind benefits both exporters and importers. For exporters, it enables better access to the demand market at a low cost. Intensifying competition between crude exporters or traders makes it essential not to miss business opportunities. Exporters who joint-stockpile their crude in importing countries can deliver the crude instantly, without long-haul transportation. In return, importing countries can expand their stock without paying crude to exporters. Importing countries also can 'de-risk' Middle Eastern crude since it has already transited the critical chokepoints of the straits of Hormuz and Malacca (Kapsarc 2017). Strengthening ties benefits both parties, providing supply security for importers and demand security for exporters.

Crude exporters such as Saudi Aramco and Kuwait Petroleum Corporation are increasing their presence in Southeast Asia. Saudi Aramco participates in major refinery projects such as the Refinery and Petrochemical Integrated Development (RAPID) in Malaysia and Cilacap in Indonesia. Kuwait Petroleum Corporation started commercial operations at Nghi Son refinery in Viet Nam in 2018. These refineries will provide significant tank capacity, which will enhance supply security. If Southeast Asian countries could leverage these projects and share the financial burden of stockpiling with crude exporters seeking downstream integration into the region, the financial burden for Southeast Asian governments and national oil companies could be significantly mitigated. Similar to other approaches to oil stockpiling, it is crucial to align the commercial viability of crude exporters and the security policy of Southeast Asian countries.

Chapter 3

Summary and Way Forward

3.1 Summary

This study examined the current status and future prospects of oil stockpiling in selected ASEAN countries – Indonesia, Malaysia, Singapore, and Thailand.

Chapter 1 described the oil demand, supply, governance, and industry in these four countries. While oil demand will increase rapidly, domestic production will decrease slightly in Southeast Asia. Rising import dependency will follow, raising concerns regarding oil supply security. Oil storage capacity varies significantly among countries. While Singapore's capacity well exceeds its annual domestic demand, Indonesia's capacity is as little as 5% of its annual demand. Thailand and Malaysia fall somewhere in between, although no official data are available for Malaysia. Indonesia and Malaysia do not have a stockpiling obligation, but Indonesia is developing a law to guarantee a 30-day government stock and a 25-day company stock obligation. In Singapore, companies in the power sector are obliged to hold certain back-up fuel, but not in other sectors. Thailand is the most advanced in terms of stockpiling legislation, and refineries are required to hold 21.5 days of stock and traders 3.5 days of stock.

Chapter 2 analysed oil stockpile options for Southeast Asia. The traditional approach, which Japan took, involves obliging companies to keep oil stocks and then introducing government stocks. While Thailand and perhaps Indonesia seem to follow this approach, the financial burden is a major obstacle. Based on an estimate by the IEA (2013), Indonesia would have required $290 million–$530 million in 2015 to meet the 30-day government stockpiling stipulation.

Although stockpiling at existing oil terminals could offer a low-cost solution, lack of data and information makes it difficult to conduct meaningful analysis. Thus, chapter 2 investigated lower-cost options such as tickets, inviting tank operators, and joint stockpiling with crude exporters. These options could significantly reduce the development cost of oil stockpiling. However, introducing direct investment (often foreign) from tank operators and crude exporters is subject to commercial viability. Governments need to create a favourable investment climate to justify investments in oil storage in Southeast Asia if they wish to expand oil storage capacity with the help of tank operators and/or crude exporters. Aligning commercial viability and stockpiling policy is crucial. Given the characteristics of different stockpiling options, many countries in Southeast Asia could develop oil stockpiling with a portfolio of options (Table 3-1).

Table 3-1: Stockpiling Options for Southeast Asia

Options / Issues	Expanding commercial stocks	Government (strategic) stocks	Tickets	Inviting tank operators	Joint stockpiling with crude exporters
CAPEX Investors	Oil companies	Government	No need	Tank operators	Oil companies
CAPEX level	Medium	High	Low	High	Medium
Advantages	Using existing infrastructure	Full control by government	Low CAPEX	Using specialised expertise	Demand security for suppliers
Challenges	Sharing cost burden	High CAPEX Reluctance of Ministry of Finance	National security concerns	Incentives required for tank companies	Sharing cost burden

CAPEX = capital expenditure.
Source: IEEJ.

3.2 Way Forward

3.2.1 Prioritising Oil Stockpiling in Energy Policy

Rising dependency on oil imports will increasingly be a concern for the security of oil supply in Southeast Asia. The majority of the crude imported into the region is from the Middle East, where geopolitical tensions are likely to continue. Since oil accounts for the largest part of the energy mix in Southeast Asia, and major supply disruption could result in devastating economic, social, and political consequences in the region, government intervention in oil stockpiling as a last resort is justified.

Some governments in Southeast Asia, such as Thailand, oblige oil companies to hold certain stocks by law, while others, like Indonesia and Malaysia, do not impose such obligations. Policy makers are generally aware of the need for oil stockpiling but struggle to form a national consensus, especially over allocating adequate budget to develop a stockpiling system. Consequently, oil stockpiling has not gained priority status in energy policy issues such as upstream developments, energy subsidies, energy efficiency, and improving energy access.

It is difficult to form a national consensus on oil stockpiling, given other pressing policy needs. If implemented following IEA standards, stockpiling could cost hundreds of millions of United States dollars per year, but stockpiling alone does not create any commercial return. This makes it difficult to secure adequate budget allocation and convince industry players to institutionalise stockpiling. If a government intends to introduce and/or expand oil stockpiling, it needs to begin with raising awareness and the policy priority of oil stockpiling. ERIA (2016) conducted a case study of oil supply disruption in Southeast Asia, but each country could develop the study with more detailed analysis covering various risk factors and disruption scenarios, while estimating economic and social impacts. Such a study would be useful to justify and help form a national consensus on budget allocation to oil stockpiling.

3.2.2 Portfolio Approach towards Oil Stockpiling

Despite the difficulty in forming a national consensus, oil stockpiling developments show positive signs. Refinery projects – together with crude exporters in Viet Nam, Malaysia, and Indonesia – will not only lower the need for product imports but also add significant storage capacity. Indonesia, the largest consumer in the region, is formulating laws for company stockpiling obligations and government stockpiling. Its oil supply security will increase when these laws are enacted and enforced.

Several options are available for oil stockpiling in Southeast Asia (Table 3-1). The traditional approach, obliging industry to maintain oil stocks and then introducing government stocks, is likely to remain the principal strategy for stockpile development because of national security concerns. Oil stockpiling is supposed to address supply insecurity, and governments wish to retain full control over oil stocks within their jurisdictions. ASEAN countries have discussed regionwide joint stockpiling, but this might not be feasible since most countries do not have adequate storage capacity to share with their neighbours.

While the traditional approach should be the main direction, low-cost options such as tickets and/or investments from tank operators and/or crude exporters could significantly alleviate the financial burden. Stockpiling at existing oil terminals could also lower the development cost because terminal construction is not necessary, although this study could not examine the details because the relevant data and information are not available. Given the financial (budget) constraints to expand domestic capacity, governments could tap into the dynamics and capability of third parties such as tank operators and crude exporters by creating a conducive investment environment.

Oil will remain the main fuel to meet rising demand in Southeast Asia. A disruption in oil supply would have catastrophic social, economic, and political consequences. Governments in the region need to address oil stockpiling using various options to accommodate the characteristics of each country. The traditional approach, institutionalising oil stockpiling by expanding commercial stocks and introducing government stocks, should be the main strategy. This should be complemented by a combination of low-cost options – inviting tank operators, joint stockpiling with crude exporters, and tickets – to help expand storage capacity and eventually supply security.

References

ADNOC (2018), ADNOC and ISPRL Celebrate Arrival of First Crude Oil Shipment for Mangalore Strategic Reserve. Press release (22 May). https://www.adnoc.ae/en/news-and-media/press-releases/2018/adnoc-and-isprl-celebrate-arrival-of-first-crude-oil-shipment-for-mangalore-strategic-reserve (accessed in May 2018)

EPU (2017), *ERIA Oil Supply Resiliency Study Workshop*. Paper presented for the Workshop Meeting of the ERIA Supporting Study Project FY2016 Oil Supply Resilience in ASEAN. Bangkok (February).

EPU (2018), EPU Organization Chart. http://www.epu.gov.my/en/organisation/chart (accessed in May 2018)

ERIA (2016), *Energy Outlook and Energy Saving Potential in East Asia 2016*. Jakarta: ERIA. http://www.eria.org/RPR_FY2015_No.5.pdf (accessed in May 2018)

IEA (2013), *Focus on Energy Security: Costs, Benefits and Financing of Holding Emergency Oil Stocks.* Paris: IEA. https://www.iea.org/publications/insights/insightpublications/FocusOnEnergySecurity_FINAL.pdf (accessed in May 2018)

IEA (2018), Energy security. http://www.iea.org/topics/energysecurity (accessed in May 2018)

IEEJ (2016), 'Cooperation Framework for Oil Stockpiling and Emergency Response System', *ERIA Research Project Report 2015,* No. 7. Jakarta: ERIA. http://www.eria.org/RPR_FY2015_07.pdf (accessed in May 2018)

IEEJ (2017), *IEEJ Outlook 2018*. Tokyo: IEEJ. https://eneken.ieej.or.jp/data/7565.pdf (accessed in May 2018)

JOGMEC (2018), Stockpiling methods. http://www.jogmec.go.jp/english/stockpiling/stockpiling_10_000003.html (accessed in May 2018)

Kapsarc (2017), *Joint Oil Stockpiling between Middle East Exporters and Northeast Asian Importers: A Winning Formula?* https://www.kapsarc.org/wp-content/uploads/2017/06/KS-2017-DP06-Joint-Oil-Stockpiling-between-Middle-East-Exporters-and-Northeast-Asian-Importers.pdf (accessed in May 2018)

MEMR, Government of Indonesia (2018a), Organizational Structure. https://www.esdm.go.id/en/profile/organizational-structure (accessed in May 2018)

MEMR, Government of Indonesia (2018b), directly obtained from the MEMR for this study.

MEMR, Government of Indonesia (2018c), Rencana Kerja dan Anggaran 2015. Jakarta. https://www.esdm.go.id/assets/media/content/content-rencana-kerja-dan-anggaran-2015.pdf (accessed in May 2018)

Ministry of Energy, Government of Thailand (2018), Organization Chart. http://energy.go.th/2015/official-structure/ (accessed in May 2018)

MTI, Government of Singapore (2018), Organisational Structure. https://www.mti.gov.sg/AboutMTI/Pages/Organisational%20Structure.aspx (accessed in May 2018)

Platts (2014), *Special Report: Oil – FOB Singapore Beyond Singapore – Towards FOB Straits*. http://www.platts.cn/IM.Platts.Content/InsightAnalysis/IndustrySolutionPapers/sr-oil-fob-singapore-straits.pdf (accessed in May 2018)

Platts (2018), Methodology and specifications guide – Asia Pacific and Middle East refined oil products. Accessed in May 2018. https://www.platts.com/IM.Platts.Content/MethodologyReferences/MethodologySpecs/Asia-refined-oil-products-methodology.pdf (accessed in May 2018)

PTT (2018), *Annual Report 2017: Sustainable Growth for All*. http://ptt.listedcompany.com/misc/ar/20180328-ptt-ar2017-en.pdf (accessed in May 2018)

Reuters (2017), Saudi Aramco reaffirms commitment to Pertamina JV as CEOs meet. 7 July. https://www.reuters.com/article/us-saudi-aramco-pertamina-idUSKBN19S1BJ (accessed in May 2018)

Tank Storage Magazine (2017), Johor: Malaysia's most promising oil cluster. 13/4. http://www.tankstoragemag.com/feature/johor-malaysias-most-promising-oil-cluster/ (accessed in May 2018)

Vopak (2017), Vopak announces expansion in Pengerang, Malaysia. News release (18 August). https://www.vopak.com/newsroom/news/vopak-announces-expansion-pengerang-malaysia (accessed in May 2018)