

CASE STUDY OF MALAYSIA'S OIL AND GAS COMPANY – PETRONAS

EXECUTIVE SUMMARY



Introduction

The past increase of carbon dioxide (CO₂) concentration in the atmosphere is contributed largely by the burning of fossil fuels – and without major policy and technological changes, this trend will continue increasing future concentrations of CO₂ and exacerbating global climate change. In light of this, a Fossil Fuel Non-Proliferation Treaty (FFNPT) has been proposed to foster a global equitable transition away from fossil fuels to clean, low-carbon energy and economies. This Malaysian study is part of the groundwork for the FFNPT initiative.

In terms of Malaysia's participation in the global fossil fuel industry, petroleum giants such as Shell and ExxonMobil have been engaged in the country's oil and gas (O&G) sector for over 100 years. There have been various efforts spearheaded by the Malaysian government and its national oil company, Petroliaam Nasional Berhad (Petronas), to attract investors and business partners among other petrochemical multinationals such as ConocoPhilips, Kaneka, Polyplastic, Toray, Dairen, Mitsui, BP, BASF, Idemitsu, Honam and Eastman Chemicals.

Malaysia currently ranks as the fourth largest exporter of liquefied natural gas (LNG) in the world. Between January and April 2019, the oil and gas industry contributed MYR46.8 billion (approximately USD11.01 billion) to Malaysia's export earnings, with MYR15.8 billion (approximately USD3.72 billion) from LNG alone. The figure below outlines the Malaysian economic performance based on major sectors. Although mining and quarrying – which includes fossil fuels – contributes a share of only 7.3%, it is a sector that powers all the other economic sectors of Malaysia.

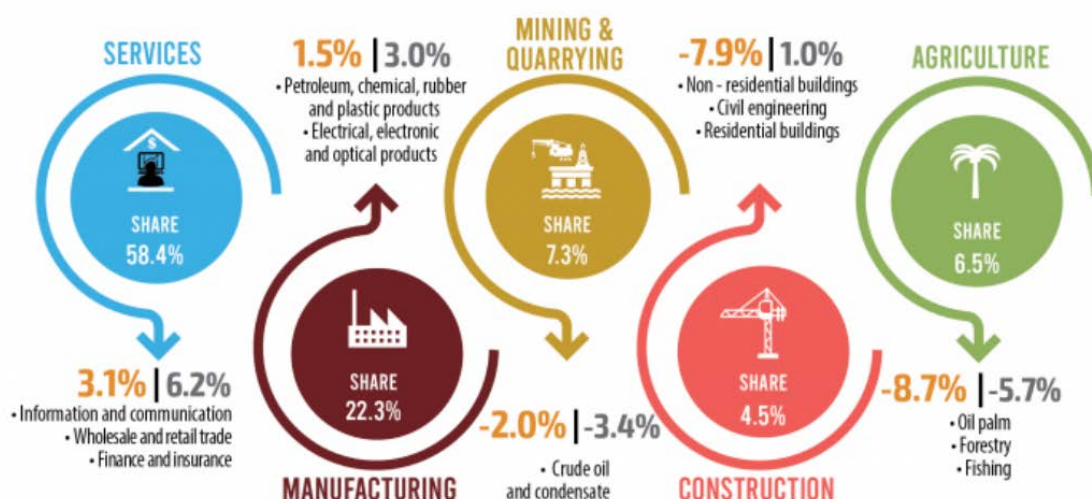


Figure 1 Malaysia major economic sectors and its performance in 2020

Malaysia relies heavily on coal, natural gas, and large hydropower. From as early as the 1970s, Malaysia has acknowledged the over-dependency on fossil fuels and set national plans to diversify the energy mix through the decades. However, these plans – even the recent ones – do not clearly define a pathway for transitioning away from fossil fuels. Malaysia's efforts and investments in recent years are somewhat focused on energy efficiency and reducing energy consumption, given the existing energy sources (i.e. fossil fuels) - by way of, for example, utilising smart meters in domestic, commercial and light industrial premises and implementing an LED public street lighting programme across Peninsular Malaysia.

About Petroliaam Nasional Berhad (Petronas)

Petroliaam Nasional Berhad (hereinafter referred to as Petronas) is a fully integrated, nationally owned company which has developed a business model that spreads widely from the point of oil exploration and extraction (i.e. upstream) to a robust network of downstream businesses (Figure 2). The Petroleum Development Act of 1974 charges Petronas with regulatory supervision over all upstream activities, and investors are required to enter into Petroleum Arrangement (PA) contracts with Petronas for the right to explore and produce oil in Malaysia. Providers of goods and services for the upstream sector are also required to be licensed by Petronas.

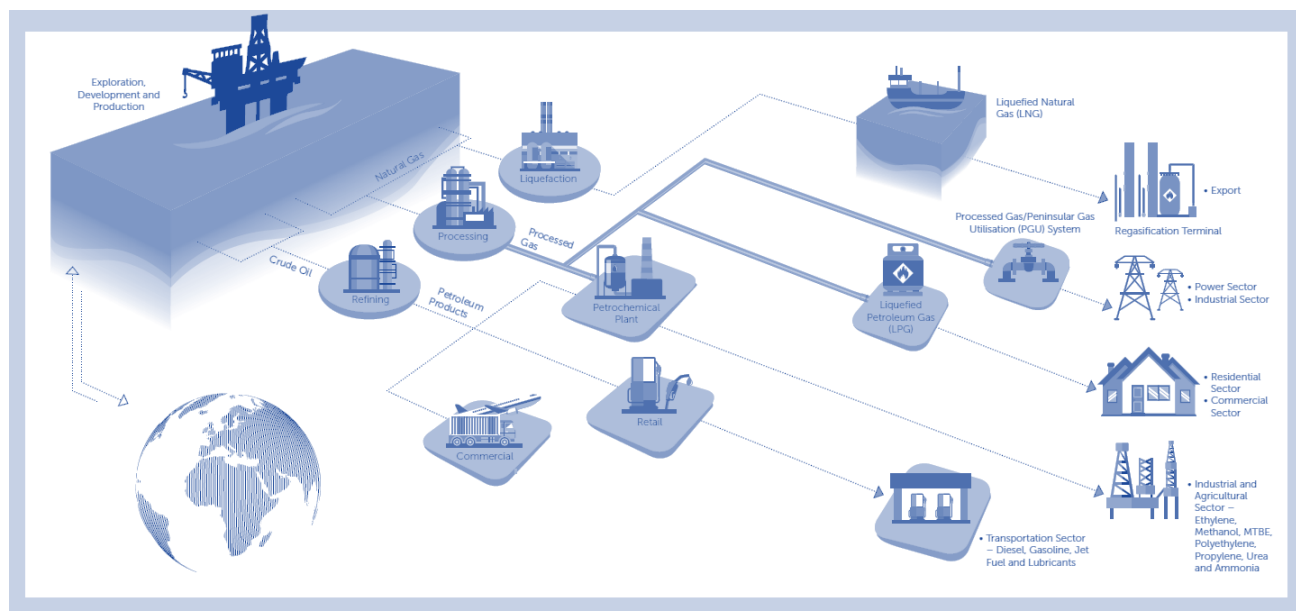


Figure 2 Petronas' upstream and downstream industries
Source: Petroleum Sustainability Report 2018

Petronas has since grown from being the manager and regulator of Malaysia's upstream sector into a fully integrated oil and gas corporation, ranked among the FORTUNE Global 500 largest corporations in the world (the only Southeast Asian company to be in the list) and with a presence in more than 65 countries. In addition to being the top Malaysian conglomerate in the resource and energy sector, Petronas has a diverse portfolio as it expands its operations into marketing, logistics and property development. In total, Petronas possessed 201 wholly owned subsidiaries, 59 partly owned subsidiaries and 65 associate companies as of 2019.

Petronas is involved in a diverse range of activities which include:

1. Exploration and production
2. Processing
3. Marketing and distribution
4. Energy shipping
5. Automotive engineering
6. Property investment

According to its latest annual report (2019), Petronas has added 0.9 billion barrels of oil equivalent (bboe) of reserves mainly through the sanctioning of 47 projects including the field offshore the state of Sarawak and the acquisition of the Tartaruga Verde field and Module III of the Espadarte field in Brazil. Petronas continues to make new oil reserve discoveries while expanding on its current and future upstream and downstream contracts be it domestically or abroad.

In the financial year **2019**, Petronas recorded a total revenue of **MYR240.3 billion** (approximately USD56.98 billion), primarily contributed by petroleum products and LNG - which accounted for 36% and 21% of the total revenue, respectively. As much as 67% of Petronas' income is derived from exports and its international operations revenue. Of this value, the revenue from exports was its biggest contributor with MYR85.5 billion (USD20.8 billion).

Despite recognising that global trends are reshaping the energy landscape, including the consumption patterns and consumer demand, Petronas has stated that oil and gas will remain as its core business. The notion of "stranded assets" has not appeared in any of Petronas' public statements or documents. While there will be significant economic and social implications from the response measures taken by countries to reduce their greenhouse gas (GHG) emissions, Petronas seems to give the impression that its core business and assets will not necessarily be affected by the world's declining demand for fossil fuels. Instead, in response to the changing energy landscape, Petronas aims to continue building its capabilities and allocate resources to new businesses to capitalise on external disruptions and better position itself for the future.

More recently, Petronas highlighted its venture into renewable energy (i.e. wind and solar power) focusing on the Asia-Pacific market. It established a "Gas and New Energy" division in April 2019 to expand beyond its traditional portfolio in oil and gas. Going forward, Petronas advocates energy solutions encompassing LNG, gas and power, and renewable energy.

Main actors

It is important to consider how the FFNPT may impact the actors involved in the operations and business of Petronas, as well as how the treaty could potentially be influenced by the responses from these actors (whether they are for it, neutral or against it). The wide range of actors includes the Malaysian government, oil and gas services providers, oil infrastructure operators, Petronas' wholly owned subsidiaries and partially owned subsidiaries, its joint ventures and investments, acquisitions, and investors.

Key government ministries and agencies in relation to Petronas and its operations, and those which are related to the energy sector in Malaysia in general, include the Prime Minister's Office, Economic Planning Unit, Ministry of Finance, Ministry of Environment and Water, Malaysian Green Technology and Climate Change Centre, Ministry of Energy and Natural Resources, Energy Commission, Sustainable Energy Development Authority, Ministry of International Trade and Industry, Malaysian Investment Development Authority, InvestKL and the Malaysia Petroleum Resources Corporation.

Of these, the Malaysian Green Technology and Climate Change Centre, the Energy Commission, and the Sustainable Energy Development Authority are the main actors which have renewable energy in their scope of interest. As such, they may be well positioned to champion a stronger push for increasing the share of renewable energy in Malaysia's energy mix. However, as these are not government ministries per se, their lack of powers in enforcement would be a limitation if the main energy providers, industries and other sectors are comfortable remaining with fossil fuels and are unwilling to change their operations to incorporate cleaner energy.

Apart from the official governmental sector, another key stakeholder in the energy sector of Malaysia is the state-controlled utility company **Tenaga Nasional Berhad (TNB)**. TNB is the largest publicly listed power company in Southeast Asia, with MYR99.03 billion (approximately USD23.31 billion) worth of assets.

Overall, there are over 3,500 **O&G businesses** in Malaysia, comprising international oil companies, independents, and services and manufacturing companies which support the needs of the O&G value chain both domestically and regionally. Many major global machinery and equipment (M&E)

manufacturers have also set up base in Malaysia to complement home-grown M&E companies, while other Malaysian O&G companies are focused on key strategic segments, such as marine, drilling, engineering, fabrication, offshore installation, and operations and maintenance (O&M) companies that provide services to the petroleum exploration and production industry. In addition, there are 26 upstream (i.e. production sharing contract) operators in Malaysia, including international oil and gas companies such as HESS, ExxonMobil, Murphy Oil and Shell.

There are three main **associations** representing over 500 companies and a workforce of 60,000 in the Malaysian oil and gas industry, namely the Malaysian Oil & Gas Engineering Council (MOGEC), Malaysia Offshore Support Vessels Owners' Association (MOSVA) and the Malaysian Offshore Contractors Association (MOCA).

As of 2019, the number of **subsidiaries under Petronas** is as below:

- Wholly owned subsidiaries (201)
- Partly owned subsidiaries (59)
- Associate companies (65)

Some of the main subsidiaries play a dominant role in Petronas' core business in the upstream sector (exploration, development and production) and some of the major downstream businesses in refineries, petrochemicals, lubricants and marketing and trading. The subsidiaries also include publicly listed companies which are involved in non-fossil-fuel-related activities but which nevertheless contribute significantly to the Petronas group's revenues.

Among the principal wholly owned subsidiaries are the following:

1. Petronas Carigali Sdn Bhd, which was founded in 1990, is an oil and gas exploration (geophysical and geological) and production subsidiary.
2. Petronas Lubricants International Sdn Bhd (PLI) is ranked among the top 10 global lubricant companies, with a presence in 86 countries, including over 30 marketing offices in 28 countries.
3. KLCC (Holdings) Sdn Bhd is an investment holding company which manages property development and provides management services. More notable is its partially owned subsidiary KLCC Property Holdings Berhad (KLCCP), a significant contributor to Petronas' profits mainly through its property investment income.
4. Petronas Research Sdn Bhd's key activities are in the provision of research, advisory and technology development services for Petronas.

The key partially owned subsidiaries are as follows:

1. MISC Berhad, which was incorporated in 1968 as Malaysia International Shipping Corporation, has core businesses in LNG asset solutions, petroleum and product shipping, offshore business as well as marine and heavy engineering. MISC owns several oil storage facilities.
2. Petronas Chemicals Group Berhad (PCG) is a leading petrochemical producer in Malaysia and the largest gas-based chemicals producer in Southeast Asia. PCG is involved primarily in the manufacturing, marketing, and sale of a diverse range of petrochemical products including olefins, polymers, fertilisers, methanol, and other chemicals and derivative products.
3. Petronas Dagangan Berhad (PDB) is Malaysia's leading retailer and marketer of downstream petroleum products. Its four core businesses are: 1) retail, 2) commercial, 3) liquefied petroleum gas (LPG), and 4) lubricants (global operations managed by Petronas Lubricants International). PDB's retail business operates more than 1,000 Petronas stations nationwide and over 700 Kedai Mesra (integrated convenience stores) that engage over 800 dealers, which include local small and medium enterprises.

4. **Petronas Gas Berhad (PGB)**, which was incorporated in 1983, is Malaysia's leading gas infrastructure and utilities company with core businesses in gas processing, gas transmission, regasification and utilities. The company processes natural gas piped from offshore fields and transports the processed gas via the Peninsular Gas Utilisation (PGU) pipeline network to Petronas' customers in Malaysia and Singapore. PGB also supplies steam, power and industrial gases for its customers at Kertih Integrated Petrochemical Complex in Terengganu and Gebeng Industrial Area in Pahang.

Petronas continues to expand its presence in the oil and gas industry through these **key joint ventures and investments with international partners**:

1. **Canada**: The LNG Canada project, which will initially comprise two LNG liquefaction processing units, aims to produce a total of 14 million tons per annum, with the potential to expand to four units. Petronas, through its wholly owned entity, the North Montney LNG Limited Partnership (NMLLP), holds a 25% participating interest in the project, whose other joint venture participants are Royal Dutch Shell PLC, PetroChina Company Limited, Mitsubishi Corporation, and Korea Gas Corporation. The project is operated through LNG Canada Development Inc.
2. **China**: Petronas has signed a deal to supply LNG to an ISO tank-filling facility owned by Shanghai-based Tiger Clean Energy in Sarawak, Malaysia. The deal is the first of its kind to be concluded virtually.
3. **Saudi Arabia**: Petronas and Saudi Aramco have entered into 2 joint ventures (equal ownership) for the Refinery and Petrochemical Integrated Development (RAPID) project in Johor, Malaysia. Saudi Aramco will supply 50% of the refinery's crude feedstock requirements. Meanwhile, natural gas, power and other utilities will be supplied by Petronas and its affiliates.
4. **Myanmar**: The Yetagun gas and condensate field in the Gulf of Martaban, Andaman Sea was a joint venture between Texaco (50%), Premier Oil (30%), and Nippon Oil (20%). After Texaco withdrew in 1997 and Premier Oil withdrew in 2002, Petronas became the operator. The field covers an area of approximately 24,130km² - where Petronas Carigali Myanmar holds a 40.91% interest and operates the field.
5. **Uzbekistan**: In 2008, Petronas Carigali Overseas Sdn Bhd signed the production sharing agreement (PSA) for a group of fields and heads of agreement for a gas-to-liquid project in Uzbekistan. The company signed the PSA with the Uzbekistan government for the Urga, Kuanish and Akhchhalak fields located in Ustyurt. The agreement was for 25 years.
6. **Mexico**: Petronas' subsidiary PC Carigali Mexico Operations (Petronas Mexico) and Sierra Oil & Gas entered into a joint venture for two blocks in the Gulf of Mexico's Salina Basin in a deep-water oil and gas auction in 2016. Petronas Mexico will be the operator of Block 4 with a 50% stake and an initial exploration period of four years. It is also a 23% stakeholder in the fifth block, which was awarded to a consortium led by Murphy Sur. More recently in April and May 2020, two wells were discovered.
7. **Shell**: Petronas Dagangan Berhad engaged in a 50-50 joint venture in two domestic projects with Shell: 1) PS Pipeline Sdn Bhd (multi-product pipeline and distribution terminal), and 2) PS Terminal Sdn Bhd (joint depots and bottling plants in Sabah and Sarawak).

As for **Petronas' acquisitions**, some of the notable ones include:

1. Tartaruga Verde and Espadarte Module III, Brazil: Petronas' subsidiary Petronas Petróleo Brasil Ltda. (PPBL) on 28 December 2019 announced the completion of the transaction for the acquisition of 50% equity in the Tartaruga Verde producing field (BM-C-36 Concession) and Module III of the Espadarte field (Espadarte Concession), both located in deep waters of the Campos Basin, offshore Brazil.

2. Amplus Energy Solutions, Singapore: In April 2019, Petronas announced its acquisition of a 100% interest in Singapore-based Amplus Energy Solutions Pte Ltd, also known as M+, marking its international foray into renewable energy. M+ has a portfolio of distributed renewable energy assets in Asia catering to commercial and industrial customers.
3. West Delta Deep Marine and Egyptian LNG projects: In 2003, Petronas acquired major oil and gas assets in Northern Africa in a 1.6 billion euro (MYR6.7 billion) deal that would give it a significant foothold in the Atlantic Basin LNG market and boost its status as a major player in the global LNG industry. The upstream assets in the WDDM concession include 13.6 trillion cubic feet of 2P gas reserves in nine discovered fields, giving Petronas 6.8 tcf of net 2P reserves.
4. Da Vinci Group, Netherlands: In September 2019, Petronas Chemicals (PetChem) completed its transaction in buying Da Vinci Group (DVG) as its first venture into specialty chemicals. The Netherlands-incorporated DVG (now a wholly owned subsidiary of Petronas) is the world's largest independent producer and formulator of silicones, lubricant oil additives and chemicals, providing PetChem a ready-made business in high-growth end markets such as personal care, coatings, construction and healthcare - particularly in Asia-Pacific.

In addition, Malaysia's upstream landscape is comprised of a group of **investors** ranging from super-majors to niche and small independent players, operators and equity players, from public-listed to private companies. As of August 2019, there were 33 investors, with an approximate 70:30 split between foreign and local investors.

Petronas' global presence

Over the decades, Petronas' operations have expanded both its upstream and downstream businesses extensively. This is due in large part to the popularity of lubricant products – a business managed by its subsidiary Petronas Lubricants International (PLI). Petronas has also introduced two new sections in addition to its upstream and downstream businesses: 1) Gas and New Energy (consisting of gas, LNG and solar), and 2) Project Delivery and Technology.

Among the Gas and New Energy partners are Australia, China, India, Indonesia, Japan, Taiwan, Thailand, South Korea, United Kingdom, Canada, Egypt, and United Arab Emirates. As for Project Delivery and Technology, the partnering countries include Iraq, United Arab Emirates, Egypt, Mauritania, Republic of Sudan, Republic of South Sudan, Italy, Spain, United Kingdom, Brunei, China, India, Indonesia, Japan, Myanmar, Philippines, South Korea and Vietnam.

The following Figure 3 shows the presence of Petronas around the world.

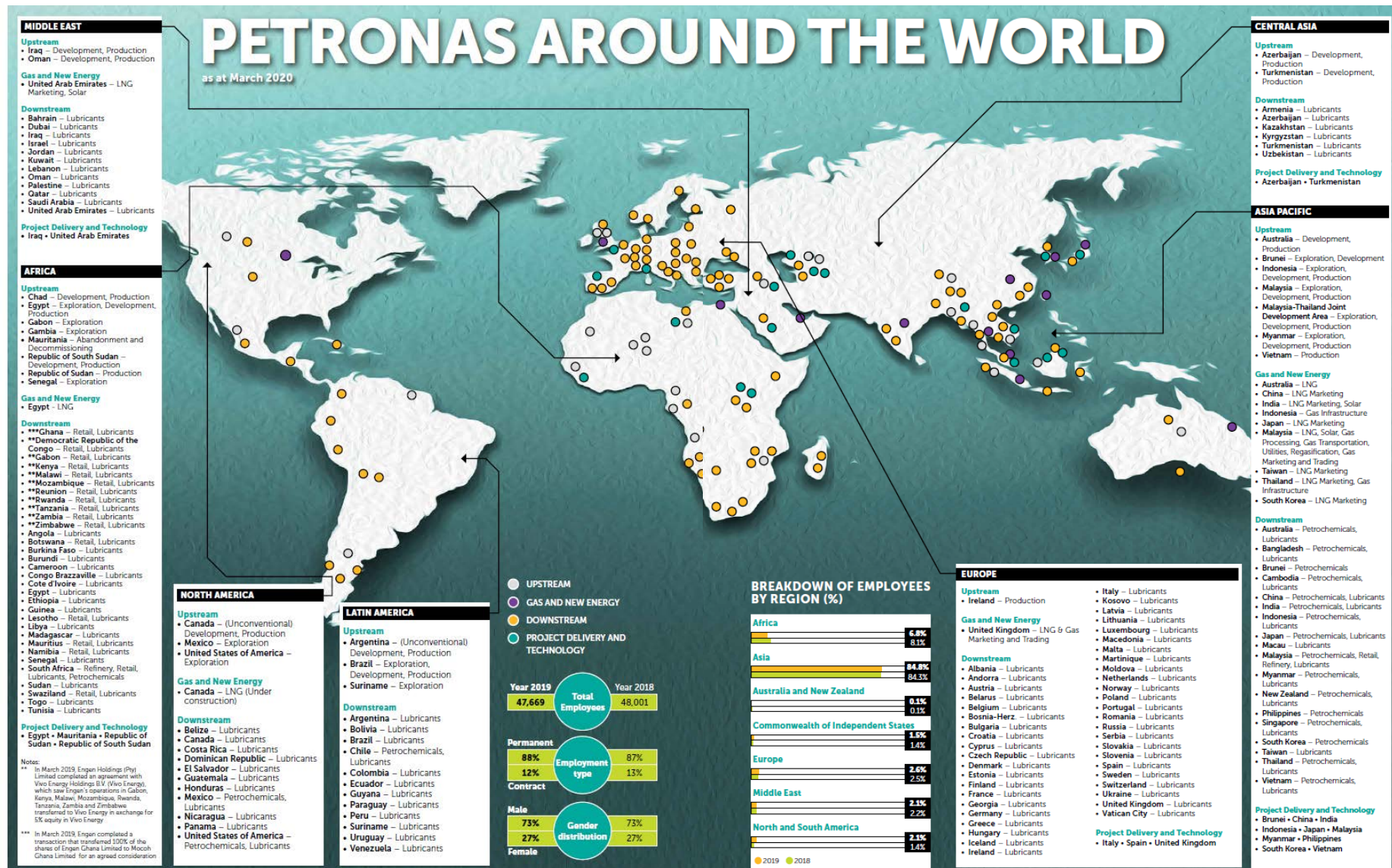


Figure 3 Petronas around the world
Source: Petronas Annual Report 2019, pages 24-25

Material and technological components

In March 2019, the Economic Affairs Ministry told Parliament that Malaysia's oil and gas reserves are expected to be depleted by 2029 based on its current output. Hence, the ministry urged Petronas to continue exploration efforts (in particular, deepwater wells) domestically and abroad to ensure Malaysia's fuel supply remains sustainable. The ministry said Malaysia's total reserves amounted to 6.7 billion barrels of oil equivalent, with Sarawak having 2.8 bboe, followed by Peninsular Malaysia (2.2 bboe) and Sabah (1.7 bboe). Figure 4 shows the official demarcation of oil and gas blocks as described by the Department of Mineral Resources & Geoscience Malaysia:

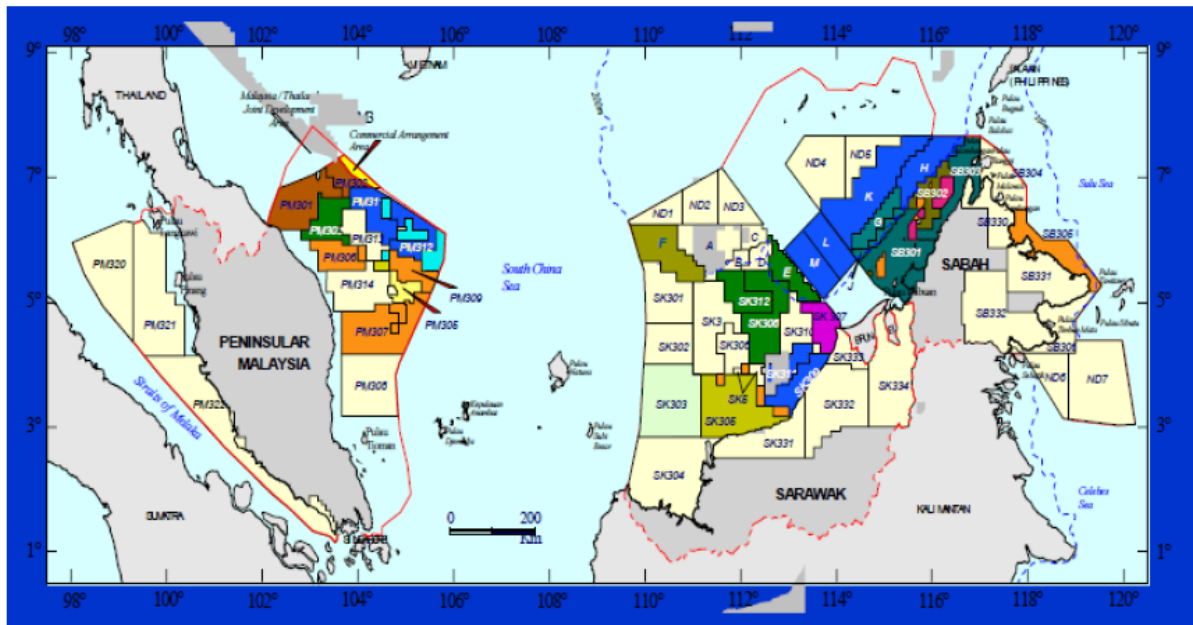
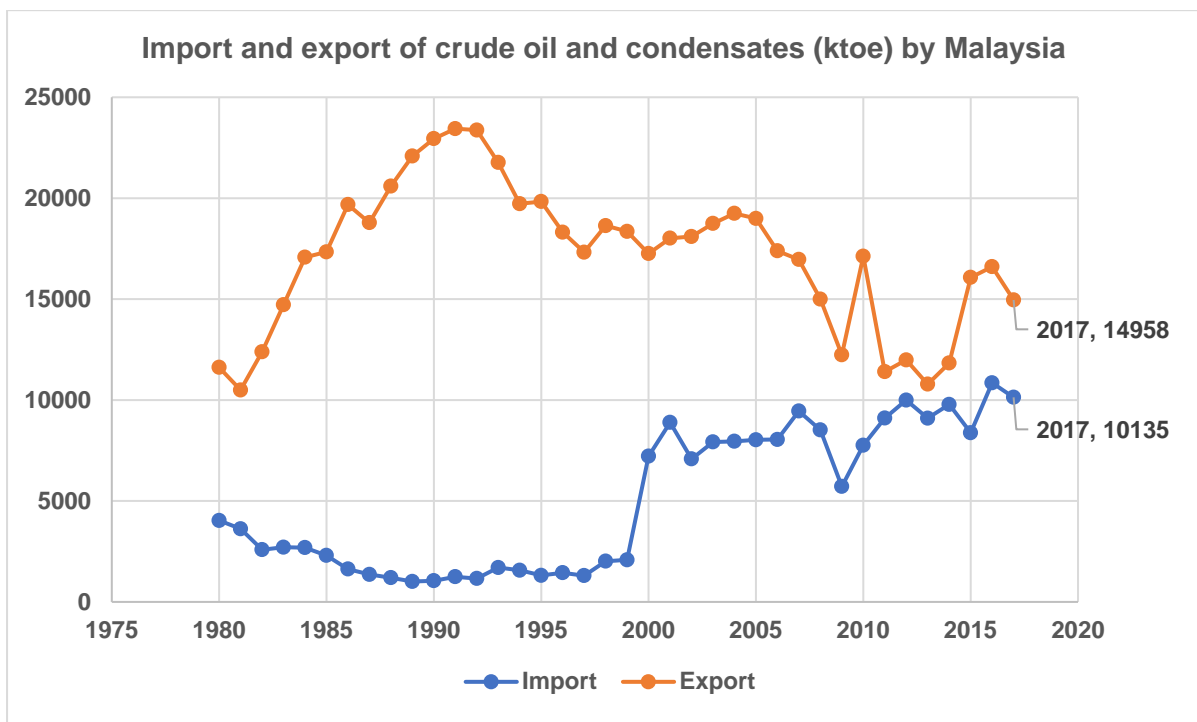
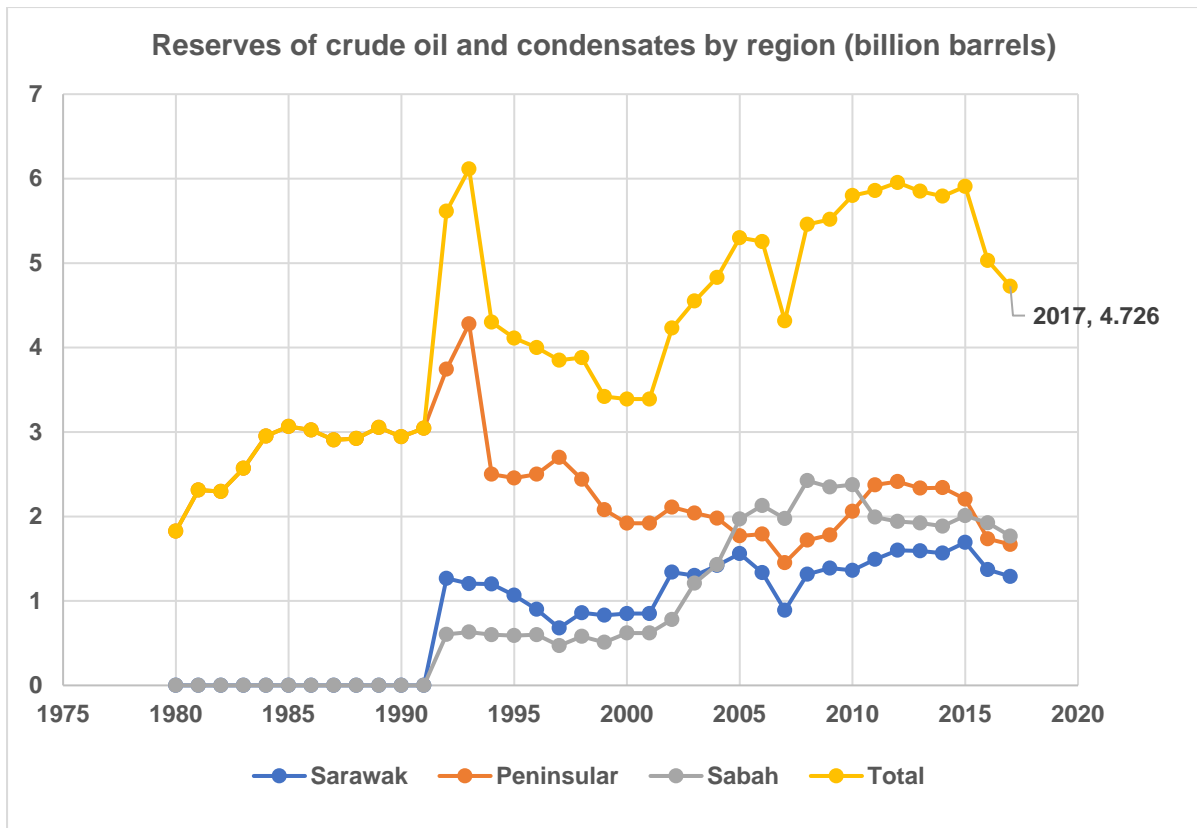


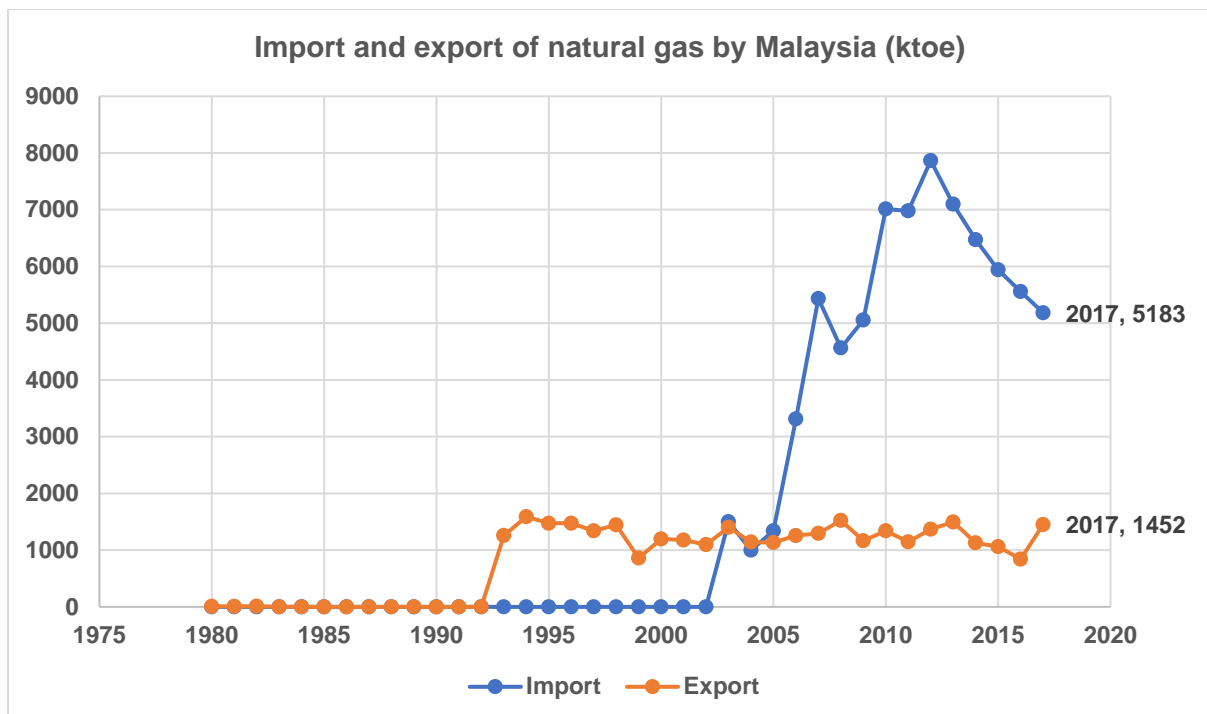
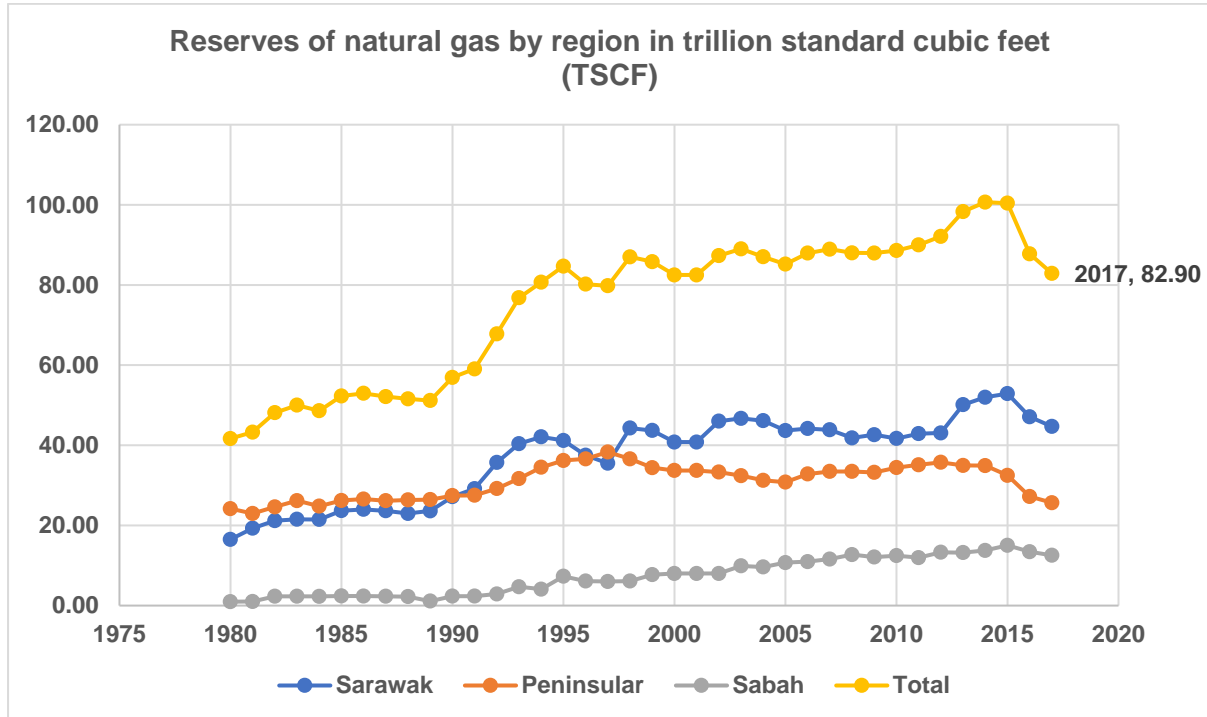
Figure 4 Official oil and gas blocks in the territorial waters of Malaysia

In April 2020, Petronas, through its subsidiary Progress Resources USA Ltd (PRUL), discovered oil in the Gulf of Mexico, an ultra-deepwater monument exploration well that was drilled to a total depth of 10,164 metres and encountered about 60 metres of net oil-bearing sands. Petronas discovered yet another well in the Salina Basin, offshore Mexico the following month.

The following graphs present the trend of reserves and the import and export of crude oil and condensates in Malaysia, based on data provided by the Energy Commission – Malaysia Energy Information Hub (MEIH) (<https://meih.st.gov.my/statistics>).



As for natural gas, according to a 2009 study, an upper limit of 2,000 million standard cubic feet per day (mmscfd) has been imposed on its production in Peninsular Malaysia. At the current rate of production, the known natural gas reserves are expected to last for about 70 years.



The following table summarises the key statistics on Petronas' reserves, assets and infrastructure. More details on these components are discussed in the full study. Further details on the Petronas contracts and activity outlook for 2020-2022 are presented in Section 3.5 of the study as well.

Description	Figures
Oil and gas service providers	3,500 O&G businesses in Malaysia (comprising international oil companies, independents, and services and manufacturing companies)
Crude oil and condensates reserves	4.726 billion barrels
Export of crude oil and condensates	14,958 ktoe
Import of crude oil and condensates	10,135 ktoe
Natural gas reserves	82.9 trillion standard cubic feet (TSCF)
Oil-producing fields	183
Decommissions	Platforms: 1 Wells: 38
Upstream	
Platforms and subsea structures	Offshore platforms: 353
	Tension Leg Platform: 1
	Subsea Structures: 14
	Mobile Offshore Production Unit (MOPU): 1
	Floating Production and Storage (FPS): 1
	SPAR: 1
Pipelines	Pipelines: 616 lines
	Pipeline length: 10,235 km
Terminals	Onshore crude terminals: 4
	Onshore gas terminals: 7
	Onshore crude and gas terminals: 2
Wells/strings	Total strings: 3,935
	Active strings: 2,191
Supply bases	Supply bases: 3
	Airports: 3
	Ports: 7
Floaters	FPSOs: 7
	FSOs: 8
	PFLNG: 1
Support vessels	Supply run: 56
	People movement: 31
	Field support: 52
Rotating equipment	Major compressors: 182
	Crude oil transfer pumps: 166
	Gas lift/gas injection compressors: 76
	Water injection pumps: 21
	Power generators: 281
Upstream infrastructure	Jackup rigs (JUR): 9-10 (in Malaysian waters) Tender Assisted Drilling Rigs (TADR): 4 Hydraulic Work-over Units (HWU): 6 Wellhead platforms (WHP): 6 Central Processing Platform (CPP): 2 Heavylift: 9

Description	Figures
	Floatover: 0
Upstream staff	12,000 persons
Ongoing upstream development projects	86
Downstream	
Refining and trading	Refineries: 2 (Melaka: >275 kbpd, Terengganu: >120 kbpd)
Petrochemical	Petrochemical processing plants: 17
Marketing	Retail stations: >1,000
	Lube oil blending facility: 1
	Joint venture depots and facilities: 6
	Bunkering facilities: 10
	Fuel terminals: 17
	Aviation terminals: 13
	LPG terminals and bottling facilities: 8
Pengerang Integrated Complex (PIC)	Refinery complex: 300 kbpd
	1 petrochemical complex: ~3.3 MTPA
Other	High pressure gas pipelines: 2,554 km

Role of Petronas

As a state-owned oil and gas company, Petronas' 46 years of existence in Malaysia has seen it assume wide-ranging roles that are deeply integrated into many aspects of national development. This section presents Petronas' roles in Malaysia in several broad categories:

Energy provision

Petronas is one of the largest LNG players globally, having sold more than 11,000 cargoes since the establishment of its first plant in 1983. In Malaysia, the LNG business is supported by the Petronas LNG Complex in Bintulu, Sarawak which comprises four plants. Gas contributes about 40% of the primary energy supply mix in Malaysia, which has targeted an increase in its gas production by one billion standard cubic metres per day or 12.5% by 2025 from the current eight billion per day.

Petronas also offers LPG cooking gas to the household, commercial and industry segments through an extensive network of LPG Channel Members. Petronas holds the largest market share in this industry within Malaysia, with a revenue of MYR1,263.6 million (USD307 million) in 2019 with over 300 dealers nationwide.

Petronas produces a range of petroleum products for the commercial sector such as Avgas for reciprocating piston engine aircrafts, Jet A-1 for turbine engine aircrafts, diesel for self-ignition compression diesel engines, bitumen to enhance binder resistance, industry fuel oil for boilers, furnaces, ovens and bunker-fired diesel engines, marine fuel oil and RON95 fuel for high-performance sparks ignition engines. These fuels are in high demand by the manufacturing, aviation, power, oil and gas exploration, agriculture, fishery, construction, timber, marine fuel, and transportation industries. Revenue from this segment was MYR14,248 million (USD3,462 million) in 2019, with over 1,000 commercial customers. Petronas is also one of the main oil and gas companies which supply fuels for the national airline.

Another of Petronas' main products is lubricants - consisting of heavy-duty oil, industrial engine oil and marine engine oil. For smaller vehicles, Petronas offers passenger car motor

oil, motorcycle oil and automotive functional fluid sold globally. This sector contributed MYR540.9 million (USD131.5 million) in revenue for Petronas in 2019.

In the residential and commercial energy sector, Petronas has a pivotal relationship with the electric utility TNB. Petronas spends up to MYR20 billion (USD4.9 billion) a year to provide subsidised gas to TNB, which has created a distortion of gas prices in the country. However, this also meant that TNB is susceptible to a high operational cost when there is a shortage of subsidised gas from Petronas. This is overcome by the recent move towards liberalisation of the natural gas market in Malaysia.

Economic and financial dimensions

According to Petronas' 2019 Annual Report, most of its revenue comes from petroleum products (MYR85.6 billion/USD20.8 billion), LNG (MYR51.3 billion/USD12.5 billion) and crude oil (MYR35.8 billion/USD8.7 billion).

The total revenue (including non-oil and gas-based revenues such as from logistics, maritime, and property investments and management) recorded by Petronas amounted to MYR240.3 billion in 2019 (Figure 5). In terms of profit after tax (2019), MYR22.27 billion/USD5.4 billion or 55% was contributed by the upstream division, followed by the newly established Gas and New Energy division (MYR9.72 billion/USD2.36 billion or 24%), and the downstream division (MYR5.27 billion/USD1.28 billion or 13%).

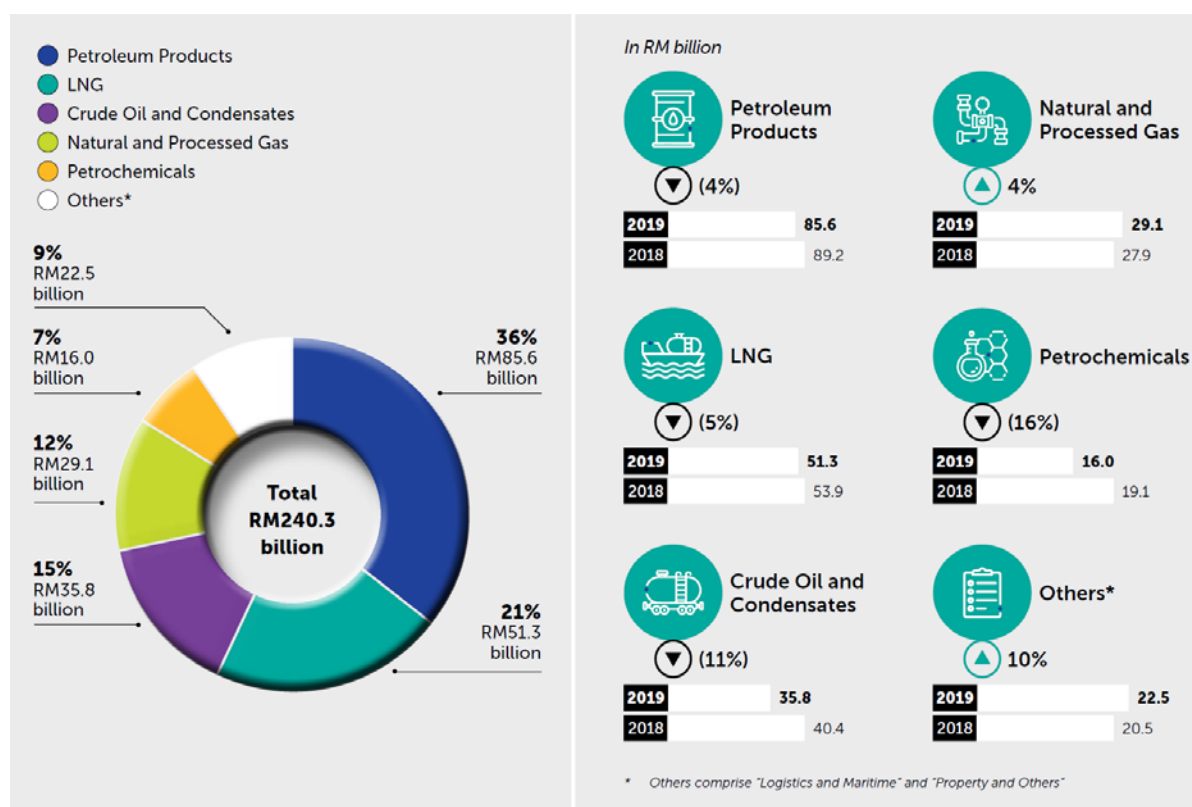


Figure 5 The Petronas group revenue for the financial year of 2019

Malaysia is heavily dependent on fossil fuels for employment, government services, export revenue and overall GDP. Malaysia is a net energy-exporting country, with crude oil and natural gas being the main energy types exported, and 97% of natural gas being exported in LNG form. Based on the most recent available data, the value of gross output contributed by the mining of petroleum and natural gas was MYR138.6 billion (USD33.6 billion) in 2017, an

increase of about 15% from 2015 (MYR120.4 billion/USD29.2 billion). The value of intermediate input in 2017 was at MYR23.9 billion (USD5.8 billion), an increase of 10.6% from 2015 (MYR21.6 billion/USD5.2 billion).

Fossil fuels contribute substantially to Malaysia's export revenues. Based on the Observatory of Economic Complexity (OEC)'s May 2020 data, the top exports of Malaysia were integrated circuits (MYR11.3 billion/USD2.73 billion), **refined petroleum (MYR3.21 billion/USD0.77 billion)**, palm oil (MYR2.69 billion/USD0.65 billion), semiconductor devices (MYR2.16 billion/USD0.52 billion), and **petroleum gas (MYR2.14 billion/USD0.58 billion)**. **Crude petroleum (MYR806 million/USD195 million)** was another major export. It is important to note that refined petroleum was also Malaysia's second top import (MYR2.36 billion/USD0.57 billion) in May 2020, after integrated circuits (MYR10.7 billion/USD2.58 billion).

Since its establishment in 1974, Petronas has been providing the Malaysian **government dividends** from its annual profits. The 2019 dividend payment by Petronas was MYR54 billion (USD12.59 billion), including a special dividend of MYR30 billion (USD7 billion) intended to help the government settle MYR37 billion in goods and services tax and income tax refunds. The additional dividend was possible due to a 12% increase in revenue to MYR251.0 billion (USD61 billion) in 2018 from MYR223.6 billion (USD54.34 billion) recorded in 2017 – attributed to the higher average realised prices for all Petronas' key products. Petronas' contribution to the national government's coffers makes up about 20% of the government's income.

Under the Petroleum Development Act, oil-producing states in Malaysia have the right to **revenue-sharing** based on a formula that has been agreed by all states. The four oil- and gas-producing states in Malaysia are Terengganu, Kelantan, Sabah and Sarawak. The basic principle of the oil and gas revenue distribution under the production sharing contracts is illustrated below (Figure 6). From 2008 to 2019, some MYR24.54 billion (USD5.82 billion) of cash payments were made to Sarawak, MYR12.78 billion (USD3.1 billion) to Sabah, MYR22.04 billion (USD5.4 billion) to Terengganu, and MYR403.25 million (USD96.8 million) was paid to Kelantan.

Oil & gas revenue distribution under the Malaysian production sharing contracts (PSC)

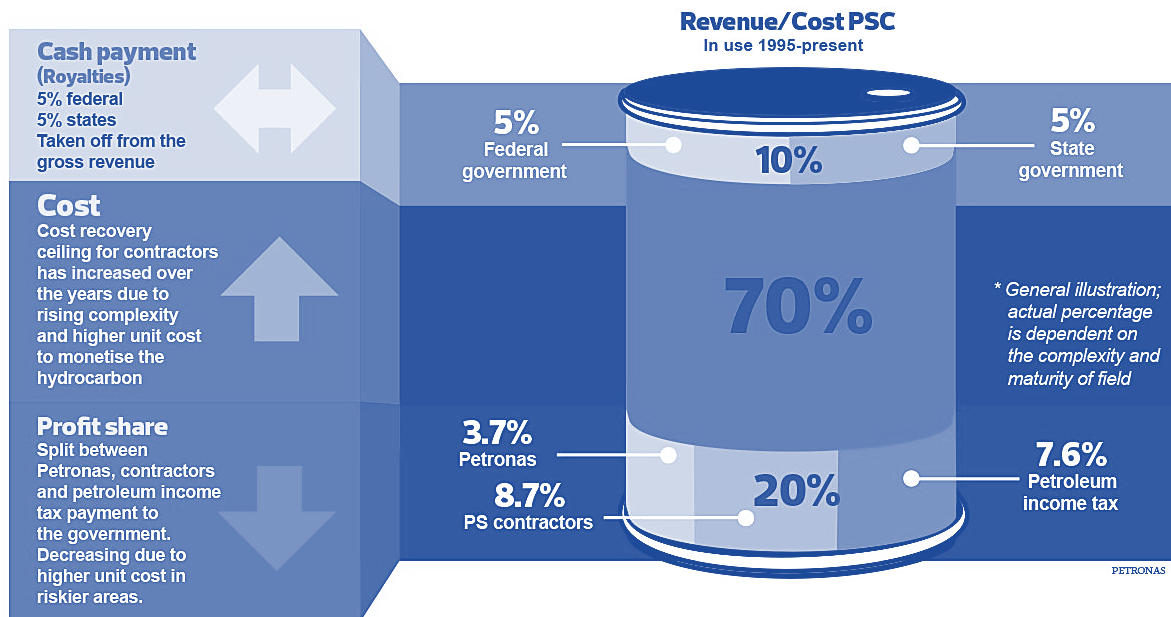


Figure 6 Oil and gas revenue distribution under the Malaysian production sharing contracts
Source: <https://www.theedgemarkets.com/article/cover-story-why-20-royalty-oil-and-gas-producing-states-not-commercially-viable-proposal>

While the formula has been set in place under the Act, the oil royalties payout in practice has different outcomes with different oil-producing states – often wrought in political interventions and intensive wrangling over the funds. It is pertinent to recognise that the recent issue of petroleum sales taxes and the demand for royalty increase are political battles that have become a thorny matter which Petronas has to deal with domestically. In this period of low oil prices, there are also concerns on whether Petronas can deliver higher dividends to the Malaysian federal government, which is in a tight fiscal position and in need of short-term revenue enhancements. Higher payouts will inevitably affect Petronas' cash flow, profitability, and capital expenditures by the billions each year – taking away resources required to expand the company's investment activities in its upstream and downstream businesses.

However, in 2019, then Malaysian Prime Minister Mahathir Mohamad reportedly said that the government was considering selling stakes in Petronas to states where the company's oil and gas fields are located, to raise funds for the debt-laden government. This year (2020), Petronas has announced that it will pay an annual dividend of MYR24 billion (USD5.6 billion) but without the special dividend. This is due to its net profit dropping 27% to MYR40.5 billion (USD9.8 billion) in 2019 from MYR55.3 billion (USD13.4 billion) recorded in 2018, as well as net impairment on assets amounting to MYR7.3 billion (USD1.8 billion).

Petronas expects a challenging operating environment in 2020 given the ongoing geopolitical uncertainties, prolonged trade tension and near-term demand disruptions due to the COVID-19 outbreak, which will affect its revenue and, hence, the dividends given to the government. Despite the government significantly reducing its dependency on petroleum-related revenue from 41.3% in 2009 to about 23% in 2018, the share is still relatively substantial and could pose a risk, particularly if the price of crude oil declines.

Petronas also plays a significant role in the development of local entrepreneurship. In 1993, it launched an initiative coined as the Vendor Development Programme (VDP) to boost the capabilities of local companies in Malaysia's oil and gas industry by way of providing support in the areas of business development, financial management, technical and information and communication technology. Since its inception, the VDP initiative has helped 99 local companies thrive in the oil and gas industry and awarded contracts worth more than MYR8.3 billion (USD2.01 billion).

Employment

The table below presents Petronas employment data from 2015 to 2019.

	2015	2016	2017	2018	2019
Total Number of Employees	53,149	51,034	49,911	48,001	47,669
Breakdown of Employees by Nationality (%)					
Malaysian	80	80	80	80	80
Other Nationalities	20	20	20	20	20
Breakdown of Employees by Region (%)					
Africa	-	-	8.2	8.1	6.8
Asia	-	-	85.1	84.3	84.8
Australia and New Zealand	-	-	0.1	0.1	0.1
Commonwealth of Independent States	-	-	1.3	1.4	1.5
Europe	-	-	2.3	2.5	2.6
Middle East	-	-	1.8	2.2	2.1
North and South America	-	-	1.2	1.4	2.1
Employment Type (%)					
Permanent	83	85	85	87	88
Contract	17	15	15	13	12
Gender Distribution (%)					
Male	72	72	72	73	73
Female	28	28	28	27	27
Number of Groupwide Technical Expertise					
Technical Authorities (TA)	499	325	499	577	240
Technical Professionals (TP)	825	815	860	941	1,028
Technical Trade Specialists (TTS)	297	198	206	225	240
Employees above & below age of 35 (%)					
Above 35	47	46	46	49	52
Below 35	53	54	54	51	48
Total Number of New Hires (Core Businesses in Malaysia)					
Malaysian	3,781	2,667	1,982	2,098	2,989
Other Nationals	297	265	427	414	509
Women in Technical Positions (%)					
	14	12	14	13	14
Attrition Rate (%)					
Male	5.9	7.3	5.8	6.5	5.5
	5.5	7.1	5.4	6.2	3.7

	2015	2016	2017	2018	2019
Female	7.0	8.0	6.8	7.3	1.8
Number of Unionised Employees	9,651	8,616	8,796	9,949	8,420

According to the Department of Statistics Malaysia (DOSM), in 2017 the petroleum and natural gas industry recorded the highest monthly average salaries and wages of MYR13,310 (about USD3,123). The petroleum and natural gas mining sector contributed a total of MYR6.9 billion in salaries and wages for Malaysia in 2017, and engaged 36,776 persons. Within this sector, the extraction of crude petroleum and natural gas group engaged 18,630 persons (50.7%) (2015: 17,950 persons). Meanwhile, the support activities for petroleum and natural gas extraction group engaged 18,146 persons (49.3%).

Political interventions

Petronas, perhaps the most profitable state-owned company in Malaysia, does not come without its political baggage. As indicated above, the issue of royalties for the oil-producing states has always been embroiled in politics. This has become even more contentious due to recent election campaign promises to increase the royalty payout.

The complications caused by political influences are summarised below in an extract from a May 2020 article by Welsh and Cheng:¹

“Despite its impressive performance, there are some controversies surrounding the management of the national corporation; Petronas reports to the prime minister and has effectively no accountability to parliament or the public. There have been more measures to increase transparency and anti-corruption efforts in recent years, driven by both market and political realities, but established practices do not encourage accountability. The prime minister has disproportionate influence over funds that are in fact public funds owned by the (people).”

Social, cultural and environmental dimensions

Yayasan Petronas (Petronas Foundation) is the corporate social responsibility (CSR) arm of Petronas. It is a non-profit organisation limited by guarantee and its major areas of engagement are as below:

1. **Education and training** – Since 1975, Petronas has invested more than USD850 million in education sponsorship (through the Petronas Education Sponsorship Programme (PESP)), internship placements, technical training and capability-building initiatives for more than 36,000 local and international recipients. This year (2020), Petronas received 10,000 sponsorship applications and the total investment for PESP alone is valued at more than MYR100 million (USD23.4 million).
2. **Community well-being and development** – *Sentuhan Harapan* is a livelihood programme to uplift the standard of living for underprivileged communities and youth. One of the initiatives under it is a six-month training programme to equip participants with the necessary knowledge and skills to become successful entrepreneurs.

¹ Malaysiakini (2020). COMMENT | Malaysia's slick politics of oil. May 11, 2020. <https://www.malaysiakini.com/columns/524943#>

3. **Environment** – Through its *Sentuhan Alam* programme, Petronas has undertaken numerous environmental projects through the years in different parts of Malaysia, notably in states where Petronas' businesses and assets are located. The projects have ranged from nature reserve protection and community forestry development to environmental education programmes.

Apart from programmes undertaken by its CSR arm, Petronas is also a major contributor in shaping the modern cultural landscape in Malaysia, via numerous arts, culture and national unity projects.

Petronas and climate change

Petronas does not publicly present a clear plan on phasing out fossil fuel production in the foreseeable future – although it does acknowledge the Paris Agreement in terms of keeping the global temperature rise below 2°C and the efforts required to further limit temperature increase to 1.5°C. On its website, Petronas states that it would manage its GHG emissions by capping them at 49.5 million tonnes of carbon dioxide equivalent (CO₂eq) for its Malaysian operations by 2024.

However, Petronas' 2019 Annual Report stated that it would continue its focus on “harnessing technology to enhance cost efficiencies and maximising our reserves recovery while balancing the implementation of our medium to long-term strategies in ensuring sustainable production” - which seems to suggest that the oil and gas extraction business will largely go on as usual, aside from the operational changes that are implemented to reduce GHG emissions and its carbon footprint.

This is echoed by the recent Petronas Activity Outlook 2020-2022 report, which stated that the company foresees a steady outlook for drilling, production support, marine vessels, and decommissioning activities. This is due to the investment opportunities in Malaysian waters and a positive outlook for turnaround and maintenance for its downstream activities.

Petronas' articulation of its responsibility in terms of supporting Malaysia's Nationally Determined Contribution (NDC) under the Paris Agreement is by way of leveraging on its natural gas and LNG (fossil fuels) portfolio to deliver low-carbon energy systems. The promotion of natural gas as low-carbon fuel is part of Petronas' Carbon Commitments (PCC), along with reducing its operational GHG emissions via energy efficiency improvements and reductions in flaring and venting.

Hence, Petronas is pushing for the increased use of natural gas, which it sees as complementary to renewable energy sources. In its effort to ensure a sustainable supply of natural gas, Petronas and four global joint venture participants reached a final investment decision in 2019 to build an LNG export facility in Kitimat in British Columbia, Canada that has an estimated project life of up to 40 years.

These efforts were encapsulated in the Petronas Climate Change Position and PCC, which articulate the company's approach in addressing climate change, as a guidance towards low-carbon energy solutions such as LNG and renewable energy, and finding ways to mitigate emissions or to create value from them.

Below is an overview of the PCC:

1. Planning and projects

- Zero continuous flaring and venting of hydrocarbon to be incorporated in the design of new upstream and downstream facilities and projects.
- Malaysia Petroleum Management (MPM) to apply a country-level CO₂ emission allowance in the planning process for high CO₂ field development.
- High CO₂ field development in upstream to incorporate carbon capture, transport, utilisation and sequestration (CCUS) technologies at the design stage.
- Carbon price shall be considered in project decision-making together with the option of carbon offsets where economically feasible.

2. Operations

- Zero continuous venting of hydrocarbon for all existing upstream and downstream facilities.
- Reduce continuous flaring of hydrocarbon for all existing upstream and downstream facilities where operationally and economically feasible.
- Downstream and LNG operating assets to meet and sustain top-quartile energy performance.

3. Renewable energy

- Renewable energy technologies to be considered in all facilities and projects where operationally and economically feasible.

Parallel to its Carbon Commitments, Petronas has lined up several “Climate Actions”, which include investment in low-carbon solutions, exploring renewable energy, innovation in the transport sector, factoring in carbon price in decision making, as well as climate change adaptation. Among the actions is establishing a GHG accounting and inventory system to measure, monitor and report emissions from its upstream and downstream plants and facilities; the inventorisation is extended to all production sharing contractors as well as other Petronas international operations.

National circumstances

Setting the scene

The phasing out of fossil fuels is undoubtedly an urgent task for the world to undertake immediately to steer away from exacerbating the impacts of climate change. In recent years, there has been more pressure on governments to draw up policies for a phaseout, in tandem with a more rapid and large-scale transition into renewable energy and other low-carbon technologies.

Like all other developing countries signatory to the United Nations Framework Convention on Climate Change (UNFCCC), Malaysia is committed to doing its fair share in cutting emissions based on its national circumstances (**equity principle**). The country has pledged in its NDC to reduce GHG emissions intensity of GDP by 45% by 2030 relative to the emissions intensity of GDP in 2005. This consists of a 35% reduction on an unconditional basis and a further 10% conditional upon receipt of climate finance, technology transfer and capacity building from developed countries.

As much as this requires a concerted international effort as envisioned by the UNFCCC, the principle of **Common but Differentiated Responsibilities and Respective Capabilities (CBDRRC)** must always be upheld. The Convention and the Paris Agreement recognise that developing countries need support – in the form of finance, capacity building and technology transfer – to achieve the agreement's objectives.

This is especially crucial as the transition out of fossil fuels for state-owned oil and gas companies like Petronas will have national-scale implications that ripple extensively across economic sectors and deep into every segment of the population. The revenues from fossil fuels are pivotal to their countries' economic growth and development, in contrast with the multinational oil companies, whose profits go to their private shareholders. Articulating the transition for state-owned companies should thus be looked at from a sustainable revenue perspective – a well-thought-out, long-term roadmap for a **just transition** to secure the rights and livelihoods of the people affected.

Phasing out fossil fuels: the global scenario

According to a report by McKinsey, the global demand for oil may peak before 2025 given increasing electrification and the large-scale move by the power sector into renewables and batteries. Meanwhile, the demand for gas will grow to up to 23% of global energy supply in 2050 as its role in the energy system remains stable.

The eight major (global) shifts forecasted in the said report are: 1) rapid uptake of electric vehicles, 2) improved efficiency gains and increased uptake of low-emission fuels for aviation and marine, 3) accelerated electrification of residential heat, 4) rapid electrification of cooking, 5) increased demand reduction and recycling of plastics, 6) more efficiency gains, recycling, and low-emission feedstock in iron and steel production, 7) more extensive electrification of EU industry low- and medium-temperature heat, and 8) accelerated cost reduction for renewables and storage.

Among the eight forecasts, those which may have the most influence on Petronas' outlook on oil and gas production would be the rapid uptake of electric vehicles, rapid electrification of cooking, and increased demand reduction and recycling of plastics, given Petronas' core businesses in the domestic and international LNG and petrochemical industry. However, the production of lubricants may remain robust as electric vehicles still need these for their transmissions and motors, albeit in a different, modified form.

Malaysia's status in carbon emissions reduction

Malaysia's total GHG emissions in 2014 were 317,627 gigagrams (Gg) (317.63 Mt) of carbon dioxide equivalent and net emissions were 50,479 Gg (50.48 Mt) CO₂eq. **The energy sector was the highest contributor to GHG emissions at 80%**, followed by the waste sector at 9%, industrial processes and product use sector at 6%, agriculture, forestry and other land use (AFOLU) sector at 4% and AFOLU-LULUCF emissions at 1%. CO₂ emissions amounted to 78% of total GHG emissions and methane (CH₄) and nitrous oxide (N₂O) emissions amounted to 18% and 3% respectively. Given that the energy sector is the highest contributor of GHG emissions, Malaysia must curtail 42.2 million tons of CO₂ emissions through renewable energy generation as a pivotal part of the country's direction towards achieving its NDC.

In comparison, Malaysia's total GHG emissions in 2011 were 290,230 Gg CO₂eq and the removals were 262,946 Gg CO₂eq. The net emissions after accounting for removals were 27,284 Gg CO₂eq. Between the net emissions for 2014 (50,479 Gg CO₂eq) and 2011 (27,284 Gg CO₂eq), there has been an almost two-fold increase just within 3 years.

As for the emissions in the energy sector, they have increased by 28% between the years 2005 and 2014. Other sectors have also seen an increase in emissions, such as the industrial processes and product use sector by 34%, AFOLU agriculture sector by 8%, waste sector by 29% and land use, land-use change and forestry (LULUCF) net removals increased by 23%. Over the same period, CO₂ emissions including LULUCF emissions only, increased by 11%, CH₄ emissions by 15% and N₂O emissions by 18%.

Malaysia's energy landscape

The following figures are the energy flow chart of Malaysia and the Energy Balance Table in 2017, sourced from the Malaysia Energy Statistics Handbook 2019 published by the Energy Commission.

Energy Flow Chart 2017

Unit: ktoe

PRIMARY SUPPLY

PRIMARY SUPPLY*

(98,298)

Crude Oil	27,471	28.0%
Petroleum Products & Others	1,909	2.0%
Natural Gas	41,201	41.9%
Coal and Coke	20,771	21.1%
Hydropower	6,240	6.3%
Renewables	707	0.7%
Total	98,298	100.0%

PRIMARY PRODUCTION

(112,867)

Crude Oil	32,807	29.1%
Natural Gas	71,140	63.0%
Coal and Coke	1,884	1.7%
Hydropower	6,240	5.5%
Renewables	795	0.7%
Total	112,867	100.0%

IMPORTS

(49,642)

Crude Oil & Others	10,211	20.6%
Natural Gas & LNG	6,998	14.1%
Petroleum Products	13,252	26.7%
Coal and Coke	19,181	38.6%
Total	49,642	100.0%

EXPORTS

(57,632)

Crude Oil & Others	15,067	26.1%
Natural Gas	1,452	2.5%
Petroleum Products	11,063	19.2%
Coal and Coke	382	0.7%
LNG	29,428	51.1%
Renewables	239	0.4%
Total	57,632	100.0%

TRANSFORMATION

GAS PLANT INPUT



36,964 LNG
1,140 GPP-LPG
2,008 MDS

OIL REFINERIES INPUT



17,647 LOCAL
9,605 IMPORT

POWER STATIONS & SELF GENERATION INPUT



12,910 NATURAL GAS
372 DIESEL
99 FUEL OIL
18,967 COAL AND COKE
6,240 HYDRO
328 RENEWABLES

GAS PLANT OUTPUT



29,428 LNG
40 LPG (FROM LNG)
138 DIESEL
51 KEROSENE
320 NON-ENERGY
1,961 LPG

OIL REFINERIES OUTPUT



8,253 PETROL
9,877 DIESEL
1,725 FUEL OIL
832 LPG
10 KEROSENE
3,255 ATF & AV GAS
3,100 NON-ENERGY
174 REFINERY GAS

POWER STATIONS & SELF GENERATION OUTPUT



11,066 THERMAL
445 SELF-GENERATION
2,309 HYDRO

FINAL USE

FINAL USE BY SECTOR

(62,489)

Residential	3,219	5.2%
Commercial	4,577	7.3%
Industry	17,463	28.0%
Transport	24,039	38.5%
Agriculture	85	0.1%
Fishery	588	0.9%
Non-Energy Use	12,517	20.0%
Total	62,489	100.0%

FINAL USE BY FUEL

(62,489)

Natural Gas	16,838	26.9%
Petroleum Products	31,241	50.0%
Coal and Coke	1,804	2.9%
Electricity	12,607	20.2%
Total	62,489	100.0%

Note *: Primary Supply = Primary Production - Flaring + Imports - Exports - Bunkers (+/-) Stock Change (+/-) Statistical Discrepancy

Commercial Energy Balance for Malaysia 2017 (Thousand Tonnes of Oil Equivalent)

ENERGY SOURCE	NATURAL GAS	LNG	CRUDE OIL (1/)	OTHERS (2/)	TOTAL PETROLEUM PRODUCTS	PETROLEUM			
						PETROL	DIESEL	FUEL OIL	LPG
PRIMARY SUPPLY									
1. Primary Production	71,140	0	32,807	0	0	0	0	0	0
2. Gas Flaring, Reinjection & Use	-8,058	0	0	0	0	0	0	0	0
3. Imports	5,183	1,815	10,135	76	13,252	5,149	5,167	226	441
4. Exports	-1,452	-29,428	-14,958	-13	-11,063	-282	-5,133	-617	-208
5. Bunkers	0	0	0	0	-390	0	-93	-297	0
6. Stock Change	0	0	-297	0	143	49	65	-11	21
7. Statistical Discrepancy	0	0	-216	0	0	0	0	0	0
8. Primary Supply	68,814	-27,613	27,471	63	1,941	4,917	6	-699	253
TRANSFORMATION									
9. Gas Plants									
9.1 LNG	-36,964	29,428	0	0	40	0	0	0	40
9.2 MDS	-1,140	0	0	0	509	0	138	0	0
9.3 GPP-LPG (3&4/)	-2,008	0	0	0	1,961	0	0	0	1,961
9.4 RGT	1,815	-1,815	0	0	0	0	0	0	0
Subtotal	-38,296	27,613	0	0	2,510	0	138	0	2,001
10. Refineries									
11. Power Stations & Self-Generation									
11.1 Hydro Stations	0	0	0	0	0	0	0	0	0
11.2 Thermal Stations	-11,872	0	0	0	-246	0	-147	-99	0
11.3 Self-Generation (5/)	-1,038	0	0	0	-226	0	-226	0	0
Subtotal	-12,910	0	0	0	-472	0	-372	-99	0
12. Losses & Own Use									
13. Statistical Discrepancy									
14. Secondary Supply									
FINAL USE									
15. Residential	1	0	0	0	608	0	0	0	606
16. Commercial	25	0	0	0	791	0	22	5	764
17. Industry	6,827	0	0	0	2,687	182	1,750	569	184
18. Transport	148	0	0	0	23,473	13,190	7,062	1	0
19. Agriculture	0	0	0	0	35	0	31	5	0
20. Fishery	0	0	0	0	588	66	523	0	0
21. Non-Energy Use	9,837	0	0	0	2,680	0	0	0	1,961
22. Total Final Use	16,838	0	0	0	30,862	13,437	9,388	579	3,514
ELECTRICITY OUTPUT									
Main Activity Producer									
Gross Electricity Generation - GWh	58,201	0	0	0	890	0	688	202	0
Autoproducer									
Gross Electricity Generation - GWh	3,930	0	0	0	805	0	805	0	0

1/ Crude production includes Condensates comprising Pentane and Heavier Hydrocarbons.

2/ Others Refer to Non-Crude Energy Forms (consist of Imported Light Diesel, Slop Re-process, Crude Residuum & Middle East Residue) Which are Used as Refinery Intake.

3/ GPP-LPG Extracts Liquid Products i.e. Condensates, Ethane, Butane, Propane from Natural Gas. Ethane is not included under LPG Production.

4/ Butane and Propane as MTBE Feedstocks are Presented as Non-Energy use under LPG column. Ethane is Presented under Natural Gas Column.

5/ Estimated figures based from the Energy Commission, Statistics of Electricity Supply Industry in Malaysia 2017.

Note : Total may not necessarily add up due to rounding

PRODUCTS												
KEROSENE	ATF & AV GAS	NON-ENERGY	REFINERY GAS	COAL & COKE	HYDRO POWER	SOLAR	BIOMASS	BIOGAS	BODIESEL	ELECTRICITY	TOTAL	
0	0	0	0	1,884	6,240	93	194	41	467	0	112,867	
0	0	0	0	0	0	0	0	0	0	0	-8,058	
0	1,205	1,064	0	19,181	0	0	0	0	0	1	49,642	
-80	-1,330	-3,433	0	-382	0	0	0	0	-239	-97	-57,632	
0	0	-0	0	0	0	0	0	0	0	0	-390	
4	3	12	0	58	0	0	0	0	32	0	-64	
0	0	0	0	30	0	0	0	0	119	0	-67	
-56	-122	-2,358	0	20,771	6,240	93	194	41	379	-96	98,298	
0	0	0	0	0	0	0	0	0	0	0	-7,496	
51	0	320	0	0	0	0	0	0	0	0	-631	
0	0	0	0	0	0	0	0	0	0	0	-46	
0	0	0	0	0	0	0	0	0	0	0	0	
51	0	320	0	0	0	0	0	0	0	0	-8,173	
10	3,255	3,100	174	0	0	0	0	0	0	0	-89	
0	0	0	0	0	-8,240	0	0	0	0	2,309	-3,931	
0	0	0	0	-18,967	0	-93	-52	-40	0	11,066	-20,203	
0	0	0	0	0	0	-0	-142	-1	0	445	-962	
0	0	0	0	-18,967	-8,240	-93	-194	-41	0	13,821	-25,096	
0	0	-317	-174	0	0	0	0	0	0	-1,057	-2,567	
-0	87	-26	0	0	0	0	0	0	0	-61	116	
61	3,342	3,076	0	-18,967	-8,240	-93	-194	-41	0	12,703	-35,808	
3	0	0	0	0	0	0	0	0	0	2,610	3,219	
0	0	0	0	0	0	0	0	0	0	3,762	4,577	
3	0	0	0	1,804	0	0	0	0	0	6,145	17,463	
0	3,220	0	0	0	0	0	0	0	379	39	24,039	
0	0	0	0	0	0	0	0	0	0	50	85	
0	0	0	0	0	0	0	0	0	0	0	588	
0	0	719	0	0	0	0	0	0	0	0	12,517	
5	3,220	719	0	1,804	0	0	0	0	379	12,607	62,489	
0	0	0	0	68,866	26,841	330	185	142	0	0	155,456	
0	0	0	0	0	5	0	426	12	0	0	5,178	

Primary production

According to the Malaysia Energy Statistics Handbook 2019, the primary production² of Malaysia relies mainly on natural gas and crude oil – and the trend from 1980 to 2017 is as illustrated in Figure 7 below:

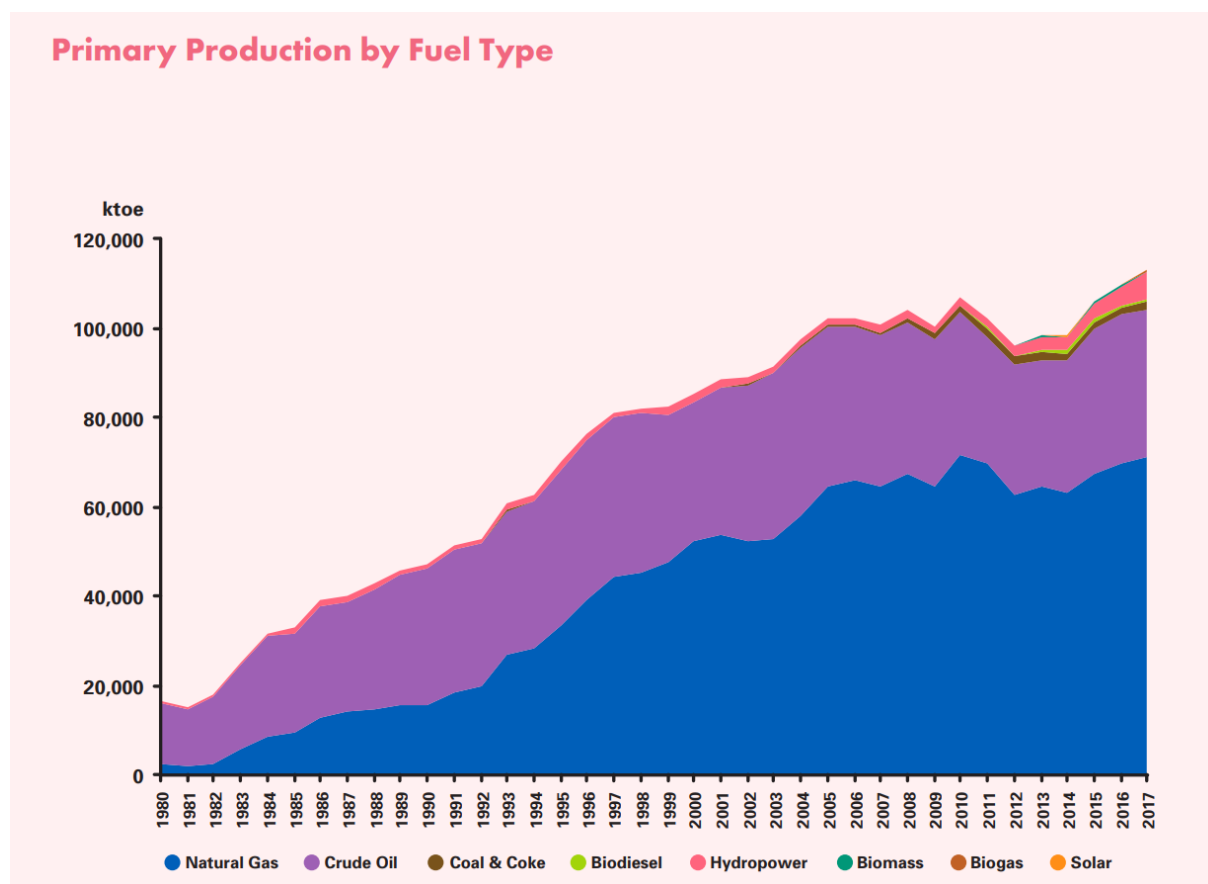


Figure 7 Malaysia's primary production based on fuel type

Source: Malaysia Energy Statistics Handbook 2019

² Primary production is the capture or extraction of fuels or energy from natural energy flows, the biosphere and natural reserves of fossil fuels within the national territory in a form suitable for use. Inert matter removed from the extracted fuels and quantities reinjected, flared or vented are not included. The resulting products are referred to as "primary" products. Source: <http://www.data.gov.my/data/dataset/primary-production-by-fuel-type>

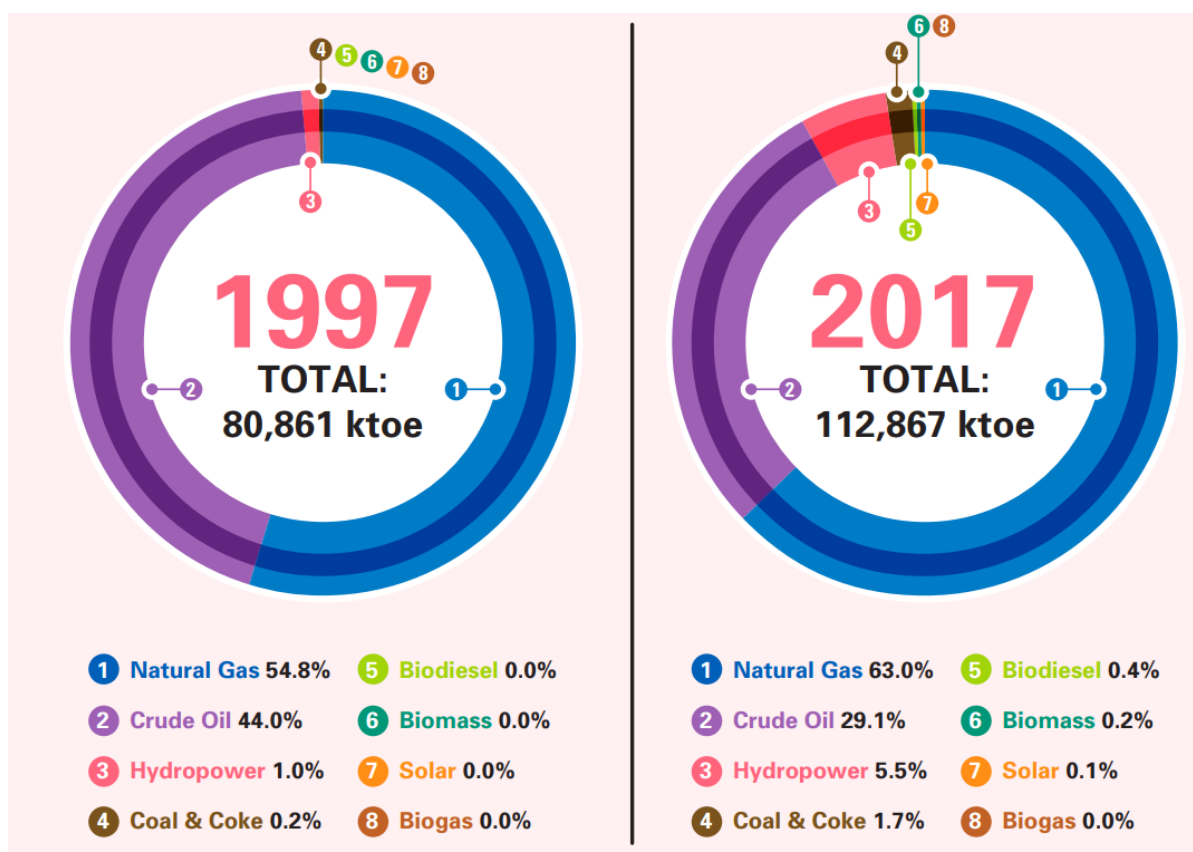


Figure 8 National energy balance 2017: Primary production by fuel type between 1997 and 2017
Source: Malaysia Energy Statistics Handbook 2019

A two-decade comparison (Figure 8) shows that Malaysia's primary production has increased by about 40% (from 80,861 ktoe to 112,867 ktoe³), predominantly contributed by natural gas and crude oil, with negligible increase in renewable energy sources such as solar and hydropower. Nevertheless, there has been a slight increase in natural gas (+8.2%) and a decrease in crude oil (-14.9%) production within the 20 years. The dominance of oil in the 1980s has been significantly reduced through the years, substituted by natural gas that is found in greater abundance in Malaysia.

This trend was further enhanced when the independent power producers (IPPs) came into the electricity sector in 1993. The IPPs have a higher tendency to build gas power plants due to quick plant uptime, lower capital cost and easy operation. However, the sector then became too dependent on gas and the National Depletion Policy – which was introduced to safeguard against over-exploitation of energy sources – was later extended from crude oil to include the natural gas reserves. An upper limit of 2,000 million standard cubic feet per day has been imposed on natural gas production in Peninsular Malaysia.

At the current rate of production, known natural gas reserves are expected to last for about 70 years, while oil is expected to last for 30 years.

³ ktoe: kilotonne of oil equivalent

Energy demand

Malaysia's energy use initially depended heavily on oil but in the past 30 years or so, the country managed to diversify its energy structure by introducing a higher use of natural gas and coal into its power generation. In the end-use sector, energy is consumed to provide energy services such as passenger transport, cooling comfort and illumination.

The annual growth rate of the Malaysian population was approximately 1.1% between 1980 and 2017. However, the electricity demand per capita has grown at a higher rate than the population – meaning the electricity demand by a person in Malaysia was about 7 times more in 2017 compared to a person in 1980 (Figure 9). The demand for electricity in Malaysia is expected to continue rising by between 2% and 3% annually in tandem with the country's economic growth.

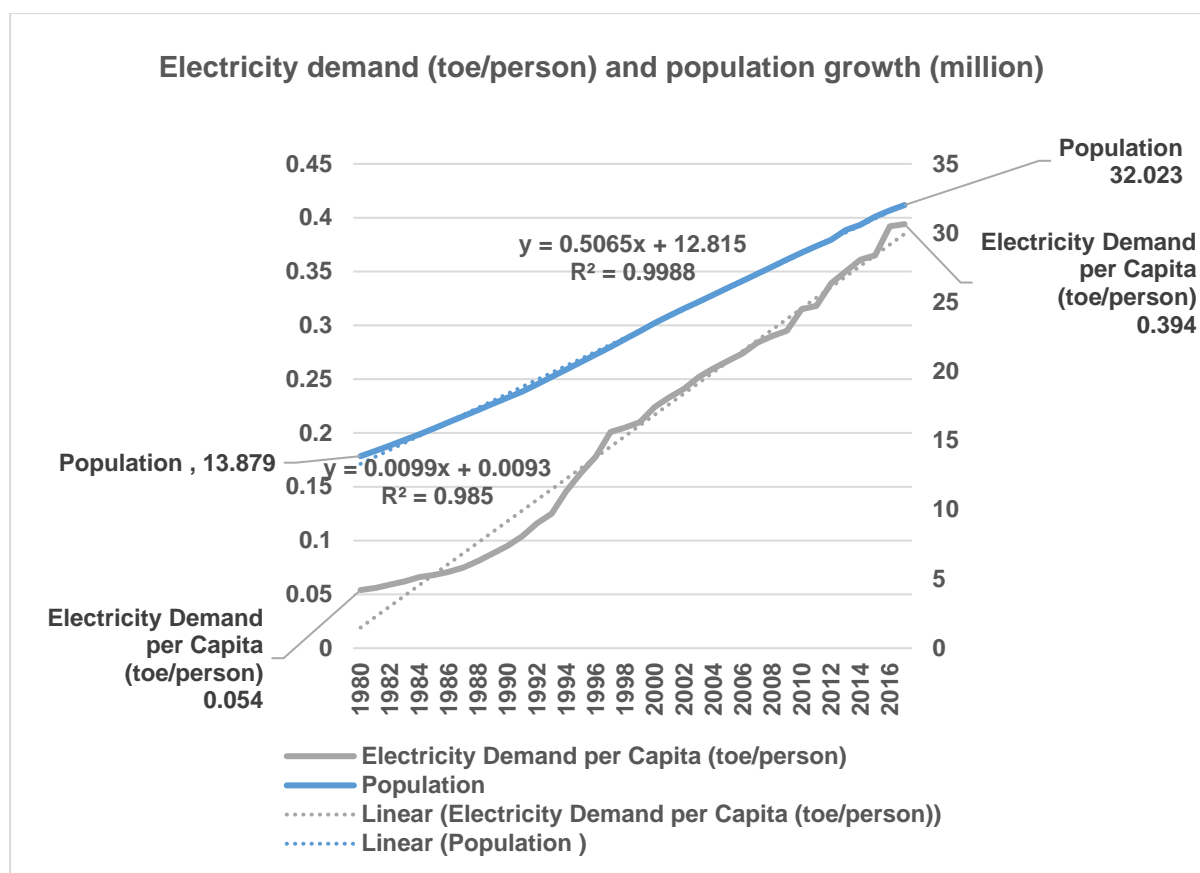


Figure 9 Electricity demand (tonne of oil equivalent, toe) per person in comparison to the annual population in Malaysia between 1980 and 2017
Source: Malaysia Energy Statistics Handbook 2019

While this is indicative of the increasing trend of energy demand over the years, it is not an accurate reflection of the energy consumption per person in the most literal sense. The final energy consumption according to sector shows that the transport and industrial sectors have been the two top sources of energy demand.

The sources of energy demand in Malaysia can be broadly categorised as follows:

Industrial: According to the energy audit launched under the Malaysian Industrial Energy Efficiency Improvement Project (MIEEIP) in 2005, most of the energy input into the industrial sector was consumed by eight industries: (1) cement 47.6%; (2) steel and iron 19.2%; (3) pulp

and paper 13.9%; (4) food 10.6%; (5) glass 2.9%; (6) wood 1.4%; (7) rubber 1.1%; (8) ceramic 0.9%; and (9) other 2.3%.

Commercial: Electricity and LPG were the main energy types consumed in the commercial sector. LPG is commonly used as cooking gas and electricity is used for (1) air-conditioning 64%; (2) illumination 12%; and (3) others 24%.

Residential: Electricity and LPG were the main energy types consumed in the residential sector. LPG is commonly used as cooking gas. The end use of electricity is for (1) refrigeration 21.1%; (2) cooking equipment 14.7%; (3) air-conditioning 11.9%; (4) washing machines 10.5%; (5) illumination 5.1%; and (6) others 36.7%.

Transportation: Four main types of vehicles were considered, including motorcars, trucks, buses and planes. Motorcycles, rail transport, and ships were not taken into consideration as they consume only a small portion of energy in Malaysia. It is assumed that all petrol was consumed within gasoline cars. In addition, it is assumed diesel was consumed within only diesel cars, buses and trucks: (1) motorcars (petrol) 100%; (2) motorcars (diesel) 6.6%; (3) buses (diesel) 5.5%; and (4) trucks (diesel) 87.9%.

Agriculture: Covers agricultural, forestry and fishing activities. This only contributes a very small portion of energy consumption in Malaysia.

The energy demand by the industrial sector began slowing down in 2007, at the same time the transport sector's energy demand started to pick up (Figure 10). By 2017, energy demand by the transport sector was approximately 1.4 times more than that by the industrial sector.

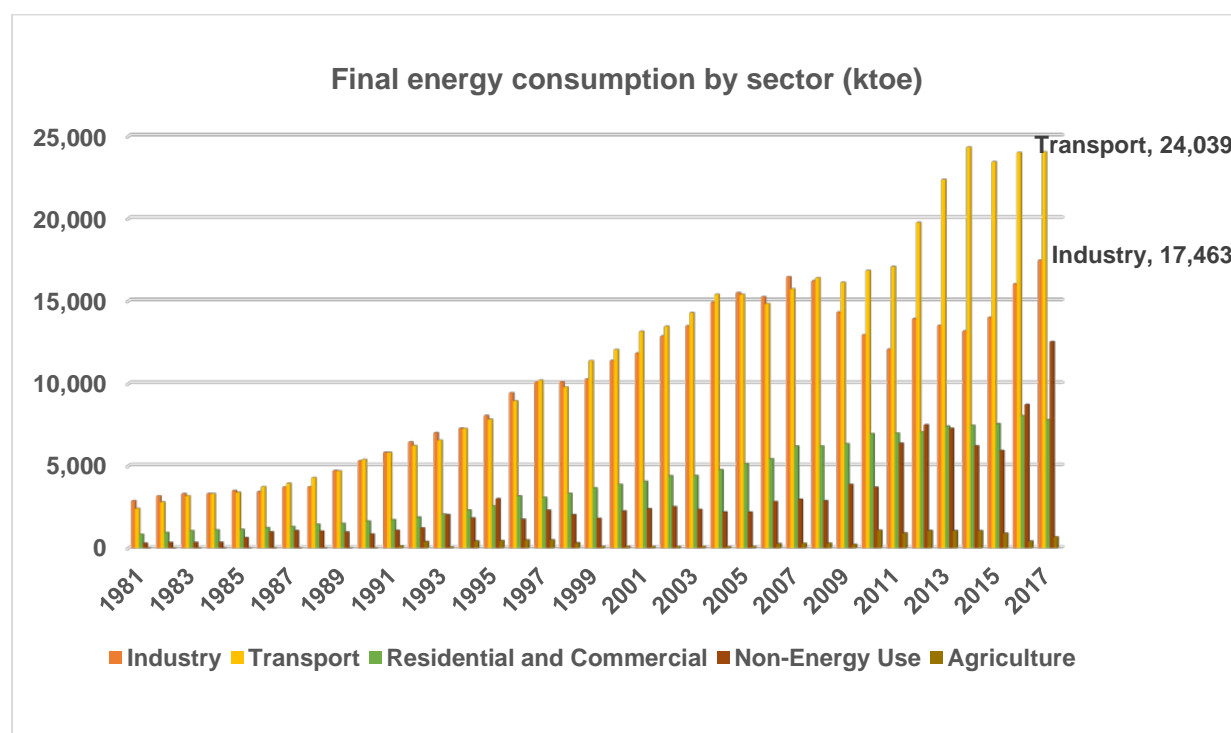
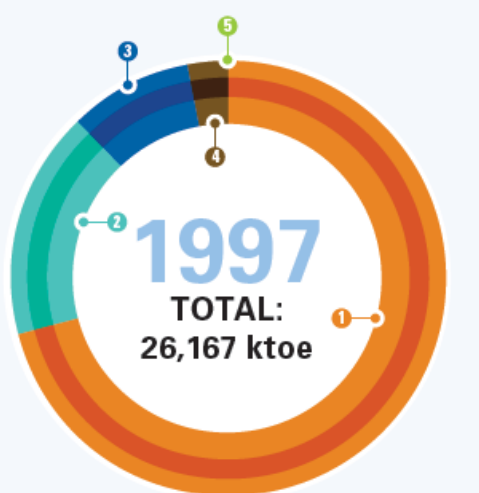
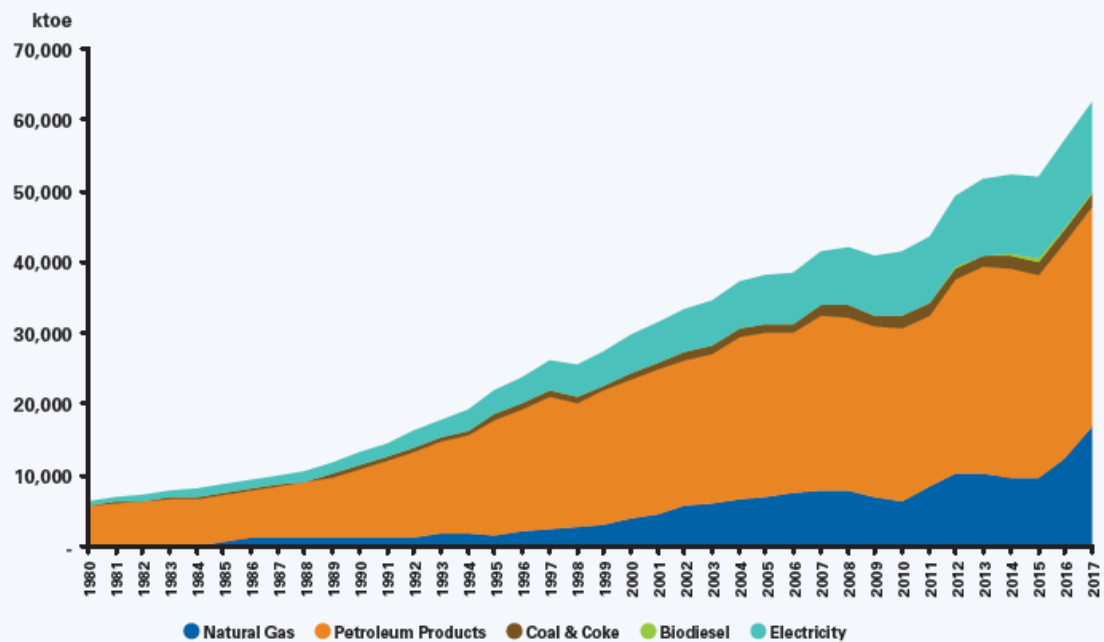


Figure 10 Final energy consumption (ktoe) by sector in Malaysia from 1981 to 2017

Source: Malaysia Energy Statistics Handbook 2019

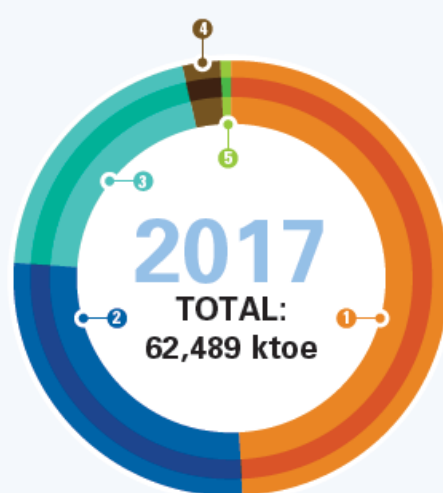
The final energy consumption by fuel type in Malaysia, which refers to all fuel and energy that is delivered to users for both energy and non-energy uses, which do not involve a transformation process, is as follows (Figure 11):

Final Energy Consumption by Fuel Type



- 1 Petroleum Products 71.0%
- 2 Electricity 16.8%
- 3 Natural Gas 9.4%
- 4 Coal & Coke 2.8%
- 5 Biodiesel 0.0%

Source: Energy Commission



- 1 Petroleum Products 49.4%
- 2 Natural Gas 26.9%
- 3 Electricity 20.2%
- 4 Coal & Coke 2.9%
- 5 Biodiesel 0.6%

Figure 11 Final energy consumption by fuel type in Malaysia from 1980 to 2017
Source: Malaysia Energy Statistics Handbook 2019

Coal consumption in Malaysia has been growing at the rate of 9.7% per year since 2002, and a 2008 study showed that CO₂ emissions from coal-fired power plants were expected to grow at 4.1% per year to reach 98 million tons by 2020, a 2.65-fold increase from 2005.

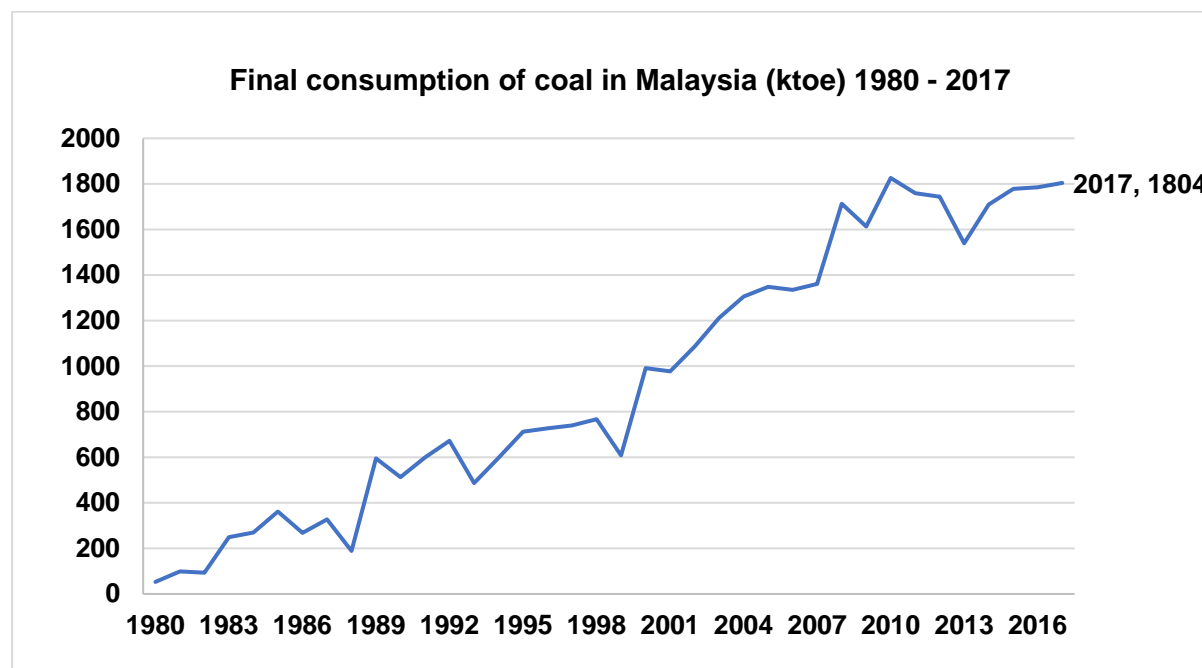


Figure 12 Final consumption of coal in Malaysia from 1980 to 2017
Source: <https://meih.st.gov.my/statistics>

Malaysia is a net importer of coal (Figure 13) and the country's coal production predominantly consists of subbituminous coal in small quantities, increasing from 0.2 Mt in 1996 to 0.4 Mt in 2001, with western Sarawak being the major producer.

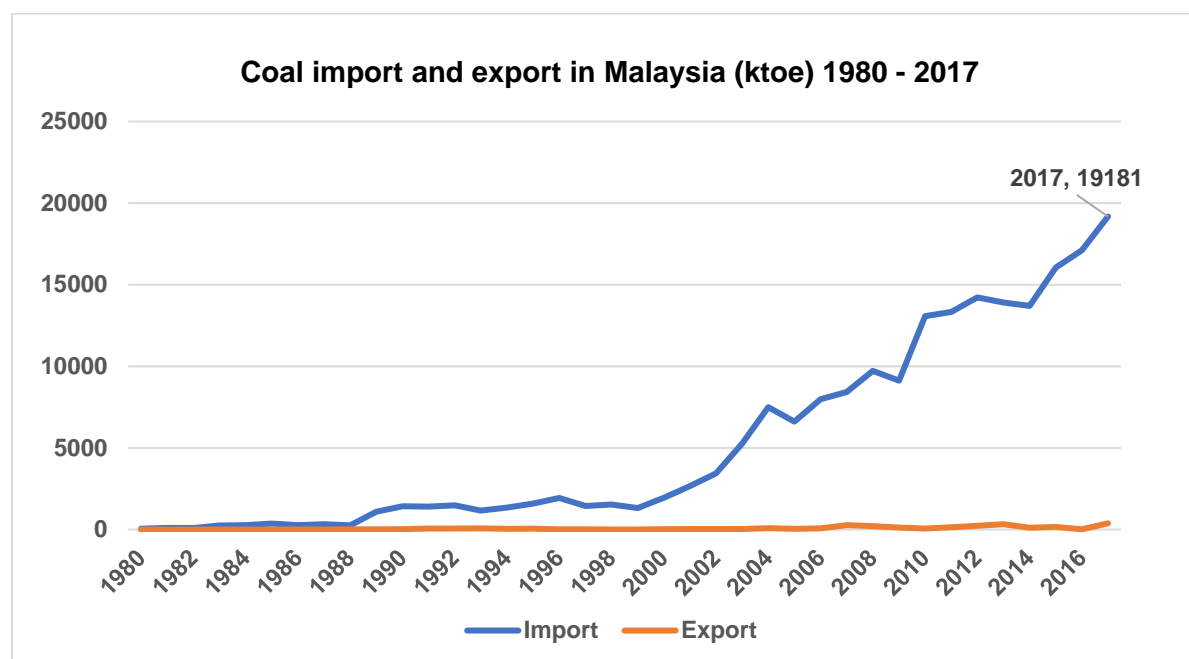


Figure 13 Coal import and export in Malaysia from 1980 to 2017
Source: <https://meih.st.gov.my/statistics>

In 2011, Malaysia produced 28.7 Mtoe of **crude oil**, which places the country 28th in the world and 4th in the Asia-Pacific region, after China, Indonesia and India.

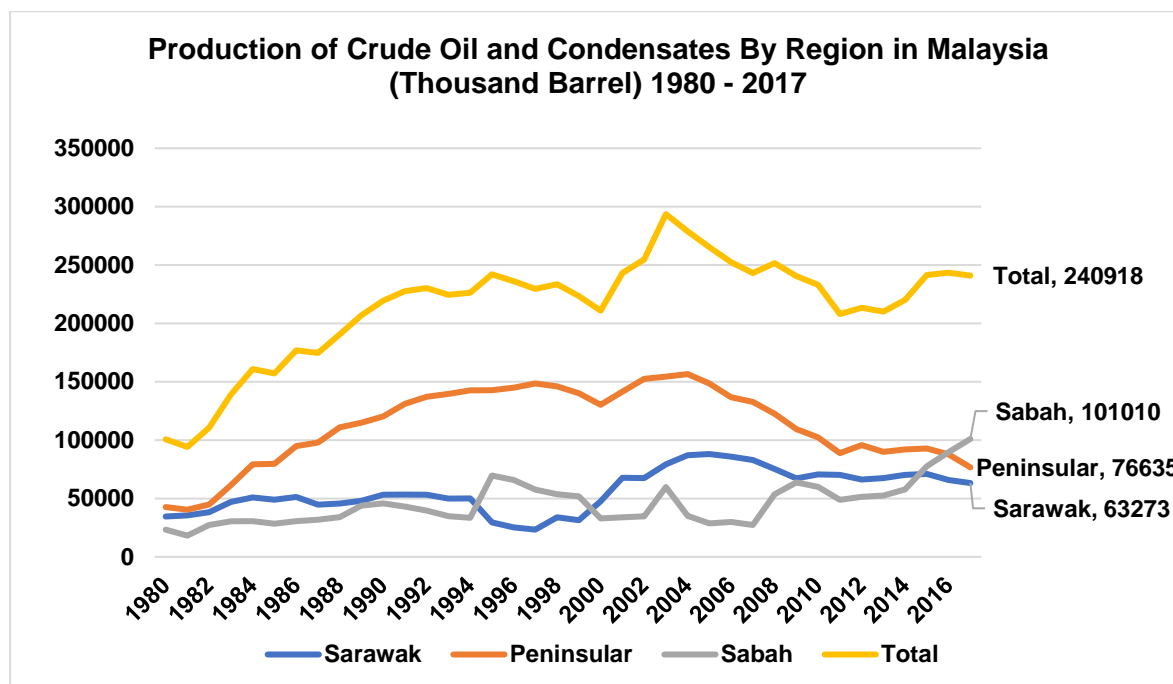


Figure 14 Production of crude oil and condensates by region in Malaysia (thousand barrel)
Source: <https://meih.st.gov.my/statistics>

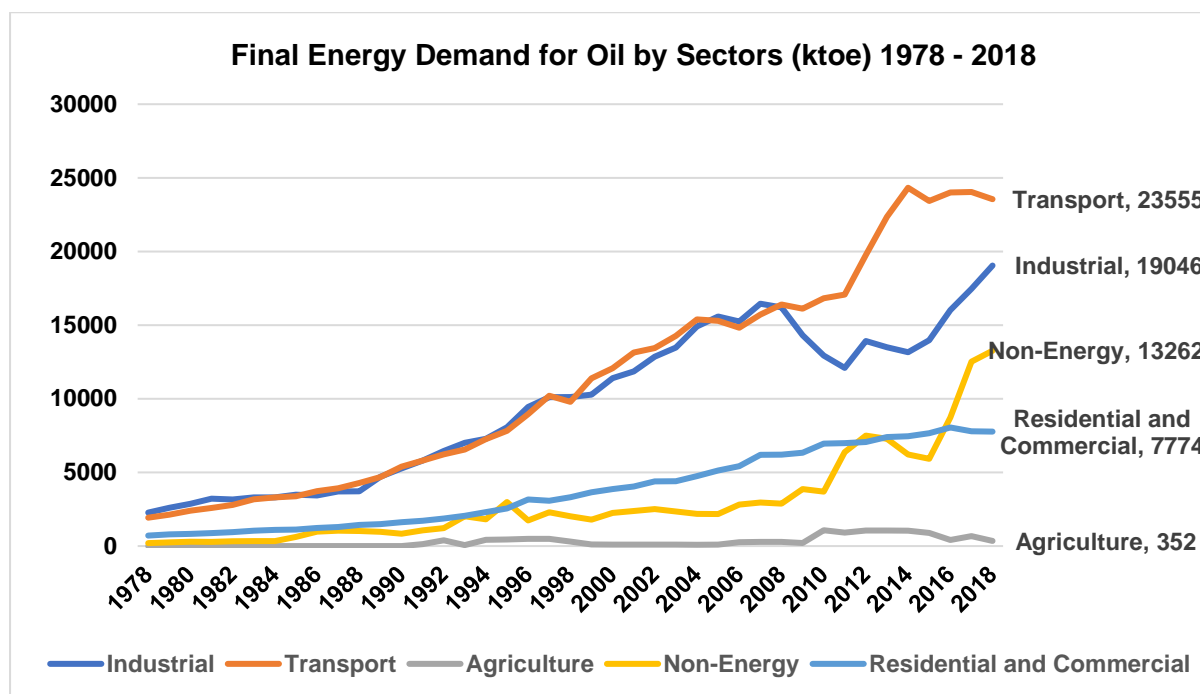


Figure 15 Final energy demand for oil by sectors (ktoe)
Source: <https://meih.st.gov.my/statistics>

According to 2011 statistics, Malaysia had proven **natural gas** reserves of 46.8 tcf, the 5th largest reserves in the Asia-Pacific region ranking after Australia, China, Indonesia and India, and 21st in the world. The production of natural gas by Malaysia is as displayed in the following Figure 16, and the country's natural gas imports and exports in Figure 17.

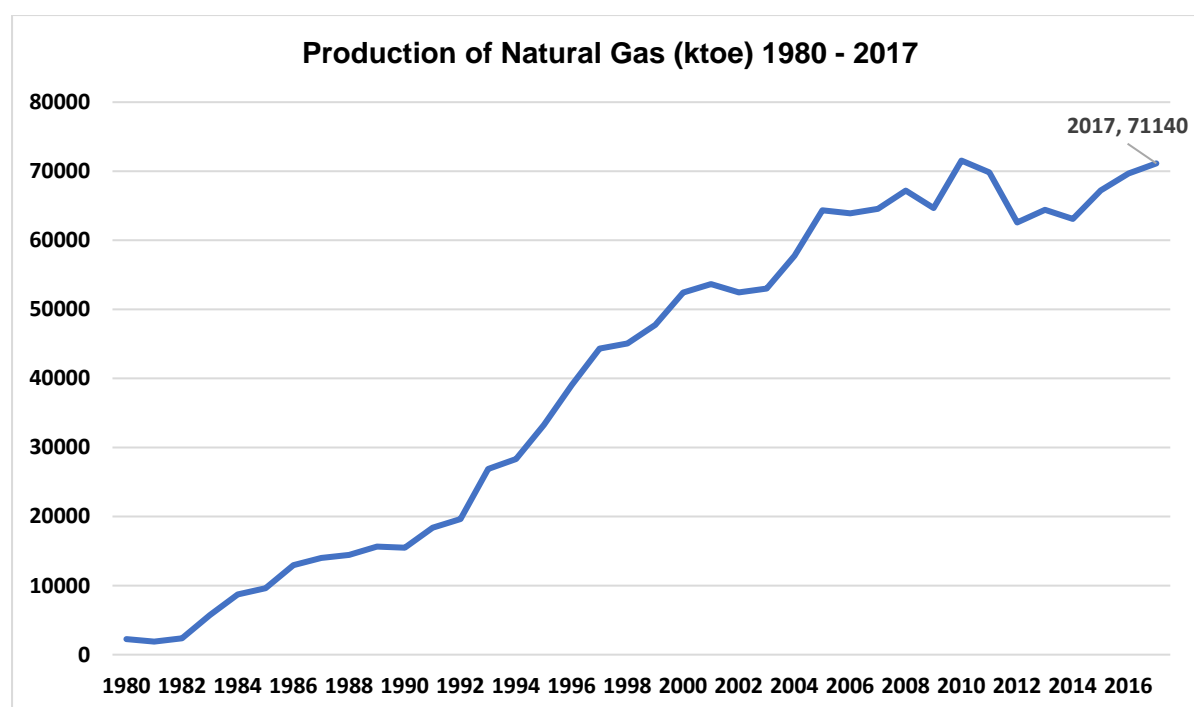


Figure 16 Production of natural gas in Malaysia from 1980 to 2017
Source: <https://meih.st.gov.my/statistics>

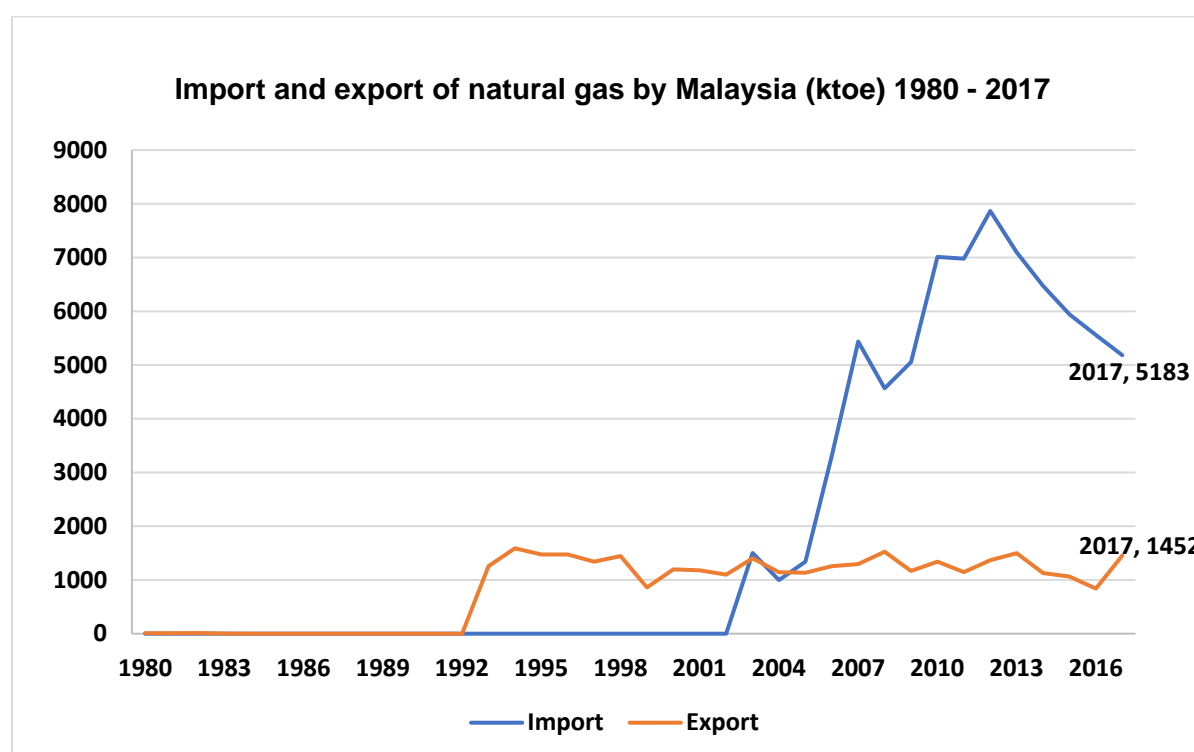


Figure 17 Malaysia's import and export of natural gas from 1980 to 2017
Source: <https://meih.st.gov.my/statistics>

The highest consumption of natural gas is currently for non-energy uses. Non-energy use refers to use of products resulting from the transformation process for non-energy purposes (bitumen/lubricants, asphalt/greases) and use of energy products (such as natural gas) as industrial feedstocks (Figure 18).

LNG is an important export commodity for Malaysia (the main exporter being Petronas), but the export level is set to drop to its lowest since mid-2018 as producers globally are pressured to cut production amid record low spot prices of the super-chilled fuel.

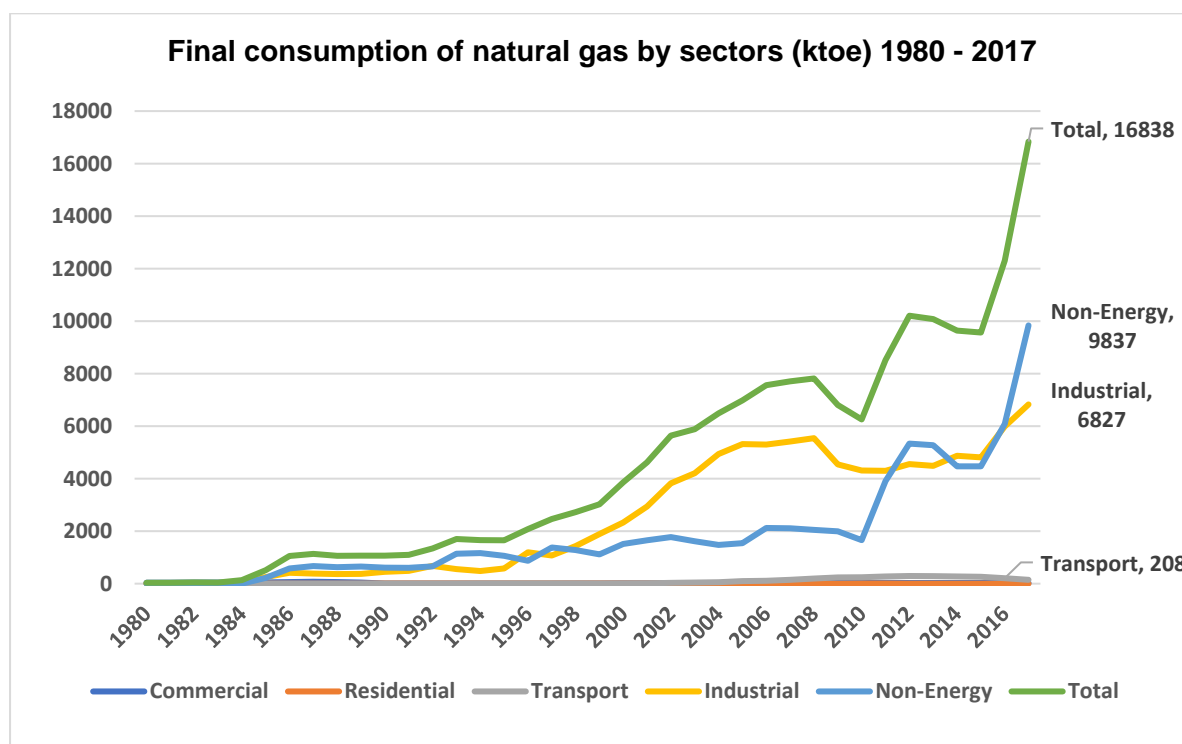


Figure 18 Final consumption of natural gas by sectors from 1980 to 2016

Source: <https://meih.st.gov.my/statistics>

The total primary energy supply of **biodiesel** in Malaysia is still extremely low – with a mere increase from 0% in 1997 to 0.4% in 2017. However, in 2019, Malaysia's biodiesel production and exports hit record levels as low prices of palm oil – which is used as feedstock to make the bio components of biodiesel – increased the appeal of blending to make biofuels. Nevertheless, this does not necessarily translate to domestic demand and consumption of biodiesel. Instead, the low palm oil prices have encouraged the uptake of palm-based biodiesel in markets such as China and the European Union. Being the second largest palm oil producer, Malaysia is riding on its existing capacity to support the rising global demand for biofuels of vegetable origin.

From March to August 2020, however, Malaysia's palm oil-derived biodiesel exports slumped significantly. With 16 processing plants, production of biodiesel in Malaysia is significantly below its full annual capacity of 2.29 million tonnes. Due to this industry overcapacity, Malaysia no longer issues licences for new processing plants and does not foresee further expansion for the next several years.

In the field of **renewable energy** (apart from hydropower), there have been a number of projects carried out by the government to ascertain the potential use of biomass in the form of

rice husks, fuel wood and palm oil waste to generate energy. There is a feasibility study on power stations using biomass and co-generation technology which looks not only into the connection of such stations into the national power grid but also at prospects for the extraction and transfer of energy resources that are needed to feed these stations.

In view of depleting coal and natural gas, the government had planned to utilise nuclear power as an electricity source by 2023. In 2012, a plan to have nuclear power plants by 2030 was announced and the nuclear drive was to be led by the Malaysia Nuclear Power Corporation (MNPC). However, the acceptance of nuclear power in Malaysia is generally low and plans to introduce it are often met with objections from civil society groups which insist that the government look into renewable energies instead. In 2018, the previous Prime Minister then stated that “Malaysia will not use nuclear power plants to generate energy, as science has yet to find ways to manage nuclear waste and the effects of radiation”.

Power producers

Due to a major nationwide power blackout in the late 1980s, independent power producers were created, abandoning a single power-producing model. Malaysia currently has 21 IPPs in Peninsular Malaysia and 6 in Sabah. Figure 19, which presents the sources of electricity generation in Malaysia by plant type, shows that the main power generation source is from thermal stations.

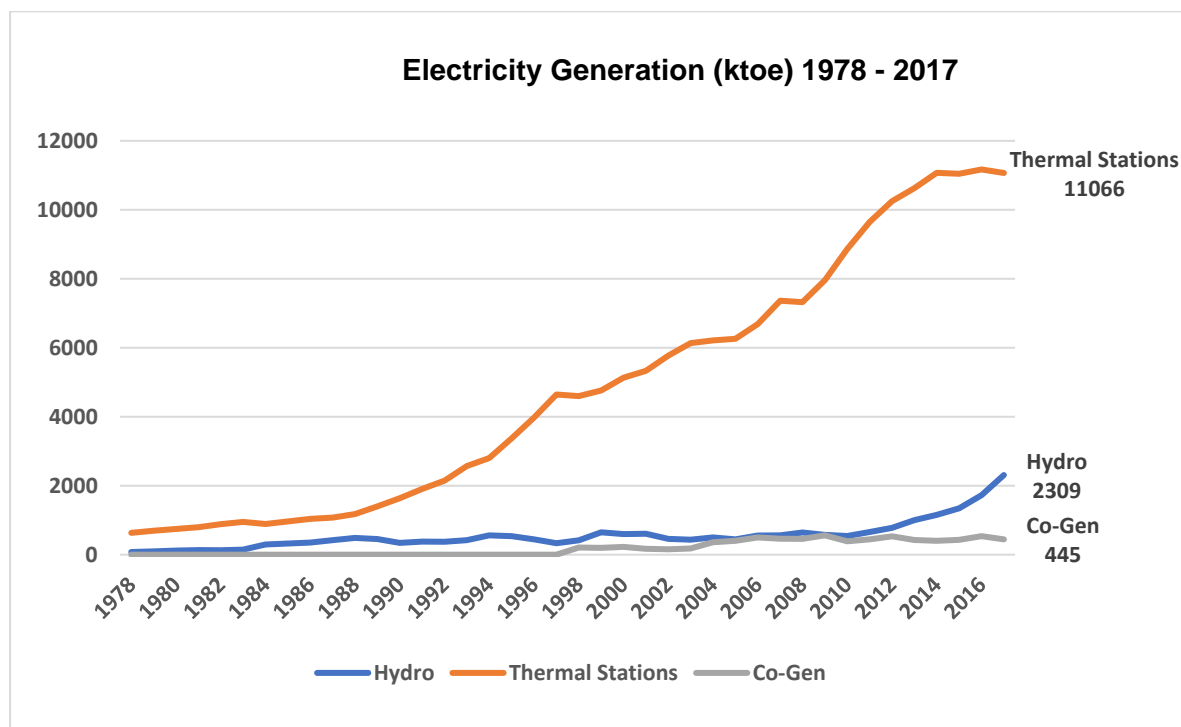


Figure 19 Electricity generation in Malaysia by plant type from 1978 to 2017

Figure 0 shows the trend of **fuel input to power stations** from 1980 to 2017 in Malaysia. In 1997, natural gas was the major fuel input at 63.4%, followed by fuel oil (20.9%) and coal and coke (7.4%). However, 20 years later, the energy mix changed, with **coal and coke becoming the main fuel input (50.6%)**, followed by natural gas (31.7%) and hydropower (16.6%) (Figure 21). This is yet another significant change to Malaysia’s energy landscape, where the share of gas in the power mix decreased, largely led by policies to switch to coal in response to declining domestic gas production.

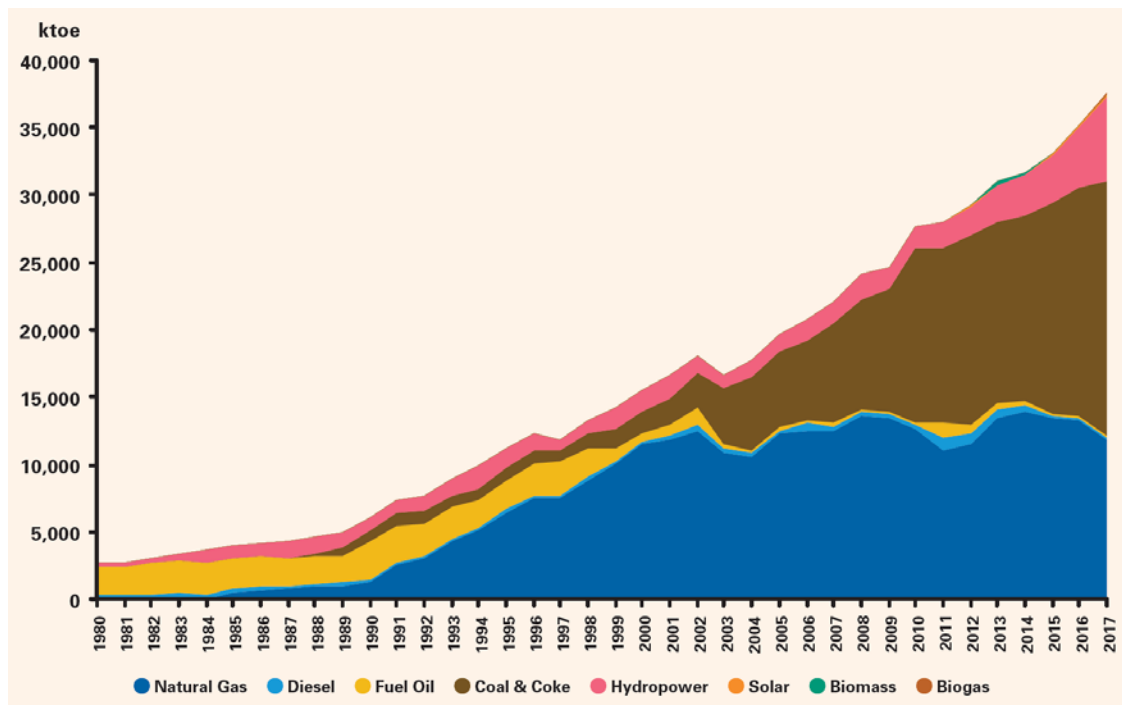


Figure 20 Fuel input to power stations from 1980 to 2017

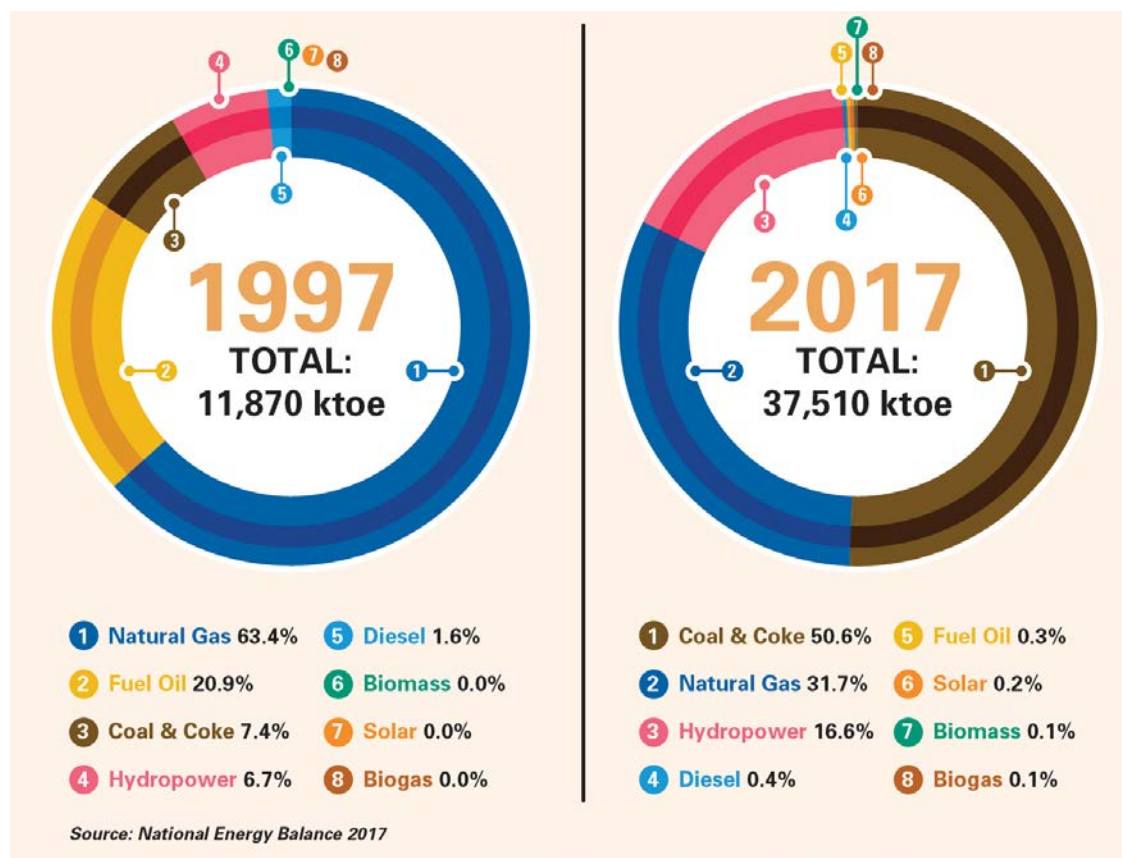


Figure 21 Fuel input composition in 1997 and 2017

Source: Energy Commission. Malaysia Energy Statistics Handbook 2019.

Electricity generation

In the two decades of implementation of the Four Fuel Diversification Policy from 1981, Malaysia sought to decrease its dependence on oil by turning also to gas, coal and hydropower as energy sources. This led to an outcome where the share of oil in the mix was reduced tremendously, while the portion of gas markedly increased.

This change was continued by the Fifth Fuel Diversification Policy, which was embedded into the 8th Malaysia Plan (2001-2005). In that policy, renewable energy sources (identified as biomass, biogas, municipal waste, solar and mini-hydro) were established as the Fifth Fuel in the national energy mix to supplement the conventional energy sources comprised of oil, gas, coal and large hydro. The effort to diversify the energy mix continued into the 11th Malaysia Plan, as reflected in Malaysia's 3rd National Communication submitted to the UNFCCC:

"Recent policies as outlined in the Eleventh Malaysia Plan (2016-2020) have focused on reducing dependency on petroleum products and mainstreaming environmental considerations, while ensuring reliable, affordable energy and safeguarding energy security."

The following Figure 22 and Figure 23, from the Malaysia Energy Statistics Handbook 2019, display the electricity generation mix and a comparison between the years 1998 and 2018.

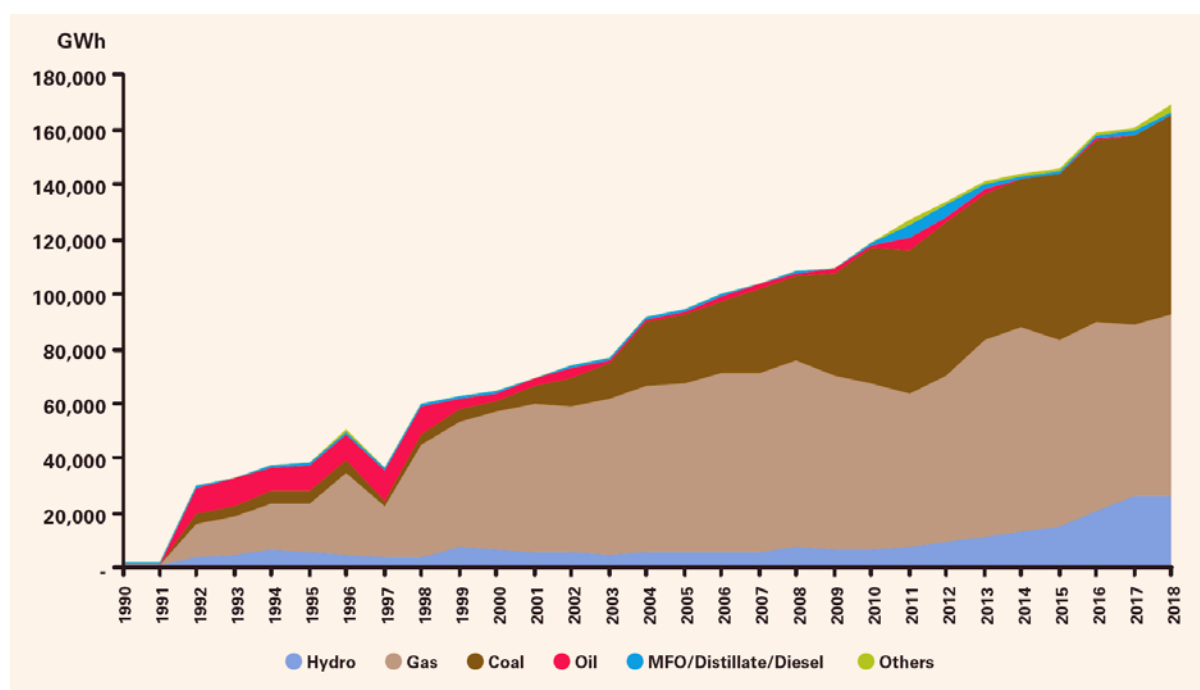


Figure 22 Malaysia electricity generation mix

Source: Energy Commission. Malaysia Energy Statistics Handbook 2019.

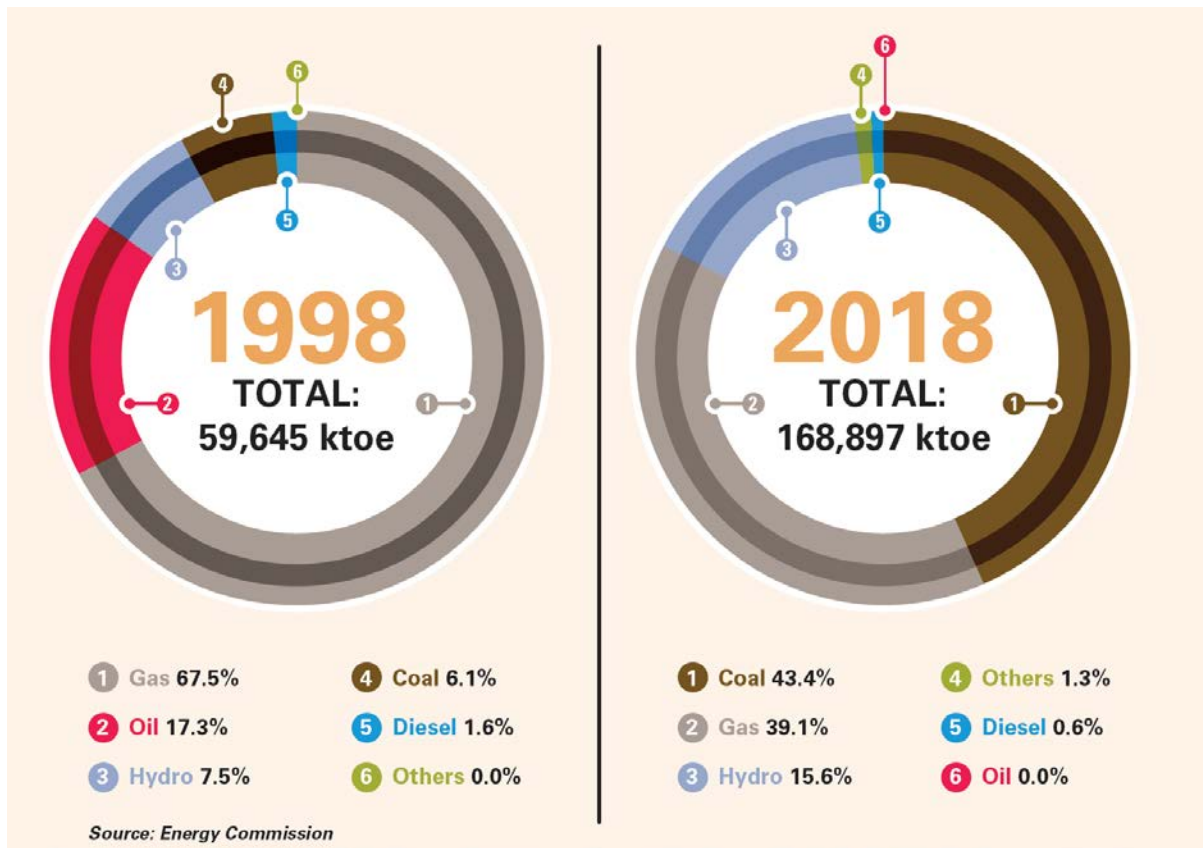


Figure 23 Electricity generation mix in Malaysia in 1998 and 2018
Source: Energy Commission. Malaysia Energy Statistics Handbook 2019.

In recent years, coal has replaced gas as the largest electricity source (Figure 23). This poses a major challenge in terms of the country's capacity to meet the growing electricity demand while at the same time considering the environmental load, energy security and economic efficiency.

Moreover, the **current electricity reserve margin in Malaysia**, which stands on average at more than 40%, especially in Sabah and Sarawak, needs to be reviewed and possibly reduced. Peninsular Malaysia's surplus capacity peaked at 56% in 2003 and 53% in 2009. This is because the power purchase agreements (PPAs) signed with the IPPs oblige TNB to purchase the electricity generated by the IPPs regardless of the reserve margin.

Installed renewable energy capacity

According to the Mid-Term Review of the 11th Malaysia Plan, the installed capacity for renewable energy in 2017 was at 7,260MW, which surpasses the original target of 2,080MW by year 2020. However, these figures are based on the ASEAN (Association of Southeast Asian Nations) definition of renewable energy which takes account of all types of hydro energy in the calculation without limiting their capacities. This is problematic particularly because hydro energy usually alludes to water dams, which are environmentally damaging, destroy carbon sequestration capacity and have displaced numerous communities of indigenous people from the forests.

Policies, regulations, and plans

Following the oil crises of 1973 and 1979, Malaysia has adopted a series of national energy policies to secure strategic energy resources for its own survival. A study found that these policies either: (1) directly responded to changes in global/domestic socioeconomic and political events, or (2) provided visions to guide development of the energy sector in alignment with the country's growth agenda.

Initially, Malaysia's energy policies were focused on petroleum development, such as the Petroleum Development Act of 1974, the National Petroleum Policy 1975, the National Energy Policy 1979, the National Depletion Policy 1980 and the Four Fuel Diversification Policy 1981. It was not until 2000 that the trend began to shift towards renewable energy with the introduction of the Fifth Fuel Diversification Policy as a strategic initiative to address the issue of fossil fuel depletion and climate change. The government set a target to obtain 5% of its energy from renewable sources by 2005. However, this policy ended up achieving only 0.3% of the target by 2005.

Despite having a National Climate Change Policy that was released in 2009, Malaysia has no legislation to reduce CO₂ emissions. Nonetheless, Malaysia has rolled out several policies and plans aimed at reducing the dependency on oil while diversifying its energy sources with renewables, and at promoting wider implementation of energy efficiency projects across sectors, in an effort to reduce the country's carbon footprint given that the energy sector has been identified as the largest GHG emitter in Malaysia.

However, Malaysia's progress towards renewable energy has been limited and too slow. Even with the latest policies and plans, e.g. the Renewable Energy Act (2011) and the 11th Malaysia Plan (2016-2020), there is no articulation of phasing out fossil fuels in line with the findings of the Intergovernmental Panel on Climate Change (IPCC).

Energy reform

The Malaysian electricity supply industry (MESI) has gone through many rounds of reforms and restructurings since it first started at the beginning of the last century. The latest series of reforms, known as MESI 1.0, has been ongoing since 2010. The objectives are to achieve secure and reliable supply of energy, to have economically competitive tariffs, to be environmentally sustainable and to improve customer satisfaction/choice. MESI 1.0 is now coming to its end, and in a recent development, the government has announced the commencement of the next series, MESI 2.0.

However, the new government that took office earlier this year plans to review these reforms, whose implementation, it says, would entail financial implications of around MYR5 billion to the government, which would also need to take over PPA obligations totalling MYR60 billion to MYR80 billion from TNB.

Meanwhile, the world is shifting away from coal, driven by the falling prices of solar and wind energy, as well as better battery storage. ASEAN member states are also focused on increasing the share of renewable energy (RE) in their energy mix as part of their sustainable energy growth and climate change commitments. As a region, ASEAN has also set a target for member countries to increase the component of RE in the ASEAN energy mix to 23% by 2025, up from 9% in 2014.

Actors in cleaner energy

Petronas is inclined towards diversifying its energy provision (while keeping oil and gas as its core business) as a response to the global shift towards renewable energy. Even if it is not wholly motivated by the urgent need to phase out fossil fuel production in light of climate change, declining oil prices and the need to ensure its business sustainability may push it in this direction. In any case, its main objective in providing affordable and reliable energy remains, even as it seeks to drive optimum use of hydrocarbons and water in its operations, embrace energy transition and support Malaysia and its host countries in meeting their pledges to the Paris Agreement.

While the public information contained in its annual reports may provide some insight into Petronas' future direction, it is not clear as to whether the company has a longer-term outlook in the scale of decades, which would include a risk assessment on declining demand to a point when fossil fuels are no longer financially viable. Nevertheless, Petronas is focusing on ramping up production of LNG as a source of cleaner energy, especially to cater to the three largest LNG markets, Japan, China and South Korea.

On the renewable energy front, Petronas is focusing on solar and wind to leverage on the continuous technological improvements and the decreasing costs. It is also exploring clean hybrid and storage solutions to cushion itself from hydrocarbon price volatility and future-proof itself in the global energy transition. Petronas currently has more than 650MW of solar projects that are either operating or under construction in India and Dubai, and over 1GW of projects under development. Among other renewable energy initiatives, Petronas has acquired Amplus Energy Solutions Pte Ltd, a leading Singapore-based company with renewable energy assets in Asia. Petronas also inked a capital investment agreement in the solar photovoltaic system start-up SOLS Energy Sdn Bhd that provides sustainable energy for the residential and small and medium enterprise (SME) sectors in Malaysia.

However, the Petronas Group CEO has stressed that oil and gas will remain as the group's core business, especially in the primary energy mix.

As mentioned above, **Tenaga Nasional Berhad** is a state-controlled electric utility company in Malaysia. TNB Fuel Services Sdn Bhd (TNBF), a wholly owned unit of TNB, oversees the import of coal for power plants in Malaysia. TNB's strategy in decarbonising is currently demonstrated via two programmes: myGreen+ and mGATS. myGreen+ provides consumers the option to subscribe to green energy and support the government's agenda of generating 20% of electricity via renewable energy sources by 2025. Meanwhile, Malaysia Green Attribute Tracking System (mGATS) allows RE generators, retailers and customers to purchase Renewable Energy Certificates (RECs) easily. In addition, TNB has a presence in more than 5 countries, with four international acquisitions of companies with RE assets. Its domestic renewable energy target is to achieve 1,700MW by 2025.

As Malaysia's energy regulatory authority, the **Energy Commission (EC)** has planned and is implementing RE-related programmes such as large-scale solar (LSS), net energy metering (NEM) and self-consumption for solar installations. The EC has also assisted the government of Malaysia through the National Energy Efficiency Master Plan (NEEMP) 2011-2020 to achieve a 10% electricity consumption reduction by 2020.

Another actor in Malaysia's transition towards cleaner energy is the **Sustainable Energy Development Authority (SEDA)**, a statutory body formed under the Sustainable Energy Development Authority Act 2011. Its key role is to administer and manage the implementation of the feed-in tariff mechanism which is mandated under the Renewable Energy Act 2011.

Meanwhile, the **Malaysian Green Technology and Climate Change Centre (MGTC)** is the government agency under the purview of the Ministry of Environment and Water mandated to lead the nation in the areas of green growth, climate change mitigation and climate resilience and adaptation. The agency provides incentives, financing and certification to facilitate divestment from fossil-fuel-dependent businesses, maximising green industry and renewable energy. The MGTC is also working towards the establishment of the Low Carbon Cities Framework (LCCF) by helping local authorities transform their cities into low-carbon cities.

The **Ministry of Finance** had approved the Green Technology Financing Scheme 2.0 (GTFS 2.0) with financing earmarked up to MYR5 billion (USD1.2 billion) in 2018. However, the new government which took office later that year decided to discontinue the Scheme but later reinstated it with a reduced allocation of MYR2 billion (USD0.5 billion) for the period from January 2019 until the end of 2020.

Challenges facing energy reform

The petroleum industry has occupied an outsize space in Malaysia's economic and institutional systems - even before the country gained its independence in 1957. This makes it extremely difficult and costly to initiate a transition to a new and more sustainable energy system.

The disconcertingly slow transition towards renewable energy in Malaysia has been further hampered by slow acceptance of RE generation in the country. A multi-stakeholder survey in 2012 found that:

1. The government is not keen to subsidise RE generation and has largely left it to the private sector to be the prime movers.
2. The monopolistic government-linked utility company (i.e. TNB) itself is not keen as the capacity of RE generation tends to be small (less than 10MW).
3. Feedstock owners themselves are not keen as alternative usage gives better yield.

In addition, energy prices in Malaysia have been kept artificially low as they are heavily subsidised by the government, creating a perverse incentive against efficient utilisation. These prices also do not internalise the cost of environmental externality, nor the social cost associated with the environmental degradation resulting from the production and use of the energy. However, raising the prices of energy has significant political consequences, as Malaysians are very sensitive towards governmental decisions that affect their day-to-day expenditures.

According to a study, the experience of other countries has shown that an energy project can take up to 30 years before it reaches a material level in a country's total energy mix. Hence, Malaysia cannot afford to wait for an incremental evolution towards a cleaner energy system as it is too slow. Complicating matters, however, is the aforementioned review by the government of MESI 2.0, which was supposed to quicken the uptake of RE. It is rather uncertain when the review is expected to be completed, and what changes will be made to the policy.

Petronas and the Five-Year Malaysia Plans

The Five-Year Malaysia Plans are economic development plans implemented by the government which focus on various growth areas of the country within a 5-year period and guide policy directions and budgetary allocations for the nation. Petronas plays a pivotal role in this arrangement – mainly as the financial enabler of Malaysia's development (through dividend payments to the government) through the decades since its establishment in August 1974. The government collected MYR26 billion (USD6.3 billion) in dividends from Petronas in 2018 and MYR54 billion (USD13.1 billion) in 2019.

In recognition of the need to mainstream climate change mitigation and adaptation into Malaysia's development plans, strategies to address climate change impacts were first incorporated into the 10th Malaysia Plan (2011-2015). These efforts were further crystallised under the 11th Malaysia Plan (2016-2020), to pursue green growth for sustainability and resilience. To achieve the goal, Malaysia recognised it is crucial to strengthen institutional frameworks through capacity building and enhance knowledge and awareness to create shared responsibility at all levels of society.

Although Malaysia is not a welfare state, Petronas nonetheless plays a foundational role in the development of the country through its economic and social contributions. In a society where the influence of fossil fuels is structurally embedded, the complexity of the energy transition cannot be understated. A just transition should hence become the anchor for strategies on phasing out fossil fuels.

Given that Malaysia's GDP relies to a large extent on fossil fuel production, removing fossil fuels from the equation will inevitably affect the financial capacity of the country to provide public services and implement programmes for the welfare of the citizens. **This raises the question: what would Malaysia's income source be as it transitions away from fossil fuel production?** And how would the Malaysian government replace the billions of ringgit that flow into its coffers each year from Petronas? This is all the more pertinent during the current economic recession caused by the global COVID-19 pandemic.

Political instability, COVID-19, price of oil, economic turbulence: a developing scenario

Amid the COVID-19 pandemic which had the world in lockdown, Malaysia has experienced seismic changes in its political and economic landscape – all of which have significant implications on the way policies, budgets and decision-making are shaped moving forward.

In February 2020, Malaysia experienced a political crisis when Mahathir resigned and opened the way for the appointment of Muhyiddin Yassin as the country's eighth Prime Minister. A few days after the new government took over on 1 March, the World Health Organisation (WHO) declared COVID-19 a pandemic. In the midst of all this turmoil, a top-level change at Petronas sparked concerns that Muhyiddin's government is set to overhaul laws that would deprive the national corporation of its role as the sole custodian of Malaysia's hydrocarbon resources. The political landscape of Malaysia has never been as volatile as in this period, where major policy changes and budget allocations that typically take years to happen are now compressed into a matter of months.

To contain the COVID-19 outbreak, Malaysia entered its first phase of Movement Control Order (MCO) on 18 March and is now in what is called the Recovery MCO (RMCO) phase under which restrictions have been eased, although the country's borders remain closed until 31 December 2020. Although Malaysia's COVID-19 case numbers and death toll are relatively low, the economic and social costs for the country have been extremely high.

Malaysia's GDP is estimated to contract by 2.61% in 2020. In terms of value of real GDP losses (relative to projected 2020 baseline), Malaysia is set to lose MYR38 billion (USD9.2

billion) (MYR73 billion in nominal terms/USD17.7 billion) and lose as many as 951,000 jobs. Household income losses are projected at MYR41 billion (USD10 billion) while private consumption is estimated to fall by 4.9%, due to income losses.

On 27 March, the Malaysian government announced a MYR250 billion (approximately USD58.5 billion) economic stimulus package, an amount equivalent to 17% of the country's GDP. The majority of the funds (55%) will go into cash handouts and a loan moratorium to assist low- and middle-income households, with another 44% to be channelled to small and medium enterprises in the form of loan moratorium, wage subsidy and financing. This amount is in addition to an economic stimulus injection amounting to MYR20 billion that had been announced by the previous government at the end of February to offset the fallout from the onset of COVID-19.

The Petronas group has not been spared the effects of the economic crunch. As an example, Petronas Chemicals' earnings have been affected by the sharp drop in demand from China, which accounted for 18% of PetChem's 2019 financial year production volume, and it is not expected to readily redeploy its output to other regions which are also experiencing the COVID-19 outbreak. In its 2019 Annual Report, Petronas has acknowledged that the outbreak will exacerbate the challenges posed by oversupply and declining prices.

Petronas was affected by an oil price crash triggered by the collapse of OPEC+ talks in March. The price war between the big oil producers Russia and Saudi Arabia foreboded an oversupply and slashed oil prices to under USD40 a barrel. This duly affected Petronas' core business in production, refining and distribution of oil and gas, including its refined products such as petrol, lubricants and petrochemicals.

The industry's volatility due to the global pandemic made itself evident when Petronas announced a net loss (after tax) of MYR21 billion (USD5.1 billion) for the second quarter of 2020 due in large part to lower revenue from the lower average prices for all products and lower sales quantity mainly from petroleum products, processed gas and LNG. The loss was also contributed by higher net impairment losses on assets. For the first half of 2020, Petronas experienced a loss after tax of MYR16.5 billion (USD4.0 billion), against a net profit of MYR28.9 billion (USD7.0 billion) recorded in the same period last year. While Petronas recorded a revenue of MYR93.6 billion (USD22.6 billion) in the first half of 2020, it was a decline of 23% compared to last year. This could affect the 2020 dividend payout to the Malaysian government. Nevertheless, the Finance Minister of Malaysia said that the loss suffered by Petronas would not affect the country's development as the government has undertaken several initiatives to stabilise the economy and generate revenue. He asserted that the government does not rely only on Petronas' resources, as the national oil company contributes less than 20% of its revenue.

While the Petronas CEO said that this period is a great reset for the oil and gas industry, the company will still look at boosting revenue from its existing business by realising new top lines for its business – that is, to dedicate efforts to penetrate emerging markets of South Asia and Southeast Asia and establish new LNG clients. Petronas aims to provide new LNG outlets such as virtual pipeline system and bunkering services by the end of 2020.

Petronas' optimism in the oil and gas industry remains unfettered as it sees oil and gas contributing 47% of energy demand in 2040 from 53% in 2018. Meanwhile, renewables are expected to contribute 24% of energy demand in 20 years from 10% two years ago. On that note, Petronas is looking towards reshaping its portfolio mix as it recognises that renewable energy may be growing 10-fold to 3GW in four years – making it an important cog of its business portfolio and revenue generator.

Nonetheless, the demand for petrochemicals may be able to withstand the world's declining dependency on fossil fuels. Although PetChem was not spared from the fall in crude oil prices as reflected in the final selling price of its products, it is set to look at more specialty chemicals. It has entered into an agreement with LG to make the chemicals used in the manufacture of nitrile rubber gloves. Hence, with a deteriorating refining margin, Petronas will look towards refining more for petrochemicals instead of petrol and diesel.

Just transition

While there is an urgent need to curb the proliferation of fossil fuels and end their use as a source of energy in the long run, the process towards achieving that aim must always be accompanied by the principle of equity. It is an issue that has been debated within international climate politics – focusing on the distribution of reductions in territorial emissions and fossil fuel consumption. The transition to phase out fossil fuels within a generation will have serious and widespread social ramifications. While it will benefit some, the transition has equal potential to harm others should the process not uphold the principle of equity.

Malaysia's transition out of fossil fuels would require an unprecedented, structural change nationwide – which may be affected by a short timeline, limited technical and financial capacity, and the impacts from the response measures taken globally in respect of the energy transition. Hence, there is a need for a comprehensive policy framework that can address these challenges and capture the opportunities that the transition offers.

Any holistic policy framework for addressing the identified challenges and incorporating the just-transition dimension would have to take the following elements into consideration (but not be limited to them):

1) **Employment:** all jobs on the value chain of fossil fuel production, including energy provision in the country, that will be affected by fossil fuel phaseout. The aspects to be taken into account include the loss of livelihood or decrease in income due to the higher cost incurred from the energy transition, and, on the other side, job opportunities arising from the new energy industry.

2) **Social and economic policy:** the potential (be it rapid or gradual) 'seismic shift' effects on Malaysia's socioeconomic structure, which would affect national income, foreign and domestic investment, trade and consumer expenditure due to indirect and induced effects, including the systemic feedbacks between these linkages.

According to a report by the International Renewable Energy Agency (IRENA), there is a potential of 25.6 million global jobs that will be created in the year 2050 by the renewable energy sector in the "current plans" scenario. Although IRENA projected that Asia could account for 64% of jobs in renewables by 2050, the global distribution of these new jobs is still uncertain as it is affected by a broad range of factors and drivers that may be either regional or country-specific. For Malaysia, energy reform is hampered by various longstanding issues that must be addressed before the renewable energy industry in the country can scale up.

Means of implementation

In the 10th and 11th Malaysia Plans, substantial national resources have been allocated to enhance a wide range of actions to address climate change in the country. These resources are further complemented by backing from the international community in terms of capacity building and technical and financial support to fulfil the country's obligations under the UNFCCC. The bulk of the international financial support is through the Global Environment Facility (GEF). The support received was channelled mainly towards developing Malaysia's institutional and technical capacity on reporting obligations to the UNFCCC and implementing

climate change mitigation actions. However, very little international assistance has been received for climate change adaptation.

The implementation has been mainly facilitated by the United Nations Development Programme (UNDP) and the United Nations Industrial Development Organisation (UNIDO). The mitigation projects supported focused on energy efficiency in buildings, manufacturing, industrial and transport sectors. Clean and green technologies were another focus area, with projects targeting small and medium industries and low-carbon cities development.

For the preparation of each National Communication and Biennial Update Report to the UNFCCC, allocation was provided by the GEF through UNDP. Malaysia has also received capacity building on GHG inventory and UNFCCC reporting from the training programme conducted by the UNFCCC's Consultative Group of Experts (CGE), Intergovernmental Panel on Climate Change, and a number of Annex I Parties to the UNFCCC. Other significant financial assistance is from the European Union (EU) and Australia for tackling climate change through sustainable forest management and community development in the state of Sabah.

Overall, however, Malaysia has not been receiving adequate funding and capacity-building support to specifically look into how to decouple its economic growth and development from fossil fuels and also to advance long-term plans which would enable that transition to meaningfully take place across the board. The bulk of the international assistance and climate funding available from the likes of the GEF and UNDP has instead focused on reporting, documentation and developing the GHG inventory.

Gaps, constraints and barriers

At the time of writing, Malaysia's policies, strategies, plans and programmes on climate change mitigation and adaptation are in various stages of development. A common challenge that defines all of them is the challenge to articulate how the coordination of efforts and commitments between all levels of organisation could be done in an integrated and effective manner.

It is acknowledged by the Malaysian government that long-term and stronger legislation on climate change is required for an effective implementation of its international climate change commitments. In a 2019 document by the then Ministry of Energy, Science, Technology, Environment and Climate Change, the drafting of a **Climate Change Act 2021** is mentioned, but information on its progress is not publicly available. Hence, it is not known if the Act would materialise as planned in 2021, and whether it would include a plan on transitioning completely from fossil fuels.

Although Malaysia's climate commitments are made by the federal government, the implementation of the committed climate actions is a shared responsibility between the federal, state, and local governments. The **Ninth Schedule of the Malaysian Federal Constitution** presents three "legislative lists" – Federal List (List I), State List (List II) and Concurrent List (List III) – which specify the jurisdiction of powers of federal and state governments, including those which both levels of government share. The separation of jurisdiction has led to several issues when it comes to climate action, specifically on matters relating to land, agriculture and agricultural loans, forests, and local government, all of which are under List II – that is, under the respective state's jurisdiction. This has given the states a level of liberty to make decisions on land use such as conversions of forests for logging, clearing of mangroves for aquaculture, or coastal land reclamation, which would destroy carbon sinks and their ability to sequester carbon from the atmosphere.

The **2018 Mid-Term Review of the 11th Malaysia Plan (2016-2020)** contained a thrust on pursuing green growth for sustainability and resilience – with a focus on the importance of natural resources and environmental sustainability in ensuring continuous economic growth and resilience of the nation against climate change and disaster. The review discussed the increase in total installed capacity of renewable energy in the review period, including the Malaysian Carbon Reduction and Environmental Sustainability Tool that was adopted to encourage construction of green buildings. However, the review also noted that natural gas, being the cleanest fossil fuel, became the preferred fuel in the generation of electricity because it is heavily subsidised. Nevertheless, it was also stated that the gradual removal of gas subsidies has made coal the cheapest option to generate electricity and support economic growth, albeit at a higher environmental cost.

The **transportation sector's** continuing dependency on petroleum has affected plans (such as those under the National Biofuel Policy 2006) to turn to alternative fuel sources. Thus, the level of fuel diversification, while having shown improvement, has been less than expected. Based on 2015 data, transport accounted for approximately 45.2% of energy demand in Malaysia – and within the transport sector, land transport accounted for approximately 90% of the usage. In light of this, the National Transport Policy 2019-2030 includes a strategy to accelerate the implementation of low-carbon mobility initiatives, such as the implementation of Low Carbon Mobility Blueprint Action Plan, provision of incentives for the energy-efficient vehicle industry and market to flourish, and mandatory requirement for purchase of low-carbon-emission vehicles in Government Green Procurement, to name some. Although the policy has outlined clear objectives and action plans, its success will be mainly dependent on close collaboration and cooperation among different agencies which are responsible for transport planning, regulation and operations, to systematically implement the policy thrusts, strategies and action plans outlined in the policy.

The **Environmental Quality Act (EQA) 1974**, an act relating to the prevention, abatement and control of pollution and enhancement of the environment, and for purposes connected to it, is currently in the process of review for the first time since its implementation. Given that it was rolled out in 1974, the act has not been able to fully or effectively address the increasing complexities of environmental issues facing Malaysia today, including the environmental impacts caused by climate change or operations and activities that contribute to or exacerbate the impact of climate change.

For the implementation of climate change actions, strong **institutional capacity** at both the national and state levels is required. In this regard, Malaysia would need to develop further the capacity of the main institutions involved in implementing climate change actions, including their capacity to effectively raise public awareness. The capacities needed include expertise in policy foresight, coordination, implementation, finance and audit.

In the area of **GHG inventory**, conscious efforts have been made to retain technical capacity built and to institutionalise the processes of a structured inventory cycle for the five sectors. However, challenges remain in completing the inventory according to the IPCC's sub-categories, filling gaps in historical data and improving data quality. In addition, technical capacity and funding for the development of country-specific emission factors for key source categories are limited. Steps identified to address these shortcomings include development of a centralised data collection and compilation mechanism and greater engagement with the private sector data providers. An estimated amount of USD6 million in international funding is required for GHG inventory improvement. The lack of a complete inventory might present a challenge in the development and implementation of policies and programmes to enhance

climate change mitigation (and adaptation), and an effective monitoring, reporting and verification (MRV) system.

By and large, **mitigation actions** require a host of measures to work concurrently, including the right legislative and enforcement tools, institutional arrangements and technology. These enabling tools often become constraints themselves when they are not supplemented by sufficient financial allocation.

Under the National Biofuel Policy 2006, there had been discussions to increase the biofuel blend concentration. However, this was hampered by several issues such as price volatility, limited infrastructure and lack of subsidies and supply. The challenges include high prices of crude palm oil and the requirements for costly upgrades to the existing infrastructure at terminals nationwide. A key point to note is that fuels in Malaysia are still heavily subsidised, and therefore the use of biodiesel, which is more expensive, will only increase the country's spending on subsidies at a time when it is trying to gradually remove these subsidies.

Aside from addressing the issues of fuel subsidies and increasing the biodiesel blend, it is also crucial to enhance competency in transport planning and management to improve the efficiency of land and rail-based transport systems in urban areas and ensure the integration of a low-carbon mobility system into urban planning.

In the area of **adaptation to climate change**, the increasing weather extremes such as rainfall and drought will pose significant challenges for Malaysia to maintain its level of development. There is an urgent need to assess more accurately the country's vulnerabilities in key sectors and enhance its resilience to protect its development gains. However, resources are required to develop a full National Adaptation Plan. Funding is also required to enhance systematic observation and research in key areas. Work is in progress for the application of international funds, particularly from the Green Climate Fund, to develop the National Adaptation Plan, and subsequently to co-finance its implementation.

In relation to fossil fuel phaseout, the current scope of climate change adaptation, at least in Malaysia's NDC, does not consider a just transition as part of the bigger picture in terms of adapting to a world that will need to rapidly decarbonise its economy.

Gaps remain in the identification of **technology needs** for mitigation and adaptation, although a preliminary technology needs assessment has been carried out in a study named "A Roadmap of Emissions Intensity Reduction in Malaysia". The extent to which these technology needs have been met remains to be seen or reported by the government.

A coherent and robust **measurement, reporting and verification system** is necessary for keeping track of the integrated impacts of end-to-end policy development and implementation in reducing GHG emissions in the country – which is a pertinent factor to consider if Malaysia is to effectively phase out from fossil fuels. However, some of the earlier sectoral policies with long-term mitigation objectives are without clear MRV arrangements. Apart from the need to build a detailed framework that integrates all the mitigation policies into a holistic roadmap, an integrated and robust MRV system is also required.

To enable greater implementation of the climate change activities planned to meet its NDC commitments as well as to tackle the gaps and constraints identified above, Malaysia is exploring opportunities to access international **funding**, especially from the Green Climate Fund, to overcome the financial barrier. An estimated amount of USD6 million in international funding is required for GHG inventory improvement. For mitigation implementation, funding of USD2.94 billion is required to upscale Malaysia's renewable energy programme and an amount of USD1.53 billion is required to implement the energy efficiency programme.

Way forward and conclusion

Although Petronas may have intensified its focus on reducing its operational carbon footprint and channelling more investments into renewable energy, extraction of fossil fuels (especially natural gas) appears to still be its main area of activity for now and well into the future. There has not been an official acknowledgement by Petronas that fossil fuels will eventually have to be phased out to address climate change, nor has there been a deliberation in the national energy plan to transform the country's energy landscape with a large-scale adoption of renewable sources.

Neither has there been a recent (and publicly available) deliberation on how Petronas would respond to the depleting oil and gas reserves and the decreasing cost of renewable energy sources, which would be able to compete effectively on price with fossil fuels. Should the world move quickly to RE, there would then only be residual demand for fossil fuels, causing further exploration (including offshore commissioning services and infrastructure) to end up with stranded assets.

The big question is: how would the new energy landscape replace and fill the integrated socioeconomic role that Petronas plays in Malaysia that goes beyond just energy production? Considering the seismic impacts of COVID-19 reverberating throughout all segments of the economy and social structure (exacerbated by the volatility of global oil prices), the phasing out of fossil fuel production in Malaysia, which would entail a deep restructuring of Petronas' business model, must be anchored on equity and a just transition.

There is a need to consider how Malaysia is going to respond to the myriad of challenges presented by a phaseout from fossil fuels, not only in terms of Petronas' current structure and production, but encompassing Malaysia's heavy dependency on coal as well. Malaysia's domestic electricity generation is heavily dependent on coal and gas, especially in Peninsular Malaysia where the major cities are the country's main economic centres. If there is a drop in coal use, Malaysia would have to turn to a reliable and affordable alternative.

A few policy changes which Malaysia could take into consideration as response measures to address the phaseout of fossil fuels may include domestic carbon taxes, subsidies for renewable energy technology producers, standards and labelling requirements, and international carbon taxes and levies. However, each of these comes with its own implications. For example, domestic carbon taxes would lead to a loss of market share for foreign exports, RE subsidies may affect the market share for foreign competitors, while international carbon taxes and levies would impact the aviation industry (loss of tourism revenue for airline destinations and loss of market share for air-freighted goods) and result in reduced trade flows for maritime transport.

The response measures implemented by developed countries would have significant implications for developing countries as well, given the nexus between response measures and trade. As it is, Malaysia, the world's second largest palm oil producer and exporter, is currently facing a decrease in exports due to bans on palm oil products by European countries citing excessive deforestation and the killing of endangered animals as a result of oil palm cultivation. Moreover, palm oil production has slumped due to a worsening labour shortage amid the coronavirus outbreak. This goes to show that the impacts of response measures taken to address climate change could be exacerbated by the unfolding of external factors not related directly to climate change.

A few preliminary suggestions on the way forward towards transitioning to cleaner energy for Malaysia are as follows, where the independent power producers are concerned:

1. **Put an end to new PPAs, and encourage IPPs to give up PPAs that are ending soon.** This would free up the market to allow better choices for consumers and the environment. Old coal plants can be closed early or run at very low capacity. This would reduce the carbon footprint and encourage efficiency.
2. **Buy out all PPAs and renegotiate.** Stop capacity payments to IPPs, and open up a market where IPPs bid to supply power and encourage a competitive market, where better choices can be made for efficiency and the environment. If a plant's capital is paid up, IPPs still earn easy money this way – albeit at higher risk but possibly higher returns.

In addition, domestic energy reform could also encompass measures which would empower the consumers by allowing them more control and flexibility to decide on their electricity consumption patterns. One of the methods is to have different electricity tariffs at different times of the day, peak and off-peak. Under the MESI system thus far, such an option is only available for industrial and commercial customers. For domestic consumers, the rate is fixed regardless of the time of the day. Savings are only possible by controlling the amount of electricity used, because a tiered tariff is applied. A variation in the electricity price carries the benefit of enabling consumers to respond to the price signals by adjusting the consumption to price level, or consuming electricity at times when the price is low. This way, they will be indirectly incentivised with a lower electricity bill. Consumers should also be able to choose their electricity suppliers. Competitive electricity retail markets help to inculcate awareness as the consumers would become more sensitive to the changes in the industry and know that altering their electricity usage accordingly will ensure that they can adapt optimally to the ongoing changes. Consumer empowerment can also be attained by encouraging them to generate (renewable) energy and to become “prosumers”.

Some industries have discovered opportunities in renewable energy and once the transformation starts, it may be rapid – leaving economies that have yet to transition to bear the brunt of high financial cost, with a range of socioeconomic implications. While coal remains cheaper per unit of energy, with the rapid development of technology or perhaps a carbon emission tax, coal may be outcompeted by renewable power. With continued reduction in renewable electricity costs or increased carbon dioxide pricing, the replacement will accelerate also for coal.

The Malaysian government, together with Petronas and TNB, would have to rethink their strategies and quicken their pace in renewable energy adoption and consider a deep restructuring that takes into account the eventual phasing out from fossil fuels. The continued use of coal in TNB's power plants and production of fossil fuels by Petronas appear to be at odds with the target of 20% renewable energy in the country's energy generation mix by 2025.

There is a need to follow up on this Malaysian case study by looking deeper into the just transition and the economic diversification it entails. This requires more systematic research and thinking to map out the landscape of interlinkages between the non-proliferation of fossil fuels, transition into renewable energy, national revenue and the socioeconomic impacts to the country. The follow-up study may consider unpacking this through several themes, including through the aspects of sectoral energy demand and its supply, the role of built infrastructure (in the context of cities) and transportation, the financial sector and its role in boosting the green economy, production and its entire value chain, and the political ramifications of transitioning into renewable energies.