Gas Technical Report 2020

The Socio-Economic Contribution of the Natural Gas Industry in Malaysia: Background Research

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Introduction

As one of Malaysia's main commodities, the natural gas industry has a significant impact on the economy through various channels. The analysis in this paper provides background research for a project titled the Malaysia-Social Economic Impact Study (M-SEIS) sponsored by the Malaysian Gas Association (MGA) undertaken by IDEAS from October 2019 to February 2020.

National Economic Impact

- The natural gas industry is a major contributor to the public finances, providing over a major source of government revenue. This is set to continue as we estimate that natural gas will **contribute nearly RM400 billion to the public finances over the next decade.**

- We estimate that the natural gas industry **generates over RM80 billion in output,** as a result of the direct, indirect and induced economic impact of the industry.

- We estimate that the impact on output **increases to over RM135 billion** when the impact of the increased government spending from fiscal revenues is included. Every **10 ringgit generated in the natural gas industry, generates over 25 ringgit in the wider economy.**

- We estimate that the natural gas industry creates over **80,000 jobs** in the wider economy. For **every 10 people employed** in the natural gas industry, more than **25 jobs are created** in the wider economy.

Local Economic Impact

- The natural gas industry has introduced major benefits to local communities – in areas where the natural gas industry is located in Kerteh, Bintulu and Sungai Udang, **median household incomes are higher** than anywhere else in their respective states.

- The natural gas industry has also supported the **entry of new businesses and spurred industrial development.** Opportunities for local businesses and workers have increased as local capacity has improved, and the industry has pursued localisation efforts.

- The rate of economic development has also resulted in localised inflation, particularly for property, which **contributes to concerns over the cost of living** in areas where the natural gas industry is concentrated.

- The natural gas industry makes a **significant financial contribution** – beyond the royalty – to local government revenues. However, there is a risk that some areas are **dependent** on this income and should prioritise diversification.

The Contribution of the Natural Gas Industry to Public Finances

The natural gas industry provides a major fiscal contribution to the government in Malaysia. As the country's foremost natural resource, the natural gas industry is subject to a unique form of taxation and royalty. Collectively, the various channels through which natural gas contributes to government revenues can be referred to as the "government take". The different components of government take are detailed in Table 1. below.

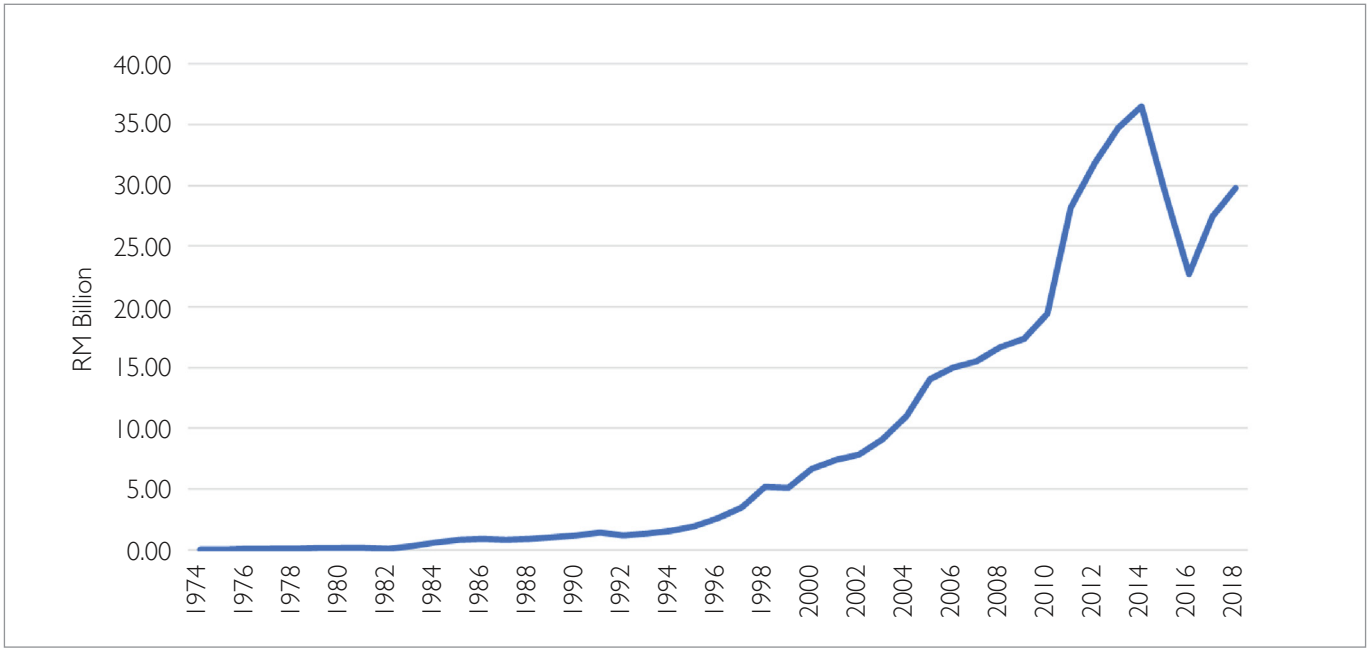
Table 1. categories of government take from natural gas industry

Economic Group	Economic Category	Economic Detail
Government Take	Government Profit Oil	Government profit oil
	Royalty Effects	Export Tax
		Royalty
		Royalty (in-kind)
	Income Tax	Withholding Tax
		Additional Tax
		Corporate Tax
		Petroleum Tax
		Windfall Profit Tax

Source: Rystad Energy

The total revenue derived from these sources has been significant in the context of Malaysia's overall public finances. Field-by-field data collected by Rystad Energy allows us to distinguish revenues from oil from those of gas production. As it is possible to see below, the scale of government take from gas is significant.

Figure 1. Government Take from natural gas in RM Billion, 1974-2018

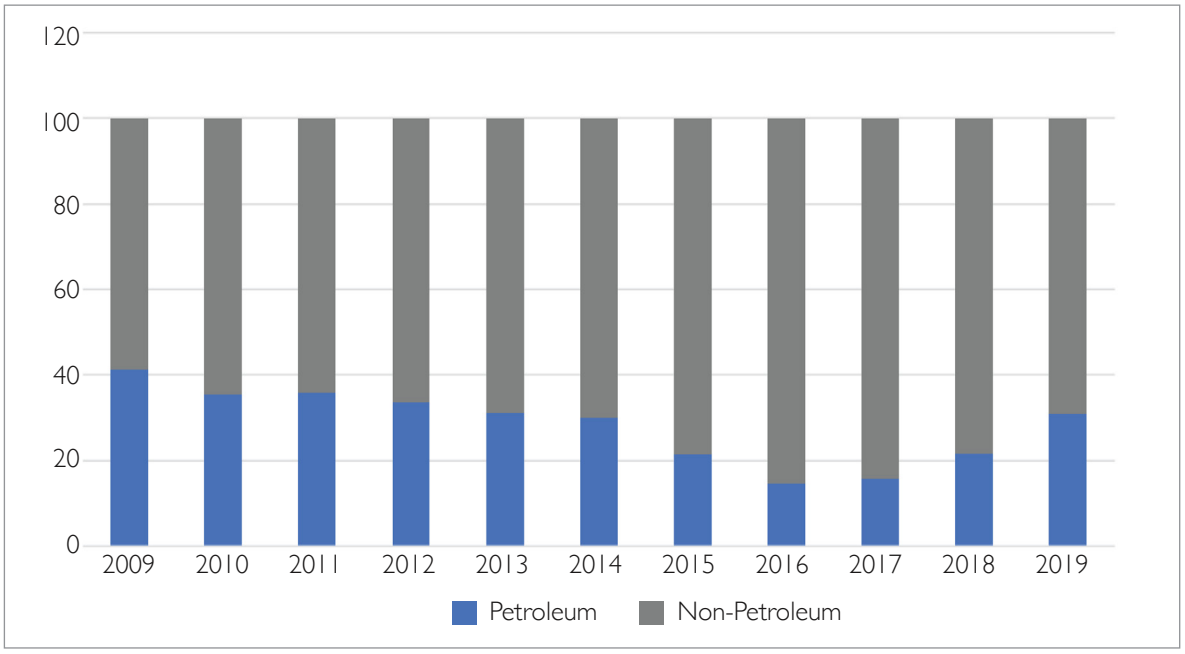


Source: Rystad Energy

Figure 1 demonstrates that the amount of government take from natural gas has generally followed an increasing trend from 1974 to 2018. The sharp decline of the government take in 2014 is because of the oil glut occurring during that period. The data starts in 1974 because PETRONAS was established in 1974, which changed the contractual terms of companies operating in Malaysia. The numbers demonstrate the significant contribution PETRONAS has made to Malaysia's public finances since its founding.

The income derived from the government take has been vital in sustaining Malaysian public finances. Figure 4 below demonstrates the high contribution of petroleum income (including both oil and gas) to government revenue relative to other, non-petroleum sources.

Figure 2. Share of petroleum and non-petroleum related federal income, 2009-2019



Source: Rystad Energy

The significant decline in petroleum revenue in 2014 motivated the government to introduce the Goods and Services Tax (GST), which resulted in significant political opposition. This episode, and the ongoing dependence on petroleum income, underscores the importance of understanding future trends of the government take.

Box 1: Natural Gas contribution to personal income tax

Due to its nature, the natural gas sector is characterised by high productivity, i.e. a large output is produced with relatively few workers. This is typical of mining industries. However, it is also the case that salaries and wages in the natural gas sector are high. As a result, in addition to the significant fiscal contribution from Royalties and Petroleum taxes, individual employees in the natural gas sector also make a significant contribution. Table B2.1 highlights the average salary paid in the oil and gas sector as compared to other high paying sectors in manufacturing and services sectors.

Table B2.1. Average salaries paid in oil and gas and other selected industries, 2017

	Total Number of Persons Engaged (Persons)	Total Salaries and Wages Paid (RM, '000)	Average Salary (RM)
Oil and Natural Gas	36,776	6,909,206	187,873
Beverages and Tobacco	17,929	608,224	33,924
Electronics	556,149	21,645,198	38,920
Transport Equipment	214,127	7,494,229	34,999
Information and Communications	225,665	13,751,293	60,937
Finance	357,993	19,824,031	55,375
Professional Services	333,139	11,529,485	34,609

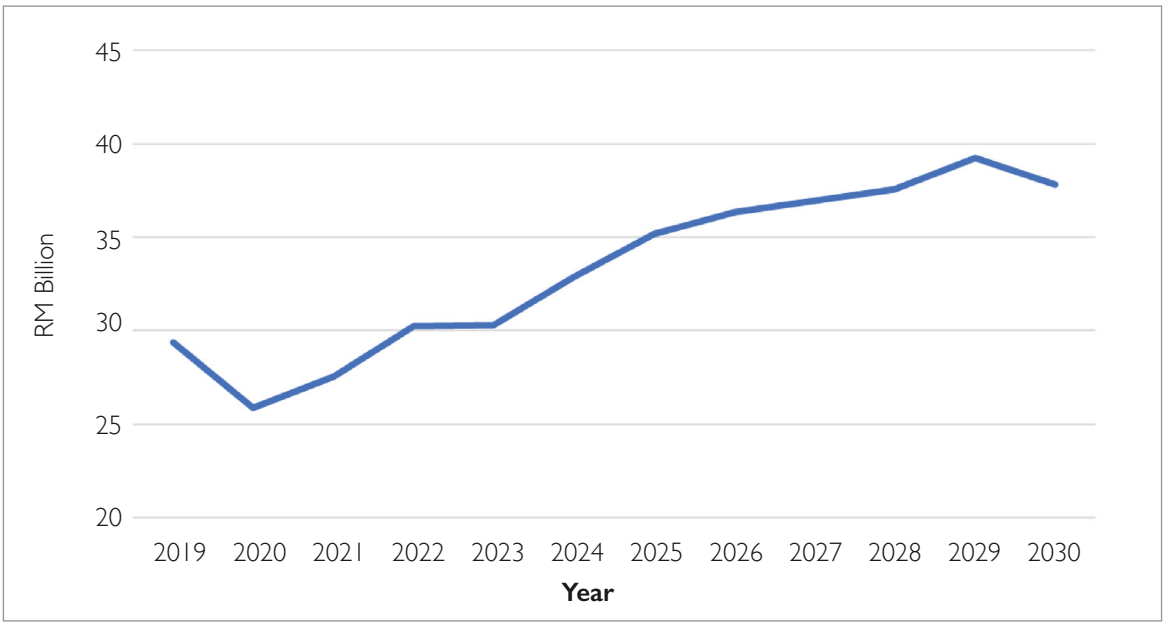
Source: DOSM

The tax base is narrow in Malaysia – in 2018, out of the 15 million people in the workforce, only 16.5% or less than 2.5 million people are subjected to taxes (The Star, 2019). The high salaries paid in the natural gas sector mean that people employed in that sector make a disproportionate contribution to personal income tax receipts.

Future Government Take

Data collected by Rystad Energy also enables us to forecast the future government take from natural gas. Figure 3 forecasts the potential government take from natural gas from 2019 to 2030. The forecast suggests natural gas revenues will contribute RM399.31 billion to public finances over the next decade.

Figure 3. Forecast of Government Take from natural gas in RM Billion, 2019-2030



Source: Rystad Energy

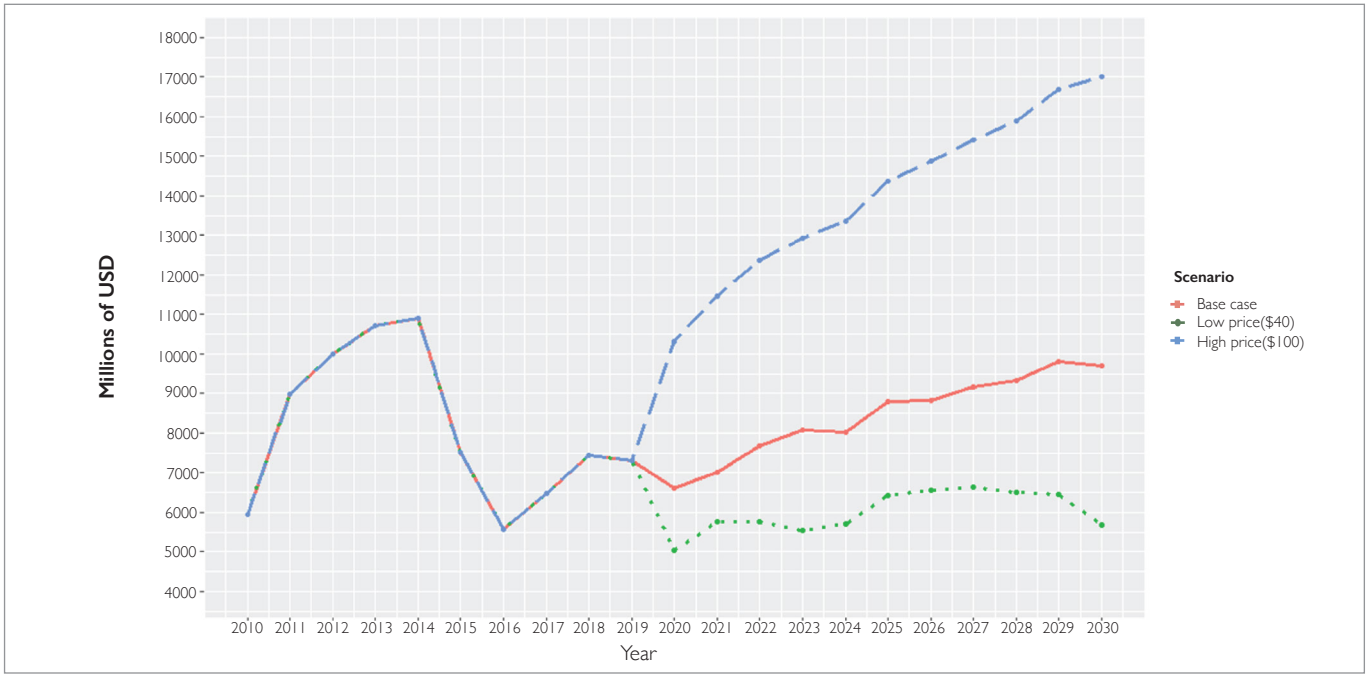
The forecast in Figure 3 represents the base case scenario[1]. However, as in the past, external factors can play a significant factor, given the price of natural gas is determined internationally. At higher prices, more fields are economically profitable to exploit (which can increase the total volume of production). Furthermore, higher prices also can result in more than a proportional rise in government take due to the terms of the production-sharing contracts (PSCs). Figure 4 and 5 illustrate the potential future production and government take, respectively, according to three different scenarios for the Brent price.

[1] This assessment was undertaken prior to the Covid pandemic

Figure 4. Forecasted natural gas production under different price scenarios

Source: Rystad Energy, IDEAS calculations

Figure 5. Forecasted government take from natural gas under different price scenarios



Source: Rystad Energy, IDEAS calculations

Figures 4 and 5 demonstrate that production is much more sensitive to downward price movements than the government take. On the other hand, the government take is more sensitive on upwards movements, as a result of how the government take is structured. This resilience in the projected government take suggests an effective tax structure from a public finance perspective.

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The Contribution of Natural Gas Industry to Economic Output and Employment

Adli Amirullah, Senior Economist

The natural gas industry makes a significant direct economic contribution, in the terms of output and employment. As a highly advanced industrial sector, the natural gas industry is characterised by relatively high paying and high productivity jobs. We define the economic impact in terms of the direct, indirect and induced impacts.

Direct Impact

The direct impact refers to the jobs, income, and output generated within the natural gas industry itself. The industry makes a significant contribution to overall GDP (quantified in Section 1.2). The industry is also highly capital intensive and highly productive.

Table 2. Selected Principal Statistics of Mining for Petroleum and Natural Gas, 2010-17

Year	Value of gross output (RM '000)	Total number of persons engaged	Salaries & wages paid (RM '000)
2017	138,636,033	36,776	6,909,206
2015	120,399,771	41,698	6,660,203
2010	105,939,341	32,701	3,833,262

Source: Department of Statistics Malaysia, 2018

Indirect Impact

The indirect impact refers to the jobs, income, and value added occurring throughout the supply chain of the natural gas industry. When describing the indirect impact of the natural gas industry, we must distinguish between the industry's backward linkages and forward linkages.

The backward linkages of the natural gas industry refer to the industries which supply inputs to the natural gas industry. For example, when a new natural gas facility is built, this will engage the construction industry thus generating additional construction employment, income and output. When the output of the natural gas industry increases, this will increase demand for those sectors with which the natural gas has backward linkages.

The forward linkages of the natural gas industry refer to the industries to which the natural gas industry supplies inputs. For example, when the output of the rubber industry increases, the demand for natural gas increases, thus increasing the output of the natural gas industry. In other words, the forward linkages describe how the natural gas meets demand in the wider economy.

Induced Impact

The induced impact refers the jobs, income and output resulting from household spending of workers and business owners' income earned either directly or indirectly from the natural gas industry. As economic activity either in the natural gas industry increases, or as a result of the indirect impact described above, the income of those working or owning businesses in the impacted industries will increase. This additional income is subsequently spent in the economy, thus generating additional demand for goods and services, which in turn translates into additional employment, income and output in the economy.

Multipliers

The relationship between the direct impact and the indirect and induced impact is described as the economic multiplier of the natural gas industry. The economic multiplier tells us the impact on the wider economy from each additional ringgit of output generated in the natural gas industry. In the economic literature, the Type I multiplier measures the direct and indirect effects of a change in economic activity and the Type II multiplier captures the direct and indirect effects and, in addition, it also reflects induced effects. The various components of the economic multiplier of the natural gas industry are summarised in the table below.

Table 3. Economic footprint of natural gas industry

Type of impact	Description	
Direct	The jobs, income and employment generated within the natural gas industry itself	
-	Backward Linkage	Forward Linkage
Indirect	The jobs, income and employment generated in industries supplying inputs to the natural gas industry	The output generated in industries receiving inputs from the natural gas industry
Induced	The jobs, income and employment generated as a result of higher household spending, as a result of increase income for workers and business owners in natural gas and supporting industries	The output generated as a result of household spending, as a result of increased income for workers and business owners in industries receiving inputs from the natural gas industry

Source: Department of Statistics Malaysia, 2018

Estimating the impact of the Natural Gas Industry using Input-Output Framework

From the I-O framework analysis, it is possible to estimate the direct, indirect, and induced effect of the natural gas industry in Malaysia[2]. The I-O framework is a quantitative economic modelling tool that represents the interdependencies between different sectors of a national economy. There are two types of multiplier that can be derived from the I-O framework. Type I multiplier measures the direct and indirect effects of a change in economic activity, whereas the Type II multiplier captures the direct, indirect, and induced effects of a change in economic activity. Type I multiplier captures the inter-industry effects only; for instance, a given industry is actively supplying or buying from other local industries. Meanwhile, the Type II multiplier includes household spending as income changes due to the changes in production.

To simplify the discussion on these two types of the multiplier, assuming other things constant, when there is an increase in final demand in the natural gas industry, the producers in the natural gas industry will adjust their production to meet the demand. That increment of production is considered as the direct effect. As the producers increase their output, these producers will increase their demand for input goods and services from their suppliers down the supply chain. That increment of the purchases of inputs is the indirect effect. Theoretically, if we add up these two numbers, we will derive to the Type I multiplier.

To comprehend the Type II multiplier, we must assume that the level of household income throughout the economy will increase as a result of increased employment due to an increase in the output of the given industry as well as the support industry. Hence, a proportion of this increased income will be re-spent on the economy to purchase goods and services. This economic activity is called the induced effect. If we add all three impact, such as direct, indirect, and induced, we will derive the Type II multiplier.

Given the absence of data on natural gas individual economic activity from I-O framework that was prepared by Department of Statistics Malaysia, for this estimate we decided to simplify the calculation by assuming the crude oil and natural gas economic activity as the proxy for the natural gas individual economic activity when calculating the Type I and Type II multiplier from I-O framework.

Below table is the result summary of Input-Output analysis for the natural gas industry.

Table 4. Impact of Natural Gas Industry in 2017

Impact*	Direct	Indirect	Induced	Total
on Output[3]	RM 53.91 billion	RM 12.55 billion	RM 15.06 billion	RM81.52 billion
on Employment	22,474 persons	17,832 persons	42,454 persons	82,761 persons

Source: Department of Statistics Malaysia, 2018 Source: Author's calculation
**All the amount noted here have been rounded at most to the nearest two decimal points from the original dataset*

[2] The estimates provided here relate only to the extraction of natural gas and not to other industries, such as gas supply.
[3] Total output of natural gas was converted from USD to MYR using the average exchange rate in 2017 published by World Bank at RM4.3004/1 USD.

Estimating the impact of the Natural Gas Industry on Economic Output

D'Hernoncourt, Cordier, and Hadley (2011) suggested a formula to calculate the Type I and Type II output multiplier as follows:

$$(1)\ (O_{MULT})_j = \Sigma_i\ L_{ij}$$

Where 'Σ_i' is the sum of all outputs from each domestic economic activity required to produce one additional unit of output. Whereas L_{ij} is the Type I Leontief inverse matrix. Meanwhile, the Type II output multiplier uses the same formula except the 'Σ_i' are the sums of all output from each domestic economic activity excluding the compensation of an employee, and the 'L_{ij}' is Type II Leontief inverse matrix.

According to our calculation, the Type I output multiplier is 1.2328, whereas the Type II output multiplier is 1.5122. These numbers indicate that one unit of output increase in the natural gas industry, there will be an increase of 1.2328 unit of output through the direct and indirect effect and an increase of 1.5122 unit of output through the direct, indirect, and induced effect.

This multiplier is used to estimate the indirect and induced impact on output in 2017. Published DOSM statistics for output do not disaggregate between extraction of petroleum and natural gas. However, the National Accounts published by DOSM provide the GDP contribution of natural gas alone. Since GDP represents the lower bound for output, we use this as proxy for the direct output in 2017.

Estimating the impact of the natural gas industry on employment

Furthermore, D'Hernoncourt et al. (2011) suggested a formula to calculate the Type I and Type II employment multiplier as follow:

$$(2)\ (E_{MULT})_j = \Sigma_i\ w_i L_{ij} / w_j$$

Where 'Σ_i' and 'L_{ij}' uses the same definition as (1) and 'w' refers to the total position employed in Malaysia per Malaysian Ringgit (MYR) of total output for each industry.

The calculated Type I and Type II employment multiplier are 1.7934 and 3.6825, respectively. Note that the total numbers of person engaged in petroleum and natural gas mining is 36,776 persons. Published DOSM statistics do not disaggregate employment between extraction of petroleum and natural gas. Since Natural gas consists of 61.11% (Table 5) of all primary production by fuel type, we assume that the total numbers of person engaged in the natural gas industry alone is approximately 22,474 persons.

Table 5. Value of total production of crude oil and natural gas in Malaysia for 2017

Type of fuel	Value of total production in MYR[4]	Proportion of the value of total production
Crude Oil	RM 59,327,080,966.59	38.89%
Natural Gas	RM 93,232,963,836.58	61.11%

Source: BP Statistical Review of World Energy

[4] The value of total production for both crude oil and natural gas was derived by using 2017 price of USD54.19/barrel for crude oil and USD8.1/British Thermal Unit for natural gas. On top of that, the currency was converted from USD to MYR using the average exchange rate in 2017 published by World Bank at RM4.3004/1 USD.

With a calculated amount of Type I and Type II multiplier, we then can calculate the impact of the natural gas industry on employment. When the total numbers of a person engaged in the natural gas industry are assumed to be 22,474 persons in 2017, the direct and indirect impact causes the total numbers of person engaged in the whole economy to increase approximately by 40,307 persons. Whereas the direct, indirect, and induced impact causes the total numbers of person engaged in the entire economy to rise by 82,761 persons.

Expanding the scope of output multiplier

In addition to the economic impacts described above, in this study we have included an additional component – the impact of the fiscal revenue generated by the natural gas industry on the wider economy since the natural gas industry is notable for its high fiscal contribution through the unique form on taxation which applies to extraction of natural resources. This revenue is an important source of government incomes which enables higher levels of government spending. Indeed, the natural gas industry (alongside oil) has historically provided a vital source of revenue for the government. The fiscal revenue generated by the natural gas industry is subsequently spent by the government, for example on the delivery of public services or development of new infrastructure. This spending will itself generate additional demand in the economy, as goods and services are purchased by the government. We therefore consider this impact as part of the overall economic contribution of the natural gas industry. Therefore, we extend the scope of our estimate to include the economic impact arising from the expenditure by government of the fiscal revenue from the natural gas industry.

In 2017, the total amount of the government take from the natural gas industry is about RM27.43 billion. On the basis that this revenue is spent by the government, the economic impact of that spending can be attributed to the natural gas industry as an extension of the induced impact, based on a multiplier effect of 2 for expenditure by the Malaysian government (Rafiq, 2012).

Table 6. Impact of Natural Gas Industry in 2017 with extended impact of government take

Impact*	Direct	Indirect	Induced	Government Take	Total
on Output[5]	RM 53.91 billion	RM 12.55 billion	RM 15.06 billion	RM 54.85 billion	RM136.37 billion

Source: Author's calculation

**All the amount noted here have been rounded at most to the nearest two decimal points from the original dataset*

According to table above, we estimated the total impact of the natural gas industry on economic output includes the extended impact from government take is equal to about RM136.37 billion in 2017. We then can calculate the final multiplier effect that allows us to get a multiplier effect of 2.51 for the natural gas industry. Meaning, every RM1 value created in the natural gas industry, there will be an additional RM1.51 of value created in the supporting sectors through the impact of indirect, induced, and government take.

[5] Total output of natural gas was converted from USD to MYR using the average exchange rate in 2017 published by World Bank at RM4.3004/1 USD.

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The Contribution of the Natural Gas Industry in Local Areas (Case Studies)

Azam Wan Hashim, Research Executive

To understand the economic impact of the natural gas industry in local areas, we have undertaken case studies in three specific locations:

- Kerteh, Terengganu;
- Bintulu, Sarawak; and
- Sungai Udang, Melaka.

In each case we have assessed available data to identify the impact of the natural gas industry in these locations and conducted interviews with representatives from local government, businesses and community representatives.

Kerteh, Terengganu

The first location assessed was Kerteh in Terengganu. The discovery of offshore oil and gas resources in 1976 began to change Kerteh from a small town in Kemanan into a petrochemical hub. The traditional economy in Kerteh has changed from agriculture and fishing sectors to an industrialized economy following the development of the oil, gas and petrochemical industry.

The Peninsular Gas Utilization (PGU) project is the longest gas pipeline in Malaysia. The project was initiated by PETRONAS in 1984 and completed in 1993. PGU enables the gas transport of approximately 2 billion standard cubic feet (BSCF) from six gas processing plants (GPPs) with a combined capacity of 2,000 million standard cubic feet per day (mmscfd) in Kerteh to the whole Peninsular. PGU leads to greater energy dependency on natural gas rather than imported raw materials for Peninsular Malaysia. The PGU comprises mainly of gas transmission and gas supply pipelines, it spans over 2,500km across Peninsular Malaysia. The six gas processing plants in Terengganu are located in two complexes, Gas Processing Kertih (GPK) and Gas Processing Santong (GPS). PGU receives gas from several sources, including the indigenous gas processed in the Gas Processing Plant in Terengganu, the gas field from PM3 Vietnam and West Natuna, the gas field from the Malaysia-Thai Joint Development Area (JDA), the RGT in Sungai Udang and the RGT in Pengerang. The gas will then be processed and distributed for power, non-power and export.

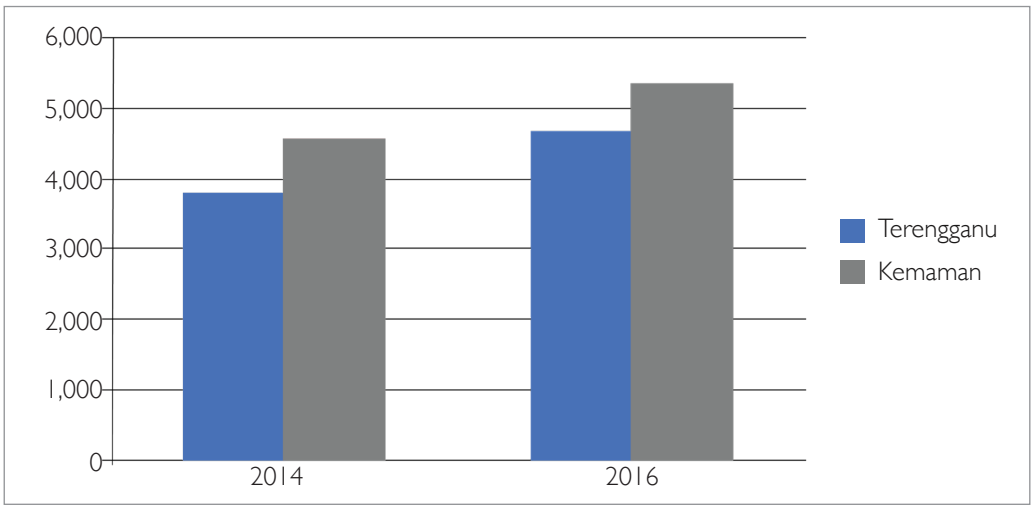
Kerteh won the name as the petrochemical hub in Malaysia as it houses the Kerteh Integrated Petrochemical Complex (KIPC) that focuses on ethylene-based products. Malaysia's first aromatics complex is also located in Kerteh. This complex has a capacity for 420 thousand metric tons of para-xylene per year and 150 thousand metric tons of benzene per year. The oil, gas and petrochemical cluster in Kertih-Gebeng has established supporting infrastructure and logistics facilities that include the ports of Kertih Port, Kemaman Port and Kuantan Port. LPG export terminal in Kemaman port is developed to export various gas products.

Economic growth

Most interviewees recognised the significant contribution of the natural gas industry in terms of economic growth in Kerteh. State government representatives noted that since the development of the oil and gas industry in Kerteh in 1982, there has been significant population growth in Kerteh and Chukai. The number of business establishments has also increased over the period, as a result of the influx of oil and gas workers and the support industries within the oil and gas supply chain. State government representatives also reported that in 2014 many of those from outside Kerteh left due to the relocation of their jobs to Johor.

It is not possible to disaggregate estimates of the output contribution of natural gas to Kerteh, but we can consider data on median household income as an indicator of economic development. Figure 6 below demonstrates that Kemaman, which is the district where Kerteh and other natural gas activities are located, has a higher median household income than for Terengganu overall. Indeed, Kemaman has the highest median household income of all districts in Terengganu.

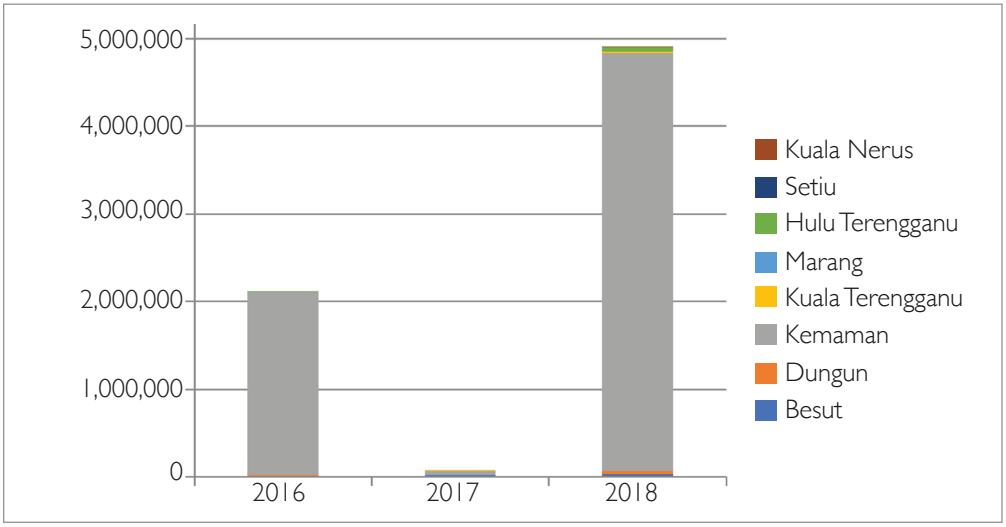
Figure 6. Median household income in Kemaman and Terengganu



Source: Department of Statistics Malaysia, My Local Stats Terengganu (2019)

A separate indicator of economic development is the level of capital investment in a district. Figure 7 illustrates the significant level of manufacturing investment in Kemaman, which has overwhelmingly dominated overall investment in Terengganu for the last three years.

Figure 7. Approved investment manufacturing project by district, 2016-2018



Source: Department of Statistics Malaysia, My Local Stats Terengganu (2019)

More broadly, the development of the oil and gas industry in Terengganu has been an enabling factor for the government to promote the "East Coast Economic Region". The integrated petrochemicals complex (IPC) in Kerteh has attracted multi-national petroleum, gas and chemical giants and it is believed to have received one of the highest concentration of foreign direct investment in Malaysia. IPC has also attracted foreign companies to join partnerships to own, develop, construct and operate petrochemical plants contributing to overall economic development in the area.

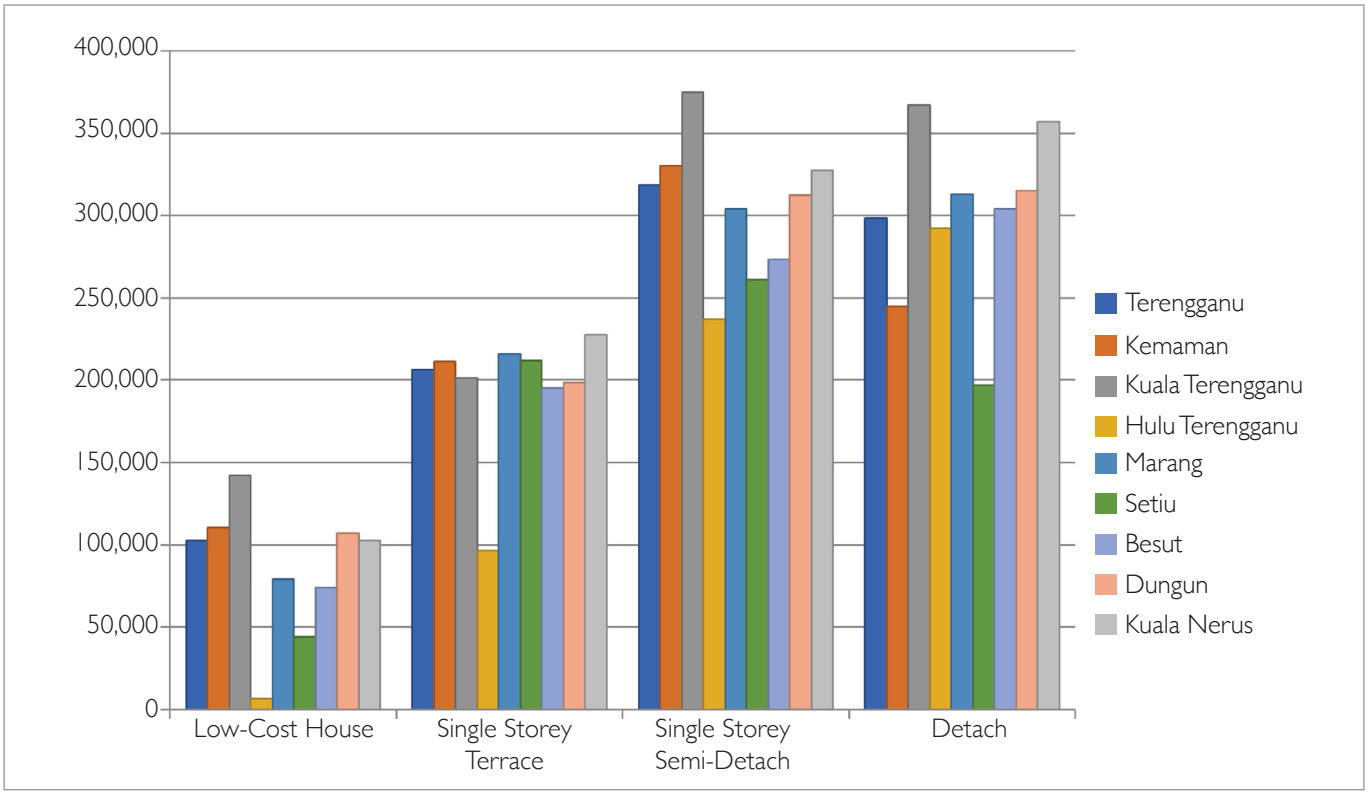
Increased costs

Alongside the increase in economic growth has been an increase in costs. Inflation itself is an indicator of economic growth, as demand rises in an area, but it can also create strains for those on lower incomes. The state government reported that prices have steadily risen alongside the economic development introduced by the natural gas industry. They claimed that Kerteh has the highest cost of living due to the oil and gas industry, necessitating the regulation of prices.

State government representatives highlighted land and house prices as a particular challenge since the 2000s. They claimed the lowest price available for a terraced house is around RM158,000 and that rental prices start at RM600. As a result, many among the younger generation are unable to buy their own homes and thus live together or with family. This effect has been offset to some extent by the development of affordable housing in Rantau PETRONAS, although this is targeted at workers in the oil and gas industry only.

Figure 8 presents the statistics on house prices by district in Terengganu. From this it is clear that although average house prices in Kemaman are towards the higher end of those for Terengganu as a whole, they are not the highest in the state and are broadly in line with house prices in other districts. This might conceal a highly localised price effect in Kerteh specifically or suggest that the impact of the natural gas industry on house prices is not as pronounced as it may appear on the ground when compared to other districts.

Figure 8. Average Price of Residential Property Transactions by District and Type, RM, Q2 2019



Source: Department of Statistics Malaysia, My Local Stats Terengganu (2019)

Local opportunities

The concentration of the gas processing plants in Kerteh and Santong has supported the business segment in term of gas processing for PETRONAS Gas. Indeed, Kerteh has surpassed the rate of industrial growth than others towns in Terengganu due to the oil, gas and petrochemical sector development, evidenced by Kemaman's higher land-use percentage for industrial sector than the other districts in Terengganu.

Interviewees recognised that the economic development associated with the natural gas industry in Kerteh has created opportunities for local industry. However, there was variation in the opportunities to local as opposed to foreign businesses. Local business representatives claimed that technical services of higher value were awarded to foreign companies, whilst maintenance and support services were more likely to be awarded to local firms. State government representatives concurred with this assessment, arguing that local industry struggled to compete with foreign companies for certain contracts. State government representatives also reported the issue of unsustainable reliance of local firms on the natural gas industry. For example, certain companies in F&B and hospitality had sought to respond to the demand of the natural gas industry but had not been able to flourish long term, suggesting that the demand of the natural gas industry alone is insufficient and local businesses need to develop more sustainable business strategies.

A separate issue reported by state government representatives is that the availability of desired goods and services is relatively low in Kerteh and, as a result, higher paid workers in the natural gas industry travel to other areas, such as Kuantan for certain purchases. As a result, there is some income leakage to neighbouring cities. However, from a different perspective this also means that the benefits of the natural gas industry are not restricted to the areas in which they are located and will also spread to neighbouring areas.

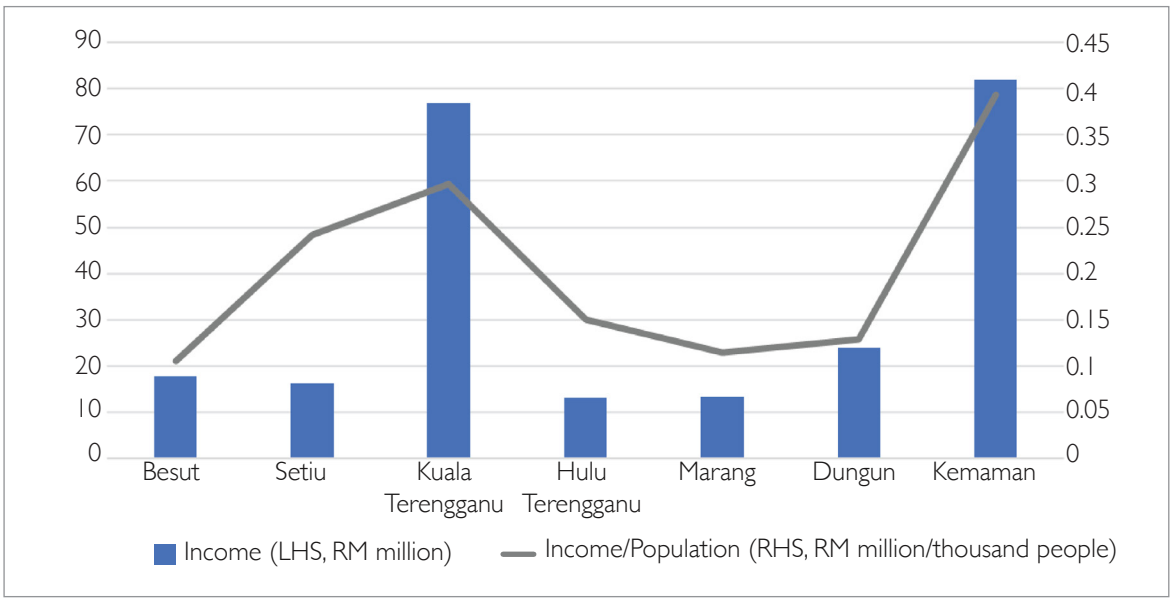
Linked to the opportunities for local businesses is the question of opportunities for individual workers. Again, interviewees recognised the net benefits of the natural gas industry but identified variation in the opportunities for local and foreign workers. Local business representatives identified that new greenfield investments typically employed foreign workers. Likewise, it was claimed that off-shore technical work is usually undertaken by foreign workers, whereas on-shore maintenance is monopolised by local workers.

This assessment was shared by representatives from the state government who recognised that many workers directly employed in the oil and gas industry came from outside, whilst supporting services employed local workers. There were also cases of low skilled foreign workers employed in supporting services, in particular construction. In order to promote opportunities for local workers, quotas of 40%-60% have been introduced. There was general recognition of efforts to localise the employment base of the natural gas industry. Since PETRONAS built its refinery plant in 1983 after the discovery of the Duyong gas field, it has widened the provision of employment to locals. Today, the majority of the PETRONAS staff are based at its operation bases located in Kertih and Santong. There was also recognition of the training opportunities introduced by the natural gas industry, such as the industrial training centre in Institute Teknologi Petroliam for developing human resources in the oil, gas and petrochemical sector and a newly established National Institute of Occupational Safety and Health (NIOSH) Institute in Kerteh in January 2018.

Public finance contribution

State government representatives identified the significant contribution of the natural gas industry to state level public finances. Although the primary fiscal contribution of the natural gas industry is channelled via federal level taxes and royalties, state level revenues will also benefit from the economic development triggered by the development of the natural gas industry. Figure 9 below compares the income of different districts in Terengganu, which demonstrates that Kemaman has the highest income of any district. It also highlights that Kemaman has the highest income relative to its population size.

Figure 9. Local government income by district in Terengganu, 2017



Source: Laporan Sosioekonomi Negeri Terengganu (DOSM, 2018)

State government representatives also recognised the significant level of reliance on the government for public finances and local economic development. Roadshows had been undertaken to reduce the current levels of reliance on the oil and gas industry, although current efforts were insufficient to significantly alter the situation.

Environmental impact

Interviewees also highlighted concerns relating to the potential negative environmental impact of the natural gas industry. State representatives claimed that the industrial zone had expanded and encroached into the buffer zone for residential properties, leading to complaints relating to the noise and smell of industrial activities, mainly communicated via social media to village chiefs. It was reported that in 2018, there was a legal case on the smell coming from industry, arising from the claim that the factory did not use the appropriate specifications for industrial fertiliser.

Social impact

Finally, interviewees noted the positive social impact of the oil and gas industry, highlighting the contribution in particular of PETRONAS through Corporate Social Responsibility (CSR) efforts to support local schools, alongside contributions from other industrial players.

Bintulu, Sarawak

The second case study was undertaken in Bintulu, Sarawak. Bintulu covers an area of 12,166km^2 with a population of 230,000. Bintulu and Tatau are the two districts in Bintulu division. The major economic activities in Bintulu are from the petrochemical industry, energy intensive industries and plantations.

PETRONAS is the biggest player in the three LNG plants in Bintulu. Natural gas is supplied to the plants from the gas fields in the Central Luconia area located between 125km and 275km offshore from Bintulu. The plants cover an area of about 223 hectares, with the LNG complex located north of Tanjung Kidurong, which is about 20km from Bintulu. The construction of the plant involved more than 4,000 workers and was completed by the end of 1982.

Bintulu LNG Complex is known as the world's largest LNG production facility. The value of LNG export in Sarawak has increased from RM2,634.8 million in 1990, to RM11,422.5 million in 2000 and RM56,129.09 million in 2012. The LNG complex includes three LNG plants with nine LNG trains as its supporting infrastructure. Malaysia LNG Sdn. Bhd. was incorporated on June 4, 1978 to construct and operate the first LNG plant. The MLNG project has not only put Malaysia on the world map as one of the largest LNG producers in the world, it has also paved the way for industrial development in Sarawak and has increased the socio-economic growth in Sarawak over the years.

Domestic demand for natural gas is Sarawak is not high and so the production of gas in Sarawak is mainly export-oriented. Bintulu embarked on its first LNG project in 1982 to export gas to Japan. Bintulu also holds several giant industrial projects including the Shell Middle Distillate Systhesis Plant, which is the world's first commercial gas-to-liquid plant. The plant converts natural gas into high quality synthetic oil products. The plant started its operations in May 1993 and its products are sold globally today. Sarawak Shell Bintulu Plant (SSBP) was built in Tanjung Kidurong in 1979 and the ASEAN Bintulu Fertilizer plant in 1985 to produce ammonia and granular urea. These developments facilitated further development of the petrochemical industries in Sarawak.

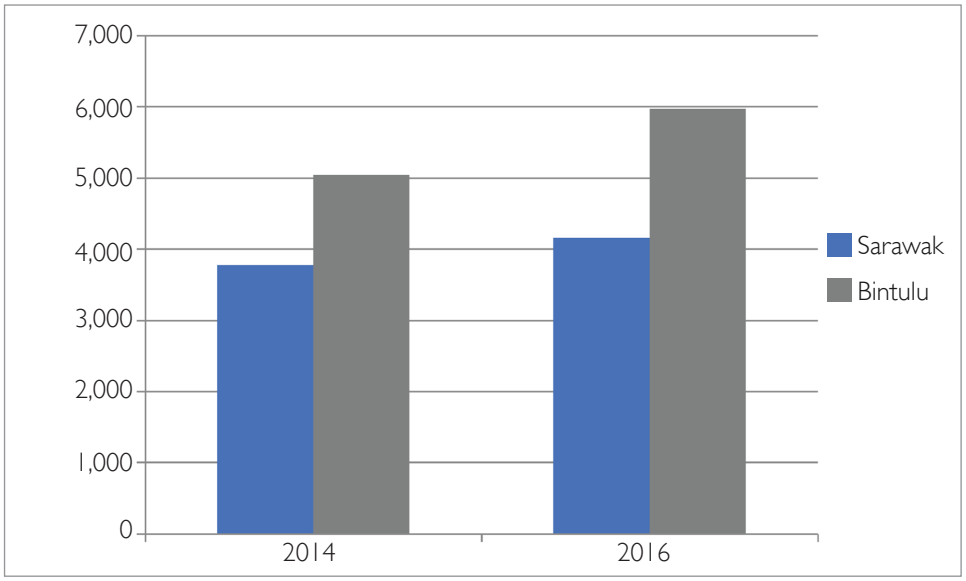
The Sabah-Sarawak Gas Pipeline (SSGP) project under the Sabah-Sarawak Integrated Oil and Gas Project was started in 2011. It encompasses the laying of onshore gas pipelines from the Sabah Oil and Gas Terminal in Kimanis, Sabah to the LNG Complex in Bintulu, covering 91km in Sabah and around 421km in Sarawak. The pipeline passes through Lawas District and Ulu Baram in Sabah before passing Miri and Bintulu in Sarawak. The construction of this 600km pipeline is to export LNG and to supply piped natural gas for domestic use.

Economic development

Interviewees recognised the significant economic development which had occurred as a result of the presence of the natural gas industry in Bintulu. Local Council representatives shared that Bintulu's population has expanded significantly in the past few decades as a result of industrial development and population growth triggered by the arrival of the natural gas industry. Bintulu had a population of 220,048 in 2010, 194,200 in 2000 and 14,000 in the 1970's based on the Population and Housing Census. After previously being only a small fishing village, the discovery of natural gas fields in 1969 led to the rapid development of the petrochemical industries in Bintulu. Urban growth due to rural-urban migration has also taken place at a very rapid rate. The level of urbanization in Bintulu has increased from 0.0% in 1980 to 74.3% in 2000. Representatives from the Bintulu Development Authority (BDA) reported that Bintulu had a population growth rate of 6.2% compared to the 2.4% national average since 1970, as a result of the economic development in the area.

The economic development in the area can be seen in the median household incomes in Bintulu, which are higher than for Sarawak overall, as illustrated in Figure 10 below.

Figure 10. Median household income in Kemaman and Terengganu



Source: Department of Statistics Malaysia, My Local Stats Sarawak (2019)

One positive aspect highlighted by the local council is that the natural gas industry has also facilitated the development of other industries, such as the upstream timber industry, which was reported as now contributing half of the economic activity in the region. The development of the upstream timber industry had been complemented by the natural gas industry and has reportedly led to the development of nine plants. The local council noted that the timber industry is now declining but is being replaced by the palm oil industry, which is also complemented by the natural gas industry. The BDA argued that the principal point for attraction for

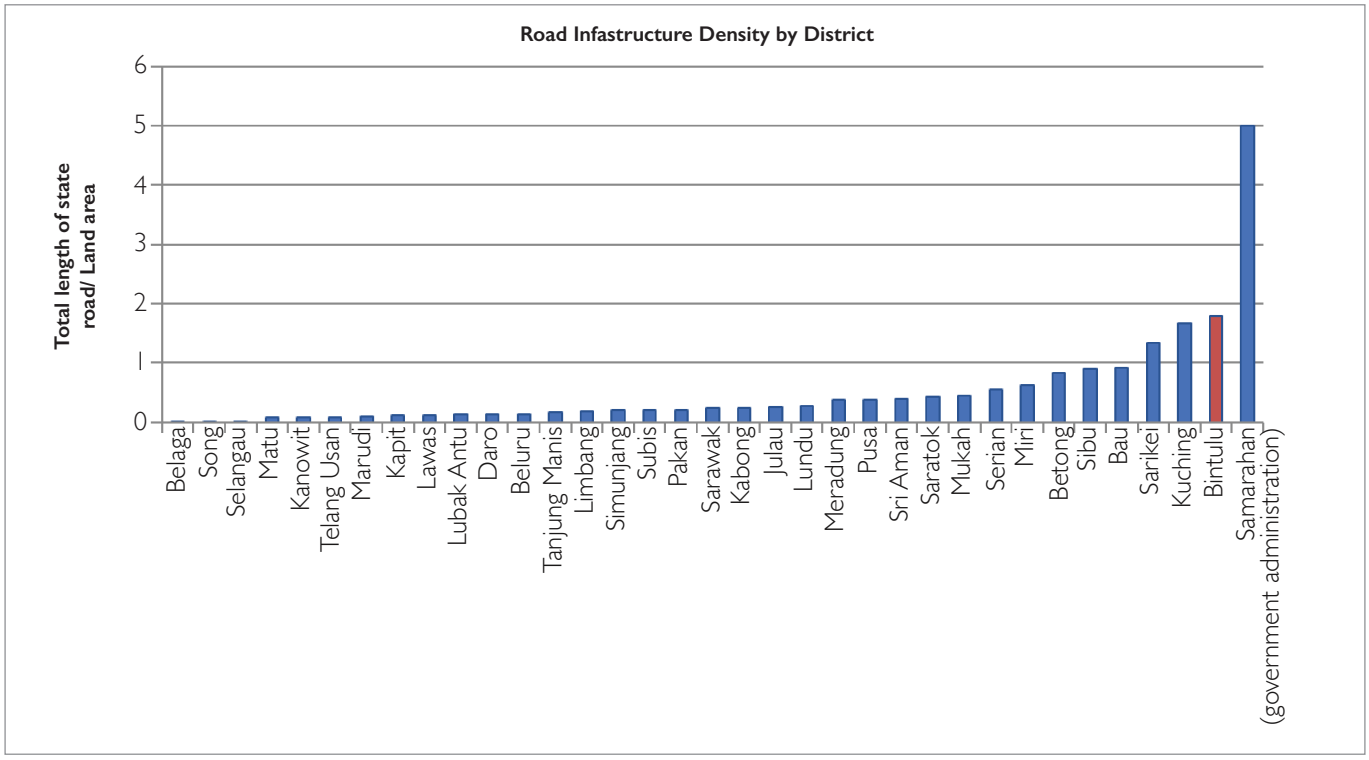
these industries was the viability of energy supply, and that most of the energy generated in Sarawak was for industrial purposes.

The local council anticipated further economic development following the expected development of the renewable energy corridor linked to the Peninsular and spurred by overseas investment, such as the Bakun dam. This demonstrates an encouraging industrial diversification, leveraging the presence of the natural gas industry without becoming too reliant on its presence.

Infrastructure development

Local council representatives noted that when the gas industry entered the area, infrastructure was dramatically improved, including the development of the road network by the federal government. This development is highlighted in Figure 11, which demonstrates that infrastructure (as measured by road density) is higher in Binutulu than any other area in Sarawak, with the exception of the government administrative district.

Figure 11. Road density by district in Sarawak, 2017

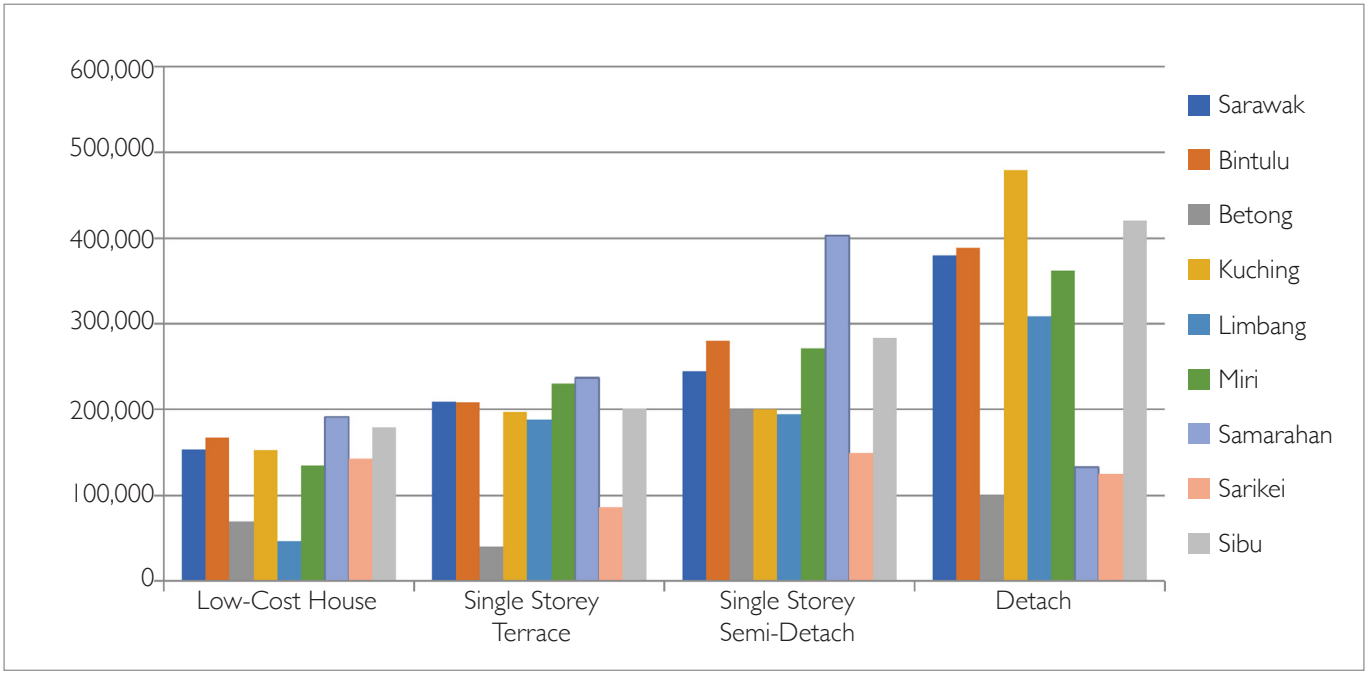


Source: Department of Statistics Malaysia, My Local Stats Sarawak (2019)

Increased costs

Local council representatives highlighted that living costs were higher in Bintulu as a result of the increased income and that this was particularly noticeable in the price of property. They reported the average cost of a single terrace house at RM500,000, a semi-detached property at RM800,000 and low-cost housing at RM180,000. However, they also noted that demand for property had declined from the peak in the 1980s. However, Figure 12 below would seem to suggest that property prices for Bintulu are not exceptional when compared against the average prices across Sarawak.

Figure 12. Average Price of Residential Property Transactions by District and Type, RM, Q2 2019



Source: Department of Statistics Malaysia, My Local Stats Sarawak (2019)

Despite the fact that Figure 19 suggests prices in Bintulu are not exceptional for the state, local council representatives reported that contractors working in the natural gas industry often struggle to afford property. The majority of contractors are Orang Asal and as a result of housing costs often live in quarters. The local council did report that low-cost housing is slowly being introduced by the government. It was also reported that native contactors were unable to access basic utilities including water and electricity.

The BDA has developed four affordable housing projects in Bintulu to address the issues of high housing costs. BDA representatives argued that the level of demand was highly dependent on timing. For example in 2013 the boom in production led to influx of foreign workers, creating pressures on the local housing market. Reportedly, property demand is currently increasing again due to the demands of newer steel industries.

Local opportunities

Local council representatives reported that the natural gas industry had led to a significant expansion in the supply of jobs in the area, specifically in maintenance work and in supporting industries. In the beginning many of the jobs had been taken up by workers coming from Peninsular Malaysia, but now most of the jobs were undertaken by locals from Bintulu and Sarawak, representing a diversity of backgrounds and ethnicities. Local business representatives concurred with this assessment. They claimed that in the early years of the natural gas industry in Bintulu, local businesses had not been able to capitalise due to low capacity. However, this had improved significantly, and now local companies and workers were able to take advantage of the opportunities. However, the local council also reported that many young people unable to find jobs in these industries were leaving Bintulu to move to the Peninsular, as the natural gas industry could only provide so many jobs.

BDA representatives reported that significant efforts had been undertaken to promote localisation of the industry, including through localisation requirements on companies and the provision of local training. Over years this had resulted in significant improvement in the integration of local workers. A similar approach had been taken to promoting opportunities for encouraging local entrepreneurship, with PETRONAS now employing Sarawakian companies in support services. As a result of this development of local firms, BDA representatives claimed that Bintulu now has a higher capability than in Pengerang because of the 40 years of experience in providing services. Indeed, in some cases these service providers were now able to be exported to overseas markets, such as Qatar and Oman.

An important issue highlighted was the relative resilience of the local employment base on the natural gas industry and supporting industries. The natural gas industry is highly sensitive to international conditions and this can lead to sudden declines in activity. Following the shock in 2014, Shell and Murphy had both undertaken retrenchment of workers, but PETRONAS had not and those jobs that had been reduced were primarily foreign engineering staff, thus local employment had not suffered significantly. The effect on vendors had also been minimal, suggesting an underlying stability in demand for local services.

BDA representatives also reported that the induced economic benefits arising from spending of income associated with the natural gas industry was increasingly retained in Bintulu. Previously spending had leaked to Miri due to product availability, but the situation had changed following the construction of new shopping malls in Bintulu.

Public finances

Turning to the public finances, the issue of the level of royalty received by Sarawak remains a point of contention. However, local council representatives also noted the significant revenue accrued from the presence of the natural gas industry through other channles, including from rents and assessment revenues. They reported that 50% of local council revenue in Bintulu came from the oil and gas industry. It was noted that this risks creating a reliance on the natural gas industry, and therefore the local council was actively pursuing a strategy to diversify revenue by promoting development of new industries, including the digital economy.

Environmental impact

Local council representatives reported that most complaints in Binutlu were related to the health impact of the natural gas industry, specifically relating to concerns around respiratory effects. However, a comprehensive assessment had concluded that the air quality was safe. More generally, the local council noted that there had been few accidents and that the companies in the natural gas industry took pride in their safety standards.

BDA representatives also reported negative perceptions of the environmental and health impacts of the natural gas industry. They referred to a study of the asthmatic and respiratory health of children in Bintulu which concluded there were negative effects from the oil and gas industry, suggesting that there remain conflicting views of the health risks associated with the natural gas industry, even among government agencies. The Department of the Environment was now monitoring the impact. There was also concerns raised about water quality around the shores in Bintulu, although it was noted that this could be due to pesticides from the palm oil industry.

Sungai Udang, Melaka

The final case study was undertaken in Sungai Udang, Melaka. The PETRONAS Melaka Refinery Complex is located in Sungai Udang, a town in the district of Central Melaka and Alor Gajah. The refinery complex houses two refining trains and has attracted many foreign workers and visitors. Both the trains are operated by PETRONAS Penapisan (Melaka) Sdn Bhd, as a wholly owned subsidiary of PETRONAS. The first train, PSR-1 was completed in 1994 and has the capacity to process 100,000 barrels per day of light, sweet crude and condensates. The second train, PSR-2, is owned by Malaysia Refining Company Sdn Bhd. PSR-2 started operations in December 1998, it has a capacity of 100,000 barrels per day of sweet and sour crude. PETRONAS planned to expand and upgrade its Melaka refinery in October 2010 to produce higher-quality fuel and meet rising demand after recently raising the plant's capacity to 290,000 barrels per day (bpd).

The Regasification Terminal (RGT) Sungai Udang, was officially announced by the Prime Minister, Dato' Sri Mohd Najib bin Razak on 10 June 2010 when he presented the 10th Malaysia Plan. The project was then estimated to cost RM3 billion. This project is Malaysia's first ever LNG regasification terminal (RGT) in Sungai Udang, Melaka and it is crucial to secure domestic gas supply and ensure the sufficiency of gas supply to meet future demand.

RGT, located 3km offshore Sungai Udang, was operational by May 2013. It was developed based on a design which comprises the world's first-of-its-kind re-gasification unit on an island jetty (JRU), two floating storage units (FSU) and a 3km sub-sea pipeline connecting to a new 30-km onshore pipeline that connects to the Peninsular Gas Utilisation (PGU) pipeline network. The two floating storage units are designed to receive the LNG imported from around the world and further converts the LNG into gas before transporting it into the PGU pipeline network for distribution. The floating storage unit (FSU) concept is time-saving compared to conventional land-based re-gasification and storage facilities and this concept has helped to shorten the completion period to 2 years.

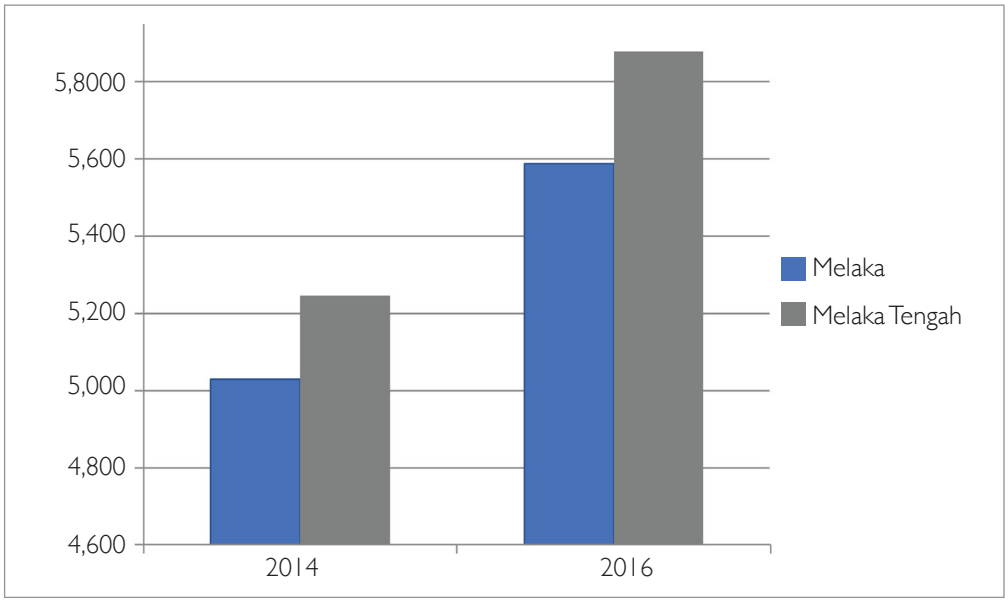
The completion of RGT in Sungai Udang marked an important milestone in the natural gas industry in Malaysia. The RGT increased the gas supply by the capacity of 500 mmscfd, and it solves the shortage of gas supply to the power sector through the import of gas globally. RGT in Sungai Udang has two agreement to import gas from other countries. The first agreement is with France's GDF Suez for the supply of 2.5 MT of LNG over 3.5 years and the second is signed with Qatar gas for the supply of 1.5 MTPA of LNG over 20 years. PETRONAS Gas Berhad also has a 20-year contract to buy 3.5 MTPA of LNG from the Santos-led Gladstone LNG project in Australia.

Economic development

Sungai Udang presents a slightly different case to Kerteh and Bintulu, given the relatively smaller footprint of the natural gas industry and the relatively higher levels of pre-existing economic development in the area and in the state more broadly, when compared to Terengganu and Sarawak. Nonetheless, interviewees did report that the natural gas industry has contributed significantly to the economic development of the area – reporting that Sungai Udang is primarily composed of two activities: the Malaysian army camp and the natural gas industry.

As Figure 13 demonstrates, the presence of natural gas industry again coincides with high levels of median household income compared to the average for the state.

Figure 13. Median household income in Melaka and Melaka Tengah, RM

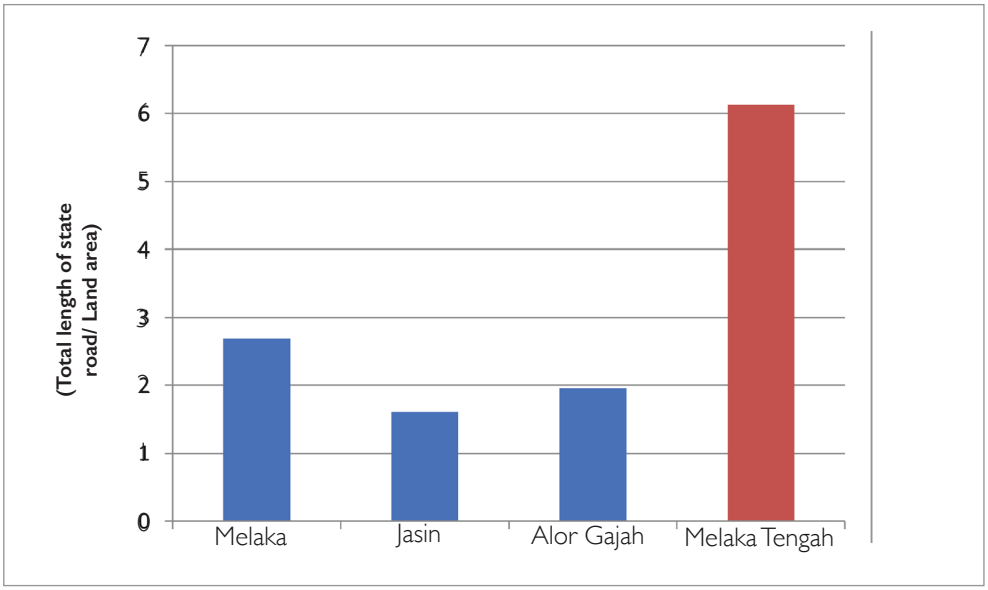


Source: Department of Statistics Malaysia, My Local Stats Melaka (2019)

Infrastructure development

Interviewees reported that the development of the natural gas industry in the areas had resulted in additional development of infrastructure in Sungai Udang. Again, it is difficult to disaggregate the impact of the natural gas industry from wider factors, but this claim seems to be supported by Figure 14 below, which demonstrates that physical infrastructure development in Melaka Tengah is significantly higher than in the state as a whole.

Figure 14. Median household income in Melaka and Melaka Tengah, RM



Source: Department of Statistics Malaysia, My Local Stats Melaka (2019)

Community representatives reported that the infrastructure development had benefitted the local community, by increasing road capacity, but that it had also caused disturbances to local residents who had to understand and abide by more complicated road traffic laws.

Local opportunities

Interviewees reported that local businesses are benefitting from the PETRONAS operations. Specifically, the increased traffic in ships has led to an increased demand for ship repair services and other supporting industries. Although it was noted that whilst these were Malaysian companies they were often not from Sungai Udang. Alongside shipping support services, there has also been an expansion in hardware services and stores in the area. However, it was also reported that local fishing communities had been negatively affected by the development.

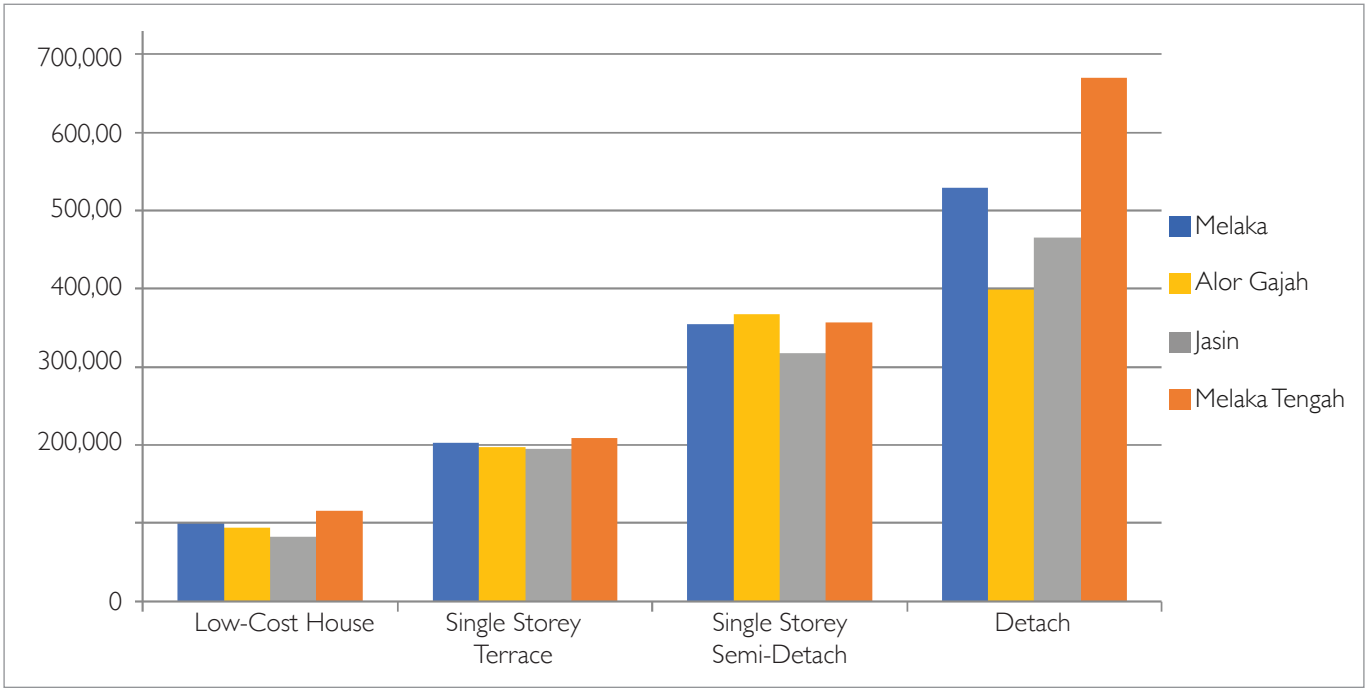
With respect to employment opportunities, it was reported that the main employment base in the area was manufacturing and palm oil. As for the natural gas industry, it was reported that the presence of foreign workers had increased. Although the industry did employ a mix of foreign and Malaysian workers, many of the Malaysian workers were from out of state.

Livings costs

As with other areas where the natural gas industry has catalysed economic development, it was noted that living costs has risen faster. As with other areas, the cost of housing was highlighted as a particular challenge following the significant influx of workers.

Figure 15 below does indicate that property prices in Melaka Tengah are among the highest in the state, in particular for detached houses. Although price levels are broadly consistent with those for the state more broadly.

Figure 15. Average Price of Residential Property Transactions by District and Type, RM, Q2 2019



Source: Department of Statistics Malaysia, My Local Stats Melaka (2019)

Public finances

It was reported that the natural gas industry was making a fiscal contribution directly to Majlis Bandaraya Melaka Bersejarah (MBMB) of several millions[6].

Environmental impact

Interviewees reported that environmental concerns were not prevalent and there was a general perception that PETRONAS maintained high standards in regards to the impacts to environment.

Social impact

Interviewees did report concerns over the social impact following the high influx of workers from outside the state. Issues included traffic congestion and parking in the roadside in additional to socially negative behaviour such as littering. There were concerns that out-of-state and foreign workers do not respect the local community. On the other hand, interviewees recognised the social contributions of the natural gas industry, noting the construction of suraus and charitable donations.

[6] Meeting with Majlis Bandaraya Melaka Bersejarah on November 8, 2019

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