MALAYSIA

SISTEM PERAKAUNAN EKONOMI-ALAM SEKITAR

SYSTEM OF ENVIRONMENTAL-ECONOMIC ACCOUNTING

Jadual Fizikal Penawaran & Penggunaan: Akaun Tenaga

Physical Supply & Use Table: Energy Account

2015

MySEEA PSUT Tenaga / *Energy*

JABATAN PERANGKAAN MALAYSIA

DEPARTMENT OF STATISTICS, MALAYSIA

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JADUAL FIZIKAL PENAWARAN & PENGGUNAAN: AKAUN TENAGA
(MySEEA PSUT Tenaga)

SYSTEM OF ENVIRONMENTAL-ECONOMIC ACCOUNTING
PHYSICAL SUPPLY & USE TABLE: ENERGY ACCOUNT
(MySEEA PSUT Energy)

2015

Pemakluman/ Announcement

Kerajaan Malaysia telah mengisytiharkan Hari Statistik Negara (MyStats *Day*) pada 20 Oktober setiap tahun. Tema sambutan MyStats *Day* adalah "Data Berkualiti, Kehidupan Sejahtera".

The government of Malaysia has declared National Statistics Day (MyStats Day) on October 20 every year. MyStats Day theme is "Better Data, Better Lives".

JABATAN PERANGKAAN MALAYSIA
DEPARTMENT OF STATISTICS, MALAYSIA

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KATA PENGANTAR

Sistem Perakaunan Ekonomi-Alam Sekitar, Jadual Fizikal Penawaran & Penggunaan: Akaun Tenaga, Malaysia (MySEEA PSUT Tenaga) 2015 menerbitkan statistik penawaran dan penggunaan tenaga di Malaysia bagi tahun 2015. Laporan ini yang julung kalinya diterbitkan bertujuan melihat sumbangan alam sekitar kepada ekonomi dan juga kesan ekonomi terhadap alam sekitar.

Statistik ini disusun berdasarkan konsep dan garis panduan yang disarankan dalam *System of Environmental-Economic Accounting* (SEEA) oleh *United Nations*. Penyusunan ini boleh digunakan untuk mengukur kecekapan penggunaan dan kelestarian sumber tenaga di samping menjadi input kepada dasar berkaitan tenaga. Statistik ini juga berguna sebagai sumber rujukan kepada penyelidik dan akademik.

Penerbitan ini mengandungi tiga bahagian utama. Bahagian pertama memaparkan penemuan utama dan ringkasan penemuan. Jadual statistik terperinci dipaparkan di bahagian kedua. Manakala bahagian ketiga pula menerangkan aspek teknikal seperti skop & liputan, konsep & definisi yang digunakan bagi memudahkan pengguna memahami statistik yang diterbitkan.

Jabatan merakamkan setinggi-tinggi penghargaan atas kerjasama dan sumbangan yang diberikan oleh semua pihak yang telah menyumbang dalam menjayakan penerbitan ini. Setiap maklum balas dan cadangan untuk penambahbaikan penerbitan ini pada masa akan datang amat dihargai.

DATO' SRI DR. MOHD UZIR MAHIDIN
Ketua Perangkawan Malaysia
April 2019

PREFACE

System of Environmental-Economic Accounting, Physical Supply and Use Table: Energy Account, Malaysia (MySEEA PSUT Energy) 2015 published statistics on energy supply and use in Malaysia for the year 2015. This inaugural report aims to understand environmental contributions to the economy as well as the economic impact of the environment.

The statistics are compiled based on the concepts and guidelines recommended in System of Environmental-Economic Accounting (SEEA) by United Nations. This statistics can be used to measure the efficiency and sustainability of energy resources as well as an input to energy-related policies. It is also a useful source of reference for researchers and academia.

This publication is divided into three parts. The first part presents the main findings and summary of findings. The detailed statistical tables are showed in the second part. Meanwhile the third part describes technical aspects such as scope & coverage, concepts & definitions as well as the key variables used to assist users in understanding the published statistics.

The Department gratefully acknowledges the cooperation and contribution rendered by all parties in making this publication a success. Every feedback and suggestion towards improving future publications is highly appreciated.

DATO' SRI DR. MOHD UZIR MAHIDIN
Chief Statistician Malaysia
April 2019

KANDUNGAN *CONTENTS*

Muka Surat
Page

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MySEEA PSUT Tenaga, 2015

Unit: *kilo tonne of oil equivalent* (ktoe)

ALAM SEKITAR

Sumber dari Alam Semula Jadi

Gas asli 71,572

Minyak mentah 34,351

Arang batu 1,773

Tenaga Tidak Boleh Baharu

Tenaga Boleh Baharu

Kuasa hidro 3,582

Biodiesel 684

Biomass 189

Solar 75

Biogas 18

JUMLAH TENAGA DARI INPUT SEMULA JADI: 112,243

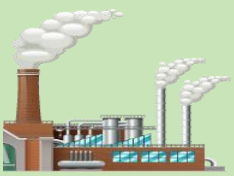
EKONOMI

Penawaran Produk Tenaga

Perlombongan & pengkuarian 103,307

Gas asli	67,580
Minyak mentah	33,955
Arang batu	1,773

Pembuatan 57,637



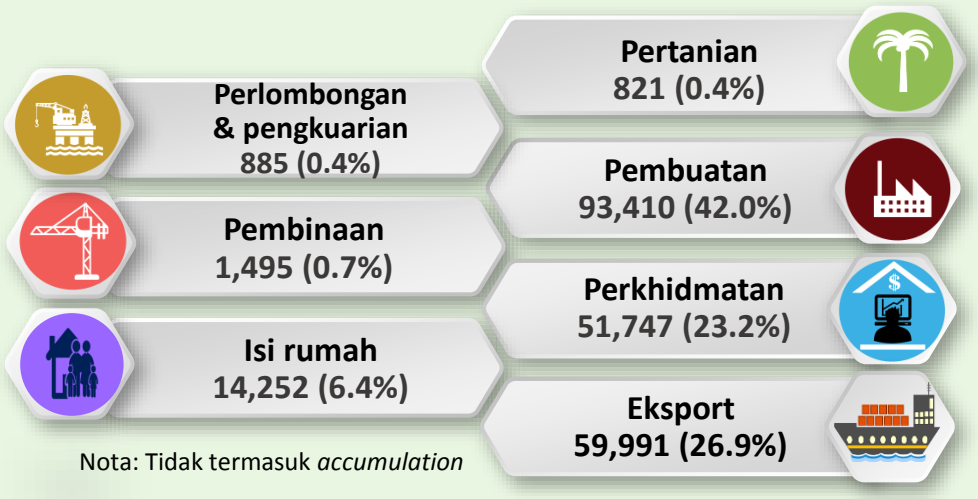
LNG	31,057
Produk petroleum	25,553
Elektrik	317
Lain-lain	710

Perkhidmatan 12,403

Elektrik 12,403

JUMLAH PRODUK TENAGA : 222,652

Penggunaan Produk Tenaga



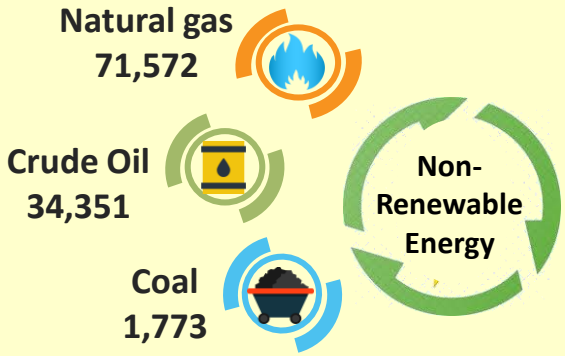
Nota: Tidak termasuk *accumulation*

MySEEA PSUT Energy, 2015

Unit: kilo tonne of oil equivalent (ktoe)

ENVIRONMENT

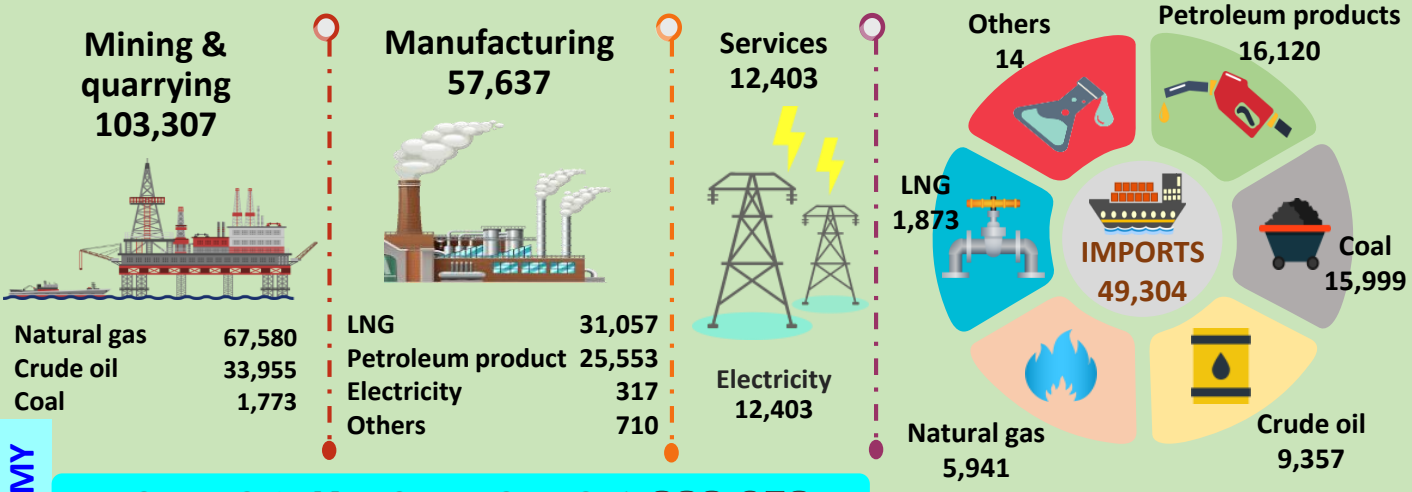
Natural Resource Inputs



TOTAL ENERGY FROM NATURAL INPUTS: 112,243

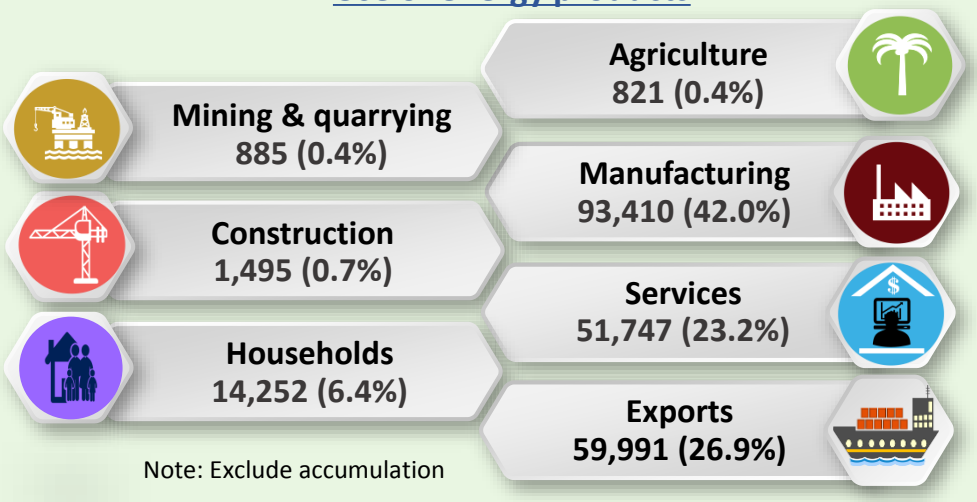
ECONOMY

Supply of Energy Products



TOTAL OF ENERGY PRODUCTS: 222,652

Use of energy products



Note: Exclude accumulation

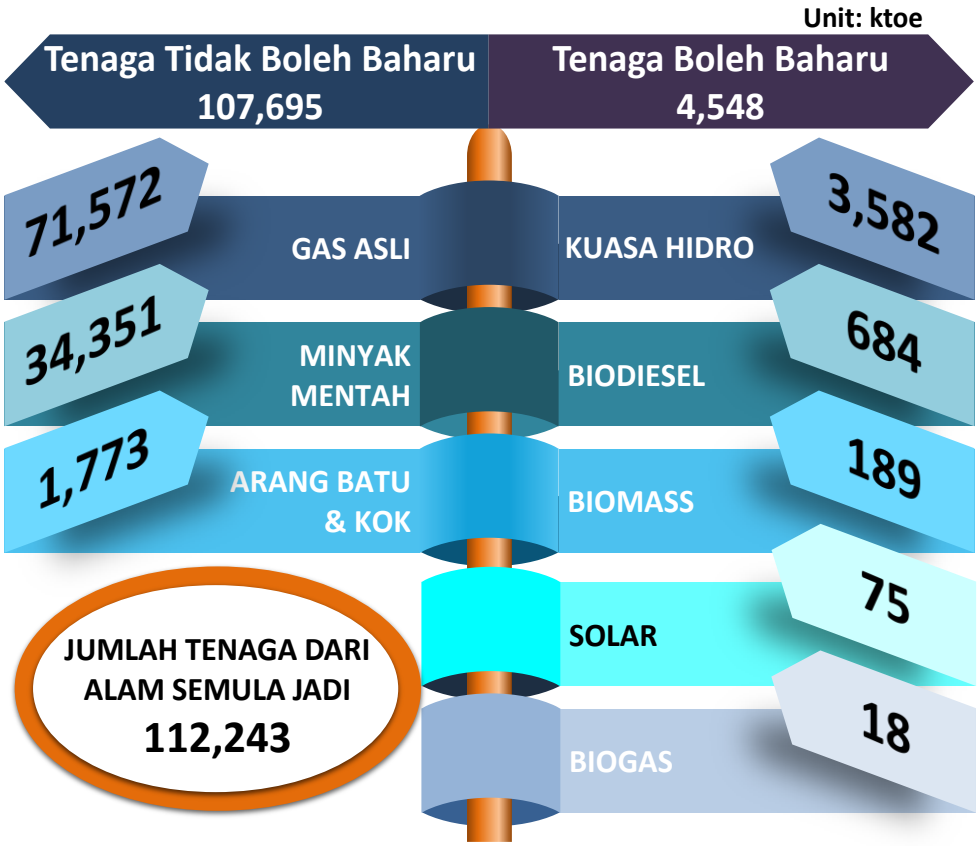
1. PENGENALAN

Penerbitan ini membentangkan maklumat penawaran dan penggunaan tenaga di Malaysia bagi tahun 2015. Secara umumnya, PSUT merujuk kepada aliran tenaga dalam unit fizikal di antara alam sekitar dan ekonomi Malaysia. Akaun ini merekod aliran tenaga bermula dengan pengekstrakan dari sumber alam sekitar ke dalam aktiviti ekonomi, aliran tenaga di dalam aktiviti ekonomi dan tenaga yang dilepaskan kembali ke alam sekitar. Jumlah tenaga daripada input semula jadi di Malaysia merekodkan 112,243 ktoe pada 2015, manakala jumlah produk tenaga adalah 222,652 ktoe.

2. TENAGA DARIPADA INPUT SEMULA JADI

Jumlah tenaga daripada input semula jadi pada 2015 merekodkan 112,243 ktoe dengan 107,695 ktoe (95.9%) adalah daripada tenaga tidak boleh baharu dan tenaga boleh baharu sebanyak 4,548 ktoe (4.1%). Penyumbang utama sumber tenaga adalah gas asli iaitu 71,572 ktoe (63.8%), minyak mentah 34,351 ktoe (30.6%) dan kuasa hidro 3,582 ktoe (3.2%).

Paparan 1: Tenaga dari Alam Semula Jadi, 2015



3. PENAWARAN & PENGGUNAAN PRODUK TENAGA

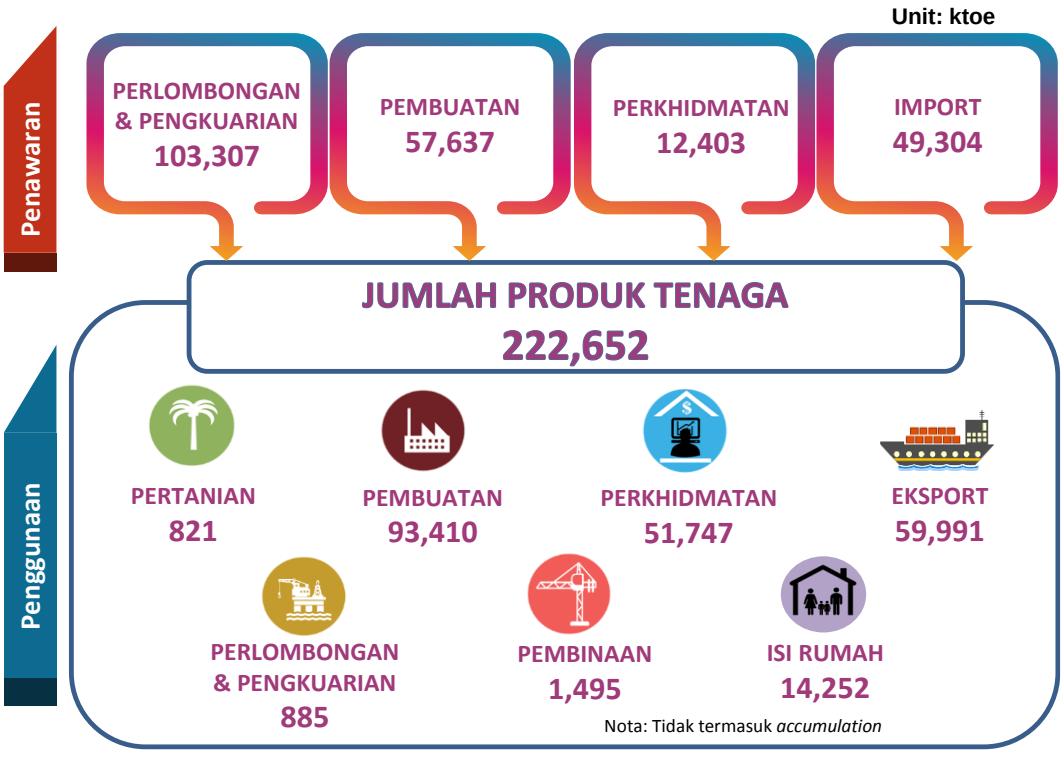
Jumlah penawaran dan penggunaan produk tenaga dalam ekonomi Malaysia pada 2015 mencatatkan 222,652 ktoe.

3.1 Penawaran Produk Tenaga

Pengeluaran domestik mendominasi penawaran produk tenaga dalam ekonomi iaitu 77.9 peratus (173,348 ktoe) berbanding import (49,304 ktoe). Perlombongan & pengkuarian merupakan pengeluar produk tenaga tertinggi iaitu 103,307 ktoe (46.4%) diikuti Pembuatan 57,637 ktoe (25.9%) dan Perkhidmatan 12,403 ktoe (5.6%). Produk tenaga utama yang ditawarkan adalah seperti berikut:

- Gas asli 73,521 ktoe (33.0%);
- Minyak mentah 43,312 ktoe (19.5%); dan
- Produk petroleum 41,674 ktoe (18.7%)

Paparan 2: Produk Tenaga mengikut Sektor, 2015



Paparan 3: Penawaran & Penggunaan Produk Tenaga, 2015

Unit: ktoe

Penawaran Domestik	Import	Jumlah Penawaran		Jumlah Penggunaan	Industri	Isi Rumah	Accumulation	Eksport
173,348	49,304	222,652	JUMLAH	222,652	148,358	14,252	50	59,991
67,580	5,941	73,521	GAS ASLI	73,521	72,457	1	-	1,062
33,955	9,357	43,312	MINYAK MENTAH	43,312	26,802	-	543	15,968
25,553	16,120	41,674	PRODUK PETROLEUM	41,674	18,044	11,919	-597	12,307
31,057	1,873	32,930	LNG	32,930	2,873	-	-	30,057
1,773	15,999	17,771	ARANG BATU & KOK	17,771	17,405	-	-10	377
11,374	1	11,375	ELEKTRIK	11,375	9,043	2,332	-	-
1,346	-	1,346	KUASA HIDRO	1,346	1,346	-	-	-
710	13	723	LAIN-LAIN	723	388	-	114	221

3.2 Penggunaan Produk Tenaga

Penggunaan produk tenaga terdiri daripada dua kategori iaitu transfomasi produk tenaga yang merekodkan 109,970 ktoe (49.4%) dan penggunaan akhir produk tenaga 112,682 ktoe (50.6%). Produk tenaga yang digunakan oleh domestik merekodkan 162,610 ktoe (73.0%) berbanding eksport 59,991 ktoe.

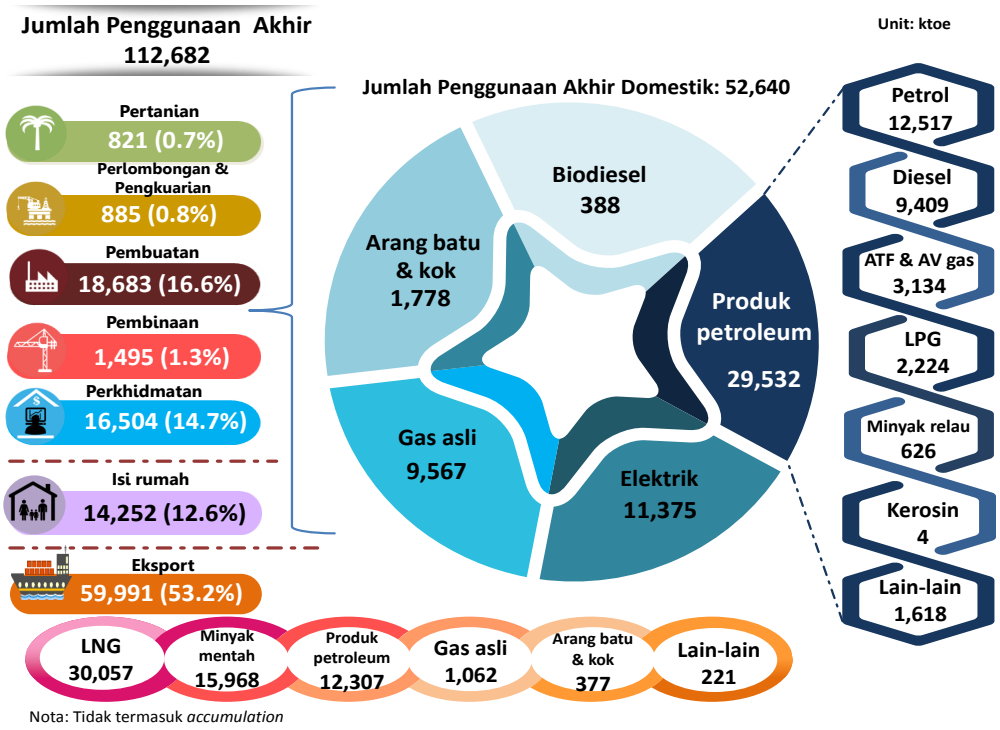
3.3 Penggunaan Akhir Produk Tenaga

Penggunaan akhir produk tenaga merangkumi sektor ekonomi (38,388 ktoe), isi rumah (14,252 ktoe) dan eksport (59,991 ktoe). Pembuatan merupakan pengguna utama produk tenaga iaitu sebanyak 18,683 ktoe. Pecahan penggunaan domestik mengikut jenis produk tenaga utama adalah seperti berikut:

- Produk petroleum 29,532 ktoe (56.1%);
- Elektrik 11,375 ktoe (21.6%); dan
- Gas asli 9,567 ktoe (18.2%).

Produk tenaga utama yang dieksport adalah LNG (30,057 ktoe), diikuti oleh minyak mentah dan produk petroleum dengan masing-masing mencatatkan 15,968 ktoe dan 12,307 ktoe. **[Paparan 4]**

Paparan 4: Penggunaan Akhir mengikut Sektor dan Produk, 2015

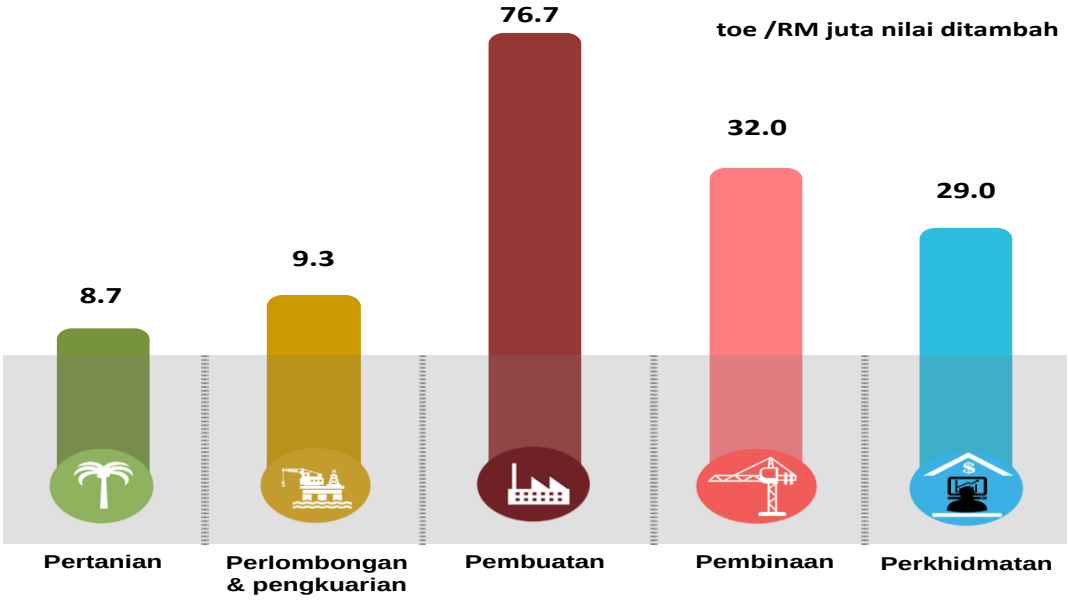


Nota: Tidak termasuk *accumulation*

4. INTENSITI PRODUK TENAGA BAGI PENGGUNAAN AKHIR MENGIKUT SEKTOR

Sektor pembuatan menggunakan tenaga secara intensif iaitu 76.7 toe bagi setiap pengeluaran RM1 juta nilai ditambah. Sebaliknya, Pertanian kurang menggunakan tenaga iaitu 8.7 toe bagi setiap pengeluaran RM1 juta nilai ditambah.

Paparan 5: Intensiti Penggunaan Akhir Produk Tenaga mengikut Sektor, 2015



5. ANALISIS PENGGANDA

Analisis pengganda merupakan kaedah untuk mengukur impak terhadap pertumbuhan keseluruhan ekonomi apabila berlaku perubahan dalam komponen permintaan akhir. Ia mengukur kesalingbergantungan secara langsung dan tidak langsung antara satu sektor dengan keseluruhan ekonomi yang melibatkan pembelian dan penjualan antara sektor.

5.1 Kesan Pengganda terhadap Permintaan Akhir Produk Tenaga

Paparan 6 menunjukkan kesan pengganda kepada produk tenaga dengan andaian peningkatan 10.0 peratus ke atas permintaan akhir dalam sektor Pembuatan. Peningkatan 10.0 peratus ke atas permintaan akhir dalam sektor Pembuatan akan memberi kesan langsung kepada penggunaan tenaga dalam sektor tersebut dengan kadar kenaikan 7.8 peratus kepada 100,671,766 toe. Pada masa yang sama, ia juga memberi kesan tidak langsung kepada kadar kenaikan penggunaan tenaga bagi Perlombongan & pengkuarian (3.8%), Pertanian (3.7%), Perkhidmatan (1.6%) dan Pembinaan (0.3%).

Paparan 6: Kesan Pengganda dengan Peningkatan 10.0 Peratus pada Sektor Pembuatan, 2015

Sektor	Penggunaan Tenaga (toe)	Penggunaan Tenaga Baru (toe) (Peningkatan 10% ke atas permintaan akhir sektor Pembuatan)	Kadar Kenaikan (%)
Pertanian	820,639	851,227	3.7
Perlombongan & Pengkuarian	885,305	918,686	3.8
Pembuatan	93,409,998	100,671,766	7.8
Pembinaan	1,494,750	1,499,436	0.5
Perkhidmatan	51,747,227	52,576,563	1.6

5.2 Kesan Pengganda terhadap Penggunaan Isi Rumah bagi Produk Tenaga

Paparan 7 menunjukkan peningkatan 10.0 peratus ke atas penggunaan isi rumah dalam Perkhidmatan akan memberi kesan langsung kepada penggunaan tenaga dalam sektor tersebut (4.1%). Pada masa yang sama, ia juga memberi kesan tidak langsung kepada sektor lain dengan peningkatan kecil dalam penggunaan tenaga.

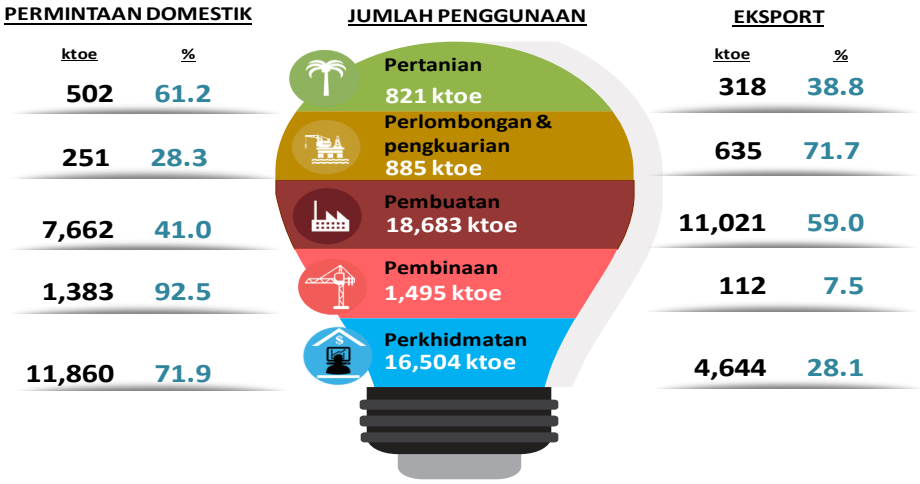
Paparan 7: Kesan Pengganda dengan Peningkatan 10.0 Peratus Penggunaan Isi Rumah pada Sektor Perkhidmatan, 2015

Sektor	Penggunaan Tenaga (toe)	Penggunaan Tenaga Baru (toe) (Peningkatan 10% penggunaan isi rumah dalam sektor Perkhidmatan)	Kadar Kenaikan (%)
Pertanian	820,639	826,389	0.7
Perlombongan & Pengkuarian	885,305	888,951	0.4
Pembuatan	93,409,998	94,086,441	0.7
Pembinaan	1,494,750	1,504,294	0.6
Perkhidmatan	51,747,227	53,873,926	4.1

6. *DECOMPOSITION* PRODUK TENAGA MENGIKUT PENGGUNAAN AKHIR - PERMINTAAN DOMESTIK & EKSPORT

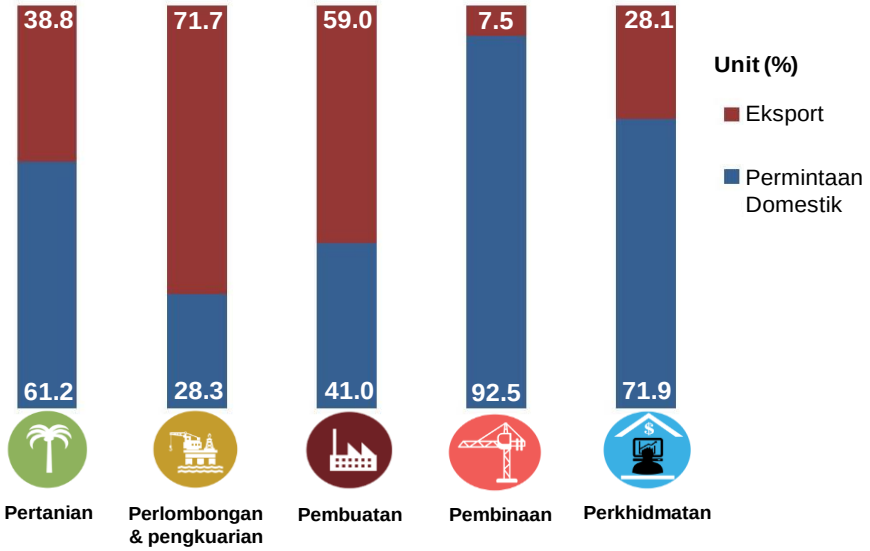
Pembuatan merupakan pengguna akhir tertinggi produk tenaga iaitu 18,683 ktoe bagi 2015. Sumbangan produk akhir tenaga bagi tujuan eksport sebanyak 59.0 peratus (11,021 ktoe) berbanding 41.0 peratus (7,662 ktoe) untuk kegunaan domestik.

Paparan 8: *Decomposition* Penggunaan Akhir Produk Tenaga mengikut Sumber dan Sektor, 2015



Paparan 9 menunjukkan sumbangan permintaan domestik dan eksport kepada permintaan penggunaan akhir produk tenaga. Sektor yang menggunakan paling banyak produk tenaga untuk memenuhi permintaan eksport ialah Perlombongan & pengkuarian (71.7%) dan Pembuatan (59.0%). Sementara itu, Pembinaan, Perkhidmatan dan Pertanian adalah sektor yang menggunakan sebahagian besar produk tenaganya untuk memenuhi permintaan domestik.

Paparan 9: *Decomposition* Permintaan Penggunaan Akhir Produk Tenaga, 2015



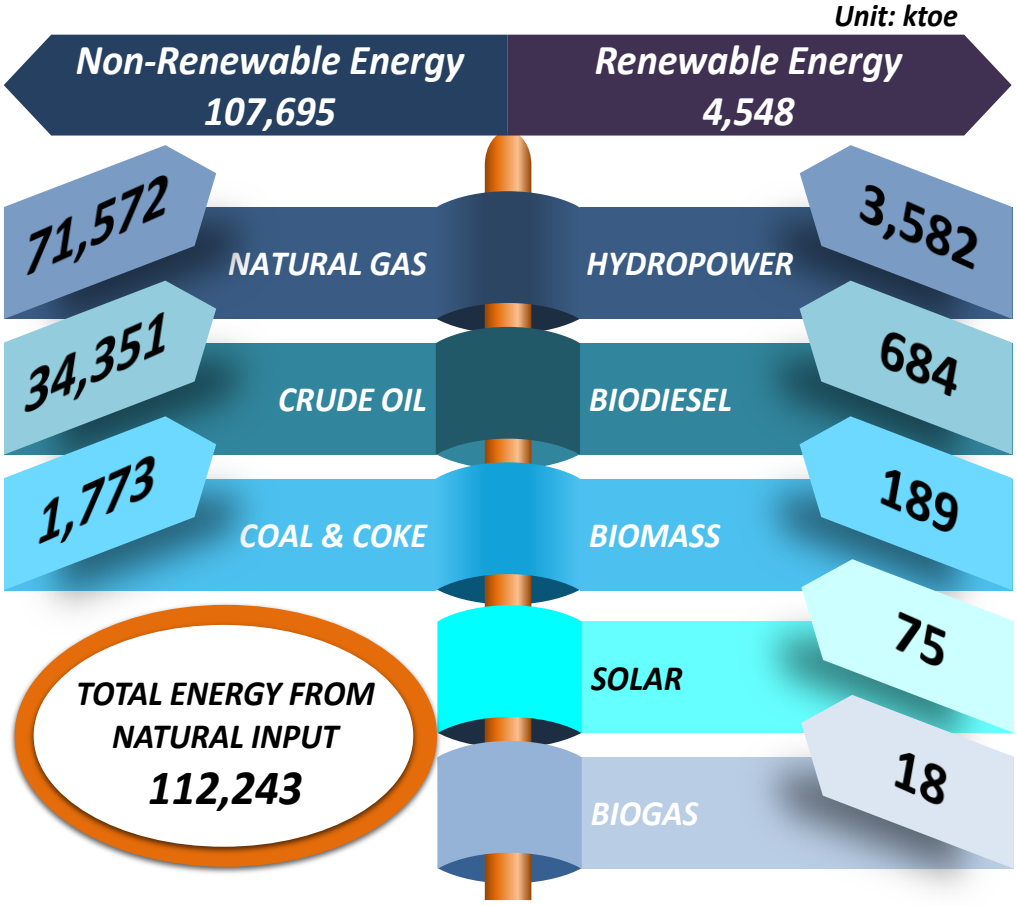
1. INTRODUCTION

This publication presents information on energy supply and use in Malaysia for 2015. Generally, PSUT refers to energy flows in physical units between environment and Malaysia's economy. The account records energy flows from extraction of the environment into the economy activities, the flows within an economy activities and the amount of energy discharged to the environment. Total energy from natural inputs in Malaysia recorded 112,243 ktoe in 2015, while total energy products was 222,652 ktoe.

2. ENERGY FROM NATURAL INPUT

The total energy from natural input in 2015 recorded 112,243 ktoe with 107,695 ktoe (95.9%) was from non-renewable energy and renewable energy of 4,548 ktoe (4.1%). The main contributors of energy were natural gas of 71,572 ktoe (63.8%), crude oil 34,351 ktoe (30.6%) and hydropower 3,582 ktoe (3.2%).

Exhibit 1: Energy from Natural Input, 2015



3. SUPPLY & USE OF ENERGY PRODUCTS

Total supply and use of energy products in the Malaysia's economy for 2015 registered 222,652 ktoe.

3.1 Supply of Energy Products

Domestic production dominated the supply of energy products in the economy of 77.9 per cent (173,348 ktoe) as compared to imports (49,304 ktoe). The Mining & quarrying was the highest energy producer of 103,307 ktoe (46.4%) followed by Manufacturing 57,637 ktoe (25.9%) and Services 12,403 ktoe (5.6%). Major energy products supplied are as follows:

- *Natural gas 73,521 ktoe (33.0%);*
- *Crude oil 43,312 ktoe (19.5%); and*
- *Petroleum products 41,674 ktoe (18.7%)*

Exhibit 2: Energy Products by Sector, 2015

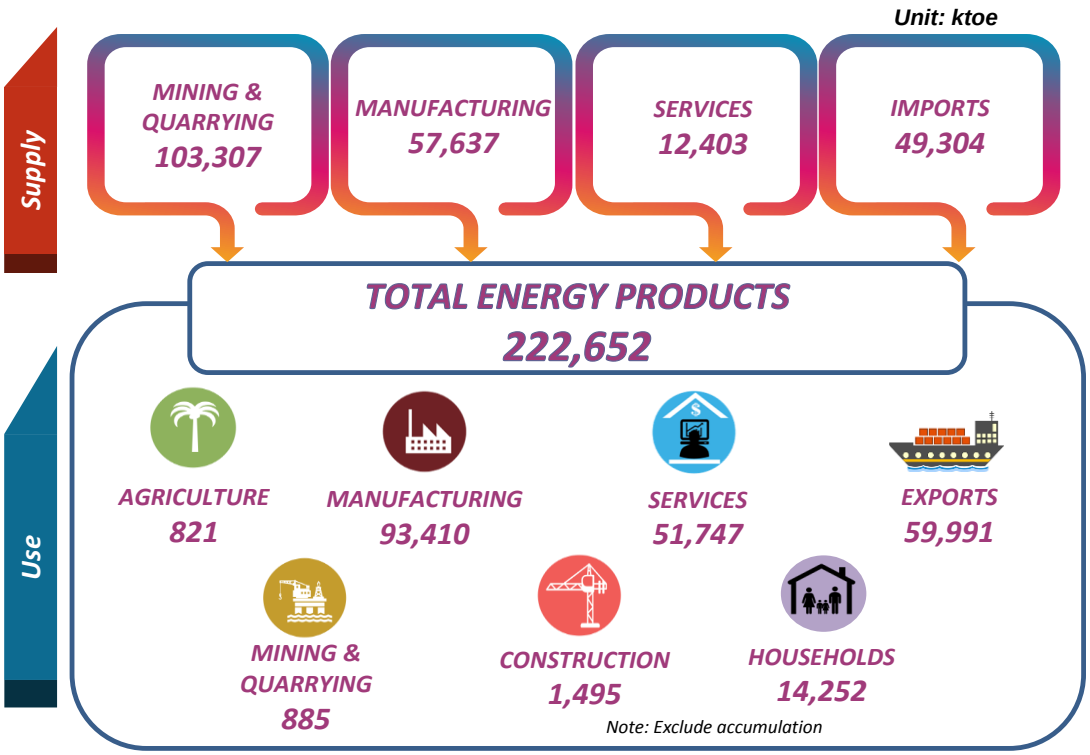


Exhibit 3: Supply & Use of Energy Products, 2015

Unit: ktoe

Domestic Supply	Imports	Total Supply		Total Use	Industries	Households	Accumulation	Exports
173,348	49,304	222,652	TOTAL	222,652	148,358	14,252	50	59,991
67,580	5,941	73,521	NATURAL GAS	73,521	72,457	1	-	1,062
33,955	9,357	43,312	CRUDE OIL	43,312	26,802	-	543	15,968
25,553	16,120	41,674	PETROLEUM PRODUCTS	41,674	18,044	11,919	-597	12,307
31,057	1,873	32,930	LNG	32,930	2,873	-	-	30,057
1,773	15,999	17,771	COAL & COKE	17,771	17,405	-	-10	377
11,374	1	11,375	ELECTRICITY	11,375	9,043	2,332	-	-
1,346	-	1,346	HIDROPOWER	1,346	1,346	-	-	-
710	13	723	OTHERS	723	388	-	114	221

3.2 Use of Energy Products

The use of energy products consists of two categories namely transformation of energy products recorded 109,970 ktoe (49.4%) and end use of energy products 112,682 ktoe (50.6%). Energy products used domestically recorded 162,610 ktoe (73.0%) compared to exports with 59,991 ktoe.

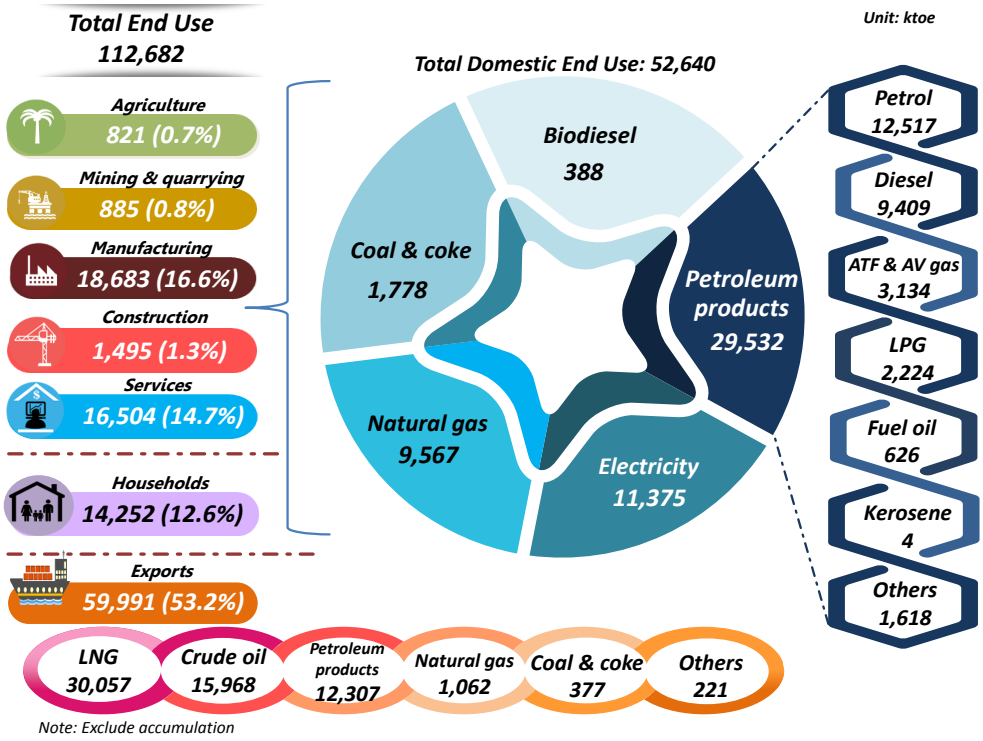
3.3 End Use of Energy Products

End use of energy products comprises economic sectors (38,388 ktoe), households (14,252 ktoe) and exports (59,991 ktoe). Manufacturing was the main user of energy products with 18,683 ktoe. The breakdown of domestic use by main energy products are as follows:

- *Petroleum products 29,532 ktoe (56.1%);*
- *Electricity 11,375 ktoe (21.6%); and*
- *Natural gas 9,567 ktoe (18.2%).*

The main energy product exported was LNG (30,057 ktoe), followed by crude oil and petroleum products which registered 15,968 ktoe and 12,307 ktoe, respectively. ***[Exhibit 4]***

Exhibit 4: End Use by Sector and Products, 2015

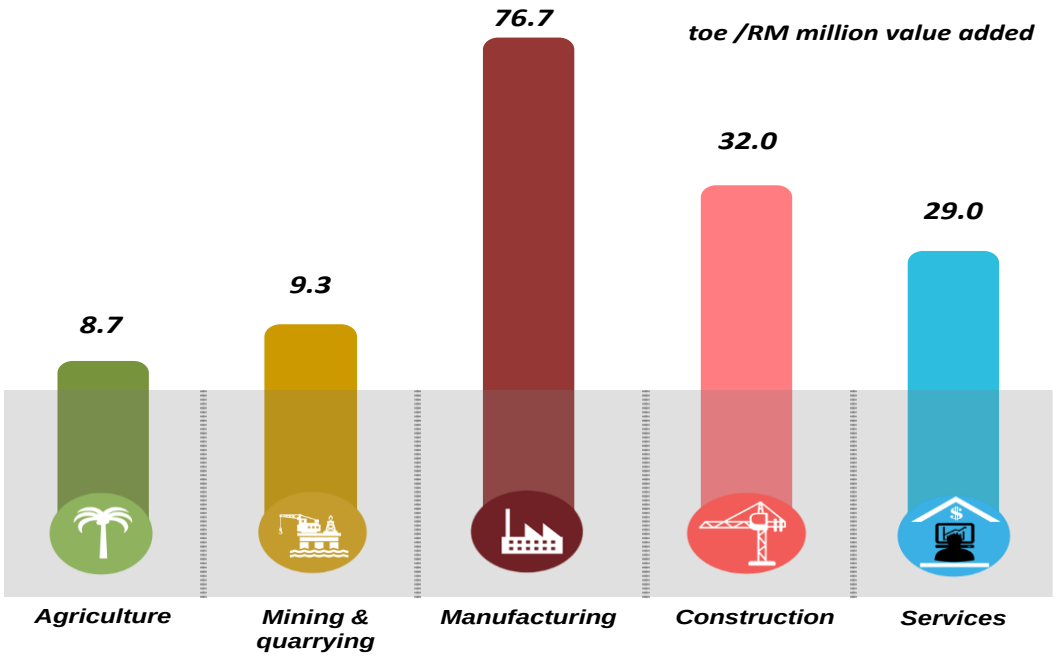


Note: Exclude accumulation

4. ENERGY PRODUCTS INTENSITY FOR FINAL USE BY SECTOR

Manufacturing sector used energy intensively at 76.7 toe per RM1 million production of value-added. On the contrary, Agriculture was the least intensive at 8.7 toe per RM1 million production of value-added.

Exhibit 5: Final Use of Energy Products Intensity by Sector, 2015



5. MULTIPLIER ANALYSIS

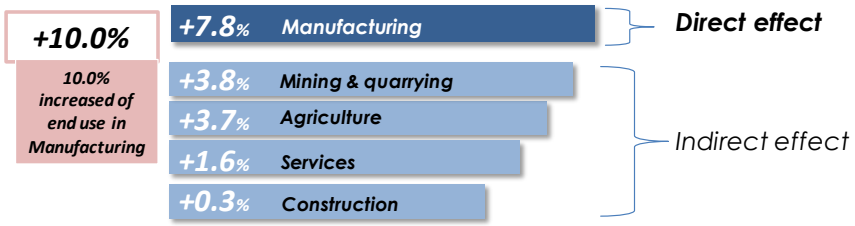
Multiplier analysis is a tool used to measure the impact to the overall growth of economy when there is changed in the final demand components. It measures directly and indirectly the interdependence between one sector and the rest of the economy that involves in purchasing and selling between the sectors.

5.1 Multiplier Effect on Final Demand of Energy Products

Exhibit 6 shows multiplier effects of energy products with a hypothetical increase of 10.0 per cent on the final demand in the Manufacturing sectors. An increase of 10.0 per cent of final demand in Manufacturing sector will effect directly the use of energy in the sector with an increase of 7.8 per cent to 100,671,766 toe. Concurrently, it also has an indirect effect to the rate of increase in energy consumption in Mining & quarrying (3.8%), Agriculture (3.7%), Services (1.6%) and Construction (0.3%).

Exhibit 6: Multiplier Effect on 10.0 Per Cent Growth in the Manufacturing Sector, 2015

Sector	Energy Use (toe)	New Energy Use (toe) (10% increase of final demand in Manufacturing sector)	Growth rate (%)
Agriculture	820,639	851,227	3.7
Mining & quarrying	885,305	918,686	3.8
Manufacturing	93,409,998	100,671,766	7.8
Construction	1,494,750	1,499,436	0.5
Services	51,747,227	52,576,563	1.6

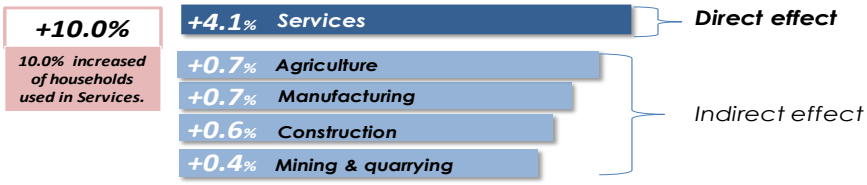


5.2 Multiplier Effect on Households Use of Energy Products

Exhibit 7 shows that a 10.0 per cent increased in households used in the Services will have a direct impact on energy use in the sector (4.1%). Simultaneously, it also has an indirect effect to other sectors with the marginal increased in energy use.

Exhibit 7: Multiplier Effect on 10.0 Per Cent Growth of Households Used in the Services Sector, 2015

Sector	Energy Use (toe)	New Energy Use (toe) (10% increase of households used in Services sector)	Growth rate (%)
Agriculture	820,639	826,389	0.7
Mining & quarrying	885,305	888,951	0.4
Manufacturing	93,409,998	94,086,441	0.7
Construction	1,494,750	1,504,294	0.6
Services	51,747,227	53,873,926	4.1



6. DECOMPOSITION OF ENERGY PRODUCTS BY END USE - DOMESTIC DEMAND & EXPORTS

Manufacturing was the highest in terms of end use of energy products at 18,683 ktoe in 2015. The contribution of end use of energy products for the purpose of exports was 59.0 per cent (11,021 ktoe) as compared to 41.0 per cent (7,662 ktoe) for domestic demand.

Exhibit 8: Decomposition of End Use of Energy Products by Sources and Sector, 2015

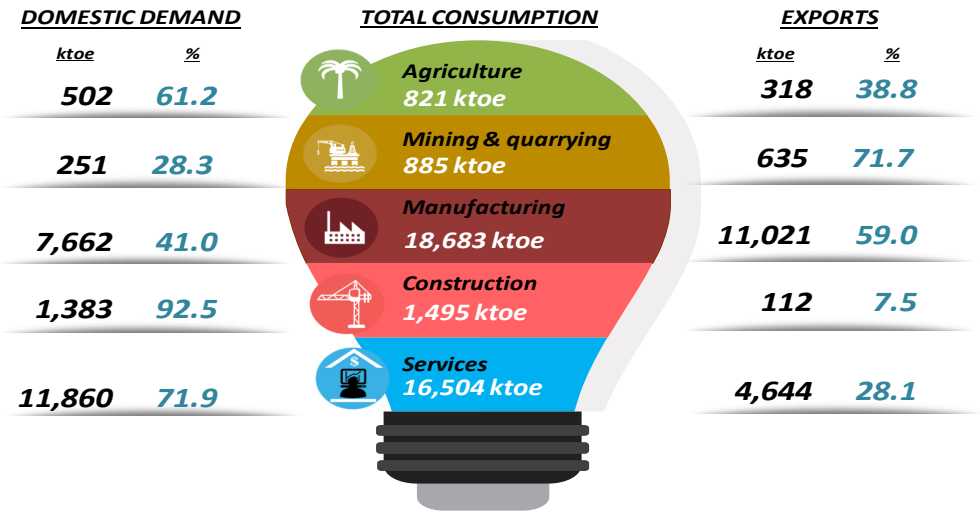
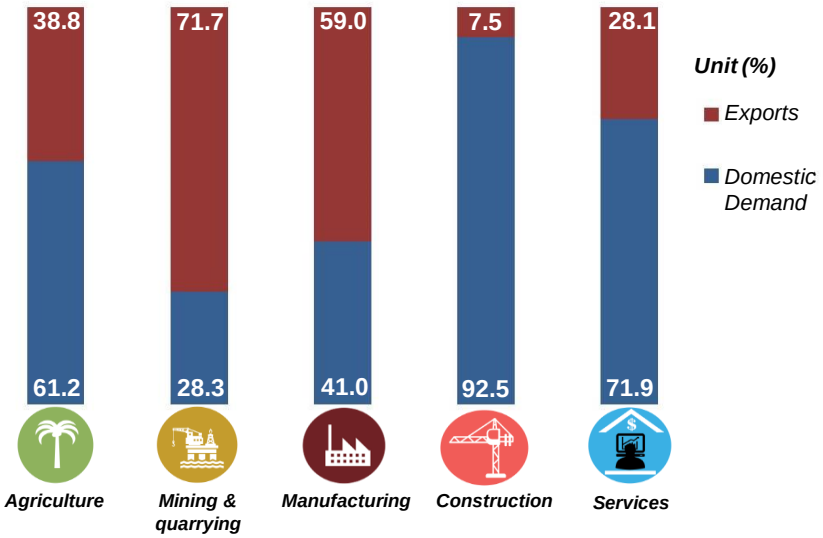


Exhibit 9 shows the contribution of domestic demand and exports to meet the demand on end used of energy products. Sectors that used the most energy products that meet exports demand were Mining & quarrying (71.7%) and Manufacturing (59.0%). In the meantime, Construction, Services and Agriculture used most of their energy products to meet domestic demand.

Exhibit 9: Decomposition of Demand for End Use of Energy Product, 2015



ARTIKEL

ARTICLES

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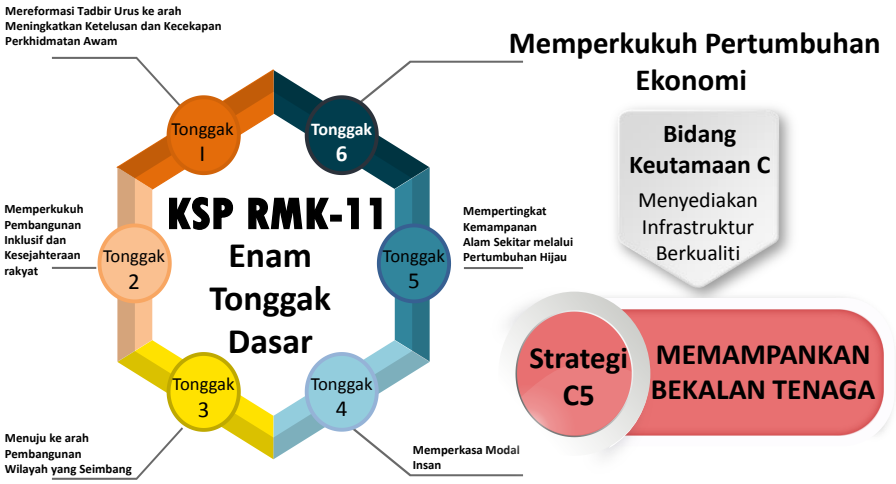
Artikel 1: Halatuju Tenaga di Malaysia

Malaysia merupakan negara yang kaya dengan kepelbagaian sumber asli yang menjadi asas penting dalam penghasilan tenaga. Kajian Separuh Penggal (KSP) Rancangan Malaysia Kesebelas (RMKe-11) telah memberi keutamaan dan penekanan baharu, bertujuan untuk mereformasi dasar sedia ada dan menggariskan sasaran sosioekonomi yang disemak semula bagi tempoh 2018-2020. KSP ini juga telah memberi penekanan khusus untuk memampankan bekalan tenaga di Malaysia di dalam Tonggak ke-6, iaitu memperkukuh pertumbuhan ekonomi melalui Bidang Keutamaan C, Strategi C5.

Rajah1: Kajian Separuh Penggal Rancangan Malaysia Kesebelas



Penyediaan bekalan tenaga yang berdaya harap dan mampan adalah penting untuk mengukuhkan jaminan tenaga dan meningkatkan kecekapan. Dalam tempoh akhir Rancangan, inisiatif akan tertumpu kepada mengukuhkan jaminan bekalan minyak dan gas, memastikan jaminan tenaga melalui pengurusan sumber yang lebih baik serta meningkatkan kecekapan sektor tenaga.

Usaha bersepadu untuk meningkatkan jaminan serta daya harap bekalan minyak dan gas akan diteruskan melalui pembinaan saluran paip tambahan dan infrastruktur lain yang baharu. Pembinaan ini termasuk fasiliti terapung gas asli cecair 2 milik PETRONAS dengan kapasiti 1.5 juta tan metrik setahun di luar pesisir pantai Sabah yang dijangka beroperasi pada Julai 2020 dan rangkaian paip gas dari Ayer Tawar ke Lembah Kinta, Perak. Sementara itu, permulaan operasi *Refinery and petrochemical Integrated Development* (RAPID) akan meningkatkan jumlah terkumpul kapasiti penapisan minyak domestik melebihi 900,000 tong sehari pada tahun 2019. Di samping itu, kapasiti simpanan minyak mentah dan produk petroleum di Pengerang *Integrated Petroleum Complex* akan ditambah daripada 1.3 juta meter padu kepada 3.2 juta pada tahun 2020. Usaha ini akan membolehkan negara meningkatkan pengeluaran produk petroleum yang mempunyai nilai ditambah yang lebih

tinggi untuk memanfaatkan pasaran tempatan dan eksport. Selain itu, penggunaan teknologi perolehan minyak tertingkat di lapangan minyak yang telah matang untuk mendapatkan minyak yang tidak dapat dikeluarkan akan meningkatkan lagi pengeluaran minyak mentah daripada lapangan tersebut.

Penjanaan elektrik yang sangat bergantung kepada arang batu dan gas yang diimport mendedahkan negara kepada risiko yang tinggi berkaitan jaminan bekalan dan turun naik harga. Dalam hal ini, tahap campuran bahan api Malaysia adalah seimbang seperti ditunjukkan oleh *Indeks Herfindahl-Hirschman* (HHI) yang berada pada tahap 0.44 pada tahun 2016. HHI mengukur tahap kebergantungan kepada jenis bahan api yang digunakan dalam campuran bahan api bagi penjanaan elektrik. Nilai HHI mencerminkan tahap kepelbagaian dalam sistem grid dengan nilai melebihi 0.5 menunjukkan kebergantungan yang tinggi terhadap sesuatu bahan api. Kerajaan berhasrat untuk terus mengekalkan campuran bahan api yang seimbang dengan meningkatkan penggunaan tenaga boleh baharu. Oleh itu, HHI akan dikekalkan di bawah 0.5 untuk memastikan kepelbagaian campuran bahan api.

Usaha untuk meningkatkan peratusan elektrik yang dijana daripada tenaga boleh baharu serta meneroka penggunaan sumber baharu akan dipergiat. Usaha ini bertujuan untuk terus mengurangkan kebergantungan kepada bahan api fosil bagi penjanaan elektrik, khususnya penggunaan arang batu yang mempunyai impak terhadap alam sekitar. Sementara itu, penggunaan sumber boleh baharu seperti solar, hidro mikro dan biogas akan dipertingkat untuk memastikan liputan yang lebih meluas di kawasan terpencil dan mencapai liputan bekalan elektrik sebanyak 99% di seluruh negara.

Usaha untuk meningkatkan kecekapan dan daya harap bekalan elektrik di Semenanjung Malaysia sedang diambil menerusi pelaksanaan fasa kedua Kawal Selia Berasaskan Insentif (IBR) dari tahun 2018 hingga tahun 2020. Mekanisme IBR menentukan tarif elektrik dengan mengambil kira kos berkaitan bahan api, penjanaan, penghantaran dan pembahagian untuk meningkatkan ketelusan dalam memacu kecekapan dan menambah baik tahap perkhidmatan. Pelaksanaan IBR akan diperluas ke Sabah dalam tempoh akhir Rancangan. Sementara itu, usaha bagi memastikan jaminan bekalan elektrik akan diteruskan dengan membina loji janakuasa baharu melalui bidaan kompetitif supaya lebih telus dan wujud persaingan yang sihat dalam kalangan pemain industri. Di samping itu, pelanjutan tempoh loji jana kuasa sedia ada akan dikajisemula. Langkah ini akan menghasilkan tarif yang lebih kompetitif dan memberi manfaat kepada pengguna.

Sumber: Kajian Separuh Penggal Rancangan Malaysia Kesebelas

Artikel 2: Sistem Perakaunan Ekonomi-Alam Sekitar, Jadual Fizikal Penawaran & Penggunaan: Akaun Tenaga, Malaysia (MySEEA PSUT Tenaga)

Oleh: Ismail bin Abdul Rahman & Idzrin Idzwana binti Ismail

Sumber asli merupakan input utama kepada penghasilan produk yang menyumbang kepada pertumbuhan ekonomi. Bagi mengekalkan kelestarian alam sekitar demi kesejahteraan generasi akan datang, sumber asli negara harus diurus dan dipelihara sebaik mungkin. Sistem Perakaunan Ekonomi-Alam Sekitar (SEEA) merupakan kerangka kerja yang mengintegrasikan maklumat ekonomi dan alam sekitar bagi mengukur kecekapan penawaran dan penggunaan sumber asli. Di samping itu, ia juga dapat mengukur sejauh mana sumber asli sedia ada dapat menampung keperluan negara dalam menjana ekonomi pada masa hadapan.

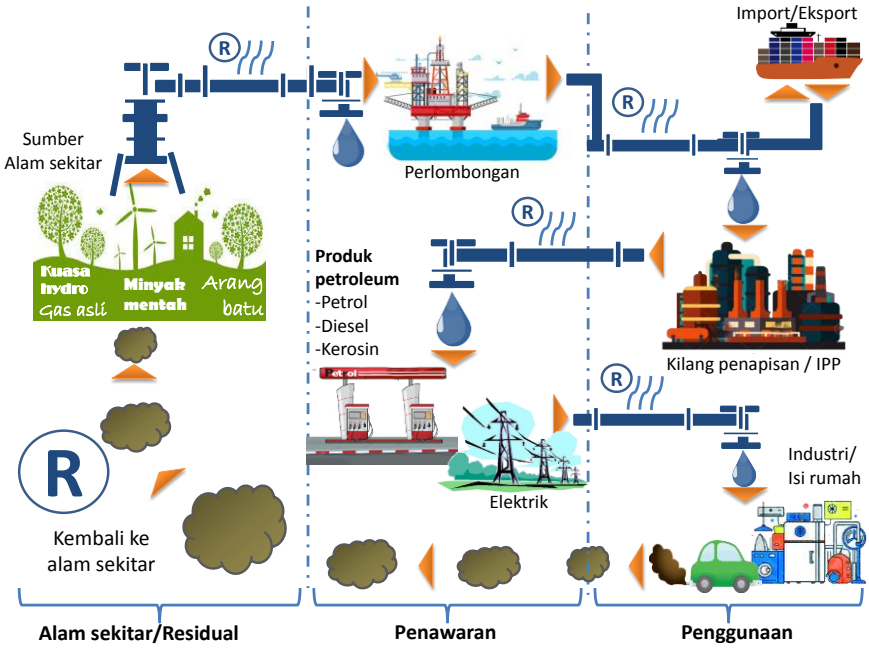
Indikator dan statistik dari SEEA membolehkan penggubal dasar mengukur keberkesanan dan kelestarian sumber tenaga serta menjadi input kepada dasar berkaitan tenaga. Ia boleh digunakan untuk menilai pencapaian rancangan pembangunan lima tahun Malaysia dan *Sustainable Development Goals* (SDGs). Rajah 2 menunjukkan indikator SDGs yang berkaitan dengan SEEA.

Rajah 2: Indikator SDGs berkaitan SEEA

Pembangunan SEEA di Malaysia telah bermula pada tahun 2013 selaras dengan penerbitan SEEA Central Framework 2012 oleh United Nations. Sebagai permulaan, kerangka SEEA di Malaysia telah memfokuskan kepada Jadual Fizikal Penawaran & Penggunaan: Akaun Tenaga (MySEEA PSUT Tenaga). Ia digunakan bagi mengenal pasti komposisi sumbangan tenaga, mengukur kecekapan penggunaan sumber tenaga, mengukur kelestarian serta jaminan sumber tenaga.

Kitaran MySEEA PSUT meliputi tiga komponen utama iaitu alam sekitar, pengeluaran produk tenaga dan penggunaan produk tenaga. Sumber tenaga yang dihasilkan oleh alam sekitar terbahagi kepada dua jenis iaitu sumber tenaga tidak boleh baharu (gas asli, minyak mentah dan arang batu) dan sumber tenaga boleh baharu (kuasa hidro, solar, biomass dll). Sumber dari alam semula jadi ini akan diekstrak dan diproses untuk menghasilkan produk tenaga.

Rajah 3: Kitaran MySEEA PSUT Tenaga



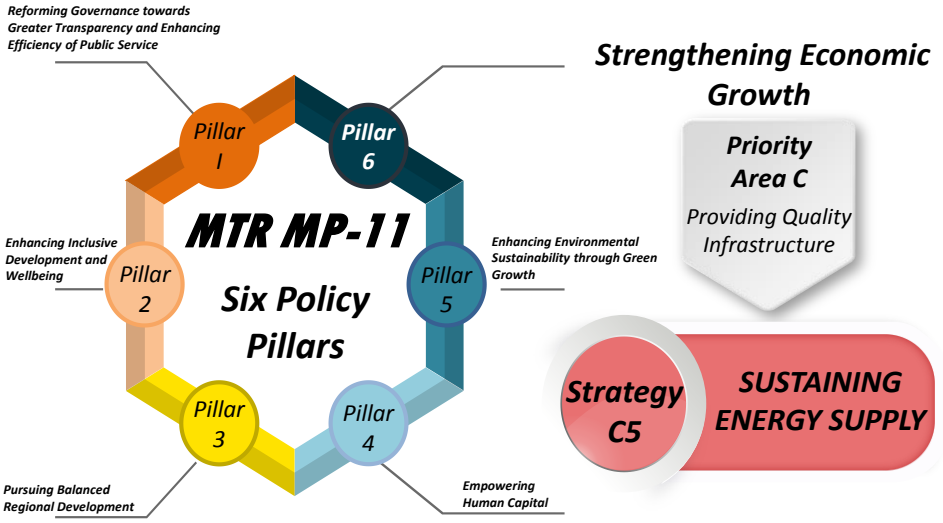
Pengeluaran dan penggunaan produk tenaga boleh dikelaskan kepada dua kategori iaitu produk tenaga yang ditransformasi dan produk tenaga yang digunakan terus oleh pengguna akhir. Sebagai contoh produk tenaga yang ditransformasi adalah produk arang batu yang diekstrak oleh sektor Perlombongan & pengkuarian akan digunakan dalam sektor utiliti untuk menghasilkan tenaga elektrik. Terdapat tiga sektor utama yang memproses dan mengeluarkan produk tenaga di Malaysia iaitu sektor Perlombongan & pengkuarian, Pembuatan dan Perkhidmatan.

Penggunaan produk tenaga juga boleh dikelaskan kepada dua kategori iaitu pengguna domestik (sektor ekonomi dan isi rumah) dan eksport. Semasa proses pengeluaran dan penggunaan produk tenaga, residual akan kembali kepada alam sekitar.

Article 1: Energy Direction in Malaysia

Malaysia is a rich country with a diversity of natural resources that is an important foundation in energy production. Mid-Term Review (MTR) of the 11th Malaysia Plan has given priorities and new emphases, aimed at reforming existing policies and outline the revised socioeconomic targets for 2018-2020. The MTR has also given special emphasis to the sustaining energy supply in Malaysia in the Pillar 6th, which is strengthening economic growth through the Priority Areas C, Strategy C5.

Figure 1: Mid-Term Review of the 11th Malaysia Plan



The provision of reliable and sustainable energy supply is fundamental to strengthen energy security and enhance efficiency. In the remaining Plan period, initiatives will focus on strengthening oil and gas security of supply, ensuring energy security through better management of resources and enhancing efficiency in energy sector.

Concerted efforts to increase security and reliability of oil and gas supply will be continued through the construction of new additional pipelines and other infrastructure. This construction includes PETRONAS floating liquefied natural gas 2, with a capacity of 1.5 million tonne per annum offshore Sabah, expected to be commissioned in July 2020 and the gas pipeline networks from Ayer Tawar to Lembah Kinta, Perak. Meanwhile, the commencement of the Refinery and Petrochemical Integrated Development (RAPID) operations will increase the combined domestic oil refining capacity beyond 900,000 barrels per day by 2019. In addition, storage capacity of crude oil and petroleum products in Pengerang Integrated Petroleum Complex will be expanded from 1.3 million cubic meters to 3.2 million by 2020. These efforts will enable Malaysia to increase production of higher

value-added petroleum products to leverage domestic and export markets. Furthermore, the application of enhanced oil recovery technology in mature oil fields to obtain stranded oil will further increase crude oil production from these fields.

Electricity generation that is heavily reliant on imported coal and gas exposes a nation to significant security of supply and price fluctuation risks. In this regard, Malaysia recorded a value of 0.44 in 2016 in the Herfindahl-Hirschman Index (HHI), which indicates a fairly diverse level of fuel mix. HHI measures the dependency on the type of fuel used in the generation mix. The HHI value reflects the diversity level of a grid system, where the value exceeding 0.5 indicates over-dependency on the particular type of fuel. The Government aspires to continuously maintain a balanced fuel mix by intensifying the utilisation of renewable energy. Therefore, the HHI will be maintained below 0.5 to ensure diversification of fuel mix.

Efforts to increase the share of electricity generated from renewable energy as well as explore the use of new sources will be intensified. These efforts aim to further reduce the dependency on fossil fuels for electricity generation, particularly the use of coal that has impact on the environment. Meanwhile, the utilisation of renewable sources such as solar, micro hydro and biogas will be intensified to ensure a wider coverage in remote areas and achieve 99% coverage of electricity supply nationwide.

Efforts to improve efficiency and reliability of electricity supply in Peninsular Malaysia are currently being undertaken through the implementation of the second phase of the Incentive Based Regulation (IBR), from 2018 to 2020. The IBR mechanism is used to determine electricity tariff, taking into account costs related to fuel, generation, transmission and distribution, to enhance transparency in driving efficiency and improving service levels. The implementation of IBR will be extended to Sabah during the remaining Plan period. Meanwhile, efforts to ensure security of electricity supply will be continued with the construction of new power plants through competitive bidding for greater transparency and healthy competition among industry players. In addition, extension of existing power plants period will be reviewed. These measures will result in more competitive tariffs and benefit consumers.

Source: Mid-Term Review of the 11th Malaysia Plan

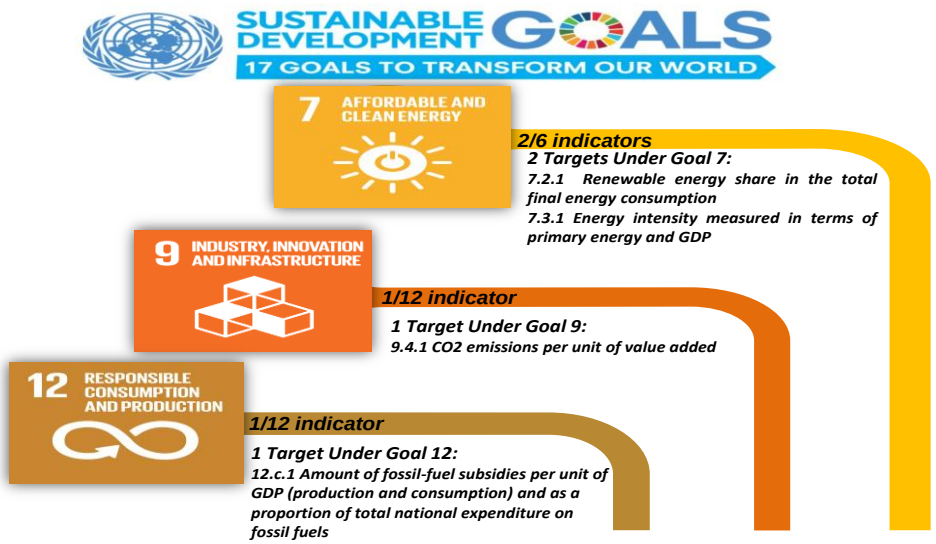
Article 2: System of Environmental-Economic Accounting, Physical Supply and Use Table: Energy Account, Malaysia (MySEEA PSUT Energy)

By: Ismail bin Abdul Rahman & Idzrin Idzwana binti Ismail

Natural resources are the main input which lead to the manufacture of products that contributes to economic growth. In order to preserve nature for the prosperity of future generations, the country's natural resources must be maintained and managed as best as possible. System of Environmental-Economic Accounting (SEEA) is the framework that integrates economic and environmental information in order to gauge efficiency for supply and use of natural resources. It also measures how far the current supply of natural resources be able to support the needs of the country so as to generate future economy.

The indicators and statistics from SEEA will enable policymakers to measure the efficiency and sustainability of energy resources as well as being an input to energy - related policies. It can be used to evaluate the achievement of the Malaysia's five - year development plan and Sustainable Development Goals (SDGs). Figure 2 shows the indicators of SDGs which related to SEEA.

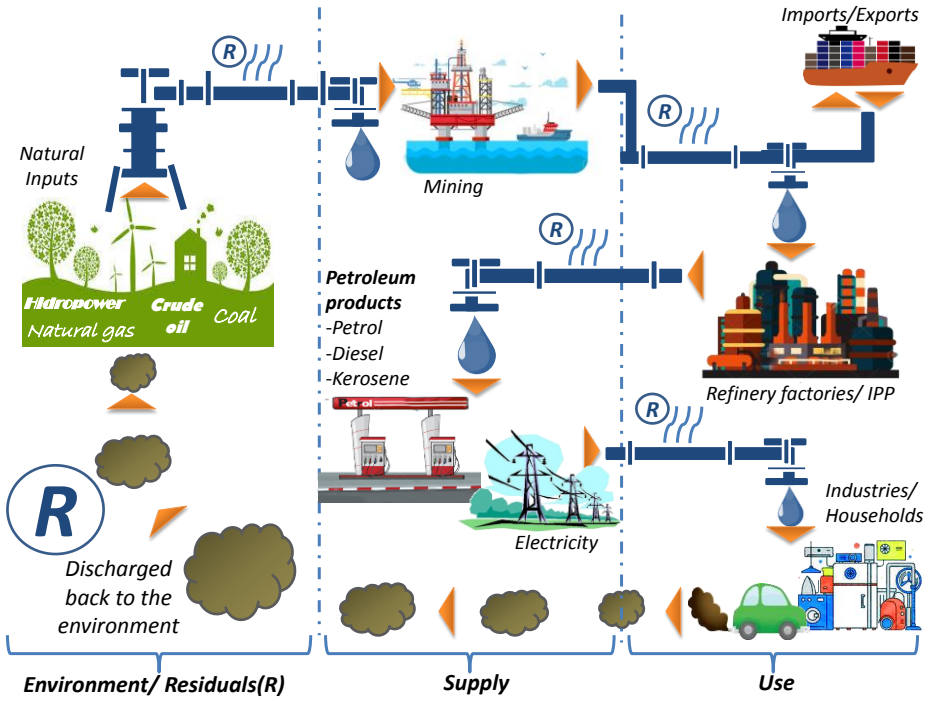
Figure 2: Indicator of SDGs related to SEEA



SEEA development in Malaysia started in 2013 in line with the publication of SEEA Central Framework 2012 by the United Nations. As a starting point, SEEA in Malaysia focused on the Physical Supply and Use Table: Energy Account (MySEEA PSUT Energy). It is used to ascertain the composition of energy contribution, assessment of efficient use of energy resources as well as to measure the sustainability and energy supply security.

The cycle of MySEEA PSUT consists of three main components which are environment, supply of energy products and the use of energy products. The energy source that is produced by the environment are divided into two groups namely non-renewable energy (natural gas, crude oil and coal) and renewable energy (hydropower, solar, biomass etc.). These natural resources input are then extracted and processed to produce energy products.

Figure 3: Cycle of MySEEA PSUT Energy



The supply and use of energy products can be classified into two categories which are transformed energy products and energy products that are used directly by end users. An example of transformed energy products is coal products extracted by the Mining & quarrying sector that is used in the utility sector to generate electricity. There are three main sectors in Malaysia that process and produce energy products namely Mining & quarrying, Manufacturing and Services.

The use of energy products can also be classified into two categories which are domestic demand (economic sectors and households) and exports. During the production process and use of energy products, residuals will be discharged to the environment.

JADUAL

TABLES

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Jadual 1: Penawaran Produk Tenaga, 2015
Table 1: Supply of Energy Product, 2015

ktoe

	Sektor/ *Sectors*					Import/ *Imports*	Aliran dari Alam Semula Jadi/ *Flows From the Environment*	Jumlah Penawaran/ *Total Supply*
	Pertanian/ *Agriculture*	Perlombongan & Pengkuarian/ *Mining & Quarrying*	Pembuatan/ *Manufacturing*	Pembinaan/ *Construction*	Perkhidmatan/ *Services*			
i. JUMLAH TENAGA DARI ALAM SEMULA JADI/ *TOTAL ENERGY FROM NATURAL INPUTS*								
Gas asli/ *Natural gas*							71,572	71,572
Minyak mentah/ *Crude oil*							34,351	34,351
Arang batu & kok/ *Coal & coke*							1,773	1,773
Kuasa hidro/ *Hydropower*							3,582	3,582
Solar							75	75
Biomass							189	189
Biogas							18	18
Biodiesel							684	684
JUMLAH TENAGA DARI ALAM SEMULA JADI/ *TOTAL ENERGY FROM NATURAL INPUTS*							**112,243**	**112,243**
ii. PRODUK TENAGA/ *ENERGY PRODUCTS*								
Gas asli/ *Natural gas*	-	67,580	-	-	-	5,941		73,521
LNG	-	-	31,057	-	-	1,873		32,930
Minyak mentah/ *Crude oil*	-	33,955	-	-	-	9,357		43,312
Arang batu & kok/ *Coal & coke*	-	1,773	-	-	-	15,999		17,771
Produk petroleum/ *Petroleum products*	-	-	25,553	-	-	16,120		41,674
Petrol	-	-	5,236	-	-	7,710		12,946
Diesel	-	-	10,036	-	-	5,155		15,191
Minyak relau/ *Fuel oil*	-	-	1,348	-	-	1,008		2,356
LPG	-	-	1,984	-	-	351		2,335
Kerosin/ *Kerosene*	-	-	50	-	-	35		85
ATF & AV gas	-	-	2,768	-	-	1,646		4,414
Bukan tenaga/ *Non-energy*	-	-	4,131	-	-	216		4,347
Gas penapisan/ *Refinery gas*	-	-	-	-	-	-		-
Kuasa hidro/ *Hydropower*	-	-	-	-	1,346	-		1,346
Solar	-	-	-	-	-	-		-
Biomass	-	-	-	-	-	-		-
Biogas	-	-	-	-	-	-		-
Biodiesel	-	-	684	-	-	-		684
Elektrik/ *Electricity*	-	-	317	-	11,057	1		11,375
Lain-lain/ *Others*	-	-	26	-	-	13		39
JUMLAH PRODUK TENAGA/ *TOTAL ENERGY PRODUCTS*	**-**	**103,307**	**57,637**	**-**	**12,403**	**49,304**		**222,652**

Nota/ *Note* : Tidak berkaitan/ *Not related*

Jadual 2: Penggunaan Produk Tenaga, 2015
Table 2: Use of Energy Product, 2015

ktoe

	Sektor/ *Sectors*								
	Pertanian/ *Agriculture*	Perlombongan & Pengkuarian/ *Mining & Quarrying*	Pembuatan/ *Manufacturing*	Pembinaan/ *Construction*	Perkhidmatan/ *Services*	Isi rumah/ *Households*	*Accumulation*	Eksport/ *Exports*	Jumlah Penggunaan/ *Total Use*
i. JUMLAH TENAGA DARI ALAM SEMULA JADI/ *TOTAL ENERGY FROM NATURAL INPUTS*									
Gas asli/ *Natural gas*	-	71,572	-	-	-				**71,572**
Minyak Mentah/ *Crude oil*	-	34,351	-	-	-				**34,351**
Arang batu & kok/ *Coal & coke*	-	1,773	-	-	-				**1,773**
Kuasa hidro/ *Hydropower*	-	-	-	-	3,582				**3,582**
Solar	-	-	-	-	75				**75**
Biomass	-	-	-	-	189				**189**
Biogas	-	-	-	-	18				**18**
Biodiesel	-	-	-	-	684				**684**
JUMLAH TENAGA DARI ALAM SEMULA JADI/ *TOTAL ENERGY FROM NATURAL INPUTS*	**-**	**107,695**	**-**	**-**	**4,548**				**112,243**
ii. PRODUK TENAGA/ *ENERGY PRODUCTS*									
Gas asli/ *Natural gas*	-	134	56,413	4	15,906	1	-	1,062	**73,521**
LNG	-	-	-	-	2,873	-	-	30,057	**32,930**
Minyak mentah/ *Crude oil*	-	-	26,802	-	-	-	543	15,968	**43,312**
Arang batu & kok/ *Coal & coke*	-	-	1,778	-	15,627	-	-10	377	**17,771**
Produk petroleum/ *Petroleum products*	775	739	3,822	809	11,899	11,919	-597	12,307	**41,674**
Petrol	63	24	511	157	2,375	9,387	-	429	**12,946**
Diesel	648	672	2,200	605	5,267	348	-491	5,943	**15,191**
Minyak relau/ *Fuel oil*	-	17	375	19	316	-	81	1,548	**2,356**
LPG	3	7	387	7	633	1,187	-161	272	**2,335**
Kerosin/ *Kerosene*	-	-	4	-	-	-	4	77	**85**
ATF & AV gas	-	-	-	-	3,134	-	-96	1,376	**4,414**
Bukan tenaga/ *Non-energy*	60	20	346	20	175	997	67	2,662	**4,347**
Gas penapisan/ *Refinery gas*	-	-	-	-	-	-	-	-	**-**
Kuasa hidro/ *Hydropower*	-	-	-	-	1,346	-	-	-	**1,346**
Solar	-	-	-	-	-	-	-	-	**-**
Biomass	-	-	-	-	-	-	-	-	**-**
Biogas	-	-	-	-	-	-	-	-	**-**
Biodiesel	-	-	-	-	388	-	114	182	**684**
Elektrik/ *Electricity*	46	11	4,596	683	3,708	2,332	-	-	**11,375**
Lain-lain/ *Others*	-	-	-	-	-	-	-	39	**39**
JUMLAH PRODUK TENAGA/ *TOTAL ENERGY PRODUCTS*	**821**	**885**	**93,410**	**1,495**	**51,747**	**14,252**	**50**	**59,991**	**222,652**

Nota/ *Note* : Tidak berkaitan/ *Not related*

Jadual 2a: Penggunaan Produk Tenaga - Transformasi, 2015
Table 2a: Use of Energy Product - Transformation, 2015

ktoe

	Sektor/ *Sectors*					Isi rumah/ *Households*	*Accumulation*	Eksport/ *Exports*	Jumlah Penggunaan/ *Total Use*
	Pertanian/ *Agriculture*	Perlombongan & Pengkuarian/ *Mining & Quarrying*	Pembuatan/ *Manufacturing*	Pembinaan/ *Construction*	Perkhidmatan/ *Services*				
Gas asli/ *Natural gas*	-	-	47,874	-	15,017				**62,891**
LNG	-	-	-	-	2,873				**2,873**
Minyak mentah/ *Crude oil*	-	-	26,802	-	-				**26,802**
Arang batu & kok/ *Coal & coke*	-	-	-	-	15,627				**15,627**
Produk petroleum/ *Petroleum products*	-	-	51	-	380				**431**
Diesel	-	-	51	-	279				**330**
Minyak relau/ *Fuel oil*	-	-	-	-	101				**101**
Kuasa hidro/ *Hydropower*	-	-	-	-	1,346				**1,346**
Jumlah Transformasi Produk Tenaga/ *Total Transformation of Energy Products*	-	-	**74,727**	-	**35,243**				**109,970**

Jadual 2b: Penggunaan Produk Tenaga - Penggunaan Akhir, 2015
Table 2b: Use of Energy Product - Final Use, 2015

ktoe

	Sektor/ *Sectors*					Isi rumah/ *Households*	*Accumulation*	Eksport/ *Exports*	Jumlah Penggunaan/ *Total Use*
	Pertanian/ *Agriculture*	Perlombongan & Pengkuarian/ *Mining & quarrying*	Pembuatan/ *Manufacturing*	Pembinaan/ *Construction*	Perkhidmatan/ *Services*				
Gas asli/ *Natural gas*	-	134	8,539	4	889	1	-	1,062	**10,629**
LNG	-	-	-	-	-	-	-	30,057	**30,057**
Minyak mentah/ *Crude oil*	-	-	-	-	-	-	543	15,968	**16,511**
Arang batu & kok/ *Coal & coke*	-	-	1,778	-	-	-	-10	377	**2,144**
Produk petroleum/ *Petroleum products*	775	739	3,771	809	11,519	11,919	-597	12,307	**41,243**
Petrol	63	24	511	157	2,375	9,387	-	429	**12,946**
Diesel	648	672	2,149	605	4,988	348	-491	5,943	**14,861**
Minyak relau/ *Fuel oil*	-	17	375	19	215	-	81	1,548	**2,255**
LPG	3	7	387	7	633	1,187	-161	272	**2,335**
Kerosin/ *Kerosene*	-	-	4	-	-	-	4	77	**85**
ATF & AV gas	-	-	-	-	3,134	-	-96	1,376	**4,414**
Bukan tenaga/ *Non-energy*	60	20	346	20	175	997	67	2,662	**4,347**
Biodiesel	-	-	-	-	388	-	114	182	**684**
Elektrik/ *Electricity*	46	11	4,596	683	3,708	2,332	-	-	**11,375**
Lain-lain/ *Others*	-	-	-	-	-	-	-	39	**39**
Jumlah Penggunaan Akhir Produk Tenaga/ *Total End-Use of Energy Products*	**821**	**885**	**18,683**	**1,495**	**16,504**	**14,252**	**50**	**59,991**	**112,682**

Nota/ *Note* : Tidak berkaitan/ *Not related*

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NOTA TEKNIKAL

TECHNICAL NOTES

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1. Skop & Liputan

Penyusunan MySEEA PSUT Tenaga 2015 adalah selaras dengan metadologi yang ditetapkan dalam Manual *SEEA Central Framework* 2012, SEEA *Energy* dan *International Recommendations for Energy Statistics* (IRES) yang dikeluarkan oleh *United Nations* (UN). Akaun ini juga menggunakan prinsip residen yang digariskan dalam *System of National* (SNA). Klasifikasi produk tenaga yang digunakan adalah berdasarkan *Standard International Energy Product Classification* (SIEC) yang turut diguna pakai oleh *United Nations Statistics Division* (UNSD) dan *International Energy Agency* (IEA). Unit fizikal yang digunakan dalam akaun ini adalah *kilo tonne of oil equivalent* (ktoe).

1. Scope and Coverage

The compilation of MySEEA PSUT Energy 2015 are in accordance with methodology set forth in the SEEA Central Framework Manual 2012, SEEA Energy and International Recommendations for Energy Statistics (IRES) issued by United Nations. This account also uses resident principle which is outlined in the System of National Accounts (SNA). The classification of energy products used are based on the Standard International Energy Product Classification (SIEC) which is also adopted by the United Nations Statistics Division (UNSD) and the International Energy Agency (IEA). Physical units used in this account is kilo tonne of oil equivalent (ktoe).

2. Konsep dan Definisi

2.1 Tenaga dari Alam Semula Jadi

Tenaga dari alam semula jadi merangkumi aliran tenaga daripada pergerakan dan perolehan tenaga dari alam sekitar oleh residen unit ekonomi. Aliran ini termasuk tenaga daripada mineral (cth: minyak, gas asli, arang batu, dll), dan input daripada sumber tenaga boleh diperbaharui (cth: solar, hidro, biomass, dll).

2.2 Produk Tenaga

Produk tenaga merujuk kepada produk yang digunakan (atau

2. Concept and Definition

2.1 Energy from Natural Inputs

Energy from natural inputs comprise flows of energy from the removal and capture of energy from the environment by resident economic units. These flows include energy from mineral (e.g. oil, natural gas, coal, etc), and inputs from renewable energy sources (e.g. solar, hydro, biomass, etc).

2.2 Energy Products

Energy products refers to products that are used (or might be used) as a source of energy. It comprises:

mungkin digunakan) sebagai sumber tenaga. Ia merangkumi:

i. Bahan api yang dihasilkan/ dijana oleh unit ekonomi (termasuk isi rumah) dan digunakan (atau mungkin digunakan) sebagai sumber tenaga;
ii. Elektrik yang dijana oleh unit ekonomi (termasuk isi rumah); dan
iii. Haba yang dijana dan dijual kepada pihak ketiga oleh unit ekonomi. Produk tenaga termasuk tenaga daripada biomas dan sisa pepejal yang dibakar untuk pengeluaran elektrik dan/atau haba. Sesetengah produk tenaga boleh digunakan untuk tujuan bukan tenaga.

i. Fuels that are produced/generated by an economic unit (including households) and are used (or might be used) as sources of energy;
ii. Electricity that is generated by an economic unit (including households); and
iii. Heat that is generated and sold to third parties by an economic unit. Energy products include energy from biomass and solid waste that are combusted for the production of electricity and/or heat. Some energy products may be used for non-energy purposes.

2.3 Transformasi Produk Tenaga

Transformasi merupakan satu proses menghasilkan produk tenaga lain menggunakan produk tenaga daripada sumber semulajadi. Sebagai contoh, produk arang batu (diekstrak oleh sektor Perlombongan & pengkuarian) digunakan dalam sektor utiliti untuk menghasilkan tenaga elektrik.

2.3 Transformations of Energy Products

Transformation is a process of producing other energy products using energy products from natural sources. For example, coal products (extracted by Mining and quarrying sector) are used in the utility sector to produce electricity.

2.4 Natural Gas

Natural gas is a mixture of gaseous hydrocarbons, primarily methane, but generally also including ethane, propane and higher hydrocarbons in much smaller amounts and some non- combustible gases such as nitrogen and carbon dioxide.

The majority of natural gas is separated from both "non-associated" gas originating from fields producing hydrocarbons only in gaseous form, and "associated" gas produced in association with crude oil.

The separation process produces natural gas by removing or reducing the hydrocarbons other than methane to levels which are acceptable in the marketable gas. The natural gas liquids (NGL) removed in the process are distributed separately.

Natural gas also includes methane recovered from coal mines (colliery gas) or from coal seams (coal seam gas) and shale gas. When distributed it may also contain methane from anaerobic fermentation or the methanation of biomass.

Natural gas may be liquefied (LNG) by reducing its temperature in order to simplify storage and transportation when production sites are remote from centres of consumption and pipeline transportation is not economically practicable.

2.5 Liquified Natural Gas (LNG)

Liquid or liquefied hydrocarbons converted from natural gas in separation facilities or gas processing plants. Natural gas liquids include ethane, propane, butane (normal and iso-), (iso) pentane and pentanes plus (sometimes referred to as natural gasoline or plant condensate).

2.6 Crude Oil

Crude oil refers to a mineral oil of fossil origin extracted by conventional means from underground reservoirs, and comprises liquid or near-liquid hydrocarbons and associated impurities such as sulphur and metals. Crude oil exists in the liquid phase under normal surface temperature and pressure, and usually flows to the surface under the pressure of the reservoir. This is termed "conventional" extraction. Crude oil includes condensate from condensate fields, and "field" or "lease" condensate extracted with the crude oil.

The various crude oils may be classified according to their sulphur content ("sweet" or "sour") and API gravity ("heavy" or "light"). There are no rigorous specifications for the classifications but a heavy crude oil may be assumed to have an API gravity of less than 20º and a sweet crude oil may be assumed to have less than 0.5% sulphur content.

2.7 Coal & Coke

Coal & coke includes the solid, cellular, infusible material remaining after the carbonisation of certain coals. Various cokes are defined according to the type of coal carbonised and their conditions of carbonisation or use: coke oven coke, gas coke, coke breeze and semi cokes.

2.8 Petrol

Petroleum distillate used as fuel in spark-ignition internal combustion engines. Distillation range is within 30°C and 250°C.

2.9 Diesel

Diesel distillation falls within 200°C to 340°C. Diesel fuels for high-speed diesel engines (automotive) are more critical of fuel quality than diesel for stationary and marine diesel engines. Marine oil usually consists of a blend of diesel oil and some residual (asphaltic) material.

2.10 Fuel Oil

Fuel oil comprises residual fuel oil and heavy fuel oil. Residual fuel oils have a distillation range of 350ºC to 650ºC and a kinematic viscosity in the range 6 to 55 cSt at 100ºC. Their flash point is always above 60ºC and their specific gravity is above 0.95. Heavy fuel oil is a general term describing a blended product based on the residues from various refinery processes.

Other names commonly used to describe fuel oil include: bunker fuel, bunker C, fuel oil No. 6, industrial fuel oil, marine fuel oil and black oil. Residual and heavy fuel oil are used in medium to large industrial plants, marine applications and power stations in combustion equipment such as boilers, furnaces and diesel engines. Residual fuel oil is also used as fuel within the refinery.

2.11 Liquified Petroleum Gases (LPG)

LPG refers to liquefied propane (C3H8) and butane (C4H10) or mixtures of both. Commercial grades are usually mixtures of the gases with small amounts of propylene, butylene, isobutene and isobutylene stored under pressure in containers.

The mixture of propane and butane used varies according to purpose and season of the year. The gases may be extracted from natural gas at gas separation plants or at plants re-gasifying imported liquefied natural gas. They are also obtained during the refining of crude oil. LPG may be used for heating and as a vehicle fuel.

2.12 Kerosene

Kerosene refers to mixtures of hydrocarbons in the range C_9 to C_{16} and distilling over the temperature interval 145ºC to 300°C, but not usually above 250ºC and with a flash point above 38ºC. The chemical compositions of kerosene depend on the nature of the crude oils from which they are derived and the refinery processes that they have undergone. Kerosene obtained from crude oil by atmospheric distillation are known as straight-run kerosene. Such streams may be treated by a variety of processes to produce kerosene that are acceptable for blending as jet fuels.

Kerosene are primarily used as jet fuels. They are also used as domestic heating and cooking fuels, and as solvents. Kerosene may include components or additives derived from biomass when blended.

2.13 Aviation Turbine Fuel (ATF)

ATF refers to light hydrocarbons for use in aviation turbine power units, distilling between 100ºC and 250ºC. They are obtained by blending kerosene and gasoline or naphtha in such a way that the aromatic content does not exceed 25 per cent in volume, and the vapour pressure is between 13.7 kPa and 20.6 kPa. Gasoline-type jet fuel is also known as "aviation turbine fuel".

2.14 Aviation Gasoline (AV Gas)

AV gas prepared especially for aviation piston engines with additives which assure performance under flight conditions. Aviation gasolines are predominantly alkylates (obtained by combining C4 and C5 isoparaffins with C3, C4 and C5 olefins) with the possible addition of more aromatic components including toluene. The distillation range is 25ºC to 170ºC.

2.15 Non Energy Products

Non energy products mainly refers to naphtha bitumen and lubricants, which are obtained by the refinery process from petroleum but used for non-energy purposes. Naphtha is a refined or partly refined light distillate, which is further, blended into motor gasoline or used as feed-stock in the chemical industry. Bitumen is a viscous liquid or solid, non-volatile and possesses waterproofing and adhesive properties. Lubricating oil is used for lubricating purposes and has distillation range within 380°C to 500°C.

2.16 Refinery Gas

Refinery gas refers to the gas released during the distillation of crude oil and comprises methane, ethane, propane and butane. Most refinery gas is retained in the refinery and used as fuel in plant operations.

2.17 Hydropower

Hydropower is electricity generation using the power of falling water.

2.18 Solar

Solar refers to electricity that can be generated through different processes such as: the conversion of energy contained in falling or streaming water, wind or waves; the direct conversion of solar radiation through photovoltaic processes in semiconductor devices (solar cells); or by the combustion of fuels.

2.19 Biomass

Biomass refers to waste material from plants or animals that is not used for food or feed. It can be waste from farming (rice husks, rice stems, palm fronds, coconut shells) or horticulture (yard waste), food processing (corn cobs), animal farming (manure rich in nitrogen and phosphorus), or human waste from sewage plants.

2.20 Biogases

Biogases refers to gases arising from the anaerobic fermentation of biomass and the gasification of solid biomass (including biomass in wastes). The biogases from anaerobic fermentation are composed principally of methane and carbon dioxide and comprise landfill gas, sewage sludge gas and other biogases from anaerobic fermentation.

Biogases can also be produced from thermal processes (by gasification or pyrolysis) of biomass and are mixtures containing hydrogen and carbon monoxide (usually known as

syngas) along with other components. These gases may be further processed to modify their composition and can be further processed to produce substitute natural gas.

The gases are divided into two groups according to their production: biogases from anaerobic fermentation and biogases from thermal processes. They are used mainly as a fuel but can be used as a chemical feedstock.

2.21 Electricity

Electricity refers to the transfer of energy through the physical phenomena involving electric charges and their effects when at rest and in motion.

Electricity can be generated through different processes such as: the conversion of energy contained in falling or streaming water; the direct conversion of solar radiation through photovoltaic processes in semiconductor devices (solar cells); or by the combustion of fuels

2.22 Eksport dan Import

Eksport merujuk kepada jumlah tenaga yang dijual oleh residen kepada bukan residen manakala Import pula meliputi jumlah tenaga yang dibeli daripada bukan residen oleh residen.

2.22 Imports and Exports

Exports refers to the amount of energy sold by a resident to a non-resident while the Imports cover the amount of energy purchased from non-resident by the resident.

2.23 Isi Rumah

Isi rumah meliputi seorang atau sekumpulan orang yang bersaudara dan/atau orang yang tidak bersaudara yang biasanya tinggal bersama dan membuat peruntukan yang sama untuk makanan dan keperluan hidup yang lain.

2.23 Household

Household consists of related and/or unrelated persons who usually live together and make common provisions for food and other essentials of living.

2.24 Analisis Intensiti

Analisis intensiti mengukur kecekapan tenaga yang digunakan bagi menghasilkan satu unit output mengikut sektor ekonomi.

Keamatan tenaga

= Penggunaan tenaga (toe)

Nilai tambah (RM) - harga malar

2.24 Intensity Analysis

Intensity analysis measure the energy efficiency used to produce one unit output by economic sector.

Energy Intensity

= Energy Use (toe)

Value Added (RM) - constant price

2.25 Analisis Pengganda

Analisis pengganda mengukur kesalingbergantungan secara langsung dan tidak langsung antara satu sektor dengan keseluruhan ekonomi yang melibatkan pembelian dan penjualan antara sektor.

2.25 Multiplier Analysis

Multiplier analysis measures directly and indirectly the interdependence between one sector and the rest of the economy that involves in purchasing and selling between the sectors.

3. Klasifikasi Sektor

Pengkelasan sektor ekonomi adalah berdasarkan Piawaian Klasifikasi Industri Malaysia (MSIC) 2008 Ver. 1.0. Bagi tujuan laporan ini, ia dikategorikan kepada lima sektor utama seperti berikut:

i. Pertanian;
ii. Perlombongan & pengkuarian;
iv. Pembuatan;
v. Pembinaan; dan
vi. Perkhidmatan.

3. Sectors Classification

The classification of the economic sector is according to the Malaysia Standards Industrial Classification (MSIC) 2008 Ver. 1.0. For the purpose of this publication, the classification is broadly categorised into five main sectors as follows:

i. Agriculture;
ii. Mining & quarrying;
iii. Manufacturing;
iv. Construction; and
v. Services.

4. Sumber Data

Sumber data bagi penyusunan MySEEA PSUT-Tenaga adalah seperti berikut:

i. Sumber Primer: Perangkaan Petroleum & Gas Asli, Perangkaan Perdagangan Luar Negeri, Banci Ekonomi, Jadual Input-Output dan Penyiasatan Perbelanjaan Isi Rumah.

ii. Sumber Sekunder: Statistik Imbangan Tenaga Nasional (NEB) yang disusun oleh Suruhanjaya Tenaga.

4. Data Source

The source of data for the preparation of MySEEA PSUT-Energy is as follows:

i. Primary Sources: Natural Petroleum & Gas Statistics, External Trade Statistics, Economic Censuses, Input-Output Tables and Household Expenditure Survey.

ii. Secondary Sources: National Energy Balance (NEB) statistics compiled by the Energy Commission.

5. Pembundaran

Perbezaan mungkin berlaku pada jumlah subkomponen dan jumlah besar disebabkan pembundaran angka.

5. Rounding

Differences may occur between the sum of subcomponents and the totals due to rounding figure.

6. Singkatan/*Abbreviations*

ATF	*Aviation Turbine Fuel*
cth	*contoh*
dll	*dan lain lain*
e.g.	*example*
etc.	*etcetera*
i.e.	*that is*
IEA	*International Energy Agency*
IPP	*Independent Power Producers*
IRES	*International Recommendations for Energy Statistics*
ISIC	*International Standard Industrial Classification*
ktoe	*kilo tonne of oil equivalent*

LNG	Gas Asli Cecair/ *Liquefied Natural Gas*
LPG	Gas Petroleum Cecair/ *Liquefied Petroleum Gas*
MSIC	Piawaian Klasifikasi Industri Malaysia/ *Malaysia Standards Industrial Classification*
NEB	Imbangan Tenaga Nasional/ *National Energy Balance*
PSUT	Jadual Fizikal Penawaran & Penggunaan/ *Physical Supply & Use Table*
RM	Ringgit Malaysia
SEB	*Sarawak Energy Bhd.*
SEEA	*System of Environmental-Economic Accounting*
SESB	*Sabah Electricity Sdn. Bhd.*
SIEC	*Standard International Energy Product Classification*
SNA	*System of National Accounts*
SUT	*Supply & Use Table*
TNB	Tenaga Nasional Berhad
toe	*tonne of oil equivalent*
UN	*United Nations*
UNSD	*United Nations Statistics Division*

LAMPIRAN

APPENDIX

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The differences between National Energy Balance and MySEEA PSUT Energy

Item	*National Energy Balance*	*MySEEA PSUT Energy*
Format presentation	***International Energy Agency (IEA)*** *Commodity by economic activity (industries classification is modified from ISIC and not consistent with SNA).* *E.g. the consumption of fuel for all transport is recorded in "Transport" sector.*	***Supply & Use Table (SUT)*** *Commodity by economic activity and using ISIC for industries classification that is consistent with SNA.* *E.g. the consumption of fuel for transport will be distributed according to industries' activites/sectors.*
Component	***Primary Supply*** *- energy entering the national territory & energy exiting from the national territory (exports/international bunkering) and stock changes.* ***Secondary Supply*** *- energy transformation, energy industries own use & losses.* ***Final consumption*** *- use of fuel, electricity and heat delivered to final consumers of energy.*	***Supply*** *- consist of 3 components i.e . Energy form natural input (primary production), Energy product (Output+import) & Energy residual.* ***Use*** *- Energy form natural input, Energy product (intermediate consumption, exports, international bunkers, accumulation, and final consumptions) & Energy residual.*
Residuals/ losses	***Losses*** *- generated from commodity (flaring, distribution, storage & transformation).*	***Residual*** *- generated from commodity & sector (flaring, distribution, storage, transformation & end use).*
Boundary	***Territory principle/location*** • *National territory.* • *Outside the territory are considered rest of the world.*	***Resident principle*** • *Based on institution units that are resident of a particular national economy.* • *Non-residence unit are considered rest of the world.*
Analysis	***Aggregated energy indicators*** *Energy intensity = Final energy demand (toe)/GDP at 2000 prices (RM Million)*	***Energy indicators by sectors*** • *Energy intensity = Energy use by sectors (toe)/Value added at constant 2010 prices by sectors (RM Million)* • *Energy multiplier by detail sectors* • *Energy decomposition*

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ROAD TO UPCOMING EVENTS
HARI STATISTIK NEGARA
20 October
WRC 2019
Banci Perdagangan Borong & Runcit
Wholesale & Retail Trade Census
March - September 2019
HIES/BA 2019
Data Shaping People's Wellbeing
January - December
62nd ISI World Statistics Congress
ISI 2019 Kuala Lumpur
18-23 August | www.isi2019.org
POPULATION & HOUSING CENSUS MALAYSIA 2020
YOUR DATA IS OUR FUTURE
July 2020
SUSTAINABLE DEVELOPMENT GOALS MALAYSIA
2015 - 2025
@StatsMalaysia | | @mycensus2020
@ISIWSC2019
#MyStatsMalaysia || #MyRetailCensus || #HIES2019 || #ISIWSC2019 || #MyCensus2020 || #LeaveNoOneBehind