Chapter 2

Energy and Transport Policy in Malaysia

2.1 Malaysia's Intended Nationally Determined Contributions

Malaysia's government submitted its Intended Nationally Determined Contributions (INDC) in January 2016. Malaysia intends to reduce its greenhouse gas (GHG) emissions intensity of gross domestic product (GDP) by 45% by 2030 relative to that of 2005. This consists of 35% on an unconditional basis and a further 10% is conditional upon receipt of climate finance, technology transfer, and capacity building from developed countries**.**

2.1.1 Overview on INDC

In the original INDC document submitted in January 2016, under the transport sector, only biofuel was meant to reduce GHG emissions. No specific target by each sector was listed. In Malaysia, the potential of reducing the energy and GHG emission was focused on renewables and energy efficiency in the power, industry, commercial, and residential sectors.

The Institute of Energy Economics, Japan (IEEJ) compared its outlook for Malaysia with the country's INDC. IEEJ's outlook has two scenarios. The reference scenario assumes changes based on the historical development of energy supply–demand and moderate policy prospect, whilst the advanced technology scenario assumes application of stronger and ambitious energy environment policies and corresponding technologies.[3]

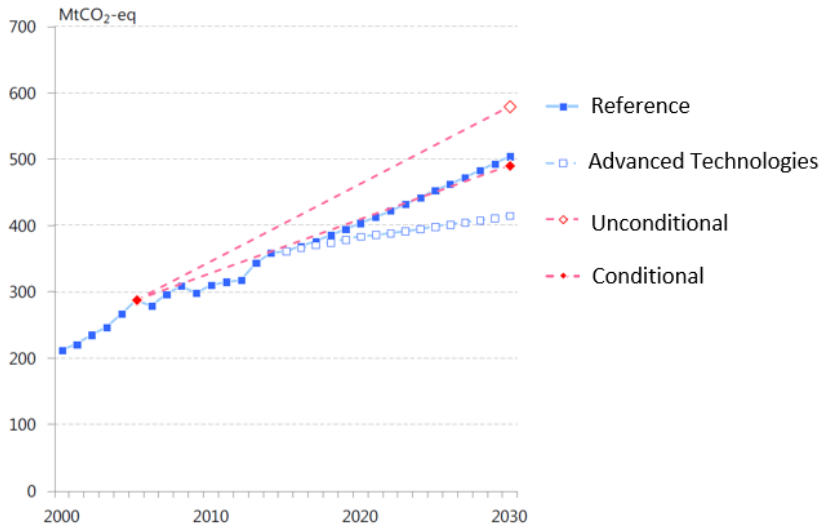
According to an analysis, Malaysia's unconditional INDC is almost the same as or slightly better than the IEEJ's reference scenario.

Since 2016, when Malaysia submitted the INDC, advanced technology such as artificial intelligence and the internet of things has been developing rapidly. For the transport sector, electric vehicles (EVs) are drawing much worldwide attention, and connected cars or autonomous vehicles are just becoming available.

Compared with the intensity of GDP, which is the INDC, the GDP growth rate exceeds the GHG emission growth rate, so the GHG/GDP ratio is expected to decline. However, the total amount of GHG emission will steadily increase. If Malaysia were willing to set itself even more ambitious targets, aggressive measures are required in the energy and the transport sectors that account for large proportions of GHG emissions.

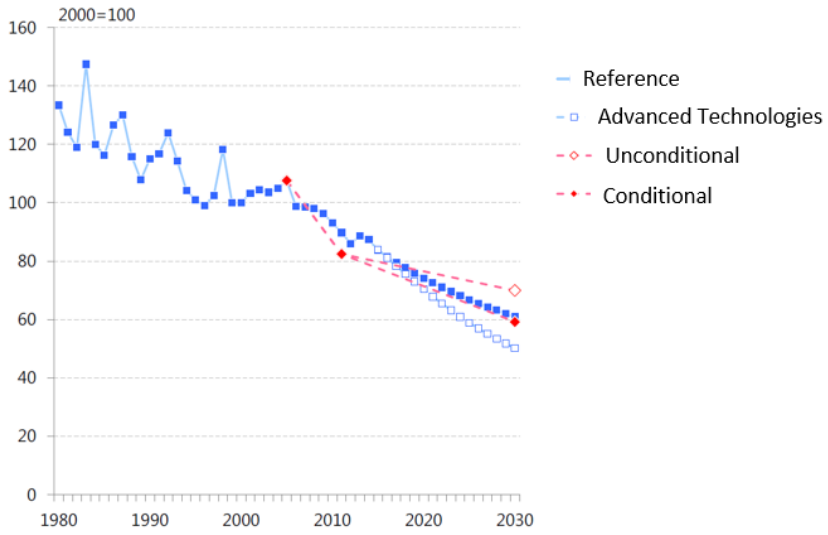
[3] Even applying an ambitious advanced technology scenario, the world cannot halve GHG emission by 2050.

Figure 2.1 GHG Projections Based on the INDC



IEEJ = Institute of Energy Economics, Japan; INDC = Intended Nationally Determined Contributions, Mt-CO_2eq = million tonnes of carbon dioxide equivalent.
*Reference case based on from past trends.
Source: IEEJ (2016).

Figure 2.2 GHG Intensity of GDP Projections Based on the INDC

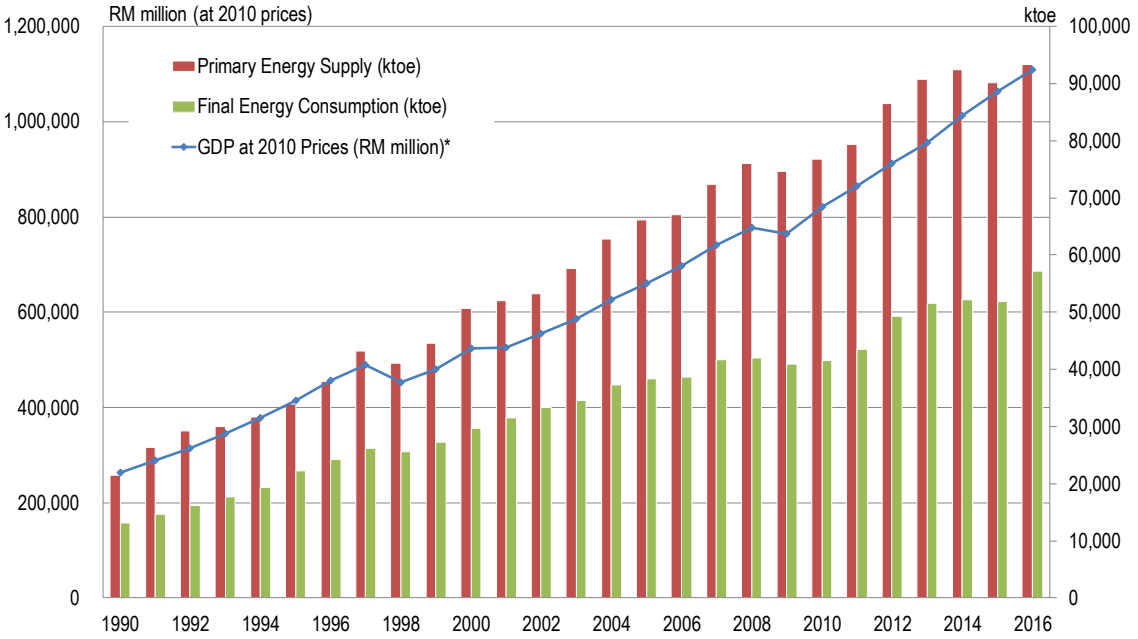


GDP = gross domestic product; GHG = greenhouse gas; IEEJ = The Institute of Energy Economics, Japan; INDC = Intended Nationally Determined Contributions.
*Reference case based on past trends
Source: IEEJ (2016).

2.1.2 Economic and energy background of Malaysia

In 2016, Malaysia's economy recorded growth of 4.2% (2015: 5%) despite considerable external and domestic headwinds. The global economic landscape was challenging, given subdued global demand and low commodity prices. In line with economic growth, performance of energy supply and demand for 2016 recorded a positive movement. Total primary energy supply increased by 3.6% to settle at 93,395 kilo tonnes of oil equivalent (ktoe). Final energy consumption in 2016 posted double-digit growth of 10.5%. The last recorded double-digit growth was in 2012 at 13.4%.

Figure 2.3 Trends in GDP, Primary Energy Supply, and Final Energy Consumption

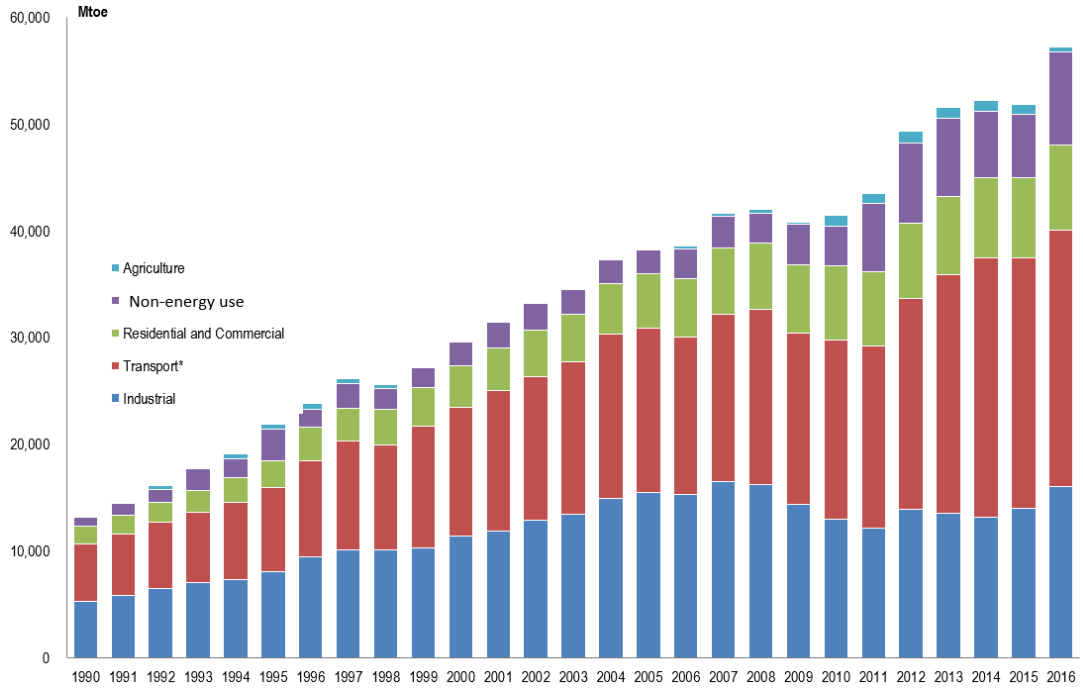


GDP = gross domestic product, ktoe = kilo tonnes of oil equivalent, RM = Malaysian ringgit.
Source: Energy Commission (2018).

The major contributors of growth were the non-energy use and industry sectors. Final energy consumption for non-energy use increased by 47.3% to register at 8,729 ktoe. Higher demand for non-energy use was mainly contributed by natural gas use, which increased by 36.1% in 2016. Total final energy consumption in the industry sector increased by 14.5% to settle at 16,019 ktoe. The increase was mainly due to higher demand for natural gas in the industry sector, especially from Sabah and Sarawak. After a reduction in 2015, total energy consumption in the transport sector increased again by 2.4% to settle at 24,004 ktoe compared to the previous year's 23,435 ktoe. Consumption for petrol in the transport sector was the main contributor for growth as petrol recorded a positive trend of 6% in 2016. Total energy consumption for the residential sector recorded growth of 5.6% to settle at 3,284 ktoe in 2016. Final energy consumption of the commercial sector increased by 7.1% to register at 4,765 ktoe

compared to the previous year's 4,449 ktoe. The agriculture and the fishery sectors recorded a downward trend of 37.7% and 59.1%, respectively.

Figure 2.4 Final Energy Consumption, by Sector



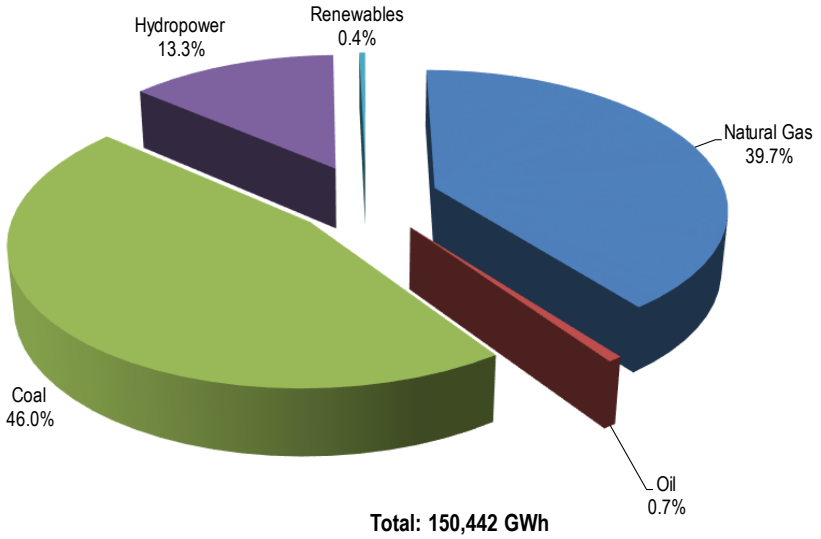
Mtoe = million tonnes of oil equivalent.
Source: Energy Commission (2018).

As of end-2016, Malaysia's total installed power generation capacity was 33,045 MW, an increase of 8.6% from 30,439 MW in 2015. The capacity increase was a result of the commissioning of new power stations – TNB Prai (1,071 MW), TNB Connaught Bridge (375 MW), and Tanjung Bin Energy (1,000 MW), which started operations on 20 February 2016, 27 February 2016, and 21 March 2016, respectively. Total gross electricity generation in 2016 was 156,665 GWh, an increase of 4.3% (2015: 150,190 GWh). Total electricity consumption was 144,024 GWh, an increase of 8.9% from the previous year (2015: 132,199 GWh). Peak demand for Peninsular Malaysia was recorded at 17,788 MW in the second quarter of 2016; Sarawak at 3,005 MW in the fourth quarter of 2016; and Sabah at 945 MW, also in the second quarter of 2016). The calculated reserve margin for Peninsular Malaysia in 2016 was 30.1% and 38.0% for Sarawak, with Sabah at 35.3%.

In Malaysia, the fuel to generate electricity consists of natural gas, coal, hydro, oil, and renewables. Total energy input in power stations increased by 6.7% in 2016 to register at 35,348 ktoe compared to the previous year's 33,133 ktoe. Coal and coke remained the main fuel source of electricity generation in the country, with a share of 48.4% of total fuel inputs or 17,101 ktoe. This was followed by natural gas at 37.5% or 13,260 ktoe; hydropower at 12.7% or

4,499 ktoe; diesel and fuel oil at 0.9% or 320 ktoe; and renewables at 0.5% or 168 ktoe. In terms of the generation mix, in 2016 the share of coal and coke constituted 44.9%, followed by natural gas at 40.7%, hydropower at 13.3%, oil at 0.7%, and the remaining 0.4% was from renewables.

Figure 2.5 Electricity Generation Mix, by Fuel Type, 2016

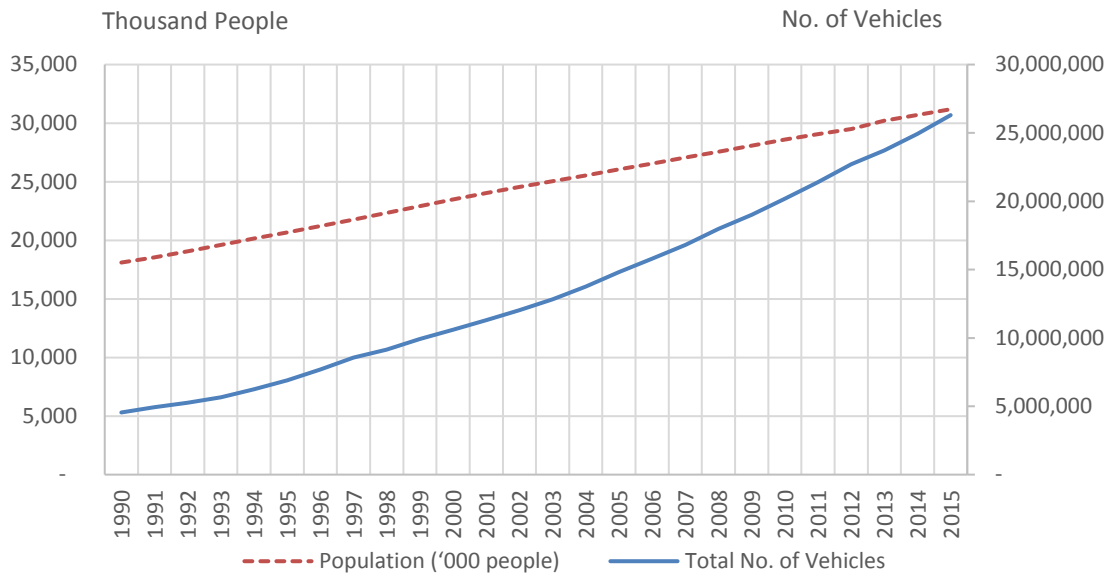


Source: Energy Commission (2018).

2.1.3 Features of Malaysia's transport sector

The number of motor vehicles in Malaysia increased by 7.3% per year on average from about 5 million in 1990 to 26.3 million in 2015. The insufficient public transport infrastructure contributed to the ever-increasing motor vehicle population. In 2015, cars and motorcycles together accounted for about 95% of the vehicles in the country. The increasing population and urbanisation also contributed to the rapid increase in vehicle numbers. Figure 2.6 shows that growth in the number of vehicles in the country has been much faster than population growth. Whilst the total population increased by 2.2% per year in 1990–2015, the number of vehicles in the country increased by 7.3% per year in the same period. As more than 90% of vehicles still run on petroleum fuels, this growth in vehicle population has significantly increased fuel demand and CO_2 emissions. The transport sector relies primarily on petroleum fuels. Presently, this sector accounts for about 45% of total final energy consumption, largely for road transportation modes. The heavy reliance of the transport sector on petroleum products, especially petrol and diesel, is a worrying trend for the future in terms of energy security and CO_2 emissions contribution.

Figure 2.6 Trends in Vehicle Numbers and Population Growth in Malaysia



Source: Ministry of Transport and Department of Statistics Malaysia (2016).

Data from Malaysia's Ministry of Transport showed that in 2015, the total number of vehicles in the country was 26,301,952, 48.9% or 12.9 million of which use gasoline. This was followed by motorcycles at 12,094,790 units or 46% of the total number of vehicles. These two types of vehicles mostly use gasoline or other petroleum products for fuel.

Table 2.1 Breakdown of Fuel Consumption and Number of Vehicles in Road Transport, 2015

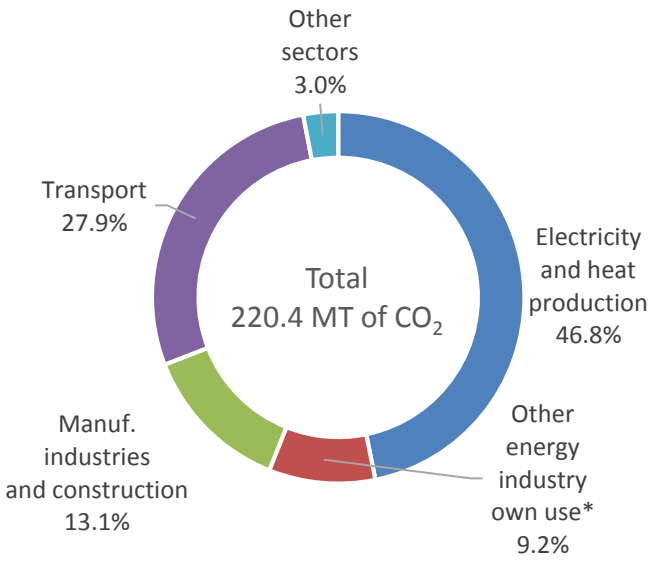
	Gasoline		Natural Gas		Diesel			Total
	Car	Motorcycle	Car	Bus	Car	Bus	Goods Vehicles	
No. of Vehicles	12,864,939	12,094,790	76,230	770	237	66,999	1,197,987	26,301,952
Share (%)	48.9	46.0	0.3	0.0	0.0	0.3	4.6	100.0
Fuel Demand (Mtoe)	8,788	3,766	251	13	504	4,445	1,766	19,533
Share (%)	45.0	19.3	1.3	0.1	2.6	22.8	9.0	100.0

Mtoe = million tonnes of oil equivalent.

Source: Ministry of Transport (2016) and Energy Commission (2018).

Data from the International Energy Agency (IEA) show that in 2015, 220.4 million tonnes of CO_2 equivalent (Mt-CO_2) were emitted from the energy sector (Figure 2.7). Major sectors contributing to CO_2 emissions in the country are electricity generation (46.8%), transport (27.9%), manufacturing (13.1%), and other (residential, commercial, and agriculture) (12.2%).

Figure 2.7 CO_2 Emissions from Fuel Combustion, 2015



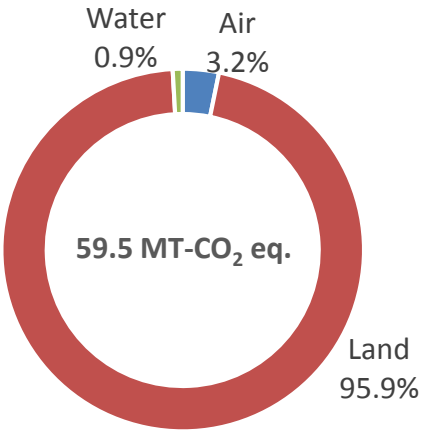
Source: IEA (2017).

Figure 2.8 shows the share of CO_2 emissions in the transport sector by transport mode. Land transportation accounts for the largest share (95.9% of total CO_2 emissions), followed by air and water. Figure 2.9 shows the contribution of different road vehicles in CO_2 emissions and demonstrates that private vehicles (car and motorcycles) represent the largest share of CO_2 emitters, with about 66.4% of the total road transportation sector. This was followed by bus and goods vehicles at 24.0% and 9.5%, respectively.

2.2 Green Technology Master Plan Malaysia 2017–2030

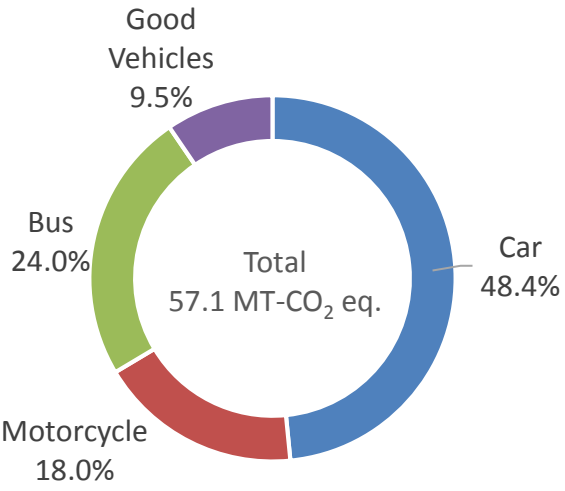
In June 2017, the government released the 'Green Technology Master Plan Malaysia 2017–2040', which outlines the strategic plans to develop green technology and create a low-carbon and resource-efficient economy. The document sets out the immediate course for the country's green growth journey. It lays the foundation for the cultivation of mindset and behavioural change to inculcate a green lifestyle amongst the people. This plan is essential to facilitate the Transformasi Nasional 2050, or TN50, an initiative to position Malaysia amongst the top countries in the world in economic development, citizen well-being, and innovation by the year 2050.

Figure 2.8 CO_2 Emissions, by Transport Mode, 2015



Source: Data calculated modelling results by Mr Zaharin, Energy Commission (2018).

Figure 2.9 CO_2 Emissions of Land Transport, by Mode



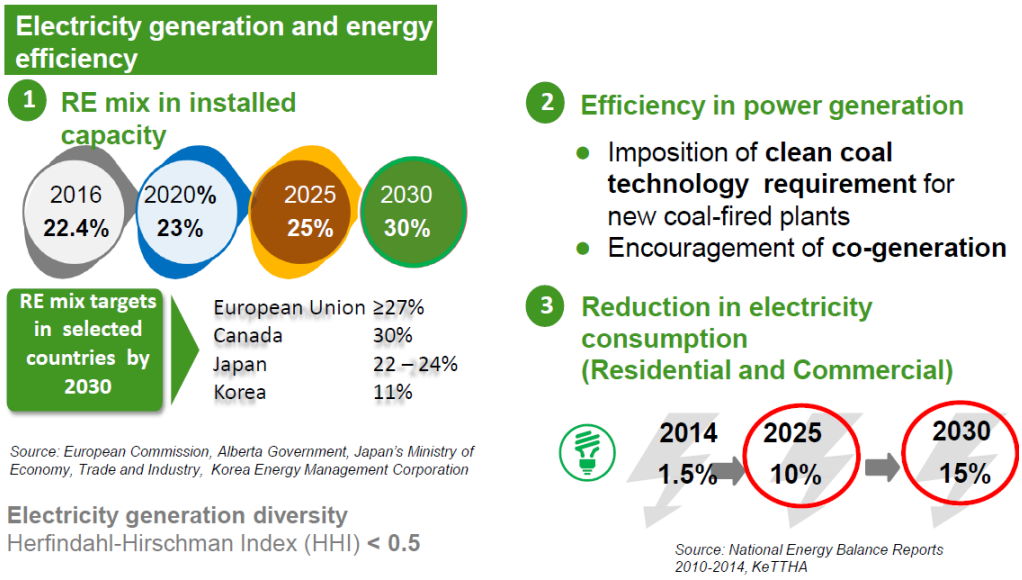
Source: Data calculated modelling results by Mr Zaharin, Energy Commission (2018).

Green technology also offers the capability of mitigating negative environmental impacts resulting from economic activities. There is a growing global need to deal with the dangers of climate change partly through the implementation of green technology. Malaysia's application of green technology provides the solution to realise the country's commitment to the world.

The master plan sets Malaysia's goals in the power and the transport sectors. The three goals of the power sector are as follows:

a) Expand renewable energy generation capacity to 25% in 2025 and 30% in 2030.
b) Introduce highly efficient coal-fired power and promote cogeneration for a more efficient power generation.
c) Reduce consumption of the residential and commercial sectors by 10% in 2025 and 15% by 2030.

Figure 2.10 Targets in the Power Sector

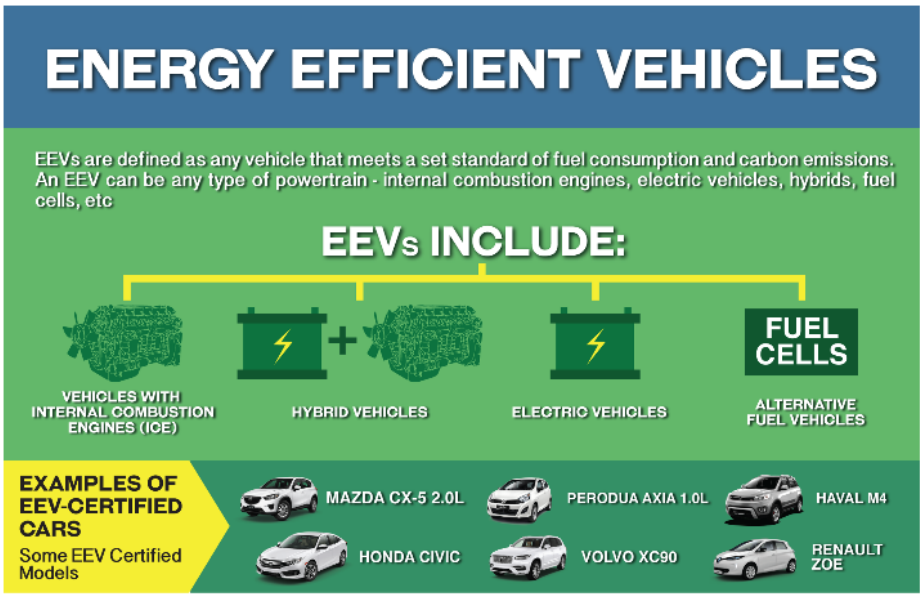


RE = renewable energy.
Source: Ministry of Energy, Green Technology and Water (2017).

The transport sector's three-pronged approach to reducing CO_2 emission is as follows:

a) Double the modal share of public transport from 20.8% in 2018 to 40% in 2030.
b) Change the ratio of EEVs to private vehicles from 32.6% in 2015 to 100% in 2030.
c) Promote the introduction of eco-friendly fuels such as palm oil.

Figure 2.11 Energy-Efficient Vehicles



EEV
STANDARDS FOR PASSENGER VEHICLES

Segment	Classification	Vehicle Kerb Weight	Fuel Economy (L/100KM)
A	Micro Car	<800	4.5
	City Car	801-1,000	5.0
B	Super Mini Car	1,001-1,250	6.0
C	Small Family Car	1,251-1,400	6.5
D	Large Family Car Compact Executive Car	1,401-1,550	7.0
E	Executive Car	1,550-1,800	9.5
F	Luxury Car	1,801-2,050	11.0
	Large 4x4	2.051-2,350	11.5
Others	Others	2,351-2,500	12.0

MAI
Malaysia Automotive Institute
An Agency under the Ministry of International Trade & Industry

Source: Malaysia Automotive Institute (2018).

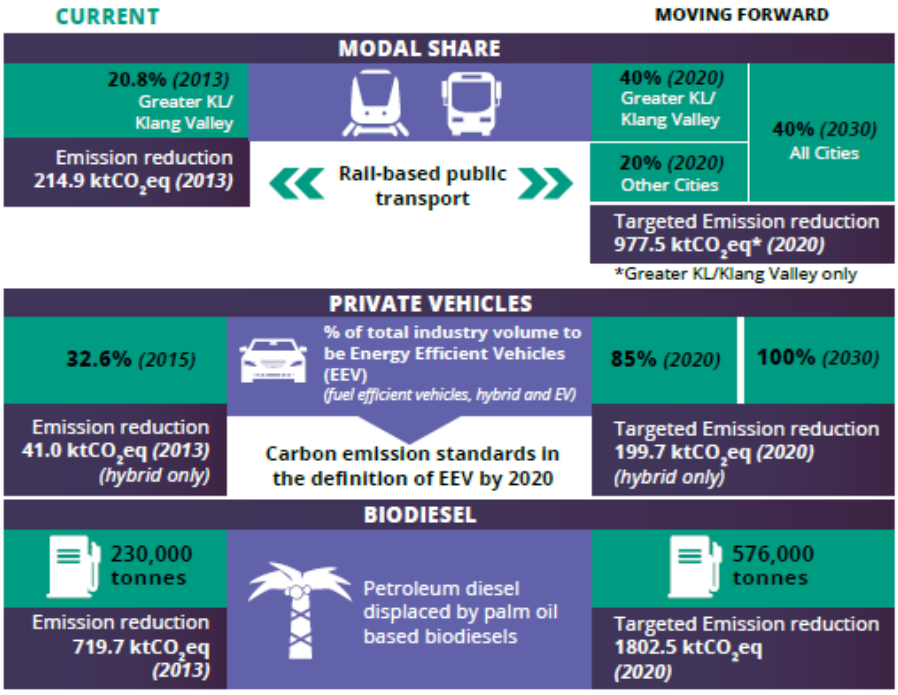
2.3 Transport Policy

The transport policy consists of five policy thrusts, 24 strategies, and 128 action items. It is in line with the Sustainable Development Goals 2030, particularly Goals 9 and 11[4] which emphasised sustainable transport system for all and resilient infrastructure to support socio-economic development. This thrust will ensure that the future enhanced, improved transport system will be efficient, clean, and resilient with minimal impact on the environment and natural resources, whilst providing the country with the necessary mobility. Main action items are as follows.[5]

[4] Goal 9 – Build resilient infrastructure, promote inclusive and sustainable industrialisation, and foster innovation; Goal 11 – Make cities and human settlements inclusive, safe, resilient, and sustainable.

[5] Presented by the Ministry of Transport in the first workshop.

Figure 2.12 Main Targets in the Transport Sector



EV = electric vehicle, $ktCO_2eq$ = kilo tonnes of carbon dioxide equivalent.
Source: Ministry of Energy, Green Technology and Water (2017).

1. Institutionalise green port, green airport, green transport terminals, and green logistics.
2. Develop sustainable and economically viable infrastructure for EEVs, for example, charging stations for EVs.
3. Provide incentives to EEV manufacturers and users and consider different models of EEVs.
4. Phase out two-stroke or non-fuel-efficient motorcycles.
5. Introduce carbon tax and increase tax on imported second-hand vehicles above a certain age.
6. Formulate and implement a fuel economy policy.
7. Facilitate green mobility through provision of necessary infrastructure (e.g. walking path, bicycle lane, covered pedestrian walkway) with safety features, and developing necessary regulatory framework.
8. Prioritise active and non-motorised modes in all urbanised areas and high-pedestrian areas (e.g. car-free zone, bicycle facilities, ban motorcycle in campuses, etc.)
9. Introduce congestion pricing and higher parking rate in city centres.
10. Implement a thorough consumer information and awareness programme by labelling all vehicles sold in the market by their energy efficiency rating.

2.3.1 National Land Public Transport Master Plan

The Land Public Transport Commission (SPAD) was established in 2010. As the central authority managing all aspects of public transport, the commission which is directly under the purview of the Prime Minister is responsible for drawing up public transport policies, plans, and regulations covering all aspects of land public transport.

SPAD launched the National Land Public Transport Master Plan (NLPTMP) in 2012. The master plan provides a high-level timeline to guide the transformation in the public transport service up to the year 2020. The NLPTMP aims to improve the land public transport system in relation to the increase in population, and the demand for accessibility, and quality and safety of public transport. It focuses on urban rail (i.e. mass rapid transit [MRT], light rail transport [LRT], and monorail), bus and other supporting infrastructure (i.e. bus rapid transit, park 'n ride bays, etc.), covering the five focus areas of improvement:

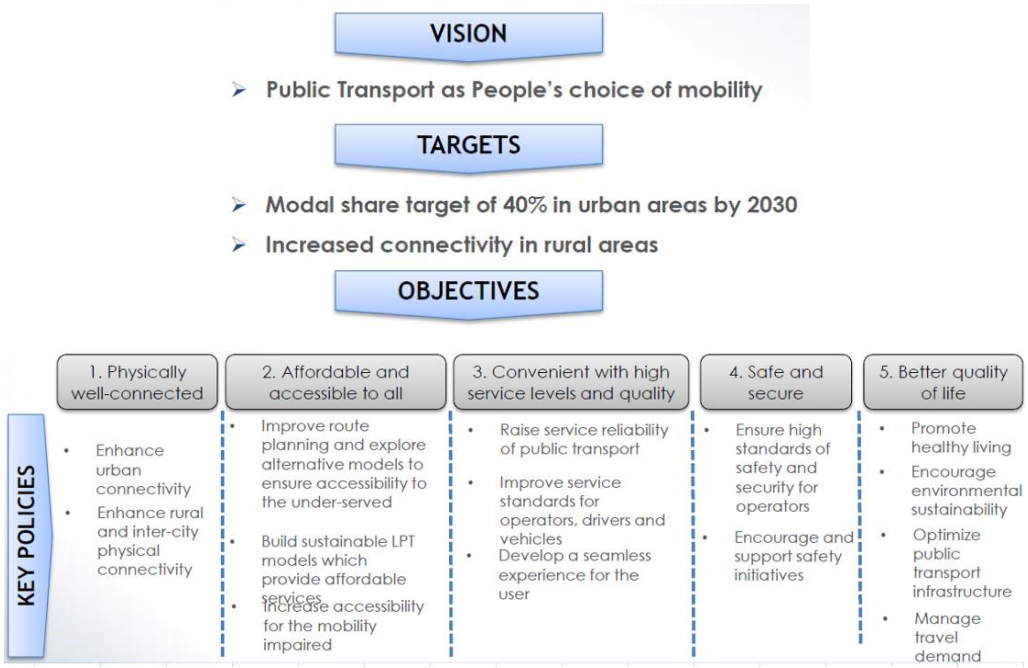
- Physical connectivity to encourage the use of public transport
- Affordability and accessibility so that public transport is available to people from all levels of society
- High service level, quality, and convenience to meet the public's expectations of service, reliability, and all-round user-friendliness
- Safety and security so that the public can be assured of their personal safety whilst using public transport
- Better quality of life by aspiring towards a clean and green environment

2.3.2 Greater Kuala Lumpur/Klang Valley Land Public Transport Master Plan

SPAD had formulated the Greater Kuala Lumpur (GKL)/Klang Valley (KV) Land Public Transport Master Plan for the metropolitan area of Malaysia where congestion is intense. A broad range of projects is under way; railway plans are strongly pushed forward. SPAD's statement published on 6 March 2018 is as follows (SPAD, 2018):

- Malaysians can now enjoy comfortable travelling in urban rail connectivity over the next 5 years with the completion of MRT Line 2 (Sungai–Buloh–Serdang–Putrajaya), the second line of the KVMRT project. The overall project is slated for opening in 2022.
- By 2021, commuters can benefit from the 37 km Bandar Utama–Klang LRT3 Line, construction of which started in the second quarter of 2017. LRT3 features 26 stations, 10 of them offering park and ride facilities for about 6,000 cars. Adding to this connectivity is the KTM SkyPark Link that will connect commuters from KL Sentral to Subang SkyPark Terminal (of the Sultan Abdul Aziz Shah Airport) in only 30 minutes. The 8 km line that connects Subang Jaya to the Subang SkyPark Terminal is under construction.

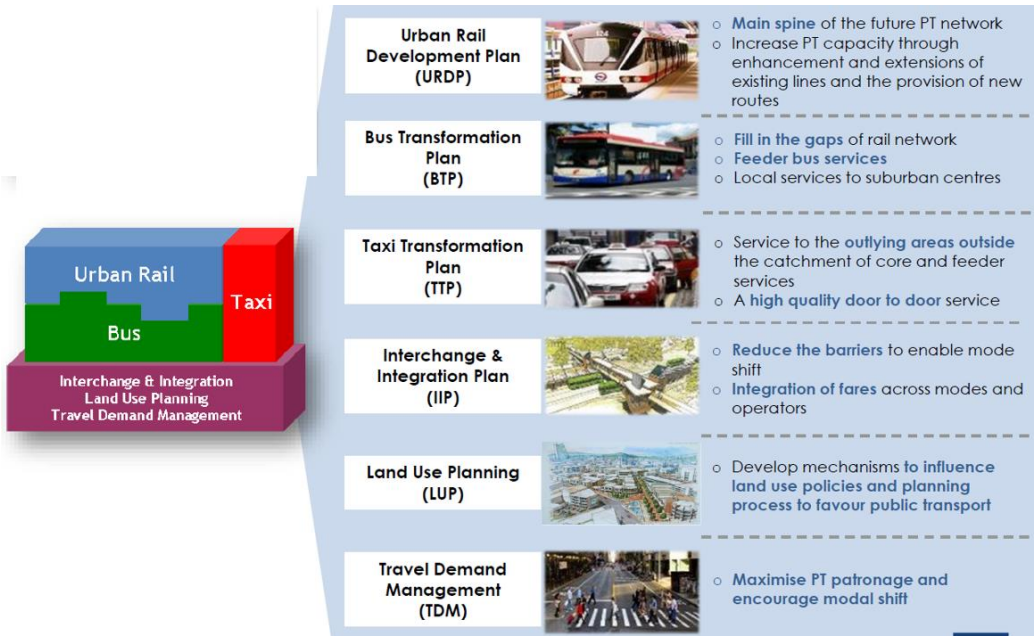
Figure 2.13 Outline of the National Land Public Transport Master Plan



LPT = land public transport.

Source: First workshop on 22 February 2018 presented by the Land Public Transport Commission (SPAD).

Figure 2.14 Outline of GKL/KV Land Public Transport Master Plan



GKL = Greater Kuala Lumpur, KV = Klang Valley, PT = public transport.

Source: First workshop on 22 February 2018 presented by Land Public Transport Commission (SPAD).

2.3.3 Intercity and cross-border connectivity gains momentum[6]

Landmark projects on intercity and cross-border connectivity are under way. SPAD's statement published on 6 March 2018 is as follows:

- Travelling to Singapore will be a hassle-free experience with the upcoming cross-border rail connections. The Kuala Lumpur–Singapore High Speed Rail project is slated to be completed by 2026. It called for a project delivery partner tender and a joint international tender for HSR AssetCo in 2017.
- In January 2018, the governments of Malaysia and Singapore signed the bilateral agreement for the Rapid Transit System (RTS) project at the Leaders' Retreat. Following this, rail operators Prasarana Malaysia Berhad and SMRT signed a letter of agreement to form a joint venture with OpCo to operate the RTS Link.
- By December 2024, commuters could board a train on the 4 km RTS from Bukit Chagar, Johor Bahru to Woodlands North station on the Thomson–East Coast Line. The RTS Link could carry 10,000 commuters an hour in each direction and would ease congestion in the causeway for thousands of commuters and tourists.

2.3.4 National Automotive Policy

The National Automotive Policy (NAP) was introduced in 2006 to transform the domestic automotive industry and integrate it into the increasingly competitive regional and global industry network. NAP was first revised in 2009 to enhance the capability and competitiveness of the automotive industry in Malaysia.

The latest revision, NAP 2014, was made to address the need to reduce carbon emission, and promote EEVs, and to position Malaysia as a EEV hub of the Association of Southeast Asian Nations by 2020. Under NAP 2014, EEVs are vehicles that meet a set of specifications in terms of carbon emission level (gram/kilometre [g/km]) and fuel consumption (l/100km). EEVs include fuel-efficient vehicles, hybrid, EVs, and alternatively fuelled vehicles such as those using compressed natural gas, liquefied petroleum gas, biodiesel, ethanol, hydrogen, and fuel cell.

A new version of NAP 2018 is being revised and is expected to be unveiled in late 2018 (JETRO, 2018).

[6]https://www.spad.gov.my/media-centre/media-releases/2018/land-public-transport-forefront-transformation

2.3.4 Land public transport issues and challenges

Below is a summary of the current land public transport issues and challenges:[7]

a) Different roles and responsibilities between the authorities
   - SPAD's jurisdiction is limited to land public transport matters only
   - Local authorities are responsible for the city's development inclusive of public transport infrastructure (i.e. bus stops, pedestrian walkways) and road/highways

b) The need for NAP and the NLPTMP to be mutually supportive
   - NAP targets to accelerate technology development and allow market expansion for domestic players
   - Meanwhile, SPAD targets to make public transport the people's choice for mobility

c) Lack of coordination between public transport planning and highway and land use planning
   - Town/city development does not include provisional areas for public transport services

d) Limited funding support
   - Currently rely on funding assistance from government

e) The need to improve service reliability and safety
   - Rail system breakdown and derailment incidents
   - Stage buses are not punctual due to congestion
   - Accidents of express buses

2.4 Technology Advancement in the Transport Sector

Malaysia is entering a new era of a more efficient transportation network. A long-awaited Radio Frequency Identification Tag gateless gantry toll system started operation in January 2018. Other landmark projects – East Coast Rail Link, West Coast Expressway, Klang Valley Double Track, LRT3, MRT2, MRT3, and the Pan Borneo Highway – are also in the pipeline or under construction. These projects are expected to boost the country's infrastructure and utility services to keep up with growing public demand.

[7] Presented by SPAD in the first workshop.

2.4.1 Intelligence Transport Systems is set to propose various solutions to traffic problems

Intelligence Transport Systems (ITS) is the application of modern computer electronic and communications technology to transport. These technologies are already revolutionising the way people live, work, and travel.

Some ITS applications already exist in Malaysia. Kuala Lumpur has had a computer-controlled traffic signal system for many years and this is being enhanced and extended. Several expressways around the Klang Valley have computerised monitoring and control systems with variable message signs and traffic detectors. Several electronic toll collection systems are in operation and the 'Touch and Go' smart card is being used for toll collection and on public transport.

Furthermore, from 2020, motorists could access real-time traffic information when the ITS begins implementation of the multi-lane free flow system at toll plazas.

2.4.2 Malaysian Intelligent Transport System Blueprint 2017–2022

The Malaysian Intelligent Transport System Blueprint 2017–2022 identifies nine sectors. The challenge is funding and finding suitable, affordable, and sustainable technology. Also imperative are public–private partnerships to develop the system.

Figure 2.15 Nine Sectors in the Malaysian ITS Blueprint 2017–2022

1. Public Transport
2. Emergency Management
3. Electronic Payment
4. Commercial Vehicle Operations
5. Traveler Information
6. Advanced Traffic Management
7. Advanced Vehicle Control
8. Safety System
9. Information Warehouse

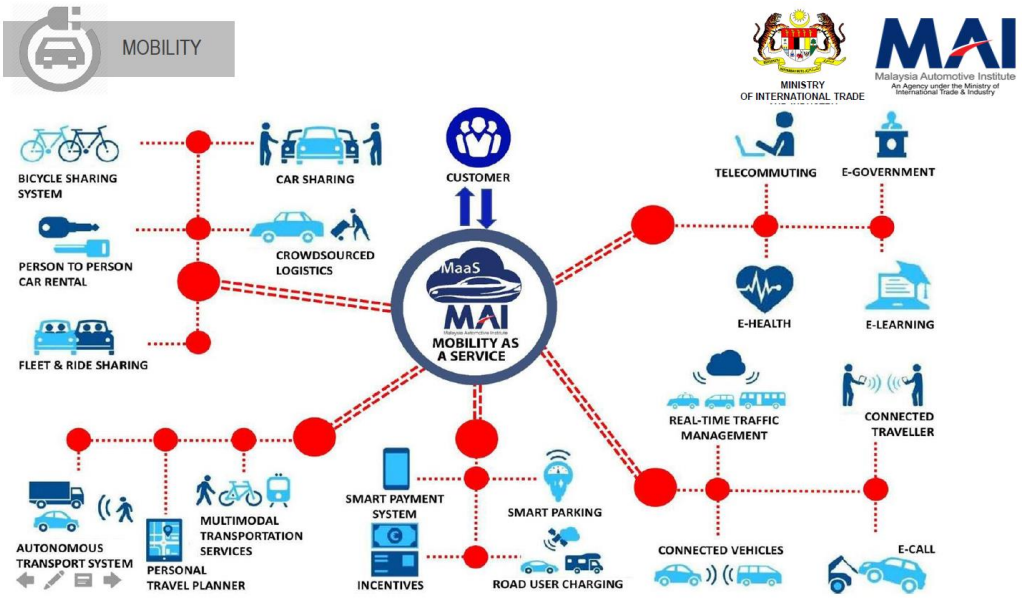
ITS = Intelligence Transport Systems.
Source: First workshop on 22 February 2018 presented by the Ministry of Transport.

In a bid to solve or improve transport problems, the planning and development of basic conventional land transportation infrastructures and facilities can benefit from the wealth of traffic data harvested through ITS implementation. Information mined from these traffic data will help support important transport policy decision-making and promote good governance.

The automobile industry itself faces new market challenges – improvements in technology, new entrants, shift to mobility as a service. Automobile manufacturers can exchange information directly with customers by collecting customers' driving situation or personal information such as travel, food and drink, music, etc.

In the wake of the trends, the Malaysia Automotive Institute takes mobility as a service and draws a mobility design of the future as follows.

Figure 2.16 Mobility Design for the Future



Source: Second workshop on 14 May 2018 presented by the Malaysia Automotive Institute.