Chapter 4

Policies in Support of Electric Vehicles

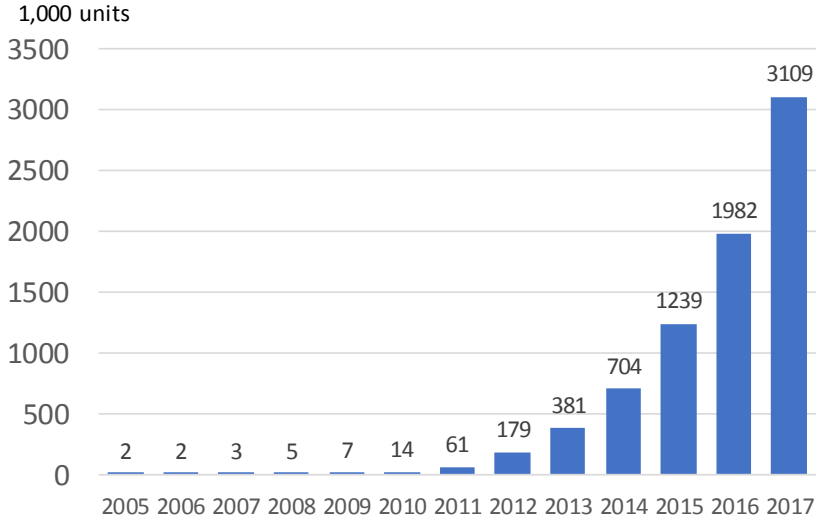
1. Introduction

In view of the potential benefits of expected oil savings and the development of new manufacturing bases, policies and measures should be introduced to encourage the use of EVs. To determine the implications for Indonesia, this chapter tries to capture the trends in Asian countries with a focus on targets, development plans, and economic incentives.

2. Global Trends

Globally, the number of EV stocks (including battery-powered electric vehicles (BEVs) and PHEVs reached 3.1 million in 2017, a 57% increase from 2016. However, this growth rate was relatively small compared with the 2016 growth rate, which hit 60% (Fig. 4.1). Much of the growth in 2017 came from China, which accounted for 51% of incremental growth between 2016 and 2017. The next biggest consumer by country was the United States, which accounted for 18% of the world's EV stock growth between 2016 and 2017.

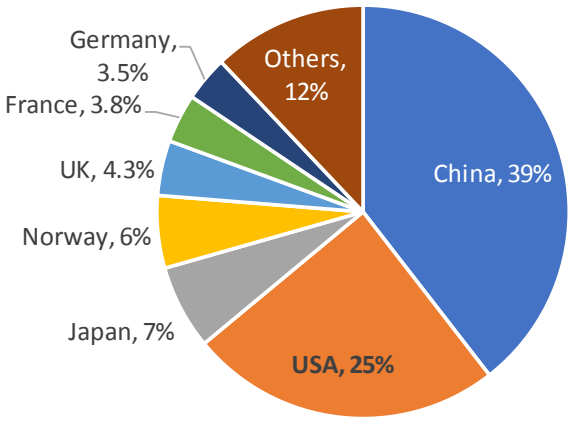
Figure 4.1: Trends in World Stocks of Electric Vehicles and Plug-In Electric Vehicles (2005–2017)



Source: Author's analysis from the International Energy Agency (2018), *Global EV Outlook*. Paris.

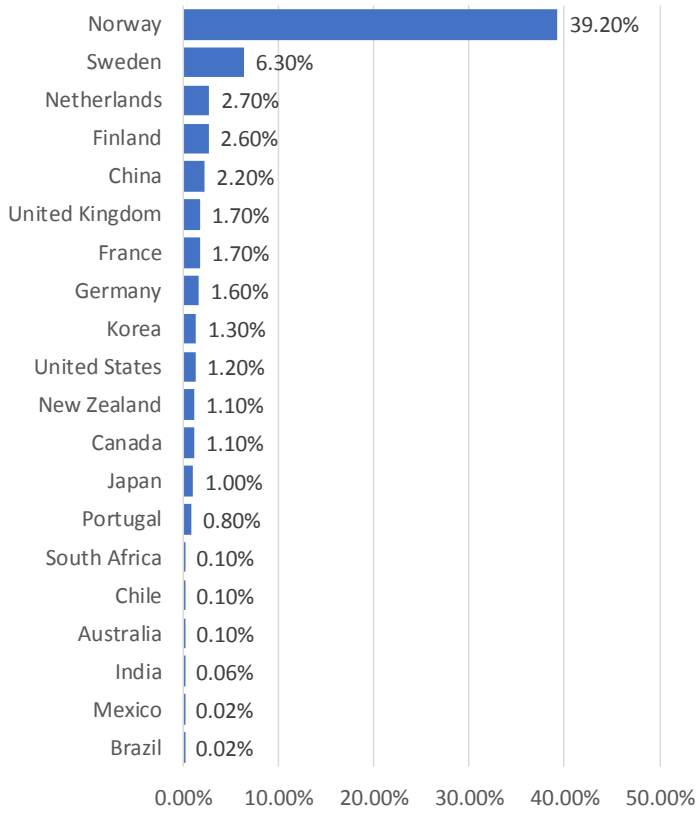
China accounted for the largest stock share in 2017 at 39%, followed by the United States at 25% and Japan at 7% (Fig. 4.2).

Figure 4.2: Trends in World Stocks of Electric Vehicles and Plug-In Electric Vehicles (2017)



UK = United Kingdom, USA = United States.
Source: Author's analysis from the International Energy Agency (2018), *Global EV Outlook*. Paris.

Figure 4.3: Electric Vehicle and Plug-In Hybrid Electric Vehicle Stock Share by Country



Korea = Republic of Korea.
Source: Author's analysis from the International Energy Agency (2018), *Global EV Outlook*. Paris.

Meanwhile, Norway holds the biggest share of total stocks of EVs (combining BEVs and PHEVs), reaching nearly 40% in 2017 (Fig. 4.3).

3. Targets

Globally, a number of countries formulate regulations or targets to increase the use of EVs and PHEVs. Drivers of different modes of transport are affected differently by the deployment of these targets. Table 4.1 shows the targets of countries in Asia and other regions.

Table 4.1: Electric Vehicle Targets in the Selected Countries

Country (Asia)	Targets
China	• Regulation requiring manufacturers to produce EVs, PHEVs, and FCVs accounting for 10% of their total sales in 2019, and 12% of total sales in 2020.
India	• The National Institute for Transforming India announced its directions for regulating the sale of EVs in the market by 2030 → The Government of India drops its direction (16 February) for EVs to account for 30% of sales by 2030.
Indonesia	• The Ministry of Energy and Mineral Resources announced that it will ban sales of ICEVs from 2040, and that it intends for EVs and HEVs to account for 25% of total vehicle sales by 2025.
Malaysia	• The National Electric Mobility Blueprint targets the following by 2020: 100,000 electric cars, 100,000 electric motorcycles, 2,000 electric buses, and 125,000 charging stations.
Thailand	• Ambitious plans to boost the number of electric cars from just under 68,000 to 1.2 million by 2036.
Philippines	• Development of a roadmap by the automobile industry association.
Singapore	• Electro-mobility roadmap study shows that 50% of vehicles in Singapore could be EVs by 2050.
Viet Nam	• Government targets 6 million eco-friendly vehicles in operation by 2020
Others	**Targets**
California	• Mandates the sale of zero-emission vehicles (excluding HEVs) to automobile manufacturers from 2018.
France	• The Minister of Environment announced that sales of gasoline and diesel-powered vehicles would be banned by 2040.
Germany	• The Bundesrat voted to ban sales of gasoline and diesel-powered vehicles by 2030.
Netherlands	• Draft law banning the sale of gasoline and diesel-powered engine vehicles from 2025 onwards submitted to the parliament.
Norway	• Zero-emissions vehicles will account for 100% of sales by 2025.
UK	• The Minister of Environment officially announced that sales of gasoline and diesel-powered vehicles will be banned from 2040.

EV = electric vehicle, FCV = fuel-cell vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle, PHEV = plug-in hybrid electric vehicle, UK = United Kingdom.
Source: Authors.

4. Trends in Asia

In Asia, policies and programmes are being formulated to encourage the deployment of EVs (Table 4.2). Although the level of policy formulation differs by country, the following four issues can be extracted as general trends in the promotion of EVs in those countries.

1. EVs as industrial development

- India has set a target that EVs will account for 30% of vehicle sales by 2030. This ambitious target is placed to benefit both consumers and society as a whole through oil savings, climate change mitigation, and domestic industrial development. India has introduced a funding programme to boost hybrid and electric technologies. Known as the scheme for the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME), it provides subsidies for consumers, technology development, charging infrastructure, pilot projects, and IEC/Operations (see Section 4.5).
- Thailand plans to boost the introduction of alternative vehicles, with an initial focus on HEVs, and to expand the deployment of EVs through 2036. The Government of Thailand considers EVs key for industrial development, and is formulating incentives that target the manufacturing sector. To encourage investment in BEVs, a low excise tax (2%) was introduced in 2017, effective through 31 December 2025. The excise tax for HEVs and PHEVs is higher, with rates depending on cylinder size and CO_2 emissions. For example, the excise tax rate for HEV and PHEV passenger vehicles with higher CO_2 emissions and a larger cylinder size (compared with that of passenger vehicles) is set at 18%.
- Malaysia began focusing on energy-efficient vehicles (EEVs) in 2014 when the country formulated the National Automotive Policy (NAP). The objectives of this policy were to promote a competitive domestic automobile industry, make Malaysia the regional hub for EEVs, and promote value-added activities in a sustainable manner. Various incentives are provided in the form of grants (for research and development, and training) and infrastructure facilities.
- The Philippines, likewise, views the introduction of EVs as a means of developing the automobile industry. The country aims to introduce 1 million EVs by 2020, and to promote investment in the manufacturing industry. Incentives are provided to manufacturers or assemblers in the form of a 9-year exemption (from 2014) from paying excise taxes and duties, as well as the suspension of VAT for the purchase of parts related to manufacturing. Similar incentives are provided to importers and users.

2. EVs seen as a tool for reducing CO_2 emissions

- Singapore promotes the use of EVs in an attempt to reduce CO_2 emissions. According to the Energy Research Institute at Nanyang Technological University, increasing the use of EVs to account for half of all cars on the road by 2050 would reduce Singapore's greenhouse gas emissions by 20% to 30% compared to a business as usual scenario. To help promote the wider use of EVs, Singapore provides a number of incentives for purchasing and using EVs (see Section 4.5).

- Viet Nam aspires to introduce HEVs and EVs in an effort to reduce CO_2 emissions. In its nationally appropriate mitigation actions Viet Nam specifies its target to introduce 6 million units of eco-friendly vehicles (including HEVs and EVs) by 2020. Progress toward achieving this target is currently slow. The only area of EV sales that has expanded is that of e-bikes (which have pedals and a slow speed of 25 km per hour). Sales reached 150,000 units in 2013, accounting for 14% of motorcycle sales.

Table 4.2: Summary of Policies and Incentives for Electric Vehicles in Asia

	India	Thailand	Malaysia
Policy	• National Electric Mobility Mission Plan issued in 2013. • 6 million–7 million electric and hybrid vehicles in India by 2020.	• Plans to boost the number of electric cars from just under 68,000 currently to 1.2 million by 2036. • HEVs are the initial focus for EV producers	• Strengthen the electric mobility eco-system and charging infrastructure nationwide • Accelerate the localisation of electric mobility technology to boost national economic growth.

Incentives	• FAME subsidy
	• Central government
	  • Excise duty
	  • Infrastructure cess
	• State government
	  • VAT
	• Delhi Pollution Control subsidy
		• Excise duty, effective through 31 December 2025
		  • Preferential rate for HEVs, PHEVs, and BEVs
			• Target
			  • Manufacturers, assemblers, and parts producers
			• Preferential treatment on
			  • excise duty
			  • import duty
			  • foreign direct investment

	Philippines	**Singapore**	**Viet Nam**

Policy	• Priority in the registration and issuance of plate numbers
	• Priority franchise application
	• Exemption from the Unified Vehicular Volume Reduction Programme
	• Free parking programme
		• Promotes the use of EVs to help meet emission reduction targets	• Government targets 6 million eco-friendly vehicles in operation by 2020
			  • Phase 1 (2013–2016): Application of hybrid vehicles
			  • Phase 2 (2013–2020): Application of EVs

Incentives	• Manufactures, assemblers, and importers
	  • Excise tax exemption
	• Users
	  • Motor Vehicle Users Charge
		• Vehicular emissions control system
		  • Rebates for HEVs and EVs
		• Road tax
		  • Lower charge for EVs
			• Not available

BEV = battery-powered electric vehicle, EV = electric vehicle, HEV = hybrid electric vehicle, PHEV = plug-in hybrid electric vehicle, VAT = value-added tax.
Source: Authors.

5. Case Studies

5.1. India

India aspires to promote EVs to support industrial development, improve the air quality, and reduce CO_2 emissions. EVs are seen as an effective tool to curb excessive dependence on oil imports.[8]

On 16 February 2018, the Government of India think tank, the National Institute for Transforming India, announced its target that EVs will account for 30% of all vehicle sales by 2030 (a change from its previous direction that EVs should account for 100% of vehicle sales by 2030).

India's market is currently dominated by e-rickshaws and two-wheeled vehicles. However, there is substantial potential for the share of EVs to increase due to rising personal incomes, the formulation of necessary policy frameworks, and the development of infrastructure.

In April 2015, the central government launched an incentive scheme known as the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME). The scheme's targets includes (i) technology platforms, (ii) demand incentives, (iii) charging infrastructure, (iv) pilot projects, and (v) electronical operations. As shown in Table 4.3, the FAME scheme has been implemented in two phases: fiscal year (FY) 2015–FY2016 and FY2016–FY2017. The scheme has been extended through September 2018.

Table 4.3: Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles Scheme Incentives

Component under FAME scheme	**FY2015–FY2016** ₹ million ($ million)	**FY 2016–FY2017** ₹ million ($ million)
Technology platforms	700 (10.5)	1,200 (18)
Demand incentives	1,550 (23.25)	3,400 (51)
Charging infrastructure	100 (1.5)	200 (3)
Pilot projects	200 (3)	500 (7.5)
Electronical operations	50 (0.75)	50 (0.75)
Total	2,600 (39)	5,350 (80.25)

Note: 'FY' before a calendar year denotes the year in which the fiscal year ends, e.g., FY2017 ends on 31 March 2017.
Source: International Council on Clean Transportation (2016), *Hybrid and Electric Vehicles in India – Current Scenario and Market Incentives*. Washington, DC.

As shown in Table 4.4, demand side incentives under the FAME scheme cover five types of vehicles (two-wheeled vehicles, three-wheeled vehicles, passenger cars, light-commercial vehicles, and buses); and the level of incentives differs by type of technology, with higher incentives for BEVs.

[8] Young, E. (2018), 'Electrifying India – Building Blocks for a Sustainable EV Ecosystem'.

Table 4.4: Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles Scheme Demand Incentives

Vehicle segment	Mild hybrid ₹ ($)	Strong hybrid ₹ ($)	Plug-in hybrid ₹ ($)	Battery-operated electric ₹ ($)
Two-wheeled vehicles	1,800–6,200 (27–93)	-	13,000–18,000 (195–270)	7,500–29,000 (112.5–435)
Three-wheeled vehicles	3,300–7,800 (49.5–117)	-	25,000–46,000 (195–270)	11,000–61,000 (165–915)
Passenger cars	11,000–24,000 (165–360)	59,000–71,000 (885–1,065)	98,000–118,000 (1,470–1,770)	76,000–138,000 (1,140–2,070)
Light commercial vehicles	17,000–23,000 (255–345)	52,000–62,000 (780–930)	73,000–125,000 (1,095–1,875)	102,000–187,000 (1,530–2,805)
Buses	3,000,000–4,100,000 (45,000–61,500)	5,100,000–6,600,000 (76,500–99,000)		

Source: International Council on Clean Transportation (2016), *Hybrid and Electric Vehicles in India – Current Scenario and Market Incentives*. Washington, DC.

In addition to the FAME scheme, the Government of India provides tax incentives in the form of a preferential rate for EVs and HEVs. The central excise duty, which is levied on all goods produced in India, is 12.5% for hybrid cars, close to half the rate for ICVs. The central excise duty for EVs (including passenger vehicles, buses, two-wheeled vehicles, and three-wheeled vehicles) would be even lower at 6% (Table 4.5).

Table 4.5: Central Government Excise Duty Rate

Vehicle category	Central excise duty
Length < 4m, gasoline/LPG/CNG, and engine capacity 1,200 cc	12.5%
Length < 4m, diesel, and engine capacity < 1,500 cc	12.5%
Length < 4m, gasoline/LPG/CNG, and engine capacity > 1,200 cc but <1,500 cc	24%
Length > 4m, and engine capacity < 1,500 cc	24%
Length > 4m, and engine capacity > 1,500 cc	27%
Length > 4m, engine capacity > 1,500 cc, and ground clearance > 170 mm (SUVs and MUVs)	30%
Buses	12.5%
Trucks	12.5%
Three-wheeled vehicles	12.5%
Two-wheeled vehicles	12.5%
Hybrid cars	12.5%
Electric cars, buses, two-wheeled vehicles, three-wheeled vehicles	6%

cc = cubic centimetres, CNG = compressed natural gas, LPG = liquified petroleum gas, m = metres, mm = millimetres, MUV = multi utility vehicle, SUV = sport utility vehicle.
Source: International Council on Clean Transportation (2016), *Hybrid and Electric Vehicles in India – Current Scenario and Market Incentives*, Washington, DC.

Table 4.6: Central Infrastructure Cess on Motor Vehicles

Vehicle Category	Infrastructure Cess
Ambulances	0%
Taxis	0%
Battery-powered electric vehicles	0%
Hybrid motor vehicles	0%
Three-wheeled vehicles	0%
Cars for physically handicapped persons	0%
Hydrogen vehicles based on fuel-cell technology	0%
Petroleum, LPG, CNG vehicles, length < 4,000 mm, engine capacity < 1,200 cc	1%
Diesel vehicles, length < 4,000 mm, engine capacity < 1,500 cc	2.5%
All other categories	4%

cc = cubic centimetres, CNG = compressed natural gas, LPG = liquified petroleum gas, m = metres, mm = millimetres, MUV = multi utility vehicle, SUV = sport utility vehicle.
Source: International Council on Clean Transportation (2016), *Hybrid and Electric Vehicles in India – Current Scenario and Market Incentives*. Washington, DC.

Infrastructure cess is a government tax on the production of vehicles and is used to finance infrastructure projects.[9] The cess levy rate on the production of vehicles is 1% for small ICEVs, 2.5% for diesel engine vehicles, and 4% for higher engine capacity vehicles.

In addition to the economic incentives provided by the central government, state governments also offer incentives for the purchase of EVs. For example, in Delhi, owners of EVs pay a lower value-added tax at the time of purchase. The value-added tax rate for ICVs is 12.5%, while that of EVs in Delhi is 5.0%.

Table 4.7: Subsidy for Battery-Powered Electric Vehicles from the Delhi Pollution Control Committee

Type of Vehicle	Vehicle Base Price	Subsidy Amount
Four-wheeled	< ₹500,000 (< $7,500)	₹30,000 ($450)
Four-wheeled	> ₹500,000 (> $7,500)	₹150,000 ($2,250)
Two-wheeled	< ₹20,000 (> $300)	₹1,000 ($15)
Two-wheeled	> ₹20,000 < ₹25,000 (> $300 < $375)	₹2,000 ($30)
Two-wheeled	> ₹25,000 (> $375)	₹5,500 ($82.5)
Three-wheeled (e-rickshaws)		₹15,000 ($225)

Source: International Council on Clean Transportation (2016), *Hybrid and Electric Vehicles in India – Current Scenario and Market Incentives*. Washington, DC.

[9] Arthapedia, *Infrastructure Cess*. http://arthapedia.in/index.php?title=Infrastructure_Cess24.43%

In the National Capital Territory (NCT) of Delhi, the Air Ambience Fund, which was created in 2008, levies a fee on the sale of diesel at a rate of ₹0.25 per liter.[10] As Table 4.7 shows, in FY2014–FY2015 cumulative fund collections reached $57.85 million, 12.86% of which is used to subsidise BEVs. Delhi's air quality is marred by high levels of suspended particulate matter, sulfur dioxide, nitric oxide, and lead, and the fund is used to promote clean technologies. The fund has also been used for the treatment of hazardous waste and development of disposal facilities.

The fund collections increased substantially in 2014–2015 (120%) compared to 22% year-on-year in 2013–2014. The substantial increase in the fund collections indicate that diesel consumption for the transport sector has risen due to the decline in the international price of crude oil. As the share of the fund used to incentivise BEVs is relatively low (12.86%), the NCT of Delhi has room to increase its utilisation.

Table 4.8: Collections and the Utilisation of the Air Ambience Fund for Incentivising Electric Vehicles

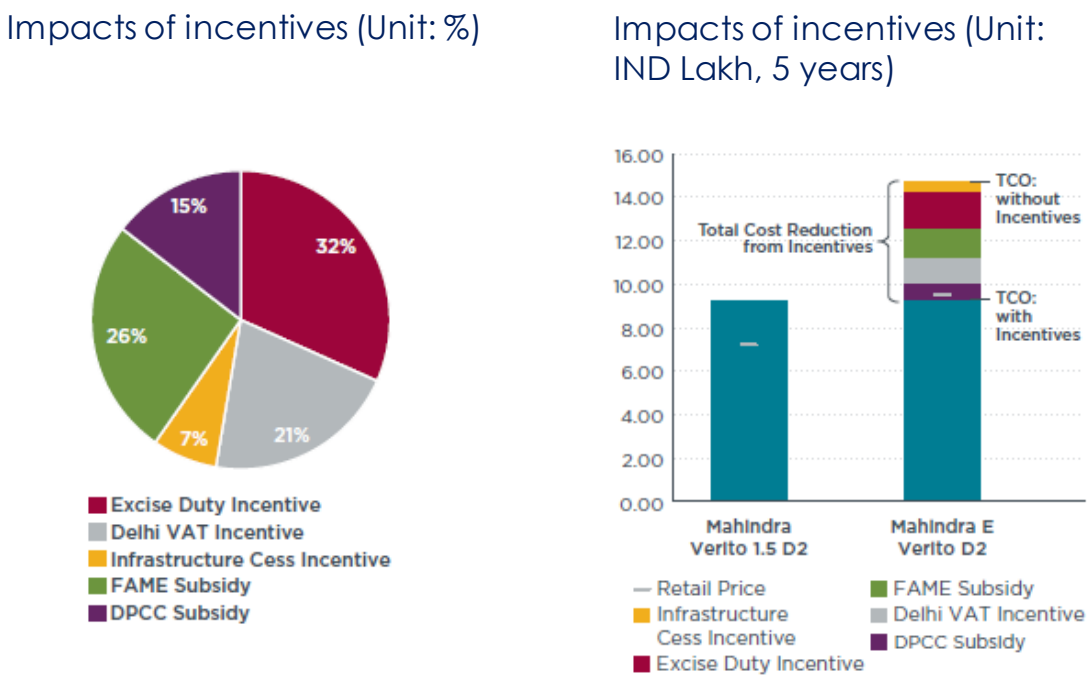
Year (up to)	**Cumulative fund collections** ₹ million ($ million)	**Cumulative utilisation towards battery-powered electric vehicle subsidy** ₹ million ($ million)	**Utilisation on a cumulative basis** (%)
FY2008–FY2009	383.2 (5.75)	-	-
FY2009–FY2010	688.8 (10.33)	41.2 (0.62)	5.98
FY2010–FY2011	893.5 (13.4)	181.2 (2.72)	20.28
FY2011–FY2012	1,160.4 (17.41)	307.0 (4.61)	26.46
FY2012–FY2013	1,442.0 (21.63)	395.8 (5.94)	27.45
FY2013–FY2014	1,754.5 (26.32)	428.6 (6.43)	24.43
FY2014–FY2015	3,856.5 (57.85)	495.7(7.44)	12.86

Note: 'FY' before a calendar year denotes the year in which the fiscal year ends, e.g., FY2017 ends on 31 March 2017.

Source: International Council on Clean Transportation (2016), *Hybrid and Electric Vehicles in India – Current Scenario and Market Incentives*. Washington, DC.

[10] Department of Environment, Government of NCT of Delhi. http://www.delhi.gov.in/wps/wcm/connect/environment/Environment/Home/Environmental+Issues/Ambient+Air+Quality

Figure 4.4: Impacts of Incentives on Electric Passenger Vehicle Price



DPCC = Delhi Pollution Control Committee, FAME = Scheme for the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME), TCO = total cost of operation, VAT = value-added tax.
Source: International Council on Clean Transportation (2016), *Hybrid and Electric Vehicles in India – Current Scenario and Market Incentives*. Washington, DC.

Figure 4.4 shows the analysis results of the TCO of EVs. The analysis was made to estimate the impacts of these incentives on the utilisation of vehicles for 5 years, assuming that the EVs are purchased and used in the NCT. These impacts are compared with those of the non-electric, non-hybrid model to understand the approximate magnitude of their impact on the TCO.

As shown in Figure 4.4, the TCO of EVs (exemplified by the Mahindra E Verito D2) would be 1% higher than that of the base model (Mahindra Verito 1.5 D2), and 51% higher without any incentives. Of the incentives' total impacts, the excise duty incentive is the most significant, accounting for 32%, followed by the FAME subsidy and Delhi VAT incentive.

5.2 Singapore

Singapore views EVs as an important means of controlling CO_2 emissions and reducing vehicle-related impacts on air quality. Oil savings resulting from the shift to EVs could help ease Singapore's energy security concerns as well.

A research body from Nanyang Technological University has projected that EVs could make up as much as 30%–50% of Singapore's vehicle stocks by 2050. The study found that increasing the use of EVs to half of all cars on the road by 2050 would reduce greenhouse gas emissions by 20%–30% compared to a business as usual scenario.

In view of these benefits, Singapore is implementing incentives to promote EVs, focusing on both purchase and use. Vehicle owners in Singapore are required to provide several items at the time of registration, making the cost of ownership higher than in neighbouring countries. The required items are (i) the registration fee, (ii) the additional registration fee, (iii) the Certificate of Entitlement (COE), and (iv) the excise duty. The registration fee of S$220 involves the costs of registering a vehicle. The additional registration fee is collected based on the unit price, known as the open market value (OMV). Of the total OMV, the first S$20,000 is charged at 100%, the next S$30,000 is charged at 140%, and more than S$50,000 is charged at 180%. The Government of Singapore uses the COE system to control the number of vehicles on the road to avoid congestion and handle road transport efficiently for both passenger and freight usage. The COE is the quota that entitles owners to use their purchased vehicles in Singapore for 10 years. To obtain the COE, vehicle owners must bid in categories corresponding to the size of their vehicle. The excise duty is collected at the time of purchase and calculated based on the vehicle's OMV.

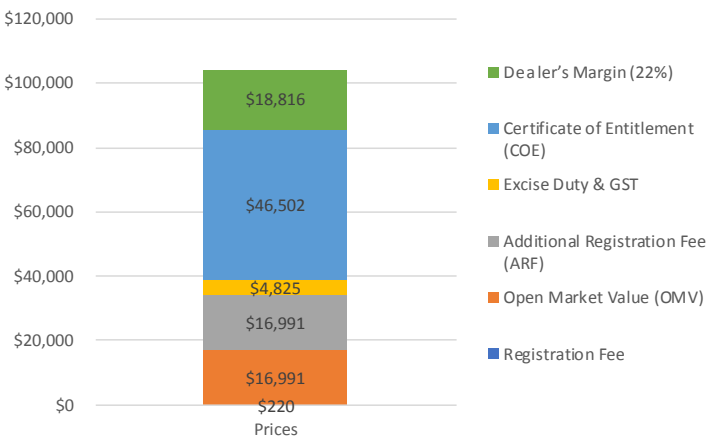
Table 4.9: Required Items with an Example of Vehicle Prices in Singapore

Items required at registration	Classification
Registration fee	S$220
Additional registration fee	First S$20,000 OMV: 100% Next S$30,000 OMV: 140% Above S$50,000 OMV: 180%
Certificate of Entitlement	Bid in Category A, B, or E
Excise duty	20% of OMV

cc = cubic centimetres, kW = kilowatt, OMV = open market value.
Note: Category A = small cars up to 1,600 cc and 97 kW, Category B = large cars exceeding 1,600 cc and 97 kW, Category C = buses and goods vehicles, Category D = motorcycles, and Category E = any kind of vehicle.
Source: Land and Transport Authority.
https://www.lta.gov.sg/content/ltaweb/en/roads-and-motoring/owning-a-vehicle/costs-of-owning-a-vehicle/tax-structure-for-cars.html (accessed May 2018)

Figure 4.5: True Cost of Vehicle Price in Singapore

	Prices
Registration Fee	$220
Open Market Value (OMV)	$16,991
Additional Registration Fee (ARF)	$16,991
Excise Duty & GST	$4,825
Certificate of Entitlement (COE)	$46,502
Sub Total	$85,529
Dealer's Margin (22%)	$18,816
Final Price	**$104,345**



GST = goods and services tax.
Source: Estimated by the Institute of Energy Economics, Japan (2018).

For example, to purchase a S$16,991 Mitsubishi ASX in Singapore, the owners would have to pay a final price of S$104.345. As the above figure shows, COE accounts for the largest share (nearly half) of the total cost.

The Government of Singapore provides incentives for zero-emission vehicles (including EVs and HEVs) through the Vehicular Emissions Scheme (VES), which it implemented in January 2018. The VES accounts for emissions of four pollutants (hydrocarbons, carbon monoxide, nitrogen oxide, and CO_2) from 1 January 2018 to 30 June 2018; and five pollutants (hydrocarbons, carbon, nitrogen oxide, particulate matter, and CO_2) from 1 July 2018. Based on the worst performing emissions, the owners' rebate or surcharge will be determined. For example, vehicles whose emissions fall under A1 or A2 qualify for a rebate, while those under C1 or C2 incur a surcharge.

Table 4.10: Rebates and Surcharges for Vehicles Based on Emissions

Band	CO_2 (g/km)	HC (g/km)	CO (g/km)	NO_x (g/km)	PM* (mg/km)	Rebate**	Surcharge
A1	**A1**≤90	**A1**≤0.020	**A1**≤0.150	**A1**≤0.007	**A1**=0.0	S$20,000	
A2	90<**A2**≤125	0.020<**A2**≤0.036	0.150<**A2**≤0.190	0.007<**A2**≤0.013	0.0<**A2**≤0.3	S$10,000	
B	125<**B**≤160	0.036<**B**≤0.052	0.190<**B**≤0.270	0.013<**B**≤0.024	0.3<**B**≤0.5	S$0	S$0
C1	160<**C1**≤185	0.052<**C1**≤0.075	0.270<**C1**≤0.350	0.024<**C1**≤0.030	0.5<**C1**≤2.0		S$10,000
C2	**C2**>185	**C2**>0.075	**C2**>0.350	**C2**>0.030	**C2**>2.0		S$20,000

CO = carbon monoxide, CO_2 = carbon dioxide, g/km = grams per kilometre, HC = hydrocarbon, mg/km = milligrams per kilometre, NO_x = nitrogen oxide, PM = particulate matter.
Source: Land and Transport Authority.
https://www.lta.gov.sg/content/ltaweb/en/roads-and-motoring/owning-a-vehicle/costs-of-owning-a-vehicle/tax-structure-for-cars.html

Table 4.11: Road Tax on Electric Vehicles

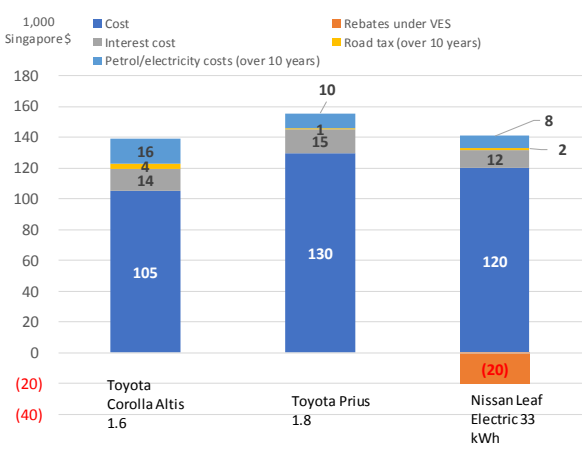
Power rating (kW)	**6-monthly road tax formula (from 1 August 2016)**
PR < 7.5	S$200×0.782
7.5 < PR < 32.5	[S$200+S2(PR-7.5)]×0.782
32.5 < PR < 70	[S$250+S6(PR-32.5)]×0.782
70 < PR < 157.5	[S$475+S12(PR-70)]×0.782
PR > 157.5	[S$1,525+S16(PR-157.5)]×0.782

kW = kilowatt, PR = power rating.
Source: Land and Transport Authority. https://www.lta.gov.sg/content/ltaweb/en/roads-and-motoring/owning-a-vehicle/costs-of-owning-a-vehicle/tax-structure-for-cars.html (accessed May 2018)

In addition to the fee paid at the time of registration, vehicle owners in Singapore must pay road tax, the rate of which is determined based on the vehicle type (PHEV, EV, or powered by gasoline, compressed natural gas, or diesel). Table 4.5 shows the formula for calculating the rate for EVs based on the maximum power rating. For example, over a 6-month period, a petroleum-powered vehicle with a 1,600 cubic centimetre engine would incur tax of S$372, while an EV with a 33-kilowatt power rating would incur S$198.

Figure 4.6: Analysis Framework

	Toyota Corolla Altis 1.6	Toyota Prius 1.8	Nissan Leaf Electric 33 kWh
Cost	$104,988	$129,988	$119,900
Rebates under VES	$0	$0	($20,000)
Interest cost	$14,302	$15,177	$11,559
Road tax (over 10 years)	$372 x 10 years	($340+$198) x 10 years	$198 x 10 years
Petrol/electricity costs (over 10 years)	$1,639.26 x 10 years	$989.62 x 10 years	$750 x 10 years
Total Net Cost	$139,403	$160,441	$120,939



kWh = kilowatt-hour, VES = Vehicle Emissions Scheme.
Source: Authors.

Figure 4.6 shows a cost comparison for passenger vehicles owned for a span of 10 years in Singapore. The analysis compares a gasoline-powered vehicle (Toyota Corolla Altis), a HEV (Toyota Prius), and an EV (Nissan Leaf). The analysis reveals that, despite the higher vehicle cost, the net cost of the EV is the lowest of the analysed vehicles due to rebates, lower interest costs, lower road tax, and lower energy costs derived from its higher fuel efficiency.

5.3 Malaysia

Malaysia has pledged a voluntary target to reduce greenhouse gas emissions at a level equal to 40% of its GDP by 2020 compared to the 2005 level. In line with this, Malaysia launched a national green technology policy in July 2009, in which it focuses on EVs as a means to support industrial development.

The government formulated the National Automotive Policy (NAP) in 2006 to facilitate the transformation of the local automotive industry and encourage its integration in global networks. The NAP was amended in 2009 and 2014 to strengthen its objectives with regard to the creation of a competitive local automotive industry and to benefit consumers. The 2014 NAP includes the following key concepts.

(i) Develop a competitive and capable domestic automotive industry;

(ii) Develop Malaysia as the regional automotive hub for energy-efficient vehicles (EEVs) by 2020;

(iii) Increase value-added activities in a sustainable way while continuously developing domestic capabilities;

(iv) Increase exports of vehicles, automotive components, spare parts, and related products in the manufacturing and aftermarket sectors;

(v) Increase the participation of competitive Malaysian companies in the domestic automotive industry, including the aftermarket sector;

(vi) Enhance the ecosystem of the manufacturing and aftermarket sectors of the domestic automotive industry; and

(vii) Safeguard consumer interests by offering safer and better quality products at competitive prices.

Malaysia Automotive Institute defines an EEV as a vehicle that meets a certain level of carbon emissions (grams per kilometre) and fuel consumption (litre/100 kilometres).[11] According to this definition, EEVs include fuel-efficient vehicles, HEVs, EVs, and alternatively fuelled vehicles (e.g., compressed natural gas, liquefied petroleum gas, biodiesel, ethanol, hydrogen, and fuel cells).

[11] Malaysia Automotive Institute. http://mai.org.my/energy-efficient-vehicles-eevs/;
Ahmad, D.A. (2014), 'Evolution of Auto Policy – the Malaysian Experience', Presentation at Auto Trade Dialogue. 4 February. Delhi.

The NAP 2014 provides economic incentives for manufacturers to promote the production of EEVs. Malaysia aims to increase annual production of motor vehicles from 601,407 units in 2013 to 1.35 million by 2020, with EEVs accounting for 1.15 million units. With regard to motorcycles, in the same timeframe, Malaysia aims to increase production from 430,000 units to 800,000 units, 650,000 of which would be EEVs.

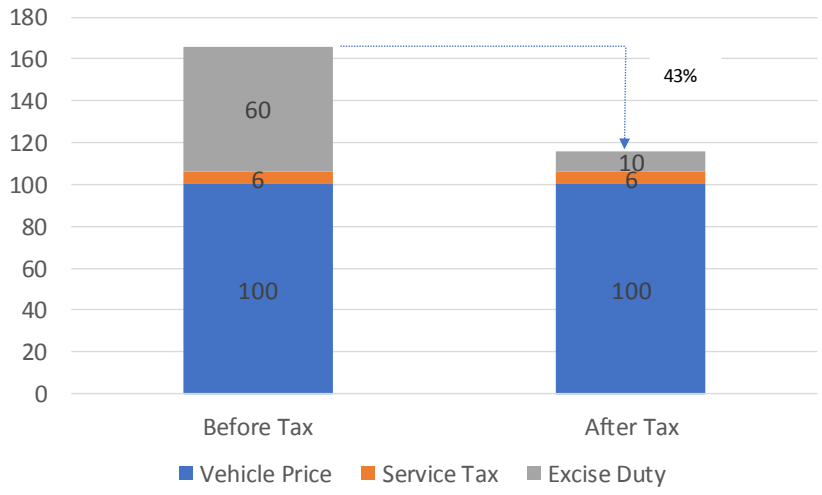
Economic incentives being prepared for both foreign direct investment and domestic investment include (i) pioneer status; (ii) investment tax allowance; (iii) grants (research and development, training); (iv) infrastructure facilitation; (v) lower taxes; and (vi) expatriates. The Government of Malaysia announced that the 2014 NAP includes RM2 billion in soft loans and grants for human capital purposes related to automotive infrastructure.

Table 4.12: Economic Incentives for Energy-Efficient Vehicles

Sector	Incentives
Incentives for local assembly and manufacturing of EEVs	• 100% tax break for 10 years for FDIs • 100% tax break for 10 years for corporate tax • Subsidy provision for training and R&D • Tax breaks (maximum 10%) for import duties • Tax breaks (maximum 10%) for import duties • Tax breaks (maximum 10%) for excise duties
Incentives for locally assembled and/or manufactured EEVs	• Tax breaks (50%) for excise duties • Subsidy provision from the Industrial Adjustment Fund
Incentives for promoting EEV-related parts	• Electric motors, HEV and EV batteries, battery management systems, inverters, ACs, air compressors • 100% tax break for 10 years for corporate tax • 100% tax break for 10 years for FDIs

AC = air conditioning unit, EEV = energy-efficient vehicle, EV = electric vehicle, FDI = foreign direct investment, HEV = hybrid electric vehicle, R&D = research and development.
Source: National Automotive Policy 2014.

Figure 4.7: Impacts of Incentives on Electric Passenger Vehicle Price



Source: Malaysian Green Technology Corporation.

The Government of Malaysia initially introduced tax exemption for imported EVs and HEVs to encourage manufacturers to invest and assemble in Malaysia. However, the significant results of the incentive met the initial objectives, and the government determined to end the tax incentives.[12]

The 2018 NAP emphasises next-generation vehicles, mobility, the Industrial Revolution 4.0, and artificial intelligence.

6. Conclusions

The biggest hurdle for the introduction of EVs is currently the upfront costs; thus, it is important for the Government of Indonesia to provide incentives for EVs to ensure the realisation of their potential benefits for drivers and consumers. Mechanisms should be in place to secure necessary funds for the provision of incentives. The case of the state of Delhi in India offers a good lesson in this regard as it charges diesel consumers an additional fee that it uses as the basis for incentive funds.

Another illustrative case is that of Malaysia, where EEVs (including HEVs and EVs) are considered an effective tool for supporting the development of the manufacturing industry. The country provides incentives to the manufacturing industry, specifically to assembly and manufacturing companies that produce parts, including electric motors, HEV and EV batteries, battery management systems, inverters, air conditioning units, and air compressors. This is an important point with regard to the stepwise development of the manufacturing industry in Indonesia.

[12] Expat Go (2014), 'Malaysia Ends Tax Breaks for Hybrid and Electric Cars'. http://www.expatgo.com/my/2014/01/25/tax-breaks-hybrid-cars-stopped-malaysian-government/