FUEL ECONOMY DATASET AND BASELINE FOR PASSENGER CARS UNDER 9 SEATS IN VIET NAM

Technical Report

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NDC TRANSPORT INITIATIVE FOR ASIA

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REPORT

FUEL ECONOMY DATASET AND BASELINE FOR PASSENGER CARS UNDER 9 SEATS IN VIET NAM

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NDC-TIA is part of the International Climate Initiative (IKI). The Federal Ministry for Economic Affairs and Climate Action (BMWK) supports this initiative on the basis of a decision adopted by the German Bundestag. It supports China, India, and Viet Nam as well as regional and global decarbonisation strategies to increase the ambition around low-carbon transport.

In Viet Nam, the project's implementing organisation is GIZ, and partner institutions include World Resources Institute (WRI) and International Council on Clean Transportation (ICCT). Viet Nam Ministry of Transport (MOT) is the Lead executive organisation and the Department of Science, Technology and Environment (DOSTE) is the project owner. For more information on the project, please visit https://www.ndctransportinitiativeforasia.org/.

During the research process, the consultant team cooperated closely with and highly appreciate the continuous support, precious feedback, and advice from DOSTE - MOT, ICCT, state management organisations, research, training agencies in the transport sector, relevant associations, and businesses.

CONTENT

ABBREVIATIONS

CO_2	Carbon dioxide
DOSTE	Department of Science, Technology and Environment
FC	Fuel consumption
FE	Fuel economy
gCO_2	Grammes carbon dioxide
GHG	Greenhouse gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
ICCT	International Council on Clean Transportation
Kg	Kilogramme
IEA	International Energy Agency
L	Litre
L/100km	Litre per 100 kilometres
LDVs	Light-duty vehicles
MOT	Ministry of Transport
NDC	Nationally Determined Contribution
NDC-TIA	NDC Transport Initiative for Asia
PIMT	Project Implementation Management Team
TCVN	Viet Nam Voluntary Standard
UNFCCC	United Nations Framework Convention on Climate Change
VR	Viet Nam Register
VAMA	Viet Nam Automobile Manufacturers Association

LIST OF FIGURES AND TABLES

01
INTRODUCTION

1.1 DESCRIPTION OF THE PROJECT

The NDC Transport Initiative for Asia (NDC-TIA) is a joint project of seven organisations, operating in China, India, and Viet Nam. It aims at promoting a comprehensive approach to decarbonising transport, i.e., a coherent strategy of effective policies that are coordinated among various sector ministries, civil society, and the private sector. In each partner country, the consortium supports countries in facilitating and informing these stakeholder processes and developing selected climate actions. This enables partners to make a sectoral contribution towards achieving their NDCs and increase ambition in transport sections of long-term strategies and 2025 NDCs – countries climate commitments at the international level. As a regional initiative, the programme disseminates knowledge as well as experiences from China, India, and Viet Nam in Asia. The consortium connects with regional stakeholders and other Asian countries in order to encourage taking a comprehensive approach to decarbonising transport. On the global level, the programme will disseminate and share experiences in the UNFCCC process.

In Viet Nam the project aims to enhance capacity building, develop a legal framework to promote low carbon development and GHG emission reduction in transport and contribute to the implementation of the Nationally Determined Contribution (NDC) of Viet Nam. Specifically, the project provides technical support to the MOT:

1. To build mechanisms, policies and roadmaps on electric mobility (E-mobility) development at the national and city levels in order to promote the introduction and sustainable development of advanced, modern, zero-emissions electrical vehicles in Viet Nam;

2. To build GHG emission mitigation scenarios for the transport sector up to 2050 in the direction of low carbon development and integration into Viet Nam's NDC of 2025;

3. To build legal documents on energy efficiency for road vehicles, and

4. To build a digital Measurement, Reporting and Verification (MRV) system for the transport sector including road, railway, inland waterways, maritime and aviation in order to enhance the transparency of GHG emissions in transport.

The project's political partner (lead executive agency) is the Ministry of Transport (MOT) in Viet Nam, the project owner is the Department of Science, Technology and Environment, MOT.

The study refers to sub-activity 2.2.2.5 in the approved Operational Plan 2021 "Fuel economy dataset and baseline for passenger cars under 9 seats in Viet Nam", under the Activity "Development of national regulations on fuel economy for road motor vehicles (priority on fuel economy of passenger cars under 9 seats, motorcycles and mopeds)".

1.2 CONTEXT

Governments around the world are currently grappling with two distinct but interconnected issues - how to reduce emissions of climate-changing greenhouse gases (GHG) and how to reduce dependence on fossil fuel, and often imported, supplies of petroleum. GHG emission and fuel economy (FE) standards for light-duty vehicles (LDVs) have progressed significantly in a little more than a decade. Over ten years ago, only four governments: China, Japan, South Korea, and the United States had introduced mandatory GHG emission and fuel economy standards. The European Union and Canada had announced their intention to introduce GHG emission standards, but neither government had a legislative framework in place. Today, 10 governments, including Brazil, Canada, China, the European Union, India, Japan, Mexico, Saudi Arabia, South Korea, and the United States have established fuel economy or GHG emission standards for LDVs.

All of them are now among the top 15 vehicle markets worldwide: nearly 80% of new LDVs sold globally are currently subject to some kind of GHG emission or fuel economy standards. Other large markets, such as Australia, Thailand, and Viet Nam, are in the process of developing standards as well.

Viet Nam submitted its updated nationally determined contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC) in 2020 with a higher ambition for GHG emission reduction. According to the updated NDC, by 2030, Viet Nam will reduce its GHG emissions to 9% – a commitment that could be raised up to 27% with international support. At the UN Climate Change Conference (COP26), Vietnamese Prime Minister Pham Minh Chinh announced strong commitments to tackle climate change and committed to achieving net zero-emissions by 2050. On 22 July 2022, Deputy Prime Minister Le Van Thanh signed Decision No.876/QD-TTg approving an action programme on the green energy transition and the reduction of carbon and methane emissions in the transport sector. The move aims to develop a green transport system in the push for net-zero emission by 2050.

In the transport sector, the 2020 updated NDC committed to implementing 5 mitigation action groups:

1. Applying energy efficiency measures in transport;

2. Changing freight transport models, restructuring the transport market;

3. Shifting from private to public means of transport;

4. Shifting from conventional fuels to biofuel, natural gas and electricity;

5. Improving the energy efficiency of transport vehicles.

GHG emission mitigation actions in the transport sector include:

1. Vehicle energy efficiency: Regulations on limiting fuel consumption for newly manufactured, assembled and imported vehicles;

2. Shifting from using personal vehicles to mass public transport, such as through the expansion of the bus system; expansion of the BRT system and deployment of the urban railway system;

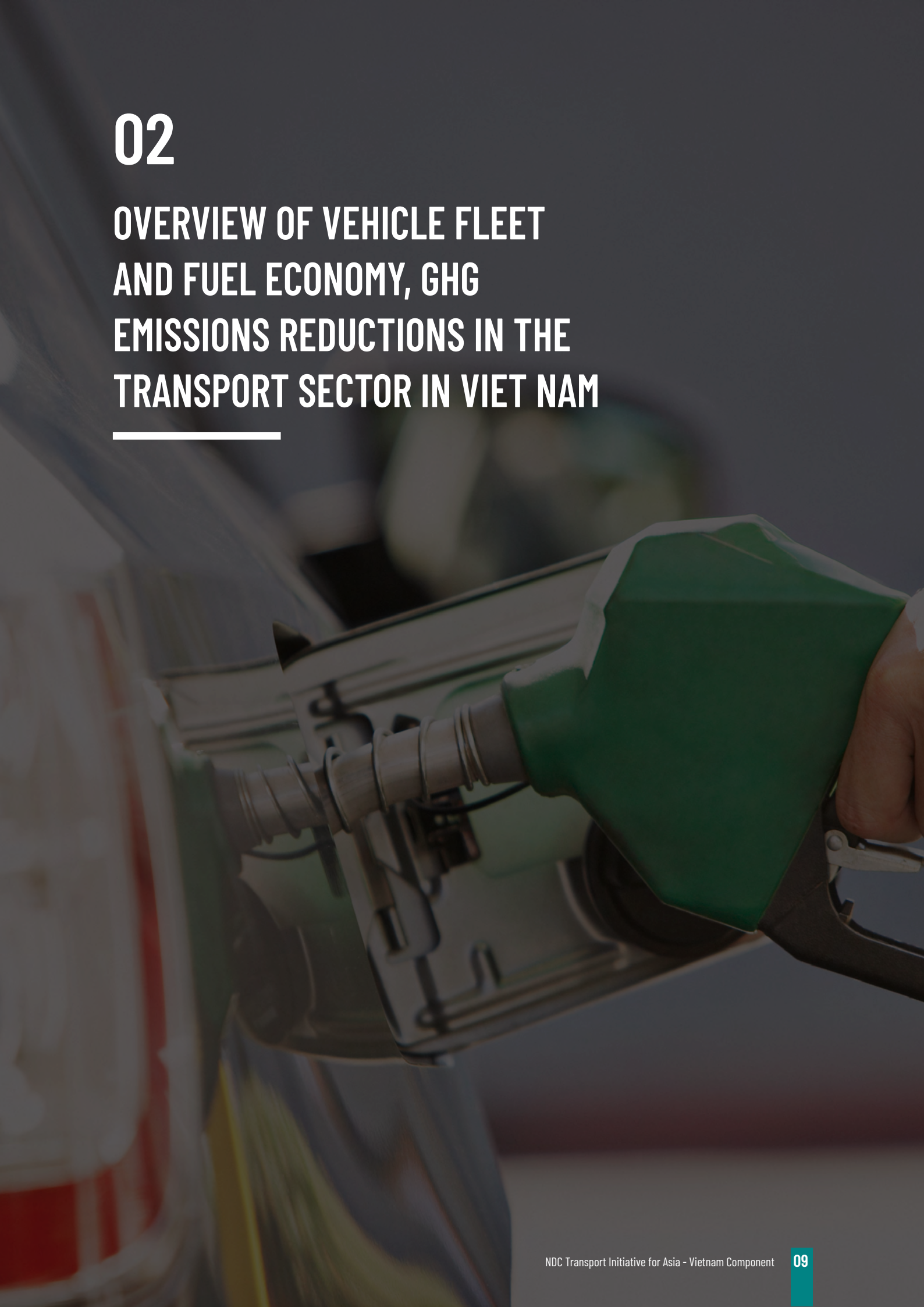
3. Shifting the freight transport mode from road transport to inland waterways and coastal transport;

4. Switching to cleaner propulsion technology, such as a transition to using electric motorcycles, encouraging the use of biofuels and encouraging the use of CNG buses.

The FE database and the baseline establishment, among other FE policies and measures, will serve as a foundation for further development of mandatory FE standards; it will provide an opportunity for policy-makers to reduce fuel consumption, and contribute to fuel security. At the same time, such policies and measures will contribute to reducing CO_2 emissions from the transport sector. If no measures are taken immediately, emissions of both criteria air pollutants and GHGs will increase exponentially as a result of the increased demand for mobility and energy in Viet Nam. Additionally, they will contribute to a just energy transition in Viet Nam which is critical to addressing current and future challenges of the energy system

02

OVERVIEW OF VEHICLE FLEET AND FUEL ECONOMY, GHG EMISSIONS REDUCTIONS IN THE TRANSPORT SECTOR IN VIET NAM



2.1 OVERVIEW OF VEHICLE FLEET AND MARKET SHARE

The entire vehicle fleet in Viet Nam grew strongly during the last decades, in particular, the ratio of road vehicle ownership increased sharply. According to statistics from the Vietnam Register by the end of November 2020, the total number of automobiles in circulation is 4,093,975 vehicles of which 2,369,625 passenger cars, 178,480 buses/coaches, 1,402,530 trucks, 37,081 special-use vehicles and 106,259 other vehicles [2].

The growth rate of cars in circulation during the period 2005 - 2020 is at an average rate of 13.3% per year. The annual growth rate of passenger cars is higher than the average and also higher than the growth of other type of automobiles, followed by the growth of trucks; the growth rate of coaches is the lowest. Details of cars in circulation in the period 2005 - 2019 are shown in Figure 1 below

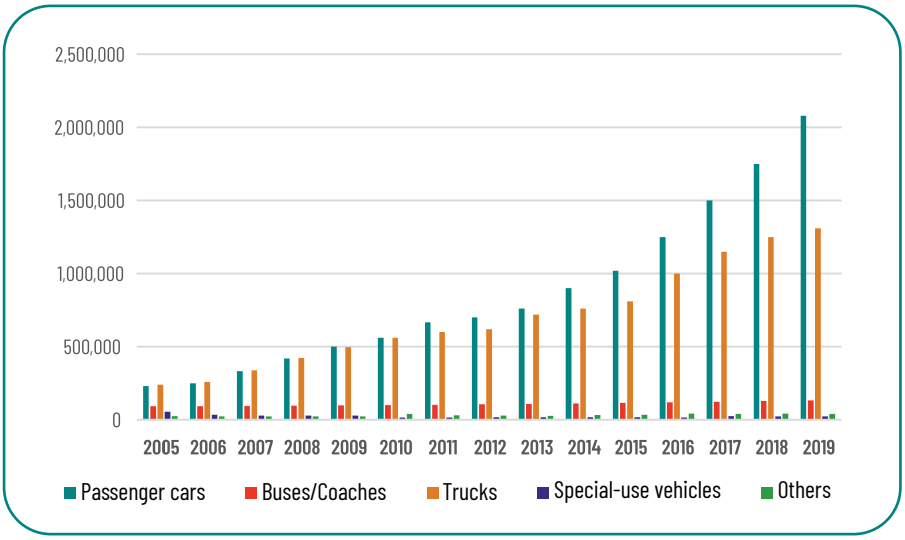


Figure 1: Summary of road motor vehicles in the period 2005-2019 [2]

The proportion of households owning a car is only about 2%; therefore, cars account for only a very small share of the vehicle fleet in Viet Nam. However, in recent years, the annual growth rate of cars has been relatively high (see Table 1 and Figure 2).

Table 1: The annual growth rate of cars in circulation in five central-level cities in Viet Nam for the period 2014 to 2018 [12]

Cities	Annual growth rate (%)
Hanoi	10.3
Ho Chi Minh City	11.7
Hai Phong	13.7
Da Nang	18.1
Can Tho	15.9

With the current number of vehicles, the rate of car ownership is about 24.56 cars/1,000 people. Comparing to other countries in the region and the developed countries, the level is still very low (equivalent to about 1/24

times compared to developed countries, 1/4 times compared to countries in the region, 1/17 times compared to Korea, 1/18 times compared to Singapore, Thailand), specifically the ratio of cars/1,000 people in developed countries is about 400 – 600 vehicles, countries in the region about 50 – 100 vehicles, Singapore about 200 vehicles, South Korea 427 vehicles and Thailand about 198 vehicles. [2].

The rapidly increasing number of road vehicles leads to an increasing demand for fuel consumption. Currently, the transportation sector with the majority of road motor vehicles using fossil fuels (petrol and diesel) has already become the third highest energy consumer in Viet Nam. In which, the proportion of vehicles using gasoline fuel is estimated at 55% of the total number of automobiles in circulation [2].

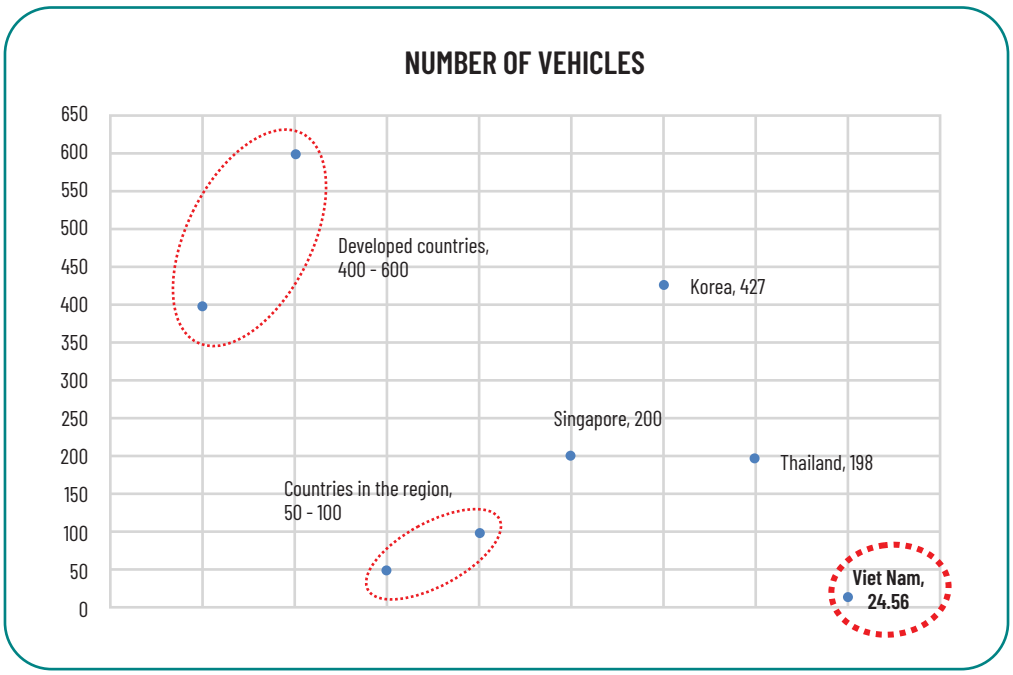


Figure 2: Passenger car ownership/1000 people of Viet Nam compared to other countries [2]

AUTOMOBILE MARKET

In recent years, with a young population structure (the median age in Viet Nam is 32.5 years and the population aged 15-24 accounts for 70%) and improving average income per capita, a significant change in private car consumption in Viet Nam has been witnessed recently. However, the expensive purchase price, tax, fees, and high operation costs are hindering the accessibility of this vehicle type [6].

The market has scored an impressive series of all-time records ending 2016 with more than double compared to 2012. However, in 2017 the market scored the first break after years, down to 12.6%. In 2018, the market started immediately to recover, signing an 11.1% growth, while in 2019 it kept surging to 14.3%. Sales in 2020 have grown by 8% despite the COVID-19 pandemic. In fact, 384,934 units have been sold. The year 2021 started positively for the Vietnamese market, in fact, in Quarter 1, 88,950 units have been sold, reporting a 40% increase in sales compared to Quarter 1, 2020[1].

[1] https://www.focus2move.com/vietnamese-vehicles-market/

2.2 GHG EMISSIONS REDUCTION IN THE TRANSPORT SECTOR IN VIET NAM

Viet Nam's economic growth in recent years has been stable, reaching over 6.8%, which put Viet Nam in the group of high-growth countries in the region as well as in the world (Viet Nam Report, 2019). The transport sector plays an important role in maintaining national economic growth. Transport is responsible for moving goods and people from one place to another safely and quickly. Common modes of transport include road, railway, maritime, inland waterway and aviation.

According to Transport Development and Strategy Institute's statistics, in the period 2011-2016, transport activities in Viet Nam consumed about 30% of the total national energy demand, 60% of total fuel consumption and increased by 10% per year. Road transport is the largest energy consumer, accounting for about 68% of transport sector fuel consumption; 90% of fuel for transportation is gasoline and diesel (of which only 0.3% is clean fuel[2]). With the consumption of large amounts of fuel, transportation activities have emitted large amounts of GHGs, increasing climate change. On average, each year transportation activities emit about 30 million tons of CO_2. Road transport accounts for 85% of emissions of the whole industry, inland and coastal waterway transport accounts for 10%, and aviation accounts for 5% [8].

Furthermore, the operation of the transport fleets emits a large amount of air pollutants. The concentration of dust in the air (Quarter 2, 2016) at intersections in cities such as Hanoi, Ho Chi Minh, Hai Phong, Da Nang etc. is 3-5 times higher than the allowable standard; The average daily concentration of CO and NO gas exceeded the allowable standards by 1.2 - 1.5 times[3]. The emission level of road motor vehicles depends heavily on the quality of the vehicles. The cause of serious environmental pollution is due to the low quality of cars and motorbikes used for many years, having low fuel efficiency, high concentration of toxic substances and dust in the exhaust gas.

The transport sector has become and will continue to be a significant emitter of greenhouse gases (GHG), contributing 30.6 million tons CO_2, which corresponds to 10.76 percent of total CO_2 emissions in 2014. Road transport accounted for 89.7 percent of transport emissions. One of the reasons for this large share of emissions is that road transport carries 94 percent of passengers and 76 percent of freight tons. The transport sector consumes five types of fuel: Gasoline is consumed by almost all road transport modes, such as two-wheelers, passenger cars, light commercial vehicles; diesel is consumed by road, railway, and inland waterway transport; fuel oil (FO) is only used for maritime vehicles; kerosene is only used in aviation; and electricity is mainly consumed by electric two-wheelers, and in the future, by metro, buses and cars.

Viet Nam can make significant headway in reducing GHG emissions from the transport sector: up to 9 percent (or 53 million tons in 2030) with domestic resources only, and 15-20 percent (or 87-117 million tons in 2030) by mobilising international support and private sector participation. Under the most ambitious scenario, Viet Nam would achieve a reduction in cumulative emissions from the transport sector of up to 1 billion tons between 2014 and 2050. The most effective measures include improving the fuel economy of vehicles, shifting freight transport from road to waterborne transport, and introducing electric vehicles of various kinds, including motorbikes, cars, and buses [7]. In particular, fuel economy standard for new vehicles has the potentail to reduce 2030 CO_2 and 2050 CO_2 to 4,5 – 5,13 millions tons and 21-25 millions tons respectively.

[2] CNG, LPG, biofuel, electricity

[3] http://www.tapchimoitruong.vn/phat-trien-ben-vung-24/Gi%E1%BA%A3m-ph%C3%A1t-th%E1%BA%A3i- kh%C3%AD-nh%C3%A0-k%C3%ADnh-do-ho%E1%BA%A1t-%C4%91%E1%BB%99ng-giao-th%C3%B4ng-v%E1%BA%ADn-t%E1%BA%A3i-19756

03

FUEL ECONOMY DATABASE OF PASSENGER CARS UNDER 9 SEATS

3.1 DATA GATHERING METHODOLOGY AND APPROACH

As mentioned in the context, according to the ICCT's report "Review international experience of fuel economy regulation for passenger cars and two-wheelers", there are currently ten governments have established fuel economy or GHG emission standards for light-duty vehicles – Brazil, Canada, China, the European Union, India, Japan, Mexico, Saudi Arabia, South Korea, and the United States. These countries account for 80% of LDV market. Among the countries that have adopted fuel consumption/CO_2 emission standards, the EU and Japan have set the furthest targets for 2030. The EU is currently considering strengthening 2030 standards and setting 2035 standards in order to achieve its target of net-zero GHG emissions by 2050. China has proposed a preliminary fleet average fuel consumption target for 2030, a 20% reduction from fleet average target of 2025. The U.S. is revisiting its fuel efficiency standards, which may lead to more stringent standards than the existing ones. Mexico, Brazil, and India are in the process of updating their existing standards. Regarding to the regulatory objective, the fuel consumption standards usually apply to all new vehicles that are produced/assembled or imported to be sold to the market. New Zealand is the only country regulates the fuel consumption of used vehicles that are imported to the country. Setting a corporate average fuel economy target instead of targets for individual models is a common practice across regions. Because efficient models can offset the negative impact of less efficient models from the same manufacturer, regulators can set stricter standards for the fleet rather than for individual models to motivate technology innovations that are still feasible for manufacturers to meet.

Regulators from around the world have realised that using a vehicle's physical attributes to set standards reduces the competitive impact on manufacturers while preserving the goal of reducing fuel consumption or CO_2 emissions. Table 2 summarises the assessment of potential index parameters based on a variety of criteria. Vehicle size, and especially footprint, is a better attribute from a regulatory perspective because it is less susceptible to gaming and maintains technology neutrality. Some countries (e.g. the U.S. and Canada) set the standard curve based on vehicle footprint, whereas some (e.g. the EU, India) based on vehicle curb weight [9]. In the region, Korea and Taiwan have already promulgated the FE standards based on the engine size. Viet Nam has also issued a voluntary standard (TCVN 9854-2013) in which regulated the FE limitation based on the vehicle's kerb mass.

Regarding the collection and compilation of data for baseline setting, the consultant team have collected the required data, which comprises the number of newly registered vehicles by:
1) Vehicle make (e.g. Toyota)
2) Vehicle model (e.g. Corolla)
3) Model production year (e.g. 2018)
4) Engine displacement (e.g. 1,800 cc or 1.8L)
5) Kerb mass (kg)
6) Rated fuel consumption (Lge/100km)

Appendix 1 shows an example of part of a database that 1) the difference between vehicle types by manufacturer and model and 2) gathers information for those vehicles along the basic vehicle characteristics needed to form a picture or baseline of the average fuel consumption for any given year.

Due to the diversity of the vehicle market, it will most likely be impossible to complete fuel consumption data for each and every newly registered vehicle – the accuracy of the fuel consumption baseline is sufficient, if fuel consumption data can be added to at least 85% of all newly registered vehicles in one year.

Table 2: Assessment of vehicle physical parameters for standard design [9]

	Diversity competitive neutrality, vertical spread	**Robustness** avoids perverse effects (circumvent the rule)	**Flexibility** no distinguish among technology	**Representativeness** proxy for utility, socially equitable	**Comprehensiveness** avoid adverse effects, safety	**Practicability** data, continuous, definition, complexity
Flat standard	-	++	++	--	•	++
Curb weight	+	-	-	-	•	+
Payload	+	--	-	-	•	+
Gross weight	+	--	-	--	•	+
Footprint	++	+	+	•	++	+
Pan area	++	-	+	+	+	•
Engine power	+	--	-	-	•	+
Displacement	+	--	-	-	•	-

Note: Index parameter: Meet criterion substantially (++)/ meets criterion (+)/ does not affect criterion (●)/ does not meet criterion in most cases (-)/ does not meet criterion at all (—)

PLAN FOR THE SURVEY AND DATA COLLECTION

• Prepare the plan for the meetings working with departments and agencies of the Viet Nam Register.
- Target departments and agencies: Department of motor vehicle technical safety inspection, Department of motor vehicle certification and Information Centre
- Content of the meetings: Collect and gather data of newly registered vehicles according to the template mentioned in the TOR
• Collect the specifications of the vehicles from other sources, e.g. VAMA, the manufactures' websites in order to cross-check the data collected.

DATA COLLECTION AND PROCESSING

• Collect data for the year 2018 and the other years from the VR according to the template mentioned in the TOR
- Filter the data for each newly registered vehicle (first registration and first time implemented technical/safety inspection; and environment protection).
- Assign data fields (FC, specifications and characteristics of the vehicles, e.g. engine displacement, kerb weight etc.)
- Summarise the number of newly registered vehicle for each make/model, look up detailed data for each vehicle in the database of VR, official registration certificates, manufacturer's catalogue in order to check the

consistency of each make/model code.

- Process missing and duplicate data through assigning more data fields to filter (using Excel tools) combined with cross-checking.
- Finalise the database of newly registered vehicles (including the number of each make/model and specifications)

Details of data collection and processing are described in Figure 3 below.

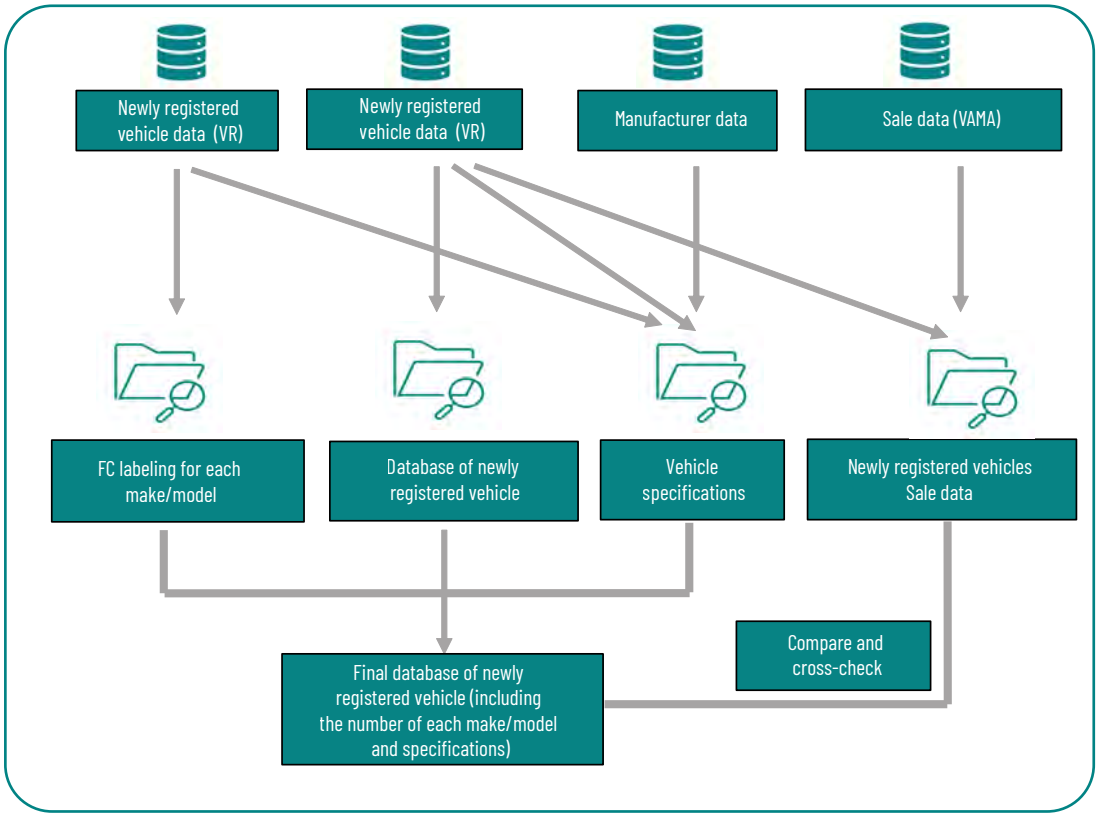


Figure 3: Data collection and finalisation process (Source: The consultant team)

3.2 RESULTS OF THE DATABASE OF PASSENGER CARS UNDER 9 SEATS

Table 3 below reveals the overall picture of the number of newly registered vehicles of 14 manufacturers during the period 2016 - 2020, thereby showing the stability of 05 manufacturers including Hyundai, Toyota, Kia, Honda and Mazda. Vehicle data analysis selects 10 manufacturers for each year, corresponding to 96.3-99.6% of the total number of newly registered passenger cars with 9 seats or less. Table 3 and Figure 4 below describe the detailed market share of the top 10 manufacturers during the period 2016-2020 (Data in the table only indicates top 10 manufactures collected for each year), in which there is a stable presence of 07 manufacturers, in addition, there are 06 other manufacturers, especially the performance of domestic car manufacturer VinFast in the last two years (2019-2020).

Table 3: Overview of newly registered passenger cars under 9 seats, period 2016-2020 (Source: The consultant team)

No.	Manufacturers	Number of newly registered vehicles				
		2016	2017	2018	2019	2020
1	Hyundai	25,336	26,150	44,959	62,280	69,075
2	Toyota	48,117	51,724	56,845	70,632	65,339
3	Kia	28,363	10,083	26,820	22,845	29,559
4	Honda	10,236	11,735	16,942	19,694	24,737
5	Mazda	22,084	20,299	24,561	26,111	24,772
6	VinFast				7,591	23,216
7	Ford	7,175	6,156	7,562	15,526	11,084
8	Mitsubishi	4,000		7,146	25,445	28,319
9	Suzuki					7,744
10	Mercedes	3,528	5,198	5,197	6,422	6,391
11	Peugeot			3,549	3,279	
12	Nissan		2,394	4,171		
13	Chevrolet	6,636	5,939			
14	Lexus	1,865	1,154			
	Total newly registered vehicles (Top 10 manufactures)	157,340	140,832	197,752	259,825	290,236
	Total newly registered vehicles	163,455	141,459	203,761	268,339	294,183
	Market share %	96.3%	99.6%	97.1%	96.8%	98.7%

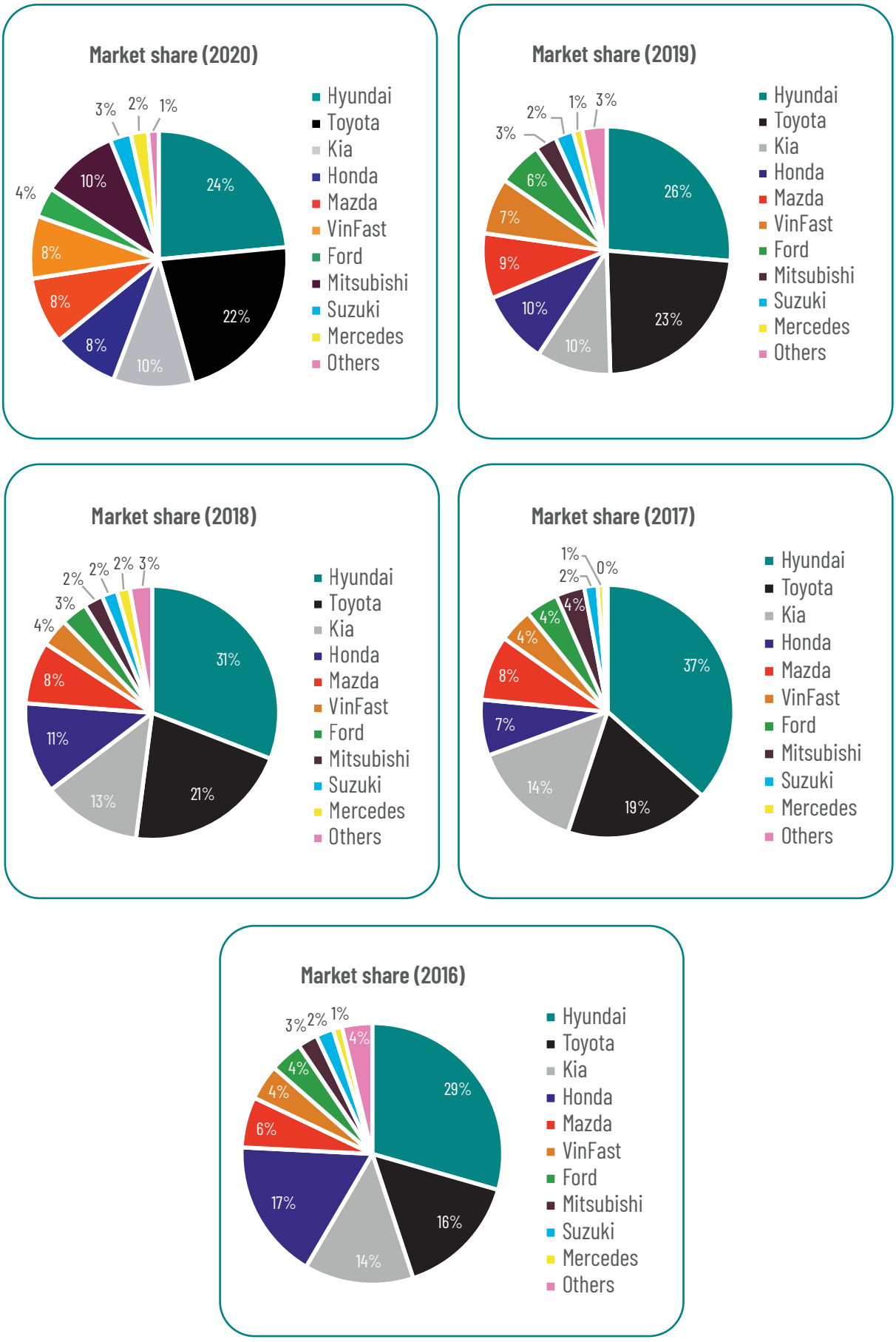


Figure 4: Market share of newly registered passenger cars under 9 seats, period 2016-2020 (Source: The consultant team)

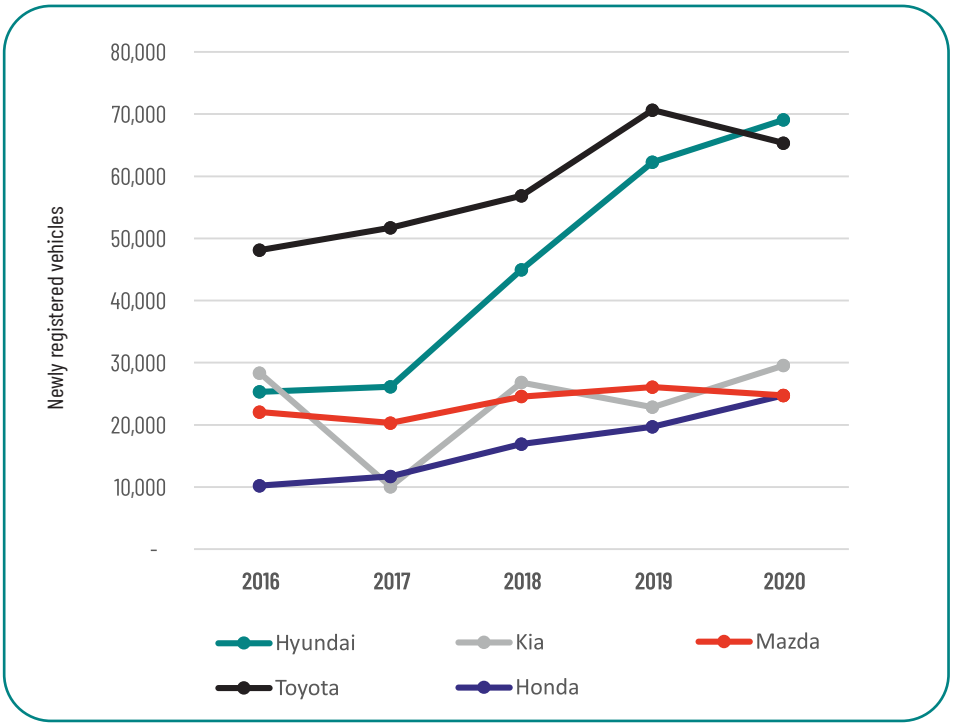


Figure 5: Number of newly registered passenger cars under 9 seats of top 05 manufacturers (Source: The consultant team)

The number of newly registered passenger cars under 9 seats of the top 5 manufacturers as shown in Figure 5, illustrates a steady growth over the years (except for Kia), in which the largest increase belongs to Hyundai, reaching more than double from 2017 to 2019 and topped the number of newly registered vehicles in 2020.

In order to have an overview of passenger cars under 9 seats in Viet Nam, data on vehicle specifications have been collected and then categorised by fuel consumption, fuel type, engine displacement and kerb mass.

Table 4 demonstrates that the average fuel consumption of manufacturers is 5-7L/100km, except for some special cases with high fuel consumption, most of which focus on luxury car manufacturers such as Mercedes, Peugeot and Lexus, or focus on multi-purpose vehicles (e.g. Ford) (Methodology for calculating the FC is described in *Section 4.3. Methodology*).

Table 4: Average fuel consumption by manufactures (Source: The consultant team)

No.	Manufacturer	Fuel consumption (L/100km)				
		2016	2017	2018	2019	2020
1	Hyundai	6.50	6.58	6.39	6.42	6.55
2	Toyota	7.68	7.56	7.15	7.00	6.95
3	Kia	5.92	5.59	6.48	4.65	6.57
4	Honda	6.96	6.67	6.26	5.60	6.42
5	Mazda	6.45	6.73	6.55	5.44	6.97
6	VinFast				7.54	7.29
7	Ford	7.67	8.18	6.75	10.31	7.39

	Manufacturer	Fuel consumption (L/100km)				
		2016	2017	2018	2019	2020
8	Mitsubishi	7.16		6.43	4.63	6.47
9	Suzuki					5.96
10	Mercedes	7.86	9.44	8.53	8.91	9.52
11	Peugeot			8.42	8.29	
12	Nissan		7.32	6.64		
13	Chevrolet	7.83	7.78			
14	Lexus	10.96	10.31			
	Average	**6.99**	**7.17**	**6.74**	**6.69**	**6.80**

Generally, the number of passenger cars under 9 seats using gasoline engines accounts for 90% or more (Figure 6), only in 2019 the market share of diesel cars increased suddenly, accounting for 17.3% of the total number of newly registered vehicles.

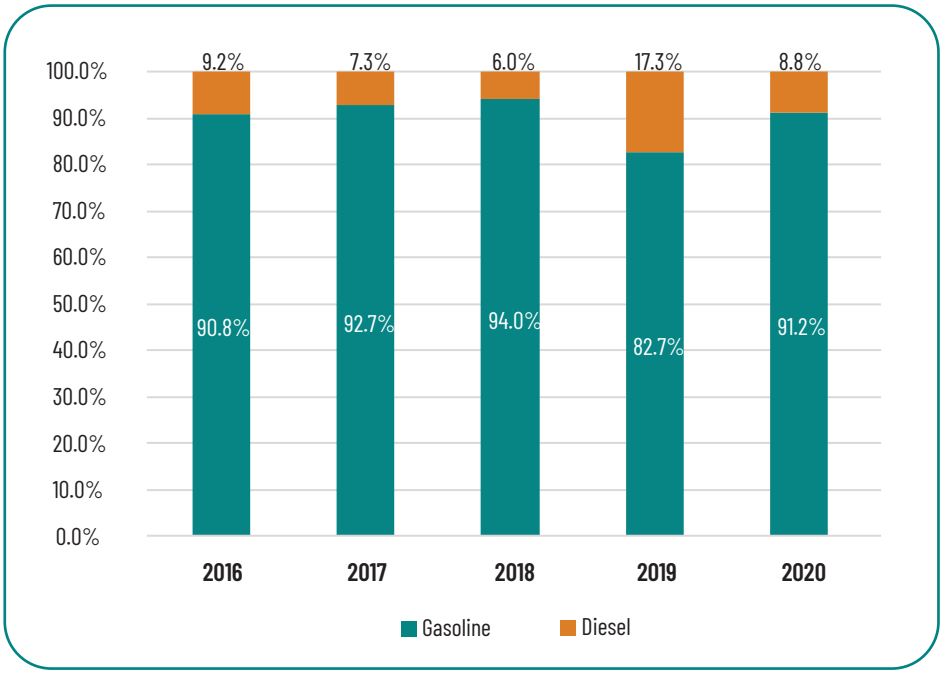


Figure 6: Fuel type of newly registered passenger cars under 9 seats (Source: The consultant team)

Figure 7 below highlights the predominance of vehicles with engines of 2.5 litres or less, especially vehicles from 1.4 to 2.0 litres, accounting for more than 50%. Vehicles of 2 litres and below tended to increase during the recent period 2017 - 2020, while models of 3 litres and above tended to decrease (Table 5).

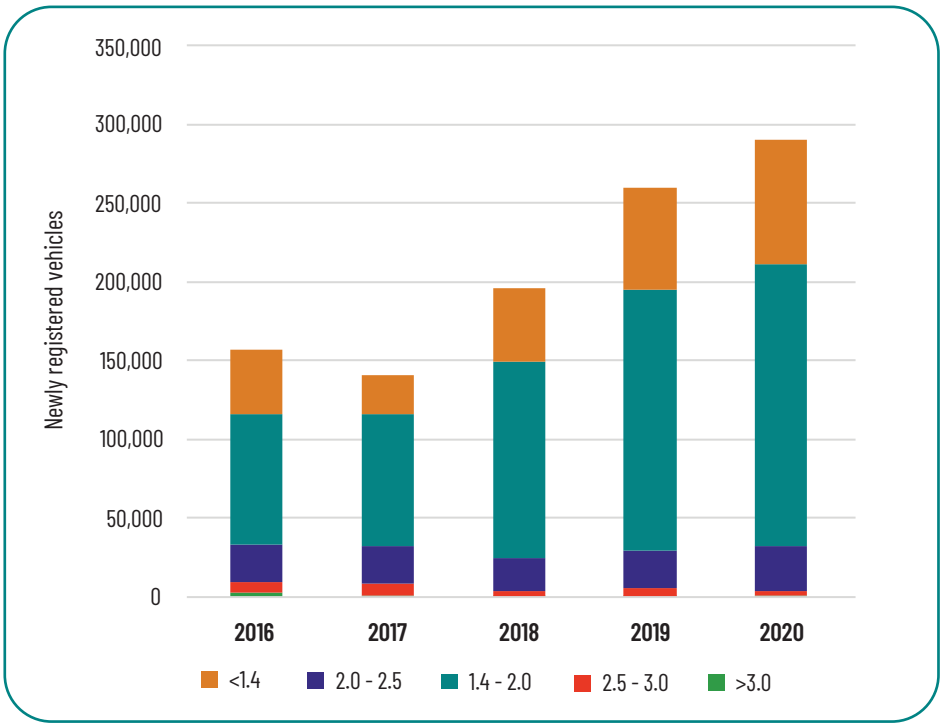


Figure 7: Engine displacement of newly registered vehicle split, 2016-2020 (Source: The consultant team)

Table 5: Number of newly registered vehicles by engine displacement (Source: The consultant team)

Engine Displacement (L)	Number of newly registered vehicles				
	2016	2017	2018	2019	2020
> 3.0	2,811	1,191	312	265	684
2.5 - 3.0	6,894	6,952	3,672	5,546	3,276
2.0 - 2.5	23,279	24,362	20,839	23,764	28,237
1.4 - 2.0	83,177	83,416	124,500	165,667	178,872
< 1.4	40,980	24,911	46,372	64,583	79,167

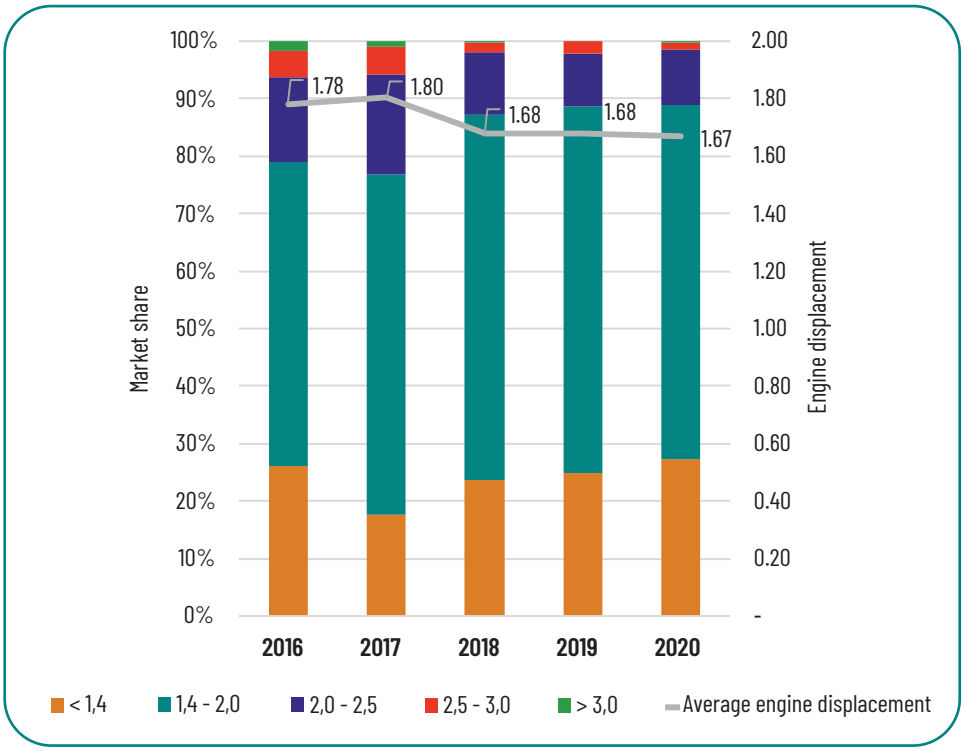


Figure 8: Average engine displacement of newly registered vehicle (Source: The consultant team)

Figure 8 indicates the change in the average engine displacement of the fleet during the period 2016-2020, with a slight increase from 2016-2017, then a decrease from 2017-2020, reaching 1.67L in 2020.

Figure 9 points out that the kerb mass of vehicles during the period 2016-2020 is dominated by vehicles from 1-1.4 tons and the number of vehicles in this segment increases gradually from 2017-2020. Although occupying a small market share, the increase of vehicles with the kerb mass from 1.6-2.0 tons, especially vehicles > 2.0 tons, may affect the average fuel consumption of the entire fleet.

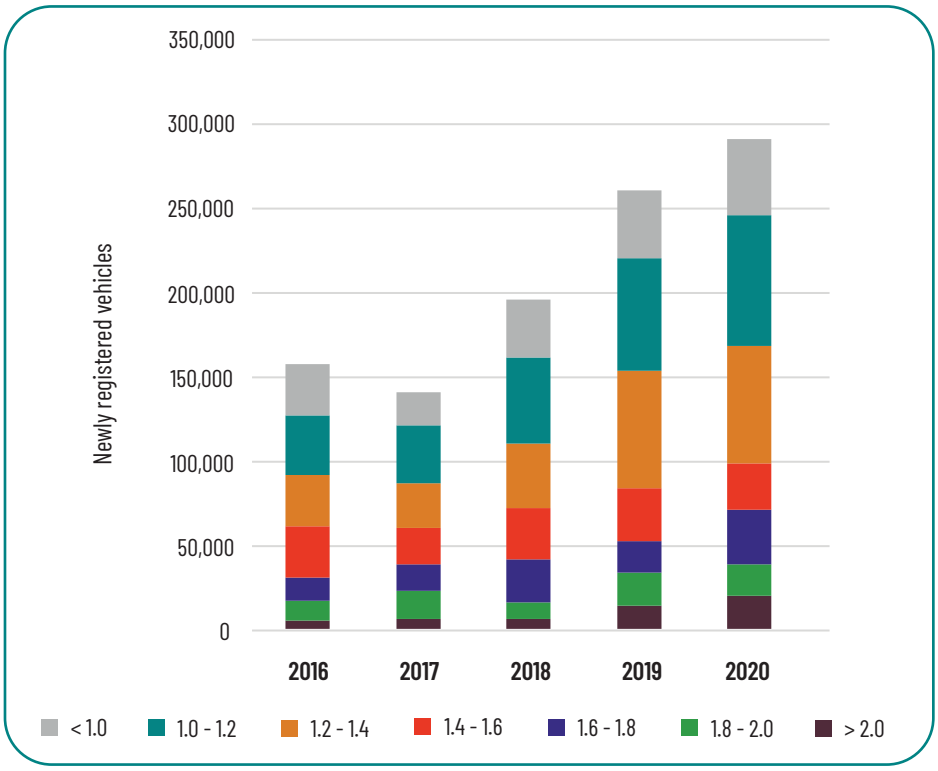


Figure 9: Newly registered vehicle split by weight, 2016-2020 (Source: The consultant team)

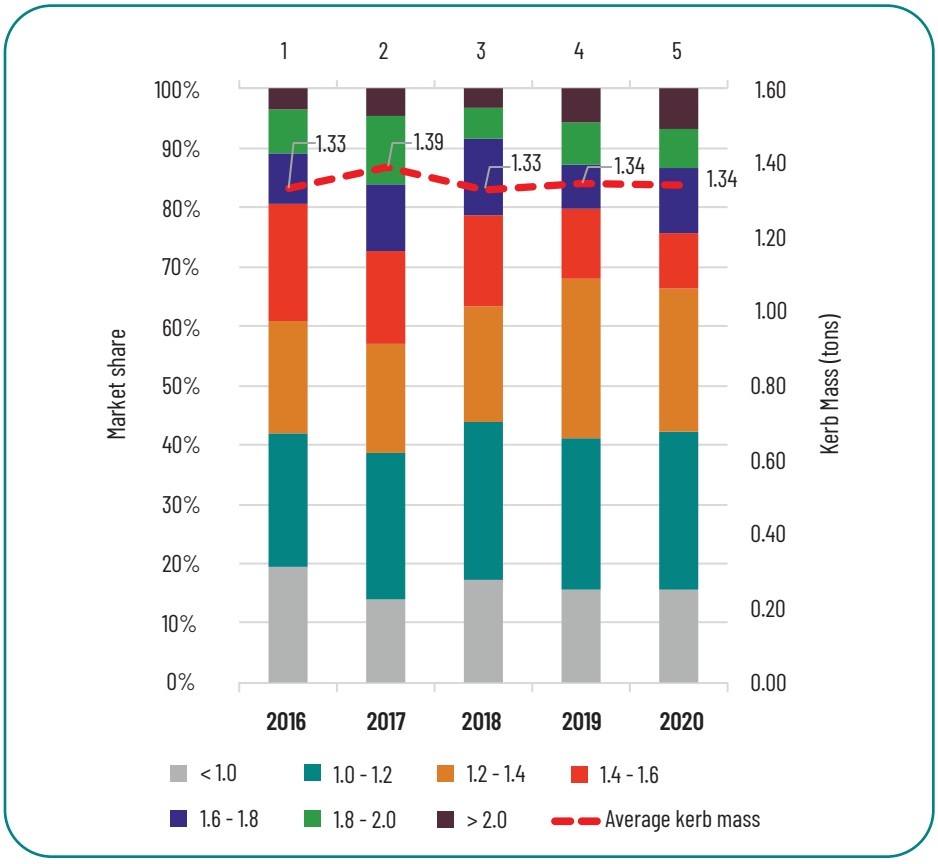


Figure 10: Average kerb mass of newly registered vehicle (tons) (Source: The consultant team)

Figure 10 above shows that there is no significant change in the average kerb mass of the fleet during the period 2016-2020 from 1.33-1.34 tons, with only a slight increase of the fleet in 2017, reaching 1.39 tons.

04

FUEL ECONOMY BASELINE OF PASSENGER CARS UNDER 9 SEATS

4.1 INTRODUCTION AND THE INTERNATIONAL CONTEXT

Globally, two emission scenarios - the six-degree scenario (6DS) and the two-degree scenario (2DS) - have been proposed by the International Energy Agency (IEA) to develop various necessary actions to reduce energy-related carbon emissions (IEA, 2016). While the 6DS represents a world with no further action with regard to energy use and climate change, the 2DS lines out an energy use and emissions scenario providing at least a 50% probability to limit the global temperature increase to 2 degrees Celsius above pre-industrial levels by 2100.

Based on the emission scenarios developed by the IEA, and within the context of the transport sector, the Global Fuel Economy Initiative (GFEI) has analysed necessary actions to achieve a 2DS focusing on LDVs. According to this initiative, improving fuel efficiency of LDVs is identified as one of the three necessary mitigation strategies, comprising avoid (avoiding transport demand), shift (shifting transport demand to more efficient modes) and improve (improving conventional vehicle technology and switching to alternative powertrains and clean fuels) measures. The initiative has also pointed out that improving efficiency using today's available technologies alone has the potential to almost stabilise LDV greenhouse gas emissions to today's levels.

Benefits of fuel economy improvements include both reductions of greenhouse gas emissions and a reduction in fuel costs on the individual, national as well as international level.

FUEL ECONOMY POLICIES IN THE ASEAN REGION [1]

The current status of fuel economy policy development varies across the region. While some ASEAN Member States (AMS) lack specific measures, others such as Singapore have introduced a bundle of measures over the last years. Singapore, Thailand and Viet Nam have mandatory labelling schemes for new PLDVs in place. Fuel economy labels are voluntary in Indonesia. Brunei Darussalam, Malaysia and the Philippines are planning to introduce fuel economy labels, while no such plans currently seem to exist in Cambodia, Lao PDR or Myanmar. All AMS have vehicle registration taxes in place, either a one-off tax for new cars, an annual vehicle circulation tax, or both. In most cases, these taxes are related to vehicle attributes such as price or engine displacement. Singapore introduced the Carbon Emission Based Vehicle Scheme (CEVS) in 2013 to tax vehicles based on their carbon emission, but in 2018 transitioned to a new mechanism, the Vehicular Emissions Scheme (VES), which in addition to assessing vehicles based on CO_2 emissions, it also assesses them based on hydrocarbon, carbon monoxide, nitrogen oxides and particulate matter emissions to calculate rebates and surcharges. In Thailand, the registration tax for new vehicles has been based on CO_2 emissions since 2016.

Indonesia and Malaysia provide tax incentives for the domestic production of fuel-efficient cars but not for consumers. These schemes are geared primarily towards industry development, rather than the objective of reducing fuel consumption.

No AMS has mandatory fuel economy, fuel consumption or CO_2 emission standards in place yet. Thailand has introduced voluntary Minimum Efficiency Performance Standards (MEPS) and High-Efficiency Performance

Standard (HEPS). Also in Viet Nam, voluntary fuel consumption limits were introduced for two-wheelers and passenger cars in 2013. The standards for passenger cars in Thailand and Viet Nam differentiate classes of vehicles based on weight. Brunei Darussalam has indicated in its Nationally Determined Contribution to the Paris Climate Agreement that it wants to adopt the EU's CO_2 standards for LDVs. In fact, the Vietnamese standards as well as the Thai MEPS allow fuel consumption to be about twice as high as the European limits for a certain weight interval. Such weak and voluntary standards apply limited pressure on car manufacturers to improve vehicle fuel efficiency. Fuel taxes show a broad variance among the AMS, with Brunei Darussalam and Malaysia on the very low end, and Singapore reaching EU price levels. Fuel taxes are a very efficient means of motivating fuel efficiency improvement. Cutting fuel subsidies can thus be a key starting point towards effective fuel economy policies.

4.2 FUEL ECONOMY – DEFINITION [11]

• Passenger car: A vehicle with a structure and equipment mainly used to carry people, carry-on luggage and/or goods, with a number of seats including the driver's seat not more than 9 according to TCVN 7271.
• Turbocharger: A device fitted to a vehicle's engine that is designed to improve the overall efficiency and increase performance.
• Vehicle type: A type of vehicle in which the vehicles have the same essential characteristics as body, engine, transmission, tires and kerb mass according to TCVN 7792.
• Kerb mass/unladen mass (mk): The kerb mass (also referred to as kerb weight) is the weight of the vehicle from the factory without any passengers or cargo on board, but with full fuel in the tank, liquid-cooled engine, battery, common tools, spare wheel or other necessary equipment provided by the vehicle manufacturer, according to TCVN 7792.
• Fuel consumption (FC): The amount of fuel consumed, in litres, of the vehicle travelling a distance of 100 km, (L/100 km). (FC using in this study is a combination of city and highway FC values).
• Fuel economy/fuel efficiency (FE): The distance travelled, in kilometres, when the vehicle consumes 1 litre of fuel, (km/L).

Within this study, the only units, which are used to measure fuel consumption are l/100 km (volumetric) or Lge/100 km ("litres of gasoline-equivalent, Lge, per 100 km – here different fuels such as diesel are normalised to the volume of gasoline, thus taking into account the various energy densities of the different fuels). On the other side, the term "fuel economy" is used interchangeably with "fuel consumption" or "fuel efficiency" without intending a change of the underlying units. This terminology accounts for the fact that policies to reduce the fuel consumption of vehicles are most often referred to as "fuel economy policies", without being affected by the respective unit of measure.

4.3 METHODOLOGY

Based on the data collection and gathering in Section 3, weighted average fuel consumption for the period 2016-2020 has been calculated using the following equation:

$$FC = \frac{\sum_i^n Reg_i \times FC_i}{\sum_i^n Reg_i}$$

FC: weighted average fuel consumption

Reg_i: number of newly registered vehicles of type i

FC_i: fuel consumption of a vehicle of type i

Weighted average FC will then be analysed by two main technical characteristics: Engine displacement and kerb mass and then other characteristics might impacts including: fuel type and engine type (turbo and normal).

4.4 FUEL CONSUMPTION BASELINE OF PASSENGER CARS UNDER 9 SEATS

A. BASED ON ENGINE SIZE

First, the weighted average FC is analysed focusing on engine displacement (Figure 11 and Table 6). Basically, it can be seen that the level of FC is closely related to the engine displacement of the vehicle, specifically, the higher the capacity, the higher the FC. Figure 11 below shows a small change in FC of the fleet of vehicles with a capacity of 2.5 litres or less, of which a noticeable increase in FC of the fleet with a capacity of less than 1.4 litres.

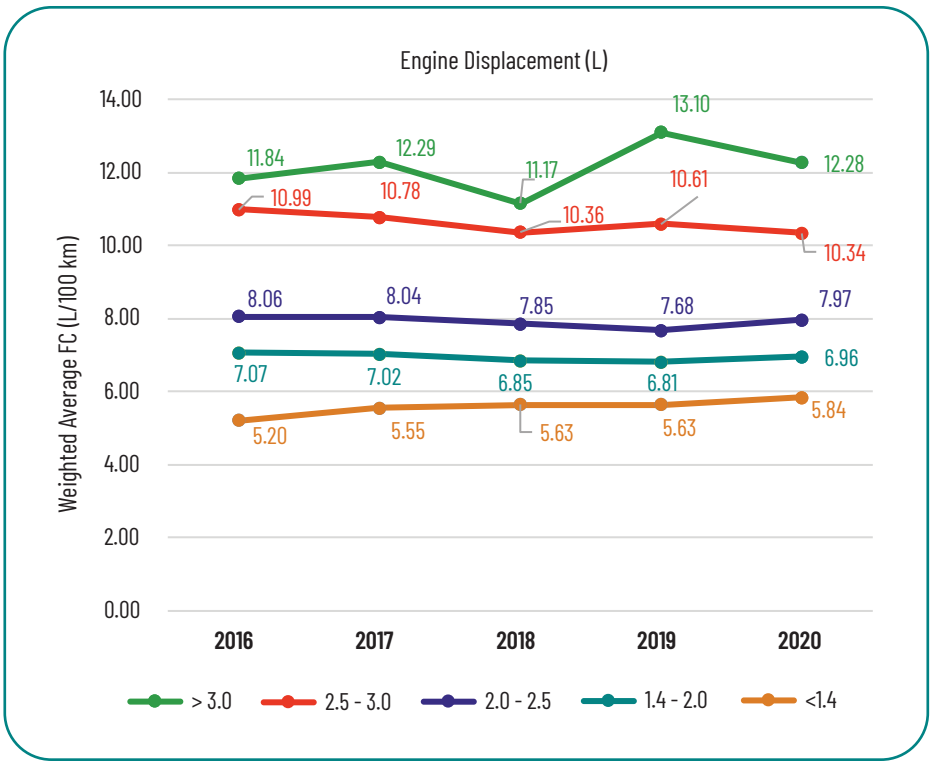


Figure 11: Weighted average fuel consumption by engine displacement (Source: The consultant team)

For vehicles from 1.4-2.5 litres, FC has improved during the period 2016-2019, but tends to increase slightly during the period 2019-2020. In addition, there is a crucial improvement of the fleet with a capacity of 2.5-3.0L during the period 2016-2020, reducing from 10.99L/100km to 10.34L/100km.

Table 6: Weighted average fuel consumption by engine displacement (Source: The consultant team)

Engine Displacement (L)	Weighted average fuel consumption by engine displacement (L/100km)				
	2016	2017	2018	2019	2020
> 3.0	11.84	12.29	11.17	13.10	12.28
2.5 - 3.0	10.99	10.78	10.36	10.61	10.34
2.0 - 2.5	8.06	8.04	7.85	7.68	7.97
1.4 - 2.0	7.07	7.02	6.85	6.81	6.96
< 1.4	5.20	5.55	5.63	5.63	5.84

For the fleet of vehicles with a capacity of > 3.0L, FC is not stable, but there is an improvement during the period 2017-2018 and 2019-2020. The weighted average FC by engine displacement is analysed as shown in Figure 12, showing a continuous change during the period 2016-2020, particularly the weighted average FC increased slightly during the period 2016-2017 and improved from 2017-2019, from 7.17L/100km down to 6.69L/100km, however, there is currently an increase again during the 2019-2020 period. Although the ratio between fleets (in terms of engine displacement) has not changed significantly, the change in FC can be explained by the increase of fleet with displacement less than 2 litres.

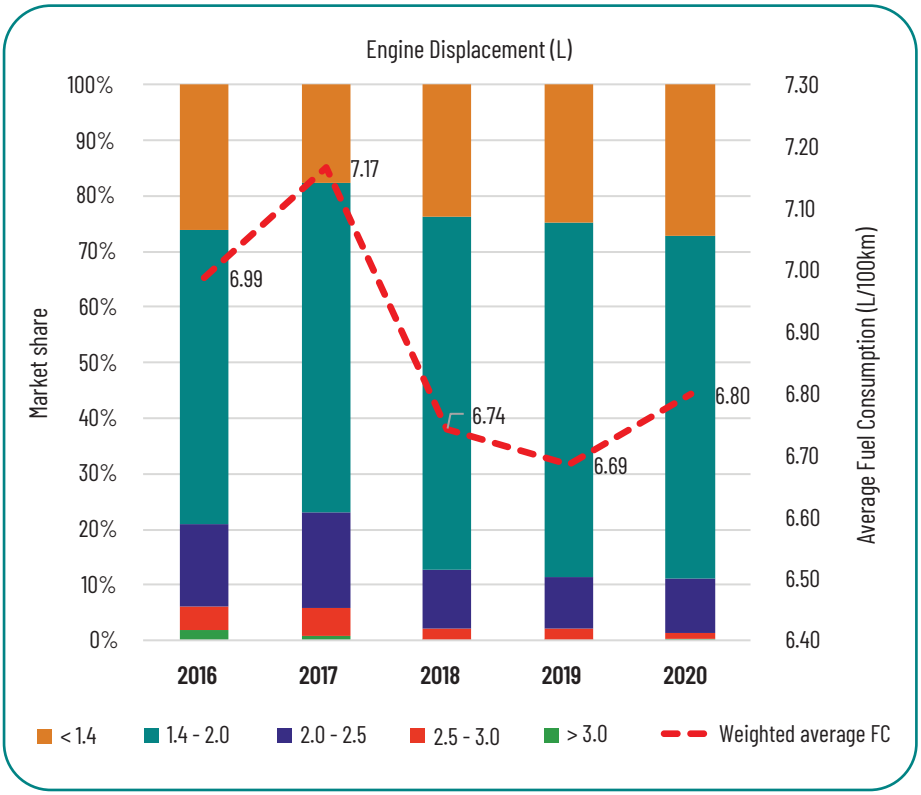


Figure 12: Market share by engine displacement and weighted average FC (Source: The consultant team)

In order to have an overview of the influence of technical characteristics on the weighted average FC of vehicles by engine, the consulting team conducted analyses related to the type of fuel used (diesel, gasoline) and engine type (turbocharger, normal).

Figure 13 below shows that vehicles with the same engine capacity (e.g.: 2-2.5L), the average FC of diesel fueled vehicles is usually lower than gasoline vehicles, in other words, vehicles using diesel fuel have more fuel efficiency than gasoline vehicles.

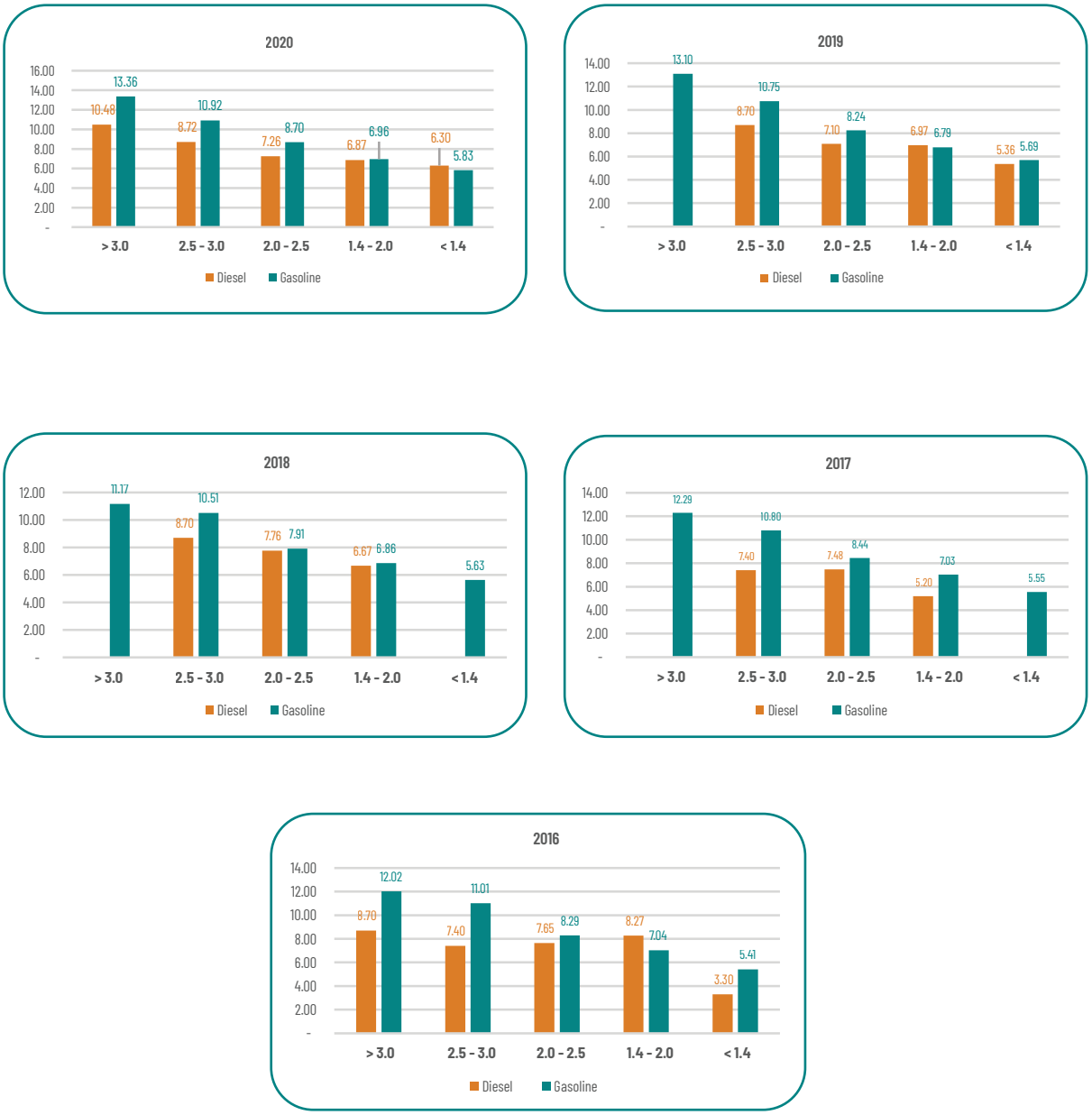


Figure 13: Average FC by engine displacement and fuel type (Source: The consultant team)

Regarding the engine type (turbocharger/ normal), Figure 14 showcases that for vehicles with the same engine displacement range (from 2L and up), the average FC of vehicles using turbocharged engine is smaller than vehicles using normal engines (naturally-aspirated). On the contrary, for vehicles with engine displacement less than 2L, vehicles using normal engine have more fuel efficiency than those using turbocharged engines. Through the above analysis, turbocharger technology does not really affect the vehicle fuel consumption and other factors such as carrying load, driving conditions, tire pressure or the driving techniques can have certain effects on the vehicle fuel consumption. Therefore, in order to have a vehicle with good fuel consumption parameters, manufacturers must consider and perfect a number of factors, not just focus on engine structure or cylinder capacity.

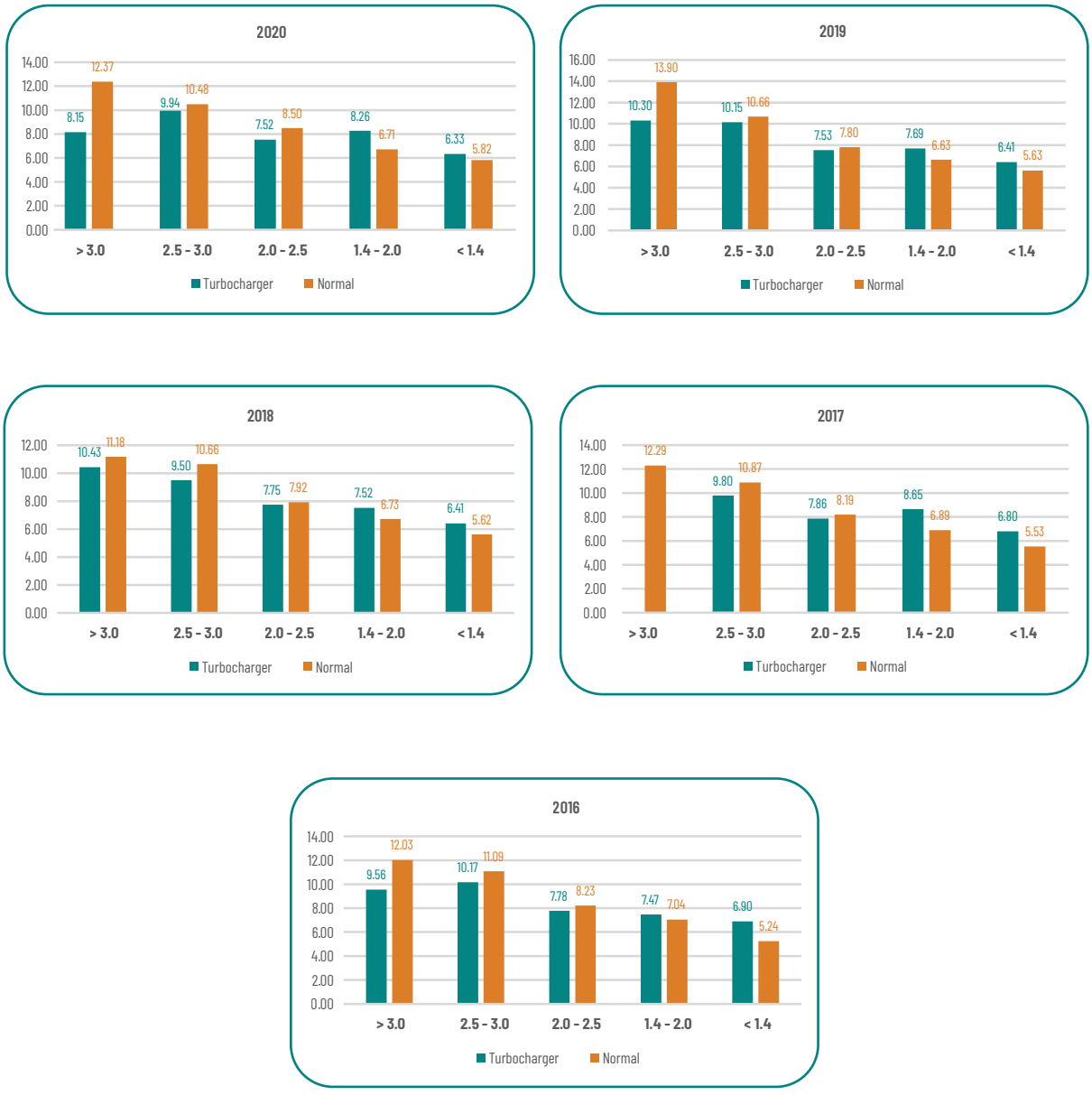


Figure 14: Average FC by engine displacement and engine type (Source: The consultant team)

According to the scenarios analysing the mitigation actions in the report "Addressing Climate Change in Transport" conducted by GIZ and World Bank in 2019 [7], the fuel economy standard of newly registered vehicles is one of the potential measures, see Table 7 below.

Table 7: FE-related mitigation option under the NDC scenarios [7]

Mitigation option	Scenario 1	Scenario 2	Scenario 3
New vehicle fuel economy and emissions standards	Vehicle fuel economy standard for new vehicles deployed in two stages: Stage 1 (2022 - 2026): In which Stage 2 (2027 onwards): In which	• Small car (<1,400cc): 6.1 L/100km • Medium car (1,400-2,000cc): 7.52 L/100km • Large car (>2,000cc): 10.4 L/100km • 2022: 50% of car sales comply with standard • 2023: 75% of car sales comply with standard • 2024-2026: 100% of car sales comply with standard • Small car (<1,400cc): 4.7 L/100 km • Medium car (1,400-2,000cc): 5.3 L/100km • Large car (>2,000cc): 6.4L/100km • 2027: 50% of car sales comply with standard • 2028: 75% of car sales comply with standard • 2029: 100% of car sales comply with standard	

Assessing the FC levels classified by engine displacement for the period 2016-2020 in comparison with the targets mentioned in the Scenarios (Table 8, Figure 15) shows the potential of the mitigation option "New vehicle fuel economy and emissions standards" is appropriate and feasible for vehicles with an engine displacement of 1,400cc or more. For vehicles with engine capacity is less than 1,400cc, it is necessary to have technological solutions to improve fuel efficiency, ensuring the target of 4.7L/100km in the period from 2027 onwards.

Table 8: Comparison of average FC by engine period 2016-2020 and the GHG reduction scenario (Source: The consultant team)

Engine Displacement (cc)	Fuel Consumption (L/100km)					
	2016	2017	2018	2019	2020	2027 onwards
> 2,000	8.99	8.78	8.26	8.27	8.30	6.4
1,400 - 2,000	7.07	7.02	6.85	6.81	6.96	5.3
< 1,400	5.20	5.55	5.63	5.63	5.84	4.7

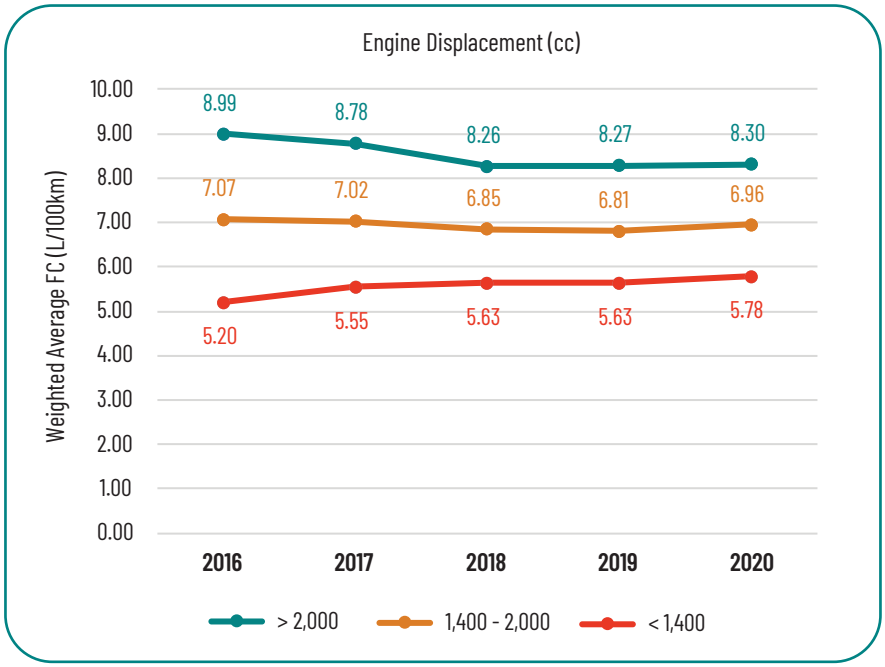


Figure 15: Weighted average FC by range of engine displacement (Source: The consultant team)

B. BASED ON KERB MASS

Next, the weighted average FC was analysed according to the vehicle's kerb mass (Figure 16 and Table 9).

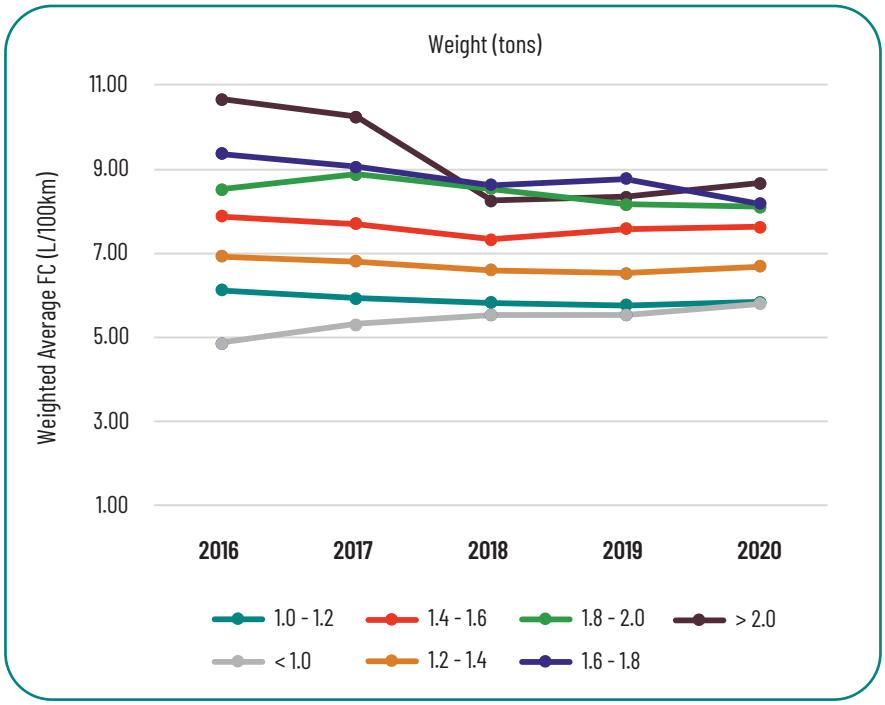


Figure 16: Weighted average fuel consumption by weight (Source: The consultant team)

Similar to the engine displacement, the FC is also proportional to the weight of the vehicle, in other words, the heavier the vehicle, the greater the FC. In general, the weighted average FC of the fleets has improved during the period 2016-2019, especially the fleet of vehicles weighing > 2 tons, reduced from 10.67L/100km to 8.34L/100km. On the contrary, the FC of the fleet weighing < 1 ton tends to increase during this period. During the period of 2019-2020, most of the FC of vehicle fleets showed signs of increasing, especially vehicles > 2 tons. In this period, only a fleet of vehicles from 1.6-1.8 tons had improved FC, from 8.78L/100km to 8.18L/100km.

Table 9: Weighted average fuel consumption by weight (Source: The consultant team)

(Figure in parentheses (.): Number of newly registered vehicles (veh.))

Vehicle weight (tons)	Weighted average fuel consumption (L/100 km)				
	2016	2017	2018	2019	2020
> 2.0	10.67 (5,443)	10.67 (5,443)	10.67 (5,443)	10.67 (5,443)	10.67 (5,443)
1.8 - 2.0	8.52 (11,808)	10.67 (5,443)	10.67 (5,443)	10.67 (5,443)	10.67 (5,443)
1.6 - 1.8	9.36 (12,993)	10.67 (5,443)	10.67 (5,443)	10.67 (5,443)	10.67 (5,443)
1.4 - 1.6	7.88 (31,040)	10.67 (5,443)	10.67 (5,443)	10.67 (5,443)	10.67 (5,443)
1.2 - 1.4	6.93 (29,799)	10.67 (5,443)	10.67 (5,443)	10.67 (5,443)	10.67 (5,443)
1.0 - 1.2	6.13 (35,354)	10.67 (5,443)	10.67 (5,443)	10.67 (5,443)	10.67 (5,443)
< 1.0	4.86 (30,704)	10.67 (5,443)	10.67 (5,443)	10.67 (5,443)	10.67 (5,443)

Assessment of the weighted average FC by weight of the fleet (Figure 17) points out the improvement in energy efficiency during the period 2017-2019, can be explained through the increase of small-weight vehicles, especially the fleet with weight from 1-1.4 tons and < 1 ton. However, the FC tends to increase again from 6.44L/100km (2019) to 6.8L/100km (2020) because of the increase in the fleet of vehicles > 2 tons and from 1.6-1.8 tons.

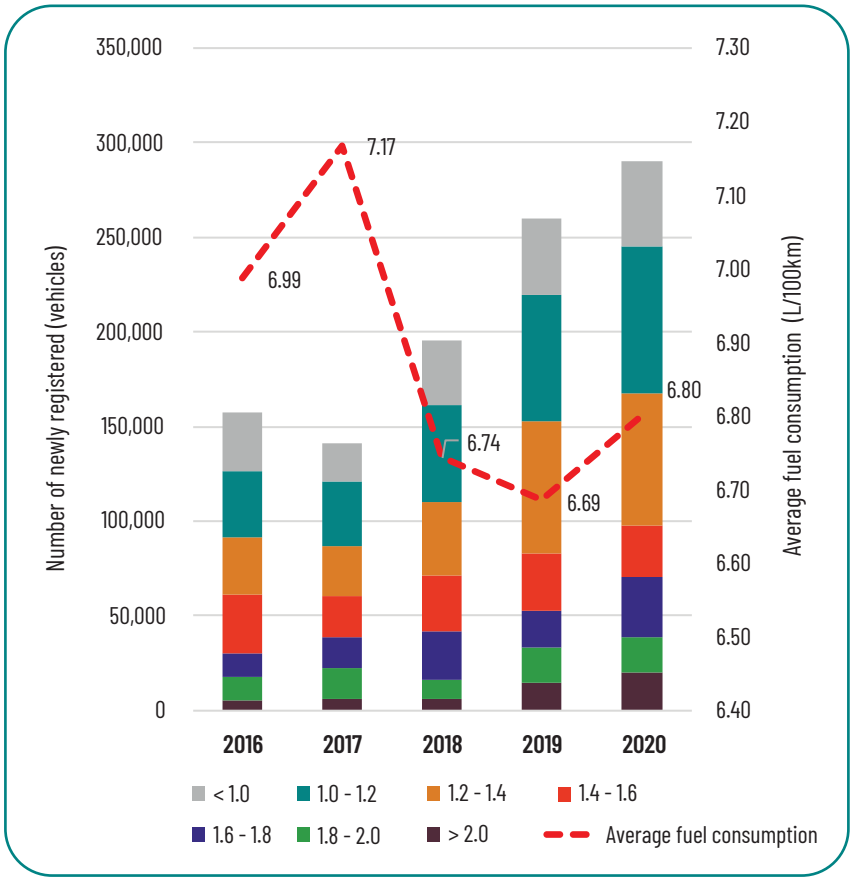


Figure 17: Market share by kerb mass and average fuel consumption (Source: The consultant team)

According to Viet Nam Standard TCVN 9854-2013 on "Road vehicles – Passenger cars – Limit of fuel consumption and method for determination", the average FC is currently divided into 17 groups corresponding to the kerb mass of the vehicle. Assessing the analytical data for the period 2016-2020 (Table 9), the average FC of all groups has improved and is below the average FC specified in TCVN 9854-2013, especially the group of vehicles with weight from 2,110-2,510 kg has a large difference in FC compared to the level mentioned in the standard (9.93-9.96 compared to 14.5-14.7L/100km).

Table 10: Average FC by weight during 2016-2020 (Source: The consultant team)

No.	Weight m_k (kg)	Average fuel consumption (L/100km)					
		2016	2017	2018	2019	2020	TCVN 9854-2013
1	$550 < m_k \leq 610$						**4.8**
2	$610 < m_k \leq 750$						**5.6**
3	$750 < m_k \leq 865$	4.99		4.97	4.93	4.76	**6.1**
4	$865 < m_k \leq 980$	4.86	5.30	5.54	5.46	5.78	**6.24**
5	$980 < m_k \leq 1090$	6.15	5.86	5.86	5.80	5.86	**6.57**
6	$1090 < m_k \leq 1205$	6.09	6.00	5.79	5.76	5.83	**7.5**
7	$1205 < m_k \leq 1320$	6.82	6.77	6.61	6.48	6.63	**7.9**
8	$1320 < m_k \leq 1430$	7.84	7.29	6.59	6.75	6.84	**8.5**

No.	Weight, m_k (kg)	Average fuel consumption (L/100km)					
		2016	2017	2018	2019	2020	TCVN 9854-2013
9	$1430 < m_k \leq 1540$	7.52	7.48	7.27	7.57	7.52	9.6
10	$1540 < m_k \leq 1660$	8.51	8.21	7.32	7.56	7.42	9.8
11	$1660 < m_k \leq 1770$	9.55	9.15	9.24	9.03	9.28	10.6
12	$1770 < m_k \leq 1880$	8.27	10.16	9.29	9.50	8.59	11.0
13	$1880 < m_k \leq 2000$	9.23	7.50	7.73	7.26	7.70	12.0
14	$2000 < m_k \leq 2110$	10.10	10.44	8.75	10.19	8.60	12.2
15	$2110 < m_k \leq 2280$	9.93	10.68	7.92	8.33	8.97	14.5
16	$2280 < m_k \leq 2510$	9.96	7.55	7.56	7.50	7.87	14.7
17	$2510 < m_k \leq 3500$	14.19	14.18	13.90	13.26	13.54	15.4

Figures 18 and 19 below describe an overview of weighted average FC of newly registered cars in the 2016-2020 period, specifically vehicles with concentrated FC from 5-8L/100km, especially in three recent years (2018-2020) have marked the prominence, i.e. the strong increase of vehicles with FC of 5-7L/100km. Figure 13 also shows that the number of vehicles with effective FC (<5L/100km) or high FC (> 9L/100km) accounts for a small percentage. During the last 3 years (2018-2020), the fleet of vehicles with FC from 9-10L/100km has decreased, but there is an increase of the fleets with FC from 8-9L/100km and 10-16L/100km.

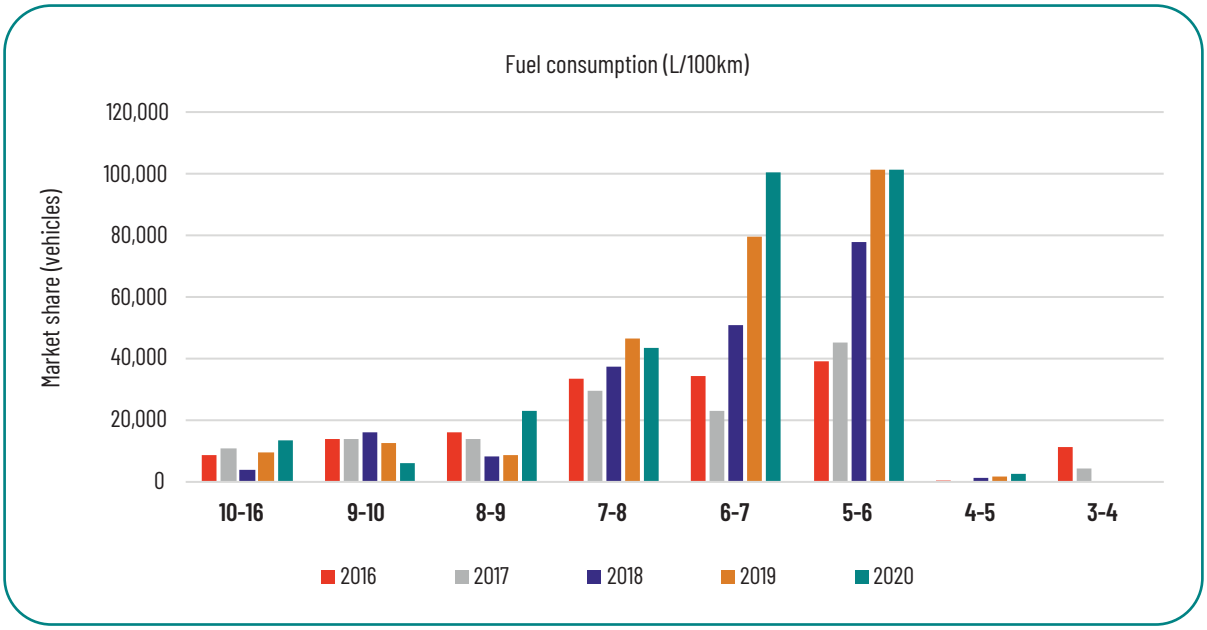


Figure 18: Fuel consumption of newly registered passenger cars under 9 seats (Source: The consultant team)

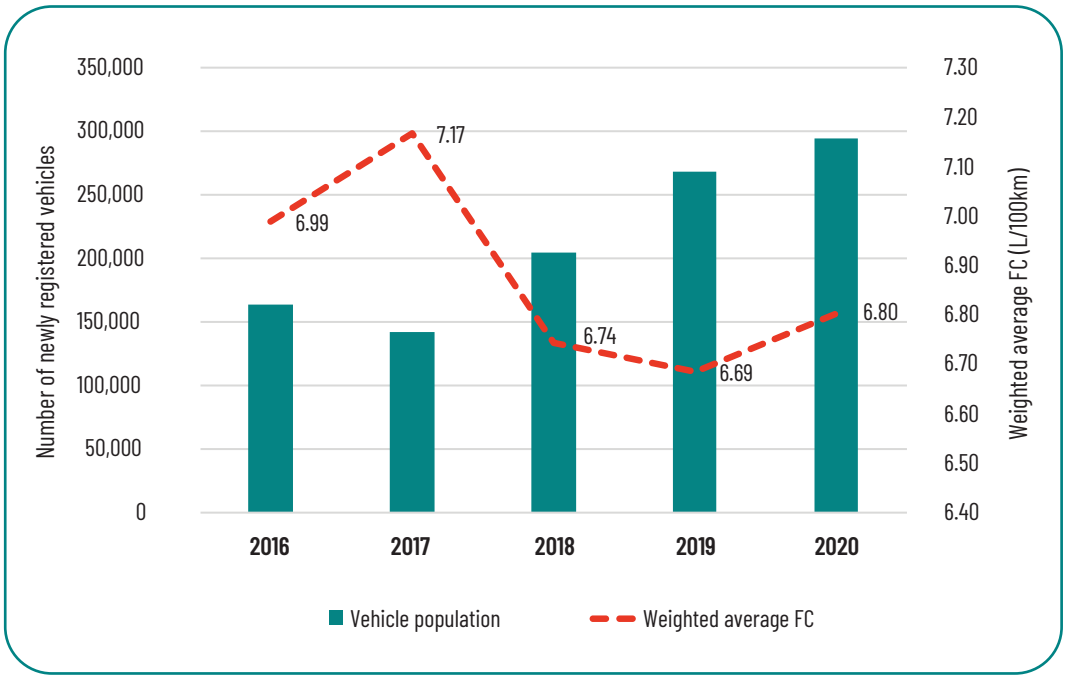


Figure 19: Average FC of newly registered passenger cars under 9 seats (Source: The consultant team)

Figure 19 shows that there is no significant impact from the implementation of energy labeling for cars with 7 seats or less (1/1/2015) and 9 seats or less (1/1/2018) to the weighted average FC of the fleet. Accordingly, the FC increased during the period 2016-2017, improved during the period 2017-2019 but started to increase again in 2019-2020.

The average FC is then disaggregated by fuel type (gasoline and diesel) (Figure 20), the analysis shows that the average FC of diesel fuel vehicles is lower than that of gasoline fuel vehicles in 2016 and 2019, and vice versa, higher in 2017, 2018 and 2020. The general trend shows that the average FC of vehicles using gasoline fuel has improved in recent years, especially during the period from 2017. This can be explained by the application of Euro 4 emission standards (from January 1, 2017), similar for vehicles using diesel fuel, the level of FC has been improved during the period 2018-2019. In addition to the assessment of the correlation between the level of FC and emission standards, the explanation for the improvement of FC levels can be through the increase in the number of vehicles with small engine displacement and weight, respectively from 1.4L and 1.4 tons or less.

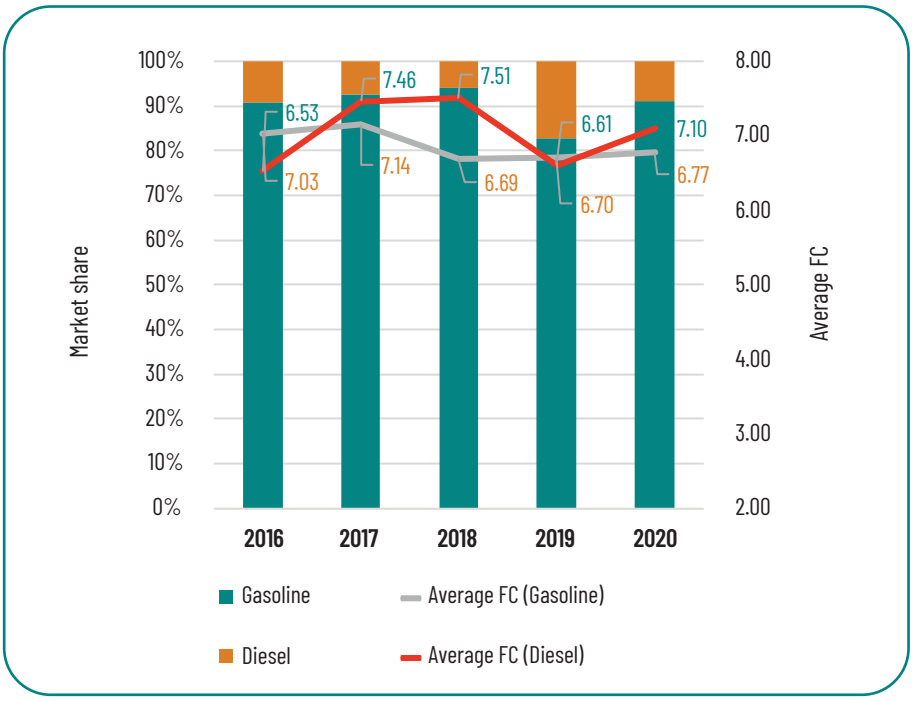


Figure 20: Weighted average FC by fuel type (Source: The consultant team)

From the perspective of GHG emissions, the weighted average FC of the fleet in the period 2016-2020 is converted to gCO_2/km and compared with some countries in the world (Figure 21, 22). Preliminary comparison highlights that the weighted average FC of Viet Nam is still quite far compared to other countries, even countries in Asia such as Japan, China, Korea or India.

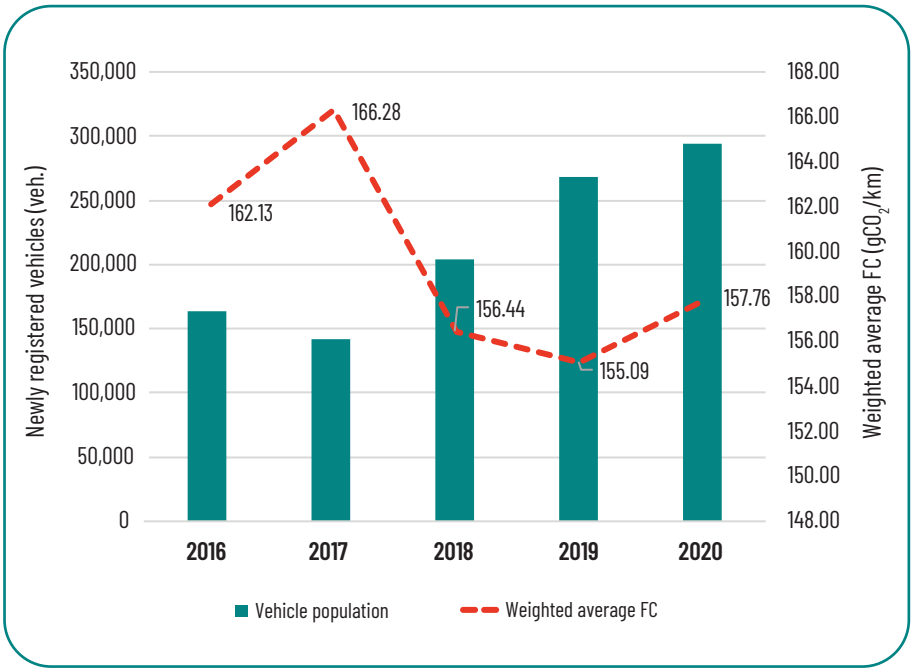


Figure 21: Market share and average CO_2 emissions values (Source: The consultant team)

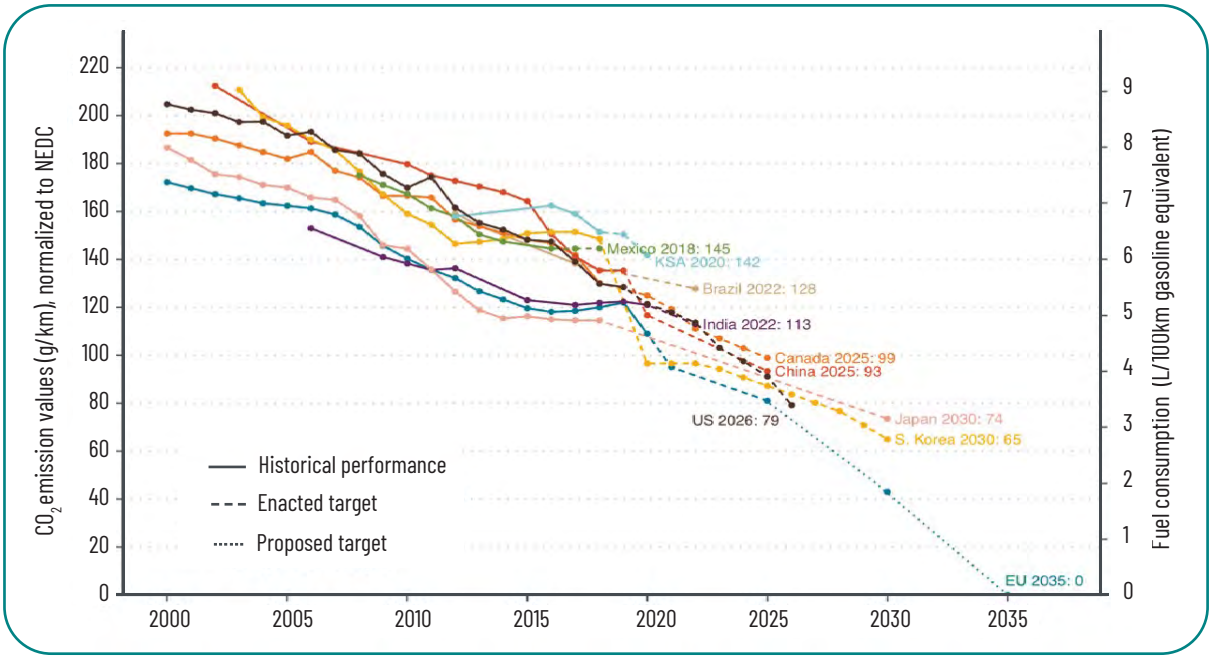


Figure 22: Historical fleet CO_2 emissions performance and current standards (gCO_2/km normalised to NEDC) for passenger cars [8]

Figure 23 and Table 11 highlight the correlation between the average FC and the number of newly registered vehicles of the top 05 manufacturers, thereby showing the stability of the manufacture Hyundai with the average FC about 6.5L/100km during the period 2016-2020. Among three manufacturers including Kia, Honda and Mazda, the average FC was not stable and increased during the period 2019-2020. Toyota's average FC was the highest among the five manufacturers, but this was the only manufacturer in which average FC decreased over the years during the period 2016-2020, from 7.68L/100km (2016) down to 6.95L/100km (2020).

Table 11: FC and number of newly registered vehicles by manufacturers (Source: The consultant team)

Manufacturer	2016		2017		2018		2019		2020	
	Number of vehicles	FC	Number of vehicles	FC	Number of vehicles	FC	Number of vehicles	FC	Number of vehicles	FC
Hyundai	25,336	6.50	26,150	6.58	44,959	6.39	62,280	6.42	69,075	6.55
Toyota	48,117	7.68	51,724	7.56	56,845	7.15	70,632	7.00	65,339	6.95
Kia	28,363	5.92	10,083	5.59	26,820	6.48	22,845	6.22	29,559	6.57
Honda	10,236	6.96	11,735	6.67	16,942	6.26	19,694	5.99	24,737	6.42
Mazda	22,084	6.45	20,299	6.73	24,561	6.55	26,111	6.63	24,772	6.97

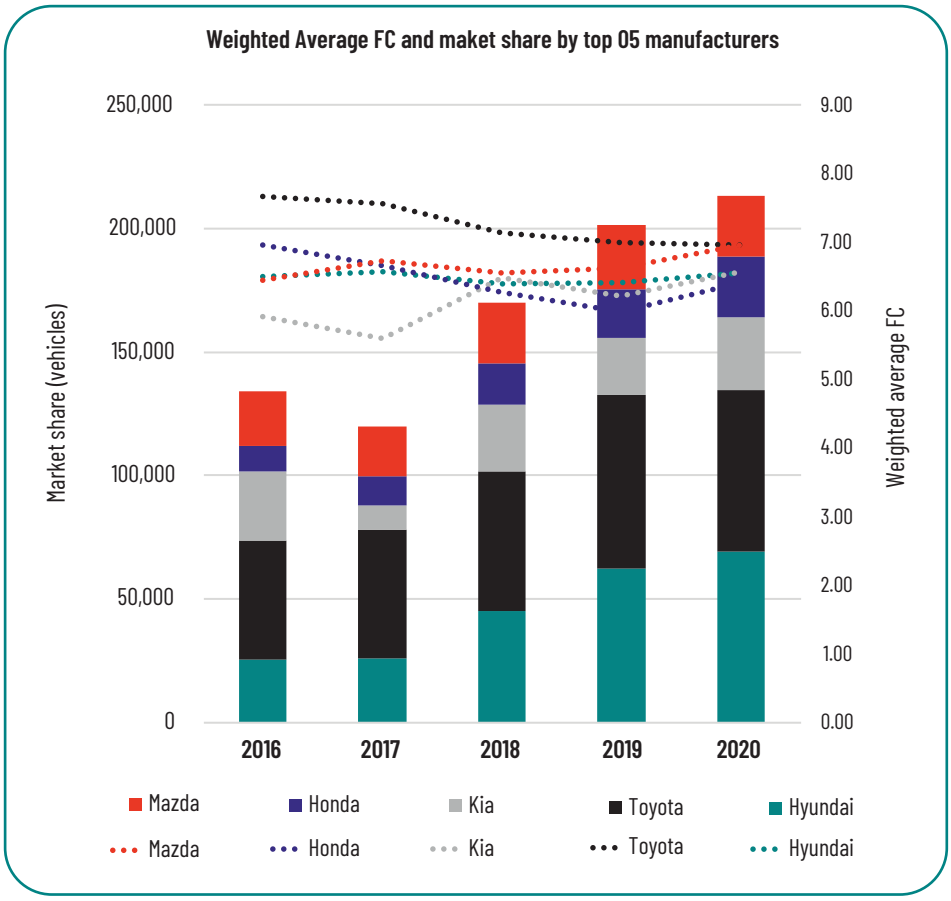


Figure 23: FC and number of newly registered vehicles by manufacturers (Source: The consultant team)

05
CONCLUSION

The development of the database including the weighted average fuel consumption, other fleet specifications and the establishment of a baseline of the weighted average fuel consumption of passenger cars under 9 seats during the period 2016-2020 has provided important information for the development of a mandatory standard on fuel consumption for passenger cars under 9 seats. With the number of newly registered passenger cars continuing to increase in recent years and the passenger car market in Viet Nam still having great potential, it is necessary to develop and produce cars with eficient fuel consumption, thereby contributing to ensuring energy security, protecting the environment and reducing GHG emissions in the transport sector. Through analysis, the average fuel consumption of vehicle fleets has reduced during the period of 2017-2019 by about 5.2% per year, reaching from 7.17 to 6.44L/100km, however in 2020, the fuel consumption has increased again at the rate of 5.7%, reaching 6.8L/100km, which can be explained by the increase in the fleet of vehicles > 2 tons and from 1,6-1,8 tons. Therefore, it is necessary to promote policies related to fuel consumption/fuel economy, specifically promulgating a mandatory standard on fuel consumption. In addition, it is essential to consider the roadmap to tighten the average fuel consumption in accordance with the national context and a feasible implementation timeline, harmonising economic development and environmental protection. Fuel consumption of vehicles is affected by various factors such as engine, weight, environmental conditions, driving habits, maintenance process, fuel quality and other issues, but the role of manufacturers in improving the FC is crucial.

The study is an important document, providing policymakers with other relevant solutions, e.g. fiscal incentives through fuel efficiency/CO_2-based taxation, based on corresponding emission levels in the context that Viet Nam has made strong commitments in the updated NDC (2020), especially recently during the COP 26 Conference, the Prime Minister affirmed that Viet Nam will implement the strong measures to reach net-zero emissions by 2050. In addition, this is also the basis for implementing relevant solutions mentioned in the "Action program for transition to green energy and mitigation of carbon dioxide and methane emissions from transport" approved by the Deputy Prime Minister (Decision No. 876/QD-TTg dated 22 July, 2022).

APPENDIX 1 DATA CAPTURE FOR NEWLY REGISTERED PASSENGER CARS UNDER 9 SEATS

No.	Manufacturer	Model	Number of newly registered vehicles	Fuel consumption (L/100km)			Kerb mass (kg)	Engine disp. (cc)	Engine type	Fuel type	Dimension
				Combine	Urban	Ex. Urban					
1	Ford	Explore	1,028	11.2	15.7	8.58	2,177	2,261	Turbo	Gasoline	5,037 x 2,005 x1,813
2	Honda	CR-V L	4,778	7.3	10.3	6.1	1,505	1,997	Normal	Gasoline	4,623 x 1,855 x 1,679
3	Toyota	Fortuner	895	7.4	9.1	6.4	1,800	2,380	Turbo	Diesel	4,705 x 1,840 x 1,850
	.....										

APPENDIX 2 TYPE APPROVAL CERTIFICATE FOR AUTOMOBILES

BỘ GIAO THÔNG VẬN TẢI
CỤC ĐĂNG KIỂM VIỆT NAM
MINISTRY OF TRANSPORT
VIETNAM REGISTER
Số (№): 20KOT/257083

CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập - Tự do - Hạnh phúc
SOCIALIST REPUBLIC OF VIETNAM
Independence - Freedom - Happiness

GIẤY CHỨNG NHẬN CHẤT LƯỢNG AN TOÀN KỸ THUẬT VÀ BẢO VỆ MÔI TRƯỜNG XE CƠ GIỚI NHẬP KHẨU

(Certificate of conformity from inspection of technical safety quality and environmental protection for imported motor vehicle)

Tình trạng phương tiện *(Vehicle's status)*: **Chưa qua sử dụng**
Người nhập khẩu *(Importer)*: **Công ty Honda Việt Nam**
Địa chỉ *(Address)*: **Phường Phúc Thắng, thành phố Phúc Yên, tỉnh Vĩnh Phúc**
Loại phương tiện *(Vehicle's type)*: **Ô tô con**
Nhãn hiệu *(Trade mark)*: **HONDA** — Mã kiểu loại *(Model code)*: **RU583ML**
Tên thương mại *(Commercial name)*: **HR-V G** — Màu xe *(Vehicle color)*: **Đen**
Số khung *(Chassis №)*: **MRHRU5830MP080005** — Số động cơ *(Engine №)*: **R18ZF4105244**
Nước sản xuất *(Production country)*: **THAILAND** — Năm sản xuất *(Production year)*: **2020**
Số tờ khai hàng hóa nhập khẩu/ngày *(Customs declaration №/date)*: **103458287440 / 05/08/2020**
Số biên bản kiểm tra *(Inspection record №)*: **002131/20OT-063/008**
Thời gian/Địa điểm kiểm tra *(Inspection date/site)*: **25/08/2020 / Thành phố Hải Phòng**
Số đăng ký kiểm tra *(Registered № for inspection)*: **002131/20OT**
Số của các báo cáo kết quả thử nghiệm *(The results of Testing report №)*: **1009 NK/BCTN-TO/20, 6890 /NETC-V/20/C**

THÔNG SỐ KỸ THUẬT CƠ BẢN
(Major technical specification)

Khối lượng bản thân *(Kerb mass)*:	**1262**	kg
Khối lượng hàng chuyên chở TK lớn nhất/cho phép lớn nhất *(Max. cargo pay mass: Designed/Authorized)*:		kg
Khối lượng toàn bộ TK lớn nhất/cho phép lớn nhất *(Max. total mass: Designed/Authorized)*:	**1795/1795**	kg
Số người cho phép chở, kể cả người lái: Tổng(ngồi+đứng+nằm+xe lăn): *(Passenger capacity including driver: Total (seating+standing+lying+wheelchair))*	**5(5 ngồi)**	người
Kích thước bao : Dài x Rộng x Cao *(Overall dimensions: L x W x H)*:	**4334 x 1772 x 1605**	mm
Công thức bánh xe *(Drive configuration)*:	**4 x 2**	
Khoảng cách trục *(Wheel space)*:	**2610**	mm
Vết bánh xe trước *(Front track)*: **1535** — Vết bánh xe sau *(Rear track)*:	**1540**	mm
Ký hiệu, loại động cơ *(Engine model, engine type)*: **R18ZF, 4 kỳ, 4 xi lanh thẳng hàng**		
Loại nhiên liệu *(Fuel)*: **Xăng** — Thể tích làm việc *(Displacement)*:	**1799**	cm^3
Công suất lớn nhất của động cơ/ tốc độ quay *(Max. engine output/rpm)*:	**105/6500**	kW/rpm
Lốp xe *(Tyres)*: - Trục 1 *(Axle 1st)*: **02 Lốp; 215/55R17** - Trục 2 *(Axle 2nd)*: **02 Lốp; 215/55R17**		
Thiết bị đặc trưng *(Special equipment)*:		

Ô tô đã được kiểm tra và đạt yêu cầu theo Thông tư số 03/2018/TT-BGTVT ngày 10 tháng 01 năm 2018 và Thông tư số 05/2020/TT-BGTVT ngày 26 tháng 02 năm 2020 của Bộ trưởng Bộ Giao thông vận tải.

This motor vehicle has been inspected and satisfied with requirements of the Circular № 03/2018/TT-BGTVT to be issued on 10.01.2018 and Circular № 05/2020/TT-BGTVT to be issued on 26.02.2020 by Minister of Ministry of Transport.

(Date) Hà Nội, ngày 27 tháng 08 năm 2020
Cơ quan kiểm tra
(Inspection body)
TL. CỤC TRƯỞNG
KT. TRƯỞNG PHÒNG CHẤT LƯỢNG XE CƠ GIỚI
PHÓ TRƯỞNG PHÒNG

Ký bởi: Cục Đăng kiểm Việt Nam
Email: vr@vr.org.vn
Cơ quan: Bộ Giao thông vận tải
Thời gian: 27/08/2020 13:59:44

Trần Hoàng Phong

Ký bởi: Trần Hoàng Phong
Email: phong.tranhoang.vr@mt.gov.vn
Cơ quan: Cục Đăng kiểm Việt Nam, Bộ Giao thông vận tải
Thời gian: 27/08/2020 13:59:41

Lưu ý: Giấy chứng nhận này sẽ không còn giá trị nếu chất lượng của phương tiện đã kiểm tra bị ảnh hưởng do vận chuyển, bảo quản, bốc xếp.
Note: This certificate will be expired if quality of the inspected motor vehicle is influenced by carrying, landing, storing, etc..

APPENDIX 3 FUEL CONSUMPTION OF THE VEHICLE

THÔNG TIN VỀ MỨC TIÊU THỤ NHIÊN LIỆU KIỂU LOẠI XE

THÔNG TIN CHUNG

Số Hồ sơ đăng ký:	0044/19/29DNCN	Số Thông báo/GCN:	19KDN/000081
Ngày cấp:	2/8/2019	Loại hình:	Cấp GCN
Doanh nghiệp:	Công ty HONDA Việt Nam		
Địa chỉ:	Phường Phúc Thắng, thành phố Phúc Yên, tỉnh Vĩnh Phúc		
Điện thoại:	0211-868888/97-437	Số FAX:	2113874351

THÔNG SỐ KỸ THUẬT CƠ BẢN CỦA KIỂU LOẠI XE

Loại xe:	Ô tô con (M1)		
Nhãn hiệu:	HONDA		
Số loại:	HR-V G (RU583LL)	Nước sản xuất:	Thailand
Số chỗ ngồi:	5	Kiểu dáng xe:	SUV
Khối lượng bản thân (kg):	1262	Công thức bánh xe:	4 x 2
Kiểu động cơ:	**R18ZF**	Loại động cơ:	4 kỳ, 4 xi lanh thẳng hàng
Kiểu hộp số:	Vô cấp (CVT)	Loại nhiên liệu:	Xăng

THÔNG TIN VỀ TIÊU THỤ NHIÊN LIỆU

Chu trình thử nghiệm:	QCVN 86:2015/BGTVT
Mức tiêu thụ nhiên liệu của chu trình kết hợp (l/100km):	6.7
Mức tiêu thụ nhiên liệu của chu trình trong đô thị (l/100km):	8.8
Mức tiêu thụ nhiên liệu của chu trình ngoài đô thị (l/100km):	5.4

THỜI HẠN GCN: 2/8/2022

APPENDIX 4 REFERENCES FOR FUEL CONSUMPTION RATE OF NEWLY MANUFACTURED CARS

No.	Source
1	http://203.162.20.156/vaq/Tieuthu_Nlieu/Tieuthu_nlieu_Tc.asp
2	http://www.greenvehicleguide.gov.au/
3	https://www.eea.europa.eu/data-and-maps/data/co2-cars-emission-8#tab-european-data
4	https://www.mlit.go.jp/jidosha/jidosha_fr10_000019.html
5	https://vrl.lta.gov.sg/lta/vrl/action/pubfunc?ID=FuelCostCalculator
6	https://bpms.kemco.or.kr:444/transport_2012/main/main.aspx
7	https://www.gov.uk/co2-and-vehicle-tax-tools
8	www.fueleconomy.gov

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www.international-climate-initiative.com

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