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Fuel consumption from new passenger cars in India: Manufacturers' performance in fiscal year 2019–20

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Introduction

Passenger vehicles sold in India have been subjected to fuel consumption standards established by the Ministry of Power since fiscal year (FY) 2017–18.[1] Since then, the ICCT has evaluated how well manufacturers of new vehicles sold in FY 2017–18 and FY 2018–19 complied with the standards.[2] Building on that, this paper examines the fuel consumption of manufacturer groups for passenger vehicles sold in FY 2019–20 and evaluates their readiness to meet more stringent requirements that will take effect in FY 2022–23. We evaluate new passenger vehicle performance and identify basic vehicle specifications by fuel type and manufacturer group. This paper also considers the potential impact of flexibility mechanisms on manufacturers' compliance with the standards, and compares results with the summary compliance report published by the Ministry of Road Transport and Highways (MoRTH).[3]

Our analysis is based on FY 2019–20 sales data and vehicle characteristic information from Segment Y Automotive Intelligence Pvt. Ltd.[4] As was the case with our earlier

1 Passenger vehicles are M1 category vehicles having seating capacity not more than eight seats in addition to the driver's seat and a gross vehicle weight not exceeding 3.5 tons. The category includes hatchbacks, sedans, SUVs, and crossovers. Fuel consumption standard: Government of India, Ministry of Power, "Gazette of India: Extraordinary. [Part II-Sec. 3(ii)]," April 23, 2015, https://beeindia.gov.in/sites/default/files/Fuel%20Efficiency%20Notification%20%2823April2015%29.pdf. Note that the fiscal year in India runs from April 1 to March 31 of the following year.

2 Zifei Yang, *Compliance with India's first fuel consumption standards for new passenger cars (FY 2017–2018)*, (ICCT: Washington, DC, 2018), https://theicct.org/publications/compliance-india-fuel-consumption-standards-pv and Ashok Deo, *Fuel consumption of new passenger cars in India: Manufacturers' performance in fiscal year 2018–19*, (ICCT: Washington, DC, 2020), https://theicct.org/publications/fuel-consumption-pv-india-052020

3 Flexibility mechanisms under the fuel consumption standards in India are super credits for electric vehicles, plug-in hybrid electric vehicles, and strong hybrids, and derogation factors for technologies such as start-stop, regenerative braking, tire pressure monitoring systems, and 6-speed transmission.

4 Segment Y Automotive Intelligence focuses on automotive markets in Asia. Annual data was purchased from Segment Y for FY 2006–07 through 2012–13, 2015–16, and 2017–18 through 2019–20.

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papers, the fuel economy data was checked against data from the Society of Indian Automobile Manufacturers (SIAM) and updated where appropriate.[5]

Background

India is the fifth-largest passenger vehicle market in the world by sales volume, and SIAM data shows annual sales in FY 2019–20 reached 2.7 million (Figure 1). Compared to FY 2018–19, passenger car sales in FY 2019–20 decreased by about 21%.

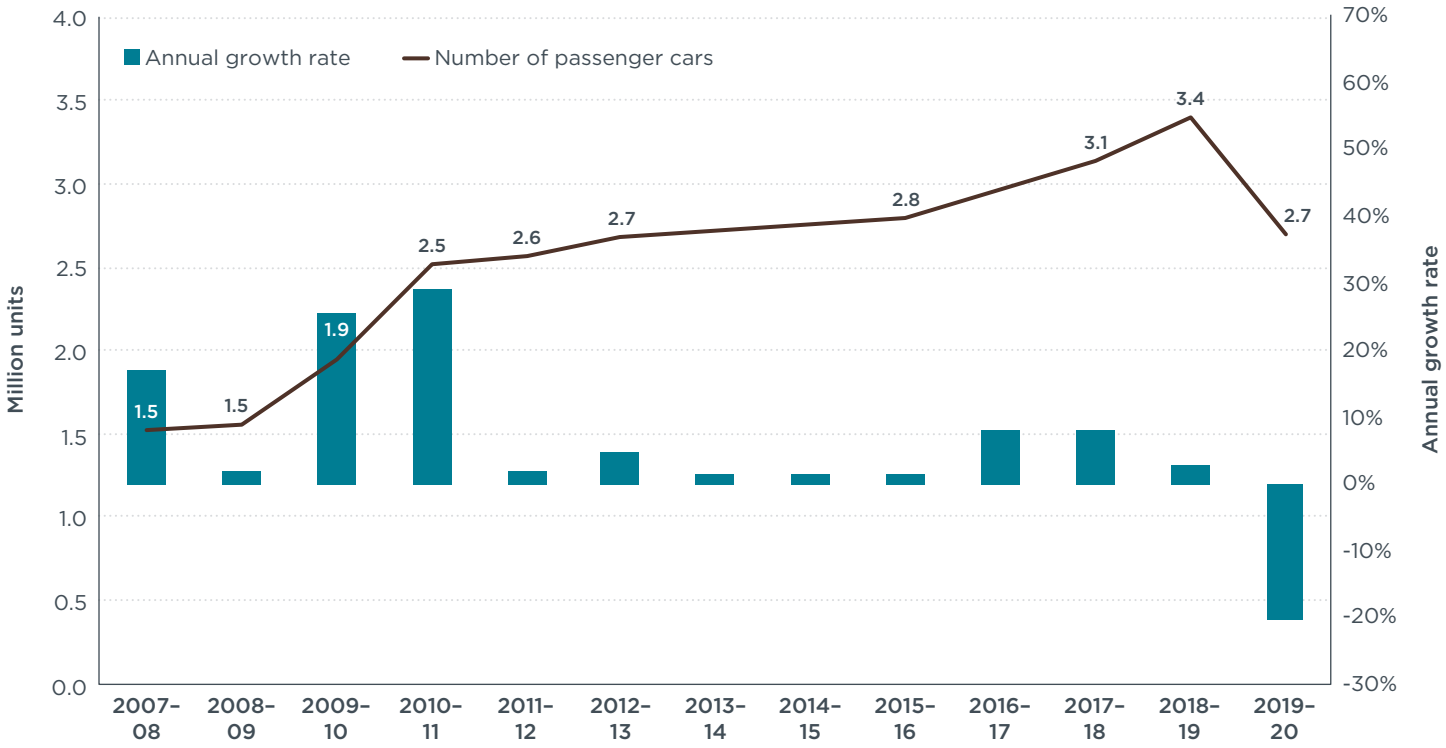

Figure 1. The trend of passenger vehicle sales in India. Source: SIAM data.

In 2015, the government of India established corporate average fuel consumption standards for passenger cars. They take effect in two phases: the first targets began in FY 2017–18 and the second are slated to begin FY 2022–23. The standards are set in terms of gasoline-equivalent liters per 100 kilometers (L/100 km) and are adjusted based on vehicle curb weight. In 2018, MoRTH, the agency in charge of implementing the vehicle fuel-consumption standards, finalized the document that describes how to determine the compliance of manufacturers with the fuel-consumption standards.[6]

The actual fuel consumption for compliance is measured as grams of carbon dioxide (CO_2) emissions per kilometer (g/km) during vehicle type approval. The factors to be used for converting consumption of different fuel types into gasoline-equivalent fuel consumption, and for converting from gasoline-equivalent fuel consumption to CO_2 emissions, are defined in the regulation.[7] Additionally, in a type-approval test, CO_2 is one of the emission parameters that is part the emission report for all fuel types. The CO_2

5 Fuel economy of vehicles sold in fiscal 2019–20 are from SIAM, https://www.siam.in/uploads/filemanager/2344WFEDeclaration2019-20.pdf For models that don't have SIAM fuel economy information, we collected information from voluntary reporting by manufacturers on manufacturers' website or advertisement materials.

6 Government of India, Ministry of Road Transport and Highways, "Administrative and technical procedure for measurement and monitoring [average] fuel consumption in l/100 km of M1 category vehicles with GVW not exceeding 3500 kg," AMENDMENT No. 7 TO Doc. No.: MoRTH/CMVR/ TAP-115/116: Issue No. 4 (2018), https://www.icat.in/pdf/Amendment_7_TAP_CAFE_23052018.pdf

7 Fuel types include gasoline, diesel, liquid petroleum gas, compressed natural gas, and electricity. Gasoline equivalent fuel consumption (liters/100 km) = 0.04217 (g/liter) × CO_2 emissions (g/km)
CO_2 emissions (g/km) = 2371.35/ fuel economy (kmpl)

value provided by the manufacturer during type approval is called the declared value (DV).[8] The CO_2 value derived from the type-approval test should not exceed the DV by more than 4%. The accuracy of the DV is again checked during conformity of production (COP) tests. The CO_2 values used in our analysis are DVs.

The compliance document includes flexibility mechanisms that are intended to reduce compliance costs and promote innovative technologies that reduce CO_2 emissions. The flexibility mechanisms that would influence manufacturers' compliance with standards include derogation factors for technologies and super credits for battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs), and strong hybrid electric vehicles (HEVs).

Derogation factors for technologies aim to reward innovative technologies that produce real-world CO_2 savings beyond what is measured over a standardized test cycle during vehicle type approval. The compliance provisions allow manufacturers to use derogation factors for four technologies—regenerative braking, start-stop systems, tire pressure monitoring systems (TPMS), and 6-speed or more transmissions. Note that TPMS is mandatory for safety under U.S. and EU regulations, but not in India. In India's standard, the CO_2 emissions values are multiplied by 0.98 for each technology applied on a vehicle. While manufacturers are also allowed to demonstrate the savings of CO_2 through technologies (1 g/km or more) other than the four on the list, the total CO_2 reduction due to the derogation factors of listed technologies or additional technologies cannot exceed 9 g/km.

Previous compliance reports published by the MoRTH showed that all car manufacturers met the FY 2017–18 and FY 2018–19 fuel consumption standards when various flexibility mechanisms were taken into account.[9] This paper evaluates compliance for FY 2019–20 by referring to the fuel-consumption standards and the rules for evaluating compliance by manufacturer groups. Fuel-consumption standards and compliance are reported in terms of equivalent CO_2 emissions.

Basic specifications of the fleet

Figure 2 plots the recent trend of market share of annual new passenger vehicle sales by fuel type. In FY 2019–20, 30% of new vehicles sold in India were diesel vehicles and 66.6% were gasoline vehicles. Compared with FY 2018–19, the diesel market share dropped by 19%, from 37% to 30%.

8 Government of India, Ministry of Road Transport and Highways, "Administrative and technical procedure"

9 Government of India, Ministry of Road Transport and Highways, "Annual fuel consumption compliance report in respect of M1 category of vehicles with GVW less than 3.5 T for year 2017–2018," https://morth.gov.in/sites/default/files/circulars_document/Annual_Fuel_Consumption_compliance_report_in_respect_of_M1_category_of_vehicles_with_GVW_less_than_3.5_T_for_year_2017-2018%C2%A0%2837KB%2C%C2%A0.pdf

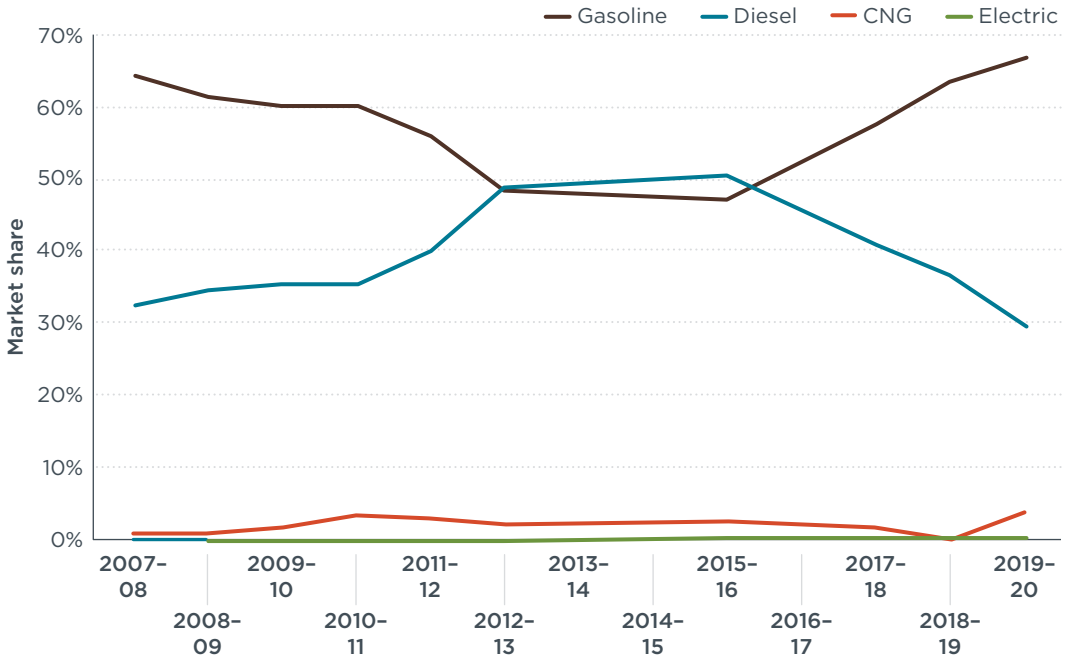

Figure 2. Trends of passenger vehicle sales in India by fuel type.

Prior to 2014, the price of diesel fuel was regulated by the Government of India, and diesel prices were lower than gasoline prices. Cheap diesel prices combined with higher fuel efficiency made the total cost of ownership of diesel vehicles much more affordable than gasoline vehicles. However, after the deregulation of diesel fuel in 2014, the price gap with gasoline decreased steadily and diesel vehicles became costlier to own. In addition, the new Bharat Stage VI emission standards, implemented from April 1, 2020 onward, require diesel vehicles to contain advanced emission control technologies that increase the upfront cost. As a result, the market share of diesel vehicles, especially smaller ones, is likely to continue declining.

The market share of electric vehicles in FY 2015–16 was 0.03% and this increased to 0.1% in FY 2019–20. The market share of compressed natural gas (CNG) vehicles also increased during the same period, from 0.1% in FY 2015–16 to 3.8% in FY 2019–20.

The decrease in the diesel share of vehicles sold impacted the average curb weight and average engine displacement of all major passenger car manufacturers, as the diesel fleet has always been heavier and more powerful than the gasoline fleet. Figure 3 plots the historical trend of curb weight and engine displacement of the new vehicles sold by fuel type.

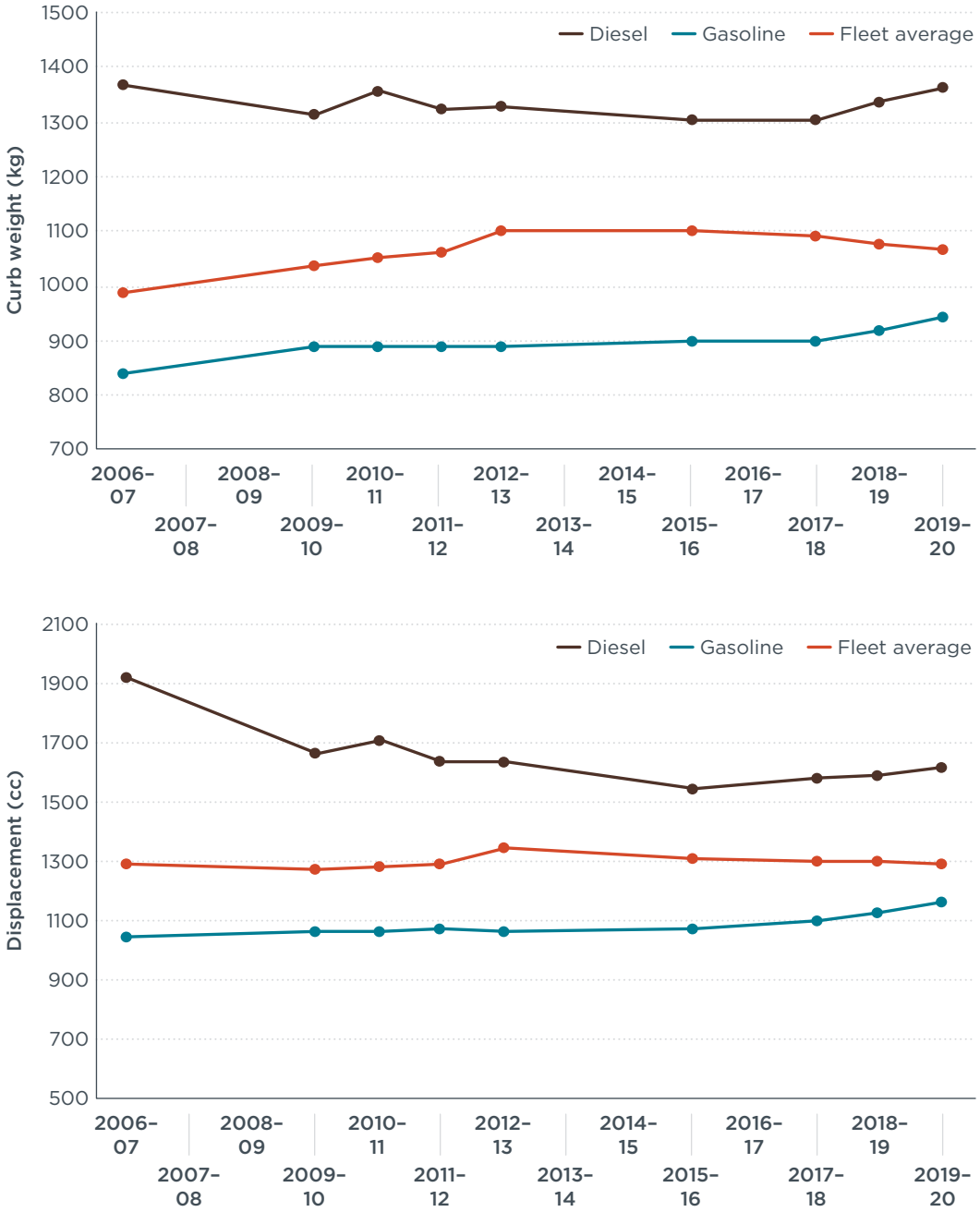

Figure 3. Trend of fleet average curb weight and engine displacement by fuel type.

Even though both diesel and gasoline vehicles are increasing in curb weight and engine displacement, the combined average weight has decreased slightly since FY 2015–16. In FY 2019–20, the average displacement for diesel vehicles was 1,625 cc, 39.2% higher than the average gasoline displacement of 1,167 cc, and the average curb weight of diesel vehicles was 1,361 kg, 44.5% higher than the gasoline average curb weight of 942 kg. As a result of the declining market share of diesel, in FY 2018–19, the fleet had an average curb weight of 1,078 kg, and in FY 2019–20 it was marginally smaller, 1,068 kg or 1% smaller. Average displacement for FY 2018–19 was 1,304 cc, and it decreased to 1,295 in FY 2019–20.

The average ratio of passenger cars to sport utility vehicles (SUVs)/vans was roughly 4:1 between FY 2006–07 and FY 2011–12. This ratio shifted suddenly by about 10% toward SUVs/vans in FY 2012–13. Since then, the market share of SUVs has been hovering around 30%. Figure 4 illustrates the trends in market shares for SUVs and vans.

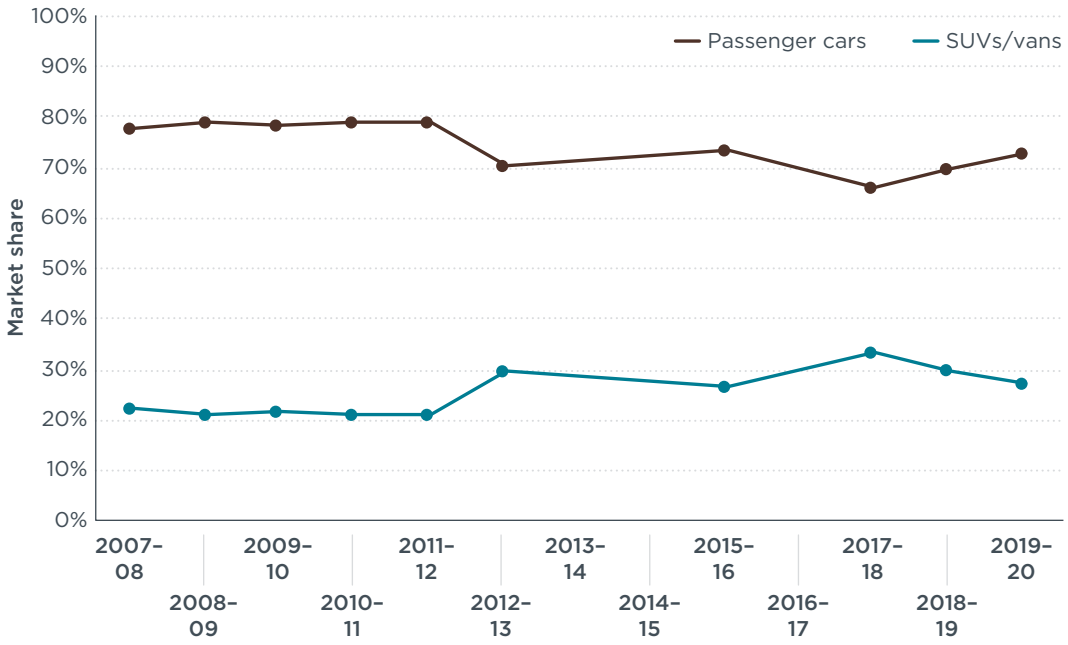

Figure 4. Trend of market share by vehicle type.

Figure 5 shows the market share of the top 15 passenger car manufactures in India. Maruti has the largest market share with 50.6% and is followed by Hyundai with 17.4%. The top three manufacturers have 74.4% of the market and thus they mostly govern industry trends in terms of new technologies and CO_2 emissions.

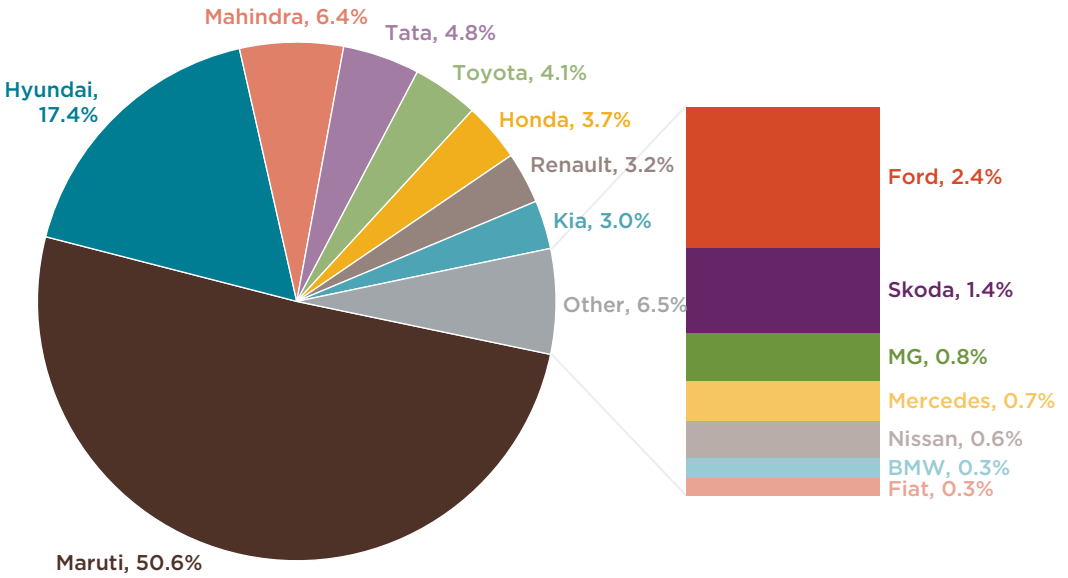

Figure 5. Market share of top manufacturers in FY 2019–20.

Historical fleet average CO_2 emissions

Our analysis shows that the sales-weighted industry average CO_2 emissions for new passenger cars in India in FY 2019–20 was 122.4 g/km, with a fleet average curb weight of 1,068 kg. The fleet target was 132.0 g/km and the fleet met the target with a margin of 7.3%. Figure 6 shows the historical fleet average performance of CO_2 from FY 2006–07 to FY 2019–20.

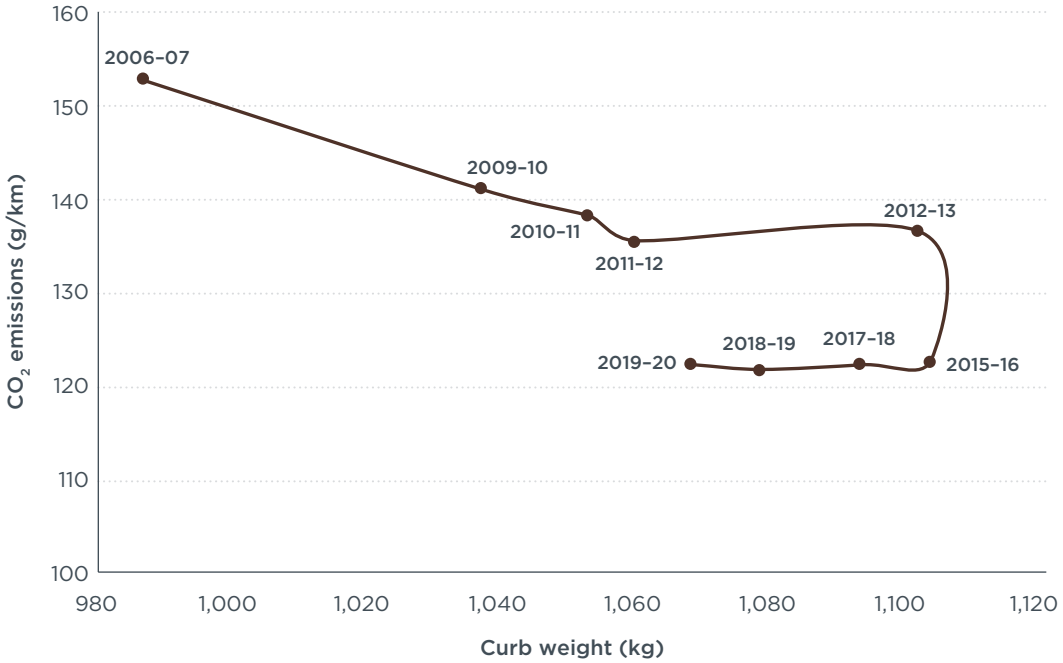

Figure 6. Trend of historical fleet average CO_2 performance and curb weight.

Looking at a time frame of 10 years from FY 2009–10 to FY 2019–20, average CO_2 emissions decreased 1.4% a year while average curb weight rose 0.5% annually. The three-year period between FY 2012–13 and FY 2015–16 saw the sharpest decline in CO_2 emissions, averaging 3.4% per year, along with the smallest increase in curb weight of 0.2% a year. In FY 2017–18, the fleet dropped significantly in curb weight; recall that this mainly reflects a decrease in the market share of diesel vehicles. In FY 2018–19 and FY 2019–20, both fleet average curb weight and CO_2 emissions remained relatively flat.

CO_2 compliance by manufacturer

Table 1 presents our estimates of the annual corporate average CO_2 performance and the average CO_2 target for all manufacturers. Note that the CO_2 target varies based on average curb weight. The table also details the market share, CO_2 emissions, and compliance relative to the FY 2018–19 and FY 2022–23 targets of each corporate group in fiscal year FY 2019–20.

According to the compliance standard, corporate group is defined as having a minimum of 51% direct shareholding in each manufacturing company by the group. This may be considered as one manufacturer for the purpose of complying with fuel-consumption standards. Further, Segment Y data provides information on 6-speed transmissions, regenerative braking, start-stop, TPMS, electric variants, and hybrid vehicles.

As compared to FY 2018–19, the list of manufacturers in FY 2019–20 is different. MG is a new entrant and has electric, diesel, and gasoline vehicles. Moreover, based on sales volumes in FY 2019–20, Force Motors, Jaguar, Isuzu, and Volvo should all be categorized as small manufacturers. Small car manufacturers are considered compliant under the provisions which set the FY 2019–20 target for small volume manufacturer at actual performance. The FY 2022–23 targets for these manufacturers will be 17% below their FY 2017–18 performance.

Table 1. Curb weight, CO_2 performance including supercredits for BEVs, PHEVs, and hybrids, and market share for passenger cars in FY 2019–20.

	FY 2018–19 (MoRTH data)			FY 2019–20							FY 2022–23			
Corporate group	Market share (%)	Target FY 2018–19 (g/km)	Performance FY 2018–19 (g/km)	Market share (%)	Curb weight (kg)	Target (g/km)	Performance W/o flexibility mechanism (g/km)	Performance With Flexibility mechanism (g/km)	Exceedance (gap) without flexibility mechanisms (%)	Exceedance (gap) with flexibility mechanisms (%)	Target for 2022–23 standard (g/km)	Gap without flexibility mechanisms (%)	Gap with flexibility mechanisms (%)	Small manufacturer
Maruti	50.8	124.3	108.7	50.6	917	123.4	112.3	111.7	9.0	9.5	102.3	-8.9	-8.4	N
Hyundai	16.2	134.3	123.7	17.4	1,052	131.1	125.8	124.6	4.1	5.0	108.7	-13.6	-12.7	N
Mahindra	7.4	162.1	156.4	6.4	1,639	164.5	159.3	155.9	3.2	5.2	136.5	-14.3	-12.4	N
Tata	6.7	138.9	135.4	4.8	1,183	138.5	130.3	128.6	6.0	7.2	114.9	-11.8	-10.7	N
Toyota	4.4	164.2	156.7	4.1	1,523	157.9	152.5	149.2	3.4	5.5	131.0	-14.1	-12.2	N
Honda	5.4	131.1	120.4	3.7	1,014	128.9	123.1	122.2	4.5	5.3	106.9	-13.2	-12.5	N
Renault	2.2	117.9	112.7	3.2	829	118.4	116.8	116.6	1.4	1.5	98.1	-16.0	-15.9	N
Kia	0.0	—	—	3.0	1,322	146.5	141.6	137.3	3.3	6.3	121.5	-14.2	-11.5	N
Ford	2.7	142.7	127.5	2.4	1,283	144.3	135.1	133.7	6.4	7.3	119.7	-11.4	-10.5	N
Skoda	1.7	142.7	134.8	1.4	1,187	138.8	134.8	133.7	2.9	3.6	115.1	-14.6	-13.9	N
MG	0.0	—	—	0.8	1,670	166.3	171.6	165.8	-3.2	0.3	138.0	-19.6	-16.8	N
Mercedes	0.4	176.6	162.6	0.7	1,753	171.0	168.8	160.0	1.3	6.4	141.9	-15.9	-11.3	N
Nissan	1.1	120.4	116.1	0.6	908	122.9	117.4	116.9	4.5	4.8	101.8	-13.2	-12.9	N
BMW	0.3	170.5	142.3	0.3	1,756	171.2	155.3	146.3	9.4	14.5	142.1	-8.4	-2.9	N
FCA	0.5	158.9	155.9	0.3	1,533	158.5	160.3	157.2	-1.2	0.8	131.5	-18.0	-16.3	N
Volvo	—	242.9	242.9	0.1	1,787	172.9	165.0	157.5	4.7	9.0	143.6	-12.9	-8.8	Y
Jaguar	—	180.8	169.9	0.1	1,751	170.9	158.7	151.3	7.1	11.4	141.8	-10.6	-6.3	Y
Force	—	240.7	240.7	0.1	2,013	185.8	213.6	213.6	-15.0	-15.0	154.3	-27.8	-27.8	Y
Isuzu	—	212	212	0.0	2,050	187.9	190.5	190.5	-1.4	-1.4	156.0	-18.1	-18.1	Y
Fleet Total	100.0	133.1	120.9	100.0	1,068	132.0	123.8	122.4	6.2	7.2	109.4	-11.6	-10.6	Y

Recall that Maruti retains the position of top-selling manufacturer with a 50.6% market share; its average curb weight is 917 kg. As the compliance targets are based on curb weight, and Maruti has a lighter than average fleet, it has to meet a more stringent target than the industry average target. In the table we used the fleet sales-weighted average weight of FY 2019–20 to calculate the FY 2022–23 targets. Assuming that the fleet average curb weight remains the same as FY 2019–20, the industry fleet average CO_2 target in FY 2022–23 will be 109.4 g/km. Therefore, the new passenger car fleet will need to reduce CO_2 emissions/fuel consumption by only 10.6% in the next three years, or about 3.67% annually.

Table 1 also includes the margins with respect to both the target for FY 2019–20 and the upcoming FY 2022–23 target. Among 15 manufacturers, BMW has the smallest gap to bridge to meet the compliance targets for FY 2022–23 and MG and FCA have the largest gap. Regarding the FY 2019–20 targets, Renault, Skoda, MG, FCA, and Nissan are meeting theirs with less than a 5% margin when flexibility mechanisms are taken into account. The lower the margin with the current target, the more these manufacturers will have to improve to meet FY 2022–23 standards; many will have to reduce fuel consumption by another 14%–20% including flexibility mechanisms. Our analysis also shows that MG and FCA are not meeting their FY 2019–20 compliance targets without the flexibility mechanisms.

India's FY 2022–23 standards are much less stringent than the EU 2021 standards. Figure 7 includes the EU and India standards, as well as a pictorial representation of annual corporate performance of all Indian manufacturers as a function of average curb weight without flexibility mechanisms or supercredits. As you can see, MG, FCA, Force, and Isuzu are not complying with the targets before the application of flexibility mechanisms.

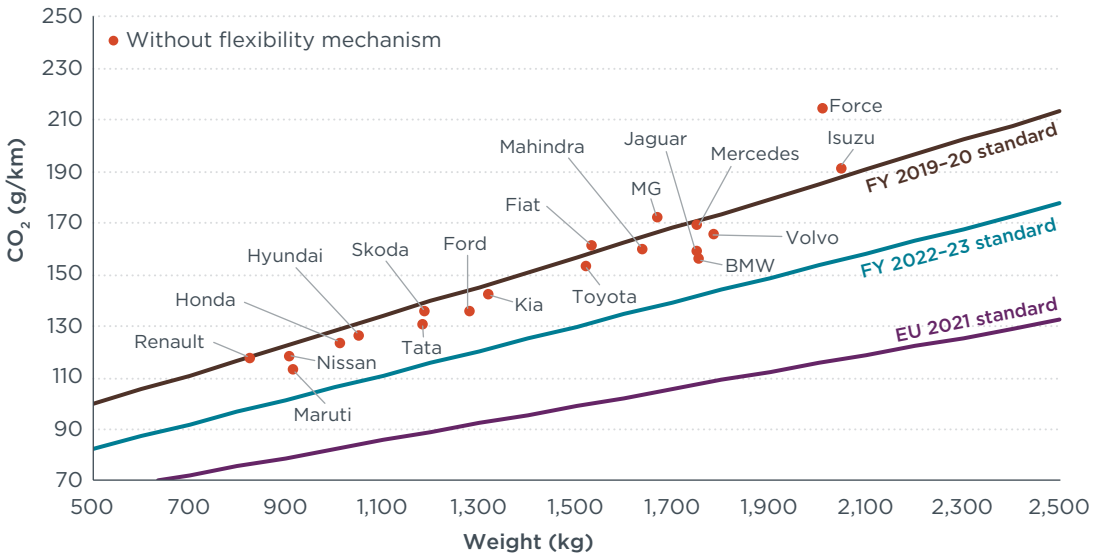

Figure 7. CO_2 performance of corporate group in FY 2019–20 without flexibility mechanisms.

Figure 8 gives the pictorial representation of corporate performance with flexibility mechanisms and supercredits. This chart includes the benefit of 6-speed transmission, regenerative braking, start-stop, and TPMS, as well as super credits from sales of electric vehicles and hybrid vehicles. For the purpose of calculating the corporate average CO_2 performance, a manufacturer uses a volume derogation factor of 3 for BEVs, 2.5 for PHEVs, and 2 for strong HEVs. This means that a BEV counts as 3 vehicles, a PHEV as 2.5 vehicles, and a strong HEV as 2 vehicles when calculating fleet average CO_2 emissions. The fuel consumption of the electricity driving portion for BEVs and PHEVs is converted from electricity consumption based on an equation provided in the regulations. This chart shows that manufacturers like MG and FCA have clearly benefited from these flexibility mechanisms.

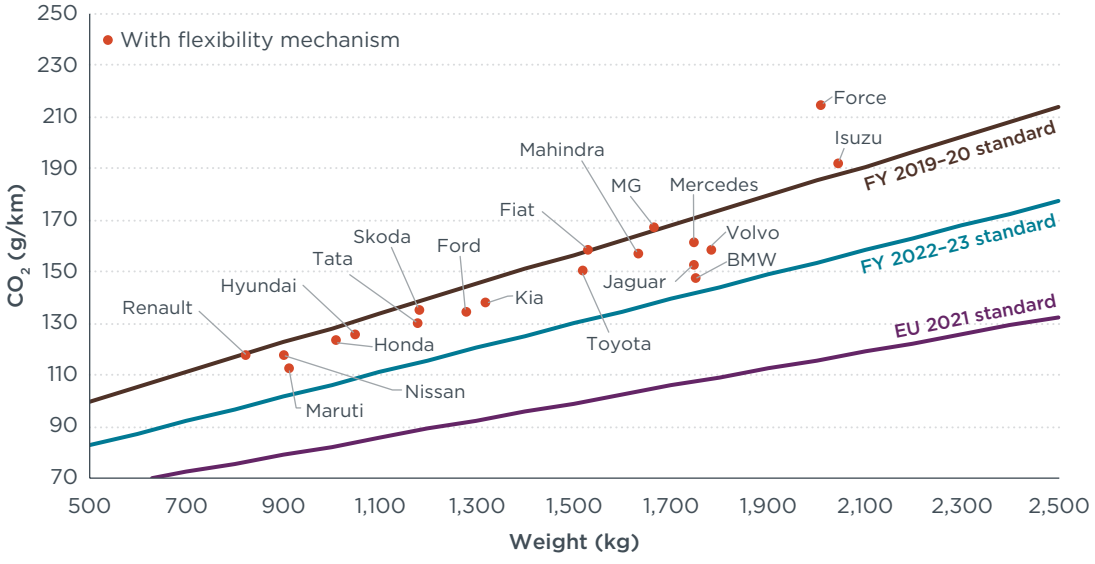

Figure 8. CO_2 performance of corporate group in FY2019–20 with flexibility mechanisms

Isuzu and Force do not need to meet compliance targets, as they qualify as small manufacturers with total sales are fewer than 5,000 units per year. Force and Isuzu are also identified as small car manufacturers in MoRTH's compliance report.

Table 2 lists the market share of vehicles equipped with flexibility mechanisms by corporate group. As you can see, corporate groups that sell luxury or high-end vehicles

are 100% equipped with 6-speed or more transmissions. The share of other flexibility mechanisms such as TPMS, regenerative braking, and start-stop are also increasing in such vehicles, including those from Mercedes-Benz, BMW, and Jaguar. The trend for 6-speed transmission and start-stop is increasing in mass-market passenger cars, too, largely because it is allowed as a flexibility mechanism under the compliance standard.

Table 2. Share of vehicles equipped with flexibility mechanisms in FY 2019–20

Manufacturer	6-speed (%)	Regenerative braking (%)	TPMS (%)	Start-stop (%)	6-speed transmission in FY 2018–19 (%)
Mercedes	100.0	27.9	98.9	98.9	100.0
BMW	100.0	97.7	97.7	97.6	100.0
Jaguar	100.0	26.8	74.6	74.6	100.0
Volvo	100.0	52.3	74.0	66.7	100.0
MG	100.0	16.3	56.4	12.7	—
Kia	100.0	0.0	55.0	0.0	—
FCA	98.7	0.0	0.1	0.3	100.0
Toyota	49.1	8.7	2.0	46.0	48.8
Tata	46.3	2.8	0.4	13.4	28.9
Mahindra	45.8	8.0	12.9	46.5	30.9
Hyundai	45.2	0.2	1.5	0.0	37.1
Honda	37.4	0.0	0.0	0.5	39.3
Skoda	28.5	2.6	5.6	2.6	25.0
Nissan	16.4	0.0	0.0	0.0	8.2
Ford	14.7	0.0	10.9	18.9	11.2
Maruti	5.5	9.3	0.0	9.3	0.0
Renault	4.9	0.0	0.0	0.0	8.7
Force	0.0	0.0	0.0	0.0	0.0
Isuzu	0.0	0.0	0.0	0.0	0.0

Table 3 gives the electric, PHEV, and strong hybrid sales volumes for manufacturers in comparison with their total sales volume.

Table 3. Share of electric, PHEV, and strong hybrids in total sales volume. Source: Segment Y data

Manufacturer	Electric/PHEV/ Strong hybrid	Sales in FY 2019–20	Total sales volume in FY 2019–20	Share of EV/ Hybrid (%)
Tata	EV	1,250	1,33,697	0.9
Mahindra	EV	884	1,79,915	0.5
Hyundai	EV	377	4,86,063	0.1
MG	EV	274	22,502	1.2
BMW	PHEV	27	8,570	0.3
Volvo	PHEV	8	2,038	0.4
Toyota	Strong hybrid	878	1,14,959	0.8

Table 4 summarizes the impact of flexibility mechanisms in terms of CO_2 g/km and the average CO_2 emissions level with and without the flexibility mechanisms. The super credit column gives the benefits achieved through the sale of electric and hybrid vehicles, and the column of flexibility mechanisms gives benefits achieved through the 6-speed, TPMS, regenerative braking, and start-stop technologies. While BMW, and Volvo sold PHEV, as related above, the sales were minimal in FY 2019–20. MG met its

compliance target using super credits and FCA met its compliance target using flexibility mechanisms benefits. The fleet average benefit is 0.3 g/km with super credits and 1.3 g/km with CO_2-reducing technologies, and this makes the overall benefit of flexibility mechanisms 1.6 g/km.

Table 4. Effect of flexibility mechanisms on CO_2 emissions by corporate group in FY 2019–20.

Corporate group	Target (g/km)	Average CO_2 w/o flexibility mechanism (g/km)	Impact of flexibility mechanisms (g/km)			With flexibility (g/km)	Small manufacturer
			Super credit	Flexibility mechanisms	Total		
Maruti	123.4	112.3	0.0	-0.6	-0.6	111.7	N
Hyundai	131.1	126.0	-0.2	-1.2	-1.5	124.6	N
Mahindra	164.5	161.3	-2.0	-3.4	-5.4	155.9	N
Tata	138.5	133.3	-3.0	-1.7	-4.7	128.6	N
Toyota	157.9	152.9	-0.5	-3.2	-3.7	149.2	N
Honda	128.9	123.1	0.0	-0.9	-0.9	122.2	N
Renault	118.4	116.8	0.0	-0.1	-0.1	116.6	N
Kia	146.5	141.6	0.0	-4.4	-4.4	137.3	N
Ford	144.3	135.1	0.0	-1.4	-1.4	133.7	N
Skoda	138.8	134.8	0.0	-1.1	-1.1	133.7	N
MG	166.3	176.9	-5.1	-6.0	-11.1	165.8	N
Mercedes	171.0	168.8	0.0	-8.8	-8.8	160.0	N
Nissan	122.9	117.4	0.0	-0.4	-0.4	116.9	N
BMW	171.2	155.9	-0.7	-8.9	-9.6	146.3	N
FCA	158.5	160.3	0.0	-3.2	-3.2	157.2	N
Volvo	172.9	165.9	-1.0	-7.3	-8.4	157.5	Y
Jaguar	170.9	158.7	0.0	-7.4	-7.4	151.3	Y
Force	185.8	213.6	0.0	0.0	0.0	213.6	Y
Isuzu	187.9	190.5	0.0	0.0	0.0	190.5	Y
Fleet Total	132.0	124.1	-0.3	-1.3	-1.6	122.4	Y

Comparison with MoRTH

Table 5 compares MoRTH's report with our analysis of Segment Y data. It also shows, in terms of percentage, the difference between the target and performance values of the two analyses. For the top car manufacturers, there is not much difference between our estimates and MoRTH data, and these top manufacturers cover 99% of the market. However, there is a difference between our estimates and MoRTH values for small manufacturers like Volvo, Jaguar, Force, and Isuzu. This could be due to different curb weights and the sales numbers used by Segment Y. However, the data for these manufacturers does not have big impact on our overall analysis, as they have minimal market share.

Table 5. Comparison between MoRTH and Segment Y for FY2019–20

No.	Manufacturer / Importer	MoRTH			Segment Y			Difference from MoRTH target (%)	Difference from MoRTH performance (%)
		Market share (%)	Target (g/km)	Performance (g/km)	Market share (%)	Target (g/km)	Performance (g/km)		
1	**Maruti**	50.5	124.4	111.2	50.6	123.4	111.7	0.8	-0.4
2	**Hyundai**	17.4	134.1	123.0	17.4	131.1	124.6	2.3	-1.3
3	**Mahindra**	6.5	162.3	156.6	6.4	164.5	155.9	-1.4	0.4
4	**Tata**	4.9	139.3	129.6	4.8	138.5	128.6	0.5	0.7
5	**Toyota**	4.1	158.5	150.4	4.1	157.9	149.2	0.4	0.8
6	**Honda**	3.7	130.0	123.0	3.7	128.9	122.2	0.8	0.7
7	**Renault**	3.5	119.9	118.1	3.2	118.4	116.6	1.3	1.3
8	**Kia**	3.0	147.3	138.2	3.0	146.5	137.3	0.6	0.7
9	**Ford**	2.3	146.5	133.3	2.4	144.3	133.7	1.5	-0.3
10	**Skoda**	1.4	142.7	134.9	1.4	138.8	133.7	2.7	0.9
11	**MG**	1.0	165.9	165.8	0.8	166.3	165.8	-0.2	0.0
12	**Mercedes**	0.4	176.7	162.3	0.7	171.0	160.0	3.2	1.4
13	**Nissan**	0.5	117.2	113.9	0.6	122.9	116.9	-4.8	-2.7
14	**BMW**	0.3	172.5	147.9	0.3	171.2	146.3	0.7	1.1
15	**FCA**	0.3	161.6	159.6	0.3	158.5	157.2	1.9	1.5
16	**Volvo**	0.0	205.2	205.2	0.1	172.9	157.5	15.7	23.3
17	**Jaguar**	0.1	182.9	176.7	0.1	170.9	151.3	6.6	14.3
18	**Force**	0.0	246.0	246.0	0.1	185.8	213.6	24.5	13.2
19	**Isuzu**	0.0	209.6	209.6	0.0	187.9	190.5	10.4	9.1

Figure 9 compares MoRTH published CO_2 values of FY 2017–18, FY 2018–19, and FY 2019–20 for the top 10 manufacturers. Except for Renault and Nissan, all manufacturers have improved their performance with respect to the previous year. Maruti and Ford are close to meeting the FY 2022–23 standard, but Mahindra, Tata, and VW have a wider gap to bridge in the coming years.

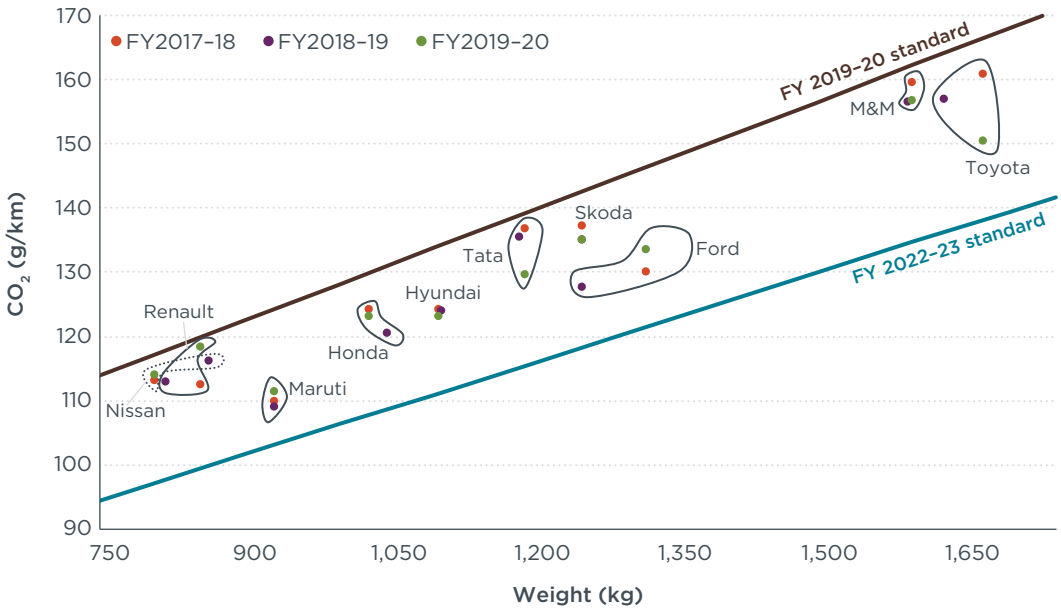

Figure 9. Fleet average CO_2 emissions of the top 10 manufacturers FY 2017–18, 2018–19, and 2019–20.

Analyzing the potential impacts of increased adoption of flexibility mechanisms and super credits

Most of the mass market manufacturers are not using the flexibility mechanisms and super credits in all of their vehicles. This leaves a lot of potential to reduce the gap with FY 2022–23 fleet average targets via more widespread use of them. Note, too, that the allowed flexibility mechanisms are cheaper in terms of cost when compared with expensive technologies that generate super credits, such as electric vehicles, PHEVs, and strong hybrids. Moreover, most manufacturers already equipped some percentage of their newly launched vehicles in FY 2019–20 with the flexibility mechanism technology and thus have experience with it. This means that manufacturers are likely to prefer to use the maximum derogation factor benefit of 9 gCO_2/km from flexibility mechanism technologies before shifting to other technologies. Table 6 gives the CO_2 reduction potential for each of the manufacturers when all four flexibility mechanism technologies are used in all the vehicles sold. Among the major manufacturers, the gap with the FY 2022–23 target is smallest for Maruti and largest for MG, FCA, and Mercedes.

Table 6 also shows scenarios of CO_2 reduction with more penetration of electric and hybrid vehicles. The analysis uses a super credits factor for both electric and strong hybrid vehicles. As Maruti has the smallest gap to close, just 1% electric vehicle penetration will be sufficient to meet its target without adding other technologies to its fleet. For Tata, Ford, and BMW, at least 2% electric vehicle penetration will be needed to meet the target, and with 3% EV penetration, all of the top 6 manufacturers will meet their targets without adding other technologies. Skoda, MG, and FCA will still have some gap even after reaching a 3% electric vehicle share in their fleet.

In our analysis, we considered a 25% fuel consumption benefit for strong hybrids as compared with conventional vehicles.

Table 6. CO_2 reduction potential with maximum use of flexibility mechanisms

Manufacturer	Performance with flexibility mechanisms in FY 2019–20 (g/km)	Performance after using all flexibility mechanisms in all sales volume (g/km)	FY 2022–23 target (g/km)	Gap with FY 2022–23 target after using all flexibility mechanisms in all sales volume (g/km)	Scenario 1: CO_2 reduction with 1% EV (g/km)	Scenario 2: CO_2 reduction with 2% EV (g/km)	Scenario 3: CO_2 reduction with 3% EV (g/km)	Scenario 4: CO_2 reduction with 1% HEV (g/km)	Scenario 5: CO_2 reduction with 2% HEV (g/km)	Scenario 6: CO_2 reduction with 10% HEV (g/km)
Maruti	111.7	103.3	102.3	1.0	2.5	4.9	7.4	0.6	1.1	5.6
Hyundai	124.6	115.8	108.7	7.1	2.8	5.5	8.3	0.6	1.2	6.2
Mahindra	155.9	147.0	136.5	10.5	3.5	7.0	10.5	0.8	1.6	7.8
Tata	128.6	120.0	114.9	5.1	2.9	5.7	8.6	0.6	1.3	6.4
Toyota	149.2	140.4	131.0	9.4	3.4	6.7	10.1	0.7	1.5	7.5
Honda	122.2	113.3	106.9	6.4	2.7	5.4	8.1	0.6	1.2	6.1
Renault	116.6	107.6	98.1	9.5	2.6	5.1	7.7	0.6	1.2	5.8
Kia	137.3	130.5	121.5	9.0	3.1	6.2	9.3	0.7	1.4	6.9
Ford	133.7	124.7	119.7	5.0	3.0	6.0	8.9	0.7	1.3	6.7
Skoda	133.7	124.7	115.1	9.6	3.0	6.0	8.9	0.7	1.3	6.7
MG	165.8	158.7	138.0	20.7	3.8	7.6	11.4	0.8	1.7	8.3
Mercedes	160.0	157.7	141.9	15.7	3.8	7.5	11.3	0.8	1.6	8.0
Nissan	116.9	108.0	101.8	6.1	2.6	5.2	7.7	0.6	1.2	5.8
BMW	146.3	146.1	142.1	4.0	3.5	7.0	10.5	0.7	1.5	7.3
FCA	157.2	148.2	131.5	16.6	3.5	7.1	10.6	0.8	1.6	7.9
Volvo	157.5	154.1	143.6	10.6	3.7	7.4	11.1	0.8	1.6	7.9
Jaguar	151.3	147.6	141.8	5.7	3.5	7.0	10.6	0.8	1.5	7.6
Force	213.6	204.6	154.3	50.3	4.9	9.8	14.7	1.1	2.1	10.7
Isuzu	190.5	181.5	156.0	25.5	4.3	8.7	13.0	1.0	1.9	9.5

Summary

As manufacturers move toward FY 2022–23 fuel-consumption standards for new passenger vehicles in India, our analysis of Segment Y data shows the fleet average CO_2 emissions for FY 2019–20 is 122.4 g/km. Assuming similar industry average weight going forward, the compliance target for FY 2022–23 will be 109.4 g/km. This means that to bridge the gap of 10.6% in the next 3 years, the industry needs to reduce fuel consumption by approximately 3.67% each year. However, the actual, real-world decrease will almost certainly be lower, as manufacturers are likely to expand their use of super credits and flexibility mechanisms.

Based on the significant progress that manufacturers have already made toward compliance with FY 2022–23 standards and the relative leniency of the standards compared with those in Europe, MoRTH should start to develop significantly more stringent post-FY 2022–23 CO_2 emission standards.

Table 7 compares the CO_2 performance for past 3 years in Europe and India. Observe that CO_2 performance is similar in both regions, even though average vehicle weight in India is far lower; this means that India badly trails Europe in efficiency technology adoption. In addition, Europe will implement stricter norms beginning in 2021 and this has been one of the major drivers behind the increase in sales of electric vehicles and strong hybrids in Europe. If India wants to pursue electrification in passenger cars, then it should update its fuel consumption standards with a focus on setting 2025 and 2030 standards on par with EU targets.

Table 7. Comparison of curb weight, CO_2 emissions, and percentage of hybrid and PHEV+BEV in Europe and India

Europe					India				
Year	**Curb weight (kg)**	**CO_2 (g/km)**	**Hybrid (%)**	**PHEV+BEV (%)**	**Year**	**Curb weight (kg)**	**CO_2 (g/km)**	**Hybrid (%)**	**PHEV+BEV (%)**
2017	1,395	118	2.7	1.4	**2017–18**	1,064	120.6	0	0.01
2018	1,397	120	3.3	2	**2018–19**	1,078	121.9	0.01	0.06
2019	1,415	122	3.7	3	**2019–20**	1,068	122.4	0.03	0.10

Corporate groups that sell luxury or high-end vehicles, including BMW, Volvo, Mercedes, and Jaguar, currently benefit more from flexibility mechanisms. However, some mass market manufacturers like MG, FCA, and Kia have also started making use of the flexibility mechanisms. Because 25.5% of the FY 2019–20 passenger cars sold in India were equipped with 6-speed or more transmissions, regulators should consider not granting CO_2 credits for this technology any longer, as the provision is intended to promote innovation and new technology adoption.

Moreover, the impact of super credits is minimal for the FY 2019–20 fleet, but its impact could grow rapidly as the market share of BEVs, PHEVs, and strong hybrids goes up. Based on the analysis of MG and Mahindra, sales of electric vehicles will help manufacturers meet their compliance targets, especially as decreasing diesel sales will make it more difficult to reduce emissions from internal combustion engine vehicles. As the impact of the flexibility mechanisms and super credits grows, MoRTH should publish detailed compliance information to allow for a thorough understanding of the impact that each individual technology is having on the overall fleet compliance. This could also help in analyzing whether the particular technology has reached a wide penetration in the market and could therefore be removed from the benefit list.

Appendix

Manufacturers	Referred name
BMW India Pvt. Ltd.	BMW
FCA India Automobiles Pvt. Ltd.	FCA
Force Motors Ltd.	Force Motors
Ford India Pvt. Ltd.	Ford
General Motors India & CSIPL	General Motors
Hindustan Motor Finance Corporation Ltd.	HMFCL
Honda Cars India Ltd.	Honda
Hyundai Motor India Ltd.	Hyundai
Isuzu Motors India Pvt. Ltd.	Isuzu
Jaguar Land Rover	Jaguar
Corporate Group - Mahindra & Mahindra Ltd. (Mahindra & Mahindra Ltd & Mahindra Electric Mobility Ltd.)	Mahindra
Maruti Suzuki India Ltd.	Maruti
Mercedes-Benz India Pvt Ltd	Mercedes
Nissan Motor India Private Ltd.	Nissan
Renault India Private Ltd.	Renault
Tata Motors Ltd.	Tata
Toyota Kirloskar Motor Pvt. Ltd	Toyota
Skoda Auto Volkswagen India Private Ltd.	Skoda
Volvo Auto India Pvt. Ltd.	Volvo
MG Motor India Pvt. Ltd	MG