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Fuel consumption from light commercial vehicles in India, fiscal year 2018–19

Author: Ashok Deo

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Introduction

This paper examines the fuel consumption of new light commercial vehicles (LCVs) sold in India in fiscal year (FY) 2018–19. These vehicles are the N1 segment in India, and passenger vehicles are the M1 category.[1] LCVs in India are not yet subject to any carbon dioxide (CO_2) emission standards, even though such standards apply to passenger cars and have proven effective in driving down test-cycle emission levels of new vehicles.

This work establishes a baseline of fuel consumption for the N1 segment in India, to help regulators develop an effective CO_2/fuel consumption standard. Additionally, we compare the N1 fleets for FY 2014–15, FY 2017–18, and FY 2018–19, understand the characteristics of the mini truck and pickup segments within the N1 category, and compare the performance of major LCV manufacturers in India in terms of fleet average fuel consumption. Finally, we assess the performance of India's LCV fleet against the LCV fleet in the European Union, considering the differences in the curb weight and size of the vehicles, and examine the performance of LCV manufacturers if a star labeling standard or passenger car fuel consumption standards were to be applied.

Background

LCVs are used in India as "last-mile" connectivity to move goods to their final destination. The light-duty vehicle market was approximately 87% passenger cars and 13% LCVs in FY 2018–19.[2] This study focuses on India's LCVs, which are bifurcated into two segments by the Society of Indian Automobile Manufacturers (SIAM), as shown in Table 1.

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1 N1 category means a motor vehicle that is used for the carriage of goods and has a gross vehicle weight not exceeding 3.5 tons. M1 category means a motor vehicle that is used for the carriage of passengers, has no more than eight seats in addition to the driver's seat, and has a gross vehicle weight not exceeding 3.5 tons.

2 The market shares for FY 2018–19 are from sales data from Segment Y.

Table 1. SIAM's segmentation of LCVs and best-selling models

Segment	Description	LCV type	Market share FY 2018–19 (%)	Top 3 best-selling models FY 2018–19	Market share (%)
N1 Mini truck	Cargo vehicles with gross vehicle weight (GVW) <2,000 kg		56.6	Tata ACE	45.9
				Ashok Leyland Dost	11.0
				Maruti Super Carry	7.7
N1 Pickup truck	Cargo vehicles with 2,000kg<GVW<3,500 kg		43.4	Mahindra Bolero Camper	14.4
				Tata Xenon	11.2
				Mahindra Imperio	8.7

Data sources and database construction

The vehicle attributes and technical parameters analyzed are curb weight, footprint, CO_2 emissions and fuel consumption, engine displacement, fuel type, and power. The sales data was obtained from Segment Y Automotive Intelligence, an independent international automotive data supplier. This data, however, did not include all the vehicle parameters needed for our analysis. Also, the fuel economy of some of the variants was not available in Segment Y data. Therefore, in constructing the database, we included information from additional sources. Most of the vehicle specifications, such as engine displacement, power output, and dimensions, were obtained from manufacturer websites. The footprint of the vehicles was calculated from track and wheelbase data available on manufacturer websites.[3] Fuel economy information was obtained from manufacturer and other commercial websites.[4]

Constructing the database primarily involved integrating the Segment Y sales data and fuel economy data on the basis of vehicle make and model. However, there were instances where a single vehicle model had multiple variants; in the absence of additional information, this analysis assumes that sales were equally distributed over the variants matched to a given sales record. The effect of this assumption is minimal, as the variation in fuel economy across variants is small relative to the variation across models. Still, it creates some uncertainty.

Once the database was assembled, we calculated the sales-weighted averages of all parameters for the N1 segment. Note that the European data discussed later in this paper was taken from the EU-28 LCV database compiled by ICCT, http://eupocketbook.org/.

Fleet characteristics of LCVs

Table 2 compares the fleet characteristics of LCVs for FY 2017–18 and FY 2018–19 for different vehicle parameters. Note that all vehicles sold in FY 2017–18 and FY 2018–19 met Bharat Stage (BS) IV emission standards. FY 2014–15 data from prior ICCT research is also included in the table.[5] In FY 2014–15, 78% of N1 category vehicles were of the BS III standard and the remaining 22% met the BS IV standard.[6] The top five models in terms of market share in FY 2018–19 were the Tata Ace, Mahindra Bolero MaxiTruck,

3 Vehicle footprint is the product of distance between axles of the vehicle (wheelbase) and the distance between the centerline of the tires (average track width). In cases where vehicle track dimensions were not readily available, track width was calculated from vehicle width using a factor of 0.8582.

4 The commercial websites used for CO_2 and other vehicle parameters were www.trucks.cardekho.com, www.autos.maxabout.com, and www.vicky.in.

5 Aparna Menon, Anup Bandivadekar, *Light-commercial vehicles in India, 2014-15*, (ICCT: Washington, DC, 2016), https://theicct.org/sites/default/files/publications/India%20LCVs_White-Paper_ICCT_23122016.pdf

6 The Supreme Court of India prohibited the sale of new BS III vehicles from April 1, 2017 onward.

Ashok Leyland Dost, Tata Xenon, and Maruti Super Carry. All CO_2 values are measured on a standard Modified Indian Drive Cycle (MIDC).[7]

Table 2. LCV fleet characteristics for FY 2014–15, FY 2017–18, and FY 2018–19

Vehicle characteristic	India fleet average		
	FY 2014–15	FY 2017–18	FY 2018–19
Engine displacement (cubic centimeters [cc])	1,647	1,674	1,602
Curb weight (kilograms [kg])	1,299	1,271	1,237
CO_2 emissions (grams [g]/kilometers [km])	157.6	145.6	143.1
Power (kilowatt [kW])	33.0	34.9	33.3
Power to weight ratio (kW/kg)	0.025	0.027	0.027
Footprint (square meters [m^2])	3.6	3.7	3.7
Diesel (%)	89	100	97.6
CNG (%)	11	0[a]	2.4

[a] Although Segment Y data shows 0%, data available on Vahan website shows that the shares of CNG vehicles for FY 2014–15, FY 2017–18, and FY 2018–19 were 2.4%, 3.1%, and 3.7%, respectively. Additionally, while Segment Y data shows only 25 EVs in FY 2017-18, Vahan data shows the respective shares of electric vehicles for FY 2014–15, FY 2017–18, and FY 2018–19 were 0.02%, 0.18%, and 0.08%. https://vahan.nic.in/nrservices/

Some highlights from the analysis are:

» The average engine displacement dropped slightly from 1,647 cc to 1,602 cc from FY 2014–15 to FY 2018–19. This drop is largely because models with lower engine displacement sold more than models with higher engine displacement. Additionally, new models with smaller engines were introduced; for example, Maruti Suzuki's Carry, which has a market share of 4.5% and an engine displacement of 793 cc, was introduced in 2016.

» The average curb weight steadily decreased from 1,299 kg in FY 2014–15 to 1,237 kg in FY 2018–19.

» Average CO_2 emissions decreased from 157.6 g/km in FY 2014–15 to 143.1 g/km in FY 2018–19. This is a 9.2% reduction over 4 years and a 2.4% annual reduction.

» Fleet average power remained almost the same with 33 kW in FY 2014–15 and 33.3 kW in FY 2018–19, and power-to-weight ratio also remained essentially the same—it was 0.025 kW/kg in FY 2014–15 and 0.027 kW/kg in FY 2018–19.

» Average footprint increased slightly from 3.6 m^2 in FY 2014–15 to 3.7 m^2 in FY 2018–19.

» The share of diesel and CNG vehicles was 97.6% and 2.4%, respectively, in FY 2018–19, whereas it was 89% and 11%, respectively, in FY 2014–15. Also, based on Segment Y data, only 25 electric LCVs were sold in FY 2017–18.

Comparison of mini trucks and pickups

Most mini trucks have double cylinder direct injection diesel engines, and many are used as a transport link to interior areas where the roads may not be wide enough to allow large-size commercial vehicles to drive. Such roads require a unique segment of vehicles with a small footprint and sub one-ton payload capacity, and these constitute 89% of India's mini trucks. The curb weight of these vehicles is lighter, and it results in lower CO_2 emissions on test cycles.

Pickups, on the other hand, are used for both commercial and personal purposes. They generally have multi-cylinder diesel engines and higher payload capacity. Additionally, our analysis of FY 2014–15 and FY 2018–19 shows that variants that were complying with

7 The MIDC cycle consists of an urban driving cycle and extra urban driving cycle. https://www.araiindia.com/CMVR_TAP_Documents/Part-14/Part-14_Chapter03.pdf

BS III standards were phased out or replaced with BS IV models. Figures 1 and 2 give the market share of BS III and BS IV variants by manufacturer in FY 2014–15.

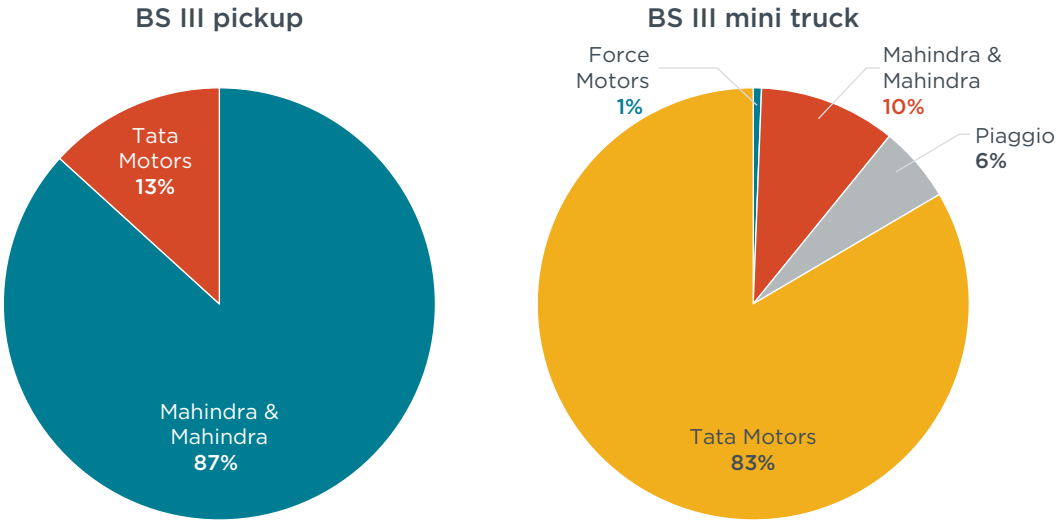

Figure 1. BS III market share by manufacturer in FY 2014–15.

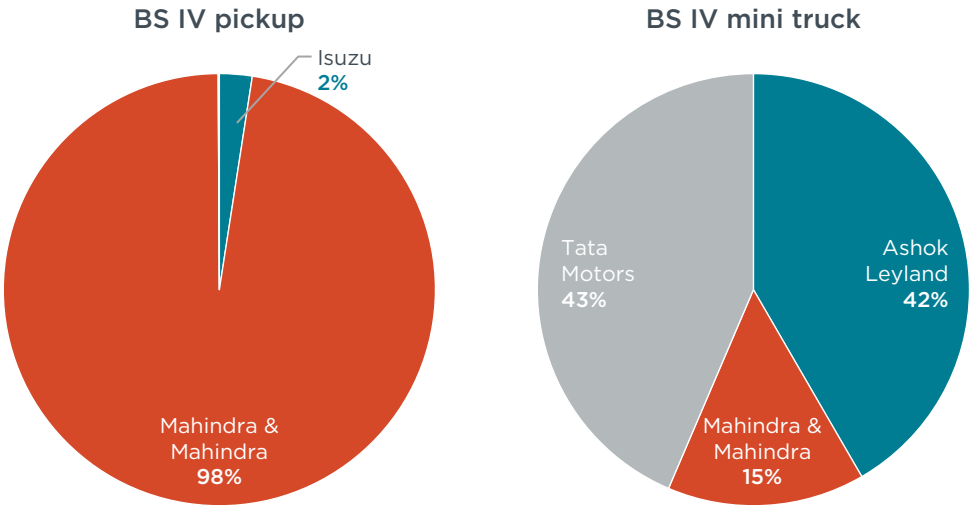

Figure 2. BS IV market share by manufacturer in FY 2014–15

Table 3 gives the CO_2 values of some of the variants that were upgraded from BS III to BS IV. The Bolero Camper, a top-selling product of Mahindra, reduced fuel consumption by 7.9% in its BS IV upgrade and Tata's 207 BS IV variant reduced its fuel consumption by 23.4%. Tata's Ace is a top-selling product and its upgrade reduced fuel consumption by 22.4%. Other manufacturer models were replaced—the Mahindra Gio was replaced with the BS IV Jeeto and the Piaggio Ape Truck was upgraded to the Porter. The upgrades in mini trucks improved the overall fuel efficiency of manufacturers more than the improvements in pickup trucks.

Table 3. CO_2 comparison of variants from BS III to BS IV

Models	Segment	Market share in FY 2014–15 (%)	BS III CO_2 (g/km)	Market share in FY 2018–19 (%)	BS IV CO_2 (g/km)	CO_2 reduction (%)
Isuzu D-max	Pickup	0.1	200.0	0.9	213.6	-6.8
Force Trump 40	Pickup	0.2	138.0	—	130.6	5.4
Mahindra Bolero Camper	Pickup	18.0	189.1	9.2	174.2	7.9
Mahindra Gio	Mini truck	1.0	98.1	—	70.4	28.2
Piaggio Ape Truck	Mini truck	2.0	132.4	—	101.9	23.1
Tata SUPER ACE	Mini truck	2.0	190.8	1.4	148.0	22.4
Mahindra Maxximo CNG	Mini truck	3.0	129.2	—	125.2	3.1
Tata 207 EX Crew Cab	Mini truck	5.0	288.1	2.4	220.7	23.4
Tata ACE zip	Mini truck	5.0	80.2	7.6	78.4	2.3
Ashok Leyland Dost	Mini truck	9.0	150.5	9.3	135.1	10.2
Tata ACE HT	Mini truck	22.0	132.4	25.2	120.9	8.7

Table 4 gives the fleet characteristics of mini trucks and pickups in FY 2014–15, 2017–18, and 2018–19. Some highlights are:

» From FY 2014–15 to FY 2018–19, the average CO_2 emissions of mini trucks decreased by 11.3% from 126.3 g/km to 112.0 g/km. The average CO_2 emissions of pickups also decreased by 5.3% from 194.1 g/km to 183.8 g/km.

» The average curb weight of mini trucks decreased from 946 kg in FY 2014–15 to 882 kg in FY 2018–19. The curb weights of pickups have remained relatively steady in the range of 1,700 kg.

» From FY 2014–15 to FY 2018–19, the average footprint of mini trucks slightly increased from 2.7 m^2 to 3 m^2. Some models launched after FY 2014–15, like Mahindra's Jeeto, which has a 10% market share and footprint of 2.9 m^2, and Maruti's Carry, which has a market share of 4.5% and footprint of 2.8 m^2, have contributed to the increase in average footprint. The average footprint of pickups also increased from 4.6 m^2 to 4.9 m^2. A shift in sales toward higher footprint models and some newly added vehicles like Mahindra's Imperio, which has a wider stance of 5.2 m^2 and a market share of 7%, have both contributed to the increase.

» The average engine displacement of mini trucks has decreased from 861 cc in FY 2014–15 to 841 cc in FY 2018–19. This drop is largely because the models with lower engine displacement sold more than the higher engine displacement models and because of the phasing out of some BS III models to BS IV.

Table 4. Comparison of characteristics between mini trucks and pickups

Fleet characteristics	FY 2014–15		FY 2017–18		FY 2018–19	
	Mini trucks	Pickups	Mini trucks	Pickups	Mini trucks	Pickups
CO_2 emissions (g/km)	126.3	194.1	115.5	181.0	112.0	183.8
Curb weight (kg)	946	1,709	913	1693	882	1,702
Footprint (m^2)	2.7	4.6	3.0	4.8	3.0	4.9
Engine displacement (cc)	861	2,559	891	2,596	841	2,597
Power (kW)	18.8	49.0	21.0	51.3	18.6	52.5
Power to weight ratio (kW/kg)	0.018	0.029	0.023	0.030	0.021	0.031
Market share (%)	53.7	46.3	54.1	45.9	56.6	43.4

Most mini trucks have a smaller footprint, lower curb weight, and lower CO_2 emissions compared to pickups, which tend to have bigger engines and heavier curb mass, both of which increase their CO_2 emissions. Figure 3 illustrates the curb weight and footprint of the pickup and mini truck segments. Mini trucks have 48% lower curb weight at the fleet average footprint of 3 m^2 as compared with pickups, which have a fleet average footprint of 4.9 m^2.

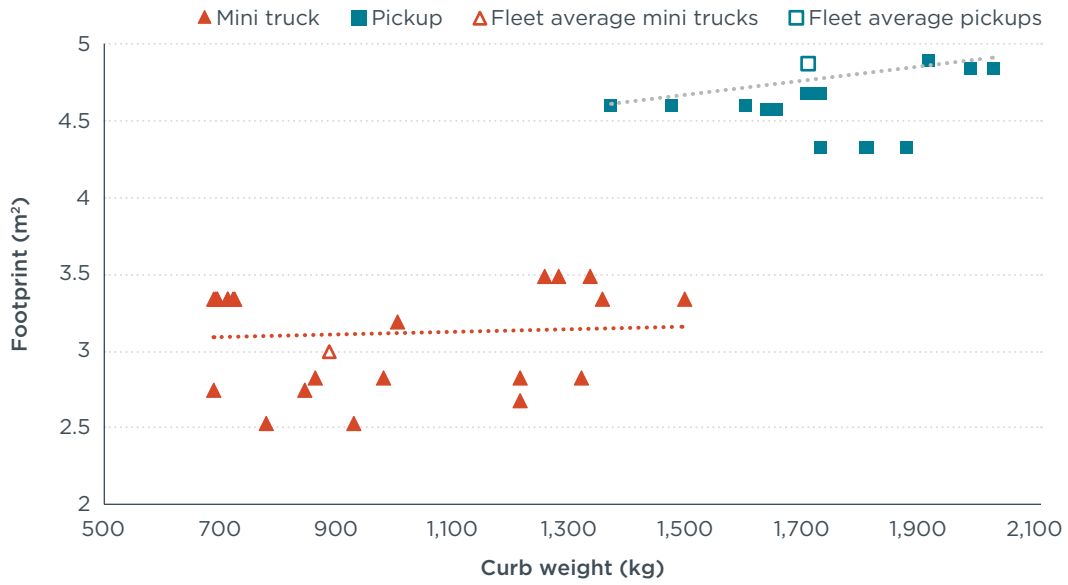

Figure 3. Footprint versus curb weight regression for LCV models in FY 2018–19.

Figure 4 illustrates the curb weight and CO_2 emissions of mini trucks and pickups. The CO_2 of mini trucks at the fleet average curb weight of 882 kg are lower by 39% compared with pickups with fleet average curb weight of 1,702 kg. When compared with the fuel consumption target lines for the M1 category, most of the mini trucks are meeting FY 2018–19 targets and some are even meeting FY 2022–23 targets. The pickups, meanwhile, have a large gap with the M1 category FY 2018–19 targets.

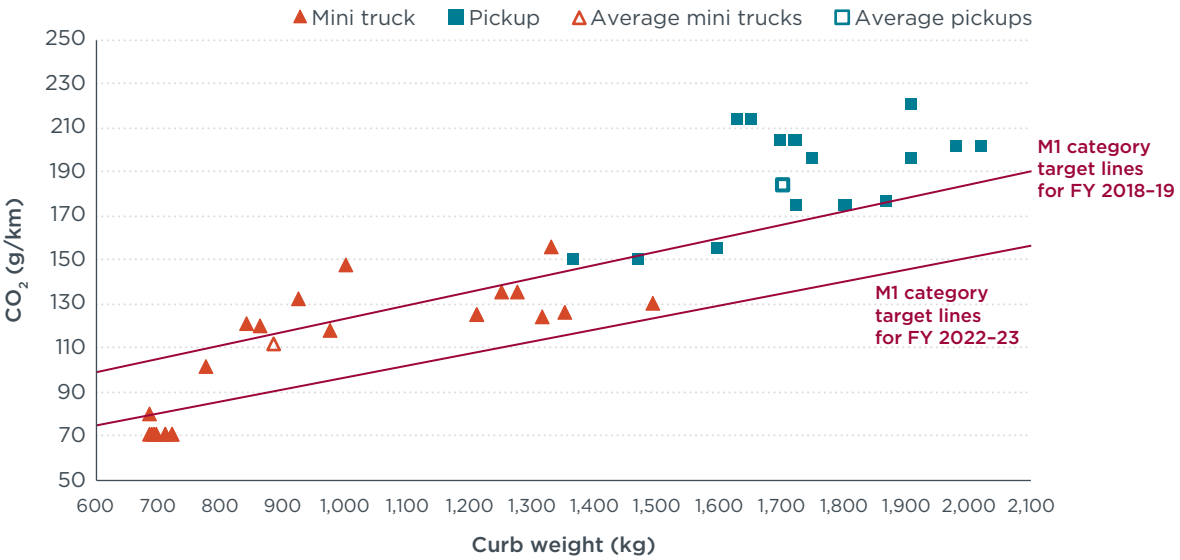

Figure 4. Curb weight versus CO_2 emissions regression for LCV models in FY 2018–19.

LCV comparison by manufacturer

Seven manufacturers sold LCVs in the Indian market during FY 2018–19: Ashok Leyland, Force, Isuzu, Mahindra, Maruti Suzuki, Piaggio, and Tata. Table 5 compares the sales-weighted average fleet profile of FY 2018–19 by manufacturer, and below that, Figure 5 gives the market share of each manufacturer within the pickup and mini truck segments for FY 2018–19.

Table 5. LCV Fleet characteristics by manufacturer for FY 2018–19

Manufacturer	Sales	Market share (%)	CNG (%)	Curb weight (kg)	CO_2 emissions (g/km)	Engine displacement (cc)	Power (kW)	Footprint (m^2)	Power/ weight (kW/kg)
Mahindra & Mahindra Ltd.	229,682	44.5	2.6	1,432	153.2	2,076	40	4.5	0.028
Tata Motors Ltd.	206,393	40.0	—	1,049	134.5	1,180	24	3.2	0.023
Ashok Leyland	49,467	9.6	10.0	1,264	137.2	1,478	42	3.5	0.033
Maruti Suzuki India Ltd.	23,874	4.6	5.6	866	119.9	816	25	2.8	0.029
Isuzu Motors India Pvt. Ltd.	4,663	0.9	—	1,634	213.6	2,499	67	4.6	0.041
Piaggio Vehicles Pvt. Ltd.	1,592	0.3	5.8	842	115.6	824	16	2.5	0.018
Force Motors Ltd.	931	0.2	—	1,717	160.8	1,947	43	4.0	0.025
Total	516,602	100	2.4	1,237	143.1	1,602	33	3.7	0.027

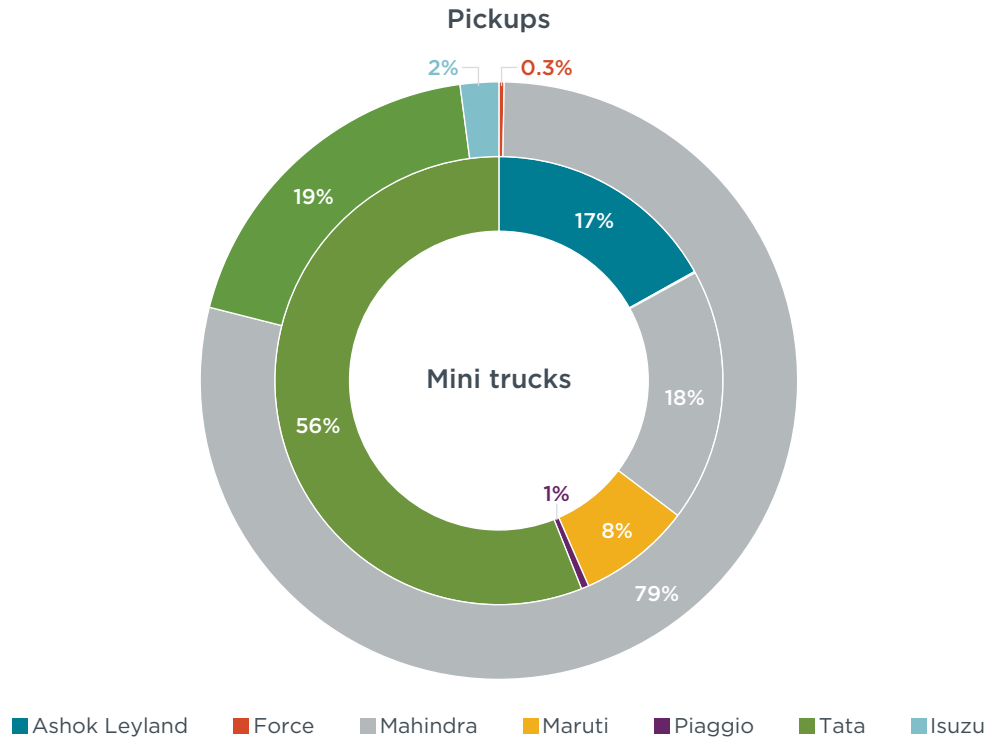

Figure 5. Fleet characteristics by manufacturer for FY 2018–19

Figure 6 shows the CO_2 emissions and curb weight of the fleet of FY 2018–19 and FY 2014–15 vehicles and the size of the circles correspond with the size of the market share of the manufacturers. The major reduction in CO_2 emissions in recent years stems from the phase out of BS III vehicles and the upgrade to BS IV. Table 6 gives the percentage improvement of each manufacturer for CO_2 emissions.

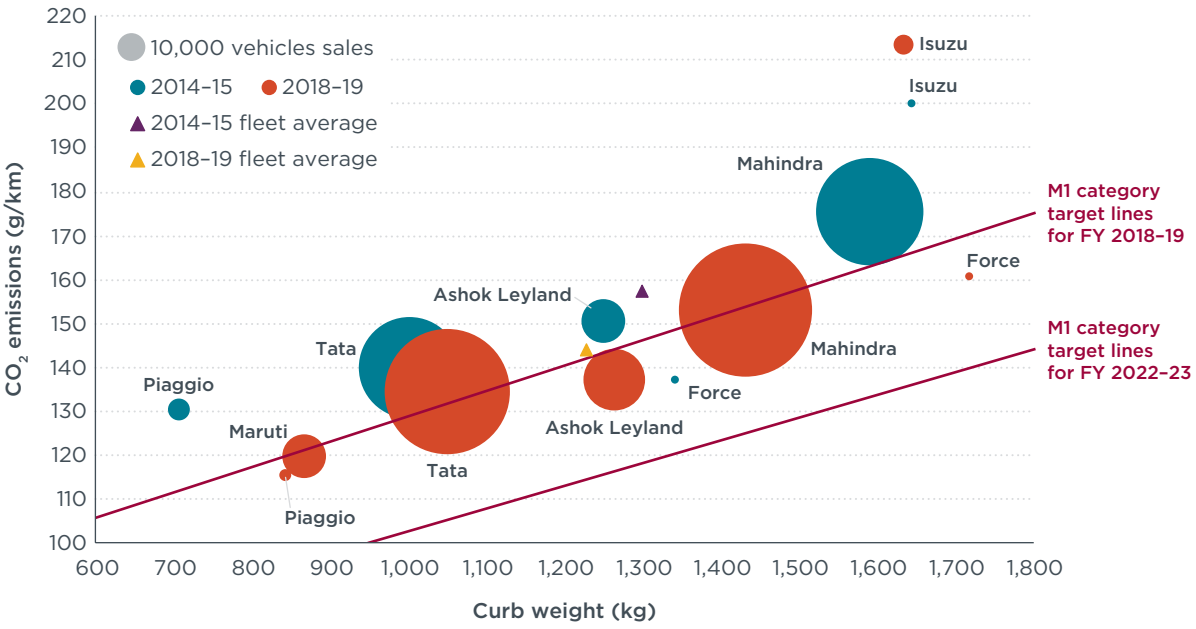

Figure 6. CO_2 emissions versus curb weight for FY 2018–19 and FY 2014–15.

Table 6. CO_2 emissions comparison by manufacturer

Manufacturer	FY 2014–15 CO_2 (g/km)	FY 2018–19 CO_2 (g/km)	CO_2 reduction (%)
Mahindra	175.4	153.2	12.6
Tata	140.0	134.5	3.9
Ashok Leyland	150.4	137.2	8.8
Maruti	—	119.9	0.0
Isuzu	200.1	213.6	-6.7
Piaggio	130.4	115.6	11.3
Force	137.2	160.8	-17.2

Figure 7 compares the CO_2 and footprint of FY 2018–19 and 2014–15 manufacturer fleets. The size of the circles correspond with the size of the market share of the manufacturers.

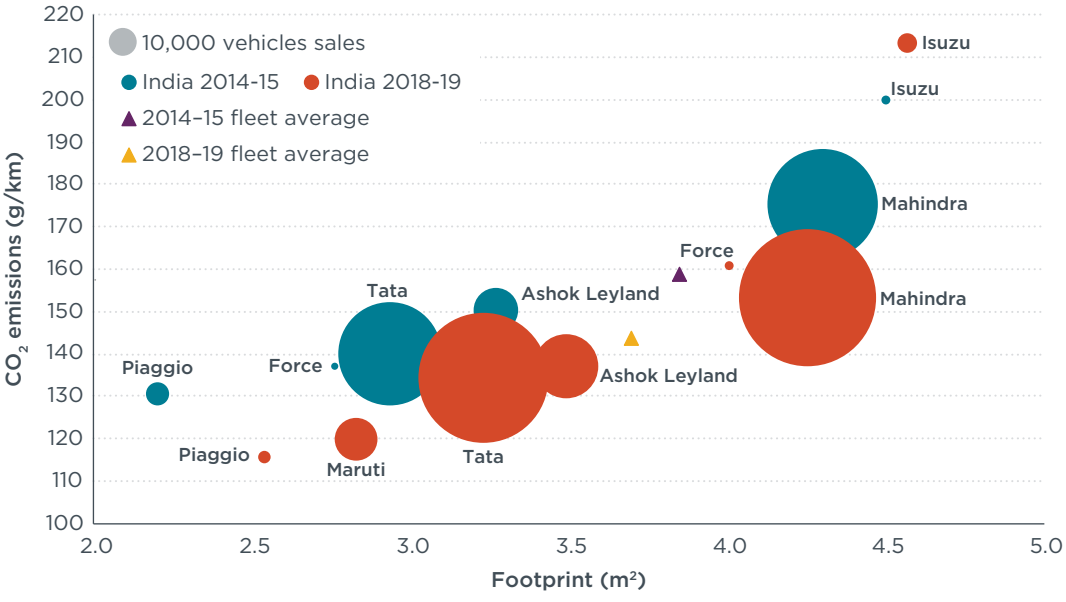

Figure 7. CO_2 emissions versus footprint for FY 2018–19 and FY 2014–15. Circle size is reflective of market share.

Comparison with the European Union

In 2018, the on-road vehicle market share for passenger cars in the European Union was 86% and the LCV market share was 12%.[8] (Trucks and buses >3.5 t made up the remaining 2%.) LCVs are also categorized as N1 vehicles in the European Union, and Table 7 details the fleet characteristics of LCVs in both India and the European Union. Our analysis shows that the engines in the LCV fleet in India are generally smaller than in the EU fleet. Compared to FY 2014–15, both India and the European Union have seen a drop in fleet average engine size. Between FY 2014–15 and FY 2018–19, the curb weight of India's LCV fleet dropped by 4.7%; meanwhile, for the EU fleet, curb weight increased by 4.4% from FY 2014 to FY 2018.

Table 7. LCV fleet characteristics in India and the European Union

Fleet characteristics	India		European Union	
	FY 2014–15	FY 2018–19	FY 2014	FY 2018
Engine displacement (cc)	1,647	1,602	1,919	1,909
Curb weight (kg)	1,299	1,237	1,752	1,829
CO_2 emissions (g/km)	157.6	143.1	171	158
Power (kW)	33	33.3	85	93
Power to weight ratio (kW/kg)	0.025	0.027	0.049	0.051
Footprint (m^2)	3.6	3.7	5.2	5.3
Automatic transmission (%)	0	0	4	7
Diesel (%)	89	98	96	94
Compressed natural gas (%)	11	2.4	0.6	1.0

The average CO_2 emissions from the EU fleet are higher at 158 g/km. Figure 8 demonstrates the relationship between curb weight and CO_2 emissions for the India and EU fleets, and shows the relative position of each manufacturer when compared with EU fuel consumption standards. At similar CO_2, most of the EU manufacturers produce vehicles with a larger footprint and higher curb weight. This suggests that the EU vehicles are, on average, more fuel efficient than the Indian vehicles. European LCVs have lots of technology that could also be used in India. Moreover, most of the pickups in India share architecture with SUVs in the M1 category and could readily use some of the same technologies to improve fuel efficiency, including start-stop, low-resistance tires, and electric power steering. All EU manufacturers are meeting 2019 standards and have fleet average values close to meeting 2020 standards. Force Motors is the only Indian manufacturer that meets the 2019 European standards.

8 The European market share for 2018 was obtained from https://theicct.org/sites/default/files/publications/European_vehicle_market_statistics_20192020_20191216.pdf

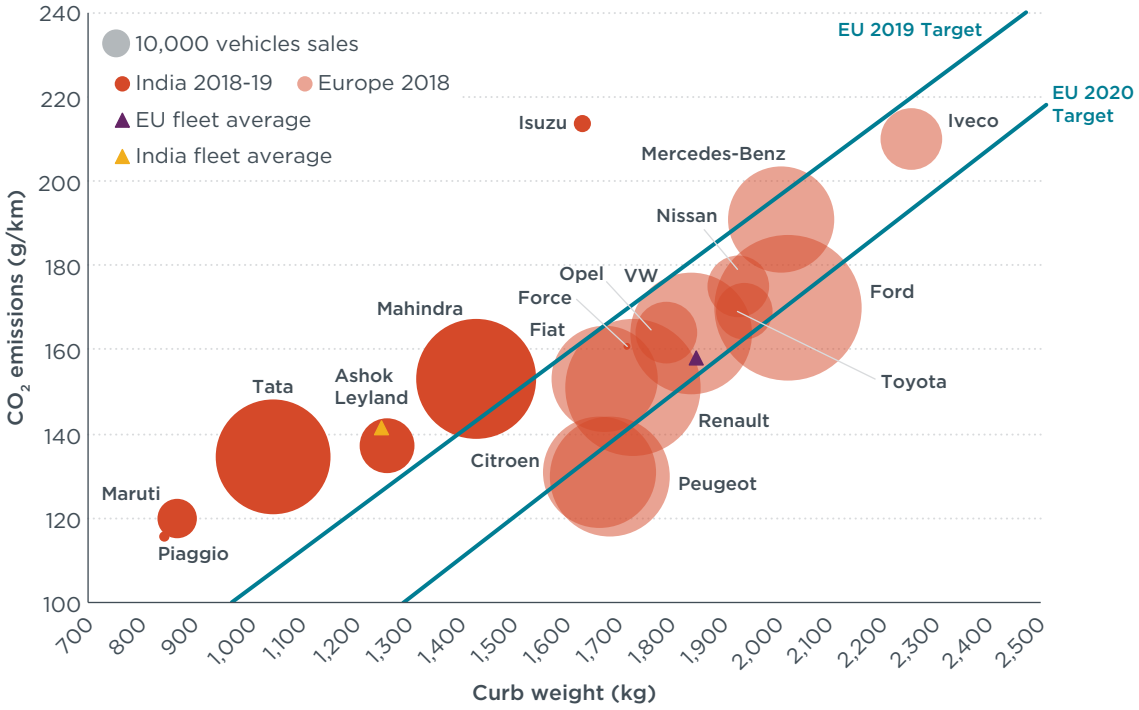

Figure 8. Curb weight versus CO_2 emissions for India and the EU-28. The size of the circles is reflective of market share.

As the figure also shows, most of the Indian manufacturers have a large gap with the 2020 EU target. This is because the slope of EU standards is quite high for Indian vehicles, which are lighter than European LCVs. Additionally, the European Union has set targets for 2025 and 2030 for LCVs; this can be a reference for India to draft its own targets for 2030.[9] Table 8 considers Indian manufacturers' CO_2 performance if EU LCV fuel consumption standards were adopted in Indian scenario.

Table 8. Gap between LCV CO_2 emissions in India and EU LCV 2020 target

Manufacturer	India FY2018–19			EU 2020 equivalent target (g/km)	CO_2 reduction required (%)
	Market share (%)	Curb weight (kg) in FY 2018–19	CO_2 emissions (g/km)		
Mahindra	44.5	1432	153.2	114.9	33.4
Tata	40.0	1049	134.5	78.2	72.1
Ashok Leyland	9.6	1264	137.2	98.8	38.9
Maruti	4.6	866	119.9	60.6	97.8
Isuzu	0.9	1634	213.6	134.3	59.0
Piaggio	0.3	842	115.6	58.3	98.4
Force	0.2	1717	160.8	142.3	13.0
Total	100	1237	143.1	96.2	48.7

Fuel-economy labeling for LCVs

India's BEE previously proposed a passenger vehicle fuel efficiency labeling program, though it never got implemented. It is a five-star rating system based on the gasoline equivalent fuel consumption of the vehicle. The BEE formulated rating bands, shown in the Table 9, and pursuant to this, the ranges of fuel consumption for each would be calculated using the curb weight (W) of the vehicle in kilograms.

9 Peter Mock, *CO_2 emission standards for passenger cars and light commercial vehicles in the European Union* (ICCT: Washington, D.C., 2019), https://theicct.org/sites/default/files/publications/EU-LCV-CO2-2030_ICCTupdate_20190123.pdf.

Table 9. BEE's proposed star rating bands for passenger cars (M1 category)

Star rating band	Gasoline equivalent fuel consumption levels (l/100km)
1 Star	FC≥0.00330xW+3.0034
2 Star	0.00330xW+3.0034≥FC>0.00264x W+3.0034
3 Star	0.00264xW+3.0034≥ FC>0.00216 xW+3.0034
4 Star	0.00216xW+3.0034≥ FC>0.00168x W+3.0034
5 Star	FC≤ 0.00168xW+3.0034

While this labeling program was not designed for LCVs, for this analysis, the same star-rating bands were applied to LCVs based on their gasoline equivalent fuel-efficiency values, and then plotted in Figure 9. Doing so shows that 11.6% of the vehicles would get a one-star rating, and 25.6% would be assigned a five-star rating. The percentage of vehicle sales receiving two, three, and four stars would be 34.9%, 14%, and 14% respectively. If a fuel-economy labeling program were implemented on LCVs, it would be easily executed within the existing program parameters.

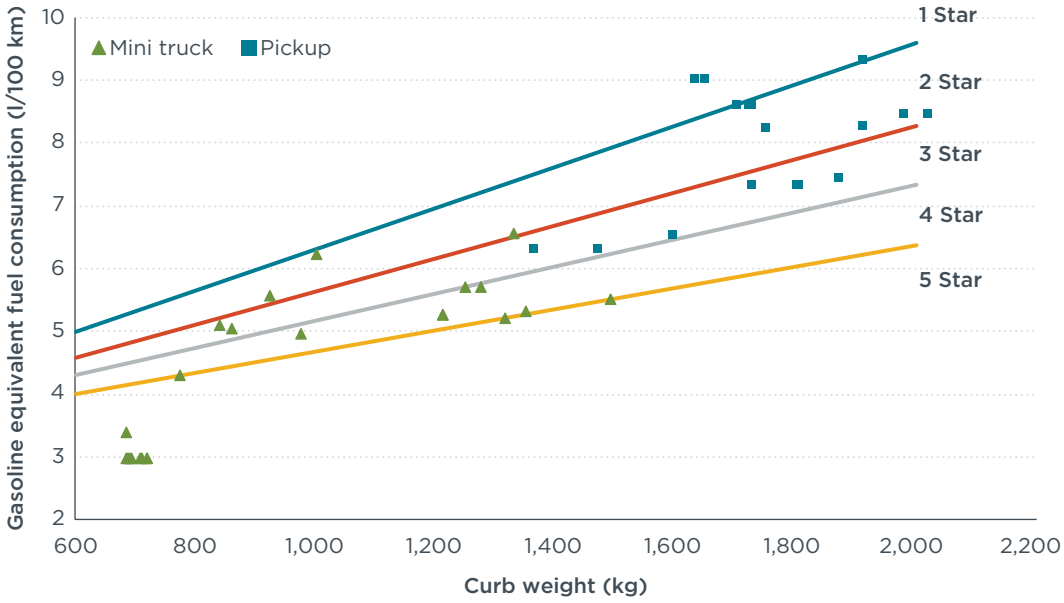

Figure 9. LCV fuel consumption labeling exercise based on proposed star rating bands for passenger cars.

Fuel economy comparison with M1

India's fuel consumption standard for M1 category passenger vehicles, the first such standard in the country, was implemented on April 1, 2017 by the Ministry of Road Transport and Highways in collaboration with the Bureau of Energy Efficiency (BEE).[10] The standard uses the average of the fuel consumption of all vehicles sold by manufacturers in the fiscal year. Based on this standard, it is expected that the passenger car fleet fuel consumption will be reduced by 22.97 million tons 2025.[11] The government should prioritize implementing a similar standard for LCVs, as it could supplement the expected reduction of fuel use.

Figure 10 compares the CO_2 emissions of the M1 and N1 category fleets in India. These segments have the same powertrain and similar engine displacements. Passenger cars have a lighter weight and better efficiency as compared to LCVs. The passenger car fleet average CO_2 value is 121.9 g/km, which is 14.8% better than the fleet average value for

10 Corporate average fuel efficiency standards for passenger cars were notified by the Bureau of Energy Efficiency https://beeindia.gov.in/content/fuel-efficiency

11 Corporate average fuel https://beeindia.gov.in/content/fuel-efficiency

LCVs for FY 2018–19.[12] Most of the pickups have similar architecture as passenger cars and thus most of the technologies can be easily applied in both segments.

The passenger car segment has a higher share of gasoline vehicles and LCVs are primarily diesel variants. However, now that BS VI emission standards are in effect, this could change because the aftertreatment systems needed for diesel variants are expensive. Most likely some of the LCVs will be sold with gasoline variants, especially in the pickup segment as it is dominated by smaller single cylinder engines with low power requirements. For example, the Maruti Carry has been launched with a gasoline variant and the diesel has been discontinued. Even the Tata Ace has come with a gasoline variant along with diesels.

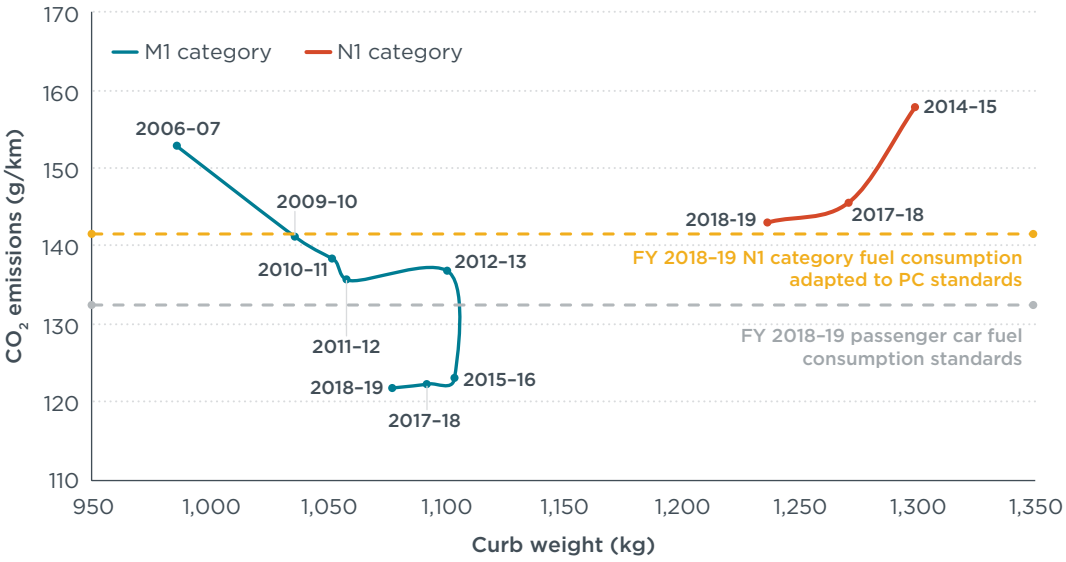

Figure 10. Fuel economy comparison of M1 and N1 category vehicles

Table 10 gives the CO_2 performance of individual LCV manufacturers against the M1 category fuel consumption standards.[13] For each manufacturer, an individual target is calculated based on the average weight of the manufacturer's vehicle fleet. It is therefore possible for manufacturers to balance out higher emissions from some models with more fuel-efficient vehicles.

Table 10. CO_2 emissions gap as compared with FY 2018–19 passenger car fuel consumption standards by manufacturer

Manufacturer	Market share (%)	Curb weight (kg)	CO_2 (g/km)	CO_2 target based on M1 industry average weight (g/km)	Gap with the target (%)
Mahindra	44.4	1,432	153.2	152.7	-0.3
Tata	39.9	1,049	134.5	130.9	-2.7
Ashok Leyland	9.5	1,264	137.2	143.2	4.2
Maruti	4.6	866	119.9	120.5	0.5
Isuzu	0.9	1,634	213.6	164.2	-30.0
Piaggio	0.3	842	115.6	119.1	3.0
Force	0.1	1,717	160.8	168.9	4.8
Grand Total	100.0	1,237	143.1	141.6	-1.0

12 Ashok Deo and Zifei Yang, *Fuel consumption of new passenger cars in India: Manufacturers' performance in fiscal year 2018–19*, (ICCT: Washington, D.C., 2020), https://theicct.org/publications/fuel-consumption-pv-india-052020.

13 The reference weight and procedure for calculations are as defined by MoRTH/CMVR/ TAP-115/116: Issue No.: 4 for M1 category. https://www.icat.in/pdf/fuel_consumption_standards.pdf

Other than Isuzu, most of the manufacturers have a gap with the M1 FY 2018–19 fuel economy standard that is within 5%. The overall performance of 143.1 g/km is 1% higher than a possible fleet average target of 141.6 g/km. Because N1 category vehicles are generally heavier than passenger cars, their target is less stringent.

Some manufacturers, including Mahindra, TATA, Force, Isuzu, and Maruti, have products in both the M1 and N1 categories. Table 11 gives the CO_2 target and performance of these manufacturers based on their combined M1 and N1 fleets. Note that Force and Isuzu are considered small volume manufacturers in the M1 category fuel consumption report released by MoRTH.[14] Small volume manufacturers are those whose total sales are less than 5,000 units per year. These manufacturers are considered compliant and the proposed provisions set the 2018–19 target for small-volume carmakers at actual performance.

Table 11. CO_2 emissions performance for combined M1 and N1 category sales

Manufacturer	M1 sales	N1 sales	Combined sales weighted curb weight (kg)	Combined sales weighted CO_2 (g/km)	Target (g/km)	Gap (%)
Maruti	1,729,826	23,874	920	109.1	123.6	11.7
Mahindra	257,355	229,682	1,527	157.8	158.1	0.2
Tata	230,921	206,393	1,123	134.1	135.1	0.7
Force	11,174	931	1,297	172.4	145.0	-18.9
Isuzu	886	4,663	1,701	213.9	168.0	-27.3

Summary and conclusions

The fleet average CO_2 emissions level for LCVs in India was 143.1 g/km in FY 2018–19. Mandatory CO_2 emission standards, if implemented, would stimulate the inclusion of additional fuel efficiency technologies such as idle start-stop, low-resistance tires, and low viscosity engine oils. Additional highlights from our analysis:

» Currently, the fleet average CO_2 emissions of India's LCVs is 9.4% lower than the European Union's LCV fleet. However, fuel consumption standards are mass based, and thus a lighter fleet has to meet a stricter CO_2 target. While heavier, the European LCVs have better technology and this helps them to meet 2019 targets. Based on fleet average weight, Indian LCVs would have to further improve by 12% to meet the EU targets for 2019.

» If India's existing passenger car fuel efficiency standards were adapted for N1 category vehicles, the fleet average CO_2 target for FY 2018–19 would be 141.6 g/km. As the performance of LCVs in FY 2018–19 was 143.1 g/km, this falls short by about 1%.

» CNG penetration is currently low in both pickups and mini trucks and makes up less than 3% in both segments. Higher penetration of CNG variants would further improve the fleet average CO_2 emissions.

» There were no strong hybrids or mild hybrids in India in either FY 2014–15 or FY 2018–19. There were sales of some electric versions of LCVs. Having a CO_2 standard could incentivize the introduction of these new technologies.

» Applying BEE's star-rating bands to LCVs could provide customers with necessary information on efficient and inefficient models relative to benchmarks. Star labels can complement other policy measures such as fleet average fuel consumption.

14 Government of India, Ministry ;of Road Transport and Highways, "Annual fuel consumption compliance report in respect of M1 Category vehicles for the year 2018–19," November 6, 2019, https://morth.gov.in/Circulars-Notifications-related-to-Road-Transport. This report gives the compliance target and actual performance of each passenger car manufacturer.