

## BRIEFING

---

JUNE 2014

# CO<sub>2</sub> emissions from new passenger cars in the EU: Car manufacturers' performance in 2013

---

The purpose of this briefing document is to expand upon the overall EU fleet CO<sub>2</sub> data recently published by the European Environment Agency (EEA). EEA's report showed that fleet-wide vehicle CO<sub>2</sub>/km emissions have decreased from 162 g CO<sub>2</sub>/km in 2005 to 127 in 2013, already exceeding the 2015 target value on average.

This document presents a summary of performance by individual car manufacturer, based on the official EEA dataset, as well as fuel and technology trends by manufacturer and member state and the impact of super-credits on each manufacturer's compliance status.

Results indicate that the top nine car manufacturers, accounting for 87% of EU-27 sales in 2013, already meet their respective 2015 targets. A number of manufacturers, for example PSA and Toyota, have also achieved notable progress towards their 2020 targets.

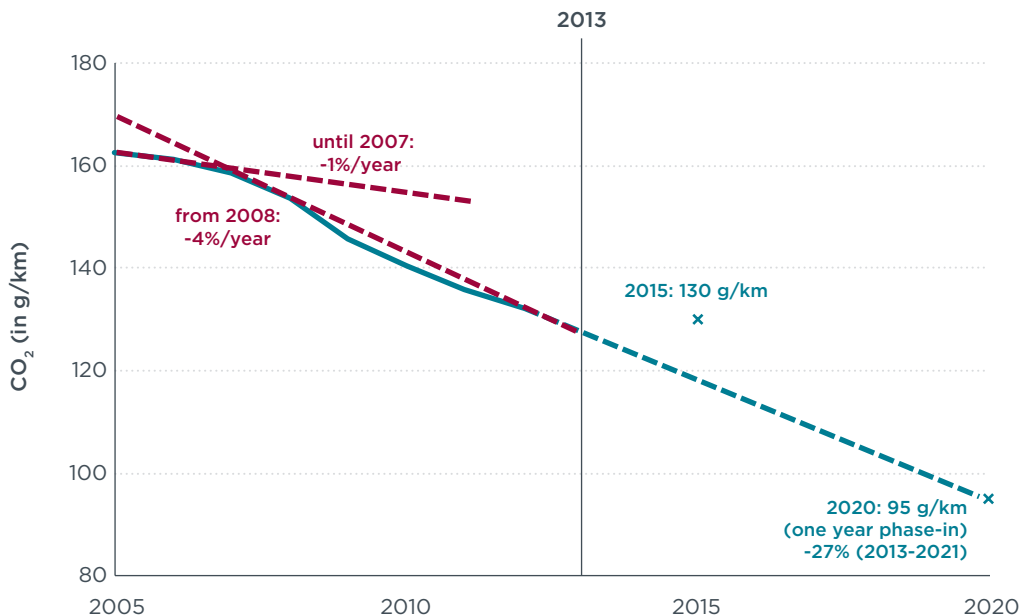
Hybrid-electric vehicles (HEVs), plug-in hybrid-electric vehicles (PHEVs), and battery-electric vehicles (BEVs) currently account for 1.9 percent of new cars in the European market. Due to the provision of super-credits, these low-carbon technologies would nonetheless have a noticeable impact on a number of manufacturers' emission values in 2013.

## 1. BACKGROUND

The EEA recently published<sup>1</sup> its provisional data for CO<sub>2</sub> emissions from passenger cars sold in the European Union during 2013.

For the EU fleet, average CO<sub>2</sub> emissions of new cars<sup>2</sup> decreased from 162 grams per kilometer (g CO<sub>2</sub>/km) in 2005 to 127 g/km in 2013—a 22 percent reduction of emissions. As CO<sub>2</sub> emissions are directly related to fuel consumption, this reduction is equivalent to a decrease in fuel consumption from approximately 6.7 liters per 100 kilometers (l/100 km) to 5.2 l/100 km.

The EEA data shows that the European automobile industry as a whole already exceeds compliance with the 2015 target of 130 g CO<sub>2</sub>/km in 2013 (Figure 1).<sup>3</sup> Upon closer inspection, two distinct trends can be identified. Up until 2007—that is, under the industry’s voluntary reduction agreement—the annual CO<sub>2</sub> reduction rate was about one percent per year. From 2008 to 2013, the rate of CO<sub>2</sub> reduction increased significantly, to approximately four percent per year. A similar trend can also be observed in individual vehicle segments. This indicates that the EU-wide mandatory CO<sub>2</sub> regulation, which was agreed on in 2008, is a key driver behind this development and is proving effective at increasing vehicle efficiency.



**Figure 1:** Historical development and future targets for CO<sub>2</sub> emission levels of new passenger cars in the EU. Effects of phase-in, super-credits and eco-innovations not shown here.

The purpose of this briefing document is to build upon the EEA’s observations, which predominantly focused on country-level trends, and present a differentiated view by individual vehicle manufacturer. The following sections analyze the progress towards the CO<sub>2</sub> standards for the top nine car manufacturers, in terms of sales, fuel and technology trends by manufacturer and member state, and the impact of super-credits on each manufacturer’s compliance status.

1 European Environment Agency, “New cars meet CO<sub>2</sub> target two years ahead of the deadline,” [www.eea.europa.eu/highlights/new-cars-met-co2-target](http://www.eea.europa.eu/highlights/new-cars-met-co2-target) European Environment Agency, “Monitoring CO<sub>2</sub> emissions from new passenger cars in the EU: summary of data for 2013,” [www.eea.europa.eu/publications/monitoring-co2-emissions-from-new-1](http://www.eea.europa.eu/publications/monitoring-co2-emissions-from-new-1)

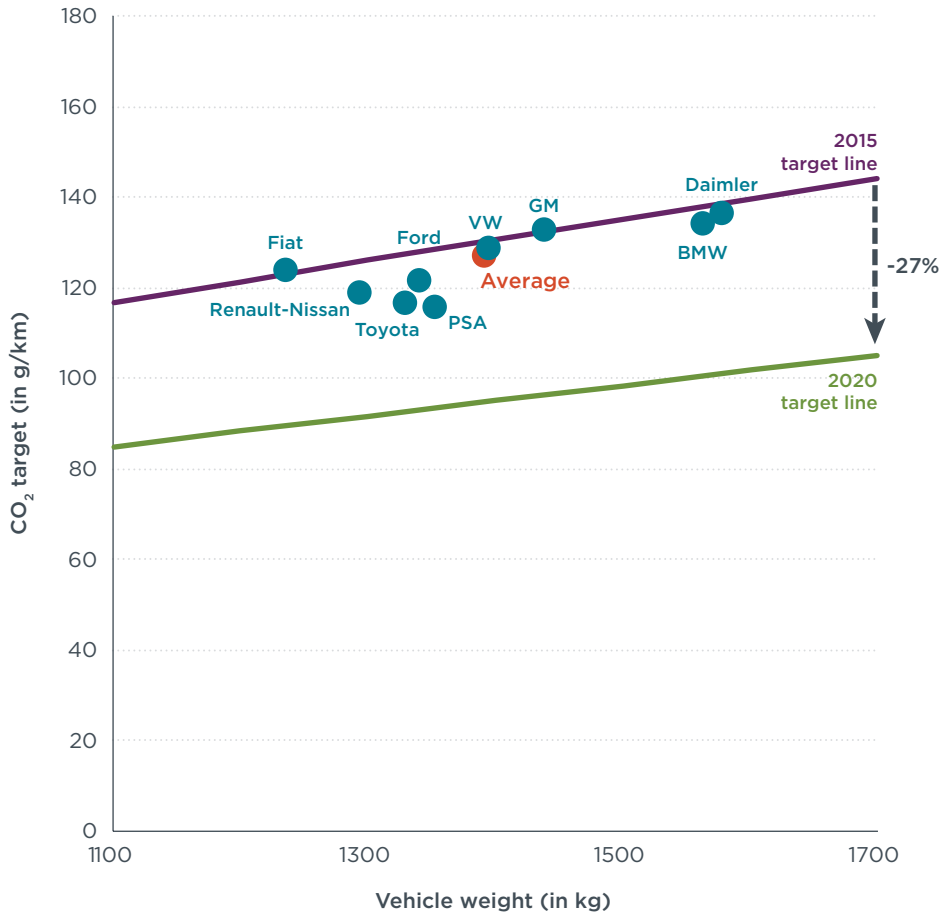
2 Based on New European Drive Cycle (NEDC) type-approval data

3 Peter Mock, “EU CO<sub>2</sub> standards for passenger cars and light-commercial vehicles,” [www.theicct.org/eu-co2-standards-passenger-cars-and-lcvs](http://www.theicct.org/eu-co2-standards-passenger-cars-and-lcvs)

## 2. CO<sub>2</sub> EMISSIONS BY CAR MANUFACTURER

According to EU regulations, new car fleet average CO<sub>2</sub> emissions must fall to 130 g/km by 2015 and reach 95 g/km by 2020 (more precisely, by 2021, taking into account the phase-in provision<sup>4</sup>). In order to account for differences in the types of vehicles sold by each manufacturer, each manufacturer's target is adjusted by the sales-weighted average mass of its vehicles.

As shown in Figure 2 and Table 1, all nine of the manufacturers analyzed currently meet their respective targets for 2015, two years in advance. Several manufacturers even exceed their respective 2015 target by a substantial margin.



**Figure 2:** 2013 actual performance of the top-selling EU passenger car manufacturers, including 2015 and 2020 (effectively 2021) target lines.

<sup>4</sup> Mock, "EU CO<sub>2</sub> standards for passenger cars and light-commercial vehicles." <http://www.theicct.org/eu-co2-standards-passenger-cars-and-lcvs>

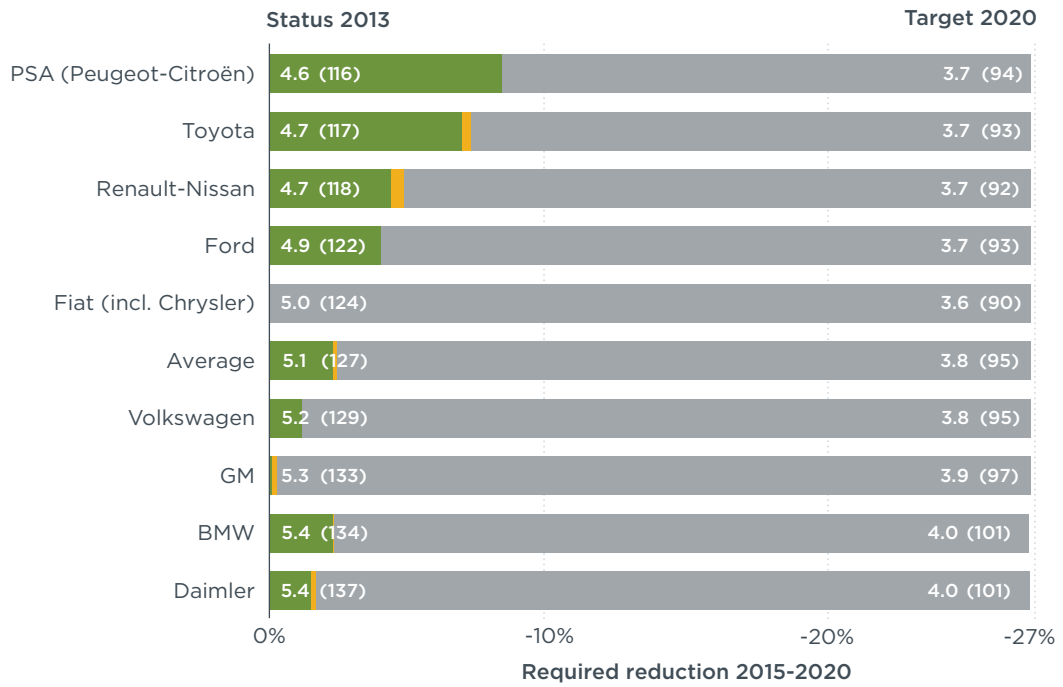
**Table 1:** 2013 actual performance of the top-selling EU passenger car manufacturers, including 2015 and 2020 (effectively 2021) targets. To illustrate the effect of the ‘super-credits’ provision, the 2021 multiplier (1.67 for all low-emission vehicles) was applied to the 2013 data.

Manufacturer	Market share	Mass (kg)	CO <sub>2</sub> (g/km)			
			2013 w/o super-credits	2013 with super-credits for 2021	2015 Target	2020/21 Target
PSA (Peugeot-Citroën)	11%	1352	116	116	129	94
Toyota	4%	1330	117	116	128	93
Renault-Nissan	13%	1292	119	118	126	92
Ford	8%	1340	122	122	129	93
Fiat (incl. Chrysler)	6%	1235	124	124	124	90
<b>Average</b>		<b>1393</b>	<b>127</b>	<b>127</b>	<b>130</b>	<b>95</b>
Volkswagen	25%	1395	129	129	131	95
GM	8%	1438	133	132	133	97
BMW	6%	1562	134	134	139	101
Daimler	6%	1578	137	136	139	101

While all analyzed manufacturers already meet their 2015 targets, 2020 targets require an additional 27 percent reduction of CO<sub>2</sub> emissions. At the moment, several manufacturers<sup>5</sup>—PSA, Toyota, and Renault-Nissan—have already progressed toward their 2020 targets by five percent or more (Figure 3).

Low-emission vehicles are weighted disproportionately in the calculation of manufacturers’ average emissions (for a more detailed explanation of this see section 4). This ‘super-credits’ mechanism is part of the provisions for meeting the 2015 and 2020/21 targets. For the calculations in Table 1 and Figure 3, the super-credits multiplier for 2021 (a factor of 1.67 for each vehicle with less than 50 g/km of CO<sub>2</sub>) was applied to illustrate the effect that the super-credits provision would have in the target year, assuming current sales levels of low-emission vehicles. As can be seen, the current effect is between zero and one g/km for the nine top manufacturers. If sales of low-emission vehicles increase as expected, the effect of super-credits is likely to be much higher by 2020/21.

<sup>5</sup> For our analysis here, we follow a definition of manufacturers that is intended to mirror the actual vehicle market as closely as possible and may be different from manufacturer pools in the context of the EU regulations. Manufacturers are defined here as: PSA (Peugeot, Citroën); Toyota (Daihatsu, Lexus, Toyota); Renault-Nissan (Dacia, Nissan, Lada, Renault); Ford (Ford); Fiat (Chrysler, Fiat, Maserati); Volkswagen (Audi, Bentley, Bugatti, Lamborghini, Porsche, Seat, Škoda, Volkswagen); GM (Chevrolet, GM, Opel); Daimler (Maybach, Mercedes-Benz, Smart)



**Figure 3:** Average 2013 fuel consumption (in l/100 km, bold) and CO<sub>2</sub> emissions (in g/km, in parentheses) of key EU passenger car manufacturers, including 2020 targets. Green bars represent the amount of over-compliance with 2015 standards in 2013. Yellow bars represent effect of the ‘super-credits’ provision, assuming the 2021 multiplier of 1.67 for low emission vehicles and respective 2013 sales levels.

### 3. FUEL / TECHNOLOGY TRENDS BY MEMBER STATE AND MANUFACTURER

In order to understand changes in CO<sub>2</sub> emissions, it is helpful to delineate underlying trends in fuels and technologies.<sup>6</sup>

Despite a 50 percent increase in sales of HEVs, PHEVs, and BEVs between 2012 and 2013, these powertrains currently account for only 1.9 percent of all newly registered cars in the EU. However, uptake of hybrid and electric vehicles has been significantly higher in some countries, particularly in the Netherlands and Norway, where aggressive fiscal incentives drive the adoption of these technologies<sup>7</sup> (Table 2).

**Table 2:** Market share of fuels / technologies for new passenger cars in 2013, by country

Country	Diesel	Gasoline	Hybrid-electric	Battery-electric	Plug-in-hybrid-electric	Other	Market share
<b>EU total</b>	<b>53%</b>	<b>43%</b>	<b>1.4%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>1.8%</b>	<b>100.0%</b>
<b>Germany</b>	48%	51%	0.8%	0.2%	0.0%	0.5%	25.0%
<b>UK</b>	50%	49%	1.3%	0.1%	0.0%	0.0%	19.2%
<b>France</b>	66%	30%	2.6%	0.5%	0.0%	0.2%	14.9%
<b>Italy</b>	54%	31%	1.1%	0.1%	0.0%	14.0%	10.9%
<b>Spain</b>	67%	31%	1.4%	0.1%	0.0%	0.0%	6.1%
<b>Belgium</b>	65%	34%	1.2%	0.1%	0.0%	0.1%	4.1%
<b>Netherlands</b>	25%	63%	5.7%	1.4%	4.1%	0.6%	3.5%
<b>Austria</b>	57%	42%	0.8%	0.2%	0.0%	0.2%	2.7%
<b>Sweden</b>	61%	34%	1.9%	0.2%	0.4%	2.6%	2.3%
<b>Denmark</b>	32%	67%	0.6%	0.3%	0.0%	0.0%	1.5%
<b>Portugal</b>	72%	26%	1.0%	0.2%	0.0%	0.8%	0.9%
<b>Finland</b>	37%	60%	2.2%	0.1%	0.1%	0.5%	0.9%
<b>Ireland</b>	72%	27%	0.8%	0.1%	0.0%	0.1%	0.6%
<b>Greece</b>	58%	41%	0.7%	0.0%	0.0%	0.1%	0.5%
<b>Luxembourg</b>	73%	25%	0.7%	0.4%	0.1%	0.0%	0.4%
<b>Others (EU)</b>	43%	56%	0.6%	0.0%	0.0%	0.8%	6.6%
<b>Switzerland</b>	37%	60%	2.2%	0.4%	0.1%	0.3%	
<b>Norway</b>	53%	35%	6.7%	5.6%	0.2%	0.0%	

The uptake of alternative fuels also varies across car manufacturers (Table 3) and brands (Table 4). Most notably, 26.7 percent of Toyota's sales were hybrid-electric and plug-in hybrid-electric vehicles—the three top-selling hybrid models in 2013 (the Auris, Yaris, and Prius) were all manufactured by Toyota. Several hybrid Lexus models also contributed to the large proportion of hybrid vehicles sold by the Toyota.

In addition to the Toyota and Lexus brands, hybrid versions of the Volvo V60, Mitsubishi Outlander, and Peugeot 508 and 3008 contributed to higher-than-average proportions of plug-in and hybrid-electric vehicle sales for those brands. Similarly, the Nissan Leaf, Renault Zoe, and Smart Fortwo Electric Drive accounted for over one percent of their respective brands' sales.

<sup>6</sup> Because the EEA data does not include details on whether a vehicle is a hybrid-electric or not, for purposes of this briefing we have supplemented it with commercial data obtained from IHS-Polk and analyzed by ICCT.

<sup>7</sup> Peter Mock and Zifei Yang, "Driving electrification: A global comparison of fiscal policy for electric vehicles", [www.theicct.org/driving-electrification-global-comparison-fiscal-policy-electric-vehicles](http://www.theicct.org/driving-electrification-global-comparison-fiscal-policy-electric-vehicles)

**Table 3:** Market share of fuels / technologies for new passenger cars in 2013, by selected manufacturers

	Diesel	Gasoline	Hybrid-electric	Battery-electric	Plug-in-hybrid-electric	Other	Market share
<b>Average</b>	<b>53%</b>	<b>43%</b>	<b>1.4%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>1.8%</b>	
<b>Volkswagen</b>	57%	42%	0.2%	0.0%	0.0%	0.9%	25.1%
<b>Renault-Nissan</b>	56%	41%	0.0%	1.0%	0.0%	1.9%	12.4%
<b>PSA (Peugeot-Citroën)</b>	62%	35%	1.8%	0.1%	0.0%	0.5%	10.9%
<b>Ford</b>	45%	53%	0.0%	0.0%	0.0%	1.3%	7.6%
<b>GM</b>	41%	54%	0.0%	0.5%	0.0%	4.2%	5.8%
<b>Daimler</b>	66%	33%	0.9%	0.5%	0.0%	0.1%	5.6%
<b>BMW</b>	81%	18%	0.1%	0.2%	0.0%	0.0%	5.2%
<b>Fiat (incl. Chrysler)</b>	31%	57%	0.0%	0.0%	0.0%	12.6%	4.7%
<b>Toyota</b>	25%	48%	25.9%	0.0%	0.8%	0.0%	4.3%

**Table 4:** Market share of fuels / technologies for new passenger cars in 2013 for selected brands

	Diesel	Gasoline	Hybrid-electric	Battery-electric	Plug-in-hybrid-electric	Other	Market share
<b>Average</b>	<b>53%</b>	<b>43%</b>	<b>1.4%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>1.8%</b>	
<b>VW</b>	56%	42%	0.2%	0.1%	0.0%	1.5%	12.6%
<b>Ford</b>	45%	53%	0.0%	0.0%	0.0%	1.3%	7.6%
<b>Renault</b>	60%	38%	0.0%	1.1%	0.0%	0.4%	6.6%
<b>Peugeot</b>	61%	36%	2.4%	0.1%	0.0%	0.6%	6.0%
<b>Audi</b>	75%	25%	0.1%	0.0%	0.0%	0.1%	5.6%
<b>BMW</b>	81%	18%	0.1%	0.2%	0.0%	0.0%	5.2%
<b>Mercedes</b>	71%	28%	1.0%	0.0%	0.0%	0.1%	5.1%
<b>Citroën</b>	64%	35%	1.0%	0.1%	0.0%	0.4%	4.9%
<b>Fiat</b>	31%	57%	0.0%	0.0%	0.0%	12.7%	4.7%
<b>Opel</b>	41%	54%	0.0%	0.5%	0.0%	4.1%	4.6%
<b>Toyota</b>	26%	50%	22.8%	0.0%	0.9%	0.0%	4.1%
<b>Škoda</b>	46%	54%	0.0%	0.0%	0.0%	0.3%	4.1%
<b>Nissan</b>	51%	45%	0.0%	1.5%	0.0%	2.1%	3.4%
<b>Hyundai</b>	39%	59%	0.0%	0.0%	0.0%	1.9%	3.4%
<b>Kia</b>	45%	53%	0.2%	0.0%	0.0%	1.1%	2.9%
<b>Dacia</b>	52%	43%	0.0%	0.0%	0.0%	5.4%	2.4%
<b>Seat</b>	44%	55%	0.0%	0.0%	0.0%	0.8%	2.4%
<b>Vauxhall</b>	38%	62%	0.0%	0.1%	0.0%	0.0%	2.2%
<b>Volvo</b>	87%	8%	0.0%	0.0%	3.7%	0.7%	1.8%
<b>Mini</b>	45%	55%	0.0%	0.0%	0.0%	0.0%	1.2%
<b>Honda</b>	34%	63%	3.0%	0.0%	0.0%	0.0%	1.1%
<b>Mitsubishi</b>	40%	47%	0.0%	0.6%	11.5%	0.6%	0.6%
<b>Smart</b>	15%	80%	0.0%	4.6%	0.0%	0.0%	0.5%
<b>Porsche</b>	37%	60%	1.5%	0.0%	1.1%	0.2%	0.4%
<b>Lexus</b>	1%	7%	92.2%	0.0%	0.0%	0.0%	0.2%

## 4. THE IMPACT OF SUPER-CREDITS

In addition to adjusting manufacturer targets for average vehicle weight, multiple mechanisms are in place to accommodate differences in manufacturers' fleets and to incentivize the uptake of low-carbon vehicles.

A key provision is 'super-credits' for vehicles emitting less than 50 g/km of CO<sub>2</sub> in the NEDC test procedure. Each car that meets this criterion is weighted disproportionately in the calculation of manufacturers' average emissions. For 2013, the multiplier used is 3.5: i.e., each low-carbon car sold in 2013 counts as 3.5 vehicles in the calculation of average emissions.

Due to the higher weighting of super-credits, manufacturers' average emission values are affected by the proportion of low-carbon vehicles in their fleets. As discussed in Section 3, the proportion of low-carbon vehicles varies significantly among manufacturers. Tables 5 and 6 therefore summarize the effect of super-credits on the average emission values of different manufacturers and brands in 2013, applying the 2013 multiplier to the 2013 low-emission vehicle sales.

Most notably, Mitsubishi received a credit of 19 g/km towards its fleet average CO<sub>2</sub> emissions during 2013. Mitsubishi's reported reduction of 25% from 2012 to 2013 would translate into an 'actual' reduction of 14% once the super-credits are factored out. This impact was driven especially by high sales of the Mitsubishi Outlander Plug-in Hybrid, predominantly in the Netherlands.

Similarly, high sales volumes of the Smart ForTwo Electric Drive, the Volvo V60 Plug-In Hybrid, and the Nissan Leaf significantly affected the average emission values of these relatively small brands in 2013. In the most extreme case, Mitsubishi, these adjustments would account for 11 percent of the inter-annual emission reductions of a brand.

The weighting of super-credits will be reduced over time. For 2021, a multiplier of 1.67 will be used. The effect of this lower multiplier, based on 2013 vehicle sales, can be seen in section 2 of this document. However, while the super-credits multiplier will be reduced, sales of low-emission vehicles are expected to rise, so that super-credits could still have a significant effect on the overall emission values of the vehicle fleet.



**Table 5:** Effect of super-credits on the CO<sub>2</sub> performance of selected manufacturers in 2012 and 2013, applying the 2012/13 multiplier of 3.5 for low emission vehicles.

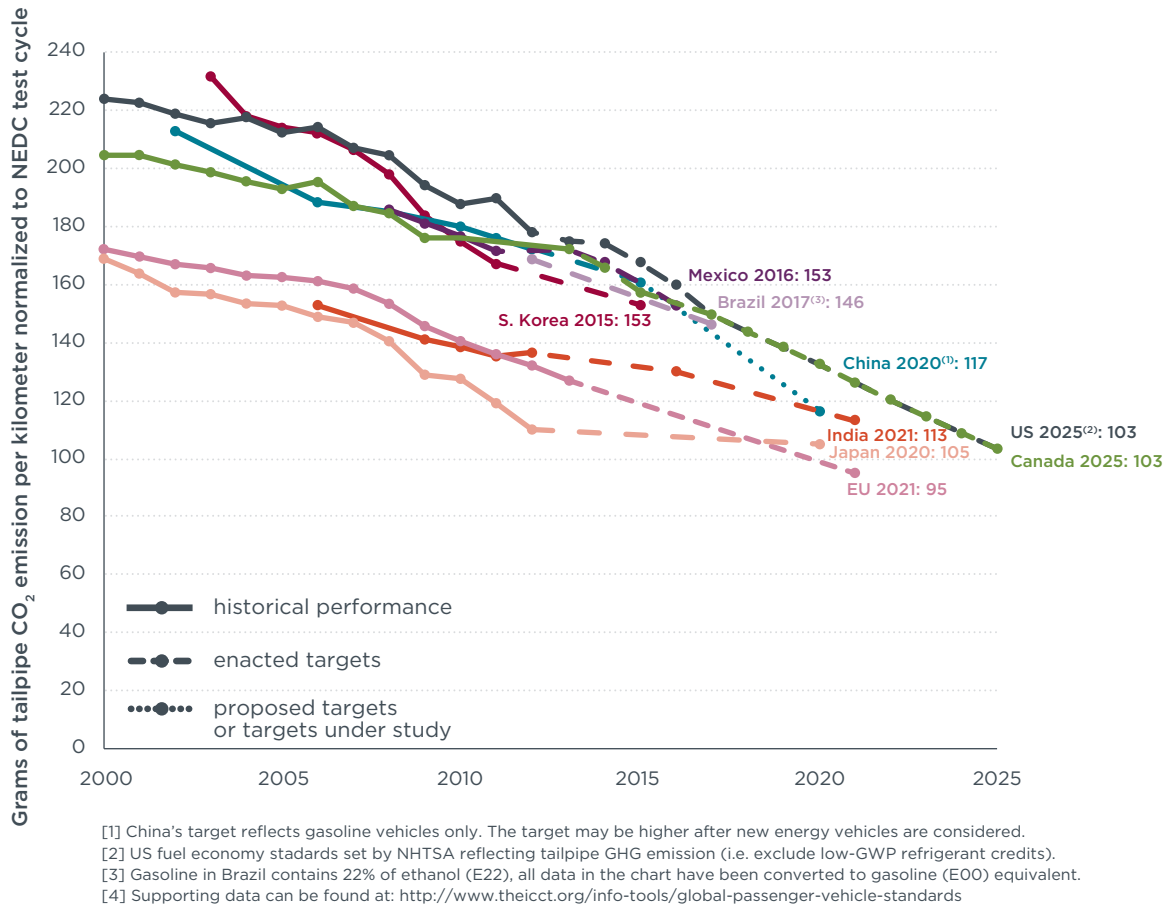
	2012			2013			Interannual Development	
	Avg. CO <sub>2</sub> emissions		Difference	Avg. CO <sub>2</sub> emissions		Difference	Reduction since 2012	
	without Super-credit	with Super-credit		without Super-credit	with Super-credit		without Super-credit	with Super-credit
<b>PSA (Peugeot-Citroën)</b>	122.0	120.9	1.1	115.7	115.5	0.2	5%	4%
<b>Toyota</b>	122.0	120.9	1.1	116.8	115.3	1.5	4%	5%
<b>Renault-Nissan</b>	128.3	127.4	0.9	119.2	116.2	2.9	7%	9%
<b>Ford</b>	128.7	128.7	0.0	121.8	121.8	0.0	5%	5%
<b>Fiat (incl. Chrysler)</b>	123.3	123.3	0.0	123.8	123.8	0.0	0%	0%
<b>Volkswagen</b>	134.8	134.8	0.0	128.9	128.8	0.1	4%	4%
<b>GM</b>	134.5	133.1	1.5	132.8	131.7	1.1	1%	1%
<b>BMW</b>	138.5	138.5	0.0	134.4	134.0	0.4	3%	3%
<b>Daimler</b>	143.2	142.6	0.6	136.6	135.1	1.5	5%	5%
<b>Mitsubishi</b>	144.3	139.7	4.6	123.8	104.8	19.0	14%	25%

**Table 6:** Effect of super-credits on the CO<sub>2</sub> performance of selected manufacturer brands in 2012 and 2013, applying the 2012/13 multiplier of 3.5 for low emission vehicles.

Brand	2012			2013			Interannual Development	
	Avg. CO <sub>2</sub> emissions		Difference	Avg. CO <sub>2</sub> emissions		Difference	Reduction since 2012	
	without Super-credit	with Super-credit		without Super-credit	with Super-credit		without Super-credit	with Super-credit
<b>VW</b>	133.0	132.9	0.0	127.4	127.2	0.2	4%	4%
<b>Ford</b>	128.8	128.8	0.0	121.8	121.8	0.0	5%	5%
<b>Renault</b>	120.8	120.3	0.5	110.1	107.1	3.0	9%	11%
<b>Peugeot</b>	121.5	120.5	1.0	115.1	114.9	0.1	5%	5%
<b>Audi</b>	138.2	138.2	0.0	134.2	134.2	0.0	3%	3%
<b>BMW</b>	140.3	140.3	0.0	135.4	134.8	0.6	4%	4%
<b>Mercedes</b>	148.8	148.7	0.1	141.1	141.1	0.0	5%	5%
<b>Citroën</b>	122.6	121.4	1.2	116.5	116.2	0.3	5%	4%
<b>Opel</b>	132.5	130.6	1.9	131.4	130.1	1.3	1%	0%
<b>Fiat</b>	119.2	119.2	0.0	121.0	121.0	0.0	-1%	-1%
<b>Toyota</b>	121.9	120.7	1.2	116.6	115.0	1.6	4%	5%
<b>Škoda</b>	132.3	132.3	0.0	125.4	125.4	0.0	5%	5%
<b>Nissan</b>	136.7	134.5	2.3	130.4	125.7	4.7	5%	7%
<b>Hyundai</b>	132.2	132.2	0.0	129.8	129.8	0.0	2%	2%
<b>Kia</b>	129.5	129.5	0.0	129.9	129.9	0.0	-0%	0%
<b>Dacia</b>	136.9	136.9	0.0	127.3	127.3	0.0	7%	7%
<b>Seat</b>	127.2	127.2	0.0	118.7	118.7	0.0	7%	7%
<b>Vauxhall</b>	134.3	133.7	0.5	133.6	133.3	0.3	1%	0%
<b>Volvo</b>	142.3	142.1	0.2	130.8	123.7	7.1	8%	13%
<b>Mini</b>	129.5	129.5	0.0	130.0	130.0	0.0	-0%	0%
<b>Honda</b>	142.7	142.7	0.0	138.0	138.0	0.0	3%	3%
<b>Mitsubishi</b>	144.4	139.8	4.6	123.9	104.9	19.0	14%	25%
<b>Smart</b>	97.1	94.0	3.1	93.9	84.2	9.7	3%	10%
<b>Porsche</b>	205.4	205.4	0.0	201.1	201.1	0.0	2%	2%
<b>Lexus</b>	121.4	121.4	0.0	121.1	121.1	0.0	0%	0%

## 5. INTERNATIONAL CONTEXT

In the international context, the EU has historically been a front-runner with respect to vehicle emission targets. In recent years, however, most large economies have specified converging CO<sub>2</sub> emission targets for new vehicles (Figure 4). Compared to the EU's 2020 target of 95 g/km, the US (103 g/km for 2025 passenger cars), Japan (105 g/km by 2020), and Canada (103 g/km by 2025) have set similar targets. When including vans, which make up approximately 10 percent of the European vehicle market, the EU's 2020 target is equivalent to approximately 100 g/km.



**Figure 4:** Comparison of global CO<sub>2</sub> regulations for new passenger cars<sup>8</sup>

## 6. OUTLOOK

It should be noted that the EEA dataset has yet to be validated. The final dataset will be published at the end of 2014, so the specific numbers in this report may change. For the 2012 market average, the discrepancy between preliminary and final data was 0.017 g/km. The preliminary data for 2013 should therefore prove sufficiently accurate to ensure representative results. The ICCT will follow up on European emissions data in the forthcoming European Vehicle Market Statistics Pocketbook 2014<sup>9</sup>.

<sup>8</sup> China's target reflects gasoline vehicles only. US CO<sub>2</sub> emission values derived from fuel economy standards set by NHTSA, reflecting tailpipe GHG emission (i.e., they exclude low-GWP refrigerant credits incorporated in the U.S. EPA GHG regulation). Gasoline in Brazil contains 22% ethanol (E22); all data in the chart has been converted to gasoline (E00) equivalent. Supporting data can be found at [www.theicct.org/info-tools/global-passenger-vehicle-standards](http://www.theicct.org/info-tools/global-passenger-vehicle-standards).

<sup>9</sup> For the 2013 edition, see [www.theicct.org/european-vehicle-market-statistics-2013](http://www.theicct.org/european-vehicle-market-statistics-2013)