

# CO<sub>2</sub> EMISSION STANDARDS FOR PASSENGER CARS AND LIGHT-COMMERCIAL VEHICLES IN THE EUROPEAN UNION

## ICCT POLICY UPDATES

SUMMARIZE

REGULATORY

AND OTHER

DEVELOPMENTS

RELATED TO CLEAN

TRANSPORTATION

WORLDWIDE.

On December 17, 2018, representatives of the European Commission, the European Parliament, and the European Council agreed on a compromise for the European Union (EU) regulation setting binding carbon dioxide (CO<sub>2</sub>) emission targets for new passenger cars and light-commercial vehicles for 2025 and 2030. The agreed-upon targets aim to reduce the average CO<sub>2</sub> emissions from new cars by 15% in 2025 and by 37.5% in 2030, both relative to a 2021 baseline. For light-commercial vehicles, a 15% target for 2025 and a 31% target for 2030 were agreed upon.

## POLICY BACKGROUND

The EU introduced mandatory CO<sub>2</sub> standards for passenger cars in 2009, after a voluntary commitment by the auto industry to reduce emissions had failed to produce adequate results. The 2009 regulation set a 2015 target of 130 grams per kilometer (g/km) for the fleet average. A similar regulation for light-commercial vehicles (also known as “vans”) followed in 2011, setting a mandatory target of 175 g/km for 2017. Vehicle manufacturers met both targets several years in advance.

A second set of regulations, passed in 2014, required average CO<sub>2</sub> emissions of new cars to fall to 95 g/km by 2021. For new vans, the target value is 147 g/km by 2020.<sup>1</sup> This second regulation also required the European Commission to review CO<sub>2</sub> emission targets and prepare a regulatory proposal for the post-2020 period. This review originally was to have been completed by the end of 2015.

The European Commission came forward with its regulatory proposal for the third set of CO<sub>2</sub> regulations in November 2017. It suggested a 15% reduction in CO<sub>2</sub> for 2025 and a 30% reduction for 2030, relative to a 2021 baseline.<sup>2</sup> EU legislative procedures require the European Commission proposal to be discussed and voted on in the European Parliament, as well as in the Council of the European Union, made up of ministers representing the governments of the EU member states.

1 Peter Mock. *EU CO<sub>2</sub> emission standards for passenger cars and light-commercial vehicles* (ICCT: Berlin, 2014). <http://theicct.org/eu-co2-standards-passenger-cars-and-lcvs>

2 Jan Dornoff et al. *The European Commission regulatory proposal for post-2020 CO<sub>2</sub> targets for cars and vans: A summary and evaluation* (ICCT: Berlin, 2018). <https://www.theicct.org/publications/ec-proposal-post-2020-co2-targets-briefing-20180109>

In a plenary vote on October 3, 2018, the European Parliament voted to strengthen the European Commission proposal by requiring a 20% reduction in CO<sub>2</sub> for 2025 and a 40% reduction for 2030, both for cars and vans.<sup>3</sup> On October 10, the European Council voted—against resistance from Germany, Hungary, Romania, and Bulgaria—also in favor of strengthening the European Commission proposal, although only to a CO<sub>2</sub> reduction of 35% for cars in 2030, leaving the 2025 interim targets as well as the 2030 vans target untouched.<sup>4</sup>

In several rounds of so-called trilogue meetings, representatives of the European Commission, the European Parliament, and the European Council then discussed their respective positions. They agreed on a political compromise on December 17, 2018.<sup>5</sup>

## THE SITUATION TODAY

For new cars, the average CO<sub>2</sub> emission value in 2017—the most recent year for which data is currently available—was 119 g/km. Under the EU regulations, CO<sub>2</sub> targets for individual manufacturers are adjusted for the average vehicle weight of their fleet. The heavier the average weight of the cars sold by a manufacturer, the higher the CO<sub>2</sub> level allowed. In addition, manufacturers are allowed to form pools with other manufacturers in order to jointly meet CO<sub>2</sub> targets. Table 1 lists those manufacturer groups with the largest market shares, their average CO<sub>2</sub> and mass value in 2017, as well as their 2015 and 2021 CO<sub>2</sub> targets. In addition, the share of plug-in hybrid and battery-electric vehicles per manufacturer group in 2017 is shown.

**Table 1.** Passenger cars: Manufacturer group<sup>6</sup> market shares, vehicle mass, CO<sub>2</sub> emissions, CO<sub>2</sub> targets,<sup>7</sup> and share of plug-in and battery-electric vehicles.

Manufacturer group	EU market share 2017	Average mass (kg) 2017	Average CO <sub>2</sub> (g/km) 2017	CO <sub>2</sub> target (g/km) 2015	CO <sub>2</sub> target (g/km) 2021	Electric vehicle share 2017
Toyota	5%	1,359	103	127	94	0.3%
PSA	16%	1,273	112	125	91	0.1%
Renault-Nissan	15%	1,310	112	126	93	2.5%
<b>Average</b>		<b>1,390</b>	<b>119</b>	<b>130</b>	<b>95</b>	<b>1.4%</b>
FCA	6%	1,259	120	124	91	0.0%
Ford	7%	1,393	121	128	95	0.0%
BMW	7%	1,570	122	139	101	5.0%
Hyundai	6%	1,348	122	129	94	1.4%
Volkswagen	23%	1,420	122	132	96	1.2%
Daimler	6%	1,607	127	139	103	2.6%

Note: All CO<sub>2</sub> values shown for the New European Driving Cycle (NEDC).

3 European Parliament. *Parliament pushes for cleaner cars on EU roads by 2030* (European Parliament: Strasbourg, 2018). <http://www.europarl.europa.eu/news/en/press-room/20180925IPR14306/parliament-pushes-for-cleaner-cars-on-eu-roads-by-2030>

4 European Council. *CO<sub>2</sub> emission standards for cars and vans: Council agrees its position* (European Council: Brussels, 2018). <https://www.consilium.europa.eu/en/press/press-releases/2018/10/10/co2-emission-standards-for-cars-and-vans-council-agrees-its-position/#>

5 European Parliament. *Curbing CO<sub>2</sub> emissions from cars: agreement with Council* (European Parliament: Brussels, 2018). <http://www.europarl.europa.eu/news/en/press-room/20181218IPR22101/curbing-co2-emissions-from-cars-agreement-with-council>

6 Our definition of manufacturer groups is intended to mirror the actual vehicle market as closely as possible and may be different from manufacturer pools formed for compliance purposes.

7 Uwe Tietge. *CO<sub>2</sub> emissions from new passenger cars in the EU: Car manufacturers' performance in 2017* (ICCT: Berlin, 2018). <https://www.theicct.org/publications/co2-emissions-new-passenger-cars-eu-car-manufacturers-performance-2017>

Vans account for about 12% of all new light-duty vehicle registrations in the EU, with the remaining 88% being passenger cars. The average CO<sub>2</sub> emission value for vans in 2017 was 156 g/km. Table 2 lists average CO<sub>2</sub> and mass values for vans in 2017, as well as the 2017 and 2020 CO<sub>2</sub> targets for the major manufacturers. In addition, the share of plug-in hybrid and battery-electric vehicles per manufacturer in 2017 is shown.<sup>89</sup>

**Table 2.** Vans: Manufacturer brand<sup>8</sup> market shares, vehicle mass, CO<sub>2</sub> emissions, CO<sub>2</sub> targets,<sup>9</sup> and plug-in and battery-electric vehicles.

Manufacturer	EU market share 2017	Average mass (kg) 2017	Average CO <sub>2</sub> (g/km) 2017	CO <sub>2</sub> target (g/km) 2017	CO <sub>2</sub> target (g/km) 2020	Electric vehicle share 2017
Peugeot	11%	1,659	129	171	137	0.6%
Citroën	10%	1,647	129	170	136	0.5%
Renault	15%	1,675	145	172	138	1.7%
Fiat	9%	1,707	152	175	141	0.0%
<b>Average</b>		<b>1,798</b>	<b>156</b>	<b>175</b>	<b>147</b>	<b>0.8%</b>
VW	11%	1,842	160	188	154	0.1%
Opel	3%	1,738	163	178	144	0.0%
Ford	16%	1,949	166	198	165	0.0%
Nissan	3%	1,883	167	191	158	4.9%
Mercedes-Benz	9%	2,004	191	203	170	0.0%
Iveco	3%	2,255	209	226	194	0.0%

Note: All CO<sub>2</sub> values shown for the New European Driving Cycle (NEDC).

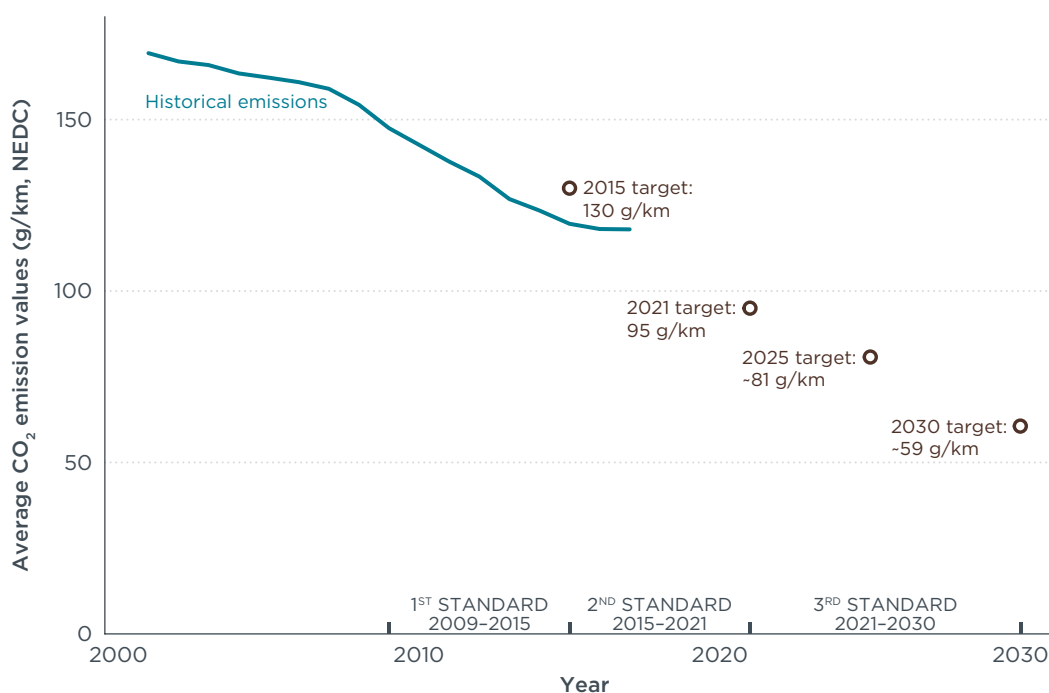
## KEY ELEMENTS OF THE REGULATION

The compromise deal reached on December 17 includes the following key elements on passenger cars.

- » New car CO<sub>2</sub> emissions, on average, have to reduce **by 15% by 2025** and **by 37.5% by 2030**, relative to a **2021 baseline**. Expressed in NEDC terms, using the current 2021 CO<sub>2</sub> target of 95 g/km as the baseline, these reductions would translate into a target value of **81 g/km (2025)** and **59 g/km (2030)** (Figure 1).

<sup>8</sup> For vans, because fewer brands are on the market, we do not group manufacturers.

<sup>9</sup> Peter Mock (ed.). *European Vehicle Market Statistics Pocketbook 2018/19* (ICCT: Berlin, 2018). <http://eupocketbook.org>



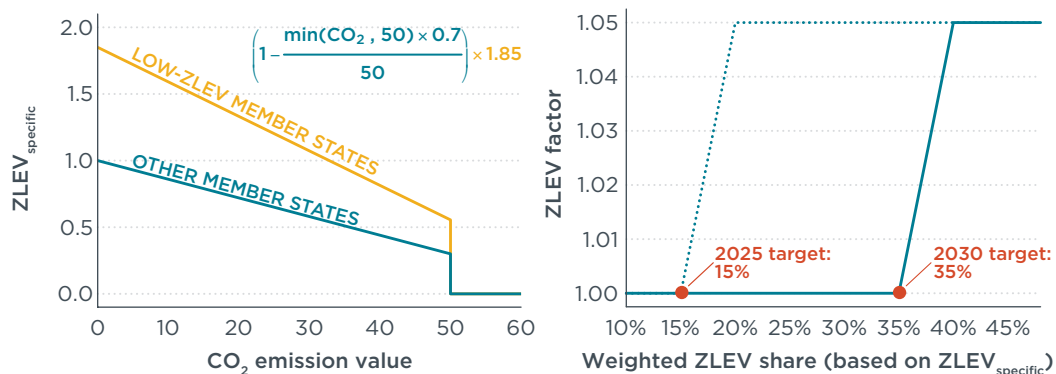
**Figure 1.** Average historical CO<sub>2</sub> emission values and adopted CO<sub>2</sub> standards for new passenger cars in the EU. All CO<sub>2</sub> values refer to New European Driving Cycle (NEDC) measurements.

- » Vehicle weight is retained as the underlying **utility parameter**, i.e., the heavier a manufacturer's car fleet, the higher that manufacturer's CO<sub>2</sub> emission target will be under the regulation.<sup>10</sup> Until 2024, a factor of 0.0333 will be used, meaning that for every 100 kilograms (kg) by which a manufacturer's average vehicle weight exceeds the average EU fleet mass, 3.33 g/km higher CO<sub>2</sub> emissions will be allowed. To determine the slope applied for calculating annual manufacturer targets from 2025 onwards, the European Commission will carry out a least-squares fit through the CO<sub>2</sub> vs. mass data of all vehicles registered in 2021.
- » The post-2020 regulation defines **zero- and low-emission vehicles (ZLEVs)** as vehicles with CO<sub>2</sub> emission values from zero up to 50 g/km. It sets ZLEV sales targets of **15% for 2025** and **35% for 2030**, while giving manufacturers some flexibility in how they reach those targets. For the purposes of the regulation, ZLEVs are counted proportional to their zero-emission capability: zero-emission vehicles count as full vehicles; vehicles with CO<sub>2</sub> emission values with 51 g/km and higher count as zero; and vehicles between 0 and 50 g/km are assigned weights between 0.3 and 1 according to a linear function based on CO<sub>2</sub> emissions. A manufacturer could thus, hypothetically, reach the target with a high proportion of plug-in hybrid-electric vehicles in its 2025 fleet and few to no battery-electric—or vice versa. Newly registered ZLEVs in EU member states whose share of ZLEVs in their national fleet is less than 60% of the EU average in 2017, and which have fewer than 1,000 new ZLEV registrations in 2017, will be counted as 1.85 vehicles against the target until 2030, or until the first year when the ZLEV share in that member state exceeds 5%.<sup>11</sup> Manufacturers that outperform the ZLEV sales targets will be rewarded with higher CO<sub>2</sub> emission targets using the so-called ZLEV factor. The ZLEV factor can range from 1, for manufacturers that fail to meet the ZLEV target, to 1.05, for manufacturers

<sup>10</sup> Peter Mock et al. *Adjusting for vehicle mass and size in European post-2020 CO<sub>2</sub> targets for passenger cars* (ICCT: Berlin, 2018). <https://www.theicct.org/publications/eu-ldv-co2-utility-parameter-20180808>

<sup>11</sup> The following 14 member states met these criteria in 2017: Bulgaria, Cyprus, Czech Republic, Estonia, Greece, Croatia, Ireland, Lithuania, Latvia, Malta, Poland, Romania, Slovenia, Slovakia. Together they accounted for 9% of new car registrations in the EU in 2017.

that exceed the ZLEV target by 5 percentage points or more. The ZLEV factor scales proportionally to the exceedance of the ZLEV target between those two limits. A ZLEV factor of 1.05 increases the manufacturer's CO<sub>2</sub> emission target by 5%, whereas a ZLEV factor of 1 leaves the emission target unchanged. As a result, there is no penalty for manufacturers not meeting the ZLEV sales targets, but only a bonus for those manufacturers exceeding them (Figure 2).



**Figure 2.** Left: Weight used to count each vehicle in calculation of ZLEV shares. Right: ZLEV factor used to adjust manufacturer CO<sub>2</sub> emission targets.

- » Since September 2017, the EU began a transition to the Worldwide Harmonized Light Vehicles Test Procedure (WLTP) for new-vehicle emissions certification. With respect to the 2025 and 2030 CO<sub>2</sub> standards, the transition to WLTP introduces an element of uncertainty regarding the de facto outcome achieved by the regulation. While the percentage reduction targets in the CO<sub>2</sub> regulation are fixed, the absolute CO<sub>2</sub> emission level to be met in 2025 and 2030 depends on the fleet average WLTP starting point of all manufacturers in 2021. This starting point, in turn, depends on the NEDC-WLTP adjustment factor, which is not yet fixed but will be determined for the 2020 new vehicle fleet for each manufacturer individually (Figure 3).

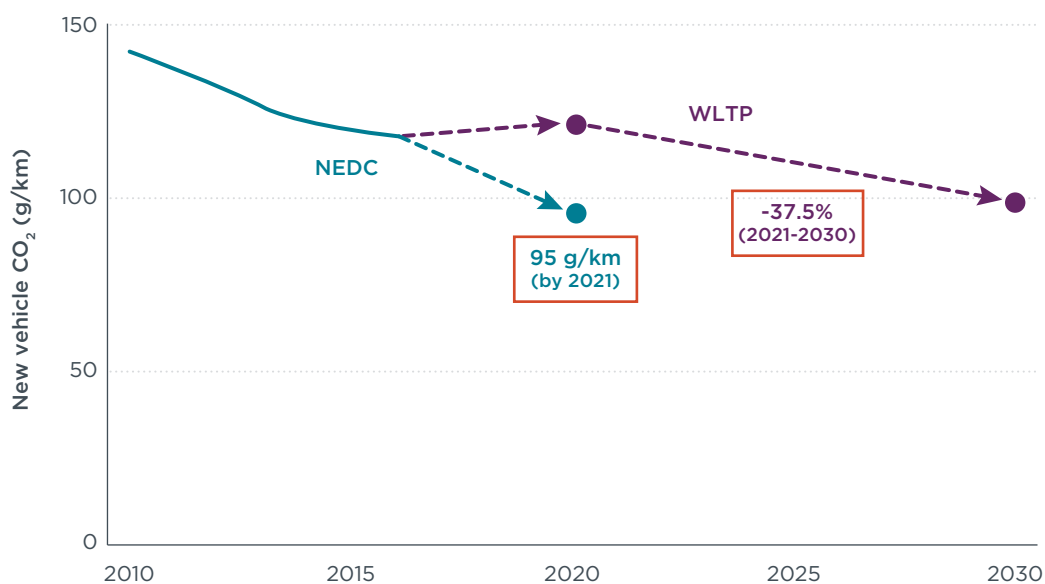
To prevent manufacturers from inflating their 2021 WLTP-NEDC ratio by declaring unjustifiably high WLTP CO<sub>2</sub> emission values, the European Commission determined that the 2021 CO<sub>2</sub> baseline will not rely on the emission values declared by the manufacturers but directly on the measured values instead. Furthermore, the European Commission introduced an amendment to the WLTP-NEDC correlation procedure which defines test parameters and conditions more precisely to prevent manipulation of the CO<sub>2</sub> test results.<sup>12</sup> The regulation also contains provisions that improve transparency by requiring vehicle manufacturers to report both measured and declared CO<sub>2</sub> values to the European Commission.

Finally, for the first time the regulation provides for systematically monitoring CO<sub>2</sub> emissions under real-world driving conditions. In the case of passenger cars, new vehicle types must determine and store lifetime fuel-consumption and/or energy-consumption values beginning in 2020.<sup>13</sup> Beginning in 2021, all new vehicles, not only new vehicle types, must be equipped with an **on-board fuel and/or energy consumption monitoring device (OBFCM)**. For light commercial vehicles, the introduction dates are shifted backwards by one year. Using data from those OBFCM units, from 2021 to 2026 the European Commission will monitor and

<sup>12</sup> European Commission. *Draft Commission Implementing Regulation amending Implementing Regulation (EU) 2017/1153 to clarify the WLTP test conditions and provide for the monitoring of type approval data with regard to passenger car* (European Commission: Brussels, 2018). <https://tinyurl.com/ycaifenn>

<sup>13</sup> European Commission. *Commission Regulation (EU) 2018/1832 of 5 November 2018 amending Directive 2007/46/EC of the European Parliament and of the Council, Commission Regulation (EC) No 692/2008 and Commission Regulation (EU) 2017/1151* (European Commission: Brussels, 2018). <https://tinyurl.com/y83gwwu8>

annually report the gap between official and real-world CO<sub>2</sub> emissions. No later than June 2023, the European Commission must assess how data from OBFDM devices may be used to prevent the real-world gap from growing. In 2027, the Commission must assess the feasibility of a mechanism to adjust each manufacturer's average CO<sub>2</sub> emissions for its real-world performance, beginning in 2030.



**Figure 3.** Schematic illustration showing how the CO<sub>2</sub> target for 2021 will still be based on NEDC, while after 2021 a percentage CO<sub>2</sub> reduction applies, relative to the 2021 starting point in WLTP.

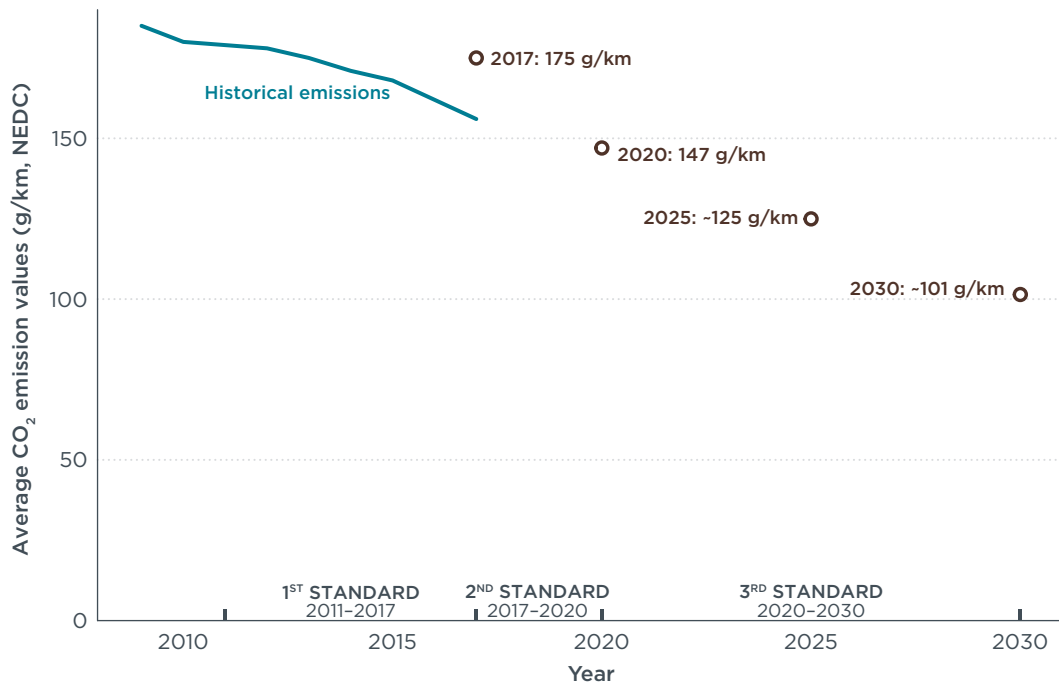
- » As was the case under the previous vehicle CO<sub>2</sub> regulations, manufacturers can apply for a maximum of 7 g/km of credits for the use of **eco-innovation technologies** whose benefits are not adequately captured by the certification test cycle. However, in contrast to the previous regulations, efficiency improvements for mobile air conditioning systems can also qualify as eco-innovations, beginning in 2025. In addition, the European Commission is tasked to review the 7 g/km cap on eco-innovation contributions for compliance purposes by 2025. Until now, eco-innovations have had only a minor effect on manufacturers' fleet CO<sub>2</sub> values. In 2017, Mercedes-Benz benefited the most from this provision (0.4 g/km). However, for individual vehicles eco-innovations have reduced CO<sub>2</sub> emissions values significantly, up to 4 g/km.<sup>14</sup>
- » **Excess emission premiums** for manufacturers failing to meet their emissions target will remain at €95 per vehicle for every g/km by which the manufacturer's fleet average CO<sub>2</sub> exceeds its target. The European Commission was tasked to evaluate the possibility of assigning the revenue from excess emission premiums to support a just transition to low emission vehicles, for example by supporting retraining for auto workers.
- » Under the current CO<sub>2</sub> regulation, **niche manufacturers** with no more than 300,000 new vehicles sold per year were subject to less stringent targets. Under the new regulation, this derogation will be phased out by 2028.
- » A **review clause** requires the European Commission to thoroughly review the effectiveness of the regulation by 2023 and to submit a report and potentially a proposal for amending the regulation to the European Parliament and European

<sup>14</sup> Uwe Tietge. *Overview and evaluation of eco-innovations in European passenger car CO<sub>2</sub> standards* (ICCT: Berlin, 2018). <https://www.theicct.org/publications/eco-innovations-european-passenger-car-co2-standards>

Council. As part of this review, the European Commission must evaluate the possibility of taking into account **life-cycle emissions** from cars for future CO<sub>2</sub> regulations.

The vans regulation differs from the proposal for cars in these particulars.

- » New vans CO<sub>2</sub> emissions, on average, must fall **by 15% by 2025** and **by 31% by 2030**. Expressed in NEDC terms, using the current 2020 CO<sub>2</sub> target of 147 g/km as the baseline, these reductions would translate into a target value of **125 g/km (2025)** and **101 g/km (2030)** (Figure 4).



**Figure 4.** Average historical CO<sub>2</sub> emission values and adopted CO<sub>2</sub> standards for new vans in the EU. All CO<sub>2</sub> values refer to New European Driving Cycle (NEDC) measurements.

- » The sales targets for ZLEVs for vans are **15% for 2025** and **30% for 2030**.
- » As with cars, vehicle weight is retained as the underlying **utility parameter**, with a slope of 0.096 to be used until 2024. For determining the slope applied for calculating the annual manufacturer targets from 2025 onwards, the European Commission will carry out a least-squares fit through the CO<sub>2</sub> vs. mass data of all vehicles registered in 2021.

## EXPECTED EFFECTS OF THE REGULATIONS

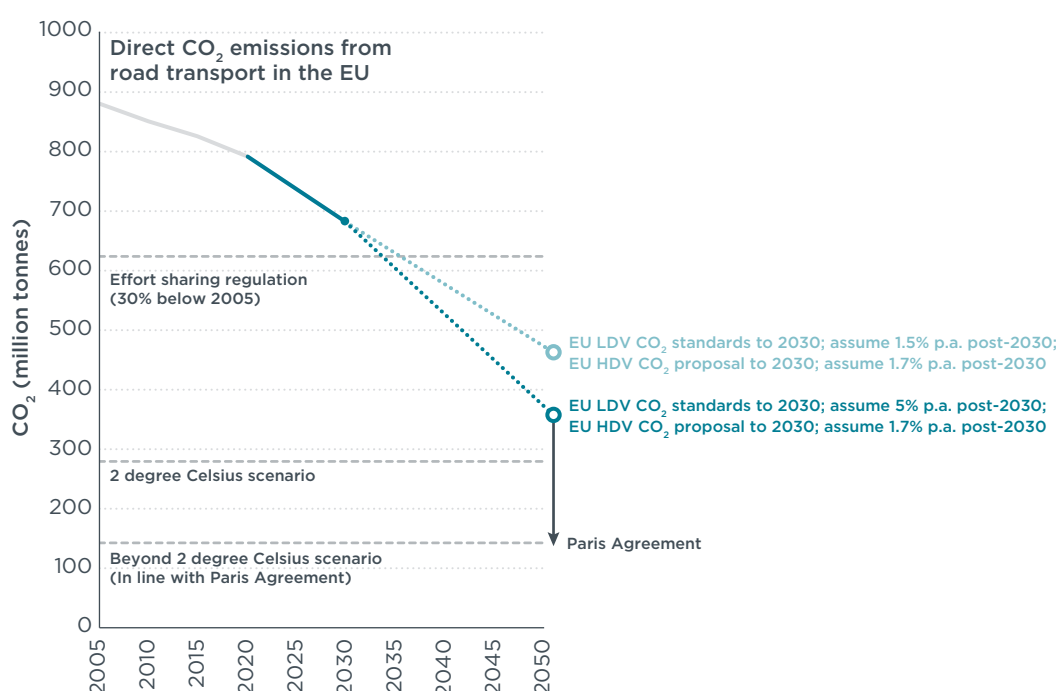
The European Union has set a short-term, binding target for greenhouse gas (GHG) emissions of 40% below 1990 levels in 2030. To achieve this goal, the sectors covered by the EU Emissions Trading System (ETS) must deliver a reduction of 43% in GHG emissions by 2030. The non-ETS sectors, to which transport belongs, must deliver a reduction of 30%. Both reduction targets are compared with 2005. Longer term, the EU is legally bound to pursue mitigation measures by the international agreement adopted at the Paris climate conference (COP21) in December 2015.

Figure 5 plots the development of direct CO<sub>2</sub> emissions from the road transport sector in the EU since 2005 and trends out to 2050. The projections to 2030 consider the impacts of the post-2020 regulation for passenger cars and light-commercial vehicles (LDVs) and the proposed standards for heavy-duty vehicles



(HDVs) issued by the European Commission in May 2018.<sup>15</sup> If the HDV standards were to be finalized according to the initial proposal, direct CO<sub>2</sub> emissions from road transport in the EU would remain well above the levels needed to meet the 2030 target for non-ETS sectors, assuming equivalent reductions are needed in each non-ETS sector. To meet the 2030 target, either further measures are needed to reduce transport sector emissions, or other non-transport, non-ETS sectors will need to make up the difference.

Post-2030, CO<sub>2</sub> emissions of new heavy-duty vehicles are assumed to be reduced at a rate of 1.7% per annum. In addition, one scenario assumes post-2030 CO<sub>2</sub> reductions for new passenger cars and light-commercial vehicles at a rate of 1.5% per annum, whereas the other assumes a rate of 5% per annum. The more stringent scenario would reduce annual emissions in 2050 by more than 100 million tonnes of CO<sub>2</sub> compared with the less stringent scenario; however neither would reduce emissions to levels consistent with the Paris agreement.



**Figure 5.** Direct CO<sub>2</sub> emissions from the transport sector under different reduction scenarios for the period 2030 to 2050. Results are estimated using the ICCT Roadmap Model.

In an underlying impact assessment for the original regulatory proposal (not taking into account any changes during the political negotiations with the European Parliament and Council), the European Commission quantified the expected effects of the proposed cars and vans regulation:<sup>16</sup>

- » Around 170 million tonnes of **CO<sub>2</sub>** reduced in the period 2020 to 2030 and better **air quality**, especially in cities
- » **GDP** increase of up to €6.8 billion in 2030, creating up to 70,000 additional **jobs**
- » On average, consumer savings of up to €600 on a new car bought in 2025 over the vehicle’s lifetime and up to €1500 for a new car bought in 2030; overall consumer savings of up to €18 billion per year in fuel costs

15 European Commission. *Proposal for post-2020 CO<sub>2</sub> targets for heavy-duty vehicles* (European Commission: Brussels, 2018). [https://ec.europa.eu/clima/policies/transport/vehicles/heavy\\_en](https://ec.europa.eu/clima/policies/transport/vehicles/heavy_en)

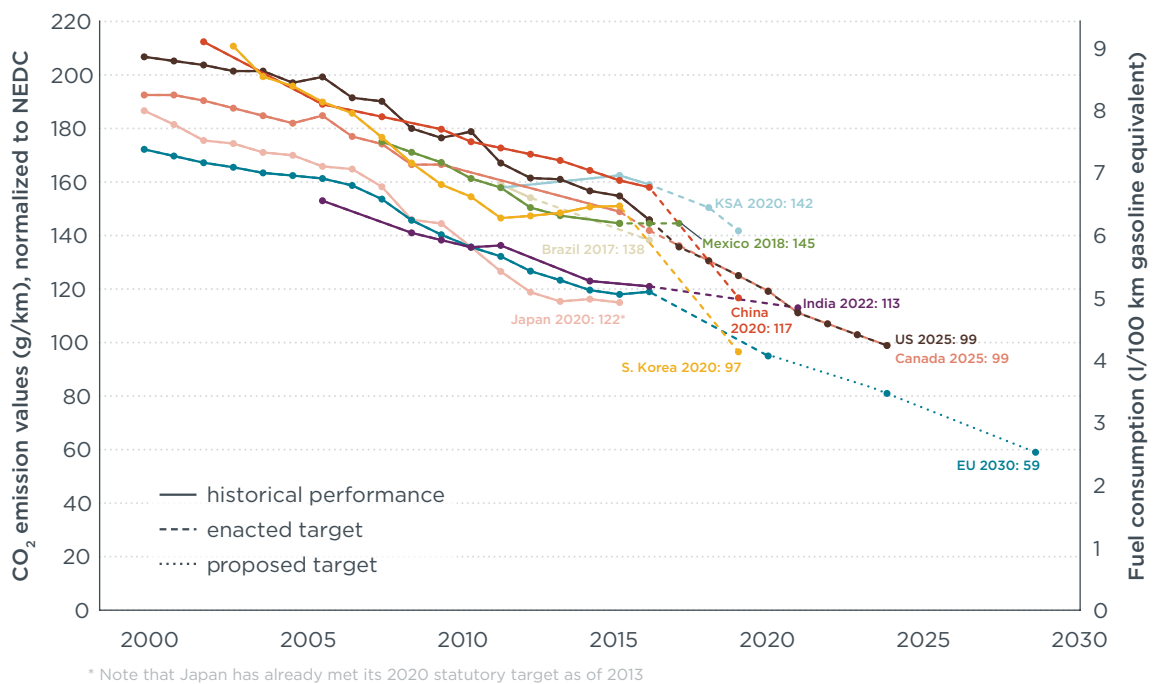
16 European Commission. *Proposal for post-2020 CO<sub>2</sub> targets for cars and vans* (European Commission: Brussels, 2017). [https://ec.europa.eu/clima/policies/transport/vehicles/proposal\\_en](https://ec.europa.eu/clima/policies/transport/vehicles/proposal_en)



- » reduction in oil use of 380 million tonnes over the period 2020 to 2040, worth around €125 billion at today's prices (around €6 billion on average per year)

## INTERNATIONAL CONTEXT

Figure 6 shows the EU CO<sub>2</sub> passenger car standards relative to similar regulations around the world. The chart converts all regulatory programs to the NEDC to make them comparable. With the new regulation, the EU becomes the only market worldwide to have set mandatory new car CO<sub>2</sub> targets up to the year 2030. For the year 2025, the EU CO<sub>2</sub> target of approximately 81 g/km compares to similar targets in the U.S. and Canada (99 g/km). However, the chart does not take into account any credits provided (such as eco-innovations), nor any differences in real-world enforcement.



**Figure 6.** Comparison of global CO<sub>2</sub> regulations for new passenger cars.<sup>17</sup>

## NEXT STEPS

Both regulations, for cars and vans, must still be formally adopted by the European Parliament and the European Council, which is expected in January 2019. This final step is regarded as a formality, and no further modifications or delays are anticipated. In parallel, a complementary regulatory proposal setting CO<sub>2</sub> standards for heavy-duty vehicles will continue under discussion in the European Parliament and the European Council, with a decision expected by the end of the first quarter of 2019.

<sup>17</sup> U.S. CO<sub>2</sub> emission values are 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). Additional information can be found in: Zifei Yang and Anup Bandivadekar, "2017 Global Update: Light-Duty Vehicle Greenhouse Gas and Fuel Economy Standards" (International Council on Clean Transportation, June 23, 2017), <https://www.theicct.org/node/1474>.