

THE EUROPEAN COMMISSION'S PROPOSED CO₂ STANDARDS FOR HEAVY-DUTY VEHICLES

ICCT POLICY UPDATES

SUMMARIZE

REGULATORY

AND OTHER

DEVELOPMENTS

RELATED TO CLEAN

TRANSPORTATION

WORLDWIDE.

On May 17, 2018, the European Commission released a regulatory proposal¹ for setting the first ever carbon dioxide (CO₂) emission standards for new heavy-duty vehicles (HDVs) sold in the European Union (EU). The proposed targets aim to reduce the average CO₂ emissions from new HDVs by 15% in 2025 and by 30% in 2030, both relative to a 2019 baseline. The baseline value will be defined based on the certified CO₂ emissions of new trucks collected under a separate upcoming monitoring and reporting regulation,² expected to enter into force in January 2019.

POLICY BACKGROUND

The Commission's proposal marks the starting point of the legislative process that presumably will lead to the EU becoming the sixth major market to regulate tailpipe CO₂ emissions from trucks. The United States, Canada, China, Japan and India already have HDV CO₂ emissions or fuel consumption standards in place. Figure 1 shows the relative stringency of the different tractor-trailer efficiency standards with respect to the baseline defined when the standards were introduced.

1 European Commission, "Proposal for a Regulation of the European Parliament and of the Council Setting CO₂ Emission Performance Standards for New Heavy-Duty Vehicles" (May 17, 2018), <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2018:284:FIN>.

2 European Commission, "Proposal for a Regulation of the European Parliament and of the Council on the Monitoring and Reporting of CO₂ Emissions from and Fuel Consumption of New Heavy-Duty Vehicles" (Brussels, May 31, 2017), <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52017PC0279>.

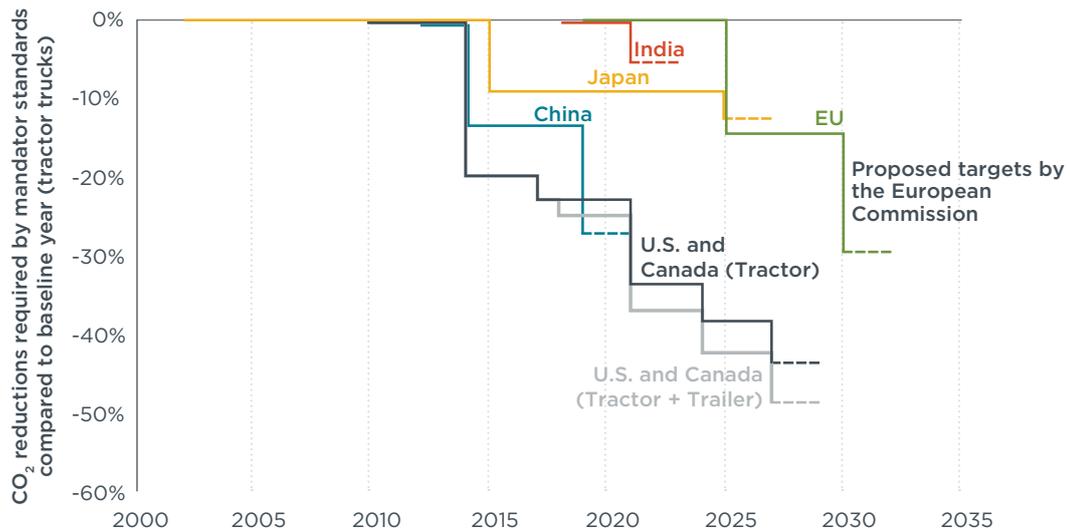


Figure 1. Tractor-truck standards around the world relative to the baseline in the first phase of the standards.³

The CO₂ standards proposal for HDVs put forward by the European Commission forms part of the third and final package of a series of regulatory proposals, called *Europe on the Move*,⁴ targeted at improving the social and environmental performance of the transportation sector.

The Commission’s plan to curb CO₂ emissions from on-road freight vehicles was outlined in its 2016 communication, *A European Strategy for Low-Emission Mobility*,⁵ and rests on three regulatory measures:

1. CO₂ Certification Regulation for HDVs:⁶ The development of the CO₂ certification regulation was led by the Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW). The regulation was adopted through Comitology⁷ by the Technical Committee—Motor Vehicles (TCMV) in May 2017 and was published in the Official Journal of the European Union in December 2017.

Beginning January 1, 2019, newly produced HDVs belonging to groups 4, 5, 9, and 10 (see Table 1) are to be certified for CO₂ emissions. These vehicle groups correspond to rigid and tractor trucks with a gross vehicle weight (GVW) over 16 tonnes, and 4x2 or 6x2 axle configuration. The CO₂ certification requirement

3 A direct comparison of stringency among the standards is not possible with the information provided in the figure. The figure attempts to show the efficiency targets around the world in a single diagram by relating the reduction requirements to a fixed baseline. Note, however, that the technology baselines, testing methodologies, test cycles, allowed payloads, and evaluated metrics are country-specific. The figure is presented for illustrative purposes and does not capture all the underlying details that are common or different across regions.

4 European Commission, “Europe on the Move: Commission Completes Its Agenda for Safe, Clean and Connected Mobility,” Press Release (17 May, 2018). http://europa.eu/rapid/press-release_IP-18-3708_en.htm.

5 European Commission, “A European Strategy for Low-Emission Mobility,” Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions (20 July, 2016). <http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:52016DC0501>.

6 “Regulation (EU) 2017/2400 of 12 December 2017 Implementing Regulation (EC) No 595/2009 of the European Parliament and of the Council as Regards the Determination of the CO₂ Emissions and Fuel Consumption of Heavy-Duty Vehicles and Amending Directive 2007/46/EC of the European Parliament and of the Council and Commission Regulation (EU) No 582/2011,” *Official Journal of the European Union* L 349 (December 29, 2017), <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L:2017:349:TOC>.

7 Comitology refers to the implementation of EU legislation in technical committees formed by representatives of the EU Member States and chaired by the Commission. The adoption of legislation through Comitology does not require an active role of the EU Parliament nor of the EU Council.

for these four vehicle groups is extended in July 1, 2019 to all vehicle registrations, regardless of production date. Six additional vehicle groups will be required to be certified in 2020. Further details on the CO₂ certification regulation can be found in a related ICCT policy update.⁸

- 2. Monitoring and Reporting Regulation:**⁹ In May 2017, as part of its first mobility package of the *Europe on the Move* series, the European Commission proposed regulation for the monitoring and reporting of CO₂ emissions and fuel consumption of new heavy-duty vehicles. Under the regulation, all relevant CO₂ certification information produced by manufacturers, including vehicle and component data, would be monitored, reported and published at EU level. Starting in 2019, the national type-approval authorities are required to report the registration data of new registered HDVs, including vehicle identification numbers, to the European Environment Agency (EEA). The EEA would then extract the detailed vehicle and component data from the manufacturers' reported data.

Starting in 2020, the data of each certified new vehicle registered in the EU from the previous year will be made publicly available by the EEA. The data will indicate the CO₂ performance of the EU heavy-duty vehicle fleet as a whole, as well as for each manufacturer and each vehicle group.

The adoption and implementation of the HDV CO₂ monitoring and reporting proposal will take place under the ordinary legislative procedure, in which the European Parliament, Council and Commission seek agreements through interinstitutional negotiations called trilogues. In March 2018, a provisional tripartite agreement was reached¹⁰ but at the time of writing, the regulation had not yet been adopted in the plenary session of the European Parliament.

8 Felipe Rodríguez, "Certification of CO₂ Emissions and Fuel Consumption of On-Road Heavy-Duty Vehicles in the European Union," Policy update (International Council on Clean Transportation, February 2018), <https://www.theicct.org/publications/certification-co2-emissions-and-fuel-consumption-road-heavy-duty-vehicles-european>.

9 European Commission, "Proposal for a Regulation of the European Parliament and of the Council on the Monitoring and Reporting of CO₂ Emissions from and Fuel Consumption of New Heavy-Duty Vehicles" (Brussels, May 31, 2017). <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52017PC0279>.

10 European Council, "CO₂ Emissions of Lorries, Buses and Coaches: Provisional Agreement with Parliament on New Rules for Monitoring and Reporting - Consilium," Press Release (27 March, 2018). <http://www.consilium.europa.eu/en/press/press-releases/2018/03/27/co2-emissions-of-lorries-buses-and-coaches-provisional-agreement-with-parliament-on-new-rules-for-monitoring-and-reporting/>.

Table 1. Heavy-duty vehicle classification for the purpose of CO₂ emissions and fuel consumption certification

Axle type	Chassis configuration	Gross vehicle weight (tonnes)	Vehicle Groups	Date of certification requirement
4x2	Rigid	>3.5 - <7.5	0	Not considered by the certification regulation
	Rigid (or tractor)	7.5 - 10	1	January 1, 2020 for all new registrations.
	Rigid (or tractor)	>10 - 12	2	
	Rigid (or tractor)	>12 - 16	3	
	Rigid	>16	4	January 1, 2019 for new produced vehicles.
	Tractor	>16	5	July 1, 2019 for all new registrations.
4x4	Rigid	7.5 - 16	6	Not considered by the certification regulation
	Rigid	>16	7	
	Tractor	>16	8	
6x2	Rigid	all weights	9	January 1, 2019 for new produced vehicles.
	Tractor	all weights	10	July 1, 2019 for all new registrations.
6x4	Rigid	all weights	11	July 1, 2020 for new registrations.
	Tractor	all weights	12	
6x6	Rigid	all weights	13	Not considered by the certification regulation
	Tractor	all weights	14	
8x2	Rigid	all weights	15	Not considered by the certification regulation
8x4	Rigid	all weights	16	
8x6 8x8	Rigid	all weights	17	Not considered by the certification regulation

3. Mandatory CO₂ standards:¹¹ The regulatory proposal for HDV CO₂ standards was put forward by the European Commission on May 17, 2018 and is the subject of this policy update. The following sections explain in detail the key aspects of the regulation.

KEY ELEMENTS OF THE PROPOSED HDV CO₂ STANDARDS

The key elements of the regulatory design of the HDV CO₂ standards proposal are summarized in Table 2, and are followed by a detailed description of the policy options chosen by the European Commission.

¹¹ European Commission, "Proposal for a Regulation of the European Parliament and of the Council Setting CO₂ Emission Performance Standards for New Heavy-Duty Vehicles."

Table 2. Summary of key elements of the HDV CO₂ standards proposal for the EU.

Policy option	Key elements
Scope	<ul style="list-style-type: none"> The regulation applies to vehicles belonging to groups 4, 5, 9, and 10 as defined in the certification regulation (see Table 1). Vehicles that are not intended for the delivery of goods are deemed to be <i>vocational vehicles</i> and are exempted from the regulation. The designation of a truck as a vocational vehicle is under the discretion of the manufacturer.
Metric	<ul style="list-style-type: none"> The average specific CO₂ emissions are measured in grams of CO₂ per tonne-kilometer (gCO₂/t-km). Compliance with the standards is determined by comparing the average specific CO₂ emissions of a manufacturer's fleet against the manufacturer-specific CO₂ targets mandated by the standard. The manufacturer's average specific emissions are a function of the CO₂ emissions of each new HDV and of the registration share in each vehicle sub-group.
Baseline	<ul style="list-style-type: none"> For each vehicle sub-group, the reference CO₂ emissions are determined based on the monitored and reported data of the year 2019 for the complete EU. The reference emissions of each sub-group are common to all manufacturers.
Targets and timeline	<ul style="list-style-type: none"> The CO₂ reduction targets for each sub-group are set relative to the baseline CO₂ emissions of the year 2019. The proposal sets a mandatory reduction of 15% relative to the 2019 baseline, in the 2025 to 2029 time period. The proposal sets a mandatory reduction of at least 30% relative to the 2019 baseline from 2030 onwards. This reduction target is to be reviewed by 2022. The numerical value of the resulting targets, in gCO₂/t-km, is specific to each manufacturer and is dependent on its fleet composition.
ZEV/LEV incentives	<ul style="list-style-type: none"> Each zero-emission vehicle (ZEV) is certified with 0 gCO₂/km and is counted as 2 vehicles, referred to as a super-credit multiplier of 2, for the purpose of determining a manufacturer's average emissions. Low-emission vehicles (LEVs) are defined as those emitting less than 350 gCO₂/km (about half of the average of the fleet emissions) and are counted as up to 2 vehicles depending on their tailpipe CO₂ emissions. The super-credit scheme is also extended to heavy-duty ZEVs in vehicle groups outside of the scope of the CO₂ standards. ZEV super-credits outside of the regulated categories can only reduce the average specific emissions of a manufacturer up to 1.5%. Total ZEV and LEV super-credits can only reduce the average specific emissions of a manufacturer by a maximum of 3%.
Flexibilities	<ul style="list-style-type: none"> From 2019 to 2024, manufacturers can accumulate early-credits that can only be used for compliance in 2025. The early-credits are calculated against a linear trajectory between the baseline and the 2025 targets. In the period 2025 to 2028, manufacturers are allowed to accumulate credits and debt. The credit/debt calculation is done against a linear CO₂ reduction trajectory between the 2025 and 2030 targets. Emissions debts must be cleared by 2029. Emissions credits cannot be carried over for compliance from 2030 onwards. At any given time, the total debt of a manufacturer cannot be higher than 5% its 2025 target multiplied by the respective number of vehicles. Credits and debts are not transferable between manufacturers
Penalties	<ul style="list-style-type: none"> Manufacturers are required to pay a per-vehicle penalty of 6,800 Euros for each gCO₂/t-km of excess emissions. In the period 2025 to 2029, the excess emissions calculation takes into account the credits and debts accumulated in the previous years.

SCOPE

The proposal sets CO₂ emissions limits for delivery vehicles belonging to groups 4, 5, 9, and 10 as defined in the certification regulation (see Table 1). These vehicle groups correspond to rigid and tractor trucks with a GVW exceeding 16 tonnes, and with 4x2 and 6x2 axle configurations. These vehicles account for 65% to 70% of all CO₂ emissions from EU’s HDV fleet, according to Commission’s estimates.¹² For the CO₂ standards, a subdivision of the aforementioned groups is proposed to account for the different use profiles of the regulated vehicles, such as urban, regional, or long-haul delivery. The sub-group segmentation is based on the cabin type and the engine power, as summarized in Table 3.

Vehicles that are not intended for the delivery of goods, such as refuse collection trucks and construction trucks, are referred to as vocational vehicles and do not count towards the calculation of the average specific CO₂ emissions of a manufacturer’s fleet and are effectively exempted from the regulation.¹³ Neither the current CO₂ certification regulation nor the CO₂ standards proposal provide technical criteria for the identification of vocational vehicles. Consequently, the certification of vehicles under the vocational vehicle category, and therefore their exclusion from the manufacturer’s CO₂ emissions calculation, is solely under the discretion of the manufacturer.

Table 3. Vehicle sub-groups for the purpose of CO2 standards

Group description	Vehicle group	Vehicle sub-group	Cabin type	Engine power	Typical mission profile
Rigid, 4x2 axle, GVW > 16 t	4	4-UD	All	< 170 kW	Urban delivery
		4-RD	Day cab	≥ 170 kW	Regional delivery
			Sleeper cab	≥ 170 kW and < 265 kW	
		4-LH	Sleeper cab	≥ 265 kW	Long-haul
Tractor, 4x2 axle, GVW > 16 t	5	5-RD	Day cab	All	Regional delivery
			Sleeper cab	< 265 kW	
		5-LH	Sleeper cab	≥ 265 kW	Long-haul
Rigid, 6x2 axle	9	9-RD	Day cab	All	Regional delivery
		9-LH	Sleeper cab		Long-haul
Tractor, 6x2 axle	10	10-RD	Day cab	All	Regional delivery
		10-LH	Sleeper cab		Long-haul

12 European Commission, “IMPACT ASSESSMENT. Accompanying the Document Proposal for a Regulation of the European Parliament and of the Council Setting CO₂ Emission Performance Standards for New Heavy Duty Vehicles,” Commission Staff Working Document (Brussels, May 17, 2018), <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD:2018:185:FIN>.

13 Note that the definition of vocational vehicles differs across regions. In the United States, for example, the definition of vocational vehicles encompasses all rigid trucks above a certain GVW, including those used for delivery.

METRIC

The CO₂ standards proposal follows a tank-to-wheel approach, addressing only the tailpipe CO₂ emissions of the regulated vehicle groups. For each manufacturer, the CO₂ emissions are regulated on a fleet-wide basis through a metric dubbed *average specific CO₂ emissions*, expressed in gCO₂/t-km.¹⁴ The average specific CO₂ emissions of a manufacturer are a function of:

- » CO₂ emissions of each new heavy-duty vehicle (expressed in gCO₂/km).¹⁵
- » The number of vehicles registered in each sub-group (see Table 3), and resulting fleet composition (i.e., shares in each vehicle sub-group).
- » Resulting average CO₂ emissions in each vehicle sub-group (expressed in gCO₂/t-km).
- » Mileage and payload weighting (MPW) factors to account for the differences in freight activity (i.e., how many tonnes are moved what distance, quantified in t-km) between the vehicle sub-groups. These weighting factors are defined in the regulation (see Table 4).
- » The multiplier related to the ZEV and LEV super-credits. The calculation of this multiplier is explained in the section titled *Incentives for zero- and low-emission vehicles*.

The approach for calculating the average specific CO₂ emissions of a manufacturer is shown in Figure 2.

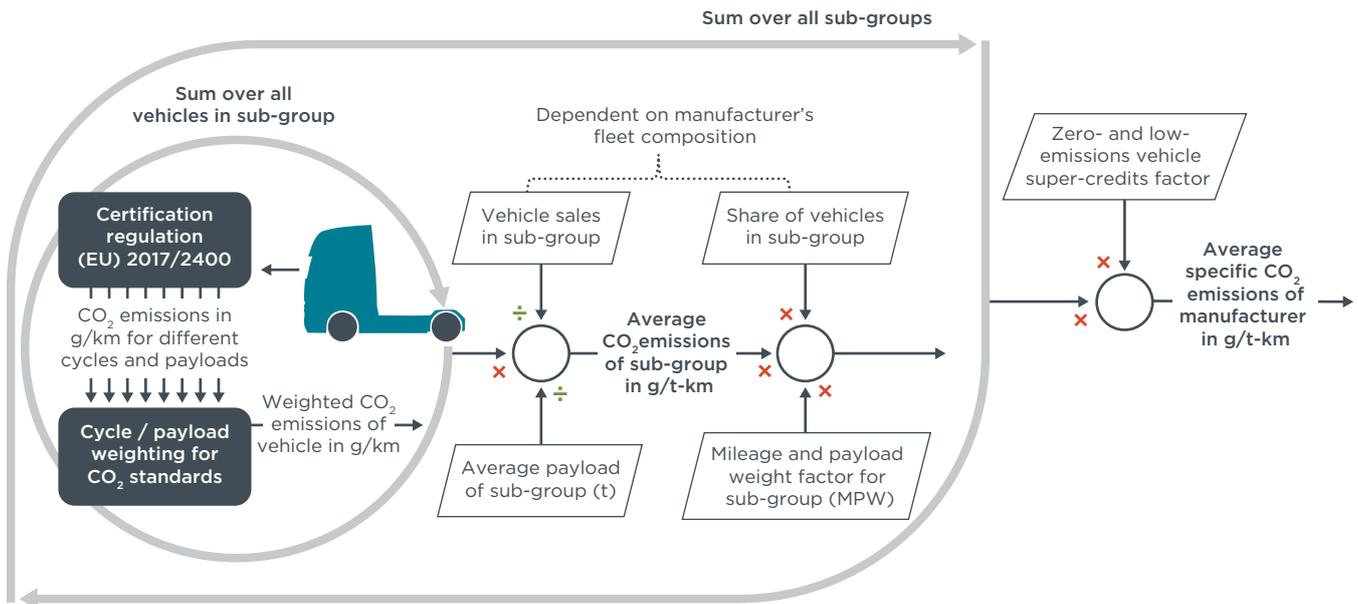


Figure 2. Calculation of the average specific CO₂ emissions of a manufacturer in a given year

The CO₂ emissions certification regulation is the starting point for the determination of average specific CO₂ emissions of a manufacturer. Depending on the vehicle group, the CO₂ certification of the vehicle provides the fuel consumption and CO₂ emissions over a set of different driving cycles (called mission profiles in the proposal) and two payloads: reference and low. The CO₂ standards proposal

¹⁴ gCO₂/t-km represent the amount of CO₂ it would take to move one tonne of goods one kilometer. t-km is an abbreviation for tonne-kilometer. It is a measure of freight activity.

¹⁵ Although the standard's metric is in gCO₂/t-km the averaging of the CO₂ emissions of the sub-group is done in gCO₂/km. This result is divided by the average payload of the sub-group and gives a value in gCO₂/t-km (see Figure 2).

establishes a set of weighting factors for the cycles and payloads to determine the CO₂ emissions of each vehicle for the calculation of the average specific emissions of a manufacturer.

To reflect the difference in freight activity between the vehicle sub-groups, the Commission proposes the use of a mileage and payload weighting (MPW) factor. The MPW factor is defined as the product of the typical vehicle mileage and average payload in the sub-group, normalized by the freight activity of sub-group 5-LH (see Table 3), which has the highest freight activity.

For example, CO₂ reductions for compliance purposes in sub-group 5-LH are weighted 10 times higher than reductions in sub-group 4-UD. For illustration purposes, consider a hypothetical manufacturer that sells an equal number of vehicles in sub-groups 4-UD and 5-LH, and sells no vehicles in the other sub-groups. To comply with the 15% reduction CO₂ target in 2025, this manufacturer could reduce by 20% the CO₂ emissions in sub-group 5-LH and not be required to reduce the CO₂ emissions in sub-group 4-UD.¹⁶

Table 4 shows the average payload and MPW factors included in the regulatory proposal. Note that the mileage and payload weighting factors do not total 1. As a consequence, the resulting average specific CO₂ emissions are technically not a weighted average.

Table 4. Assumptions for the calculation of weighting factors and resulting values.

Vehicle sub-group	Mission profile weighting	Payload weighting*	Average payload (tonnes)	Annual mileage (km)	MPW** factor
4-UD	Urban Delivery: 100%	Low: 50% Reference: 50%	2.650	60,000	0.099
4-RD	Regional Delivery: 90% Long Haul: 10%	Low: 50% Reference: 50%	3.180	78,000	0.154
4-LH	Regional Delivery: 10% Long Haul: 90%	Low: 50% Reference: 50%	7.420	98,000	0.453
5-RD	Regional Delivery: 90% Long Haul: 10%	Low: 30% Reference: 70%	10.258	78,000	0.498
5-LH	Regional Delivery: 10% Long Haul: 90%	Low: 30% Reference: 70%	13.842	116,000	1.000
9-RD	Regional Delivery: 90% Long Haul: 10%	Low: 30% Reference: 70%	6.280	73,000	0.286
9-LH	Regional Delivery: 10% Long Haul: 90%	Low: 30% Reference: 70%	13.400	108,000	0.901
10-RD	Regional Delivery: 90% Long Haul: 10%	Low: 30% Reference: 70%	10.258	68,000	0.434
10-LH	Regional Delivery: 10% Long Haul: 90%	Low: 30% Reference: 70%	13.842	107,000	0.922

* The values of low and reference payloads are depending on of the mission profile.

** MPW: Mileage and payload weighting. Rounded to 3rd decimal place.

¹⁶ This example assumes that the manufacturer is at the baseline level in 2019, and that the respective 2019 average CO₂ emissions are 60 g/t-km for sub-group 5-LH and 200 g/t-km for sub-group 4-UD. These emissions values were estimated using VECTO and the Commission's weighting factors.

BASELINE

The proposed CO₂ standards would mandate relative fleet-averaged CO₂ reductions against a fixed baseline. The baseline emissions are defined for each sub-group and are common to all manufacturers. The Commission does not provide a numerical value for the reference emissions but does establish a methodology for its determination.

Sum over all vehicles of all manufacturers in a sub-group with reported CO₂ data for 2019 (i.e., produced after January 1st 2019, or registered after July 1st 2019)

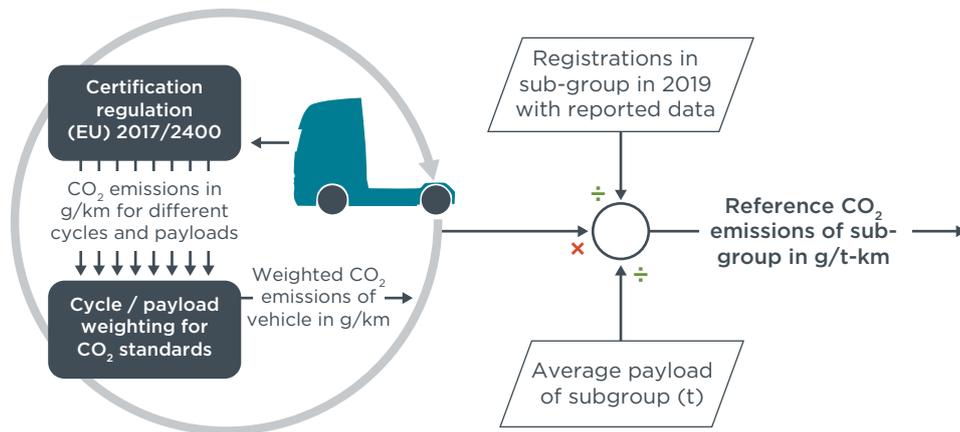


Figure 3. Calculation of the reference emissions (baseline) for a vehicle sub-group

The reference CO₂ emissions are determined for each vehicle sub-group and are based on the monitored and reported data of the year 2019.¹⁷ The calculation of the reference CO₂ emissions, illustrated in Figure 3, uses the same set of weighting factors for the mission profile and payload shown in Table 4.

TARGETS AND IMPLEMENTATION TIMELINE

The Commission's proposal would set binding CO₂ targets from 2025 onwards. The reduction targets are defined relative to the 2019 baseline described in the section above. The implementation timeline is divided in two periods, with different regulatory stringencies:

- » From 2025 to 2029: A relative reduction of 15% from 2019 levels.
- » From 2030 onwards: A relative reduction of *at least* 30% from 2019 levels.

The proposed reduction targets are based on a cost-benefit analysis undertaken by the Commission in support of the proposal.¹⁸ Table 5 summarizes the increase in manufacturing costs and the net savings of the first owner¹⁹ for the targets proposed by the Commission and more stringent reductions. Although the mandatory reduction targets would result in increased manufacturing costs, the saved fuel costs more than offset the increased capital investment of truck buyers. The more stringent reduction targets still resulted in net economic benefits according to the Commission analysis.

¹⁷ Only vehicles produced after January 1st, 2019 or registered after July 1st, 2019 are required to be certified for CO₂ emissions under EU regulation 2017/2400.

¹⁸ European Commission, "IMPACT ASSESSMENT. Accompanying the Document Proposal for a Regulation of the European Parliament and of the Council Setting CO₂ Emission Performance Standards for New Heavy Duty Vehicles," Commission Staff Working Document (17 May, 2018). <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD%3A2018%3A185%3AFIN>

¹⁹ The Commission assumes that the first owner keeps the vehicle for 5 years.

Table 5. Costs and benefits of the targets proposed and of the most ambitious target studied

Reduction target	Increase in manufacturing costs* (Euros per vehicle)	First owner net savings* (Euros per vehicle)
15% (2025)	3,088 - 10,800	23,438 - 26,337
30% (2030)	19,291 - 47,618	54,771 - 58,005
20% (2025)	7,339 - 27,797	33,002 - 37,589
35% (2030)	33,185 - 58,760	72,120 - 82,429

* The range in manufacturing costs and net savings represent the base and high cost scenarios analyzed in the Impact Assessment of the Commission.

The reduction target from 2030 onwards would be subject to a review in 2022 to account for the development and deployment advanced technologies that are not yet readily available in the market.

Figure 4 illustrates the calculation process of the specific emissions target of a manufacturer. The numerical value of the 2025 and 2030 targets in gCO₂/t-km are specific to each manufacturer. For a given year, the manufacturer specific emissions targets depend on the composition of the manufacturer’s fleet and on the reference CO₂ emissions of each vehicle sub-group. The latter are common to all manufacturers.

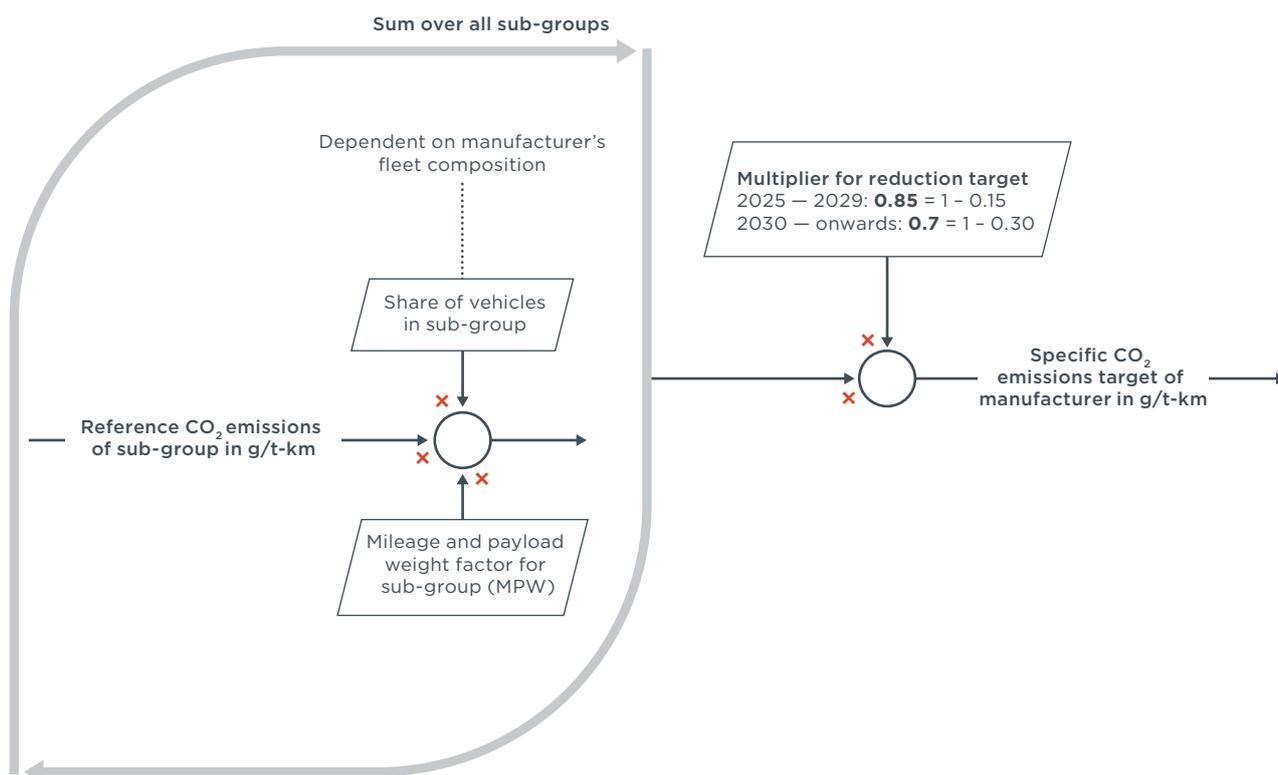


Figure 4. Calculation of the specific emissions target of a manufacturer for a given year

INCENTIVES FOR ZERO- AND LOW-EMISSION VEHICLES

The regulatory proposal includes incentives for accelerating the development and adoption of zero- and low-emission heavy-duty vehicles (ZEVs and LEVs). The regulatory incentive consists of counting ZEVs and LEVs as more than one vehicle, referred to as a super-credit multiplier, in the calculation of the average specific CO₂

emissions of a manufacturer. ZEV and LEV (ZLEV) super-credits can only reduce the average CO₂ emissions of a manufacturer by a maximum of 3%.

Each ZEV, or a vehicle certified with 0 gCO₂/km, is counted as 2 vehicles in the averaging set and therefore has a super-credit multiplier of 2. LEVs, which are defined as vehicles emitting less than 350 gCO₂/km, have super-credit multipliers between 1 and 2. The value of the super-credit multiplier varies linearly with the tailpipe CO₂ emissions. For example, as shown in Figure 5, a LEV with CO₂ emissions of 175 gCO₂/km would count as 1.5 vehicles.

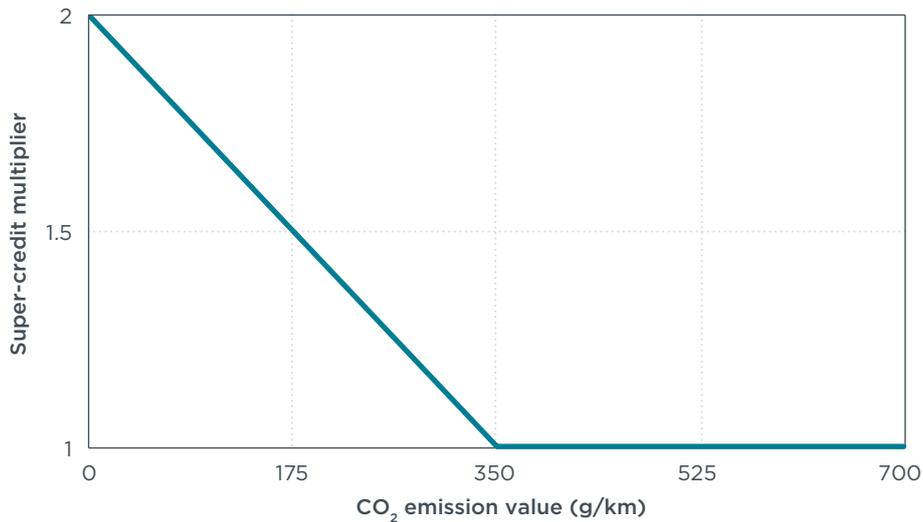


Figure 5. Super-credit multiplier as a function of tailpipe CO₂ emissions

The Commission's proposal for the super-credit scheme also extends to heavy-duty ZEVs in vehicle groups outside of the scope of the CO₂ standards. Sales of zero-emission buses and trucks outside of groups 4, 5, 9 and 10 (see Table 1), as well as vocational vehicles in those groups, can be used to generate ZEV super-credits with a multiplier of 2. The contribution of ZEV super-credits from vehicles outside of the regulated vehicle sub-groups can only reduce the average specific emissions of a manufacturer by a maximum of 1.5%. Once the cap is reached, additional ZEVs sold outside of the regulated groups by a manufacturer would not generate super-credits, and thus would not count towards compliance.

The ZLEV incentive is included in the calculation of the average specific CO₂ emissions of a manufacturer through the use of a ZLEV factor (see Figure 2 and equation below). The calculation of the ZLEV factor depends on the share of ZLEVs in a manufacturer's fleet and on the applicable super-credit multiplier for each ZLEV. For a given manufacturer, the ZLEV factor is defined as:

$$\text{ZLEV factor} = \frac{V}{V_{\text{conv}} + \text{ZLEV}_{\text{in}} + \text{ZLEV}_{\text{out}}}$$

- » V is the total number of HDVs under the scope of the regulation (i.e., vehicles in groups 4, 5, 9 and 10, **excluding** vocational vehicles).
- » V_{conv} is the total number of non-ZLEVs under the scope of the regulation.
- » ZLEV_{in} is the resulting number of ZLEV vehicles within the regulated groups (**including** vocational vehicles) after accounting for super-credits.
- » ZLEV_{out} is the resulting number of ZEV vehicles outside of the regulated groups after accounting for super-credits.

The ZLEV factor is capped at a minimum of 0.97, that is, ZLEV super-credits can only reduce the average CO₂ emissions of a manufacturer by a maximum of 3%. Since the ZLEV factor multiplies the complete average CO₂ emissions of a manufacturer, ZLEV from different sub-groups result in the same benefits, disregarding their freight activity.

COMPLIANCE FLEXIBILITIES

As described in a previous section, manufacturers would comply with the binding CO₂ limits using the average specific CO₂ emissions of their regulated vehicle fleet. This approach offers compliance flexibility, meaning the CO₂ targets do not need to be met by every individual vehicle.

Additional compliance flexibility is offered in the banking and borrowing scheme in which manufacturers are allowed to accumulate CO₂ emissions credits and debts during specific periods of time. The credit/debt accounting, done in gCO₂/t-km, is proportional to the number of vehicle registrations under the scope of the regulation produced by the manufacturer. Credits and debts are not transferable between manufacturers.

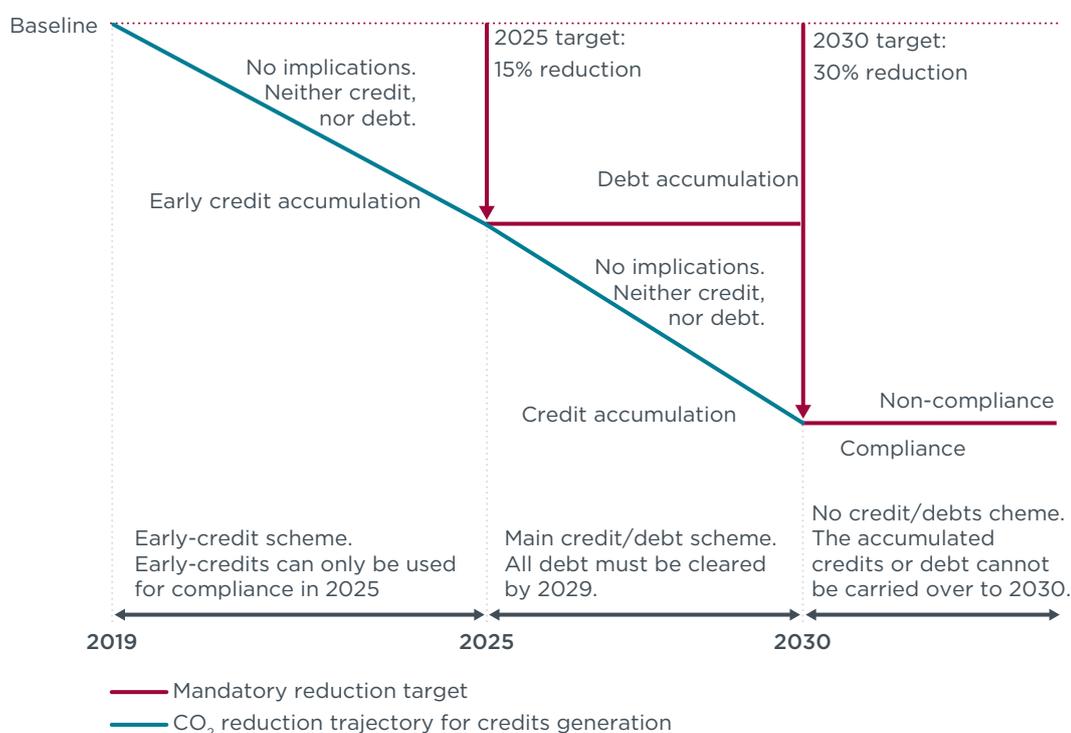


Figure 6. Illustration of the credit/debts scheme for compliance flexibility

The banking and borrowing scheme proposed by the Commission is illustrated in Figure 6. Starting in 2019 and through 2024, manufacturers are allowed to accumulate early-credits before the introduction of the first mandatory reduction step in 2025. These early-credits are generated once the manufacturer's average specific CO₂ emissions are below the CO₂ reduction trajectory (depicted by the blue line in Figure 6). The CO₂ reduction trajectory is defined as a linear function between the 2019 reference CO₂ emissions and the 2025 specific emissions target. The early-credits accumulated between 2019 and 2024 can only be used for compliance in 2025, and do not have any validity thereafter. There are no implications if a manufacturer's average CO₂ emissions are above the CO₂ reduction trajectory during this period (i.e., no debt is accumulated).

From 2025 to 2028, manufacturers can generate credits if the manufacturer's average specific CO₂ emissions are below the linear CO₂ reduction trajectory between the 2025 and 2030 specific emissions targets. During this period, manufacturers accumulate debt if their average specific CO₂ emissions are above the respective CO₂ target (depicted by the red continuous lines in Figure 6). If the average emissions of a manufacturer lie between the mandatory target and the CO₂ reduction trajectory neither credits nor debts are generated. Emissions credits can only be used for compliance up to 2029 and any emission debts must be cleared by 2029. In any case, emissions credits and debts cannot be carried over for 2030.

From 2025 to 2028, the total debt cannot be higher than 5% of the manufacturer's target in 2025 multiplied by the respective number of vehicles.²⁰ If the accumulated debt exceeds this threshold, the manufacturer is required to pay a per-vehicle penalty of 6,800 Euros for each gCO₂/t-km of excess emissions.

Under the proposal, compliance with the target in 2030 and thereafter would be evaluated each year without the application of past credits or accumulate debt. Excess CO₂ emissions above the target would result in immediate financial penalties. However, the proposal also establishes a review of the mandate in the year 2022 to assess the appropriateness of extending the credit/debt scheme to the post-2030 period.

OTHER POLICY ELEMENTS

This section discusses the policy elements put forward by the Commission's proposal that have indirect impacts on the stringency and environmental benefits of the proposed CO₂ reduction targets.

Adjustments to the baseline

The standards proposal includes provisions for adjusting the reference CO₂ emissions (see Figure 3) used to calculate the emissions targets of manufacturers (see Figure 4). The reference CO₂ emissions could be adjusted under the following circumstances:

1. In the case of changes in the mission profiles weights, average payloads, and annual mileage (see Table 4). Under the proposal, the Commission would be empowered to carry out changes in these parameters, and thus on the reference CO₂ emissions.
2. In the case that adjustments are made to the CO₂ certification procedure (e.g., changes in the simulation model or mission profiles) that result in changes in CO₂ emissions of more than 5 gCO₂/km. The before-and-after CO₂ emissions of a set of representative vehicles would be used to calculate the adjustment. Although the proposal does not include a methodology for the selection of these representative vehicles, it does mandate the development of one.

Review clause

The proposal establishes that, by the end of 2022, the Commission must review of the effectiveness of the CO₂ standards, review the 2030 reduction target, and propose CO₂ reduction targets for other types of HDVs, including trailers. The 2022 review would also include an assessment of the ZLEV incentives, of the credit/debt

²⁰ The accounting of credits, debts, and excess emissions is done in the same metric as the targets, gCO₂/t-km. Nevertheless, the credits, debts, and excess emissions take into account the number of new vehicles. For example, if a manufacturer, with a regulated fleet size of 10,000 vehicles, exceeds the target by 1 gCO₂/t-km, then it would accumulate have a debt of 10,000 gCO₂/t-km.

system, and of the appropriateness of prolonging those flexibilities for the post-2030 period.

Publication of manufacturer performance

Under the proposed regulation, the Commission would be required to make public the following performance data for each manufacturer:

1. Average specific emissions (see Figure 2), from 2019 onwards.
2. ZLEV factor (see Figure 5), from 2020 onwards
3. Specific emission target (see Figure 4), from 2025 onwards
4. The CO₂ reduction trajectory (see Figure 6) in the 2020 to 2030 period.
5. Emission credits (see Figure 6) in the 2020 to 2030 period.
6. Emission debts (see Figure 6) from 2025 onwards
7. Excess emissions from 2025 onwards

Real-world data and in-use conformity checks

In the proposal, the Commission empowers itself to monitor and assess the real-world representativeness of the CO₂ certification procedure. The data source for this assessment would require the introduction of mandatory on-board fuel consumption meters.

Another provision related to in-use CO₂ emissions is the introduction of an in-service conformity test for the certified CO₂ emission values. The deviations determined from these tests would be taken into account when evaluating compliance with the CO₂ standards.

NEXT STEPS

The CO₂ standards proposal for new heavy-duty vehicles in the EU, described in this policy update, was proposed by the European Commission on May 17, 2018. This marks the beginning of the legislative procedure for turning this proposal into law. During the coming months, the European Parliament and the European Council carry out interinstitutional negotiations, called trilogues, that seek to reach an agreement on proposed amendments to the regulation.

Depending on the duration of this legislative process, the regulatory proposal for setting CO₂ standards for new HDVs could be turned into law in the current legislative term before the 2019 elections (expected for May 2019) or could be carried over to the new legislature.