Truck CO2: Europe's chance to lead

Position paper on the review of the HDV CO2 standards

September 2022

Summary

The review of the HDV CO_2 standards is the opportunity to put the European heavy-duty vehicle (HDV) sector on a trajectory in line with climate neutrality. **HDVs are responsible for 28% of CO_2 emissions from road transport in the EU**, despite only accounting for 2% of vehicles on the road. If no action is taken, these emissions will continue to grow. The upcoming proposal by the European Commission could turn the 2020s and 2030s into the key decades to clean up trucking and ensure Europe's continued industrial leadership in the sector.

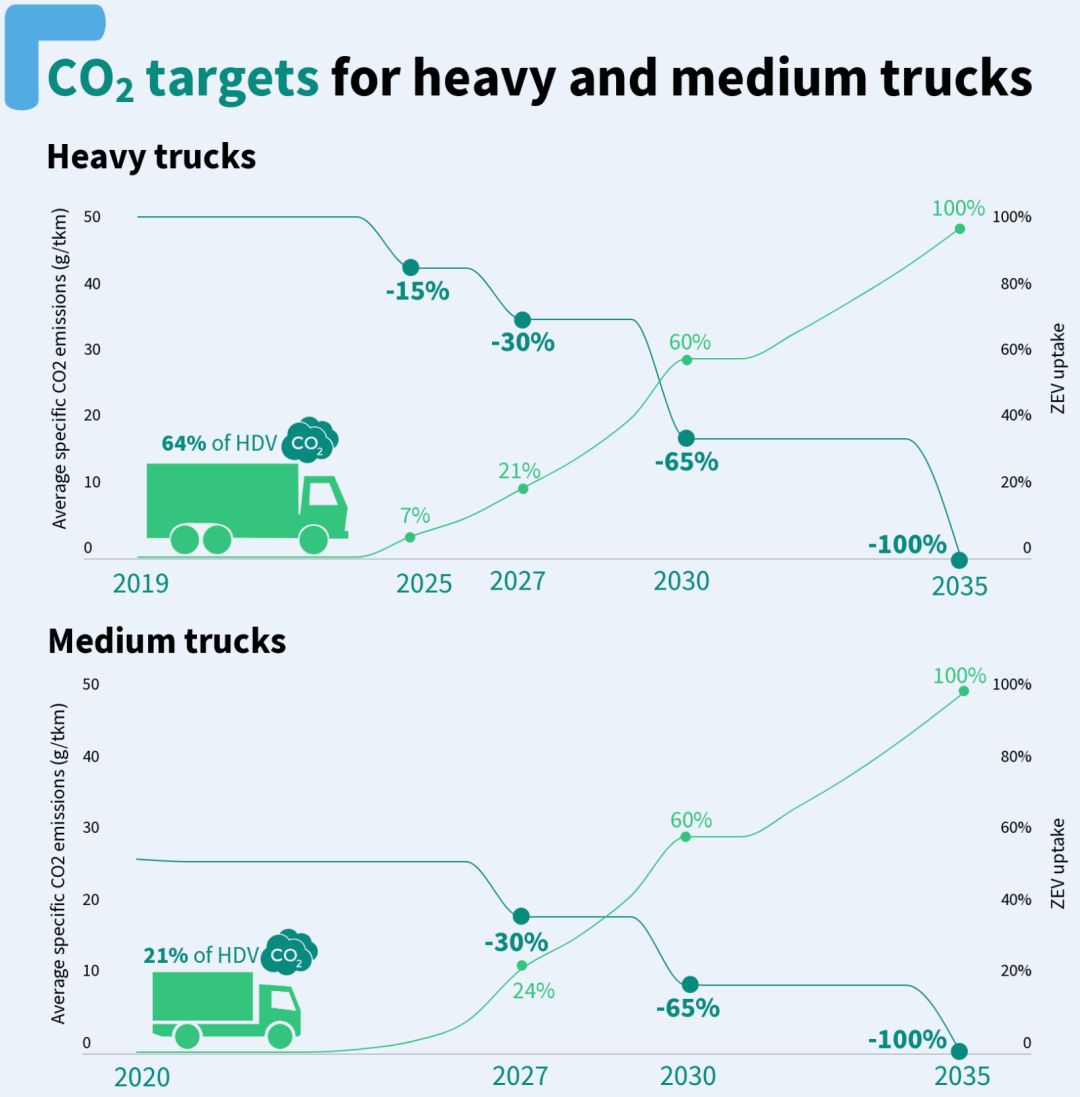
To reduce the EU's greenhouse gas (GHG) emissions and reach climate neutrality by 2050, HDVs need to be entirely decarbonised. Given that trucks last on average more than 18 years on the road, this means ending the **sale of all new freight trucks and buses with combustion engines by 2035**, with vocational vehicles following by 2040. This would **reduce overall HDV emissions by 95% by mid century**, with only a small share of the remaining fleet relying on diesel.

Zero emission vehicles (ZEVs) are the only available technology which can reduce emissions quickly, decarbonise the heavy-duty vehicle sector in the long-term and eliminate harmful air pollution. European truck makers have already announced that they intend to ramp up ZEV sales: an estimated 7% of total truck sales will be zero emission by 2025, rising to 44% by 2030 on average and up to 60% for individual manufacturers. Europe's largest truck maker Daimler has already announced to only sell zero emission trucks and buses from 2039 in Europe. Scania has also pledged to go fully electric by 2040.

The European Commission needs to ensure that these voluntary commitments materialise by including the following key elements in its upcoming legislative proposal:

- A **CO_2 reduction target of -100% should be set for all medium and heavy lorries by 2035**, except for vocational vehicles which should be regulated by a ZEV target (see below).

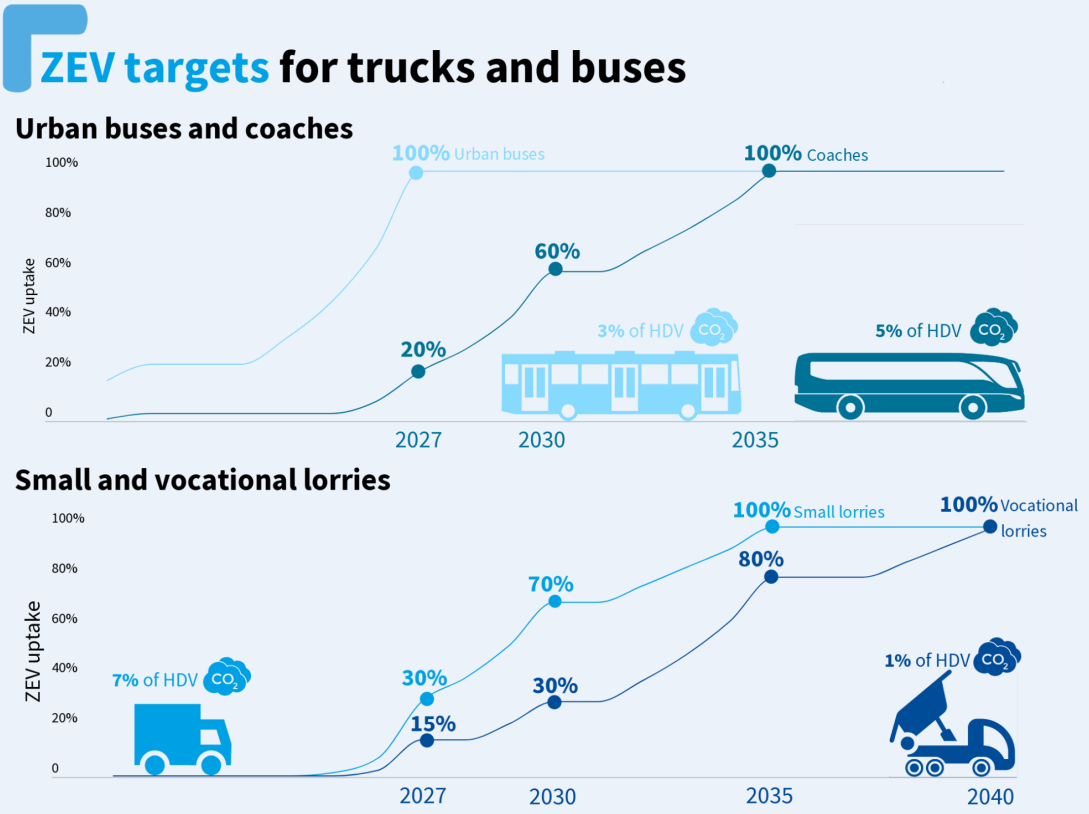
- The current CO_2 target for 2030 of **-30% should be brought forward to 2027** for medium and heavy lorries and should **increase to -65% by 2030**.



- The CO_2 standards are currently only regulating heavy lorries which are responsible for just 64% of all emissions from HDVs. The regulation **needs to be extended and also cover small and medium lorries, vocational trucks, urban buses and coaches as well as trailers**.

- Vehicle groups which are (partly) not certified under the Vehicle Energy Consumption Calculation Tool (VECTO) should be regulated by a **ZEV sales target** and **reach 100%**

ZEV sales in 2027 for urban buses, 2035 for small lorries (3.5 to 7.4 tonnes) and coaches, and 2040 in the case of vocational vehicles.



- The **incentive mechanism for zero- and low-emission vehicles (ZLEVs)** needs to be improved. From 2027, the scope of the benchmark should be **limited to long-haul ZEVs** and eventually **phased out in 2030**.

- **Credits for renewable and low-carbon fuels should not be included in the HDV CO_2 standards** as it would not help solve the emissions problem of HDVs. It would mix different types of regulations and undermine their effectiveness. E-fuels would represent the most costly compliance option and will only be available in limited quantities which are needed for hard-to-abate sectors where electrification is not an option.

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1. Europe's heavy-duty climate problem

The **CO_2 standards for heavy-duty vehicles** (HDVs)[1] are the most important legislation to regulate climate emissions from new trucks and buses in Europe. They set the direction and speed at which original equipment manufacturers of trucks (OEMs) have to produce and sell cleaner trucks. The European Commission is about to review HDV CO_2 standards, which were first adopted in 2019, by the end of November 2022.

HDVs are responsible for **28% of CO_2 emissions from road transport** in the EU,[2] while only accounting for 2% of the vehicles on the road in Europe.[3] If no action is taken, these emissions will continue to grow. The European Commission expects truck activity to further increase by 44% between 2020 and 2050, while activity from buses and coaches would grow by 72% in that same period.[4]

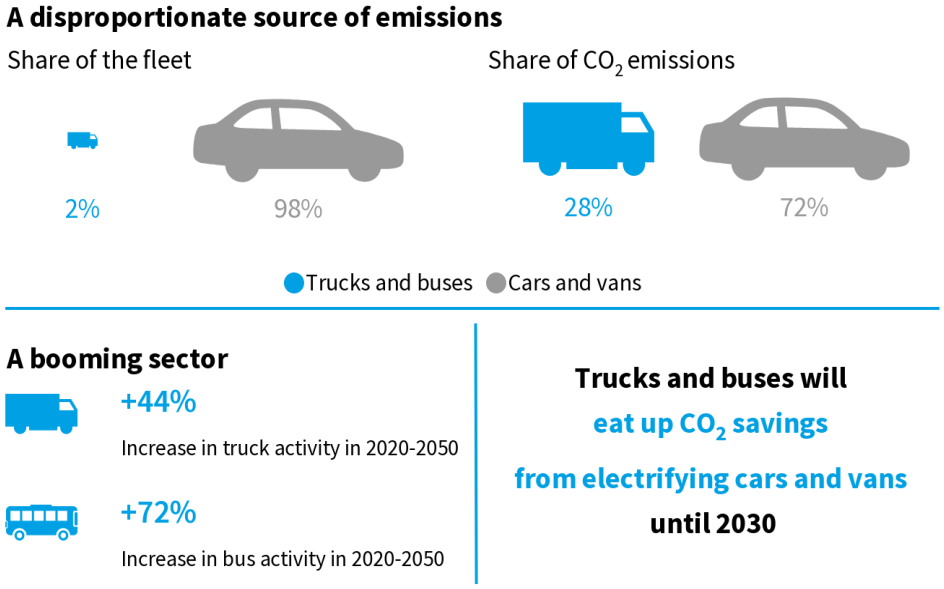

Figure 1. HDV fleet and emission shares

To reduce greenhouse gas (GHG) emissions quickly enough and reach climate neutrality by 2050, HDVs need to be entirely decarbonised. Zero emission vehicles (ZEVs)[5] are the only available technology which can cut emissions from new sales quickly, fully decarbonise the heavy-duty vehicle sector in the long-term and eliminate harmful air pollution. The lifecycle GHG emissions of battery

[1] European Union (2019). Regulation (EU) 2019/1242 setting CO2 emission performance standards for new heavy-duty vehicles. Link.
[2] UNFCCC (2019). GHG data from UNFCCC. Link.
[3] ACEA (2022). Report – Vehicles in use, Europe 2022. Link.
[4] European Commission (2021). EU reference scenario 2020. Link.
[5] Zero emission vehicles are defined as vehicles without an internal combustion engine or with one that emits less than 1 gCO_2/kWh / 1 gCO_2/km (depending on type-approval). This also allows for hydrogen combustion trucks.

electric trucks (BETs) in Europe are already around 50% lower than their diesel counterparts and will continue to decrease further.[6]

Given that on average most trucks last more than 18 years on the road, this means **ending the sale of all new freight trucks and buses with combustion engines by 2035 is necessary**, with vocational vehicles following by 2040. T&E analysis[7] shows that reaching 100% zero emission vehicle sales in all freight segments by 2035 (and for vocational vehicles by 2040) would reduce the sector's overall GHG emissions by 95% by mid century, with only a small number of diesel vehicles remaining in the legacy fleet. Reaching 100% ZEV sales for all segments only by 2040 would fall short of the EU's climate targets: HDV emissions would only be reduced by 89% in 2050, with 20% of the remaining fleet still running on conventional diesel. **Increased ambition is also needed before 2030** to reduce oil demand from HDVs.

2. Setting trucks and buses on a path to 100% ZEV sales

The review of the HDV CO_2 standards is **the opportunity to put the European heavy-duty vehicle sector on a trajectory in line with climate neutrality**. The upcoming proposal by the European Commission can turn the 2020s and 2030s into the key decades to clean up trucking and ensure Europe's continued industrial leadership in the sector. The regulatory ambition needs to reflect the techno-economic and market prospects of ZEVs, while ensuring that the HDV segment delivers the necessary emission savings to reach Europe's climate targets.

2.1. How all new freight trucks and buses *must* and *can* be ZEV by 2035

Reaching **100% ZEV sales by 2035 for all freight trucks, buses and coaches is necessary** in order to decarbonise the fleet in time. A 100% CO_2 reduction target for all freight trucks including small, medium and heavy lorries by the mid 2030s is also feasible from a technological and cost perspective, including for long-haul trucks.[8] Upcoming analysis commissioned by T&E is demonstrating the techno-economic feasibility of reaching 100% zero emission sales for urban and regional delivery, as well as long-haul trucks by the mid 2030s across all European markets.[9]

Endine the sale of polluting diesel trucks in that timeframe also ensures sufficient lead time to roll out the necessary infrastructure network and convert European production lines to a fully zero emission lineup. And ultimately, it will give the necessary technology clarity and investment certainty to the industry.

[6] European Commission (2020). Determining the environmental impacts of conventional and alternatively fuelled vehicles through LCA. Link.
[7] Transport & Environment (2022). Addressing the heavy-duty climate problem. Link.
[8] Transport & Environment (2022). Why long-haul trucks can be battery electric. Link.
[9] TNO (forthcoming). Techno-economic uptake potential of zero-emission heavy duty trucks in Europe.

2.2. Higher ambition is needed to increase ZEV sales before 2030

The current regulation is too weak to ensure ZEV production is ramping up quickly enough and at the volume needed. Previous T&E analysis has shown that OEMs could easily comply with the current regulatory ambition by selling very few ZEVs until 2029.[10]

While the technology costs of ZEVs are expected to drop and infrastructure is about to be rolled out, transport companies who want to go zero emission today are struggling with a lack of supply of ZEVs.[11]

The **CO_2 target for medium and heavy lorries** therefore needs to **increase to -65% in 2030** and a new **intermediate target of 30% should be introduced for 2027**. With Daimler's announcement to sell up to 60% ZEVs by 2030, this can be considered feasible and realistic when taking into account the overall market dynamics and some additional fuel efficiency improvements.[12]

2.3. The regulation needs to be extended to all vehicle types

The CO_2 standards are currently only regulating heavy lorries which are responsible for just 64% of all emissions from HDVs (see figure 2). The **regulation needs to be extended and also cover small and medium lorries, vocational trucks, urban buses and coaches as well as trailers**. Research shows that the cumulative emissions savings of the current CO_2 standards could be increased by up to 50% if they were extended to small and medium lorries, vocational vehicles and trailers.[13]

[10] Transport & Environment (2021). Easy Ride: why the EU truck CO2 targets are unfit for the 2020s. Link.
[11] European Clean Trucking Alliance (2020). Position paper. Make zero-emission trucks an offer you can't refuse. Link.
[12] Detailed analysis commissioned by T&E on the techno-economic and market potential of zero emission trucks will be published later this year.
[13] ICCT (2021). Benefits of extending the EU heavy-duty CO2 emissions standards to other truck segments. Link.

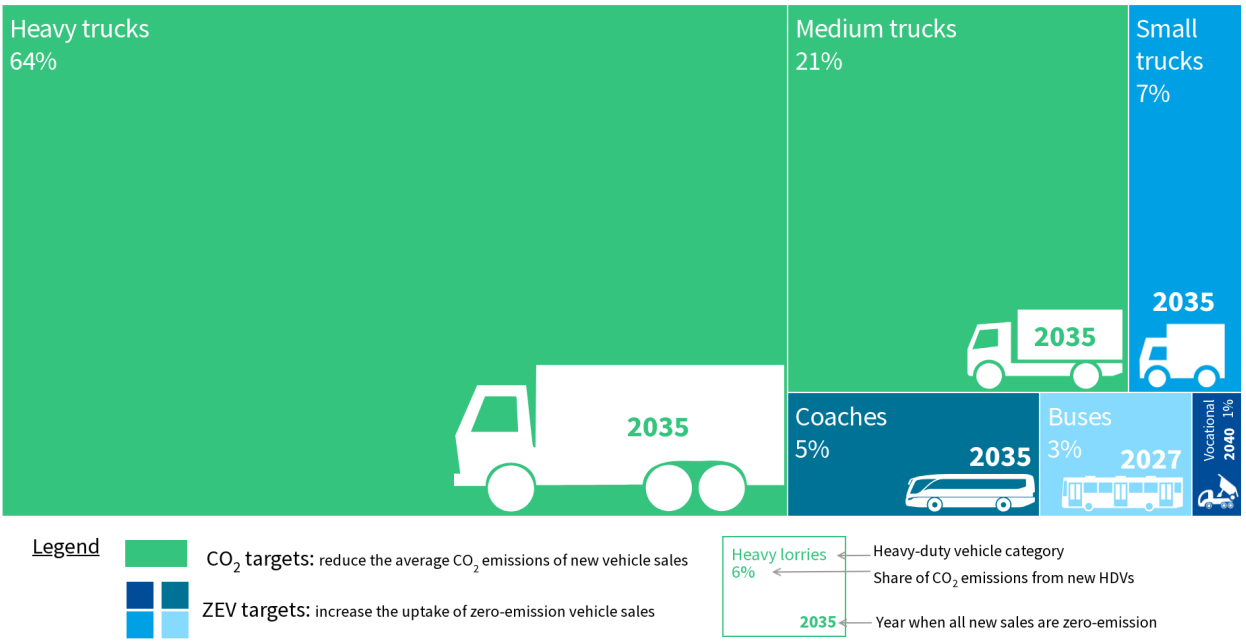

Figure 2. Emissions split between HDV categories

Medium lorries (7.4 to 16 tonnes) should be regulated via the same common CO_2 reduction target as heavy lorries (above 16 tonnes). Vehicle groups which are (partly) not certified under the Vehicle Energy Consumption Calculation Tool (VECTO) on the other hand should be regulated by ZEV sales targets and reach 100% ZEVs in 2027 for urban buses, 2035 for small lorries (3.5 to 7.4 tonnes) and coaches and 2040 in the case of vocational vehicles.[14]

The reason why only certain vehicle groups should be regulated by a CO_2 reduction target and others should fall under a ZEV sales target is that at least parts of these vehicle groups are not certified under VECTO which makes setting a CO2 target impossible.[15] A ZEV target which requires manufacturers to sell a certain share of ZEVs from a given year is therefore the only feasible way to regulate their emissions.

3. Industry is headed for zero emission trucking

Truck makers already aim for 50% zero emission sales by 2030

European truck manufacturers have already announced that they intend to ramp up ZEV sales: an estimated 7% of total truck sales will be zero emission by 2025, rising to 44% by 2030 on average and up to 60% for individual manufacturers.[16] T&E analysis shows that ambitious CO_2 targets for 2030, including a reduction of -65% for medium and heavy lorries, would deliver 659,000 ZEVs on EU+UK

[14] Some unregulated vehicle groups will not be certified under VECTO and can therefore not be regulated by a CO_2 reduction target. They instead require setting ZEV sales which require manufacturers to sell a certain share of ZEVs from a given year.
[15] European Union (2017). Regulation (EU) 2017/2400 as regards the determination of the CO2 emissions and fuel consumption of heavy-duty vehicles. Link.
[16] Transport & Environment. (2021). EU truck targets too weak to incentivise transition to zero-emission vehicles. Link.

roads in total by 2030 (see figure 3). This amounts to just 7% more ZEVs than what truck makers have already announced publicly for the end of the decade.

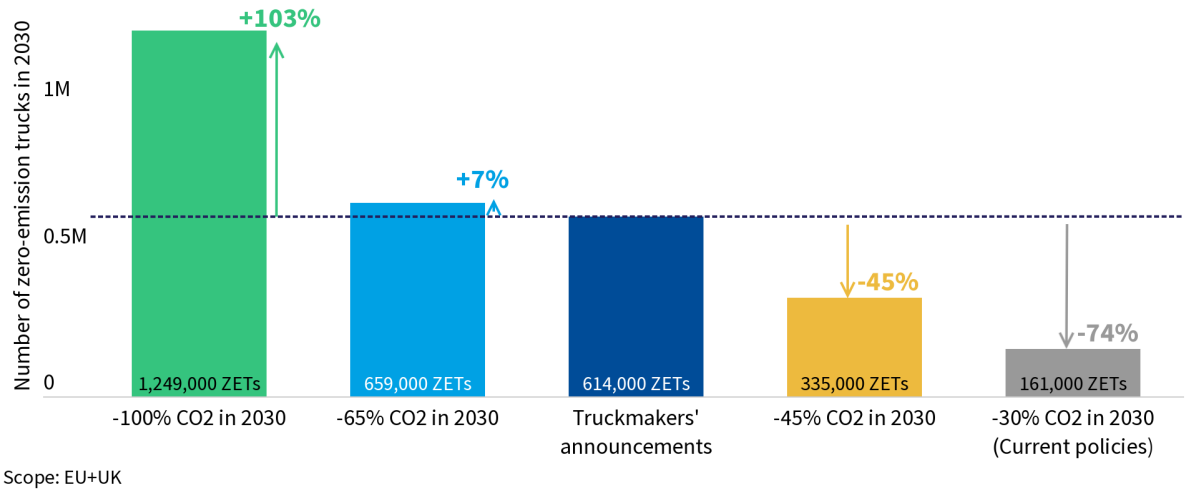

Figure 3. Number of zero emission trucks in 2030

What's more, Europe's largest truck maker Daimler has already announced to only sell zero emission trucks and buses from 2039 in Europe.[17] Scania is aiming to go fully electric by 2040[18] and has pledged to fully transition to zero emission trucks and buses by that date under the 'Global Memorandum of Understanding on Zero-Emission Medium- and Heavy-Duty Vehicles'.[19]

However, these are only voluntary announcements. Stringent CO_2 standards are needed in order to ensure these announcements materialise. The upcoming legislative proposal by the European Commission must take the manufacturers' announcements into consideration and align the regulatory ambition with the expected ZEV market uptake.

Electric long-haul trucks are coming in 2024

There is increasing consensus among truck manufacturers that BETs will play a dominant role in the decarbonisation of the road freight sector. Around 50 BET models have already been announced for series production until 2023.[20] Most of the manufacturers, including Daimler, MAN, Scania and Volvo, are now focussing on bringing them to the mass market for all vehicle segments, and including for long-haul starting from 2024. Recent studies by environmental organisations,[21] research groups[22] and truck makers[23] expect total cost of ownership (TCO) parity of long-haul BETs before or by the mid 2020s depending on the country and available policy incentives.

[17] Daimler (2019). Daimler Trucks & Buses targets completely CO2-neutral fleet of new vehicles by 2039 in key regions. Link.
[18] Eurotransport (2022). Scania ab 2040 nur noch elektrisch. Link.
[19] Calstart (2022). Global MoU Subnational Government & Private Sector Endorsers. Link.
[20] International Energy Agency (2022). Global EV Outlook 2022. Link.
[21] Transport & Environment (2021). How to decarbonise long-haul trucking in Germany. Link.
[22] ICCT (2021). Total cost of ownership for tractor-trailers in Europe: Battery-electric versus diesel. Link.
[23] TRATON (2021). Deep dive e-mobility - the TRATON perspective. Link.

Daimler is readying its 500 km range *eActros LongHaul* truck for series production in 2024.[24] MAN will also begin series production of its first electric long-haul truck with a range of 400 km by 2024.[25] By the same year, Scania will offer battery-powered 40-tonne trucks capable of running four and a half hours between breaks for 560 km.[26] And by 2025, the company also intends to offer battery electric vocational vehicles such as construction, mining and timber trucks.[27] Volvo has already started the series production of its Volvo FH Electric this year which makes it possible to drive up to 500 km with a short stop for charging.[28] In addition, the series production of fuel cell electric trucks (FCETs) is planned for the end of the decade by several manufacturers in Europe.

AFIR will set binding infrastructure targets from mid-decade

Meanwhile, with the Alternative Fuels Infrastructure Regulation (AFIR), the European Commission has proposed mandatory targets for high-power charging stations across the European road network by 2025, reaching full coverage of the network by 2030.[29] The Council's position on the legislation maintains this timeline and foresees additional targets for 2027, while targets for hydrogen refuelling stations will follow from 2030.[30] Although the draft regulation in its current state is underestimating the expected market deployment of BETs, it will ensure a basic coverage of truck charging infrastructure when the first electric long-haul trucks are coming to market and reach full network coverage by 2035.[31]

Progress on the ground is not waiting for AFIR to be finalised. A joint venture by the five major truck brands Daimler, MAN, Scania, Volvo and Renault Trucks plans to install 1,700 public truck charging points across Europe by the second half of the 2020s.[32] CharIN, the industry's standardisation initiative, has launched the Megawatt Charging System (MCS)[33], which is capable of recharging battery electric trucks during their daily rest breaks. The technology will be commercially available in 2024. Research has shown that high-power truck charging is not only technically and economically feasible but would also not pose fundamental challenges with respect to the grid connection.[34]

[24] Daimler (2022). Mercedes-Benz Trucks to unveil the eActros LongHaul electric truck for long-distance transport in September. Link.
[25] MAN (2022). MAN and ABB E-mobility rev up for the next phase of electromobility in long-haul trucking. Link.
[26] Scania (2022). The Scania Report 2021. Annual and Sustainability Report. Link.
[27] Scania (2021). Scania's commitment to electrification – our initiatives so far. Link.
[28] Volvo (2022). Volvo's heavy-duty electric truck is put to the test: excels in both range and energy efficiency. Link.
[29] European Commission (2021). Proposal for a regulation of the European Parliament and of the Council on the deployment of alternative fuels infrastructure. Link.
[30] Council of the EU (2022). General approach on alternative fuels infrastructure (AFIR). Link.
[31] Transport & Environment (2021). AFIR: How can the EU's infrastructure law make Europe 'fit for 55'? Link.
[32] TRATON (2021). The TRATON GROUP, Daimler Truck, and Volvo Group sign joint venture agreement for European high-performance charging network. Link.
[33] CharIN (2022). CharIN e. V. officially launches the Megawatt Charging System (MCS) at EVS35 in Oslo, Norway. Link.
[34] Transport & Environment (2022). Flicking the switch on truck charging. Link.

Europe's industrial leadership is at stake

Europe's truck makers are world leaders in developing commercial vehicle technology and established a growing presence in global and emerging markets.[35,36,37] With increasing competition from overseas, Europe's automotive and supplier industry risks falling behind and losing its global competitiveness. Not giving the right market signal by setting ambitious CO_2 standards and putting an end date to polluting diesel trucks would risk jeopardising Europe's technological edge in the heavy-duty industry and could make the continent a mere import destination for the technology of tomorrow.

4. Detailed recommendations

4.1. CO_2 targets for medium and heavy lorries

The current CO_2 target of -15% which will take effect in 2025 should continue to apply to heavy lorries. The banking and borrowing mechanism should also be maintained. The CO_2 target for 2030 of -30% should be brought forward to 2027 and apply to both medium lorries as well as heavy lorries in the form of one common target.[38] Such an intermediate target in 2027 would lead to a faster ramp-up of ZEV sales already from the second half of the 2020s, while still providing enough lead time for truck makers in regard to their development cycles.

The common target for medium and heavy lorries should increase to -65% by 2030. This is the equivalent of a 60% ZEV sales share, assuming a modest 1.3% fuel efficiency improvement of newly sold combustion trucks per year.[39] By 2035, a CO_2 target of -100% should apply to all medium and heavy lorries, except for vocational vehicles which should be regulated under a ZEV target (see section 3.3).[40]

[35] ICCT (2020). Race to zero. How manufacturers are positioned for zero emission commercial trucks and buses in North America. Link.
[36] ICCT (2021). The evolution of commercial vehicles in China: a retrospective evaluation of fuel consumption standards and recommendations for the future. Link.
[37] ICCT (2021). Market analysis of heavy-duty vehicles in India for fiscal years 2019–20 and 2020–21. Link.
[38] Applying a common target to both medium and heavy lorries would provide OEMs with additional flexibility by allowing them to comply with the targets over a wider range of vehicle sales.
[39] ICCT (2017). Fuel Efficiency Technology in European Heavy-Duty Vehicles: Baseline and Potential for the 2020–2030 Time Frame. Link.
[40] This concerns the vehicle groups 4v, 5v, 9v and 10v which are currently exempt from the regulation of heavy lorries. They should continue to be kept separate from the heavy lorry group and instead be regulated under the ZEV target for vocational vehicles.

Table 1. CO_2 targets for medium and heavy lorries

Vehicle category (weight)	VECTO groups (axle config)	Type of target	Targets	Comments
Heavy lorries (> 16 t)	4, 5 (4 x 2) 9, 10 (6 x 2) 11, 12 (6 x 4)	CO_2 reduction target	- 15% 2025 -30% 2027 -65% 2030 -100% 2035	Vocational trucks included under ZEV target for 'vocational vehicles'
Medium lorries (7.4 - 16 t)	1s, 1, 2, 3 (4 x 2)	CO_2 reduction target	-30% 2027 -65% 2030 -100% 2035	Common CO2 reduction target with heavy lorries from 2027

Currently most heavy lorries above 16 tonnes are regulated under the HDV CO_2 standards. Vehicle groups 11 and 12, mostly composed of delivery trucks, are not. But they are already certified under VECTO and covered under the monitoring and reporting regulation. They should therefore be included under the heavy lorry category as well.

Also certified but unregulated are medium lorries between 7.4 to 16 tonnes. They offer robust certification data under VECTO and should be covered by the same CO_2 target as heavy lorries. Their reference CO_2 emissions will be determined based on the available monitoring and reporting data for the reference period 2020-2021 (also called the 'baseline').[41] Vocational vehicles which fall under these groups are mostly municipal utility vehicles such as garbage trucks and should be included under the same CO_2 target.[42]

Vocational vehicles which fall under the currently regulated heavy lorries (4v, 5v, 9v and 10v) are exempt from the regulation at the moment. As they mostly comprise construction trucks, they should continue to be kept separate and instead be regulated by a common ZEV target together with other vocational vehicles (see section 3.3).

ZLEV incentive mechanism

The regulation includes a mechanism to incentivise the sales of zero- and low-emission vehicles (ZLEVs) by rewarding manufacturers with an on-paper CO_2 emissions reduction. This applies in the form of a super-credits scheme until 2024, which counts new ZLEVs with a multiplier of up to two against the targets. From 2025, a bonus-only benchmark applies. It incentivises manufacturers who reach at least 2% ZEV sales by reducing their CO_2 reduction target. For each percentage point above the 2%, the target will be reduced accordingly. The benchmark is capped at 5%, which means that the target can be diluted by up to 3 percentage points.

[41] European Union (2018). Regulation (EU) 2018/956 on the monitoring and reporting of CO2 emissions from and fuel consumption of new heavy-duty vehicles. Link.
[42] European Commission (2017). VECTO tool development: Completion of methodology to simulate Heavy Duty Vehicles' fuel consumption and CO2 emissions. Link.

An incentive mechanism can have merit to act as a temporary stimulus to kick-start the zero emission truck market. But it should only reward future-proof technologies in those vehicle segments which are yet to begin their transition to zero emission. The current mechanism however counts all ZEVs equally, with low emission vehicles (LEVs) and even unregulated ZEVs also being counted (except for buses and coaches). In addition, the ZLEV incentive mechanism lacks ambition. The benchmark of 2% will be reached easily already before the mid 2020s given the current market dynamics.

The most recent change to the certification regulation is introducing the certification of electric vehicle range. This metric should be used to determine which vehicles are counted towards the benchmark from 2027. Only ZEVs with a certified electric range of 400 km and more should count. This would incentivise a faster ramp-up of ZEVs in the long-haul segment. From 2027, the scope of the benchmark should be limited to long-haul ZEVs in which case an ambition level of a minimum 15% ZEV sales share would be appropriate from 2027.

The benchmark design should also be complemented by a malus. LEVs and unregulated ZEVs should not count towards the benchmark anymore from 2027. Finally, the mechanism should be phased out by 2030 when it is expected that ZEVs will account for the majority of the sales.

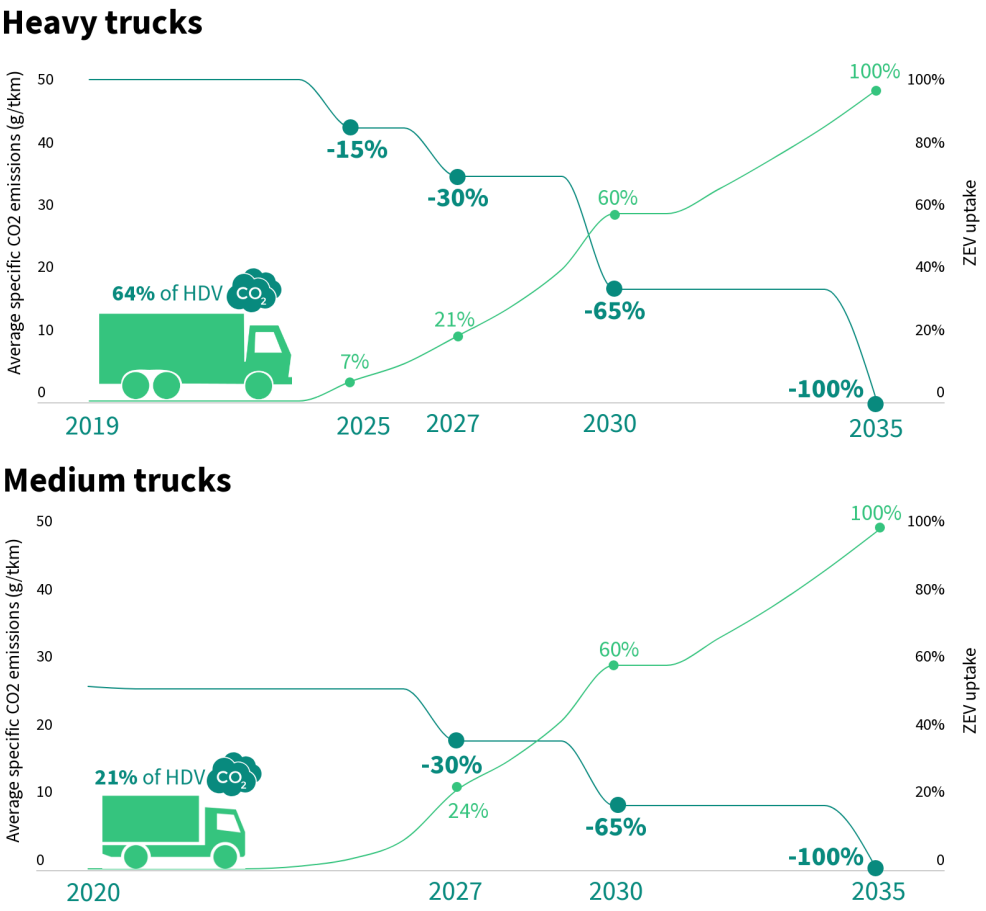

Figure 4. CO_2 reduction targets for medium and heavy lorries

3.2. ZEV targets for small lorries

Currently unregulated small lorries comprise all other trucks between 3.5 and 7.4 tonnes which are type-approved as HDVs. The European Commission has decided that some unregulated vehicle groups will not be certified under VECTO, including small lorries up to 5 tonnes. This means that they cannot be regulated by a CO_2 reduction target. A ZEV target should therefore be applied. Such a target would require manufacturers to sell a certain share of ZEVs from a given year.

This ZEV target should also apply to vehicles between 5 and 7.4 tonnes despite those already being included under VECTO. Vehicles type-approved as LDVs but not regulated under the CO_2 standards for cars and vans should be included in this category as well to avoid creating a loophole between the two regulations.[43]

For small lorries, a ZEV target of 35% should be introduced in 2027. In line with an optimal trajectory, this ZEV target should be increased to 70% by 2030 and 100% by 2035. Transitioning all small lorry sales to zero emission by the mid 2030s is feasible from a techno-economic perspective. A recent study has examined the TCO for this particular vehicle segment and concluded that TCO parity can be reached in all six examined European cities by 2030 without purchase subsidies.[44]

Table 2. ZEV targets for small lorries

Vehicle category (weight)	VECTO groups (axle config)	Type of target	Targets	Comments
Small lorries (3.5 - 7.4 t)	0 (4 x 2) 53 (4 x 2) 54 (4 x 2)	ZEV target	30% 2027 70% 2030 100% 2035	ZEV target proposed as VECTO certification not available

3.3. ZEV targets for vocational vehicles

Vocational vehicles such as refuse and construction trucks are currently not regulated under the HDV CO_2 standards. Given that the majority of those vehicle groups that consist of vocational trucks will not be certified under VECTO, a ZEV target should also be applied to those.

A multi-stage production process is very common for vocational vehicles where the first-stage manufacturer is responsible for the base vehicle (which includes the drivetrain and chassis) on the

[43] Heavy-duty engine type-approval under EU Regulation 595/2009 applies to all vehicles exceeding a reference mass of 2,610 kg. At the request of the manufacturer, vehicle variants with a reference mass up to 2,840 kg can be type-approved under the light-duty chassis dynamometer test as per EU Regulation 715/200. Those vehicles do not fall under the CO_2 standards for cars and vans and must therefore be included under the HDV CO_2 standards.
[44] ICCT and RAP (2022). Electrifying last-mile delivery: a total cost of ownership comparison of battery-electric and diesel trucks in Europe. Link.

one hand and the second-stage manufacturer for the superstructure (such as the bodywork) on the other.[45] Applying a CO_2 reduction target based on VECTO certification would lead to additional regulatory complexity due to shared responsibilities, while a ZEV target would offer a simple solution to limit the scope of the regulation to the first-stage manufacturer of the base vehicle.

Vocational vehicles which belong to the vehicle groups 4v, 5v, 9v and 10v and which are currently exempt from the regulation should be included under this ZEV target. The same should apply to the vehicle groups 6, 7, 8, 13, 14, 15 and 17 which are not going to be included in VECTO and are almost exclusively composed of vocational vehicles. The vehicle groups 11v, 12v and 16 fall under the certification regulation but mostly comprise vocational trucks and should therefore also be grouped under this ZEV target.

Table 3. ZEV targets for vocational vehicles

Vehicle category (weight)	VECTO groups (axle config)	Type of target	Targets	Comments
Vocational vehicles (all weights)	4v, 5v (4 x 2) 9v, 10v (6 x 2) 6, 7, 8 (4 x 4) 11v, 12v (6 x 4) 13, 14, (6 x 6) 15 (8 x 2) 16 (8 x 4) 17 (8 x 6 / 8 x 8)	ZEV target	15% 2027 30% 2030 80% 2035 100% 2040	ZEV target proposed as VECTO certification not available for most vehicle groups

For vocational trucks, a first ZEV target of 15% should apply in 2027. Subsequent targets should be set for 2030 (30%) and 2035 (80%). Construction trucks, off-road vehicles or vehicles for heavy-load or special road freight movements may have more challenging operational requirements in terms of onboard energy storage, running time or infrastructure. Since they usually run lower mileage, they might also need more time to achieve TCO parity compared to long-haul trucks. A 100% ZEV target should therefore be set for 2040.

[45] European Commission (2014). Development and validation of a methodology for monitoring and certification of greenhouse gas emissions from heavy duty vehicles through vehicle simulation. Link.

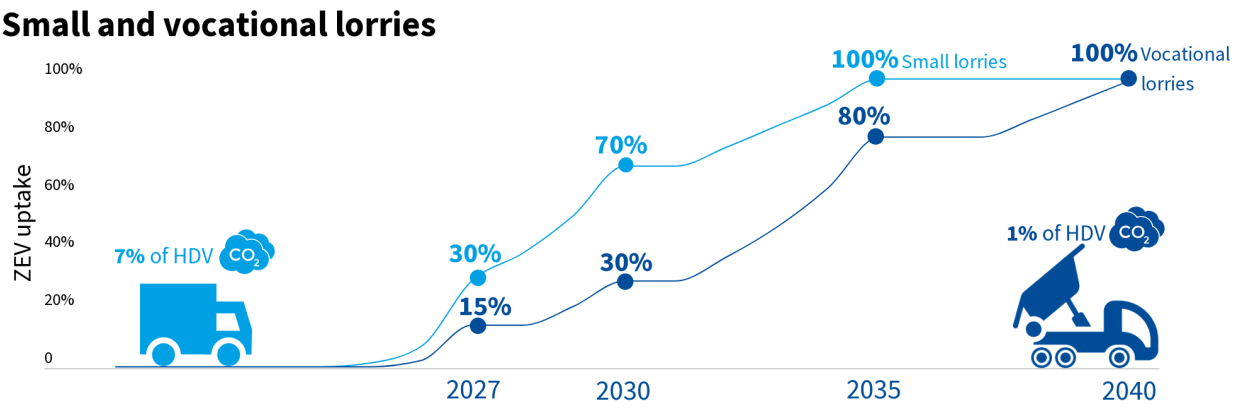

Figure 5. ZEV targets for small lorries and vocational vehicles

3.4. ZEV targets for urban buses and coaches

Both urban buses and coaches should be regulated on the basis of a ZEV target. All medium and heavy buses as well as coaches exceeding 3.5 tonnes and type-approved as HDVs should be included. Buses are included in the VECTO certification procedure.[46] However,the accuracy of the simulation of urban buses apparently lacks robustness.

In addition, the multi-stage production process is also very common for urban buses and coaches where different manufacturers are responsible for the base vehicle and the superstructure. A ZEV target would offer a simple solution to limit the scope of the regulation to the first-stage manufacturer of the base vehicle.[47]

Opting for a ZEV target for both urban buses and coaches would also limit the complexity of the monitoring and reporting procedure as it would exempt second-stage manufacturers from the reporting obligations.

Urban buses should therefore be regulated by a 100% ZEV target in 2027. A 100% ZEV target in 2027 for urban buses is feasible when considering that 23% of all EU sales in 2021 were already zero emission, with both Western and Eastern European member states leading the way (Netherlands already at 100% and Bulgaria at 73%).[48]

[46] European Union (2022). Regulation (EU) 2022/1379 as regards the determination of the CO2 emissions and fuel consumption of medium and heavy lorries and heavy buses and to introduce electric vehicles and other new technologies. Link.
[47] Limiting the scope to first-stage manufacturers would also not lead to a distortion of the market. According to ACEA, the main vehicle OEMs are already responsible for around 80% of new vehicle registrations as single-stage manufacturers. See also ACEA (2022). Position Paper. Review of CO2 emission standards regulation for heavy-duty vehicles. Link.
[48] Transport & Environment (2022). Cities are buying more electric buses, but an EU deadline is needed. Link.

Multiple bus manufacturers have already decided to go fully electric. Daimler has announced to only offer zero emission city buses from 2030[49] and MAN is aiming for 100% city buses to be battery electric by 2030.[50] It is also necessary given the Clean Vehicles Directive (CVD),[51] which sets targets for the procurement of 'clean buses', would only deliver around 31% zero emission bus sales between 2026–2030.

Table 4. ZEV targets for urban buses and coaches

Vehicle category (weight)	VECTO groups (axle config)	Type of target	Targets	Comments
Urban buses (low-floor)	31 - 40	ZEV target	100% 2027	ZEV target proposed due to multi-stage process
Coaches (high-floor)	31 - 40	ZEV target	20% 2027 60% 2030 100% 2035	ZEV target proposed due to multi-stage process

Coaches should follow a similar trajectory as medium and heavy lorries, with ZEV targets of 20% in 2027, 60% in 2030 and 100% in 2035. This is in line with what can be considered feasible for coaches due to their similarities with long-haul trucks in regard to their operational needs and expected TCO parity.

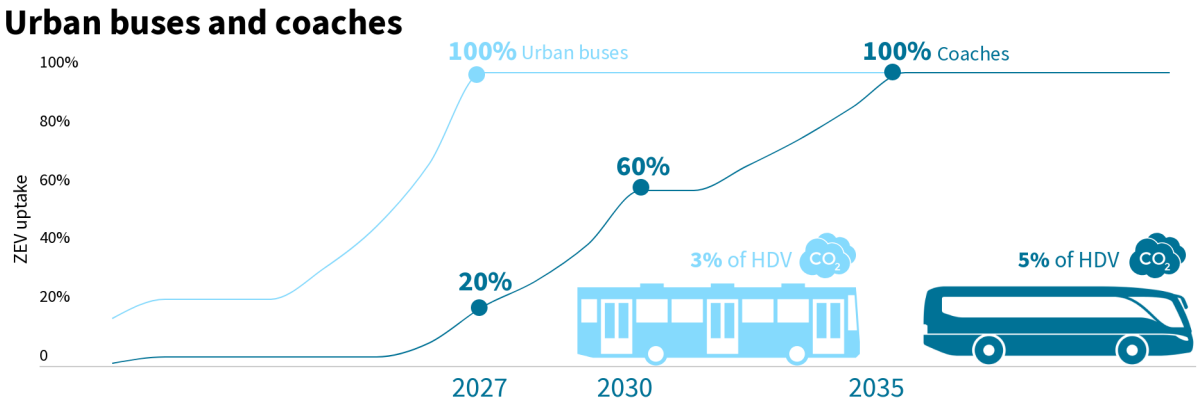

Figure 6. ZEV targets for urban buses and coaches

[49] Daimler (2022). Daimler Buses to offer CO2-neutral vehicles in every segment by 2030 – dual-track strategy based on batteries and hydrogen. Link.
[50] MAN (2022). Presentation by Alexander Vlaskamp CEO of MAN Truck & Bus SE at the International Press Workshop of the IAA Transportation. Link.
[51] European Union (2019). Directive (EU) 2019/1161 on the promotion of clean and energy-efficient road transport vehicles. Link.

3.5. Energy efficiency standards for trailers

Trailers can be made more energy efficient by reducing their aerodynamic drag, rolling resistance and curb weight. As part of the HDV CO_2 standards, energy efficiency standards for trailers should be introduced so that cost-effective efficiency technologies can be scaled up on the market.

This is now possible with the most recent change to the certification regulation, which extends VECTO also to trailers.[52] Energy efficiency standards should be set for box trailer types where this is technically and practically feasible (around 69% of total trailer sales[53]).

A first target should be set for 2027 and second for 2030. According to the ICCT, the maximum cost effective potential by 2030 would be an efficiency improvement of 12.3% for long-haul and 8.6% for regional delivery. Based on this, a 5% energy efficiency target is proposed for 2027 and 7% by 2030 for the regional delivery duty cycle, and 7% for 2027 and 10% by 2030 for the long-haul duty cycle.

Table 5. Energy efficiency standards for trailers

Vehicle category (weight)	VECTO groups (axle config)	Type of target	Targets	Comments
Trailers	-	Energy efficiency standard	5% RD 2027 7% LH 2027 7% RD 2030 10% LH 2030	RD: regional delivery cycle LH: long-haul cycle

4. Why fuels should not be included in the regulation

A crediting system for so-called 'renewable and low-carbon' fuels, including advanced biofuels and e-fuels, should not be included in the HDV CO_2 standards as this would risk creating regulatory loopholes and not help reducing emissions from HDVs due to sustainability issues and future supply limitations.

A fuel crediting system risks creating regulatory loopholes

Fuel credits would mix well-to-tank (fuels and electricity) and tank-to-wheel (vehicle tailpipe emissions) regulations which would lead to incoherent and, in the worst case, unenforceable legislation. It would blur the roles and responsibilities of different market participants for a regulation that only applies to vehicle manufacturers. It would also increase the risk of double-counting and cause additional administrative burden for EU and national authorities that would need to track fuel credit trading, sustainability criteria and overall compliance. Instead, fuels

[52] European Union (2022). Regulation (EU) 2022/1362 as regards the performance of heavy-duty trailers with regard to their influence on the CO2 emissions, fuel consumption, energy consumption and zero emission driving range of motor vehicles. Link.
[53] ICCT (2018). Market analysis of heavy-duty commercial trailers in Europe. Link.

and electricity should continue to be governed by separate regulations as part of the Renewable Energy Directive (RED) and the Fuel Quality Directive (FQD).

Fuels would not help reduce emissions from HDVs

Food- and crop-based biofuels are associated with significant indirect emissions, often causing higher GHGs than their fossil counterpart.[54] Synthetically produced fuels, such as e-fuels, would also not be able to reduce air pollutant emissions in any meaningful way.[55]

E-fuels will remain scarce and expensive

Advanced biofuels and e-fuels can technically be produced sustainably but scaling up renewables, electrolyser and e-fuel production facilities will take time and larger quantities would likely not be available before 2040.[56] The limited quantities, which will be available, are needed to decarbonise hard-to-abate sectors where electrification is not an option such as aviation, maritime shipping and parts of industry.[57] These sectors will also have a higher willingness to pay for these fuels which would make it challenging to provide any substantial volumes to road transport.

E-fuels would also represent the most costly compliance option for truck manufacturers and society as a whole. Trucks are heavily used capital goods that run for more than one million kilometres over their lifetime.[58] This means that energy costs dominate the TCO. Previous analysis by T&E has shown that internal combustion trucks running on e-fuels would never be cost-competitive with zero emission alternatives, not even if those fuels were being produced overseas in favourable regions and imported to Europe.[59]

5. Other regulatory elements

5.1. Extending the monitoring and reporting regulation

The proposed ZEV targets for small lorries, vocational vehicles, buses and coaches as well as efficiency standards for trailers require the extension of the monitoring and reporting obligations for manufacturers and member states to the affected vehicle groups in order to verify compliance. This needs to be done by amending the monitoring and reporting regulation.[60]

[54] ICCT (2017). Potential greenhouse gas savings from a 2030 greenhouse gas reduction target with indirect emissions accounting for the European Union. Link.
[55] Transport & Environment (2021). Magic green fuels: Why synthetic fuels in cars will not solve Europe's pollution problems. Link.
[56] Odenweller et al. (2022). Probabilistic feasibility space of scaling up green hydrogen supply. Link.
[57] Transport & Environment (2020). E-fuel would be wasted on cars while it's badly needed to decarbonise planes and ships – study. Link.
[58] ICCT (2018). European heavy-duty vehicles: Cost-effectiveness of fuel efficiency technologies for long-haul tractor-trailers in the 2025 - 2030 timeframe. Link.
[59] Transport & Environment (2021). How to decarbonise long-haul trucking in Germany. Link.
[60] European Union (2018). Regulation (EU) 2018/956 on the monitoring and reporting of CO2 emissions from and fuel consumption of new heavy-duty vehicles. Link.

Multi-stage production is particularly common for small lorries, vocational vehicles, buses and coaches. Opting for a ZEV target for these vehicle types would limit the complexity of the monitoring and reporting procedure as it offers the opportunity to limit the regulatory procedure to the first-stage manufacturer and ignore second-stage manufacturers.

5.1. Exemptions for small-volume manufacturers

Due to a more fragmented market, the possibility to exempt small-volume manufacturers from the regulation of small lorries, vocational vehicles, buses and coaches as well as trailers could be considered in which case an appropriate definition and sales threshold needs to be determined.

5.3. Pooling between manufacturers

Pooling between the established truck manufacturers may hamper technological competition between an already limited number of truck manufacturers. However, this may be less of a problem in the case of new market entrants which are focussing exclusively on ZEVs.

The option to allow pooling between new (small scale) and established truck makers based on an appropriate definition and annual production threshold could therefore be considered. Such a mechanism could foster innovation in the heavy-duty vehicle sector and help new market entrants to enter the zero emission vehicles benefiting competition and innovation.

5.4. Use of revenues from emissions fines

To aid the transition, the EU should establish a comprehensive European automotive transition agenda (including but not limited to HDVs) and establish a dedicated fund to finance the conversion and re-skilling of the labour workforce across Europe. Such a fund should support the transition towards the establishment of new industries and skills in those regions where the impact of the transition will be most acute. In the case where truck manufacturers would fail to meet their targets and would have to pay penalties, the revenues from such fines should be allocated to such a fund.

6. Conclusions

The HDV CO_2 standards are the most important legislation to regulate climate emissions from new trucks and buses. HDVs are responsible for 28% of CO_2 emissions from road transport in the EU. If no action is taken, these emissions will continue to grow.

To reduce emissions by at least -55% by 2030 and reach climate neutrality by 2050, HDVs need to be entirely decarbonised. To achieve this, a 100% CO_2 reduction target in 2035 for all freight trucks and buses is necessary. The CO_2 targets for medium and heavy lorries need to increase to -65% in 2030

and a new intermediate target of -30% should be introduced for 2027. In addition, the regulation needs to be extended and also cover small and medium lorries, vocational trucks, urban buses and coaches as well as trailers.

Credits for so-called 'renewable and low-carbon' fuels should not be included in the HDV CO_2 standards as it would not help solve the emissions problem of trucks and buses and risk creating regulatory loopholes.

The review of the HDV CO_2 standards is the once in a decade opportunity to put the heavy-duty vehicle sector in Europe on a trajectory in line with climate neutrality. The upcoming proposal can turn the 2020s and 2030s into the key decades to clean up trucking and ensure Europe's continued leadership in the industry.

Further information

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Summary table

Vehicle category (weight)	VECTO groups (axle config)	Type of target	Targets	Comments
Heavy lorries (> 16 t)	4, 5 (4 x 2) 9, 10 (6 x 2) 11, 12 (6 x 4)	CO_2 reduction target	- 15% 2025 -30% 2027 -65% 2030 -100% 2035	Vocational trucks included under ZEV target for 'vocational vehicles'
Medium lorries (7.4 - 16 t)	1s, 1, 2, 3 (4 x 2)	CO_2 reduction target	-30% 2027 -65% 2030 -100% 2035	Common CO_2 reduction target with heavy lorries from 2027
Small lorries (3.5 - 7.4 t)	0 (4 x 2) 53 (4 x 2) 54 (4 x 2)	ZEV target	30% 2027 70% 2030 100% 2035	ZEV target proposed as VECTO certification not available
Vocational vehicles (all weights)	4v, 5v (4 x 2) 9v, 10v (6 x 2) 6, 7, 8 (4 x 4) 11v, 12v (6 x 4) 13, 14, (6 x 6) 15 (8 x 2) 16 (8 x 4) 17 (8 x 6 / 8 x 8)	ZEV target	15% 2027 30% 2030 80% 2035 100% 2040	ZEV target proposed as VECTO certification not available for most vehicle groups
Urban buses (low-floor)	31 - 40	ZEV target	100% 2027	ZEV target proposed due to multi-stage process
Coaches (high-floor)	31 - 40	ZEV target	20% 2027 60% 2030 100% 2035	ZEV target proposed due to multi-stage process
Trailers	-	Energy efficiency standard	5% RD 2027 7% LH 2027 7% RD 2030 10% LH 2030	RD: regional delivery cycle LH: long-haul cycle