



# Review of the HDV CO2 standards

T&E's response to the public consultation

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February 2022

## 1. Executive summary

The CO2 standards for new heavy-duty vehicles (HDVs) are the most important legislation which regulates the climate emissions from new trucks and buses in Europe. The legislation sets the direction and the speed at which truck OEMs have to produce and sell cleaner trucks.<sup>1</sup> HDVs are responsible for 27% of CO2 emissions from road transport in the EU,<sup>2</sup> while only accounting for 2% of the vehicles on the road in Europe.<sup>3</sup>

To reduce the EU's greenhouse gas (GHG) emissions by at least 55% until 2030 and reach climate neutrality by 2050, HDVs need to be decarbonised. To achieve this, the sale of most conventional trucks and buses must be ended by 2035. The review of the HDV CO2 standards which is expected for the last quarter of 2022 is the once in a decade opportunity to put HDVs on a Green Deal compliant trajectory.<sup>4</sup>

### Truck makers announce close to 50% ZEV sales by 2030

Zero emission vehicles (ZEVs) are the only available technology which can reduce emissions quickly, decarbonise the HDV sector in the long-term and tackle harmful air pollution. The lifecycle GHG emissions of battery electric trucks (BETs) are already 50% lower than their diesel counterparts and will continue to decrease.<sup>5</sup>

European truck manufacturers have already made voluntary commitments for ramping up ZEV sales: An estimated 4 - 9% of total truck sales would be zero emission by 2025, rising to 41 - 47% by 2030 on average, and up to 60% for individual manufacturers.<sup>6</sup>

But these are only voluntary commitments with no regulatory certainty or safeguards and strong HDV CO2 standards are needed to make this happen. The European Commission needs to align its

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<sup>1</sup> European Union (2019). Regulation (EU) 2019/1242 of the European Parliament and of the Council of 20 June 2019 setting CO2 emission performance standards for new heavy-duty vehicles. [Link](#).

<sup>2</sup> UNFCCC (2019). GHG data from UNFCCC. [Link](#).

<sup>3</sup> ACEA (2022). Report – Vehicles in use, Europe 2022. [Link](#).

<sup>4</sup> European Commission (2021). Reducing carbon emissions – review of emission standards for heavy-duty vehicles. [Link](#).

<sup>5</sup> European Commission (2020). Determining the environmental impacts of conventional and alternatively fuelled vehicles through LCA. [Link](#).

<sup>6</sup> Transport & Environment (2021). Easy Ride: why the EU truck CO2 targets are unfit for the 2020s. [Link](#).

impact assessment assumptions on the future uptake of ZEVs based on the current and expected market dynamics.

### **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. Overall, more than 60 BET models have been announced for 2023.<sup>7</sup> Most of the manufacturers, including Daimler,<sup>8</sup> MAN,<sup>9</sup> Scania<sup>10</sup> and Volvo,<sup>11</sup> are now focussing on bringing them to the mass market for all vehicle segments, and including long-haul starting from 2024.

Daimler is readying its 500 km range eActros LongHaul truck for series production in 2024. MAN is also initially planning with 500 km ranges from 2024. Scania intends to enter the long-haul market by the same year with vehicles capable of running four and a half hours between breaks. Recent studies by environmental organisations,<sup>12</sup> research groups<sup>13</sup> and truck makers<sup>14</sup> expect total cost of ownership (TCO) parity of long-haul BETs before or by the mid 2020s depending on the policy incentives.

### **AFIR proposes infrastructure targets for 2025**

Meanwhile, with the Alternative Fuels Infrastructure Regulation (AFIR), the European Commission has proposed mandatory targets to roll out a network of high-power charging stations across Europe by 2025 and although the proposal 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 entering the market.<sup>15</sup>

### **The CO2 targets are too weak to exploit the potential of ZEVs**

However, while the technology costs of ZEVs are coming down and charging infrastructure is about to be rolled out, transport companies who want to go zero emission are struggling with a lack of supply of ZEV models.<sup>16</sup> The current CO2 reduction targets are too weak to ramp up the supply of ZEVs quickly on time and with the volume needed to decarbonise road freight. T&E analysis shows that OEMs can comply by selling almost no ZEVs until 2029.<sup>17</sup>

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<sup>7</sup> International Energy Agency (2021). Global EV Outlook 2021. [Link](#).

<sup>8</sup> Daimler Truck (2021). Daimler Truck Strategy Day. [Link](#).

<sup>9</sup> Handelsblatt (2021). Abschied vom Diesel – MAN kündigt Serienproduktion von Elektro-Lastwagen an. [Link](#).

<sup>10</sup> Scania (2021). Scania's commitment to electrification – our initiatives so far. [Link](#).

<sup>11</sup> Volvo (2021). Volvo Trucks ready to electrify a large part of goods transports. [Link](#).

<sup>12</sup> Transport & Environment (2021). How to decarbonise long-haul trucking in Germany. An analysis of available vehicle technologies and their associated costs. [Link](#).

<sup>13</sup> ICCT (2021). Total cost of ownership for tractor-trailers in Europe: Battery-electric versus diesel. [Link](#).

<sup>14</sup> TRATON (2021). Deep dive e-mobility - the TRATON perspective. [Link](#).

<sup>15</sup> Transport & Environment (2021). AFIR: How can the EU's infrastructure law make Europe 'fit for 55'? [Link](#).

<sup>16</sup> European Clean Trucking Alliance (2020). Position paper. Make zero-emission trucks an offer you can't refuse. [Link](#).

<sup>17</sup> Transport & Environment (2021). Easy Ride: why the EU truck CO2 targets are unfit for the 2020s. [Link](#).

Instead, the CO<sub>2</sub> standards should follow the optimal and cost-effective CO<sub>2</sub> reduction trajectory based on the techno-economic developments of zero emission vehicle technology while ensuring sufficient emission reductions to reach Europe's 2030 and 2050 climate targets. The current 2030 target of 30% should be brought forward to 2027 as an intermediate target which would provide enough lead time for truck makers in regard to their development cycles. The 2030 target needs to be increased to around 65% in line with announcements made by truck manufacturers to ensure their voluntary commitments are materialising.

In addition, the current 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, the ambition increased to 15%, and its design complemented by a malus. The mechanism should be phased out in 2030.

### **A 100% CO<sub>2</sub> target in 2035 for most HDVs is feasible and needed**

A 100% CO<sub>2</sub> reduction target in 2035 for all HDVs except for vocational vehicles needs to be assessed as part of the impact assessment. Such a target is necessary in order to fully replace the legacy fleet by 2050 given that on average most trucks last more than 15 years on the road.<sup>18,19</sup> A 100% target in 2035 is also feasible from a technological and cost perspective, including for long-haul trucks.<sup>20</sup> The option of 100% ZEV sales in 2035 for all HDVs including vocational vehicles should also be assessed as part of the impact assessment.

### **The CO<sub>2</sub> standards need to be extended to all vehicle categories**

The CO<sub>2</sub> standards are currently only regulating heavy lorries which are responsible for 65 - 70% of all CO<sub>2</sub> emissions from HDVs.<sup>21</sup> Research shows that the cumulative emissions savings of the current CO<sub>2</sub> standards could be increased by up to 50% if they were extended to all truck categories including small and medium lorries, vocational vehicles and trailers.<sup>22</sup>

The regulation needs to be extended to all vehicles including small and medium lorries, vocational trucks, urban buses and coaches as well as trailers. Medium lorries (7.5 - 16 tonnes) should be regulated via the same common CO<sub>2</sub> reduction target as heavy lorries (> 16 tonnes). Vehicle groups which are not being certified under VECTO should be regulated by a ZEV target and reach 100% ZEVs in 2035 for small lorries (3.5 - 7.5 tonnes) and 2040 in the case of vocational vehicles.

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<sup>18</sup> European Commission (2013). Transport data collection supporting the quantitative analysis of measures relating to transport and climate change (TRACCS). [Link](#).

<sup>19</sup> ACEA (2022). Report – Vehicles in use, Europe 2022. [Link](#).

<sup>20</sup> Transport & Environment (2022). Why the future of long-haul trucking is battery electric. [Link](#).

<sup>21</sup> European Commission (no date). Reducing CO<sub>2</sub> emissions from heavy-duty vehicles. [Link](#).

<sup>22</sup> ICCT (2021). Benefits of extending the EU heavy-duty CO<sub>2</sub> emissions standards to other truck segments. [Link](#).

Reaching 100% ZEV sales for urban buses is feasible when considering that 16% of all EU sales in 2020 were already zero emission, with both Western and Eastern European member states leading the way (Netherlands at 81% and Poland at 28%).<sup>23</sup>

### Summary table

Vehicle category (TPMLM)	VECTO groups (axle config)	Type of regulation	Target years	100% ZEVs	Comments
Heavy lorries (> 16 t)	4, 5 (4 x 2) 9, 10 (6 x 2)	CO2 reduction target	2025 2027 2030 2035	2035	Vocational trucks included under ZEV target for 'vocational vehicles'
Medium lorries (7.5 - 16 t)	1, 2, 3 (4 x 2)	CO2 reduction target	2027 2030 2035	2035	Common CO2 reduction target with heavy lorries from 2027
Small lorries (3.5 - 7.5 t)	0 (4 x 2)	ZEV target	2027 2030 2035	2035	
Vocational vehicles (all weights)	4v, 5v (4 x 2) 9v, 10v (6 x 2) 6, 7, 8 (4 x 4) 11, 12 (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	2027 2030 2035 2040	2040	
Urban buses (all weights)	-	ZEV target	2027	2027	
Coaches (all weights)	-	ZEV target	2027 2030 2035	2035	
Trailers	-	Energy efficiency standard	2027 2030	-	

### Fuel credits must not be included in the CO2 standards

Credits for so-called renewable and low-carbon fuels, including advanced biofuels, should not be included in HDV CO2 standards as it would not help solve the emissions problem of trucks and buses. A fuel crediting system would mix different types of regulations and undermine their effectiveness. E-fuels would represent the most costly compliance option for truck manufacturers and society as a

<sup>23</sup> Transport & Environment (2022). Netherlands leads the way on new electric buses – analysis. [Link](#).

whole and will only be available in limited quantities which are needed for hard-to-abate sectors where electrification is not an option.

Mixing upstream (fuels) and downstream (vehicles) risks causing incoherent and, in the worst case, unenforceable legislation. Instead, the decarbonisation of fuels should continue to be governed by separate regulations such as the Renewable Energy Directive and Fuel Quality Directive. The impact assessment should carefully assess the risks of mixing the roles and responsibilities of different market participants and industries into one regulation that only applies to truck makers.

In particular, the impact assessment should look at the costs and the TCO associated with different powertrain and fuel options, the overall availability and scalability of fuels, and the possible prioritisation of such fuels for hard-to-abate sectors where electrification is not an option such as aviation, shipping and parts of industry. Lastly, it should examine whether there can be any additional climate benefits expected from introducing a fuel crediting system into the HDV CO2 standards.

### **The 2022 review can make or break the transition**

If the upcoming review succeeds in addressing these issues, it can turn the 2020s into a successful decade when it comes to cleaning up trucking and ensuring Europe's continued industrial leadership in the sector. The impact assessment should therefore assess these and more measures which can help improve the legislation and which are further outlined below.

## **2. CO2 reduction target for medium and heavy lorries**

Vehicle groups which are already regulated should continue to fall under a CO2 reduction target (vehicle groups 4, 5, 9 and 10). Those groups which are not yet regulated but offer robust certification data under the 'Vehicle Energy Consumption Calculation Tool', or (VECTO) should be integrated into the same CO2 target (vehicle groups 1, 2 and 3).

Currently regulated heavy lorries include the vehicle groups 4, 5, 9 and 10 and mostly cover trucks exceeding 16 tonnes technical permissible maximum laden mass (TPMLM). Vocational vehicles which fall under these groups (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 be regulated by a common ZEV target together with the other vocational vehicles instead (as explained in Section 4).

Currently certified but unregulated medium lorries include the vehicle groups 1, 2, 3, which cover trucks between 7.5 - 16 tonnes TPMLM. Their reference CO2 emissions will be determined based on the available monitoring and reporting data for the reference period 2020 - 2021 (also called the

'baseline').<sup>24</sup> Vocational vehicles which fall under these groups are mostly municipal utility vehicles such as garbage refuse trucks and should be included under the same CO2 target.<sup>25</sup>

### **CO2 reduction target**

The current 2030 CO2 target 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. An intermediate target in 2027 would lead to a ramp up of ZEV sales already from the second half of the 2020s and provide enough lead time for truck makers in regard to their development cycles. Applying a common target to both medium and heavy lorries would be an additional flexibility.

The common target for medium and heavy lorries should increase to around 65% in 2030 which is the equivalent of 55 - 60% ZEV sales if assuming a modest 2% fuel efficiency improvement of ICE trucks per year. With Daimler's announcement to sell up to 60% ZEVs by 2030, this can be considered feasible and realistic when considering the overall market dynamics.<sup>26</sup>

By 2035, a CO2 target of 100% should apply to all medium and heavy lorries except for those vocational vehicles which are monitored and reported under the vehicle groups 4v, 5v, 9v and 10v. Ending the sale of all urban, regional delivery and long-haul combustion trucks by 2035 is feasible from a techno-economic perspective.<sup>27</sup>

A 100% CO2 target by 2035 also provides sufficient lead time to further improve the business case for these vehicle segments, roll out the necessary infrastructure network and convert European production lines to a fully zero emission lineup. And ultimately, it will give the necessary market and investment certainty to the industry.

For heavy lorries, the 2025 CO2 target of 15% which will take effect in 2025 should apply until 2026. Other elements of the current regulatory design such as the banking and borrowing mechanism should be maintained as well.

### **ZLEV incentive mechanism**

The current ZLEV incentive mechanism lacks ambition and is not fit for purpose given the expected market dynamics. The voluntary benchmark of 2% will be reached easily already in the first half of the decade. From 2027, the scope of the benchmark should be limited to long-haul ZEVs, the

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<sup>24</sup> European Union (2018). Regulation (EU) 2018/956 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. [Link](#).

<sup>25</sup> European Commission (2017). VECTO tool development: Completion of methodology to simulate Heavy Duty Vehicles' fuel consumption and CO2 emissions. Upgrades to the existing version of VECTO and completion of certification methodology to be incorporated into a Commission legislative proposal. [Link](#).

<sup>26</sup> More detailed T&E analysis on the techno-economic potential of zero emission trucks and the emission reductions required under the EU's climate targets will be published later this year.

<sup>27</sup> Transport & Environment (2021). Why the future of long-haul trucking is electric. [Link](#).

ambition increased to 15%, and its design complemented by a malus. Eventually, the mechanism should be phased out in 2030.

The current super-credits scheme will apply until 2024. From 2025, a bonus-only ZLEV benchmark will take effect if a minimum of 2% ZLEV sales is being met and which can reduce a manufacturer's specific target by a maximum of 3 percentage points, thereby weakening the overall CO2 targets.

The purpose of the benchmark should be to incentivise the faster adoption of clean technologies. It should only reward future-proof technologies in those vehicle segments which are yet to begin their transition to zero emission technology. However, in the current regulation LEVs and even unregulated ZEVs also count towards the benchmark (except for buses and coaches) and all ZEVs are counted equally. This does not incentivise manufacturers to sell more ZEVs with higher vehicle ranges.

LEVs and unregulated ZEVs should therefore not count towards the benchmark from 2027. The second amendment to the certification regulation is introducing the certification of electric vehicle range.<sup>28</sup> 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 which would incentivise a faster ramp-up of ZEVs in the long-haul segment. If the benchmark is limited to long-haul ZEVs, a level of 15% can be considered as appropriate from 2027.

Finally, the incentive mechanism is supposed to be a temporary stimulation to kick-start the electric truck market. This incentive remains important in the second half of the 2020s but should be phased out by 2030 when it is expected that ZEVs will account for the majority of the sales to avoid a continued weakening of the CO2 targets beyond the 2030s.

### **3. ZEV target for small lorries**

Some unregulated vehicle groups will not be certified under VECTO and can therefore not be regulated by a CO2 reduction target. This is the case for small lorries with a TPMLM not exceeding 7.5 tonnes. To solve this, a ZEV target should apply to all small lorries which would require manufacturers to sell a certain share of ZEVs from a given year.

A ZEV target also requires the extension of the monitoring and reporting obligations for truck manufacturers and member states to the respective vehicle groups in order to verify compliance. The possibility to exempt small-volume manufacturers from this regulation could be examined in which case an appropriate definition and threshold should be assessed.

Currently unregulated small lorries comprise all trucks between 3.5 and 7.5 tonnes TPMLM which are type-approved as HDVs. Vehicles type-approved as LDVs but not regulated under the CO2 standards

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<sup>28</sup> European Commission (2021). Heavy-duty vehicles - extension of scope of procedures for determining CO2 emissions. [Link](#).

for cars and vans should be included in this category to avoid creating a gap between the regulations.<sup>29</sup>

For small lorries, a ZEV target of around 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. Small lorries are similar to light-duty vans in terms of their technical and operational requirements. The proposed targets for vans are based on a recent study by BloombergNEF for T&E which concludes that such a market uptake of electric vans is feasible under the accelerated market-driven scenario.<sup>30</sup>

#### **4. ZEV target for vocational vehicles**

Vocational and special purpose vehicles such as refuse and construction trucks are currently not regulated under the HDV CO2 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 these. The monitoring and reporting regulation needs to be extended to those relevant vehicle groups that do not yet have to be monitored and reported (other than 4, 5, 9, 10, 11, 12 and 16).

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 certified in the future and are almost exclusively composed of vocational vehicles. The vehicle groups 11, 12 and 16 fall under the certification regulation but mostly comprise vocational trucks so should also be included under the same ZEV target.

For vocational trucks, a first ZEV target should apply in 2027. Based on an optimal trajectory, following targets should be set for 2030 and 2035. Construction trucks, off-road vehicles or those for heavy-load or special road freight movements may have more challenging operational requirements in terms of onboard energy storage, operational uptime or infrastructure. And since they usually run significantly lower mileages, they might also need some additional time to achieve TCO parity compared to long-haul trucks. A 100% ZEV target should therefore be set for 2040 when all of them are capable of transitioning to zero emission.

#### **5. ZEV target for urban buses and coaches**

Both urban buses and coaches should be regulated on the basis of a ZEV target. Heavy buses are about to be included in the VECTO certification procedure. However, the accuracy of the simulation

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<sup>29</sup> 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 CO2 standards for cars and vans and should therefore be regulated under the HDV CO2 standards.

<sup>30</sup> BloombergNEF (2021). Hitting the EV inflection point. Electric vehicle price parity and phasing out combustion vehicle sales in Europe. [Link](#).

results seems to not be robust enough for urban buses. In addition, multi-stage production processes are common particularly for coaches where two different manufacturers are responsible for the drivetrain as well as the chassis and bodywork. Applying a CO2 target would require more regulatory complexity due to shared responsibilities, whereas a ZEV target would offer the simple option to limit the scope of the regulation to the manufacturer of the drivetrain.

All medium and heavy vehicles with a TPMLM exceeding 3.5 tonnes and type-approved as HDVs should be included. The monitoring and reporting regulation also needs to be extended to those. Due to a more fragmented market, a potential exemption of small-volume manufacturers could be considered.

Urban buses should be regulated by a 100% ZEV target in 2027. This is feasible when considering that 16% of all EU sales in 2020 were already zero emission, with both Western and Eastern European member states leading the way (Netherlands at 81% and Poland at 28%). For coaches, a ZEV target of 100% by 2035 should apply with preceding targets starting from 2027. This is in line with what can be considered feasible for long-haul trucks due to their similarities in regard to their operational requirements and expected TCO parity.

## 6. Energy efficiency standards for trailers

Trailers can be made significantly more energy efficient by reducing their aerodynamic drag, rolling resistance and curb weight. As part of the HDV CO2 standards, energy efficiency standards should be introduced so that energy efficiency technologies can be brought to the market. This is possible as the second amendment of the certification regulation extends VECTO also to trailers.

Energy efficiency standards should be set to all trailer types where this is technically and practically feasible. The first standards should be set for 2027 and reach the maximum cost-effective potential by 2030 which is estimated to be around 12.3% for long-haul and 8.6% for regional delivery by that date.<sup>31</sup> The monitoring and reporting regulation needs to be extended accordingly. Small-volume manufacturers could be exempted from such standards if this is deemed appropriate.

## 7. Contribution of renewable and low-carbon fuels

Credits for so-called renewable and low-carbon fuels, including advanced biofuels, should not be included in HDV CO2 standards as it would not help solve the emissions problem of trucks and buses. A fuel crediting system would mix different types of regulation and undermine their effectiveness. E-fuels would represent the most costly compliance option for truck manufacturers and society as a whole and will only be available in limited quantities which are needed for hard-to-abate sectors where electrification is not an option.<sup>32</sup>

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<sup>31</sup> ICCT (2018). Market analysis of heavy-duty commercial trailers in Europe. [Link](#).

<sup>32</sup> Transport & Environment (2020). E-fuel would be wasted on cars while it's badly needed to decarbonise planes and ships – study. [Link](#).

Mixing upstream (fuels) and downstream (vehicles) risks causing incoherent and, in the worst case, unenforceable legislation. Instead, the decarbonisation of fuels should continue to be governed by separate regulations such as the Renewable Energy Directive and Fuel Quality Directive. The impact assessment should carefully assess the risks of mixing the roles and responsibilities of different market participants and industries into one regulation that only applies to truck makers.

In particular, the impact assessment should look at the costs and the TCO associated with different powertrain and fuel options, the overall availability and scalability of fuels, and the possible prioritisation of such fuels in hard-to-abate sectors where electrification is not an option such as aviation, shipping and parts of industry.

It should also assess the potential risk of double-counting, whether a vehicle manufacturer has any control over where a vehicle is fueled once it is placed on the market and to what extent such a compliance option would increase the administrative burden at EU and national level. Lastly, it should examine whether there can be any additional climate benefits expected from introducing a fuel crediting system into the HDV CO2 standards.

## **8. Pooling**

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 impact assessment should therefore assess the possibility to allow pooling between new and established truck makers based on an appropriate definition and threshold.

## **9. Use of revenues from emission fines**

The Commission should undertake an assessment of the potential job and economic impacts due to the transition in the HDV sector. The transition will happen faster than expected and it is important to start preparing for it now. The impact assessment should assess the possible implications and require member states to carry out national stress tests to identify the areas impacted and quantify the potential job or economic impacts.

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 workforce. Such a fund should support the transition towards new industries and skills in those regions where impact will be most acute. In the case where truck manufacturers fail to meet their targets, the revenues from such fines should be allocated to such a fund.

## Further information

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