



Tolling: the highway to green trucking

How to implement the Eurovignette reform to clean up trucks

November 2022

Summary

Tolling in the EU is governed by the Eurovignette directive. While member states are not required to impose road tolls, where they do, they must follow the directive. The text of the newly-revised directive entered into force in March 2022,¹ and is a vital reform to help put cleaner trucks on the road and deliver much-needed emission reductions from freight vehicles.

The requirement to vary truck tolls by CO₂ is the centrepiece of the revised directive. The most effective way to implement this reform is carrot-and-stick, i.e. reduce tolls for cleaner trucks, and increase them for trucks that emit more. Incentivising cleaner trucks while at the same time disincentivising less efficient ones will most influence a truck's total cost of ownership (TCO) and new truck purchases, a strategy that best reduces energy use and emissions.

Member states that toll trucks by distance - and where the government has retained the power to vary toll charges - are best placed to deliver change. Sequenced by tonne-kilometres of road freight, these countries are: Germany, Poland, Belgium, Austria, Czechia, Hungary, Slovakia, Slovenia and Bulgaria. Denmark will switch to distance-based tolling in 2025, and the Netherlands in 2026/7. By 2027 government-directed distance-based tolling will apply in Member States which have more than half (53%) of EU truck freight. Where government-controlled distance-based tolling applies, the deadline to vary tolls by CO₂ is March 2024.

Two years later, by March 2026, countries with government-directed distance-based tolling also need to charge trucks for their air pollution burden. For the four member states that already apply air pollution charges - Austria, Belgium, Czechia and Germany - it will be a case of assessing their revision. In terms of implementation, it will be important for member states to consider their revisions in an integrated way, i.e. follow a strategic planning process with both the 2024 and 2026 deadlines in mind.

The highway networks of five member states are dominated by concession contracts, namely France, Italy, Croatia, Greece and Portugal (while Ireland's highway network is partly

¹ EU Directive 2022/362. [Link](#). The 2022 reform has been consolidated with the earlier legislation, hereafter referred to as "the directive". [Link](#).

concession-controlled). Tolling in these member states is distance-based, but the existing concession agreements typically mean that governments can only vary toll charges by agreement with the concession holder (or under a formal procedure, often signed decades ago, with little regard to climate breakdown, air pollution and noise). For new concession agreements, or where existing contracts are renewed or substantially amended, concession countries must respect the implementation deadlines set out in the revised directive.

However, without a pro-active approach by concession governments to existing contracts, reform will be slow. These governments can step up with a more innovative approach, for example, by engaging with existing concessionaires to persuade them to revise tolls in a revenue-neutral way (i.e. reductions for cleaner trucks offset by increases for trucks that emit more). Concession countries account for 28% of EU road freight, and it is important for these member states to have toll systems that support the transition.

Tolling based on the amount of time spent in a country (rather than the distance travelled), does not recover external costs in a proportionate way, and is in decline across the EU. By 2027, Sweden, Estonia, Latvia and Luxembourg may be the only remaining member states with time-based truck charges, meaning this type of tolling (often called 'vignettes') would apply in countries that together account for just 4% of EU road freight. From 2024, countries that retain vignettes must vary them for CO₂ on key trans-European routes (the TEN-T core network). From 2030/2, time-based charges on the TEN-T core network will only be possible in very limited circumstances.

A small number of member states which toll heavy goods vehicles exempt some or all freight vehicles between 3.5 and 12t gross vehicle weight, namely Denmark, Germany (3.5 - 7.5t), Luxembourg and Sweden. Under the revision, these exemptions must be removed by March 2027.

Transiting to zero emission trucks can be further aided by the use of new revenue from toll reform. In particular, external cost charging (for CO₂, air pollution and noise) will supplement current revenue streams, and can be re-distributed equitably, with due attention to the reduced capacity of smaller truckers to finance zero emission freight vehicles.

Overall, the Eurovignette revision is an opportunity-filled reform. Tolling according to CO₂ and charging for air pollution and noise will aid the shift to cleaner trucks. Thanks to the breadth and depth of the revision, policy-makers are given the tools they need to match ambition on climate, and air and noise pollution, to their domestic political landscape. The best reform will be achieved by each country starting soon, and fully exploiting the opportunity available.

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1. Introduction

Heavy-duty vehicles (HDVs) are responsible for 26% of CO₂ emissions from EU road transport² while only accounting for 2% of the vehicles on the road.³ To reduce the EU's greenhouse gas (GHG) emissions by at least 55% by 2030 and reach climate neutrality by 2050, HDVs need to be entirely decarbonised. To achieve this, all new sales of freight trucks and buses must be zero emission by 2035, with the remaining heavy duty vehicles (vocational trucks and coaches) following no later than 2040.⁴

Zero emission vehicles (ZEVs) comprise battery electric vehicles (BEVs) or fuel cell electric vehicles (FCEVs) running on green hydrogen.⁵ Battery electric trucks are the most feasible option to reduce emissions quickly, and fully decarbonise the heavy-duty vehicle sector and eliminate harmful air pollution by 2050.⁶ European truck manufacturers have already made voluntary commitments to ramp up ZEV sales: an estimated 4 - 9% of total truck sales will be zero emission by 2025, rising to an average of around 45% by 2030, and up to 60% for certain manufacturers.⁷

There is increasing consensus among truck manufacturers that battery electric trucks (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 by 2023.⁸ Most truck-makers, including Daimler, MAN, Scania and Volvo, are now focussing on bringing BETs to the mass market for all vehicle segments - including for long-haul - starting from 2024.

As it forms the commercial background to this reform, it's important to give a sense of developments in the sector: for example, Daimler is readying its 500 km range eActros LongHaul truck for series production in 2024.⁹ MAN will also begin series production of its first electric long-haul truck with a range of 400 km by 2024.¹⁰ By the same year, Scania will offer battery-powered 40-tonne trucks with a 560 km range.¹¹ And by 2025, the Swedish truckmaker also intends to offer battery electric vocational vehicles such as construction, mining and timber trucks.¹² Volvo started the series production of its Volvo FH Electric in 2022 with which it is possible to drive up to 500 km with a short stop for charging.¹³

² UNFCCC (2019). GHG data from UNFCCC. [Link](#).

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

⁴ Transport & Environment (2022). The review of the EU's truck CO₂ standards. [Link](#).

⁵ Zero emission vehicles are defined as vehicles without an internal combustion engine or with one that emits less than 1 gCO₂/kWh or 1 gCO₂/km (depending on type-approval).

⁶ Transport & Environment (2022). Electric trucks take charge. [Link](#).

⁷ Transport & Environment (2021). Easy Ride: why the EU truck CO₂ targets are unfit for the 2020s. [Link](#).

⁸ International Energy Agency (2022). Global EV Outlook 2022. [Link](#).

⁹ Daimler (2022). Mercedes-Benz Trucks to unveil the eActros LongHaul electric truck for long-distance transport in September. [Link](#).

¹⁰ MAN (2022). MAN and ABB E-mobility rev up for the next phase of electromobility in long-haul trucking. [Link](#).

¹¹ Scania (2022). The Scania Report 2021. Annual and Sustainability Report. [Link](#).

¹² Scania (2021). Scania's commitment to electrification – our initiatives so far. [Link](#).

¹³ Volvo (2022). Volvo's heavy-duty electric truck is put to the test: excels in both range and energy efficiency. [Link](#).

The revision EU road tolling legislation

Europe's revised road tolling law, the so-called *Eurovignette* directive¹⁴, mandates governments which levy tolls on trucks to vary them according to CO₂ emissions. CO₂-based tolling is a key enabler to transition the European truck fleet to zero emissions. Depending on the reform option chosen, the differentiation of road tolls according to CO₂ emissions will significantly - or very significantly - bring forward the date when zero emission trucks become cheaper than diesel on a total cost of ownership (TCO) basis.

This policy briefing lays out the main elements of the new law with regard to trucks and provides concrete policy recommendations for national regulators on how to implement the directive and reform their national truck tolling systems. Regulatory elements that concern passenger cars, light commercial vehicles and buses are not addressed here. Tolling instruments such as voluntary congestion charges or mark-ups for environmentally sensitive regions are also out of scope for this briefing.

2. EU tolling today: a (very) brief geographical overview

A large block of EU countries apply distance-based tolling directly overseen by the government (see the map in figure 1). The price structure is typically determined by a national authority, generally in collaboration with one or more government ministries. Long-term contracts giving power or influence to non-state actors *over the price structure* are not used. This block is anchored by Germany and Poland, with Austria, Czechia, Slovakia, Hungary and Slovenia to the south. To the west and north, the block includes Belgium, with Denmark and the Netherlands set to join in 2025 and 2026/7 respectively. Government-directed distance-based tolling is also in use in Bulgaria and is being adopted in Lithuania. By 2027, government-directed distance-based tolling is expected to apply in 12 Member States which together account for 53% of EU road freight.¹⁵

A handful of member states toll by distance but with long-term concession contracts granted to private operators ('concession countries'). Almost all highways in France and Italy are under such concessions. Croatia, Greece and Portugal are also concession-dominated, while selected highway sections in Ireland are concession tolled. Spain has a decreasing number of concessions, because its toll roads are becoming free-to-use as contracts expire. However, Madrid pledged to introduce a new national toll system covering all its highways as part of its Covid recovery and resilience plan.¹⁶ Again, based on national tonne-kilometre data, concession-controlled distance-based tolls will apply in Member States with 28% of EU road freight by 2027.

¹⁴ European Union (2022). Directive 1999/62/EC of the European Parliament and of the Council of 17 June 1999 on the charging of vehicles for the use of road infrastructures. [Link](#).

¹⁵ National data for tonne-kilometres carried by road is taken from the European Commission's 2021 statistical pocketbook, EU transport in figures. [Link](#). The 12 countries are Austria, Belgium, Bulgaria, Czechia, Denmark, Germany, Hungary, Lithuania, the Netherlands, Poland, Slovakia, and Slovenia.

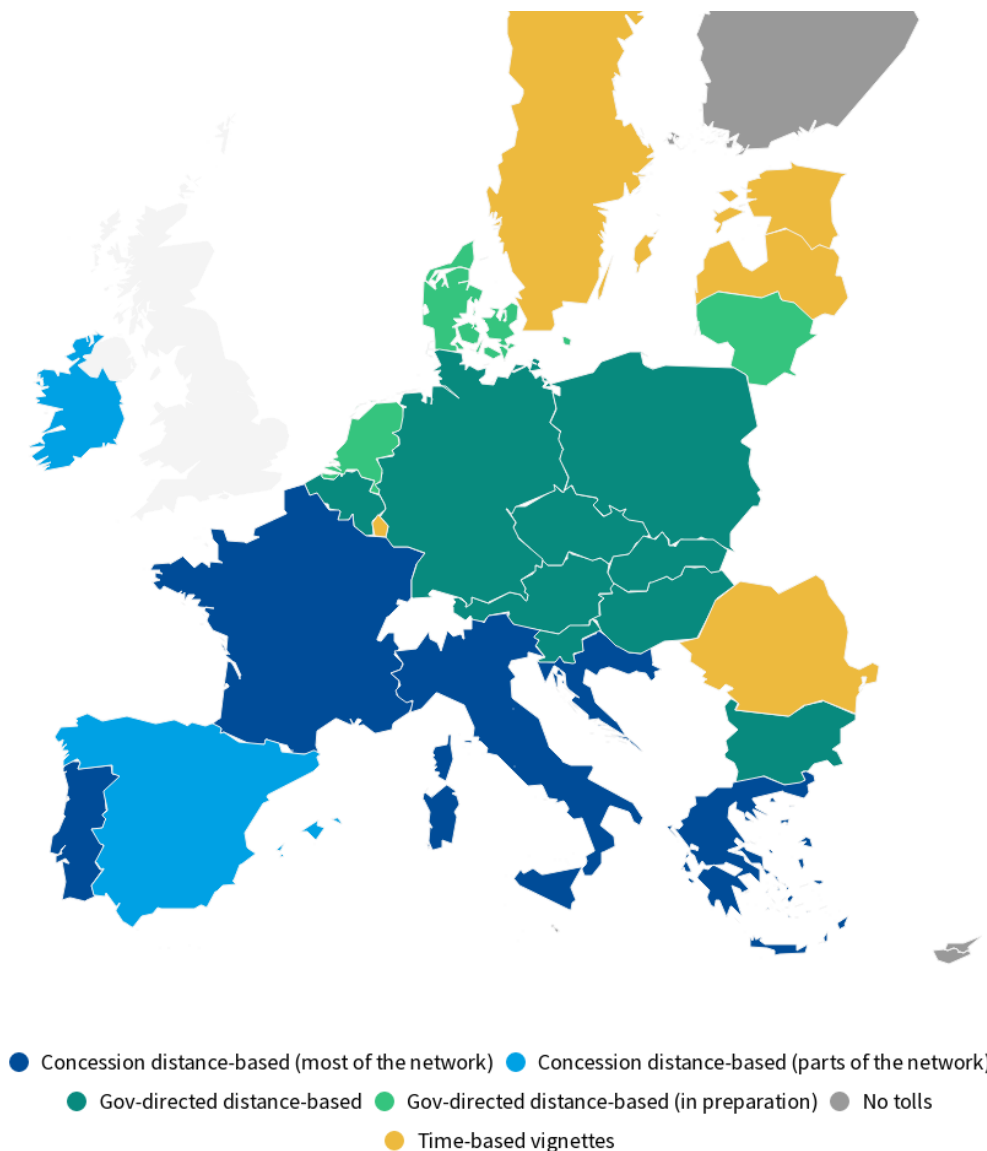
¹⁶ European Commission (2021). Spain's Recovery and Resilience Plan. [Link](#). "It is necessary to develop a payment system for the use of the high capacity road network that allows for the covering of maintenance costs and integrating the externalities of road transport" (Plan summary, p 127).

Distance-based tolling can be contrasted with time-based user charges, which allow a vehicle to use the infrastructure for a given period, e.g. a day or week. Time-based user charges are also referred to as vignettes. User charges are declining across Europe but a small number of countries may retain them for regional reasons (to avoid greater transport costs for remote areas), or due to the implementation costs of switching to distance-based tolling. Sweden is the largest vignette country. Estonia and Latvia also apply vignettes, as does Luxembourg. Lithuania is anticipated to transition to distance-based tolling in 2023/4.¹⁷ Romania currently has vignettes but pledged to migrate to distance-based charging under its post-pandemic recovery programme.¹⁸ By 2027 it's likely that vignettes will apply in Member States that together account for just 4% of EU road freight.

Adding both types of distance-based tolling together gives 81% coverage (53% government-directed and 28% concession-operated). Together with vignette user charging, this brings total EU truck toll/vignette coverage to around 85%. The remaining 15% is either in transition or untolled, a figure dominated by Spain and Romania (both are transitioning; see above), while also including Finland, Malta and Cyprus which currently do not have truck tolls (see the map below). How the EU's toll geography interacts with the Eurovignette revision is teased out in section 3.

¹⁷ GNSS Consulting (2022). An overview of the plans in Lithuania for procuring a nationwide tolling system. [Link](#).

¹⁸ European Commission (2021). Recovery and resilience plan for Romania. [Link](#).



Sources: European Commission (2017 and 2022), Government of the Netherlands (2022), Government of Finland (2021), Vinetki.bg (2021).

Figure 1. Overview of truck tolling systems in the EU

3. How toll reform lowers TCO for zero emission trucks

Fleet operator surveys show that TCO is one of the most important factors when purchasing and operating a truck for road haulage purposes.^{19,20} The production volume of zero emission trucks is currently low, resulting in higher upfront vehicle costs, and slowing large-scale market adoption.

¹⁹ Öko-Institut e.V. (2022). Anforderungen der Logistikbranche an einen Umstieg auf klimaschonende Fahrzeugtechnologien - Ergebnisbericht einer standardisierten Befragung. [Link](#).

²⁰ Bain & Company (2022). European Truck Market Outlook 2022. [Link](#).

Recent studies by environmental organisations,²¹ research groups²² and truck makers²³ include TCO assessment for long-haul BETs. A conclusion shared across these reports is that as ZE vehicle sales ramp up, production costs will fall, improving the business case of ZEVs. These studies also emphasise how CO₂-based road tolling is one of the most effective policy instruments to achieve TCO parity. Other key initiatives are purchase grants or Truck-as-a-Service models for vehicles and support schemes for infrastructure.

Current toll charges for a long-haul truck can amount to up to €25,000 annually, or around a quarter of the TCO of a diesel truck. Tolling exemptions and reductions for ZETs reduce the cost gap with their diesel counterparts considerably, as would additional CO₂ charges on combustion trucks to internalise their climate costs. Figure 2 (below) illustrates how CO₂-based tolling contributes to the TCO parity of long-haul ZE trucks in Germany already by the mid 2020s. The assumptions behind the chart are based on the current tolling rates for a 40-tonne truck in Germany, and the implementation of the upcoming toll reform as agreed under the Federal Government's coalition agreement.^{24,25,26}

²¹ Transport & Environment (2022). Electric trucks take charge. [Link](#). Transport & Environment (2021). How to decarbonise long-haul trucking in Germany. An analysis of available vehicle technologies and their associated costs. [Link](#).

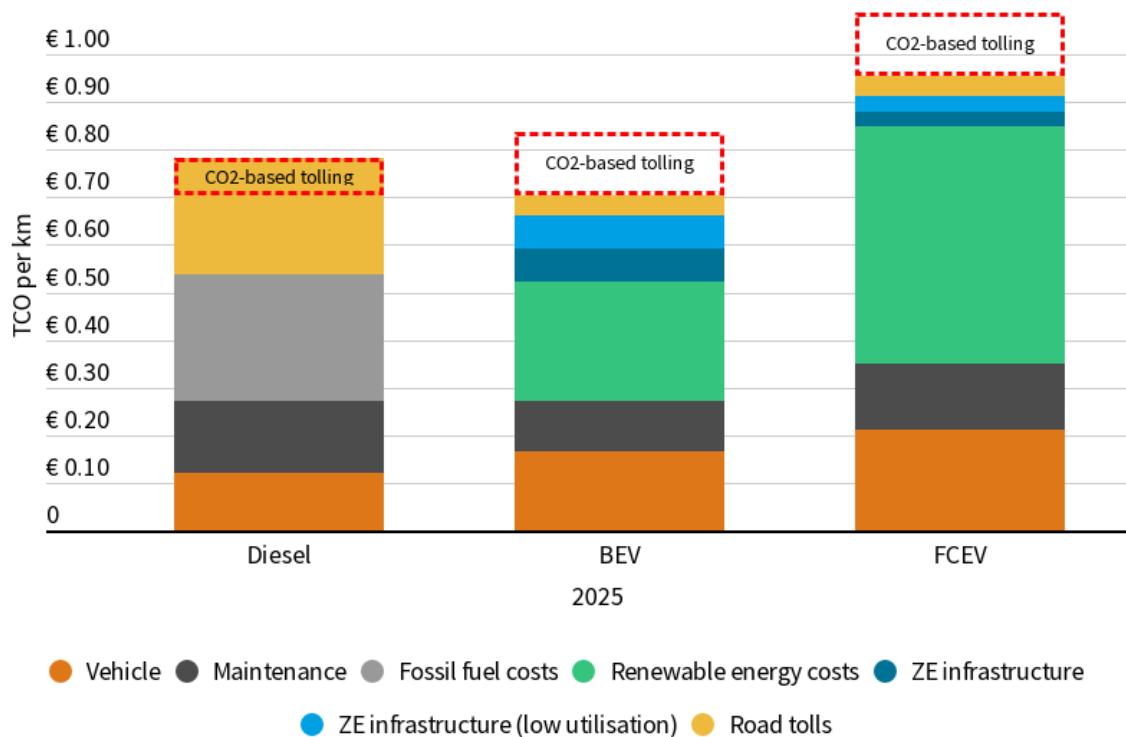
²² ICCT (2021). Total cost of ownership for tractor-trailers in Europe: Battery-electric versus diesel. [Link](#).

²³ TRATON (2021). Deep dive e-mobility - the TRATON perspective. [Link](#).

²⁴ Current rates for infrastructure, air and noise pollution are assumed, and that the CO₂ external cost charge is equivalent to the reference value, with 90% of total distance travelled on the tolled network.

²⁵ Bundesministerium der Justiz (2021). Gesetz über die Erhebung von streckenbezogenen Gebühren für die Benutzung von Bundesautobahnen und Bundesstraßen (Bundesfernstraßenmautgesetz - BFStrMG). [Link](#).

²⁶ Bundesregierung (2021). Mehr Fortschritt wagen. Bündnis für Freiheit, Gerechtigkeit und Nachhaltigkeit. Koalitionsvertrag zwischen SPD, BÜNDNIS 90/DIE GRÜNEN und FDP. [Link](#).



Notes: Illustrative TCO for a 40-tonne tractor trailer with 500 km range in Germany. All vehicles exclusively powered by renewable energy. Road tolls varied according to the new Eurovignette directive.

Sources: T&E calculations based on Transport & Environment (2021), European Union (2022) and Bundesministerium der Justiz (2021).

Figure 2. TCO of a long-haul truck in Germany post-reform (2025)

Road toll costs (yellow) include all components within the toll, namely the infrastructure charge and the external cost charges for air pollution, noise and CO₂ (outlined further below). The increase for diesel reflects the introduction of the external cost charge for CO₂, and also higher air and noise external cost charges, together with a marginal increase in the infrastructure charge. In contrast, the BEV and FCEV benefit from reductions in the infrastructure charge (75%), with the red dashed rectangles showing what is no longer being paid, i.e. the saving. (Strictly-speaking, the dashed red rectangles capture the impact of the reform, but as CO₂ variation makes up the overwhelming share of the changes, it is retained as a shorthand.)

4. New obligations for EU member states

Following the 2022 reform, member states that levy truck tolls have to comply with four key obligations in regard to their current and future truck tolling systems, as shown in the timeline below, namely:

- CO₂-based tolling,
- air pollution charging,
- the tolling of small freight vehicles (from 3.5t), and
- distance-based tolling on the TEN-T core road network.

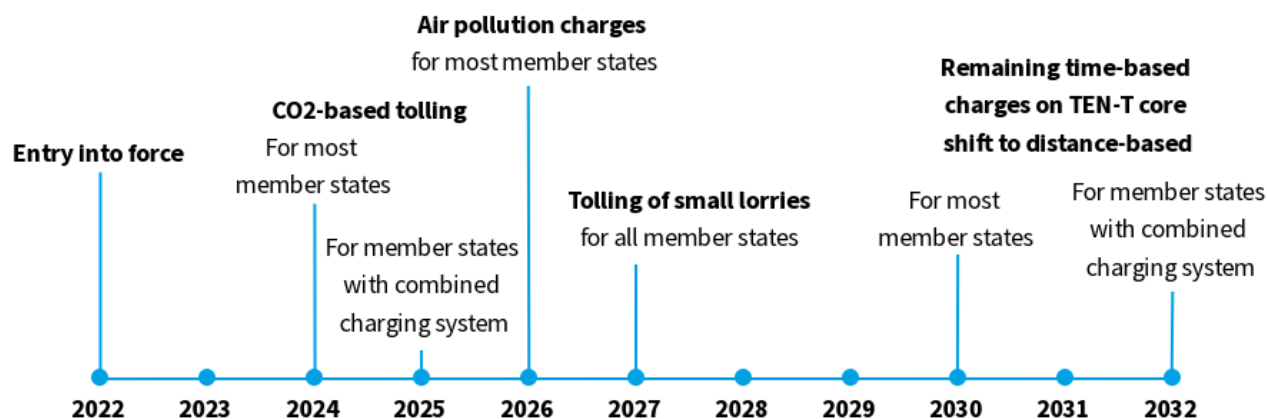


Figure 3. Timeline of new Eurovignette obligations²⁷

4.1. Mandatory CO₂-based tolling for trucks

Until now, the Eurovignette directive only obliged member states to vary infrastructure and user charges by gross vehicle weight (GVW), the number of axles, and the EURO emission classes regulating pollutant emissions.²⁸ However, varying tolls according to pollutant emission standards is becoming largely redundant given that Europe's long-haul HDV fleet is increasingly dominated by vehicles type-approved under EURO VI.²⁹ Varying truck tolls for CO₂ on the other hand creates the necessary steering effect towards zero emission trucks, which alongside the greening of the electricity grid, enables the EU to reach its climate goals.

To vary tolls for CO₂, there are three options open to Member States. These options are discussed in detail in the next section, with reference to both distance-based tolling and time-based vignettes.

4.1.1. Applying CO₂ variation

Distance-based tolls

Excluding concession contracts, member states with distance-based tolls must vary tolls for heavy goods vehicles (HGVs) by CO₂ not later than 24 March 2024. (Countries with concessions must apply CO₂ variation from that date when the toll contract is newly-signed, renewed or substantially amended. Existing concession contracts can be exempted.) Member states must adopt one of three implementation options, which relate to the toll's components, including potential components.

- Option 1: member states vary the infrastructure charge component of the toll according to the CO₂ of the truck. Infrastructure charges are levied to recover the construction, maintenance

²⁷ See the Annex of this briefing for country-specific deadlines and details.

²⁸ Varying the infrastructure charge for trucks according to EURO emission classes continues to be mandatory until CO₂ variation takes effect.

²⁹ ICCT (2022). Quantifying the long-term air quality and health benefits from Euro 7/VII standards in Europe. [Link](#).

and operational costs of the road, and make up around 90% of the overall toll for more efficient trucks in modern tolling systems.³⁰

- Option 2: the member state *applies an external cost charge for CO₂* on top of the infrastructure charge, leaving the infrastructure charge unchanged.
- Option 3: the third implementation option is to *do both of the above*: i.e. vary the infrastructure charge for CO₂, and apply a CO₂ external cost charge.

Vignettes / time-based user charges

Four countries have time-based charges that are linked to one another, namely Denmark, Luxembourg, the Netherlands and Sweden. These member states (sometimes referred to as ‘original Eurovignette countries’) obtained a one-year extension to implement CO₂ variation, bringing their deadline to 24 March 2025. Under the revised directive, new time-based road charges for trucks are restricted to limited circumstances from 2024. After March 2024, remaining time-based vignettes on core parts of the Trans-European Transport Network (TEN-T) must be varied according to a truck’s CO₂ emissions.

As explained above, most attention in this paper is focused on the implementation in respect of distance-based tolling, to which this section now returns.

How does CO₂ variation work for distance-based tolling?

Under option 1 (described above), the directive provides that the variation of the infrastructure charge “shall not be designed to generate additional revenue”. This means that the revenue loss due to reductions or exemptions for the most efficient trucks need to be compensated for by increasing the infrastructure charge for the least efficient. Differentiated CO₂ charging is made possible by banding, namely the allocation of vehicles into one of five different CO₂ emission classes.

The allocation depends on a vehicle's CO₂ emissions contained in the certification regulation for HDVs (which in turn are the results produced under VECTO, the EU’s Vehicle Energy Consumption calculation Tool).³¹ The bands for classes 4 (low emission vehicles / hybrids) and 5 (zero emission vehicles) do not change annually. Classes 2 and 3 (see below) essentially comprise more efficient fossil fuel trucks, and the annual banding here is tightened each year, governed by a downward trajectory as set out in the CO₂ emission standards for new HDVs.³² Freight vehicles registered before the beginning of the reference period (i.e. before June 2019) will be allocated to CO₂ emission class 1, as will the small remaining cohort of (generally specialist) trucks not subject to VECTO certification.

³⁰ In Germany, for example, the infrastructure charge makes up 92% of the toll for a 40t EURO VI long-haul truck (16.9c per kilometre out of 18.3c in total). Older trucks pay more: the infrastructure charge remains the same, but the air pollution charge increases steadily with older EURO classes. See further the toll rates section of the Toll Collect website. [Link](#).

³¹ European Union (2020). Commission 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. [Link](#).

³² The classes are divided by sub-group according to vehicles' technical characteristics and typical use patterns relevant to fuel consumption and CO₂ emissions; see further: 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](#).

CO₂ emission class	Vehicle definition
Class 1	Vehicles not belonging to any other class
Class 2	CO ₂ emissions more than 5% but not more than 8% below the emissions reduction trajectory
Class 3	CO ₂ emissions more than 8% below the emissions reduction trajectory but not within the classes below
Class 4 (LEV)	CO ₂ emissions more than 50% below the reference CO ₂ emissions
Class 5 (ZEV)	Vehicles without an engine or with one that emits less than 1 gCO ₂ /kWh or 1 gCO ₂ /km (depending on type-approval)

Table 1. CO₂ emission classes

As introduced above, the emissions reduction trajectory is defined under the CO₂ standards for new HDVs and determines which vehicles fall within classes 2 and 3. This trajectory moves downward, re-shaping the vehicles newly-included within classes 2 and 3 over successive years, as shown in the example below.

Within the VECTO emissions classification system, category 5 trucks are two-axle tractor units: they are used in the example below based on their high annual sales, accounting for around half of all CO₂ from new trucks. Long-haul (or LH) is the largest sub-group within VECTO category 5, and the figure below maps the emissions reduction trajectory for the long-haul sub-group of VECTO category 5, based on the 2019 CO₂ standards (shown in grey). The coloured lines map the CO₂ emissions ceilings that govern the allocation of individual vehicles to CO₂ emission classes in a given year.

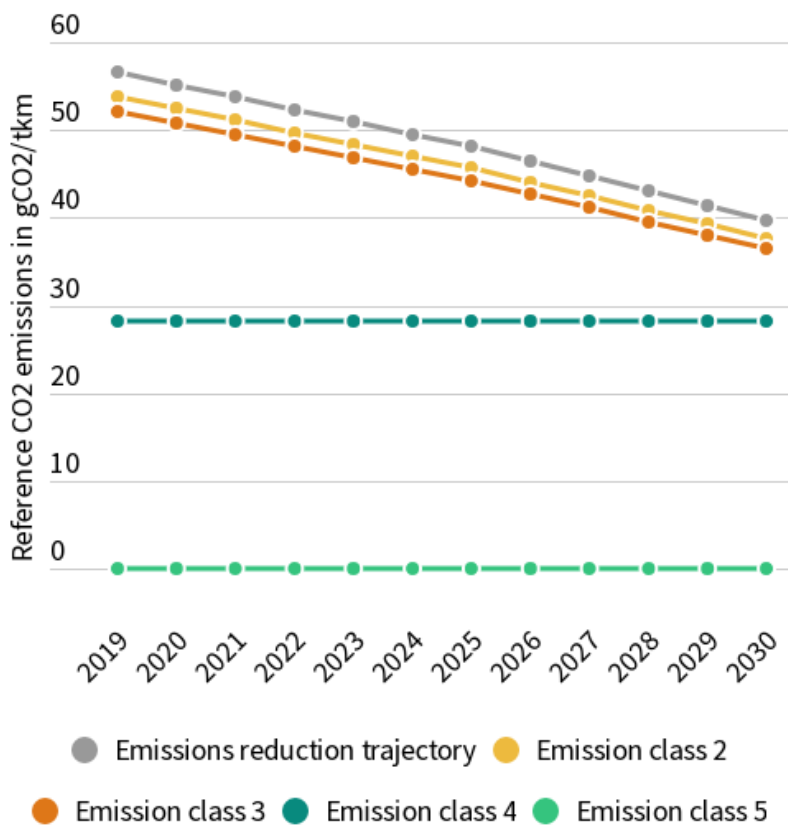


Figure 4. Emissions reduction trajectory for the long-haul vehicle sub-group of VECTO category 5.
 Source: T&E calculations based on European Union (2021) and EEA (2021).

Turning to the proportion of newly-assembled HDVs already regulated, the current HDV CO₂ standards govern HGVs responsible for 65 - 70% of total CO₂ emissions from HDVs in the EU, and for 77% of total truck sales above 7.5 tonnes.^{33,34} For soon-to-regulated vehicle groups, member states will need to vary their infrastructure and user charges based on CO₂ after these vehicles are included in the HDV CO₂ standards,³⁵ with reference values subsequently published in an implementing act.³⁶

Which vehicle technologies will benefit?

The toll classes are technologically neutral. Looking for example at diesel and LNG vehicles, it is (and will remain) necessary to examine a manufacturer's CO₂ emission results to determine whether particular vehicles fall into class 1, 2 or 3. For example, analysis by T&E of 2021 data for new Iveco and Scania long-haul trucks indicated that Iveco's diesel and LNG models would both fall into

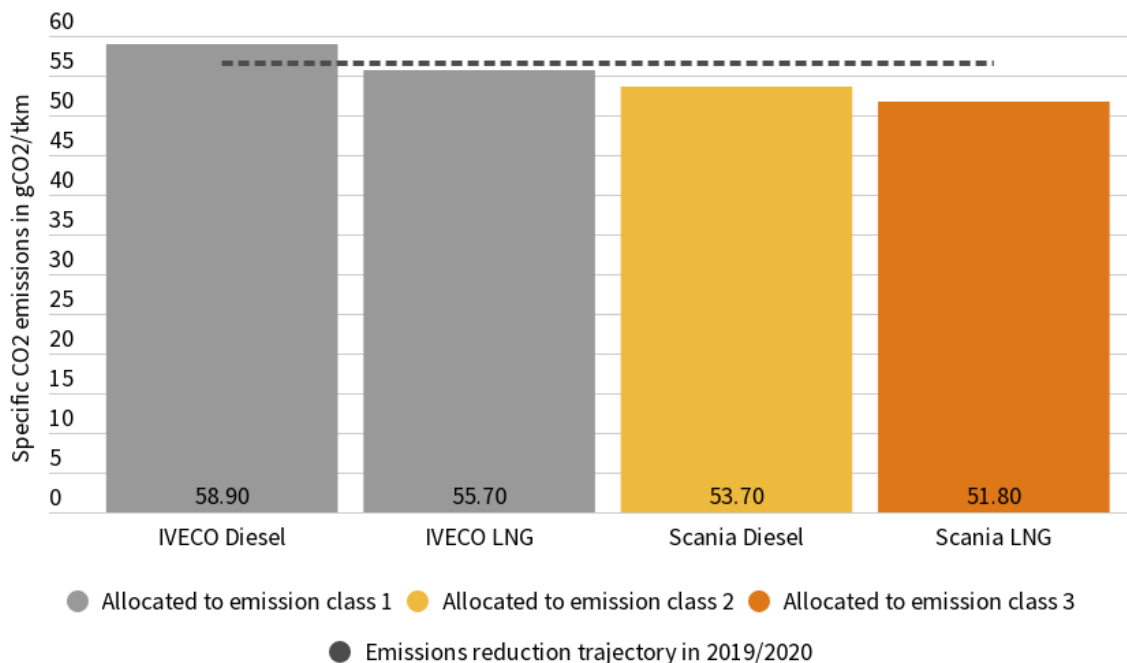
³³ European Commission (no date). Reducing CO₂ emissions from heavy-duty vehicles. [Link](#).

³⁴ International Council on Clean Transportation (2020). The EU heavy-duty CO₂ standards: Impact of the COVID-19 crisis and market dynamics on baseline emissions. [Link](#).

³⁵ The European Commission is about to review HDV CO₂ standards, with a legislative proposal expected in late 2022 / early 2023. An extension of the regulation to all HDVs including small and medium lorries, trailers, urban buses and coaches and possibly also vocational trucks is anticipated.

³⁶ See article 7ga(7) of the directive.

emission class 1. On the other hand, Scania’s diesel truck fell into emission class 2, while its LNG model fell into emission class 3 (see figure 5 below).



Notes: Certified CO₂ emissions of IVECO and Scania trucks in sub-group 5-LH for the reference period 2019/2020. Bar colours reflect the respective CO₂ emission class to which the vehicles would be allocated.

Sources: T&E calculations based on European Union (2021), EEA (2021), ICCT (2021).

Figure 5. CO₂ emissions of different vehicle technologies in the long-haul sub-group of VECTO category 5

Toll reduction by vehicle class

Member States are permitted to introduce a full toll exemption (100%) for ZEVs on the infrastructure charge and keep this in place until the end of 2025, after which the reduction must amount to 50-75% compared to the least fuel-efficient ICEVs in class 1.

CO ₂ emission class	Vehicle definition	Toll reduction compared to class 1
Class 1	Vehicles not belonging to any other class	-
Class 2	CO ₂ emissions 5 - 8% below the emissions reduction trajectory	5 - 15%
Class 3	CO ₂ emissions >8% below the emissions reduction trajectory but not within the classes below	15 - 30%

Class 4	CO ₂ emissions more than 50% below the reference CO ₂ emissions (LEV)	30 - 50%
Class 5	ZEV	50 - 75% (100% until 2025)

Table 2. Reduction for CO₂ variation by vehicle class

The flexibility given to member states to adjust toll reductions enables them to respond to increasing Z(L)EV sales and a gradually changing fleet profile towards 2030 and beyond, while keeping tolling revenue on target.

Assessment of vehicle classification 6 years after first registration

Six years after first registration, member states must reassess the allocation of vehicles to emission classes 2 and 3, and, where relevant, reclassify the vehicle based on the updated emission class thresholds (Article 7g-a 1a of the directive). The purpose of this process is to continue to promote the renewal of the fleet and to avoid the distortion of the second-hand market.³⁷ Also, the fact that ICE vehicles with improved fuel-efficiency only benefit from reductions for a limited period of time helps maintain overall momentum towards road freight decarbonisation.

Whether, for example, a class 2 or 3 vehicle first registered in 2023 moves to a lower class in 2029 will depend on how it performs on the emission reduction trajectory (described and mapped above) at the later date. Overall however, it is fair to say that a high proportion of class 2 and 3 vehicles will move down the emission classification system over time, with their toll reductions decreased (or ended) as these vehicles age.

4.1.2. CO₂ external cost charges

Vary the infrastructure charge, apply a CO₂ external cost, or both?

CO₂ variation of the infrastructure charge works like a bonus-malus system: very simply, toll reductions for cleaner trucks are financed by slightly higher charges for the most-polluting vehicles, and overall the reform should be revenue neutral.

On the other hand, a CO₂ external cost charge can be applied without making any reductions for cleaner trucks. A reform using external cost charging does not need to be revenue neutral, i.e. the vehicles that pollute more must pay more, and reductions for cleaner trucks need not be given.

Deploying both tools - varying the infrastructure charges, and applying an external cost charge - is potentially the most interesting option, offering the most help to transition to cleaner fleets. As already mentioned, the infrastructure charge part of the reform should be revenue neutral (higher

³⁷ Recital 32 of Directive 2022/362.

charges for the most-polluting vehicles offset by reductions for cleaner trucks). Then external cost CO₂ charging on top of this nudges new truck purchasing to the best-performing emission classes.

Member states have significant discretion in terms of the level of the CO₂ external cost charge. The directive contains reference values for external cost charges but member states can apply higher such charges where they justify it. The directive's reference value for the external cost of CO₂ corresponds to 100 EUR/tCO₂, in line with the central estimate in the *Handbook on the external costs of transport*.³⁸ However, this figure only reflects the climate change avoidance costs in the short- and medium-run, whereas the true burden of emitting CO₂ needs to take its longer term impact into account. (The short / medium time can be variously defined, but is generally taken as within a decade or so; however, the worst societal impacts of rising CO₂ concentrations are expected to occur beyond this timeframe.) To also cover climate-related externalities in the longer term, the directive gives member states the option to increase the reference value of the charge by a factor of 2, i.e. equivalent to 200 EUR/tCO₂. This higher value is consistent with more recent estimates, e.g. the German Environment Agency puts climate externalities at 195 EUR/tCO₂ today, and 215 EUR/tCO₂ by 2030.³⁹

The table below sets out the external cost charge corresponding to 100 EUR/tCO₂ for the dominant long haul trucks in the EU. For such trucks, approved under EURO VI and falling into emission class 1, the external cost charge for CO₂ is 8 cents per kilometre. Where national governments decide to price CO₂ in a longer-term frame, and apply 200 EUR/tCO₂, the external cost for CO₂ also doubles, rising to 16c per kilometre for dominant long haul trucks. In other words, an increase in the cost applied to CO₂ from 100 to 200 EUR/tCO₂ results in the doubling of the cents-per-kilometre figures shown in the final column to the right of the table below.

³⁸ European Union (2020). Handbook on the external costs of transport. [Link](#).

³⁹ Umweltbundesamt (2020). Methodenkonvention 3.1 zur Ermittlung von Umweltkosten. Kostensätze. [Link](#).

Vehicle class		cent/vehicle-kilometre	Interurban roads (including motorways)
Heavy goods vehicle having a technically permissible maximum laden mass above 32 tonnes or having 5 or more axles	CO ₂ emission class 1	Euro 0	9,1
		Euro I	8,1
		Euro II	
		Euro III	8,0
		Euro IV	
		Euro V	
		Euro VI	
	CO ₂ emission class 2		7,6
	CO ₂ emission class 3		7,2
	Low-emission vehicle		4,0
Zero-emission vehicle		0'	

Table 3. Reference values for the external-cost charge for CO₂ emissions for heavy goods vehicles
Source: Table 1 of Annex IIIc of the directive.

Review planned for 2027

In 2027 the European Commission will assess the implementation and effectiveness of CO₂ variation, together with its coherence with the planned revision of other EU legislation, namely, the directives governing emissions trading and energy taxation. The Commission may then submit a legislative proposal to amend the provisions of the Eurovignette directive if appropriate.

Legislation regarding emissions trading for buildings and road transport, or ETS-BRT for short, is in negotiation. While the revised Eurovignette directive gives member states the option of discontinuing CO₂ variation if the EU's emission trading system is extended to cover buildings and road transport, the levels currently in discussion for road transport under ETS-BRT do not come close to the longer-term estimates for the external cost of CO₂ of 200 EUR/tCO₂, or more. In other words, transitioning to cleaner trucking, and lowering freight emissions in the coming years, will require CO₂ variation through the 2020s and beyond.

In practice, the 2027 review is likely to be an opportunity to grow the complementarity between member states' toll systems on the one hand, and ETS reform on the other, both systems having key roles to play in delivering the transport transition. In concession countries, for example, France, Italy, Greece and Portugal, CO₂ variation risks being applied slowly (as toll contracts are renewed or substantially amended). ETS-BRT offers these member states (and Croatia and Ireland) a floor CO₂ price, boosting their ability to transition trucking.

Outside of concession countries, government-directed distance-based tolling has great capacity to re-distribute revenue within the member state (e.g. for equity reasons to help smaller trucking firms

to transition). Between richer and less wealthy member states, ETS-BRT can help with redistribution through its associated Social Climate Fund, again based on equity.

4.2. Mandatory air pollution charges for trucks

The reform also requires countries with distance-based tolls to apply air pollution charges for trucks from March 2026. Today only four member states charge trucks for their air pollution: Austria, Belgium, Czechia and Germany. Additional countries will need to apply air pollution charges by March 2026, namely, Bulgaria, Hungary, Poland, Slovakia and Slovenia. Planned reform in Lithuania and Denmark (between 2023 and 2025) should see these countries charge for air pollution by March 2026. The Netherlands is expected to join those countries above as part of its reform in 2026/7. (While there are plans in Romania and Spain to progress distance-based tolling, they are not sufficiently advanced to say more.)

Where concession contracts are renewed or substantially amended after March 2026, air pollution charges will need to be levied. Over time, this will see a further 6 member states (Croatia, France, Greece, Italy, Ireland and Portugal) charging for air pollution, in line with the countries above. The remaining member states do not toll trucks (e.g. Finland, Malta) or apply vignettes which do not fall under a legal duty to apply air pollution charges (e.g. Sweden).

While vans and minibuses are not within scope here, it's worth briefly noting that where these vehicles are subject to tolls or vignettes, the rates must be varied for environmental performance from Jan 2026, where technically practicable.⁴⁰

Dealing with diversion

If applying an external cost air pollution charge on a tolled highway would divert traffic to a sensitive untolled route, the directive offers a solution. If the member state shows that adding an external air pollution charge “*would lead to the diversion of the most polluting vehicles, resulting in negative impacts on road safety and public health*”, it can avail of a derogation and not apply the charge on that section of highway.⁴¹ With this provision, difficult local situations, or “*duly justified cases*” as the directive refers to them, need not influence the national level of the external cost charge.

Reference values, and beyond the reference values

Before March 2022 member states were constrained by maximum limits on air pollution charges set out in the directive. The revised law replaces maxima with reference values. Member states can exceed reference values for air and noise pollution “*guided by the principle of efficient pricing that is a price close to the social marginal cost of the usage of the vehicle charged ... all parameters, data and*

⁴⁰ See article 7gb(2) of the directive. For vans and minibuses, this provision gives member states the flexibility to “choose to apply reductions to zero-emission vehicles only, without applying any variation to other vehicles and without notifying the Commission”.

⁴¹ Article 7ca(3) of the directive.

other information necessary to understand how the various external-cost elements are calculated shall be made public”.⁴²

In the Alps, for example, research indicates that the external costs of air and noise pollution from road transport are approximately 4 times higher compared to lowland regions.⁴³ The impact of air pollution is far higher due to inversion (which traps pollutants near the ground), while gradients and altitude lead to greater levels of direct exhaust emissions. Noise pollution is also worse due to gradients, inversion and the amphitheatre effect. To go higher than the reference values, member states will need to notify and justify their proposals to the Commission (in line with the procedures set out in the revised directive), and are aided in this task by a growing body of literature examining the true impact of air and noise pollution in given regional / sensitive settings.

The reference values in the revised directive for air and noise external costs as applied to a typical long-haul 40t truck are reproduced below. The reference figure stands just below 1c per kilometre for a EURO VI vehicle. The older the truck, the more its use is financially discouraged by higher reference rates. Overall, making air pollution external cost charges mandatory is a big step towards better recovering the costs of trucking’s impact on human health and the environment.

Vehicle class	cent/vehicle-kilometre	Suburban ⁽¹⁾	Interurban ⁽²⁾
Heavy goods vehicle having a technically permissible maximum laden mass above 32 tonnes or having 5 or more axles	Euro 0	33,5	19,4
	Euro I	25,0	14,1
	Euro II	24,9	13,9
	Euro III	20,1	11,1
	Euro IV	14,2	7,5
	Euro V	7,6	3,8
	Euro VI	3,4	0,8
	Less polluting than Euro VI, including zero-emission vehicles	2,8	0,3

Table 4. Reference values of the external cost charge for air pollution and noise.

Source: Table 1 of Annex IIIb of the directive.

4.3. Phasing out truck vignettes on the TEN-T core network

Compared to time-based vignettes, distance-based road tolls are more efficient and fairer. Distance-based tolling also better incentivises the purchase of more environmentally friendly vehicles, improving the logistics efficiency of road haulage.⁴⁴ From 2024, the introduction of new time-based road vignettes for trucks will therefore be restricted to limited circumstances. Moreover,

⁴² See Annex 111a(3) of the directive.

⁴³ European Commission (2020). Handbook on the external costs of transport. [Link](#). See pages 147 - 149.

⁴⁴ Transport & Environment (2017). The benefits of road tolls. [Link](#).

if time-based vignettes remain on the core parts of the TEN-T after March 2024, they must be varied according to truck CO₂ emissions.

From March 2030, member states have to discontinue user charges for HDVs on the core TEN-T. Member States with a common system for user charges benefit from a longer deadline and will be required to discontinue or adapt it by March 2032.⁴⁵ However, member states with vignettes may continue to apply such user charges on sections of the core TEN-T in duly justified cases where applying a distance-based toll would either involve disproportionate administrative, investment and operating costs compared to the expected revenue, or lead to the diversion of traffic with negative impacts on road safety or on public health. As noted above, the overall share of EU truck freight subject to vignettes from 2027 is set to be small (applying in MSs with 4% of EU road freight).

4.4. Mandatory tolling of small trucks

A heavy goods vehicle exceeds 3.5t GVW. However, a small number of member states that apply tolls to HGVs don't start at 3.5t, namely, Denmark, Germany, Luxembourg and Sweden. These member states will continue to enjoy significant flexibility⁴⁶ up until March 2027, but will need to toll all HGVs from 3.5t GVW after this date.

Given its central role as a transit country, the issue is particularly relevant in Germany where HGVs 3.5 to 7.5t are currently exempt from tolls. Luxembourg and Sweden also currently do not charge tolls on trucks with a GVW of less than 12t. Denmark's reform plan, agreed in June 2022, will see HGVs between 3.5 and 12t tolled slightly earlier than the EU deadline (1 Jan 2027, rather than 24 March 2027).⁴⁷ The planned reform in the Netherlands is on track to toll HGVs from 3.5t in 2027.

On foot of pressure during negotiations from Germany, a so-called 'craftsperson exemption' was included in the final text of the revision. Under this provision, member states may reduce or exempt HGVs between 3.5 and 7.5t GVW "*used for carrying materials, equipment or machinery for the driver's use in the course of the driver's work, or for delivering goods which are produced on a craft basis, where the transport is not effected for hire or reward*".⁴⁸ This provision also applies to ZEVs with a GVW up to 4.25 tonnes due to their higher drivetrain weight.

⁴⁵ Currently the truck vignettes in Denmark, Luxembourg, the Netherlands and Sweden are linked, but given the reform planned in DK and NL, this provision will most likely only apply to LU and SE by the turn of the decade.

⁴⁶ A member state may choose to apply tolls only to HGVs of 12 tonnes or more where it considers that tolling HGVs "of less than 12 tonnes would (a) create significant adverse effects on the free flow of traffic, the environment, noise levels, congestion, health, or road safety, due to traffic diversion; (b) involve administrative costs of more than 15% of the additional revenue resulting from that extension; or (c) concern a category of vehicles which does not cause more than 10% of the chargeable infrastructure costs". See Article 7(13) of the directive.

⁴⁷ Danish Ministry of Transport (2022). Fact sheet: Kilometer-based toll for trucks. [Link](#).

⁴⁸ See Article 7(9)(b) of the directive.

5. Policy recommendations

The road freight sector needs robust carbon pricing to put more efficient trucks on the road and bring down its emissions. Member states face different starting points and levels of political opportunity to address truck CO₂ on the one hand, and air and noise pollution from trucks on the other. Overall, however, the Eurovignette revision is a rich reform package, offering strong scope to match political ambition with policy measures.

Member states with government-directed distance-based tolls are well placed to deliver change, and key countries in the central distance-based block include Germany, Austria, Poland and Belgium. Countries due to significantly revise their truck tolling systems in the coming years are also well placed, particularly Denmark, Lithuania and the Netherlands, where the introduction of distance-based truck charging is anticipated in 2025, 2023/4 and 2026/7 respectively. Romania and Spain have made public commitments towards distance-based truck charging (e.g. in their Covid Recovery and Resilience Plans), but greater detail on the timing and extent of their reforms is awaited. In overall terms, the best reform will be achieved by each country starting soon, and fully exploiting the opportunity available.

Looking at climate emissions, and in the case of government-directed distance-based tolling, the most interesting reform option in our assessment is to both vary the infrastructure charge for CO₂, and apply a CO₂ external cost. Deploying both tools means that tolls for cleaner trucks will become cheaper, while trucks that emit more will need to pay more. Combining the carrot and the stick best influences the pattern of new truck purchasing, and offers the most help to transition to cleaner fleets.

Nine national capitals are working to a March 2024 deadline to vary tolls for CO₂ across their tolled highway network. Sequenced by road freight activity, these countries are: Germany, Poland, Belgium, Austria, Czechia, Hungary, Slovakia, Slovenia and Bulgaria. Just two years later, air pollution charges become mandatory across their tolled networks (March 2026). T&E suggests an integrated approach, i.e. a strategic planning process with both the 2024 and 2026 deadlines in mind.

A small number of member states which currently toll HGVs continue to apply exemptions for freight vehicles between 3.5 and 12t GVW (Denmark, Luxembourg and Sweden, with 3.5 - 7.5t exempt in Germany). These will need to be removed no later than March 2027.

The highway networks of five member states are dominated by concession contracts - France, Italy, Croatia, Greece and Portugal, while Ireland's highway network is partly concession-controlled. Under existing concession agreements, governments can typically only vary toll charges by agreement with the concession holder (or under a formal procedure, often decades old, which has little regard to CO₂, air pollution or noise). A pro-active approach on existing contracts will be needed by concession countries. Otherwise, they risk a slower transition. These governments need to engage with existing concessionaires to persuade them to revise tolls in a revenue-neutral way (i.e. reductions for cleaner

trucks offset by increases for trucks that emit more). While the directive does not demand such action, it certainly points in this direction.⁴⁹

Being based on time and not distance, truck vignettes do not apply the user/pollution pays principle in a proportionate way. This is increasingly reflected by member state reform. Such vignettes cover an ever-decreasing amount of EU road freight, and the application of this directive's reforms will continue this shift.

Some targeted support to the road freight sector is needed for the transition to ZEVs. Governments should use part of new revenues from toll reform to financially support the transition. The introduction of external cost charges will yield additional revenue available to support the sector, and this support should be delivered in line with the equity goals of member states and the EU, with particular attention on the presence of SMEs in the trucking sector.

Member states are urged to start work on the implementation of the reform as soon as possible.

Further information

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⁴⁹ Where concession tolls are not varied for CO₂, Article 7ca provides that “member states may assess the possibility of applying an external-cost charge for CO₂ emissions and for air pollution or discounts, related to those emissions”, and that “the result of that optional assessment, including a justification of the reason why the external-cost charge or discount is not applied, shall be notified to the Commission”. During negotiations between Parliament and Council, MEPs sought a stronger provision but concession countries declined saying they couldn't engage effectively with concessionaires if binding commitments were placed in EU law.

Annex. New obligations for EU member states

EU member state	Entry into force of new obligations			
	CO ₂ -based tolling	Air pollution charges [1]	Distance-based tolling on TEN-T core [2]	Tolling of small lorries 3.5 - 12 tonnes [3]
Austria	March 2024	In force	In force	In force
Belgium	March 2024	In force	In force	In force
Bulgaria	March 2024	March 2026	In force	In force
Czech Republic	March 2024	In force	In force	In force
Denmark	March 2025	March 2026 [1]	March 2032	March 2027 (Jan planned)
Germany	March 2024	In force	In force	March 2027 [4]
Estonia	March 2024	---	March 2030	In force
Croatia	Does not apply truck tolls, or existing concessions exempt until renewed or substantially amended [5]			
Cyprus				
Finland				
France				
Greece				
Ireland				
Italy				
Spain				
Latvia				
Lithuania	March 2024	March 2026 [1]	March 2030	In force
Luxembourg	March 2025	---	March 2032	March 2027
Hungary	March 2024	March 2026	In force	In force
Malta	Does not apply truck tolls			
Netherlands	March 2025	See [1]	March 2032	March 2027

Poland	March 2024	March 2026	In force	In force
Portugal	Existing concessions exempt until renewed or substantially amended			
Romania	March 2024	See [1]	March 2030	In force
Slovenia	March 2024	March 2026	In force	In force
Slovakia	March 2024	March 2026	In force	In force
Sweden	March 2025	---	March 2032	March 2027

Notes.

[1] Vignette countries are not required to charge for air pollution whereas MSs with distance-based tolling must do so by March 2026. (Existing concessions can be exempted until they are renewed or substantially amended). Vignette counties shifting to distance-based tolls become subject to the requirements governing distance-based tolling when they transition. For Denmark and Lithuania the transition is expected before March 2026. For the Netherlands, the transition is expected in 2026/7. For Romania, more information is awaited.

[2] After March 2030, member states may continue to apply user charges on the TEN-T core in duly justified cases or by establishing a combined charging system.

[3] Trucks with 3.5 - 7.5 tonnes GVW used for carrying materials, equipment or machinery on a craft basis can be exempted from road tolls. Zero emission vehicles up to 4.25 tonnes GVW can also be exempted.

[4] Germany is currently tolling all trucks from 7.5 tonnes GVW.

[5] Member states which do not toll trucks are exempt from the obligation to introduce CO₂-based tolling. Member states with concession tolls are also exempt from the new obligations until such contracts are renewed or substantially amended.

Sources. European Union (2022), European Commission (2017), Government of the Netherlands (2022), Government of Finland (2021), Vinetki.bg (2021), Bundesministerium der Justiz (2021).