

# CO<sub>2</sub> differentiated truck tolls – what the EU should do

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## Summary

Greenhouse gas emissions from heavy duty vehicles have increased by 36% between 1990 and 2010. Without additional action the share of heavy duty vehicle's carbon emissions in road transport will increase from 30% in 2012 to around 40% in 2030. Without such additional action on truck emissions, meeting the EU's 2030 climate targets would be very challenging for member states.

Economic instruments are a key ingredient of a credible strategy to deal with truck CO<sub>2</sub> emissions. For example, taxes and charges that are differentiated on the basis of carbon emissions have accelerated the uptake of low carbon cars. For trucks, such policies currently do not exist. The main reason is that until recently there was no way to measure new truck CO<sub>2</sub> emissions in a standardised manner. This will change with the introduction of the HDV CO<sub>2</sub> test procedure – known as VECTO – in 2016. The VECTO CO<sub>2</sub> certificate for new trucks will enable CO<sub>2</sub> differentiated charges and taxes and the German government has already announced it wishes to introduce CO<sub>2</sub> differentiated<sup>i</sup> road charges before 2020.

T&E commissioned CE Delft to undertake a study<sup>ii</sup> to assess the usefulness, as well as the possible implementation and design issues, of CO<sub>2</sub> differentiated kilometre charging. The report's key findings are that:

- 1) CO<sub>2</sub> differentiated road charging is technically feasible and would contribute to lowering road freight carbon emissions. It would stimulate hauliers to purchase and operate the most efficient vehicles and improve the business case for investments in fuel saving technologies.
- 2) The EU should revise the Eurovignette directive (2011/76/EU) to enable CO<sub>2</sub> differentiated kilometre charges based on the EU's VECTO test procedure for truck and bus CO<sub>2</sub>. To safeguard the internal market and ensure coherent pricing signals the EU must establish common principles to underpin national charging systems.
- 3) There are a number of technical and design issues. These include the unavailability of certified emission values for older trucks and buses, the inclusion of trailers and aerodynamic devices as well as the actual design of the differentiation scheme.

T&E's view is that the Commission should enable CO<sub>2</sub> differentiated charging and make the updated Eurovignette proposal a key part of its 2016 decarbonisation strategy. The combination of smarter charging and the introduction of CO<sub>2</sub> targets for new trucks would form a coherent package that would reduce truck and bus carbon emissions by almost 40 megatons of CO<sub>2</sub> by 2030. Whilst more efficient trucks would be more expensive to purchase, these investments would rapidly show returns, freeing up resources for additional investments or consumption.

We recommend that the Commission's focus should be on enabling smarter road charging and ensuring the overall fairness of member states' charging policies. However, the EU must refrain from prescribing exactly how governments shall design their CO<sub>2</sub> differentiated charging policies.

# 1. Why the EU should enable CO<sub>2</sub> differentiated road charges for HGVs

## 1.1. What is CO<sub>2</sub> differentiated road charging

A number of EU countries including Germany, Austria and Poland currently require trucks to pay kilometre charges when travelling on that country's highways (and national roads). The charges are primarily based on the infrastructure damage trucks cause. Virtually all countries that have kilometre charging for trucks, differentiate these charges based on the air pollution emissions (EURO class) of the vehicles. This encourages the purchase and use of the most modern and least polluting vehicles.

These charges could also be differentiated on the basis of the trucks' carbon emissions. So, road charging differentiation is not to increase revenues or including CO<sub>2</sub> in the external costs. The purpose of such a policy is to stimulate the market to move in a direction that would deliver additional benefits to society as a whole, and to hauliers in particular.

## 1.2. The market needs an efficiency push

Fuel represents between a quarter and a third of long distance haulage costs.<sup>iii</sup> Hence, it could be expected that trucks would become ever more efficient. However, this is not the case. During the last two decades new truck fuel efficiency has barely improved<sup>iv</sup>. This is because differences in fuel economy are often small and, therefore, fuel efficiency is often not the decisive factor when buying a new truck<sup>v</sup>. Uncertainty over payback periods and difficult access to finance also play a role. On top of that, the European Commission accuses truckmakers of cartel practices.<sup>vi</sup> So it is clear that trucking needs an efficiency push.

Contrary to passenger cars, there are currently no fiscal or economic instruments to incentivise efficient truck purchasing. Having CO<sub>2</sub> differentiated road charging or taxation would push the market to provide more fuel-efficient HGVs, as hauliers would have an extra incentive to buy more fuel-efficient vehicles.

## 1.3. Regulation needs to continue driving fleet renewal

In Germany EURO class differentiation in road charging accelerated the renewal of the fleet.<sup>vii</sup> EURO standards differentiation resulted in a younger and cleaner fleet. Germany was successful because they implemented the maximum differentiation allowed for in the annexes to the Directive. CO<sub>2</sub> differentiation would have an impact on the overall fuel-efficiency of the fleet. A side-effect of CO<sub>2</sub> based charges would be to continue stimulating fleet renewal which would have wider economic and road safety benefits.

## 1.4. Member states need EU help, not obstruction to reduce HDV CO<sub>2</sub>

Emissions from heavy-duty vehicles (HDV) increased by 36% between 1990 and 2010. HDV emissions currently represent around 30% of all road transport CO<sub>2</sub> emissions and 5% of all EU CO<sub>2</sub> emissions. Unless additional measures are taken HDV emissions will increase to 40% of road transport emissions by 2030<sup>viii</sup>. By 2030 trucks and buses will emit approximately 15% of total 'effort sharing' or non-ETS emissions. To reach the targets, truck emissions need to be dealt with. Some member states such as Germany have announced they want to introduce CO<sub>2</sub> differentiation (energy efficiency differentiation) in road charging. The Commission should make this possible.

# 2. Why the Commission needs to act: Fair Competition & Consistent Price Signals

The "Eurovignette" directive establishes a framework to encourage road charging for HGVs within the EU. For those countries who wish to introduce road charging within their borders, there are rules in the directive that define the methodology in which member states (MS) may charge trucks.

Varying the infrastructure portion of tolls based on CO<sub>2</sub> emissions is not foreseen under the current EU road charging scheme. Germany has recently proposed the adoption of CO<sub>2</sub> differentiation on their roads and

plan to establish this before 2020. Such differentiated tolls will be a very effective means to promote the use of more efficient and lower carbon vehicles and would neatly align with the EU's Energy Union and climate ambitions. T&E proposes that such CO<sub>2</sub> differentiation is enabled by the new Eurovignette Directive. We also propose that the EU should define a number of boundary conditions and principles national systems should respect.

## **2.1. To avoid inconsistent pricing signals**

Action must come at an EU level in order to avoid situations where differentiation is set in a manner that is inconsistent. The directive itself establishes that “inconsistent charging schemes should be avoided in order not to distort competition in international goods transport”. In 2012, an Internet consultation of stakeholders was organised where 75% of respondents expressed that differences in the type of charges on vehicles between MS distort competition between hauliers. Since the haulage market is a very international market we need to avoid this if charges are to be differentiated based on CO<sub>2</sub> emissions for HGVs in Europe. At the very least the EU should define general principles and guidelines for member states to follow when they introduce differentiation.

## **2.2. To ensure fair Competition**

If left entirely to member states, CO<sub>2</sub> differentiation may be set in a manner that is discriminatory to certain vehicles or manufacturers. This was an issue in 2011 with Germany's car labelling system, which was considered by France and Italy to be discriminatory due to the fact that the vehicle's emissions ranking was relative to its weight. Similar problems exist with Germany's plans to establish vignettes for passenger cars.

The Commission wants “transparent, proportionate and non-discriminatory” road charging that does not “unduly discriminate against certain categories of users”. To ensure such a system, CO<sub>2</sub> differentiation should be considered by the European Commission in order to establish a fair and coherent mechanism to differentiate HGV charges.

Furthermore, trucks move across borders every day at a far greater rate than cars do. HGVs are therefore an international vehicle. EU action would be better for both the toll operator and the hauliers as any administrative burdens and costs would be reduced as a result of coherent rules. Consequently, this would be beneficial to the functioning of the internal market.

# **3. How the system could work – Solvable challenges**

## **3.1. Current differentiation of tolls**

Toll differentiation already exists today. Directive 2011/76/EU allows for differentiation based on both air pollution<sup>ix</sup> and noise. Tolls may also vary in certain circumstances in relation to the infrastructure charge. This directive contains maximum values for such differentiation within its annexes.

Several countries applying tolls to HGVs in Europe differentiate the levels based on EURO class, which classifies the vehicles based on their pollution standards. Every truck's EURO class is then communicated to the toll operator via a sticker placed inside the windscreen of the cabin. The class is established based on the vehicle registration certificate.

The air pollution portion of the German road toll is differentiated based on the emission class. The EURO categorisation is verified by checking the vehicle data that the HGV owner declares to the toll charger when ordering the On-Board Unit (OBU). These OBUs are compulsory under a distance based charging scheme. Satellite technology within the OBU tracks the distance travelled by the truck.

Germany also differentiate HGV tolls based on the amount of axles on a truck. The logic behind this is that trucks with more axles are heavier and, as a result, are causing more damage to the road infrastructure. Trucks with four or more axles are subject to a larger toll than those with three or two. The number of axles

can be checked by an enforcement gantry taking a three-dimensional scan of the truck whilst driving past the toll. This process only takes a few seconds. If a toll violation is suspected, the data is passed on to Toll Collect for further assessment<sup>x</sup>.

In many respects CO<sub>2</sub> differentiated charging could build on the existing system for EURO class differentiation. New tractors and rigid trucks would have a CO<sub>2</sub> certificate and this can be declared to and enforced by the tolling authorities. The issue is somewhat more complex for trailers.

### **3.2. How to establish the CO<sub>2</sub> emissions of trucks – and what about old trucks?**

VECTO is a simulation tool that calculates the CO<sub>2</sub> emissions of HGVs. The idea behind this tool is to present information on the energy efficiency of a HGV so that customers can select their truck based on VECTO figures. VECTO is a monitoring, reporting and verification system that will be introduced in type approval in 2016. CO<sub>2</sub> differentiation must be based on the commonly agreed VECTO procedure. CO<sub>2</sub> differentiation of tolls would provide an immediate practical use for such information. Furthermore, it would be in the interest of the toll collectors and public authorities to ensure accurate VECTO testing, which would strengthen the credibility of VECTO.

For those trucks that do not have a VECTO CO<sub>2</sub> certificate, and for which there is no reliable data on its energy performance, there could be the highest CO<sub>2</sub> related HGV toll applicable. Although this could be perceived as arbitrary by owners of older vehicles, we feel this is a sensible approach since new vehicles are very likely to be more efficient than older ones. This is also currently the mechanism used for charging HGVs when there is no EURO class information. Finally, this approach would encourage fleet renewal which would have wider economic and safety benefits.

### **3.3. Which VECTO value to use - one single value in grams per vehicle kilometre**

For information purposes, trucks tested by VECTO will receive different CO<sub>2</sub> values to reflect different mission profiles and loading rates. The reason for this is that VECTO is partially designed to inform consumers who can decide which of the different values is relevant to them. However, for regulatory or taxation purposes vehicles will need to have a single value. Vehicles with certain characteristics (e.g. tractors) will need to be considered to be used for long haul purposes even if it is possible that sometimes such a tractor might also do regional distribution jobs. Using a single value is essential to reduce the possibilities for manufacturers to game the system<sup>xi</sup>. For example, if charges are relatively lower for regional delivery trucks, there could be an incentive to sell long haul trucks dressed up as regional trucks. Hauliers would then be free to use them as they please. For road charging purposes specifically one could also consider using the long haul mission profile CO<sub>2</sub> value as this is most in tune with the type of infrastructure covered by charges (highways and national roads).

The single value could be established in different units. We believe that this parameter should reflect the purchasing behaviour of hauliers and be relevant from an environmental point of view. Truck magazines report fuel consumption of trucks per 100 kilometres. Carbon dioxide emissions are directly related to fuel consumption. Hence, a metric of grams per vehicle kilometre (g/vkm) seems most appropriate. In addition, the risk of unintended consequences is smaller for g/vkm. Indeed, introducing a parameter based on tonnes transported would encourage a shift towards larger, more polluting, vehicles. This is also in line with the current differentiation model for EURO classes which is based on the emissions of the vehicle engine, not on the tonnage that vehicle is transporting.

This however, does not prevent that gram per ton kilometre, or gram per cubic meter/kilometre, is used for other purposes such as carbon reporting in the logistics sector.

### 3.4. Charge functions vs. step-based approach

When designing road pricing schemes, charging categories could be continuous or step-based. The first one implies that vehicles would be charged depending on their emissions, applying a formula, while the second one would create different categories, and any truck within the specific category would be charged equally. Although both options have cons and pros, CE Delft estimates that a continuous approach would be more suited to achieve larger reductions. However, if it is not differentiated by the type of vehicle, there may be a risk that it would encourage the use of smaller vehicles (in the same way that ton/km would encourage larger vehicles). A different approach would be to create vehicle classes (urban, regional, long haul, construction, buses) and to use a continuous function within this category. The benefit of such an approach would be to avoid encouraging smaller/bigger vehicles but to steer hauliers towards the most fuel efficient vehicles within that category. So a haulier considering which vehicle to buy or use on tolled roads, would go for the most efficient one within the vehicle class they're considering.

## 4. Trailers, Retrofits and Aerodynamic Devices

### 4.1. Trailers

Under the VECTO system, reference trailers (and bodies) will take the place of actual trailers (and bodies) during the testing process. This means that the actual energy performance of various trailers will not be recorded within the initial VECTO results. There are several devices that can reduce CO<sub>2</sub> emissions from trailers and these should be accounted for in any CO<sub>2</sub> differentiation scheme. The most important of those are aerodynamic add-ons. Aerodynamic tails and side skirts offer significant fuel savings and their use is facilitated and promoted by the recently adopted directive 2015/719. However, experience in the US (SmartWay US and SmartWay California) suggests that market take up of devices will only really take off on a large scale once (regulatory) incentives are in place.

The performance of (retrofitted) aerodynamic devices components would need to be verified and accredited. Such accreditation would be possible as part of VECTO although specific provisions would need to be made for this. A system could be developed where the use of a device or combinations of different devices (e.g. tails, skirts, mud flaps) – for example based on a points scheme – would qualify for a km-charge discount. The discount would not need to be very high. For example, a 0,5ct/km discount means a haulier driving 100,000km would save €500 per year on top of already considerable fuel savings. Provisions should also be made for vehicles or trailers that have aerodynamic features as standard. The list of compliant add-ons, as well as the appropriate km-charge discount/increase should, at least initially, be developed at a MS level but should be based on criteria that ensures non-discrimination and coherence. The entire trailer would eventually play a role in the toll differentiation based on CO<sub>2</sub> but this will come with time as VECTO develops.

In real world terms, trailers can be switched and fitted to different tractors for different journeys. Such trailers can differ in dimensions and design so toll differentiation based on CO<sub>2</sub> emissions must ensure proper compliance mechanisms. However, this is not an entirely new problem since many existing road charging schemes are based on the number of axles and this must also be enforced.

### 4.2. The SmartWay Example and Retrofit Verification

In California HGV owners must replace or retrofit their vehicles with compliant aerodynamic technologies and low rolling resistance tires in order to be allowed to operate on Californian highways. These retrofits must be SmartWay verified. SmartWay “establishes credible performance criteria and reviews test data to ensure that vehicles, equipment and technologies will help fleets improve their efficiency and reduce emissions”<sup>xii</sup>. All the equipment and technologies that are SmartWay verified can be found online. T&E suggest that a similar independent testing and verification system, based on VECTO, should be established within Europe in order to create a list of “acceptable” retrofitting that could warrant a reduction in the maximum fare for HGV for which there is no VECTO information. The retrofits would also need to be checked to ensure they're

operational. A way to do this could be to add such technologies to a vehicle's registration document, check them using an automatic enforcement gantry, or check them annually during the vehicle's maintenance calls.

## 5. What the EU should do

The EU will need to act in order to tackle the growing CO<sub>2</sub> emissions from HGVs. These emissions have increased some 36% between 1990 and 2010 and currently account for 25% of road transport emissions. Trucks will, therefore, play a vital role in the decarbonisation of transport. Differentiating tolls based on CO<sub>2</sub> emissions could send a clear signal to hauliers that trucks with poor fuel efficiency will be charged more than those that emit less CO<sub>2</sub>. This would promote more fuel efficient vehicles within the sector and directly contribute to reaching Europe's 2030 ESD targets.

The EU will review the road charging legislation in 2016. The framework for CO<sub>2</sub> differentiation needs to be established at an EU level by means of a modification of Directive 2011/76/EU for reasons explained within this briefing, namely, fair competition and coherent and environmentally sound pricing signals.

The EU should avoid being overly prescriptive and refrain from proposing specific rules or charge levels. Instead it should focus on the establishment of sound principles to underpin national schemes. Within these boundaries member states should be free to develop their own schemes although they should present draft schemes to the Commission for scrutiny before introducing them.

Whilst we consider that CO<sub>2</sub> differentiated road charges should initially remain optional, the Commission should eventually propose amendments that require member states to put such differentiation in place before a set deadline, as they did in Directive 2006/38/EC in relation to the differentiation of infrastructure charges based on EURO emission classes.

## Further information

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## Endnotes

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<sup>i</sup> German Climate Action plan p47

[http://www.bmub.bund.de/fileadmin/Daten\\_BMU/Pool/Broschueren/aktionsprogramm\\_klimaschutz\\_2020\\_broschuere\\_en\\_bf.pdf](http://www.bmub.bund.de/fileadmin/Daten_BMU/Pool/Broschueren/aktionsprogramm_klimaschutz_2020_broschuere_en_bf.pdf)

<sup>ii</sup> CE Delft, 2015. CO<sub>2</sub>-differentiated road charges for HGVs.

<sup>iii</sup> FTA, 2015. FTA's Manager's Guide to Distribution Costs - April 2015 Update Report.

<sup>iv</sup> See page 7 of Transport & Environment, 2015: Lorry CO<sub>2</sub> – Why Europe needs standards

<sup>v</sup> GIPA, (to be published). Market survey on fleet managers' purchase behaviour, 2015.

<sup>vi</sup> European Commission, 2011. Antitrust: Commission confirms unannounced inspections in the truck sector

<sup>vii</sup> European Commission, 2013. Ex-post evaluation of Directive 1999/62/EC, as amended, on the charging of heavy goods vehicles for the use of certain infrastructures.

<sup>viii</sup> Transport & Environment, 2015. Too big to ignore – truck CO<sub>2</sub> emissions in 2030.

<sup>ix</sup> "Cost of traffic-based air pollution" means the cost of the damage caused by the release of particulate matter and of ozone precursors, such as nitrogen oxide and volatile organic compounds, in the course of the operation of a vehicle.

<sup>x</sup> [https://www.toll-collect.de/en/toll\\_collect/service/fragen\\_\\_\\_antworten/kontrolle/kontrolle.html](https://www.toll-collect.de/en/toll_collect/service/fragen___antworten/kontrolle/kontrolle.html)

<sup>xi</sup> CE Delft, 2013. CO<sub>2</sub> standards and labels for heavy duty vehicles.

<sup>xii</sup> <http://www3.epa.gov/smartway/forpartners/technology.htm#tabs-5>