# Uptake of truck fuel efficiency technologies

## Why market forces alone will not do the job

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## Summary


Trucks account for around a quarter of EU road transport greenhouse gas emissions and consume on average 180 million litres of diesel every day in Europe. Hauliers spend 32 000 euro per year on fuel on average per truck.[1] The crude oil required in Europe to refine into diesel is mostly imported from Russia and the Middle East.[i]

Although the trucking sector is more cost-driven than passenger cars, truck fuel economy has stalled since the mid-1990s.[ii] As explained in this T&E report, this is related to a number of market barriers such as truckmakers' market power, split incentives and limited affordable supply of technologies.

A new report by the ICCT assessing the uptake of fuel-saving technology for trucks confirms these market barriers. Our briefing finds that if hauliers purchasing a new truck invest in the seven cost-effective technologies described here - all of which are currently on sale, fleet average truck fuel consumption could be cut by 18%, which would save them 5 760 euro yearly. Instead, the market penetration of these technologies remains very low. One example is turbocompounding: it has been available since 2000 and saves nearly 3% fuel - but is absent from nearly all new trucks (only fitted on 0.24%). Another example is low resistance tyres. These can be retro-fitted to existing as well as new trucks. Low resistance tyres save 7% fuel but have a very low market penetration of only 1%.

These technologies are being left on the shelf for a number of reasons. Firstly because many of these technologies are optional and have to be purchased at a significant cost premium. For many of Europe's SME hauliers this is a big obstacle, especially given the difficulties they face in accessing finance. Secondly, there are split incentives for truckers.

Overcoming these barriers will require fuel efficiency standards, which would make fuel saving technologies standard, rather than optional. Mass deployment would cut costs and further improve the payback periods. This will make fuel saving technologies accessible to the entire trucking market, rather than only to the most advanced fleets. For example, fuel/CO2 standards would not just ensure high-efficiency tyres are fitted to new trucks; huge reductions in unit cost would also enable large-scale retro-fitting across the existing truck fleet.

The report only deals with new technologies available since 2015. By 2030 the potential for fuel savings is far greater. Indeed, a report by AEA Ricardo Energy & Environment shows that truck fuel consumption could be cut cost-effectively by 30% by 2030 through EU fuel efficiency standards.

The EU Commission has announced it will propose truck fuel efficiency standards in early 2018.

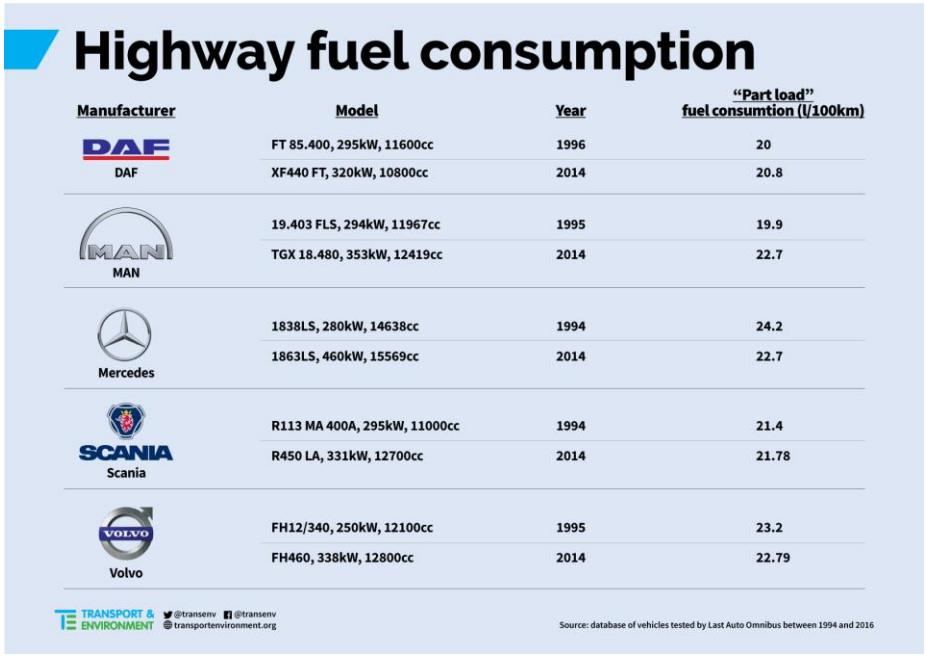

[1] This is the average number for a tractor trailer truck.

# 1. Introduction

## 1.1. Growing truck CO2 emissions

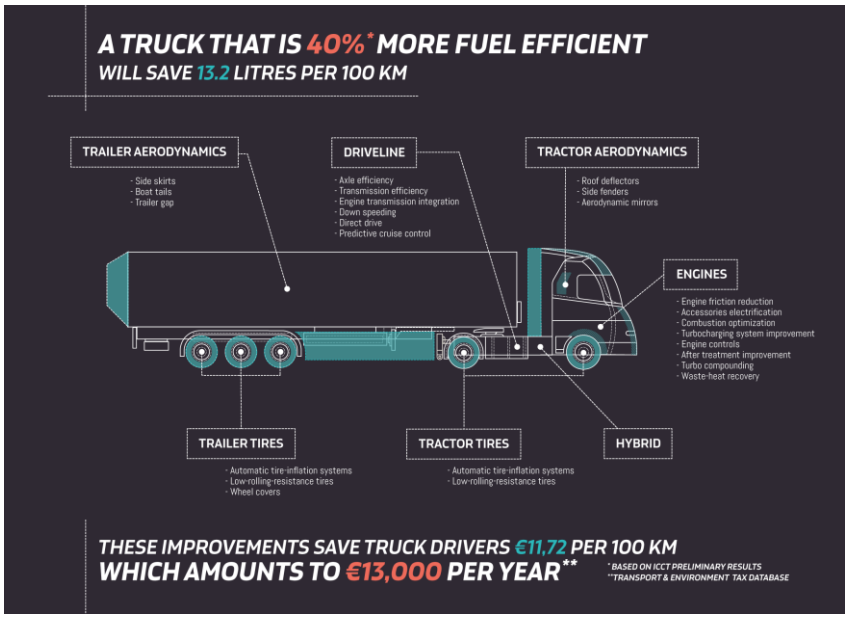
According to the International Energy Agency (IEA), road freight is the main contributor of road transport CO2 emissions since 2000.[iii] Trucks currently make up a quarter of EU road CO2 emissions and this is only expected to grow. Looking at European Commission (EC) projections, emissions from heavy goods vehicles (HGVs) will increase by 10% between 2010-2030 and 17% from 2010 to 2050 – unless action is taken.[iv] By 2030 the EU and Member States need to reduce CO2 emissions from the so-called non-ETS sectors (i.e. transport, agriculture and buildings) with 30% compared to 2005 levels. In order to meet these targets, truck CO2 emissions need to be tackled urgently.

There are two main reasons that explain the growing trend of truck emissions. The first one is the increasing demand for road freight. Recent Eurostat numbers show that the share of road transport increased in 2014, accounting for three-quarters of EU freight in 2015. This while at the same time the share of rail and inland waterways in EU freight transport decreased.[v] A second reason is the stagnating fuel efficiency improvements in the European fleet. As the graph unveils, the average fuel consumption of trucks has not substantially improved since 1990.[vi]




## 1.2. Lots of untapped potential

Different research shows that there still remains a lot of untapped potential to improve the fuel efficiency of trucks in a cost-effective manner. A new study by the International Council on Clean Transportation (ICCT) demonstrates that 2015 baseline tractor-trailer trucks could be 43% more fuel efficient in 2030 by applying short and long-term fuel efficiency technologies to the vehicle. The same accounts for rigid urban trucks which also have an efficiency potential of 43% by 2030.[vii]



Other 2017 research done by AEA Ricardo Energy & Environment had a closer look at the costs of many of these fuel efficiency technologies. The study finds that that the fuel consumption of new tractor-trailer trucks could be cost-effectively reduced by a third in the 2020–2030 timeframe. These improvements would be cost-effective for hauliers as virtually all of the fuel savings (30%) could be achieved within a payback time of less than three years.[viii]

# 2. The market is not delivering the goods

## 2.1. Excellent trucks – only for the few

Despite the potential and availability of these technologies many of them do not find their way into the market on a large scale. Indeed, the best in class trucks have many state-of-the-art technologies but this does not apply to the average vehicles in Europe. The 2017 AEA Ricardo study for example shows that there is big difference in fuel consumption between the economy, average and premium vehicles in the EU (39 to 31 L/100km).[ix]

Another example is the optimised tractor that was used for the Mercedes Efficiency Run 2016. This truck has a predictive cruise control system to improve the fuel efficiency of the vehicle. But research done by the ICCT looking specifically at the market penetration of fuel efficiency technologies shows that the market adoption of this technology is only 20% for new tractor trailers in Europe.[x] [xi]

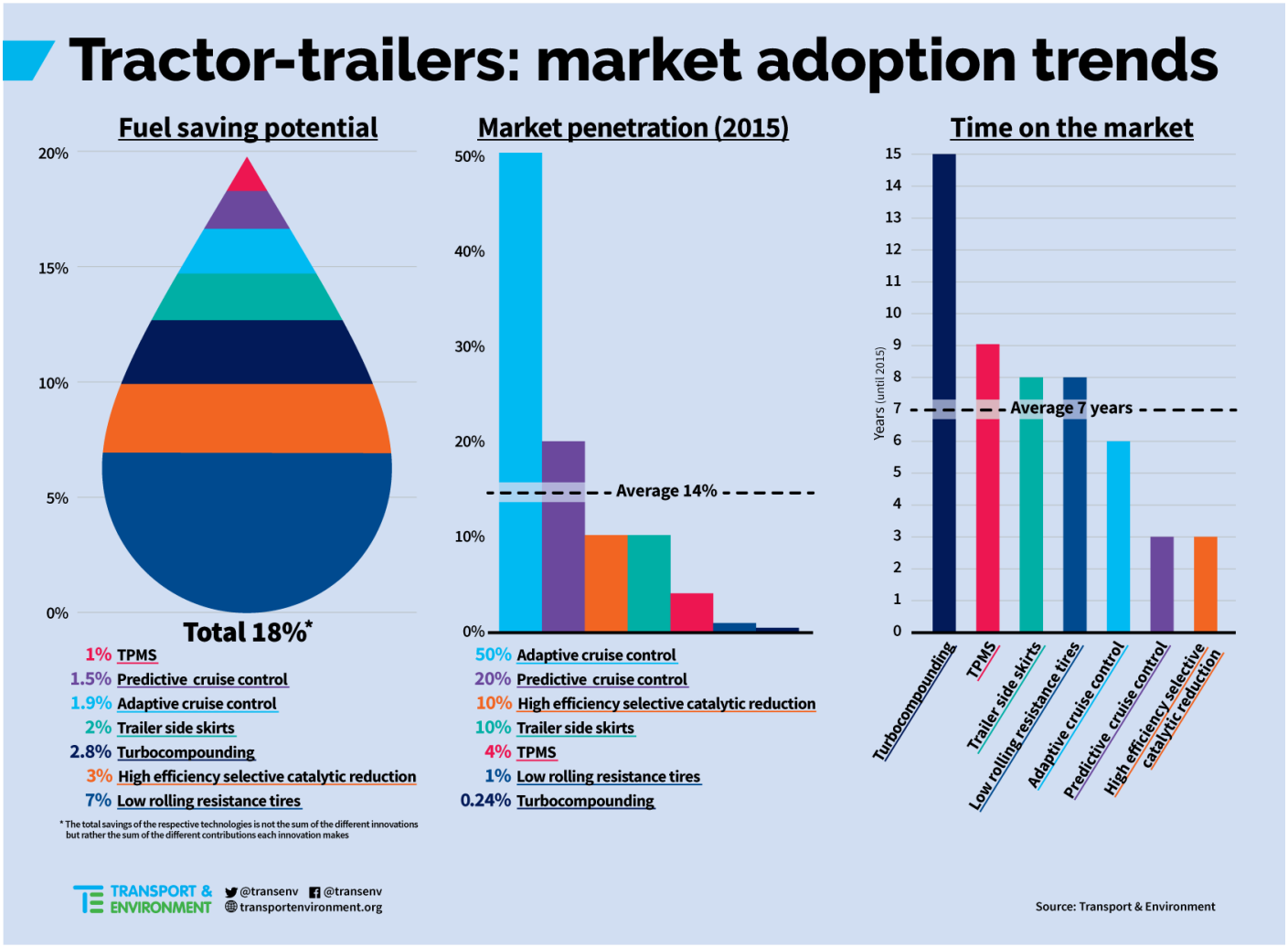
**Truck used at Mercedes Efficiency Run 2016**

In this briefing we look in more detail at the technologies discussed in the ICCT paper mentioned above, their market adoption and how we can overcome these market barriers. The research finds that there are still many technologies that have high fuel efficiency potential but currently only a low market penetration.[xii] This is not only a missed opportunity for EU climate but also a loss for the transport sector because they do not always have access to many of these fuel saving technologies. This while at the same time fuel represents 25 to 30% of their operating costs.[xiii]

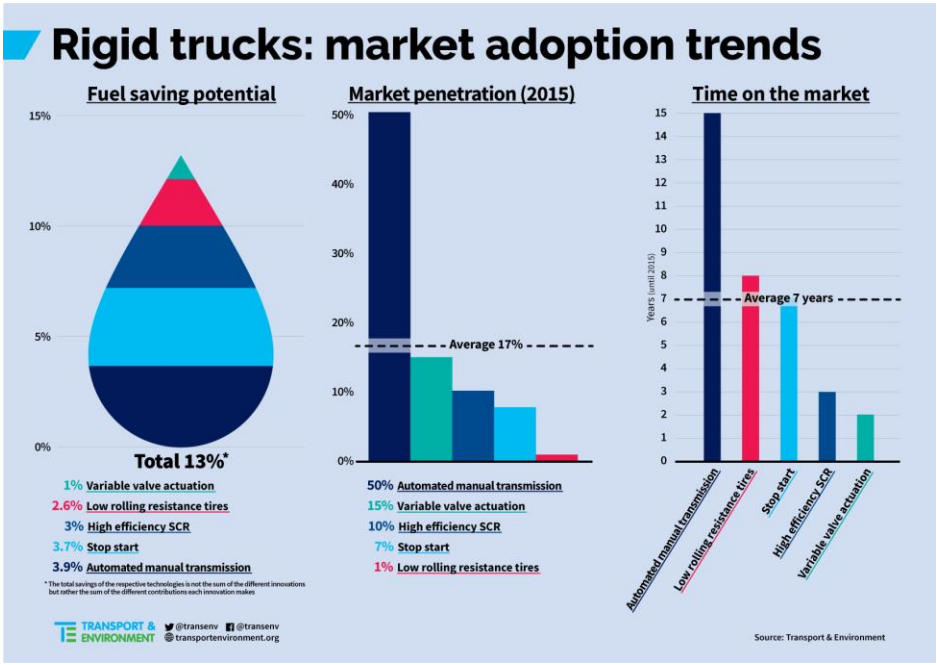
## 2.2. ICCT research – our findings in more detail

The ICCT study looked at the market adoption trends of 27 fuel efficiency technologies for tractor-trailers and rigid trucks in the EU, US and China based on market penetration data of the last 20 years. In this briefing we will focus on seven tractor-trailer and five rigid truck technologies in the EU market – see infographic below. As for the technology side, we focus on technologies that have a reduction potential of at least one percent or more. Regarding the market penetration, we look at technologies that are available now (i.e. more than 0.1 percent) and have a market adoption of no more than 50 percent.

The infographics show that for tractor trailers there are seven different technologies with some good fuel saving potential totaling up to 18 percent. They have been available on the market for seven years on average but have a low market adaption of only 14 percent on average. Technologies such as for example turbocompounding and high efficiency SCR have a high potential but only a low market penetration despite being available for a long time.

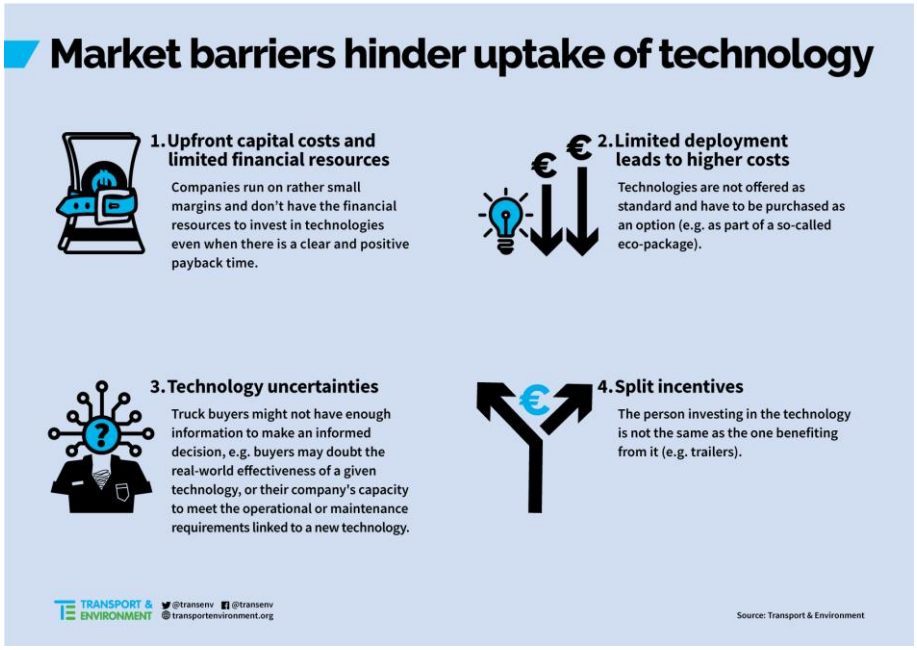



We see the same happening for rigid trucks with a total fuel saving potential of more than 13 percent but again a rather low average market penetration rate of 17 percent while they have been available for seven years on average. It is important to stress here that for both categories we only selected the technologies that have an adoption rate of more than 0.1 percent (i.e. some manufacturers are fitting them to their 'premium' or 'eco' model trucks). When taking into account other technologies with high potential but low market adoption - such as waste heat recovery and hybrid powertrains - the potential fuel saving is higher and market adoption even lower.



# 3. Explaining the results – why the market is failing

Our findings clearly show that for both truck categories, market forces alone are not ensuring a wide uptake of these technologies. Some technologies we selected have been available for nearly one decade but still their adoption has been poor. At the same time the transport sector has a big interest in purchasing these technologies because of their high fuel costs. There are as a matter of fact different four market barriers that avoid the uptake of these technologies explained in the infographic below.




# 4. Conclusions - How this can be fixed

## 4.1. Will VECTO and Monitoring and Reporting of Truck CO2 emissions solve the problem?

In May the European Commission and Member States adopted the VECTO test procedure. It will require CO2 emissions and fuel consumption from new trucks to be calculated in a harmonized way according to this test procedure.[xiv] The Commission also made a proposal for monitoring and reporting of truck CO2 emissions. It will regulate which data OEMs have to share with the EC and which parameters they have to make publicly available.[xv]

Manufacturers claim that VECTO and monitoring and reporting will generate big fuel savings because of increased transparency for the truck buyers. They state that it will boost competition and stimulate the market uptake of cleaner vehicles.[xvi] It is true that VECTO and monitoring and reporting of truck emissions are steps in the right direction but it will not bring the changes we need to overcome the market barriers discussed earlier because of the following three main reasons:

- VECTO and monitoring and reporting will not suddenly boost the production volume of fuel-saving technologies and make these technologies standard. So the main market barriers discussed earlier (limited financing resources, high costs and availability) will not disappear.
- The new test procedure will allow easier comparisons between trucks. But given that the differences in fuel consumption between comparable trucks of different brands are small, VECTO will not bring a big change.[xvii]
- Thirdly demand-side barriers such as risk aversion and split incentives will not be affected by the introduction of a CO2 test procedure for trucks.

## 4.2. Ambitious fuel efficiency standards and CO2 based road charging are the answer

With fuel efficiency standards, many of the technologies that are discussed in this paper and that are currently offered only as an option will become part of the standard vehicle. Also, as all that manufacturers have to sell these more efficient vehicles, such regulation ensures a level playing field. It will increase the adoption of efficiency technologies which will help to overcome the main market barriers discussed above such as limited availability, high upfront costs, technology uncertainty and split incentives.[xviii]

Secondly, standards will also help to solve the problem of technology uncertainty. When developing and implementing fuel efficiency standards, policy makers such as the European Commission make a thorough assessment of the available technologies and their effectiveness, for example during the impact assessment. Such exercises will make transport operators more familiar with these technologies and their effectiveness.[xix]

Thirdly it will help the tackle the issue of split incentives. If for example trailer manufacturers have to meet certain efficiency standards before they can sell their products, the efficiency of the standard trailers will already be quite high regardless who is operating the trailer.

Apart from truck CO2 standards, smart fiscal policies such as the Eurovignette Directive will also increase the uptake of fuel efficiency technologies. In its May 2017 proposal on the Review of the Eurovignette Directive, the European Commission proposed to differentiate tolls based on the CO2 emissions of trucks and give discounts to zero-emission vehicles. This means that hauliers with more fuel efficient trucks will get a discount at the toll. It will therefore function as a major incentive for buying more efficient tractors.[xx] Previously the Eurovignette Directive had profound effects in Germany, cleaning up the truck fleet. The share of Euro IV and Euro V class vehicles rose from 2% to nearly 62% between 2005 and 2009.[xxi]

# Conclusions

Truck CO2 emissions are on the rise and need to be curbed urgently. By 2030 Europe needs to reduce CO2 emissions from the so-called ESD sectors by 30%. Transport, the single largest contributor, will have to do its part. Trucks account for around one quarter of EU road CO2 emissions and this is set to grow. More efficient trucks that burn less fuel can be a big part of the solution and will also help Member States achieve their legally binding 2030 targets.

There is still plenty of potential to improve truck fuel efficiency. But this paper clearly shows that market forces alone will not do the job. Transport operators are looking for solutions and cleaner vehicles but the offer from manufacturers remains limited or only at high costs.

Countries such as the US, Canada, China and Japan already have introduced fuel (or CO2) standards for trucks. Europe is currently the only big global market without them. The European Commission has announced early 2018 as the publication date for proposed standards. As shown here, truck CO2 standards would oblige truck OEMs to offer many of these technologies on all trucks, increasing the offer, lowering procurement costs and raising uptake.

The time for all stakeholders – from cities to transport companies, and from climate campaigners to engineers leading fuel efficiency innovation - to get behind ambitious and early standards is now. This will be a major step forward in getting these technologies adopted and put greener trucks on our roads as soon as possible.

## Further information

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## Endnotes

[i] https://www.transportenvironment.org/sites/te/files/publications/2016_07_Briefing_Europe_increasingly_dependent_risky_oil_FINAL_0.pdf
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