Road to 2030: how EU vehicle efficiency standards help member states meet climate targets

Transport emissions reductions in the context of the 2030 Effort Sharing Decision

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Executive Summary

This paper attempts to quantify the challenge for EU member states in reducing transport emissions under the expected 2030 'effort sharing decision' and the extent to which CO_2 standards for cars, vans and trucks can help achieve those targets.

In October 2014 EU heads of state decided on new targets for reduction of greenhouse gas emissions by 2030. Emissions under the EU emissions trading system (ETS) will have to fall by 43% from 2005 levels, and emissions outside the ETS – mainly transport, buildings and agriculture – by 30%. The latter target will be made legally binding on member states through a new so-called 'effort sharing decision' or ESD, for which the Commission will make a proposal in 2016.

Transport is currently the biggest ESD sector (34%) and the Commission assumes[1] that without additional action, transport emissions will roughly remain constant until 2030. The ESD proposal provides a unique opportunity to align EU transport policies with climate goals. Combining the setting of emissions reduction targets – under the ESD – with actual measures to reduce emissions can increase support for both.

This paper defined three possible 2030 targets for GHG emissions from the transport sector: -20, -30 and -40% compared with 2005 levels. We then calculated to what extent improved vehicle efficiency could help meet these three targets, both at EU and national levels. This assessment rests on a number of assumptions, explained in the methodology section, and is not an exact calculation. It does, however, make it very clear what the impacts are of (not) mandating improved vehicle efficiency.

The study's key outcomes[2] are:

1) **CO_2 standards for new cars, vans and trucks are essential** to meet the 2030 targets; depending on assumptions they can close around half of the gap between targets and 'business as usual' trends.
2) Apart from the stringency of the standards, the year in which they are introduced is key: **the earlier the better.** It takes time for better new vehicles to make an impact on total fleet emissions. Standards need to be introduced in 2025 at the latest; introduction by 2030 renders them a lot less effective for meeting 2030 ESD targets
3) **Heavy-duty vehicle emissions need to be tackled** – inaction on trucks would mean truck emissions would further increase (or at best remain stable) by 2030.

The Commission's 2016 proposals should not just define targets for member states but also, in parallel, propose measures that actually reduce emissions, which should include 2025 CO_2 standards for cars, vans and trucks, road charging, and e-mobility. This bundling would increase member states' support for a robust implementation of ESD targets as well as emission reduction measures. Measures described in this paper would not only help meet the 2030 targets but would also create jobs and deliver big economic and energy security benefits.

[1] The Commission's reference scenario assumes, for instance, strong continued growth of transport volumes rests on sometimes doubtful assumptions (e.g. a lot of transport growth) but for reasons of comparability and consistency with other ESD analysis we used it as a basis.

[2] The analysis is based on a modelling approach and uses the best available information, where possible from the European Commission. It rests on a number of assumptions, explained in the methodology section, and is therefore not an exact prediction of the future. It is, however, a good way of showing the impact of (not) introducing certain measures.

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1. Introduction

1.1. Why this study? Why relevant?

On October 2014 the European Council[3] agreed on reducing domestic greenhouse gas emissions by at least 40% by 2030 compared to 1990 levels. The heads of state decided that emissions not included under the EU Emissions Trading System (non-ETS emissions) must be brought 30% below 2005 levels, down from a 10% reduction for 2020. The non-ETS sector represents 55% of total EU emissions[4]. How the -30% target will be distributed among member states was not decided but it is clear that transport is the largest emitter in the non-ETS (34% of total). Road transport is the main contributor to climate change within the sector (more than 90%[5]) in the non-ETS sector. Neither international shipping or extra-EU flights are currently included in the ETS or in the non-ETS sector. Light-duty vehicles (passenger cars and vans) are the main source (more than 70%[6]) of road transportation emissions[7]. New measures are needed to reach the 2030 targets, in particular at EU level.

This study investigates how new car, van and heavy-duty vehicles standards could contribute to meeting the 2030 non-ETS target.

1.2. Objectives

The objective of this study is three-fold:

1. Analyse different emission reductions targets for member states, including contributions towards the target from the transport sector.
2. Quantify the gap between transport emission projections and emission levels needed to achieve 2030 targets.
3. Calculate how many emission reductions would be delivered by both existing standards for cars and vans and also by potential new standards for cars, vans and heavy-duty vehicles, based on a modelling exercise of different reductions pathways for cars and vans, both in 2025 and 2030.

1.3. Structure of the study

The next chapter provides some basic background on EU climate policy and the role of transport in it. It includes information on the latest developments, such as the Energy Union, the Road to Paris and the revision of the Transport White Paper.

Then we analyse the role of different sectors within the Effort Sharing Decision (ESD), with a specific focus on the transport sector. It includes a brief discussion of potential flexibilities that could water down the targets, an analysis of possible targets for member states for non-ETS

[3] European Council, 2014. Conclusions – 23/24 October 2014.
[4] http://ec.europa.eu/clima/policies/ets/index_en.htm, consulted on April 20th, 2015. ETS covers 45%.
[5] EEA GHG Viewer, 2012 emissions data.
[6] Impact assessment accompanying proposals to amend Regulation (EC) No 443/2009 and Regulation (EU) No 510/2011 establishes that light-duty vehicles are responsible for 13.5% of all emissions, which was translated into transport emissions.
[7] Cars, vans, motorbikes and HDVs are included in the "road transportation" category of the IPCC, while trains are in the "railways" category of the IPCC. Electric locomotives are powered by electricity generated at stationary power plants as well as other sources. The corresponding emissions are covered under the Stationary Combustion (1.A.1).

emissions by 2030, and a review of transport emissions projections and reductions expected to be delivered by current standards, to finally come up with the existing gap.

Subsequently, we present our analysis on how many emission reductions could be delivered by new standards for cars and vans, and also some analysis by the Commission on reductions delivered by new heavy-duty vehicles standards. We looked at how much of the gap could be covered just by the introduction of new standards, and discuss other measures that could be taken at EU level.

The last chapter provides some policy recommendations on next steps at an EU level to ensure an environmental integral implementation of the targets and the important role that EU action on the form of new standards can play for the transport sector and for the whole non-ETS side of the economy overall.

2. EU Context

2.1. Transport and climate change

Preventing dangerous climate change is a strategic priority for the European Union. The EU has legislated to achieve a 20% reduction of GHG emissions by 2020 below 1990 levels. In January 2014, the European Commission issued a communication proposing a next step for 2030: the EU should reduce its greenhouse gas emissions by 40% compared with 1990 levels[8]. EU leaders agreed with this in October 2014[9]. The EU's 2050 ambition is to reduce greenhouse gas emissions by 80-95% compared to 1990 levels.

Different sectors will contribute differently towards achieving a decarbonisation of the EU's economy. The importance of the transport sector, where emissions increased by 20% between 1990-2010[10], is growing. The figure below illustrates the evolution of transport emissions without additional measures to curb them. The figure clearly suggests that without significant transport emissions cuts, the EU's 2050 ambition are not achievable.

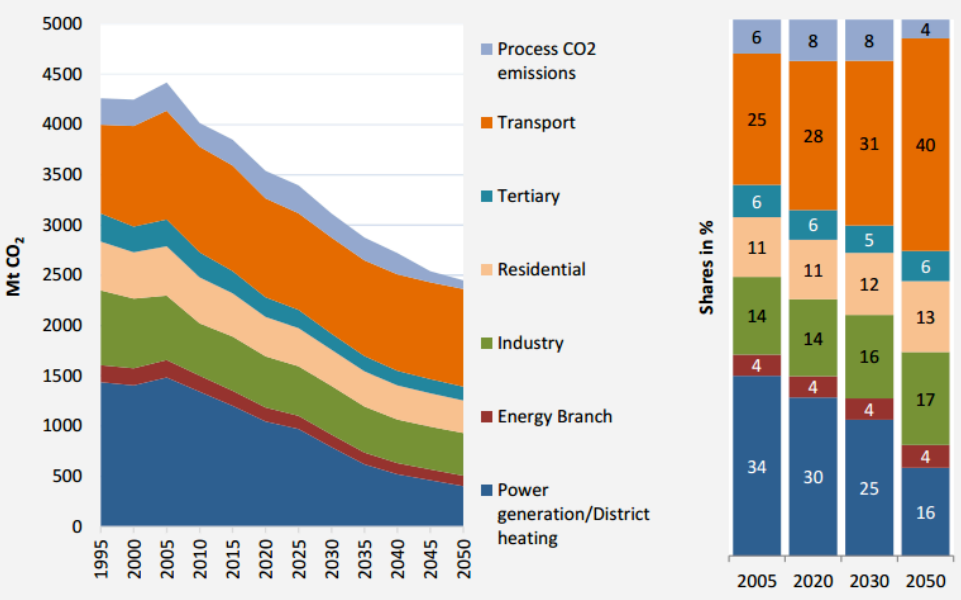


Figure 1[11]: Evolution of CO2 Emissions by Sector

[8] http: //ec.europa.eu/clima/policies/2030/index_en.htm, consulted on April 2015.
[9] European Council, 2014. Conclusions on 2030 Climate and Energy Policy Framework
[10] EEA GHG viewer.
[11] European Commission, 2013. Trends to 2050. Reference Scenario 2013.

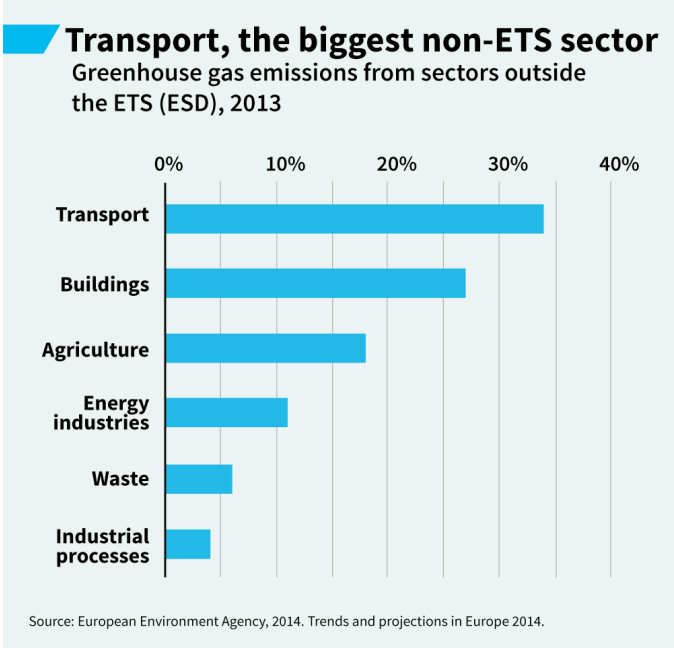
2.2. EU Climate policy

2.2.1. The 2030 climate and energy framework

The EU has several instruments to reduce GHGs. In general, emissions can be classified under two main categories: those coming from installations regulated by the EU Emissions Trading System (ETS) and those coming from sectors not regulated by the ETS.

The EU ETS covers more than 11,000 power stations and industrial installations, although they need to be large enough to be included in the system. It is considered by the European Commission to be the cornerstone of the EU's policies to combat climate change[12]. It is a cap-and-trade scheme. There is an overall cap that is reduced every year. Allowances are auctioned or given for free, depending on the sector, and installations can freely trade with allowances. It also includes aviation emissions, although currently only those arising from intra-EU flights. Aviation emissions in the ETS should also include extra-EU flights, as was originally covered in law. Currently only 25% of all aviation emissions are within the scope. In total, the EU ETS covers around 45% of the EU's greenhouse gases (GHG)[13]. Given the current annual reduction in the cap, the last allowances will be given at the end of the 2050s.

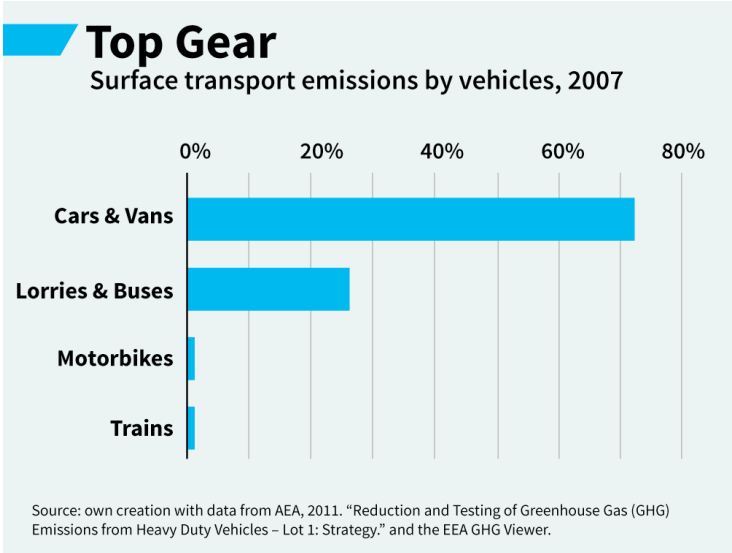
The Effort Sharing Decision (ESD) is the other key tool to reduce GHG emissions in the EU. It establishes annual GHG targets for member states for most sectors not included in the EU ETS (non-ETS), such as transport (except aviation and international shipping), buildings, agriculture, waste or smaller industry. Even though not all transport emissions are included in the ESD, transport is the sector with the largest emissions in the ESD, as illustrated by the graph below. Within the transport sector, road transport is responsible for more than 90% of the emissions[14].



International maritime emissions are currently not included in the ETS or the ESD. The Road to Paris Protocol [15] established that the -40% target will include "all sectors and all sources of emissions". Although they were not included in this study, we can expect they will be included in the ESD, especially because the emissions from European maritime transport activities are expected to increase 15% by 2030 compared to 2005 levels[16].

[12] http://ec.europa.eu/clima/policies/ets/index_en.htm, consulted on April 20th, 2015.
[13] European Commission, 2013. The EU Emissions Trading System (EU ETS) factsheet.
[14] EEA GHG viewer, data for 2012.
[15] European Commission, 2015. The Paris Protocol – A blueprint for tackling global climate change beyond 2020.
[16] European Commission, 2013. Impact Assessment - Part 1 accompanying the Proposal for a Regulation on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport.

In October 2014 the European Council [17] agreed on reducing domestic GHG emissions by at least 40% by 2030 when compared to 1990. It was also agreed that sectors **not** included under the EU ETS would reduce their emissions by 30% below 2005 levels. This is compared with a previous reduction target of 10% by 2020. The Council also asked the Commission to "*examine instruments and measures for a comprehensive and technology neutral approach for the promotion of emissions reduction and energy efficiency in transport, for electric transportation and for renewable energy sources in transport also after 2020*".



2.2.2. The transport white paper

The 2011 White Paper (WP) on transport[18] is currently subject to a mid-term review. It says that transport GHG emissions would need to decrease by at least 60% by 2050 below 1990 levels in order to achieve the overall reduction target of 80-95% by that same year. In order to achieve this,

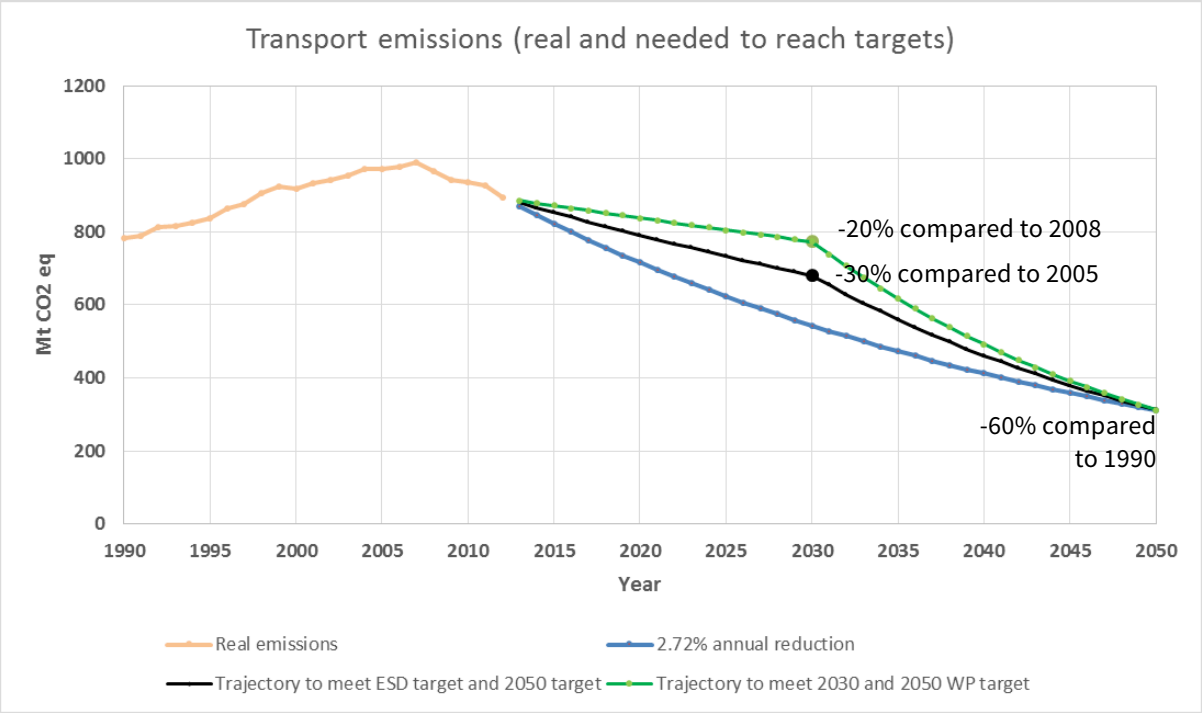


Figure 2: medium and long-term transport goals[19]

[17] European Council, 2014. Conclusions – 23/24 October 2014.

[18] European Commission, 2011. Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system.

the WP proposes to reduce emissions 20% by 2030 compared to 2008. However, the 20% reduction target is not in line neither with the longer-term goal, or the non-ETS sectors target of -30% below 2005 levels by 2030. If transport is going to contribute by the same proportion (-30% by 2030 compared to 2005 – black line), it should go considerably beyond the interim target proposed by the WP (see graph below). If the transport sector would only deliver a reduction of 20% by 2030 compared to 2005 (green line below), other sectors like agriculture or housing would need to deliver significantly bigger reductions.

2.2.3. Energy Union

The Energy Union Communication[20] published in February 2015 calls for a decarbonisation of the transport sector. It also recognised that "*the Commission will pay special attention to those sectors with a huge energy efficiency potential, in particular the transport and buildings sector".* It specifically mentioned that "*Europe needs to speed up electrification of its car fleet and other means of transport and become a leader in electro-mobility and energy storage technologies*". It also recognises the importance of having stricter standards post-2020:

"*Realising its energy efficiency potential requires a continued focus on tightening CO2 emission standards for passenger cars and vans post-2020, and on measures to increase fuel efficiency and reduce CO2 emissions for heavy-duty vehicles and buses*."

The Energy and Climate Commissioner also called for "*efficiency first*" to become the motto of the Energy Union[21]. The interim target of the transport white paper is not ambitious enough to advance towards that goal.

The 2011 WP called for a 60% reduction by 2050 compared to 1990. In order to achieve this goal, emissions would need to decrease 2.72% annually from 2012 real values. It would follow the blue line in the graph above. If this trajectory is not followed, a considerably higher, if not unrealistic, annual decrease of around 4.5% per year, would need to happen between 2030 and 2050. If further reductions are expected to be delivered after 2030 due to facts like fleet turn-over, it doesn't seem reasonable to leave all the effort for the future. For instance, even if the average usage of a car in the EU is 14-15 years, most of the kilometres are driven in their first years, so the impact of early measures are delivered sooner than many analysts forecast.

3. Transport in the Effort Sharing Decision

3.1. Flexibilities

While the ESD overall target was agreed there is significant uncertainty about how it will be implemented. EU leaders agreed that "the availability and use of existing flexibility instruments within the non-ETS sectors will be significantly enhanced". Some of these 'flexibilities' have the potential to weaken the ESD target as well as the overall 2030 ambition. Below we discuss the most important flexibilities that are currently considered for inclusion in the ESD.

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[19] This graph does not include aviation and international shipping emissions. Intra-EU aviation emissions are included in the ETS. It can be expected that by 2030 also extra-EU aviation emissions will be included in the ETS. International shipping emissions should be included in the ESD as all sectors are to be included in the at least 40% reduction target.

[20] European Commission, 2015. A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy.

[21] Miguel Arias Cañete, 2015. Speech by Commissioner Arias Cañete at the Lisbon Council "Towards an Effective Energy Union". Brussels, 17 February 2015

LULUCF

So far, land-use sector emissions have not been included in the ESD. EU leaders did, however, agree to "*include Land-Use, Land-Use Change and Forestry (LULUCF) into the 2030 greenhouse gas mitigation framework […] as soon as technical conditions allow and in any case before 2020*". This was confirmed in the Energy Union Communication[22], as well as in the EU's Intended Nationally Determined Contribution (INDC) for the Paris Conference of the Parties later this year. In that document[23] it was clear that LULUCF was going to be included in the 40% target. Unfortunately the EU does "*does not provide any further clarity on accounting rules and potential magnitude of their impact on emissions levels by 2030*"[24]. It is clear, however, that in Europe the land-use sector is assumed to absorb rather than emit CO2, i.e. through afforestation. Hence the likely effect of the inclusion of land-use emissions would be to reduce the effort required from other sectors. The Commission's 2012 LULUCF impact assessment[25] concludes that including LULUCF in the ESD could reduce the required effort by up to 39 megatons[26] per year and could reduce the ESD effort by up to 44% in 2020.

In this study the LULUCF sector has been left out of the analysis. In the case of it being incorporated into the ESD at a later stage, the whole legislative instrument and its baselines would need to be revised.[27]

Carry over

Another issue around the ESD is the fact that it allows the carrying over of emissions from one year to the next. There will be a big surplus[28] at the end of the first ESD period, which runs between 2013 and 2020. This study expects there won't be any carry-over between periods, because it would highly compromise the environmental integrity of the recently adopted targets and the current ESD makes no allowance for this[29]. The surplus was partially due to the usage of international carbon credits.

International offsets

Up to 750 million international credits can be used during the 2013-2020 period, equal to more than half of the overall reduction effort[30]. The use of offsets is not considered in this study for the 2020-2030 ESD period. The European Council stated that reduction targets will be achieved domestically[31], which implies that offsets from third countries won't be allowed in the system. Besides, the submitted Intended Nationally Determined Contribution of the EU and its member states doesn't consider the contribution of international credits[32].

[22] European Commission, 2015. A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy.
[23] European Commission, 2015. The Paris Protocol – A blueprint for tackling global climate change beyond 2020.
[24] Climate Action Tracker, 2015. EU could clarify forestry, land use accounting to strengthen its INDC.
[25] European Commission, 2012. Impact Assessment on the role of land-use, land-use change and forestry (LULUCF) in the EU's climate change commitments.
[26] Of the options considered, accounting option C was the closest one to the finally agreed upon decision.
[27] Several NGOs, 2015. Principles and Recommendations: LULUCF and the EU climate and energy framework for 2030.
[28] Carbon Market Watch, 2014. Tackling 60% of the EU's climate problem. The Effort Sharing Decision post-2020
[29] Climate Strategies, 2015. Enhanced flexibility in the EU's 2030 Effort Sharing Agreement: issues and options.
[30] Carbon Market Watch, 2014. Tackling 60% of the EU's climate problem. The Effort Sharing Decision post-2020
[31] European Council, 2014. Conclusions – 23/24 October 2014.
[32] Latvian Presidency of the European Council, 2015. Submission by Latvia and the European Commission on behalf of the European Union and its member states.

ETS non-ETS trading

The European Council left the door open[33] to the partial linkage between the ESD and the ETS "*through a limited, one-off, reduction of the ETS allowances, to be decided before 2020*". However, this study assumes that such a linkage would not take place, because the shape or size of such a transfer are not known. If done, it should be ensured that the environmental integrity of both the ESD and the ETS is preserved.

Transport in the ETS

The inclusion of the transport sector was an option that was restated by the European Council in October 2014: "*under existing legislation a Member State can opt to include the transport sector within the framework of the ETS"*. However, the inclusion of transport in the ETS, either at the EU level or at the national level by individual member states, is a very bad idea because[34]:

1. It would delay and reduce the rate of emissions reductions in transport, putting at risk the achievement of climate and energy security goals and increasing costs;

2. It would undermine much more effective specific climate policies for transport such as standards for vehicle efficiency and clean fuels for 2025 and 2030, which stimulate investment in low-carbon technology in the transport sector;

3. It would weaken rather, than strengthen the ETS, and increase, not reduce, costs because it shifts carbon reduction away from the – sheltered – transport sector to potentially exposed ones.

For these reasons, the inclusion of transport in the ETS has not been considered in this study.

Bunkers

Currently, intra-EU aviation emissions are included in the ETS. It can be expected that by 2030 also extra-EU aviation emissions will be included in the ETS. International maritime emissions, although currently are not included in the ESD, should be built-in as all sectors are to be included in the reduction target of at least 40% as established in the Paris Protocol Communication. Although they were not included in this study, we can expect they will be in the ESD. In that case, baselines and reference scenarios will need to be revised accordingly.

3.2. Effort sharing between member states

The Council agreed on continuing to use the same methodology to set the national reduction targets for non-ETS sectors, which includes a distribution of effort based on relative GDP per capita. It will span between 0% and -40%. It also states that for those member states "*with a GDP per capita above the EU average the target will be relatively adjusted to reflect cost-effectiveness in a fair and balanced manner"*. The exact distribution of efforts will be agreed after the Paris COP.

To come up with relevant values, different studies on the subject were analysed[35][36]. After analysing the alternatives, we decided that the most realistic option was to come up with a combination of Scenario B (GDP based) and Scenario C (GDP + cost effectiveness) from a UK non-paper. For countries below the average EU GDP per capita, values from Scenario B were chosen. For member states above the average EU GDP per capita, Scenario C was chosen. Values were adjusted slightly to reach the overall -30% target required. Our tool allowed the selection of different approaches

[33] European Council, 2014. Conclusions – 23/24 October 2014. Paragraph 2.12.
[34] Transport & Environment, 2014. Three reasons why road transport in the ETS is a bad idea.
[35] Netherlands Environmental Assessment Agency, 2013. Non-ETS emission targets for 2030.
[36] UK Department of Energy & Climate Change, 2014. UK non-paper: EU 2030 climate and energy framework - costs and benefits for member states of scenarios for effort sharing in the non-traded sector.

and, after a comparison of all the results, this one was deemed the most appropriate. The table below presents the values for ESD emissions in 2005 (base year)[37], the percentage reduction that each member could have to fulfil with the target, and the emissions level it should have by 2030 under the ESD.

Member State	2005 base year ESD emissions (Mt CO_2 eq)	Potential 2030 ESD targets below 2005 levels	2030 emissions to meet the target (Mt CO_2 eq)
Belgium	79.60	-30%	55.72
Bulgaria	24.00	-1%	23.76
Czech Republic	62.10	-13%	54.03
Denmark	38.10	-36%	24.38
Germany	494.90	-39%	301.89
Estonia	5.80	-10%	5.22
Ireland	48.70	-31%	33.60
Greece	63.80	-19%	51.68
Spain	238.00	-28%	171.36
France	417.80	-36%	267.39
Croatia	18.90	-7%	17.58
Italy	338.40	-33%	226.73
Cyprus	6.30	-23%	4.85
Latvia	8.50	-6%	7.99
Lithuania	13.40	-8%	12.33
Luxembourg	10.20	-35%	6.63
Hungary	52.90	-9%	48.14
Malta	1.10	-17%	0.91
Netherlands	127.40	-35%	82.81
Austria	58.10	-35%	37.77
Poland	177.50	-9%	161.53
Portugal	50.70	-18%	41.57
Romania	74.30	-2%	72.81
Slovenia	12.10	-19%	9.80
Slovakia	23.50	-10%	21.15
Finland	33.80	-35%	21.97
Sweden	44.80	-35%	29.12
United Kingdom	389.40	-36%	249.22
EU-28	2914.00	-30%	2041.93

3.3. Effort sharing between different sectors

To assess what share of the ESD emissions currently comes from the transport sector, we use the latest available data (2012) from the European Environmental Agency[38]. Civil aviation emissions are not included as they are not part of the ESD. The table also includes the percentage that transport emissions represented on the ESD for that same year.

[37] European Environment Agency, 2014. Trends and projections in Europe 2014. Tracking progress towards Europe's climate and energy targets for 2020.
[38] EEA GHG data viewer.

Member State	2012 ESD emissions (Mt CO_2 eq)[39]	2012 ESD transport emissions (Mt CO_2 eq)	% that transport represented within ESD in 2012
Belgium	77.9	24.92	32%
Bulgaria	27.3	8.39	31%
Czech Republic	58.3	16.90	29%
Denmark	33.1	12.11	37%
Germany	476.7	153.58	32%
Estonia	7.5	2.28	30%
Ireland	41.4	10.89	26%
Greece	53.4	15.60	29%
Spain	207.1	77.49	37%
France	376.9	127.45	34%
Croatia[40]	20.1	5.96	30%
Italy	283.2	103.87	37%
Cyprus	4.2	2.04	49%
Latvia	8.5	2.79	33%
Lithuania	16.3	4.54	28%
Luxembourg	10.2	6.52	64%
Hungary	42.4	10.85	26%
Malta	1.081	0.55	51%
Netherlands	116.2	33.96	29%
Austria	51.6	21.58	42%
Poland	180.4	46.77	26%
Portugal	44.2	16.63	38%
Romania	72.4	14.94	21%
Slovenia	11.5	5.77	50%
Slovakia	21.6	6.57	30%
Finland	31.6	12.47	39%
Sweden	39.6	18.58	47%
United Kingdom	335	113.29	34%
EU-28	2629.3	876.93	33%

The next key question is in which sector will the reductions take place? Many different approaches can be taken.

According to Commission's analysis in the impact assessment for the 2030 package[41] for the different options considered at the time, the transport sector would reduce its emissions by 14% under the 40% agreed target. The table below summarises the values from the analysis, although it is not possible to differentiate by subsectors within the ESD because sectors such as transport or industry are both partially in the ETS and the ESD. The reference scenario informs about the expected outcome of implementing the already-agreed policies in the context of the 2020 package, while the second column refers to the agreed targets under enabling conditions without

[39] EEA, 2013. Trends and projections in Europe 2013. Tracking progress towards Europe's climate and energy targets for 2020 (the report from 2013 was used because 2012 was the last year that transport emissions were available).
[40] Croatia refers to 2010 data, as it was the latest available.
[41] European Commission, 2014. Impact Assessment accompanying "A policy framework for climate and energy in the period from 2020 up to 2030".

explicit energy efficiency policies. The difference in the third column is that explicit energy efficiency policies are included. In that analysis, transport emissions are hardly reduced compared to the reference level (from -12% to -14%). A reduction of 14% is not even enough to reach the -20% target for transport below 2008 levels established in the White Paper on Transport. The agreed target, combined with explicit energy efficiency measures (third column on the table below), that include new and more stringent standards for both light-duty (passenger cars and vans) and heavy-duty (trucks and buses) vehicles, would get us closer to the target on the White Paper. That target, as explained in previous sections is not ambitious enough to reach future targets. Besides, values for new standards included in the impact assessment are not ambitious enough.

	Ref in 2030	**GHG40**	**GHG40/EE**
GHG emissions reduction in ETS Sectors vs 2005	-36%	-43%	-38%
GHG emissions reduction in non-ETS Sectors vs 2005	-20%	-30%	-35%
CO2 emission reductions vs 2005	-29%	-36%	-36%
Power generation + District Heating	-47%	-57%	-48%
Industry	-22%	-27%	-26%
Residential, Services & Agriculture	-31%	-39%	-49%
Transport	**-12%**	**-14%**	**-20%**
Non-CO2 emission reductions vs 2005	-19%	-40%	-38%
Agriculture	-4%	-28%	-25%
Other non-CO2 sectors	-36%	-55%	-52%

We analysed three possible scenarios for 2030 for reductions in the transport sector. Firstly, we looked at a -30% scenario that assumes transport will do its fair share in meeting the 2030 ESD targets. This scenario is considered the basis for the analysis. The other scenarios are modifications of this main one. Then, we assessed a -40% scenario that is in line with the EU's ambition to reduce transport CO2 by 60% by 2050. Finally, a -20% scenario based on the Commission's 2011 transport white paper. For all these scenarios we assessed the extent to which improved vehicle efficiency could help meet these targets at both EU and national levels. This assessment rests on a number of assumptions, explained in the next section, and is not an exact calculation. It does, however, make it very clear what the impacts are of mandating improved vehicle efficiency, or not.

In this study the main scenario is that the transport sector will contribute proportionally because:

- A lower transport target shifts the burden to other sectors like agriculture, industry and housing
- A lower transport target jeopardises the long-term decarbonisation of road transport

Specifically, we considered the share that transport emissions represented in 2012 for each member state. That same percentage was applied to 2030 target emissions. For instance, if in one country transport emissions represented 30% in the ESD by 2012, they would also represent 30% by 2030. In the table below, transport emissions levels for each member state are shown, and they indicate how much of a decrease would be needed compared to 2005 levels for countries to contribute their fair share towards the ESD 2030 target (main scenario of -30%):

Member State	Transport emissions by 2030 to meet the target - Mt CO_2 eq
Belgium	17.83
Bulgaria	7.30
Czech Republic	15.66
Denmark	8.92
Germany	97.26
Estonia	1.58
Ireland	8.84
Greece	15.10
Spain	64.12
France	90.42
Croatia	5.21
Italy	83.16
Cyprus	2.35
Latvia	2.62
Lithuania	3.43
Luxembourg	4.24
Hungary	12.32
Malta	0.46
Netherlands	24.20
Austria	15.79
Poland	41.87
Portugal	15.64
Romania	15.03
Slovenia	4.92
Slovakia	6.43
Finland	8.67
Sweden	13.66
United Kingdom	84.28
EU-28	671.32

In the EU as a whole, transport emissions would need to decrease by 30% by 2030 below 2005 levels if transport emissions were to keep the same proportion as it had in 2012 within the ESD.

To adapt those values to the other two scenarios, the -20% from the White Paper for 2030 and the -40% to be in line with the 2050 White Paper target, the values above were all multiplied by a common factor to ensure that the final cumulative level was in line with the scenario in question.

3.4. Reference scenario

The table above shows the effort required from the transport sector at EU and national level. To assess to what extent current and agreed policies would contribute to reaching this target, we used the projected transport emissions by 2030[42] in the European Commission's 2013 Reference Scenario[43]. This includes policies and measures adopted in the Member States by April 2012 and

[42] European Commission, 2014. Trends to 2050. Reference Scenario 2013.

[43] The Commission's 2050 reference scenario rests on sometimes doubtful assumptions (e.g. a lot of transport growth) but for reasons of comparability and consistency with other ESD analysis we used it as a basis.

policies, measures and legislative provisions (including on binding targets) adopted by or agreed in the first half of 2012 at EU level. Among many other measures, it included the implementation of both the regulation on CO_2 from cars[44] and the regulation on CO_2 from vans[45].[46]

As aviation emissions are not included in the ESD, they were subtracted from the reference scenario. Projected emissions are not differentiated by mode of transport. Therefore, the same percentage that aviation emissions represented in 2012 was subtracted from 2030 projections, with an increase of 20% as aviation emissions are going to have a higher importance in the future. To reach this conclusion, projected energy usage by transport sectors was analysed in the same document.

3.5. The gap between a -30% target and the reference scenario

The gap can be defined by the difference between the reference scenario and the level where transport emissions should be by 2030 to meet the target. It is sensitive to both the reference scenario (and its underlying assumptions) and to the selection of the effort sharing to be undertaken by member states. If either or both change, the gap would be different, but based on what was explained in previous sections it is a good approximation of what the reality could look like. With this in mind, the gap for each member state would be as follows:

Member State	2030 Ref Scenario ESD transport emissions 2030 (no aviation)	Transport emissions by 2030 to meet the target - Mt CO_2 eq	Gap between transport target & Ref scenario - Mt CO_2 eq	% reduction needed between ref scenario and transport fair share
Belgium	27.26	17.83	9.44	-35%
Bulgaria	7.66	7.30	0.36	-5%
Czech Republic	18.09	15.66	2.43	-13%
Denmark	13.42	8.92	4.50	-34%
Germany	134.59	97.26	37.33	-28%
Estonia	2.20	1.58	0.61	-28%
Ireland	14.68	8.84	5.84	-40%
Greece	19.74	15.10	4.64	-24%
Spain	105.65	64.12	41.54	-39%
France	119.99	90.42	29.57	-25%
Croatia	5.68	5.21	0.48	-8%
Italy	105.91	83.16	22.76	-21%
Cyprus	3.15	2.35	0.79	-25%
Latvia	3.80	2.62	1.17	-31%
Lithuania	4.30	3.43	0.87	-20%
Luxembourg	7.50	4.24	3.26	-44%

[44] Regulation (EC) No 443/2009.
[45] Regulation (EC) No 510/2011.
[46] According to the impact assessment accompanying the proposals amending both the cars and vans standard regulations, the implementation of both policies would deliver a reduction of 49 Mt of CO2 equivalent by 2030 compared to 2010. However, these policies were already factored in the reference scenario.

Hungary[47]	12.10	12.32	-0.22	+2%
Malta	0.80	0.46	0.33	-42%
Netherlands	39.47	24.20	15.27	-39%
Austria	23.33	15.79	7.53	-32%
Poland	54.92	41.87	13.05	-24%
Portugal	19.38	15.64	3.73	-19%
Romania	17.03	15.03	2.01	-12%
Slovenia	5.80	4.92	0.88	-15%
Slovakia	7.79	6.43	1.36	-17%
Finland	12.06	8.67	3.39	-28%
Sweden	19.73	13.66	6.06	-31%
United Kingdom	129.77	84.28	45.49	-35%
EU-28	935.80	671.32	264.48	-28%

The same analysis was also performed for the other two scenarios, where transport emissions were reduced by 20% by 2030 compared to 2005 levels (in line with the White Paper target for 2030) and where transport emissions were reduced by 40% (to put the EU on track to meet the White Paper target for 2050).

The next key question is: what options do we have to bridge the gap? Obviously the answer is not an easy one. In this report we look into one specific set of measures at an EU level that could deliver huge reductions and better position member states to meet the 2050 targets: new efficiency standards.

4. Standards

4.1. Why ambitious standards are good

4.1.1. An effective and cost effective EU-level measure

Standards are needed to overcome market barriers. Car, van and even truck buyers heavily discount future fuel savings when they purchase new vehicles – i.e. they focus much more on the initial investment cost than on the savings. This is why EU models (e.g. PRIMES), which use high discount rates in order to account for this, tend to present transport emission cuts as relatively expensive. But analyses that use discount rates typically used in socio-economic cost benefit analyses – mostly 4% – tend to conclude otherwise. For example, the impact assessment on reducing car fuel consumption by a third, towards 95 g/km CO2 on average, concluded it was a highly cost effective measure, with payback in a few years.

In previous impact assessments[48], the EC recognised that EU action was required for the following reason:

"*EU action is necessary in order to avoid the emergence of barriers to the single market in the automotive sector and because of the transnational nature of climate change. Without EU level action there would be a risk of a range of national schemes to reduce light duty vehicle CO2 emissions. This would particularly disadvantage vehicle manufacturers and component suppliers as differing ambition levels and design parameters would require a range of technology options and*

[47] Hungary would not need to reduce its emissions, because it has always had relatively small transport emissions, combined with small transport emissions growth in the reference scenario compared to all other sectors, and an small overall reduction target through the whole period.

vehicle configurations, diminishing the economies of scale. Manufacturers hold differing shares of the vehicle market in different Member States and would therefore be differentially impacted by various national legislations. Costs of compliance would increase and consumers would not benefit from lower costs and economies of scale that an EU wide policy delivers."

4.1.2. Economy

Currently, transport is the second largest expenditure for European households. An average EU household spends €1,900 per person per year on transport[49]. That is 13% of the total consumption in EU households per person. Citizens only spend more on housing. In the EU, people spend more money on transport than on food.

When looking at the specific expenditure within the transport sector, the operation of personal transport equipment is by far the largest expenditure. In almost all cases, operating the vehicle is more than double the actual purchase of the vehicle, although in some member states it is more than four times. The expenditure on operating the vehicle is also higher in all member states than in transport services (rail, planes, buses, etc). In member states analysed, within the category of operating personal transport equipment, fuel consumption was by far the largest share.

Studies have concluded[50] that having more efficient cars would translate into important savings in consumers' pockets. They would have more money to spend on the rest of the economy, generating growth. The study also concluded that between 660,000 and 1.1 million net additional jobs could be created compared to a reference scenario in which cars continue to run on today's technology.

4.1.3. Energy security

Transport is a critical sector when talking about energy security in the EU. 94% of transport relies on oil products, of which 90% is imported[51]. This dependency has worsened during the last decades[52]. In 2014, 29% of all imported crude oil came from Russia, up to €78 billion[53]. All oil imports add up to an annual cost of €271 billion[54]. In 2012, 76% of energy content of all petroleum products were used by the transport sector[55]. That adds up to a cost of €564 million every day worth of imports for the transport sector only. Road transport uses more than 70% of all oil derived fuels used in the transport sector[56]. That means that more than half of all petroleum products are used for road transport in the EU. Stricter standards on road vehicles would considerably improve the EU's energy independence.

[49] Eurostat, 2013. Analysis of EU-27 household final consumption expenditure.
[50] Cambridge Econometrics et al, 2013. Fuelling Europe's Future: How auto innovation leads to EU jobs
[51] European Commission, 2015. Energy Union Package. A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy.
[52] European Commission, 2014. EU Energy markets in 2014.
[53] European Commission, 2015. Monthly and cumulative crude oil imports into the EU.
[54] €-$ average exchanged rated used (1.3285): European Central Bank, 2014. ECB reference exchange rate, US dollar/Euro.
[55] http://www.eea.europa.eu/data-and-maps/indicators/final-energy-consumption-by-sector-8/assessment-2
[56] http://www.eea.europa.eu/data-and-maps/daviz/transport-energy-consumption-eea#tab-chart_2

4.1.4. Competitiveness of industry

The European car industry cannot compete solely on price. It must constantly innovate to maintain its competitive advantage. Smart regulation is an important driver of innovation – particularly in areas like decarbonising vehicles where the needs of society are high but car buyers place less priority on innovation. Fuel efficiency regulations are also needed since car-buying is an economically irrational process in which buyers heavily discount the value of future fuel savings and accept a huge cost premium for driving a new car.

The Cars 2020 process commented that:

"The European automotive industry's leadership in technology continues to be challenged globally. The EU must keep a vanguard in producing vehicles which are attractive to EU consumers, clean, fuel-efficient, safe and connected. In order to maintain the leading position in the development and deployment of cutting-edge automotive technologies and preserving the competitive advantage in the global markets, it is indispensable to strengthen technological expertise by further investments in innovative solutions. Recognizing the importance of the automotive industry for the European economy and being aware of the challenges related to meeting air quality and climate change goals, the Commission has taken an active role in providing an adequate support to the sector."[57]

Smart regulation as well as research support are key elements of maintaining the EU's competitiveness. Smart regulation includes using appropriate discount rates to cost carbon savings appropriately in different sectors.

In several areas EU regulations are now falling behind global competitors. For example: truck CO_2 standards are present in the US and Japan, but not in the EU; and, air pollution limits for diesel cars are more lax in Europe than the US. While CO_2 limits for 2020 in Europe are lower than in other markets, new car fleet average CO_2 emissions are lower in Japan and the EU obsolete testing system leads to much poorer performance on the road.

A striking and concerning development is in the number and type of patents for advanced technologies being generated in the EU. The global innovation leadership of the EU in 2000 has been steadily eroded by Japan and Korea. The figure presents patents issued by region for advanced (hybrid, electric and fuel cell) technologies and basic (ICE and design) patents using data from the OECD. Japan and Korea have a significant leadership in advanced patents while the EU has a small lead in ICE and design related patents. The US and Canada lag significantly.

A key reason for the difference is the dominance of diesel in the EU. Diesel innovation has been the main focus of the innovation efforts of European carmakers. However, today's high share of diesel cars in Europe is unique; of 68 million manufactured cars globally 10 million were diesel and 7 million of these were sold in Europe. In the world's other large car markets – the US, Japan and China – almost all new cars are equipped with petrol engines and hybrids achieving a growing market share to improve efficiency. In a globalised world, European innovation should focus on technologies that have a clear future. Having strict standards in place would create an incentive towards more sustainable powertrains that will have an increasing demand worldwide. There is a real danger of Europe losing its competitive edge in low-carbon vehicles if manufacturers are not pushed to introduce the latest technologies through regulation.

[57] European Commission, 2014. CARS 2020 Report on the state of play of the outcome of the work of the High Level Group

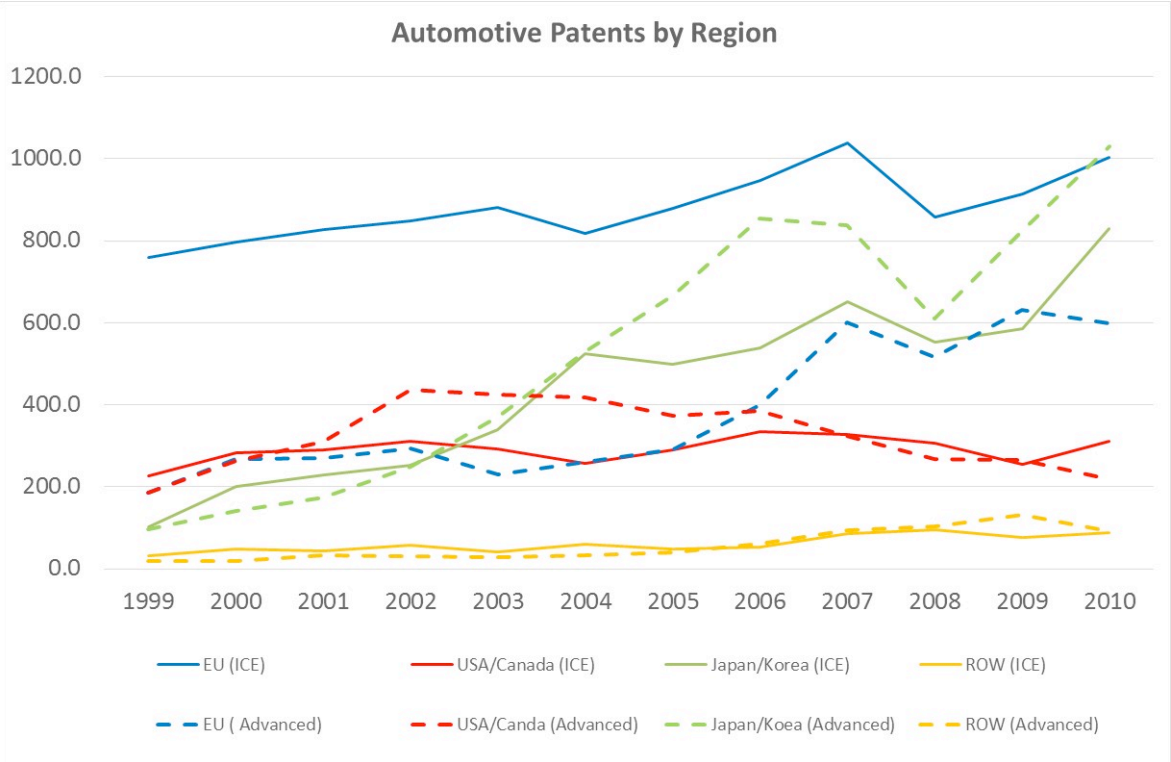


Figure 3[58]: automotive patents by region

Ambitious standards ensure that European manufacturers can sell their vehicles worldwide. If other regions set tougher standards, export possibilities are severely harmed. The European diesel car is an example: it has barely sold in the US because the US has never given diesel vehicles a more relaxed standard than petrol vehicles, something the EU has done for 25 years.

4.2. Reductions delivered by new standards

4.2.1. Light-Duty Vehicles (cars and vans)

We developed a spreadsheet tool to calculate how many emission reductions would be delivered by new, additional emission reductions from new cars, vans and heavy-duty vehicle CO_2 standards. An annual percentage reduction model was chosen.

In order to calculate the annual reductions delivered by each standard for each member state on top of reductions delivered by current standards, the following criteria were used:

- Annual new registrations by member state: we used EEA data[59]. Pre-crisis and crisis averages were used to reflect for changes in both periods. It is a conservative approach, because the Commission considers that the LDV fleet in going to continue to increase in the medium term[60].
- Annual mileage by vehicle/age: both cars and vans travel very different distances at different stages of their lifespan. Specific data[61] was available for their first three years. For instance, vans drive 45% of their total lifetime mileage over their first three years. For the

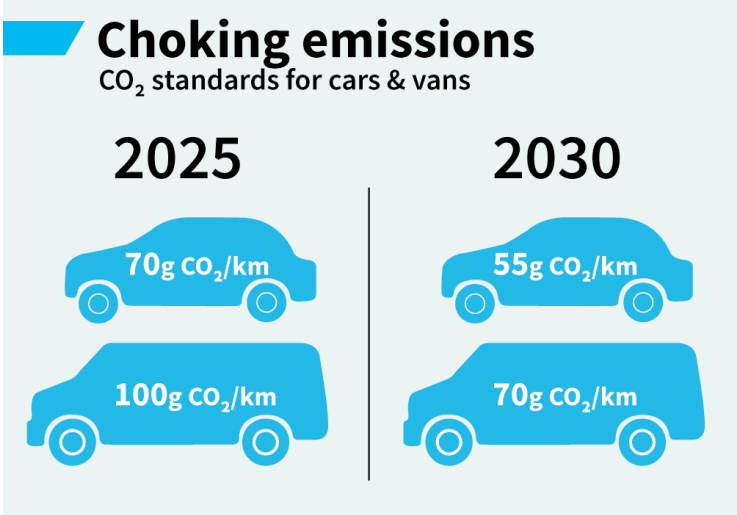
[58] In house analysis based on OECD data
[59] EEA, 2014. Monitoring CO2 emissions from passenger cars and vans in 2013.
[60] Impact assessment accompanying proposals to amend Regulation (EC) No 443/2009 and Regulation (EU) No 510/2011, section 2.3.
[61] Ricardo-AEA, 2014. Understanding vehicle lifetime mileage and its impacts on the cost-effectiveness of light-duty vehicle CO2 Regulations.

remaining of their lifespan it was divided in decreasing mileage in periods of three years as well. It would reflect the fact that new vehicles drive much more than older ones. Average scrappage age and average lifetime mileage was obtained from the same source.

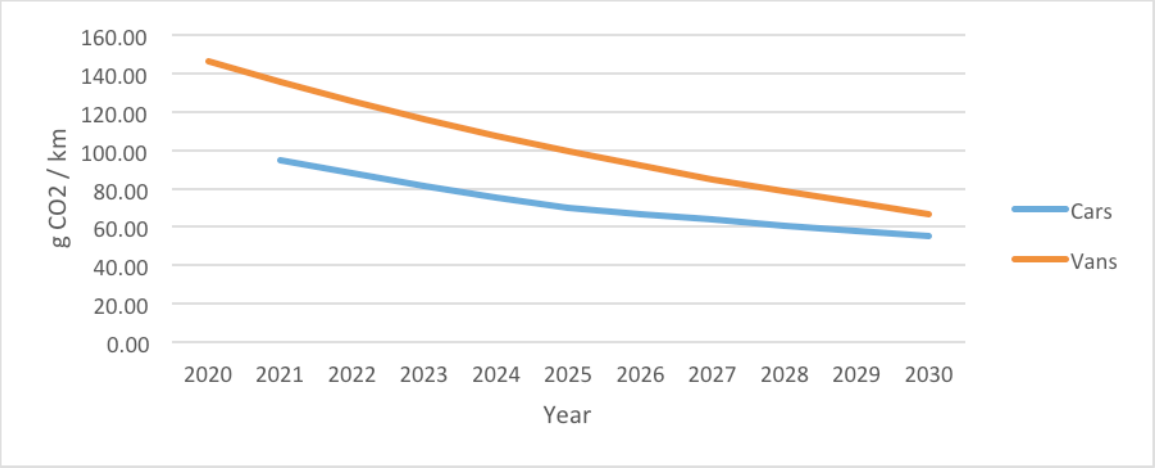
- Annual percentage reduction: Annual reduction values between 1 and 10% were available for the period 2020-2025 and 2025-2030, differently for cars and vans.

Reductions are cumulative. A car put on the market in 2021 under a new standard would deliver reductions if compared with only having current standards in place both in 2021 and 2030, although relatively reductions delivered would be higher in 2021 as more kilometres would be driven. This information was calculated for both EU level and member state level.

Many European countries (such as Lithuania, Poland, Bulgaria, Czech Republic, Estonia, Greece, Slovakia, Romania or Cyprus) import important amounts of second hand cars every year. For instance, in the case of Poland, for each new car registered in the country, 3 used cars are imported[62]. However, this reality has not been reflected in the study. Most cars imported are over 9 years old. That means that almost a decade would be needed for more ambitious standards to have an impact on cars sold in one member state and then imported into another member state. As this study is looking at a 10 years period (2020 to 2030), the effect of this fact would not be important. For instance, in the case of Poland, the major importer of used cars, three quarters of imported cars are above 9 years old. That is also the case for Lithuania, Latvia and Estonia, the relatively largest importers of used cars. Therefore, only new cars with increased standards in place would deliver additional reductions compared to a business as usual scenario.



On the model, specific values had to be chosen. For passenger cars, a value of 70 g/km by 2025 and 55 g/km by 2030 were chosen, while for vans a value of 100 g/km by 2025 and 70 g/km by 2030 was selected, as can be seen in the graph below.



[62] Oko-Institut, 2011. European second-hand car market analysis Final Report.

Figure 4: Passenger cars and vans CO2 standards by 2025 and 2030

With those values in mind, the reductions delivered by 2030 would be the following:

Member State	Additional car & van standards between 2020 & 2030 (Mt CO_2 eq)	% of the effort delivered by new, ambitious car and van standards
Belgium	-2.78	29%
Bulgaria	-0.25	68%
Czech Republic	-0.72	30%
Denmark	-0.77	17%
Germany	-16.00	43%
Estonia	-0.11	18%
Ireland	-0.63	11%
Greece	-0.90	19%
Spain	-5.58	13%
France	-12.01	41%
Italy	-10.06	44%
Cyprus	-0.09	11%
Latvia	-0.09	7%
Lithuania	-0.07	8%
Luxembourg	-0.23	7%
Hungary	-0.63	100%
Malta	-0.02	7%
Netherlands	-2.63	17%
Austria	-1.65	22%
Poland	-1.49	11%
Portugal	-0.96	26%
Romania	-0.70	35%
Slovenia	-0.31	36%
Slovakia	-0.33	24%
Finland	-0.64	19%
Sweden	-1.35	22%
United Kingdom	-12.61	28%
EU-27[63]	-73.63	28%

4.2.2. Heavy-Duty Vehicles (trucks and buses)

Reductions delivered by heavy-duty vehicles (HDV) standards have also been included in the exercise. According to the Impact Assessment of the Strategy for Reducing Heavy-Duty Vehicles Fuel Consumption and CO2 Emissions[64], if limits for 2030 – i.e. a reduction of 35% of CO_2 emissions vs 2015 levels – are introduced before 2020, and a progressive adjustment of new vehicle registrations with this objective takes place, this fuel efficiency and CO_2 emissions reduction objective would translate into 36.7 Mt CO2 savings by 2030. To divide those reductions by member state, given the limited amount of available data for HDVs compared to cars and vans, a simplified

[63] Croatia was not included in the reductions delivered by standards due to the lack of data for new vehicles registered.
[64] European Commission, 2014. Impact assessment accompanying strategy for Reducing Heavy-Duty Vehicles Fuel Consumption and CO2 Emissions.

approach has been chosen. A study commissioned by the European Commission[65] has been used to show the percentage of CO_2 emissions coming from HDV out of total road transport emissions. Information was available for 2007. Knowing the total road transport emissions[66] and the percentage for HDV, emissions were calculated for each member state. Then a percentage of total HDV emissions were calculated for each member state. That is the percentage that was used to split the 36.7 Mt among member states.

The results of the reductions delivered are shown in the table below:

Member State	**Reductions from HDV standards (35% improvements between 2015 - 2030) - Mt CO_2 eq**
Belgium	-1.30
Bulgaria	-0.22
Czech Republic	-1.75
Denmark	-0.31
Germany	-4.59
Estonia	-0.12
Ireland	-0.26
Greece	-1.25
Spain	-4.79
France	-4.96
Italy	-3.31
Cyprus	-0.05
Latvia	-0.20
Lithuania	-0.40
Luxembourg	-0.20
Hungary	-0.98
Malta	-0.04
Netherlands	-0.97
Austria	-1.40
Poland	-2.17
Portugal	-0.74
Romania	-0.77
Slovenia	-0.28
Slovakia	-0.49
Finland	-0.67
Sweden	-0.61
United Kingdom	-3.87
EU-27[67]	-36.70

4.3. Key outcomes of the modelling exercise

4.3.1. The earlier, the better

[65] AEA, 2011. Reduction and Testing of Greenhouse Gas (GHG) Emissions from Heavy Duty Vehicles – Lot 1: Strategy.
[66] EEA GHG viewer, data for 2007, as it was the year available in the AEA report.
[67] Croatia was not included in the reductions delivered by standards due to the lack of information for truck emissions in the study used.

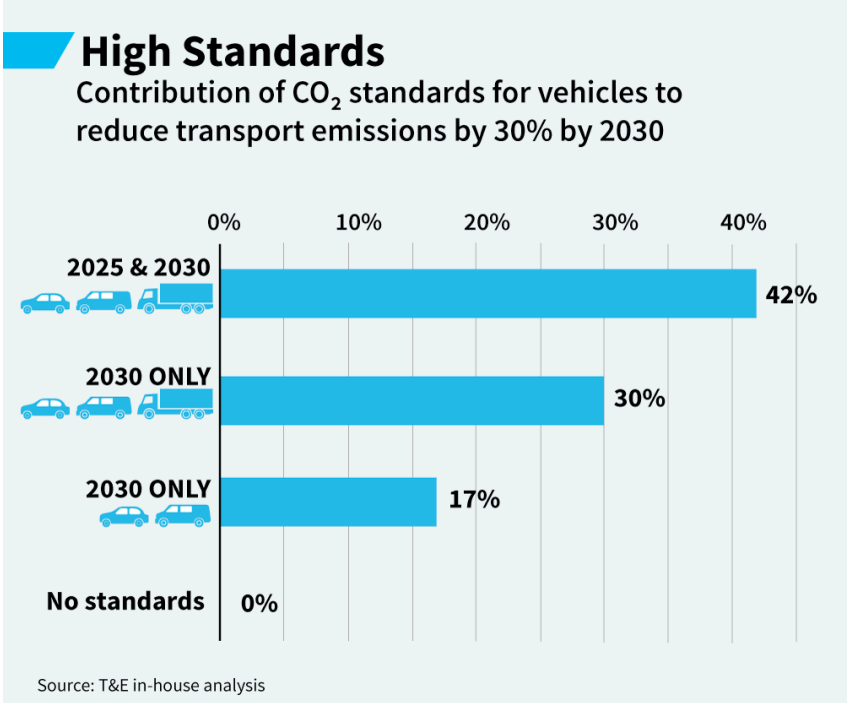
The developed tool allowed us to easily change the values and the dates for the implementation of different standards. The conclusion is clear: the introduction date of new standards is absolutely key to their effectiveness. The fact that both diesel and petrol cars, and especially vans, are mostly driven during their first three years, has a huge impact on how fast reductions are delivered.

For instance, if the implementation of 70 grams per kilometre for cars and the 100 grams for vans was postponed to 2030, the impact would be 32 megatons (45% less) of CO_2 less than if implemented by 2025. Postponing action towards 2030 would make achieving the 2030 ESD targets much more difficult.

Annual targets increase predictability and environmental integrity. In contrast to, for example, the US, the EU has set standards for 2015 and 2020 without demanding intermediary emission cuts. This gives complete freedom to manufacturers as to how and at what pace they wish to meet the targets. But it also means annual reduction trajectory will be different from the Commission policy. To increase predictability for member states the EU could consider introducing annual targets, together with a system of banking, borrowing and trading of emission credits to provide flexibility for manufacturers.

4.3.2. Standards are fundamental to achieve the targets, but additional measures are needed

New standards for cars, vans and trucks are indispensable for achieving the 2030 targets. They would cover over 40% of the required effort if transport emissions would need to be reduced by 30%. This would increase to over 60% of the required effort to achieve the transport white paper -20% target.



Member State	Additional car & van standards between 2020 & 2030 - Mt CO_2 eq	Reductions from HDV standards (35% improvements between 2015 - 2030) - Mt CO_2 eq	Additional needed reductions in transport fair share in 2030 if extra standards – Mt CO_2 eq[68]	% of the gap covered by new standards (-30% for transport)	% of the gap covered by new standards (-40% for transport)	% of the gap covered by new standards (-20% for transport)
Belgium	-2.80	-1.30	5.36	43%	34%	58%
Bulgaria	-0.25	-0.22	-0.10	100%	32%	100%
Czech Republic	-0.73	-1.75	-0.04	100%	52%	100%
Denmark	-0.77	-0.31	3.41	24%	19%	33%
Germany	-16.06	-4.59	16.74	55%	40%	85%
Estonia	-0.11	-0.12	0.38	38%	27%	58%
Ireland	-0.64	-0.26	4.95	15%	12%	19%
Greece	-0.90	-1.25	2.49	46%	31%	83%
Spain	-5.60	-4.79	31.17	25%	20%	32%
France	-12.09	-4.96	12.60	57%	39%	98%
Croatia	-	-	-	-	-	-
Italy	-10.08	-3.31	9.39	59%	38%	100%
Cyprus	-0.09	-0.05	0.66	17%	12%	28%
Latvia	-0.09	-0.20	0.89	24%	18%	34%
Lithuania	-0.07	-0.40	0.40	54%	34%	100%
Luxembourg	-0.23	-0.20	2.82	13%	11%	16%
Hungary	-0.63	-0.98	-1.82	100%	99%	100%
Malta	-0.02	-0.04	0.27	20%	17%	25%
Netherlands	-2.65	-0.97	11.66	24%	19%	30%
Austria	-1.66	-1.40	4.48	41%	31%	57%
Poland	-1.50	-2.17	9.38	28%	19%	50%
Portugal	-0.96	-0.74	2.04	45%	28%	100%
Romania	-0.70	-0.77	0.54	73%	35%	100%
Slovenia	-0.32	-0.28	0.29	67%	37%	100%
Slovakia	-0.33	-0.49	0.54	60%	35%	100%
Finland	-0.64	-0.67	2.08	39%	28%	59%
Sweden	-1.36	-0.61	4.10	32%	24%	47%
United Kingdom	-12.68	-3.87	29.02	36%	28%	48%
EU-28	-73.97	-36.70	153.67	42%	31%	63%

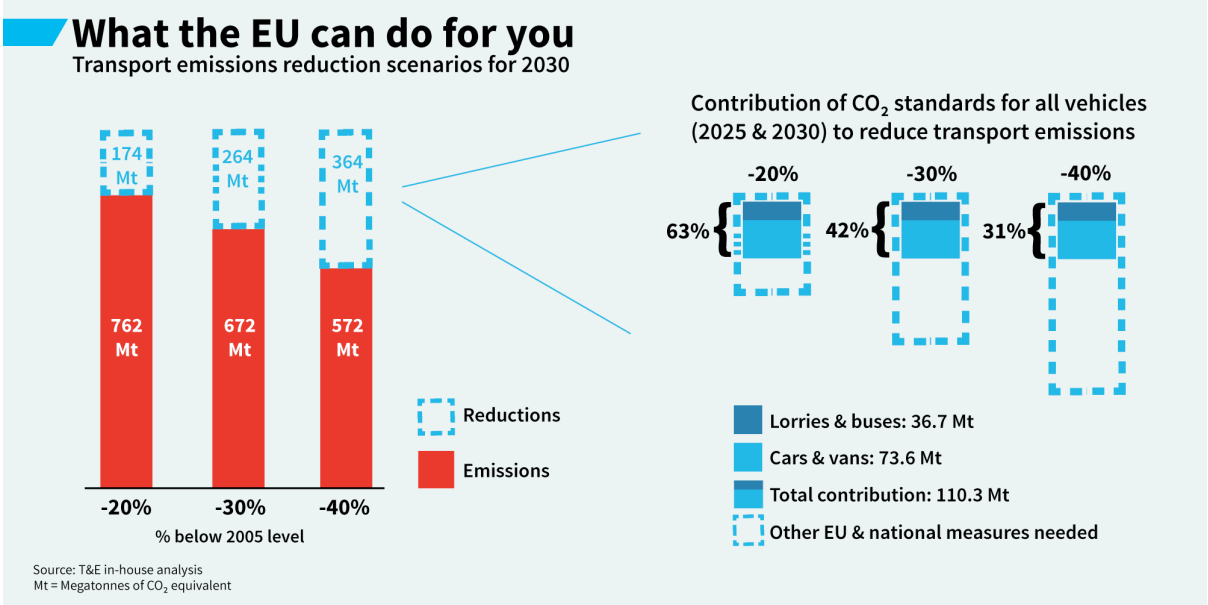
From this table it has become apparent that efficiency standards for cars, vans and trucks have a key role to play in hitting ESD targets. Under the assumptions used (-30% for transport, no flexibilities used), efficiency standards could close almost half of the gap between the reference scenario and ESD targets.

It is striking that results per member state show such a high variation. The main reason is the reference scenario. Let's look, for instance, at Germany and the Netherlands. Germany had in 2012

[68] Negative values in this column mean that the member state would overachieve the target. That would reduce the needs for reductions in other sectors or they could trade with other member states.

transport emissions of 154 Mt. The reference scenario projected an emissions level of approximately 134 Mt by 2030. The scenario already reflected reductions, so additional reductions would cover a large part of the gap. However, the Netherlands had in 2012 34 Mt of GHG emissions from the transport sector. The reference scenario projected an emissions level of 39 Mt by 2030. As there is an increase in emissions in the system, additional reductions would cover a relatively smaller fraction of the gap. In that case, if reference scenario emissions are overestimated in the reference scenario, new standards would deliver a much higher percentage of the gap.

But standards alone cannot do the job. Additional measures will need to be implemented as well. Additional measures are needed. In the next section the most important EU-level measures are briefly analysed.



4.3.3. Heavy-duty vehicle emissions need to be tackled

In our analysis we've assumed new truck emissions are reduced by around 35%. According an analysis performed by the Commission in 2014, this could lead to emission cuts of 37 megatons by 2030. In our analysis we assume that truck CO2 standards will be introduced but it needs to be noted that there has still not been a decision on this. Our analysis clearly shows member states cannot afford EU inaction on HDV standards.

Indeed, according to studies performed for the Commission heavy-duty vehicle emissions could increase by 15%[69] without additional action. Even the most positive interpretations (e.g. the Commission's 2014 impact assessment[70]) of future HDV emissions assume they will not decrease without the introduction of standards. The net effect of inaction is roughly as big as postponing car and van standards from 2025 to 2030.

4.4. Additional measures

To meet the 2030 ESD target additional measures are required in most member states (even if transport does not contribute proportionally). While the responsibility for the emission reductions lies with the member states, there are a number of EU measures that could help them.

[69] AEA, 2011. Reduction and Testing of Greenhouse Gas (GHG) Emissions from Heavy Duty Vehicles – Lot 1: Strategy.
[70] European Commission, 2014. Impact Assessment accompanying the document Strategy for Reducing Heavy-Duty Vehicles Fuel Consumption and CO_2 Emissions.

4.4.1. Road charging

It entails charging directly for the use of roads, taking into account the true costs of driving. This includes costs related to infrastructure and maintenance but also congestion, air pollution, accidents, among others. The latter are not generally considered in drivers' decisions, leading to more driving than the socially desirable level. By internalising these costs, road charges will induce drivers to change their behaviour, fostering more efficient transport[71]. One expected impact is a reduction in the amount of driving and, consequently, a decrease in CO2 emissions.

Lorries

While road-charging policies need to be implemented at national level, the EU has a key role to play. Since the EU allowed km-based road charging for lorries, nine countries including Germany and Poland have decided to introduce lorry tolls. A new proposal on lorry charging was announced for 2016 and is an opportunity to phase out time-based vignettes (sticker systems), mandate infrastructure charging, and enable CO_2 differentiation. The generalisation of lorry road charging could be a key instrument in increasing transport efficiency, checking expected increases in lorry mileages and driving the greening of the lorry fleet.

Cars

There is no EU framework for car charging but the Transport Commissioner Violeta Bulc has announced she will propose one. She plans to set up a European framework to facilitate the roll out of car charging. The EU could, for example, adopt a number of technical standards, including for vehicles, which would significantly reduce the cost of introducing and operating car charging schemes.

Studies commissioned in the Netherlands[7273] and in Finland[74] analysed the implementation of a nationwide road charge on passenger cars based on distance travelled. These kilometre-based fees, varying according to the level of CO_2 emissions and location, would substitute fixed motoring taxes. The studies predict a 4% to 14% decrease in CO_2 emissions by 2030 compared to a business as usual scenario.

4.4.2. Fuel taxation

The Energy Taxing Directive (ETD), agreed on 2003, is outdated. Fuel tax levels are decreasing and the lack of EU coordination holds back member states that would like to increase fuel taxes. Indeed, the fact that some member states deliberately choose to lower their fuel taxes – to attract foreign drivers and hauliers – has put a break on fuel tax increases in many countries.

Fuel tax increases could contribute very significantly to achieving the 2030 target.

The impact assessment of the 2011 proposal to reform the ETD[75] stated that large reductions could be delivered by revising the ETD. The Commission estimated its proposal would reduce overall EU emissions between 0.5 and 1% by 2030. This could even increase to -3.45% if the most effective

[71] Victoria Transport Policy Institute, 2014. Road Pricing: Congestion Pricing, Value Pricing, Toll Roads and HOT Lanes.
[72] Geurs , K., Haaijer , R. and Meurs , H., 2010. The Dutch national kilometre charge: impacts on the Dutch car market and environment.
[73] MuConsult, 2009. Effecten milieudifferentiatie basistarieven kilometerprijs. MuConsult, Amersfoort.
[74] Ministry of Transport and Communications, 2014. Fair and Intelligent Transport. Working Group Final Report.
[75] European Commission, 2011. Impact assessment Accompanying document to the Proposal for a Council Directive amending Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity

option of the impact assessment was chosen. This would deliver more than 100 megatons from non-ETS sectors by 2020[76]. By 2030, the potential reductions delivered by an ambitious ETD revision would be even larger. An important part of those reductions would be within the transport sector as it is the largest consumer of final energy in the EU (almost 32%[77]).

T&E will publish in May 2015 a study on why it should be revised, including, among other reasons, because it is a key tool to reduce transport GHG emissions.

4.4.3. An EU-mobility strategy

The European Commission is pushing through the Energy Union for the electrification of the transport sector. Electrification of the transport sector is linked to the policies already described in this study around new standards for cars, vans and HDV. However, electrification is not only about electric vehicles. It goes way beyond, as described in T&E's electrification strategy[78]. Electrification is the only credible option left for deep decarbonisation of surface transport and is inherently more energy efficient than other options. Europe should propose a long-term strategy for cross-modal, cross-vehicle electrification of transport. Done in the right ways, this will also facilitate multimodality and a shift to more sustainable vehicle sharing and lighter and smaller vehicles.

4.4.4. Post 2020 decarbonisation policy for transport fuels

The GHG emissions of transport fuels need to be tackled with a dedicated decarbonisation framework after 2020, if the EU is serious about reaching its long-term transport decarbonisation targets. Such a fuels policy should follow a qualitative rather than quantitative approach, building on the Fuel Quality Directive decarbonisation trajectory instead of the Renewable Energy Directive volume target. It should aim at preventing the use of high-carbon fossil fuels in transport and should focus on promoting only truly sustainable alternatives, such as renewable electricity and sustainable advanced biofuels.

5. Conclusions and policy recommendations

Meeting the 2023 ESD targets will require significant efforts in the transport sector. This paper shows that regardless of what level of reductions the EU and its member states would opt for (-20%, -30%, -40%) standards play a key role in helping member states to achieve the targets in a cost-effective manner; they can close roughly half the gap between 'business as usual' and 2030 targets.

Our analysis also shows that standards need to be introduced in 2025 to have a meaningful impact in 2030. Postponing standards until 2030 halves their effectiveness; postponing standards until after 2030 means member states will need to achieve the lion's share of the cuts nationally. The analysis also shows that truck standards are needed too. The effect of not introducing truck standards would be almost as big as postponing the 2025 targets until 2030.

The Commission's 2016 ESD proposals should set national targets, but also help member states achieve them. The Commission should bundle its existing transport plans and propose a transport package built around 2025 CO2 standards for cars, vans and trucks, as well as road charging and e-mobility. Such a package could cover a large chunk of the reductions that are needed in the

[76] The impact assessment mentions that option 4 would deliver around 37% of the effort needed by 2020 from ESD sectors.
[77] EEA, 2015. Final energy consumption by sector and fuel (CSI 027/ENER 016)
[78] Transport & Environment, 2015. Electrification strategy: a shift to sustainable e-mobility.

transport sector. This could increase member state acceptance of the ESD targets, reduce the pressure for loopholes and create support for EU measures to cut emissions all at the same time. The measures would not only help in meeting the 2030 targets but would also create jobs and deliver big economic and energy security benefits.