Final Report

Expert study on the conditions of a potential inclusion of road transport into the EU Emissions Trading System

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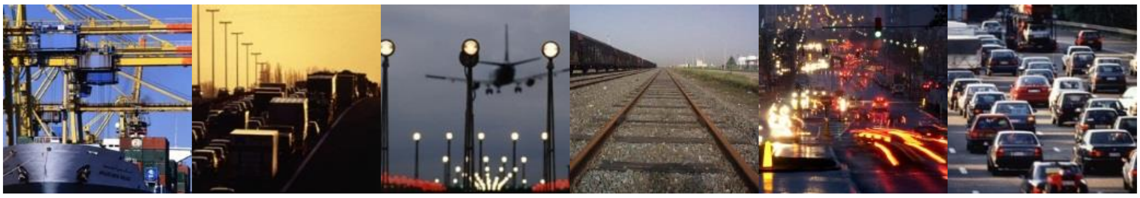

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Contents

Executive Summary

'Europe will apply its emissions trading scheme to buildings and transport', European Commission President Ursula von der Leyen told a summit of world leaders on 22 April 2021. Indeed, the European Commission announced earlier, in the European Green Deal of end 2019, that it considered to apply emission trading to road transport.

This report studies the conditions of the potential inclusion of road transport into the European Emissions Trading System, the EU ETS.

- We first describe the European climate context and the role of the road transport sector. We give a detailed description of the functioning of the EU ETS and provide an overview of the most important existing policy instruments addressing the CO_2 emissions of road transport.
- In the second part, we study how emission trading for road transport can be set up: we look at the main system options and the interactions with the existing policy instruments.
- In the third and last past of the study we analyse the impact of the most relevant policy options on CO_2 emissions, abatement costs and on the incentives for technological innovation. Finally, the economic and social impact on road transport users, fuel suppliers, the other EU ETS sectors and governments are analysed.

Throughout this study the focus is on CO_2 reduction. While road transport has other dimensions and generates other externalities, this focus permits to get a clear picture of this single objective and the policies to reach it. Moreover, we focus on the tank-to-wheel emissions. These are the direct tailpipe emissions of road transport.

Part 1: Context

1. The European Union has set a greenhouse gas (GHG) reduction target of 55% in 2030 and the climate neutrality objective in 2050. To reach this a decrease of transport emissions by 90% would be needed in 2050 compared to 1990. Road transport is responsible for 71% of total transport emissions. This amounts to 786.2 Mt CO_2 in 2018. Between 1990 and 2018 road transport emissions have increased by 27%. It is the only sector where emissions have not decreased yet. With the existing and additional policies foreseen by the Member States, only a decrease towards the 1990 level is projected by 2030.

2. The EU ETS currently covers around 40% of the EU GHG emissions, originating from large industrial installations, the power sector and flights within the European Economic Area. Between 2005 and 2018 the emissions of the stationary installations have been reduced by 29%. Emissions from intra-EEA aviation are included in the EU ETS since 2012. In pre-Covid times, they were still increasing, and the aviation sector had to buy a substantial share of its allowances from the other EU ETS sectors.

The main characteristics of the EU ETS functioning today are:

- A fixed cap guarantees the environmental performance of the system: the yearly decreasing cap sets the maximum yearly CO_2 emissions of the combined ETS sectors.

- An emission allowance offers the right to emit 1 tonne of CO_2. All EU ETS companies must surrender one emission allowance for each tonne of CO_2 they have emitted over the course of the year.
- Trade between market participants enables cost efficiency: reductions will be achieved where abatement costs are the lowest because each emitter can search for the cheapest way to comply: either reduce CO_2 himself or turn to other emitters who can do so for less money.
- The CO_2 price is formed by the market: at the level where supply meets demand. The EUA price[1] on 16 April 2021 was 44 euro/tonne of CO_2 (and the past month never below 40 euro/tonne).
- The emission allowances are bankable (can be used in future years), guaranteeing intertemporal efficiency. In the case of expected high future CO_2 prices, the ETS could stimulate innovation as it makes it profitable to invest in research and development.
- In the period 2013–2020 the allowances were attributed to installations via a combination of free allocation (47%) and auctioning (48%). To limit the risk of carbon leakage firms operating in an internationally competitive subsector receive a larger share of their allowances for free.
- The auctions yield substantial revenues which are mainly used for domestic climate and energy purposes by Member States. A smaller share is used for EU funds for innovation in ETS sectors and modernisation of the energy system.

3. Many policies and measures both at EU and national level address the CO_2 emissions of road transport. Most EU policies are under revision now to contribute better to the objectives of the European Green Deal.

[1] See e.g. this website for the daily ETS carbon prices https://ember-climate.org/data/carbon-price-viewer/

	Main policy instruments	Category	Under revision under European Green Deal?
EU	Effort sharing regulation	Target setting	yes
	Renewable Energy Directive (recast) (RED II)	Target setting	yes
	Energy Efficiency Directive	Target setting	yes
	Energy Taxation Directive	Pricing	yes
	Eurovignette Directive	Pricing	yes
	CO_2 emission standards vehicles	Product standard	yes
	Fuel Quality Directive	Product standard	no
	Alternative Fuel Infrastructure Directive	Infrastructure	yes
	EU funding programmes	Infrastructure and innovation	yes
	Car Labelling Directive	Awareness raising	no
	Directive on Combined Transport of goods between Member States	Legislative	yes
National	Fuel taxes	Pricing	
	Other taxes and charges: vehicle taxes and subsidies, road charges, tolls, parking tariffs	Pricing	
	Other policies for CO_2 reduction	Infrastructure, land use planning, awareness raising…	

The existing EU and national transport CO_2 policies have had significant impacts, but they have not been able to achieve absolute CO_2 reductions in road transport. On the contrary, emissions keep increasing.

This can partly be explained by the elasticities of road transport demand. The income elasticities of both passenger and freight transport demand are close to unity which means that demand rises (more or less) proportionally with increasing incomes. The price elasticity for road transport fuel demand is relatively low, so in the past higher fuel prices only had a small impact on the fuel demand. The price elasticity is expected to rise in the future when low/zero carbon vehicles become more available and affordable.

Part 2: Policy options

1. This part first gives an overview of the different options that can be envisaged to include transport in the EU ETS, with a short discussion of their advantages and disadvantages. These options are:

- separate or an integrated system,
- national versus an EU-wide system,
- upstream versus downstream approach,
- allowance allocation model,
- treatment of alternative fuels,
- treatment of passenger and freight road transport.

On the **design options** we find that an **EU-wide** (instead of national), **upstream system** (at the level of the fuel suppliers), **including al transport fuels** and **both for passenger and freight transport has the most advantages**. The allocation of allowances via **auctioning** is preferable over free allocation. This is because free allocation would lead to large rents (windfall profits) for the fuel distributors and also because auctioning would generate a substantial income stream for national governments. We limit the analysis of the impacts to these withheld options, but still leave open whether a separate or integrated system should be chosen, as well as the option of free allocation in a transition phase.

2. We analyse the **interaction of an ETS for road transport with the existing policy instruments**. We want to know if the introduction of road transport in the EU ETS and the existing policy instruments would work in the same direction or counteract each other.

First we expect that if road transport is included in the EU ETS, the risk that the existing road transport policy instruments would hamper the functioning of this extended EU ETS is very limited, thanks to the Market Stability Reserve (MSR). The MSR absorbs oversupply of allowances (e.g. if case a large uptake of zero emission vehicles would suddenly decrease the demand for CO_2 permits) and releases allowances from the reserve in case of shortage. The extension could strengthen the EU ETS by improving market liquidity.

Second, we see that, for the purpose of CO_2 reduction, many of the existing climate policies for road transport are complementary to an inclusion of road transport in an ETS and would best be maintained when road transport is introduced in an ETS.

	Policy instrument	Complementary to transport in ETS?
EU	Effort sharing regulation	No, ESR and ETS are in principle mutually exclusive. In case a separate closed ETS for transport (and building) emissions, different accounting rules might be established which allow these sectors to stay within the ESR scope[2], this could lead to unnecessary policy overlap.
	Renewable Energy Directive (recast) (RED II)	Yes, RED is useful to complement ETS for well-to-tank emissions (via sustainability criteria) and RED can provide incentives for innovation towards renewable fuels/energy for transport. But not efficient to maintain sub-target for transport.
	Energy Efficiency Directive	No, if energy efficiency is considered merely as an instrument to decrease CO_2 emissions it is not useful to maintain the EED for road transport energy use.
	Energy Taxation Directive	No, energy taxation can be a substitute for an ETS carbon price, if reflecting the relative carbon content of the fuels. But it sets no cap on absolute quantity of emissions and does not allow trade with other sectors.
	Eurovignette Directive (proposed reform to introduce a CO_2 element)	No, the proposed introduction of a CO_2 element could form a substitute for transport in ETS (only if applied everywhere in the EU). But it sets no cap on absolute quantity of emissions.
	CO_2 emission standards vehicles	Yes, both are needed to give the right incentives to consumers and car manufacturers and to stimulate innovation. Standards will put a downward pressure the CO_2 price in the ETS.
	Fuel Quality Directive	Yes, useful to complement ETS for well-to-tank emissions via sustainability criteria
	Alternative Fuel Infrastructure Directive, EU funding programmes, Car Labelling Directive, Directive on Combined Transport of goods between Member States	Yes, they are flanking policies which can be mutually reinforcing with transport in ETS
National	Fuel taxes	No, national energy taxation is already a substitute for an ETS carbon price, if reflecting the relative carbon content of the fuels correctly. But fuel taxes set no cap on absolute quantity of emissions and allow no trade across sectors. Maintaining the current high levels of fuel taxation would decrease the efficiency gains of an ETS for road transport.
	CO_2 related vehicle taxes and subsidies	Yes, CO_2 related acquisition taxes and subsidies are complementary to an ETS carbon price by providing an extra incentive at the moment of vehicle purchase. CO_2 related ownership taxes are less steering towards low emission vehicles.
	Other policies for CO_2 reduction	Yes, flanking policy which can be mutually reinforcing with transport in ETS.

CO_2 standards for vehicles help to make the consumer chose for fuel efficient vehicles (also in the presence of split incentives e.g. for drivers of company cars). Additionally, they **foster R&D**. The other complementary policies set sustainability criteria for alternative and renewable fuels/energy, help to inform consumers, take away barriers and supply alternatives to car use. From an economic efficiency perspective however, it is better to set the targets for renewable and sustainable fuels at a high economy-wide level, without a specific sub-target for road transport.

On the other hand, **some existing policy instruments would become redundant in a scenario with an ETS for road transport**. Road transport should be removed from the Effort Sharing Regulation and the Energy Efficiency Directive if included in an ETS, because the European wide ETS takes over this function. The pricing instruments (the Energy Taxation Directive, national fuel taxes and the proposal to introduce a CO_2 element in the Eurovignette Directive) are to be revised, as the EU ETS carbon price is now taking over the climate policy function in a more efficient way. The EU ETS carbon price has the advantage of setting a cap on the absolute emissions and to make use of the cheaper abatement options in other sectors.

Part 3: Impacts

We analyse the impacts of an ETS for road transport on CO_2 emissions, abatement costs, the incentives for technological innovation and its uptake. The economic and social effects for road transport users, fuel suppliers, vehicle manufacturers, other EU ETS sectors and national governments are also considered.

Total CO_2 emissions included in the EU ETS will decrease at the pace of the yearly decreasing cap on the number of allowances[3], irrespective of the system options chosen. The share of road transport in this reduction will depend on the scope option chosen. The impact on abatement costs and the permit price also depend on this scope.

Impact on	Separate Road transport ETS	Separate Road transport and Buildings ETS	Integrated EU ETS
Road transport CO_2 emissions	Depending on tightness of cap and its future decrease	Relatively less reductions in road transport (and more in buildings)	Relatively lesser reductions in road transport (and more in the other EU ETS sectors)
Abatement costs	High transport abatement costs (but lower than when same CO_2 reduction in road transport would have to be achieved without a carbon price)	Lower transport abatement costs (which could be lowered further if fuel taxes would decrease)	Lowest overall abatement costs and lowest road transport abatement costs (which could be lowered further if fuel taxes would decrease).
Permit price	Probably high, to achieve reductions in presence of high abatement costs and low price elasticity	Lower price than a separate ETS for transport only.	Probably lower than in a separate ETS for road transport and/or buildings. Probably higher than in the current EU ETS scope (without transport and buildings).

[3] It will also depend on the functioning of the MSR, in case the surplus is so large that a cancellation of allowances is applied.

Abatement costs in the road transport sector are, at this moment, much higher than in other sectors. This is the result of the high road fuel taxes that act as carbon taxes[4]. The EU-27 unweighted average of **implicit carbon prices of current nominal energy and carbon tax rates amounts to around 240 euro/tonne CO_2 for petrol and around 160 euro/tonne CO_2 for diesel**. This can be compared with **abatement costs in the EU ETS sector of 30 to 40 euro/tonne CO_2** and sometimes even lower abatement costs in the building sector.

In theory, the integration of road transport in the existing EU ETS could lead to a perfect **cost-efficient[5] distribution of the abatement efforts,** but the current high fuel taxes for road transport preclude this. Indeed, as long as current high fuel taxes remain in place, a simple integration of the transport sector in an ETS system would imply adding the permit price to the existing fuel (carbon) taxes and would increase the cost of abatement in the transport sector. A **tax reform is needed to lower progressively the existing fuel taxes so that carbon permit prices can really play their role**. This will lead to less (relatively expensive) abatement in the road transport sector and more (relatively cheap) abatement in the other EU ETS sectors.

These **existing EU ETS sectors** will thus face **higher permit prices** (although the existing complementary road transport policies and the MSR are expected to prevent very strong price increases) and hence **higher abatement costs**. Protection against carbon leakage (in the form of a share of free allocation or a carbon border adjustment mechanism) will be needed for energy-intensive subsectors working in internationally competitive markets.

A tax revision is needed anyway as the future reduction of transport fuel use will erode the tax base and strongly reduce tax revenues for governments.

The allocation of allowances via **auctioning** is preferable over free allocation as a free allocation would lead to large rents (windfall profits) for the fuel distributors. For the road transport user this would not make a difference as we expect **full cost pass-through** of the permit price in the fuel prices.

Auctioning would generate a substantial **extra income stream** for national governments, but this needs to be corrected for the decrease of their national fuel taxes. The net effect on the fuel price for the consumers is rather unclear, as an efficient carbon market would bring the abatement costs in the transport sector (160-240 euro/tonne CO_2) closer to the abatement costs in other sectors (30 à 40 euro/tonne CO_2).

If one does not correct for the already high carbon taxes in the transport sector, **fuel prices for consumers** are expected to increase. The resulting impact on the fuel transport bill will depend on the income category and situation of households. Poorer households, owning an inefficient car and

[4] The current fuel taxes act as effective carbon taxes. The OECD uses this concept to measure how policies change the relative price of CO_2 emissions from energy use. It is expressed in euro/tonne of CO_2 and includes carbon taxes, emission permit prices and specific taxes on energy use. The latter are typically set per physical unit or unit of energy, but can be translated into effective tax rates based on the carbon content of each form of energy. The current fuel taxes in the EU countries do not lead to a perfect single carbon price for each tonne of CO_2, because the tariffs do not correctly reflect the relative carbon content of the different fuels (due to e.g. the petrol – diesel difference and also because of the many exemptions and reductions).

[5] In this report the term cost-effective and cost-efficient are used as synonyms, both meaning the least cost solution for a given target.

living in remote areas with less alternatives for car use will be hit most. So **flanking policies are necessary for these households**.

A more efficient larger carbon market requires a reduction of existing motor fuel taxes and some consider this as a risk that this will delay the **technological innovation and its uptake** in the road transport sector. There are however two important counterforces. First, there are the existing **CO_2 standards** for vehicles that reduce the emissions for all new cars and lorries. These standards also generate **important spill-overs to the rest of the world** in terms of technology transfer. Second the permits are bankable and this creates a **long-term price signal** that will guide car manufacturers, fuel producers and consumers in their innovation decisions. This is an economy wide signal that will **reallocate efforts across sectors and intertemporally in an efficient way**, if governments stick to their climate policy goals.

In terms of cost-efficiency, the **inclusion of road transport in the existing EU ETS** seems the best option if one reduces the existing road fuel taxes. This option would enable the **largest efficiency gains, limit transaction costs and could strengthen the existing EU ETS by improving market liquidity**.

To limit other potential risks (outside supply-demand unbalances, there can be risks concerning the correct monitoring, reporting and verification etc.) of hampering the functioning of the EU ETS, it can be an option to foresee a **transitionary phase** with a separate ETS for buildings and road transport fuels alone, which will evolve to a fully integrated system.

The **final full integration of road transport in the EU ETS**, combined with a **decrease of the existing fuel taxes**, has the advantage of setting a **cap on the absolute emissions**, to make use of the cheaper abatement options in other sectors and hence to **reallocate efforts across sectors and intertemporally in the most efficient way**.

Part 1: Context

In this first part of the study, we start with a brief description of the EU climate context, with its **greenhouse gas emission (**GHG) objectives and evolution of the emissions. Secondly, we dive into the functioning of the EU ETS: its characteristics, the past and projected trends and the plans for its scope extension. In this part we also provide an overview of arguments pro and contra this extension. Thirdly we list the current policies to reduce CO_2 emissions of road transport.

1.1 Climate context

At the core of the European **Green Deal**, the European Commission proposed in September 2020 to raise the **2030 greenhouse gas emission reduction target, including emissions and removals, to at least 55% compared to 1990**. This target has been endorsed by the European Council in December 2020. The long run target is to become, as EU, **climate neutral by 2050**. This objective has been endorsed by the Council in December 2019, submitted to the UNFCCC in March 2020 and will be legally enshrined by the European Climate Law. This target concretely means that by 2050 the EU will achieve net zero greenhouse gas emissions, all remaining emissions must be offset by e.g., carbon capture by soils and forestation.

The European Commission is now in the process of making detailed legislative proposals by June 2021 to implement and achieve the increased ambition.

For transport, the European Green Deal wants to accelerate the shift to sustainable and smart mobility. Recognising that **transport accounts for a quarter of the EU's greenhouse gas emission, and is still growing**, it states that a **90% reduction of GHG emissions in transport by 2050** is needed to achieve climate neutrality. This should be achieved by:

- a strong boost for multimodal transport (shift of freight to rail and inland waterways),
- automated and connected multimodal mobility,
- the price of transport reflecting its impact on the environment and health,
- increasing the production and deployment of sustainable alternative transport fuels,
- drastically less polluting transport via a combination of measures among which the CO_2 emission performance standards for cars and vans and the possible application of ETS to road transport.

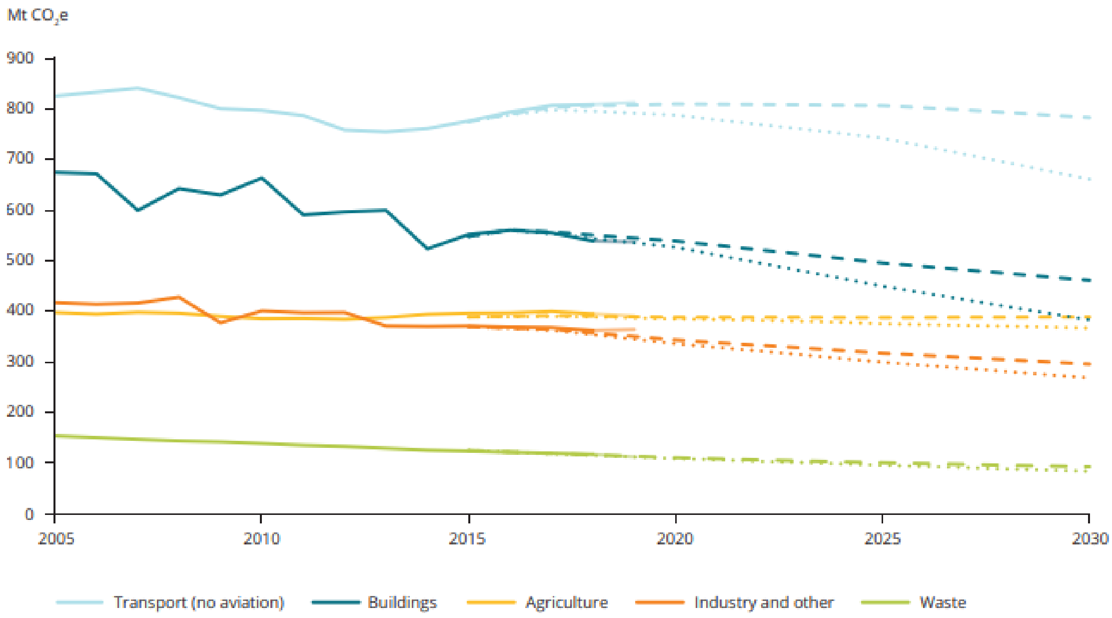
This last option is the focus of this report: what would be the impact and appropriate conditions of a potential inclusion of road transport into the EU ETS.

The figure underneath illustrates the historical trends and future projections in emissions of all sectors under the Effort Sharing legislation[6]. In 2018, these emissions were 10% below 2005 levels. However, total ESR emission levels during the period 2015 – 2019 remained above 2014 levels. This was largely due to increased emissions observed in the transport sector. By 2030, aggregated projections from EU-27 Member States point to at least a 18% reduction in Effort Sharing emissions, compared with 2005 base-year levels with existing and adopted policies and measures

[6] The EU divided the total GHG emission sources in two groups: those that participate in the European wide ETS system (power production, industry, intra EU air transport) and the others, the non-ETS sectors (transport, buildings, agriculture, services, small industry..). For the second group, abatement targets have been defined per Member State in the Effort Sharing regulation, see chapter 1.3 for more explanation.

(dashed lines in the graph). An assessment of Member States' National Energy and Climate Plans shows that the EU-27 plans to reduce its Effort Sharing emissions by an aggregated 32% compared to 2005 (dotted lines).

Figure 1 EU-27 GHG emission trends and projections under the scope of the Effort Sharing Regulation

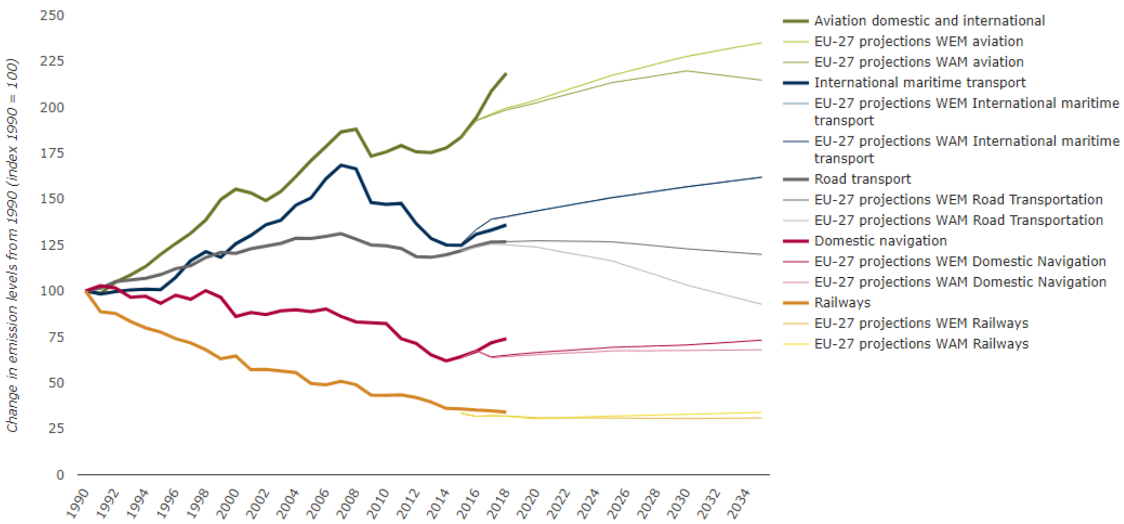


Source: EEA (2020) Trends and projections in Europe 2020

The next figure shows the change in emission levels from 1990 onwards for the various transport subsectors. Road transport constitutes the highest proportion of overall transport emissions (71% in 2018), with an emission of 786.2 Mt CO_{2eq}[7] in 2018 which is 27% above its level in 1990. Its emissions are expected to decline a bit faster than the other transport modes in the WAM[8] scenario (which includes further policies and measures that Member States plan to implement in coming years).

[7] CO_2 equivalent is a metric measure to compare various greenhouse gases on the basis of their global-warming potential by converting the amount of other gases to the equivalent of carbon dioxide with the same global warming potential. For simplicity, in the remaining of this report we denote this simply by CO_2.
[8] WAM stands for With Additional Measures.

Figure 2: Greenhouse gas emissions from transport in the EU, by transport mode and scenario



Source: EEA 2020 Greenhouse gas emissions from transport in Europe

1.2 Functioning of the EU ETS

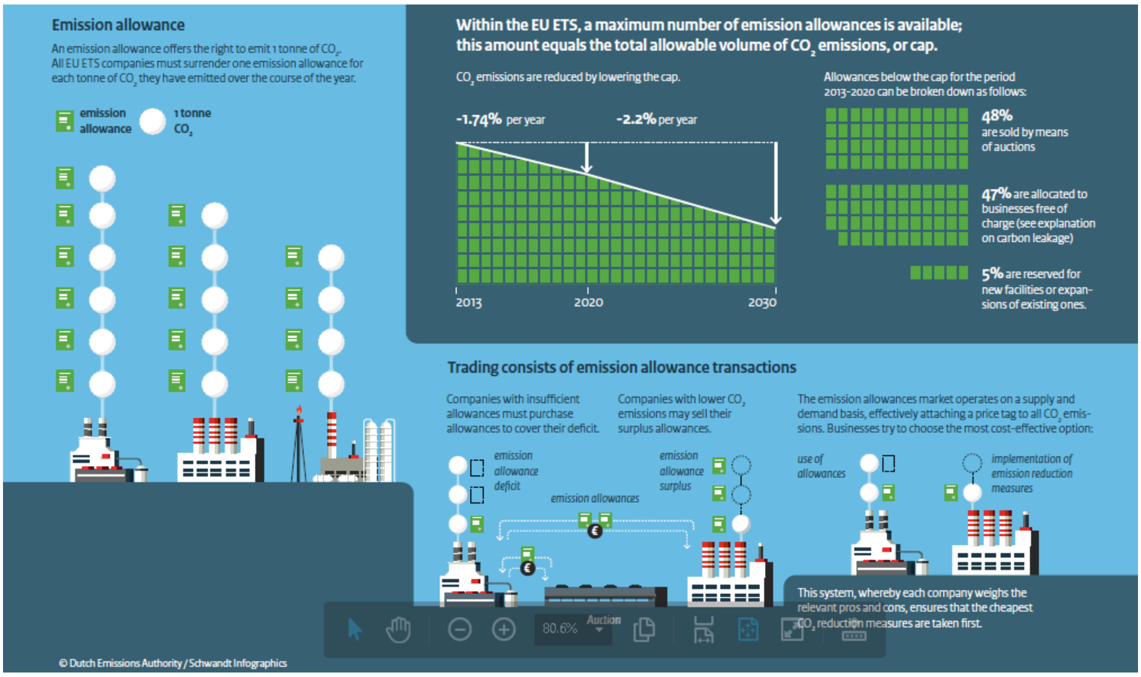
1.2.1 Characteristics: how does the EU ETS work

The EU Emissions Trading System (EU ETS) covers the greenhouse gas emissions carbon dioxide (CO_2), nitrous oxide (N_2O) and perfluorocarbons (PFCs), from heavy energy-using installations (power stations & industrial plants) and airlines operating between countries of the European Economic Area. For these sectors the ETS is the key tool for reducing greenhouse gas (GHG) emissions in the EU. It regulates emissions from nearly 11 000 power plants and manufacturing installations as well as around 600 aircraft operators flying from/to EEA airports. It covers around 40% of the EU's GHG emissions.

The EU ETS is a **'cap and trade'** system: it sets a total cap on emissions, allocates the emission rights over emitters and lets emitters receive or buy emission allowances. An emission allowance grants the right to emit one tonne of CO_2.. The total amount of allowances is set by the cap and is lower than the historical emissions. Companies can choose to reduce emissions or trade allowances with one another, in order to achieve reductions at least cost. The EU ETS cap on emissions decreases each year according to a linear path. For the period 2013 – 2020, the total number of emission allowances decreased by 1.74% per year. From 2021 onwards, the annual rate is 2.2%. First introduced in 2005, the EU ETS has undergone many changes. It is currently in its fourth trading period (2021 – 2030).

Since phase 2 (2008), if an ETS participant has a surplus of allowances at the end of a trading phase it can 'bank', or in other words carry forward, these allowances to count towards its obligations in the next phase.

Figure 3: Functioning of the EU ETS



Source: Dutch Emissions Authority[9]

Since 2013, operators from the **power generation** sector must buy all their allowances through **auctions**, with exceptions for some countries. The **manufacturing industry** received 80% of its **allowances for free** in 2013. This proportion decreases gradually year-on-year, down to 30% in 2020, other than for sectors deemed to be exposed to so-called carbon leakage. The revised ETS Directive determines that between 2026 and 2030 this percentage will be further reduced to 0.

So auctioning has become the default mode for allocating allowances. The Auctioning Regulation specifies the timing, administration and other aspects of how auctions should take place to ensure an open, transparent, harmonised and non-discriminatory process. The European Commission has appointed the German **EEX trading platform**[10] as the common auction platform for 25 Member States participating in a joint procurement procedure (as well as three EEA EFTA States and the Innovation and Modernisation Funds). Germany and Poland do have their allowances auctioned via EEX, but each separately from the community. EEX holds regular auctions of EU general allowances (EUAs) and EU aviation allowances (EUAAs) on its spot market and publishes the volumes that it will sell each year in the auction calendar. The auctions for the 25 EU countries take place 3 times a week. The participants of the auction are the companies and aircraft operators subject to the EU ETS and also investment companies, banks and intermediaries in possession of a permit. The price is established by the bids.

Recently it has been noticed that the number of financial market players on the ETS market has been increasing and that e.g. hedge funds, in expectance of future price increases, acquire

[9] https://www.emissionsauthority.nl/topics/emissions-trading-in-europe/documents/publications/2015/12/10/infographic-how-does-the-eu-ets-work

[10] The EEX auction platform is a web-based system, accessible via the internet, to which the admitted members have access. See https://www.eex.com/en/markets/environmental-markets/eu-ets-auctions

(significant) quantities of CO_2 certificates. This can contribute to strong price increases in the short term already[11]. The activities of the financial market players can help to make the current CO_2 price reflect the long-term scarcity. But if this would lead to excessive price fluctuations, the European Commission might take measures to limit the impact of investors on the market.

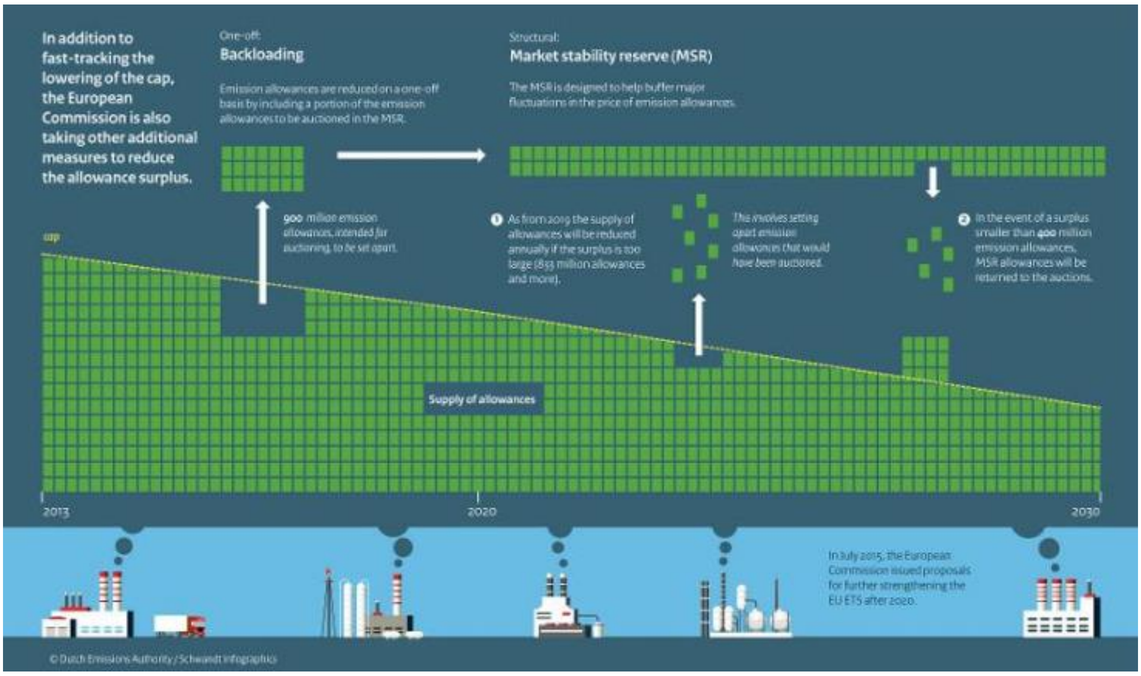
Carbon leakage refers to the situation that may occur if, for reasons of costs related to climate policies, businesses were to transfer production to other countries with laxer emission constraints. This could lead to an increase in their total emissions. The risk of carbon leakage may be higher in certain energy-intensive industries. To safeguard the competitiveness of industries covered by the EU ETS, the production from sectors and sub-sectors deemed to be exposed to a significant risk of carbon leakage receives a **higher share of free allowances**.

The **amount of free allocation** is calculated based on a formula where its production quantity (in tonnes of product) is multiplied with the **benchmark** value for that particular product (measured in emissions per tonne of product). These benchmarks are based on the performance of the most efficient installations, so only the most efficient installations in each sector receive enough free allowances to cover all their needs. Also in the case of free allocation, installations have an **incentive to reduce their emissions**: by reducing their emissions they will generate a surplus of allowances which they can sell to another installation, as illustrated by figure 1.

In the **aviation** sector, the large majority (82%) of allowances is distributed for free, 15% is auctioned and 3% is placed in a special reserve to provide allowances for new operators or for operators having a fast growth of their activities. Airlines can buy allowances from the other EU ETS sectors, but the opposite was not allowed for installations until the end of 2020 (stationary sources could not use the EUAAs). Some international credits could also be exchanged by aircraft operators for EU ETS emission allowances up to 1.5% of their verified emissions during the 2013 – 2020 period. In 2019, the aviation sector had to buy allowances from the other EU ETS sectors for 47% of its emissions, corresponding to 32.1 $MtCO_2$. International credits were exchanged for 0.3 Mt.

[11] See for example an article on the possible cause of the recent CO_2 price increase in Der Spiegel and on https://www.archyde.com/emissions-trading-how-hedge-funds-accelerate-the-coal-phase-out/

Figure 4: Recent EU measures to strengthen the EU ETS



Source: Dutch Emissions Authority[12]

The **revenue from the auctions of allowances** is very substantial, cumulated over the period 2012 – June 2020, the auctions raised more than **57 billion euro[13]**. The yearly revenue is the result of the **volume** of allowances auctioned (see table below) and the prevailing **price** (see figure below).

The **proceedings of the auctions** are, apart from the volumes foreseen for the Modernisation and Innovation Fund, **attributed to the Member States**.

[12] https://www.emissionsauthority.nl/topics/emissions-trading-in-europe/documents/publications/2015/12/10/infographic-how-does-the-eu-ets-work

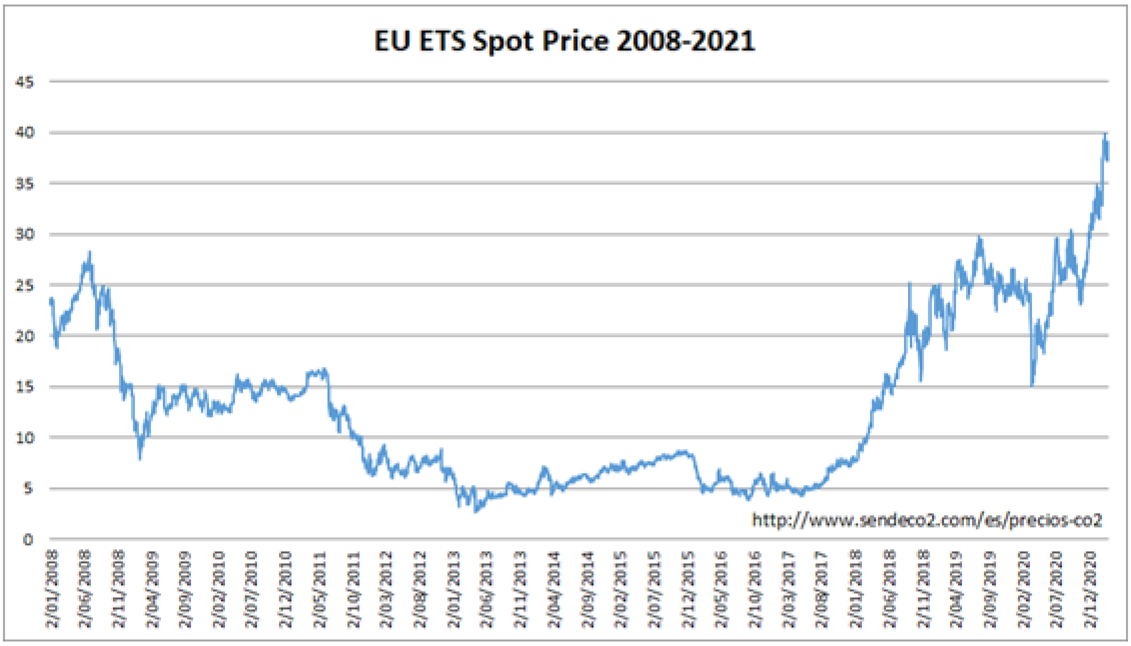
[13] generated by Member States, the UK and EEA countries.

Table 1: Total volume of phase 3 allowances auctioned from 2012 to 30 June 2020

Year	General allowances	Aviation allowances
2012	89 701 500	2 500 000
2013	808 146 500	0
2014	528 399 500	9 278 000
2015	632 725 500	16 390 500
2016	715 289 500	5 997 500
2017	951 195 500	4 730 500
2018	915 750 000	5 601 500
2019	588 540 000	5 502 500
2020 (until 30 June 2020)	360 446 000	3 371 500

Source: Report on the functioning of the European carbon market, COM/2020/740

Figure 5: Evolution of the EUA price 2008 – 2021



Source: www.sendeco.com/es/precios-co2

The EU ETS Directive provides that at least 50% of auction revenues should be used by Member States for **climate and energy related purposes**. Member States spent or planned to spend, in the period 2013 – 2019, about **78% of auction revenues** for such purposes, mostly on **renewable energy, energy efficiency and sustainable transport**.

In 2019 **two low carbon funds** were established: the Innovation Fund and the Modernisation Fund. The **Innovation Fund** supports first-time market development and commercial scale demonstration of innovative technologies and breakthrough innovation in the ETS-sectors[14]. The **Modernisation Fund** supports investments in modernising the power sector and wider energy systems in ten lower-income Member States, from 2021 onwards.

Since 2019, a correction mechanism, called the **Market Stability Reserve** (MSR), is in place for the ETS. Due to the large surplus of permits in the past, among others because of the financial and economic crisis of 2007, the EC decided to limit the number of allowances as from 2019. As a result, the price of allowances has increased. The MSR functions on the basis of a set of pre-determined rules that, when the number of allowances is above a certain threshold (833 million), place into a reserve a proportion (set at 24% in the period 2019 – 2023) of the total number of allowances in circulation (TNAC). If the number of allowances in circulation falls below a lower threshold (400 million) allowances are released from the reserve. The size of the MSR is limited, as from 2023, allowances held in the MSR above the previous year's auction volume will be destroyed. In practice this is done by auctioning a lower number of permits in the following years. As permits are bankable (can be used in future years), this correction mechanism will lower the total cumulative emissions for the period 2020 – 2050 than foreseen by the cap.[15]

To sum up: the main characteristics of the EU ETS functioning today are:

- A fixed cap guarantees the environmental performance of the system: the yearly decreasing cap sets the maximum yearly CO_2 emissions of the combined ETS sectors.
- An emission allowance offers the right to emit 1 tonne of CO_2. All EU ETS companies must surrender one emission allowance for each tonne of CO_2 they have emitted over the course of the year.
- Trade between market participants enables cost efficiency[16]: reductions will be achieved where abatement costs are the lowest because each emitter can search for the cheapest way to comply: either reduce CO_2 himself or turn to other emitters who can do so for less money.
- The CO_2 price is formed by the market: at the level where supply meets demand. The EUA price[17] on 16 April 2021 was 44 euro/tonne CO_2 (and the past month never below 40 euro/tonne).
- The emission allowances are bankable (can be used in future years), guaranteeing intertemporal efficiency. In the case of expected high future CO_2 prices, the ETS could stimulate innovation as it makes it profitable to invest in research and development.
- In the period 2013 – 2020 the allowances were attributed to installations via a combination of free allocation (47%) and auctioning (48%). To limit the risk of carbon leakage firms operating in an internationally competitive subsector receive a larger share of their allowances for free.
- The auctions yield substantial revenues which are mainly used for domestic climate and energy purposes by the Member States. A smaller share is used for EU funds for innovation in ETS sectors and modernisation of the energy system.

[14] The first call, launched in July 2020, provides grant funding of **1 billion euro** and will be followed by regular calls until 2030.

[15] For estimates see: Bruninx, K., Ovaere, M., Delarue, E., 2020. The long-term impact of the market stability reserve on the EU emission trading system. Energy Economics 89 (June).

[16] 16 In this report the term cost-effective and cost-efficient are used as synonyms, both meaning the least cost solution for a given target.

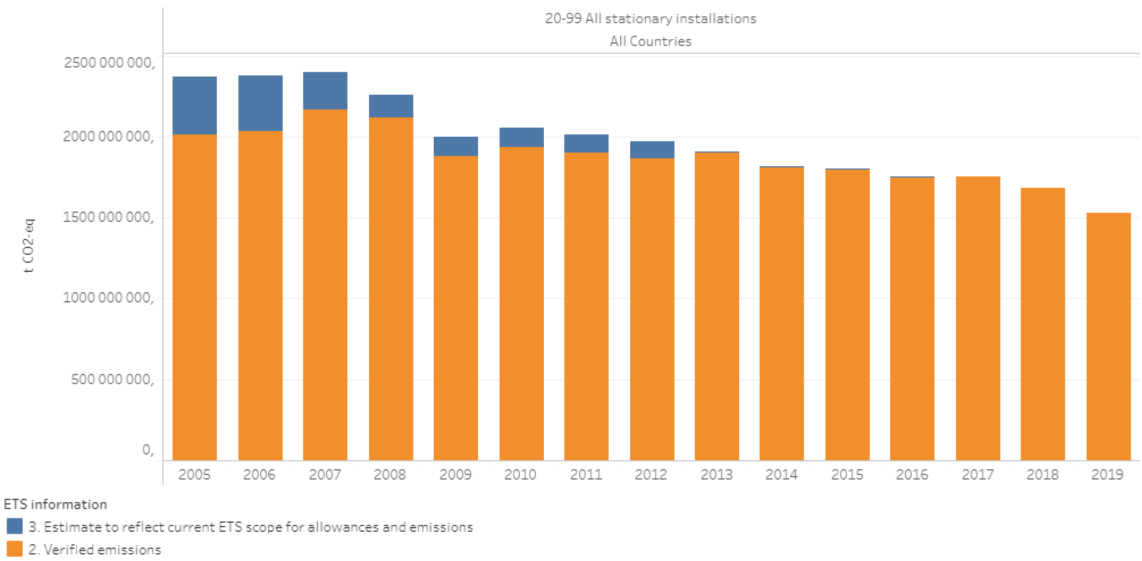
[17] See e.g. this website for the daily ETS carbon prices https://ember-climate.org/data/carbon-price-viewer/

1.2.2 Past and projected trends

1.2.2.1 Emissions trends

Total EU ETS emissions from stationary installations declined by 4.1% between 2017 and 2018 and even with 9% between 2018 and 2019. Over a longer period, total EU ETS emissions from **stationary installations** have declined by around **29%** between 2005 and 2018 (Figure 6). Total emissions have been declining, on average, by 62 Mt per year during phase 3 (2013 – 2020), considerably faster than the cap, which declines by 36 Mt per year. Combustion installations (mainly power plants) remain the main source of emissions in the EU ETS (65% of total EU ETS emissions in 2018). This is also the sector where the main emission reductions have taken place (5.6% per year in phase 3).

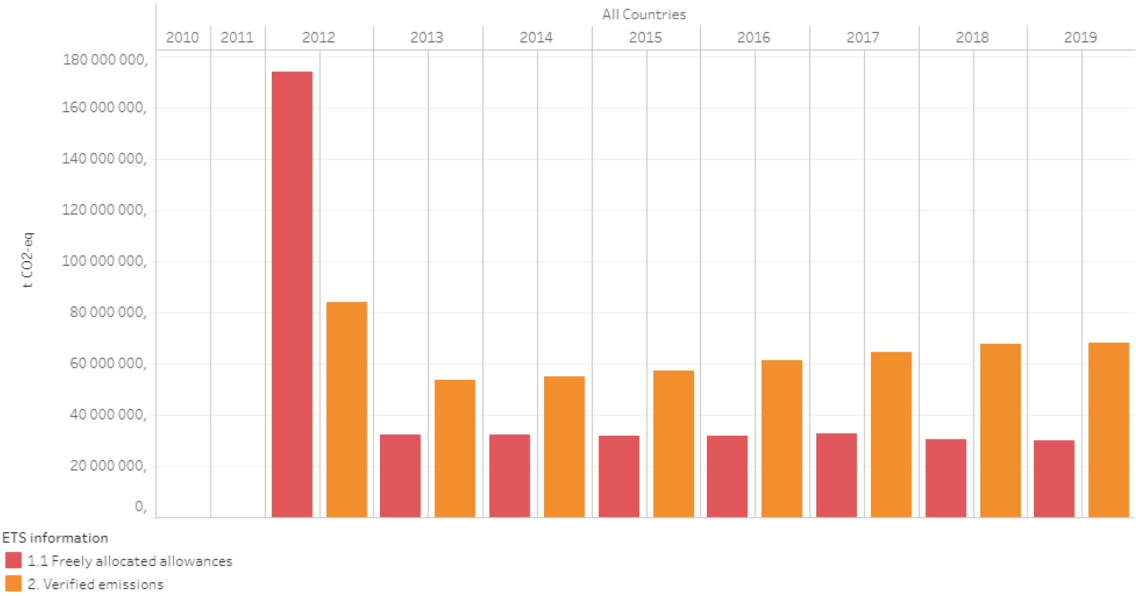
Figure 6: historical ETS emissions stationary sources, in tonne CO_2-eq



Source: https://www.eea.europa.eu/data-and-maps/dashboards/emissions-trading-viewer-1

The ETS emissions from the aviation sector continued to increase year on year throughout the third trading period , and in 2018 were 4% higher than in the previous year. This primarily reflects the increasing demand for air travel. The number of aviation allowances put into circulation in 2013 – 2016 was significantly lower than the original cap (that reflected the 2008 legislation including all flights for, to and within the EEA) because of the temporarily limited scope to flights within the EEA (to support the development of a global measure by the ICAO).

Figure 7 EU ETS freely allocated allowances and verified emissions of aviation 2012 – 2019



Source: https://www.eea.europa.eu/data-and-maps/dashboards/emissions-trading-viewer-1

The inclusion of the aviation sector in the EU ETS had a significant impact on the environmental performance of the system as a whole. In phase 3, until 2019, aircraft operators surrendered 296 million aviation allowances and 127 million general allowances, the latter figure representing the contribution of the aviation sector to the overall stringency of the EU ETS. In the European Green Deal it is announced that the European Commission will propose to reduce the ETS allowances allocated for free to airlines.

More sectoral details can be found in the EU ETS dataviewer of the European Environmental Agency.

1.2.2.2 Supply and demand

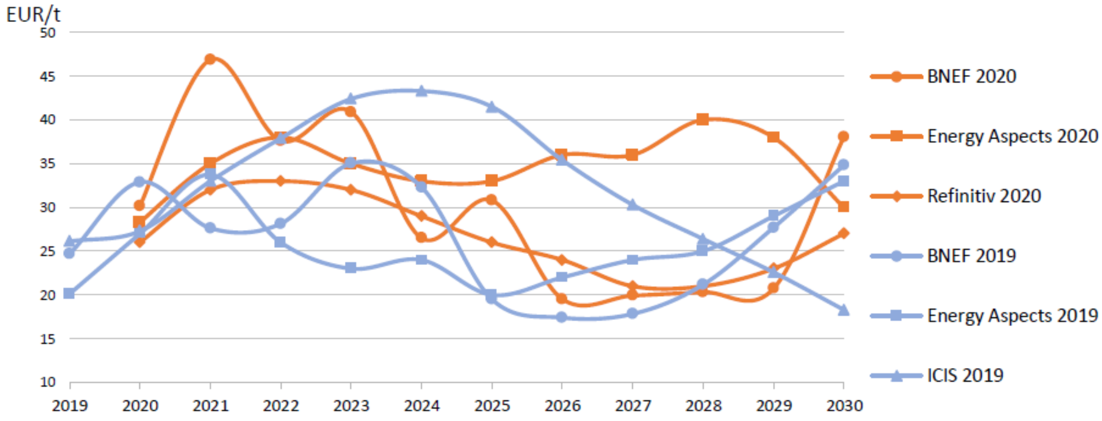
At the start of phase 3 in 2013, the EU ETS was characterised by a large structural imbalance between the supply and demand of allowances, equalising 2.1 billion allowances. As a short-term measure the European Commission postponed the auctioning of 900 million allowances in the period 2014 – 2016. As a long-term solution, to address the structural imbalance, the Market Stability Reserve (MSR) was created and began operating in 2019. In May 2019, the European Commission announced that more than 397 million allowances will be placed in the MSR between 1 September 2019 and 31 August 2020.

The EEA prepares estimates based on national projections of ETS emissions reported by Member States. According to these EEA estimates, the total number of allowances in circulation (TNAC) will decrease, as a consequence of allowances moving into the reserve over the coming years. From 2023 onwards, allowances held in the MSR above the previous year's auction volume will no longer be valid. As EU ETS emissions are projected to be higher than the cap from 2026 onwards, the demand for allowances will contribute to further reducing the TNAC. With measures currently in place, the EEA also estimates that the TNAC might not fall below the lower MSR threshold of 400 million before 2030.

1.2.2.3 Price projections

The historic evolution of the EUA price is depicted in the above figure 6. The figure below plots 2019 and 2020 forecasts of the EUA price from different analysts. All three 2020 forecasts (in orange) expect the price of carbon to increase in the early 2020s.

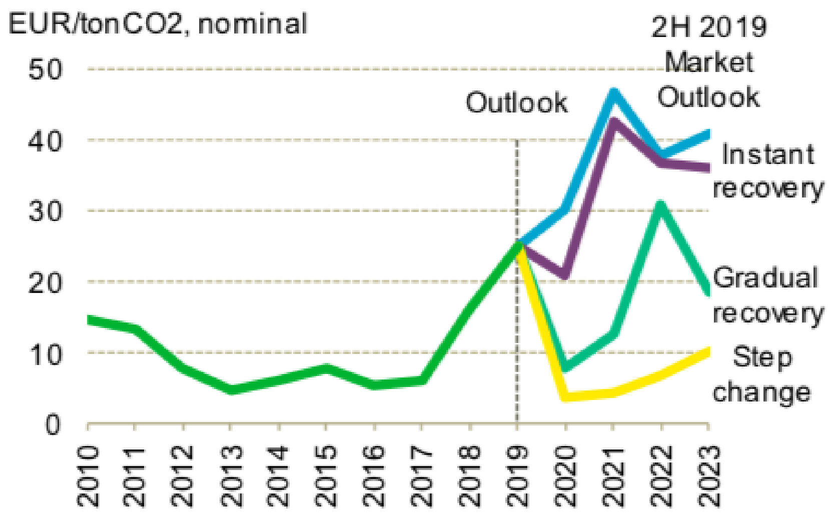
Figure 8: EUA price forecasts



Source: ERCST, Wegener Center, BloombergNEF and Ecoact (2020)

These forecasts were made before the current health crisis started, and do not take into account the economic consequences and related impact on emissions. BloombergNEF modelled the price impacts of three different scenarios: a swift recovery to baseline emissions by October 2020, a gradual recovery to baseline by January 2023, and a "step-change" scenario with no recovery to baseline emissions.

Figure 9: EUA price forecasts under 3 COVID-19 scenarios



Source: ERCST, Wegener Center, BloombergNEF and Ecoact (2020)

The EU ETS is being reviewed in 2021. Higher ambitions for the ETS sector in 2030 and the revision of the MSR make that total ETS emissions and ETS prices are uncertain. This can be one of the reasons[18] why the price of the ETS permits increased considerably over the last months: from 25 – 30 to 40 euro/tonne of CO_2 (cfr. Fig 5). The divergent scenarios in Figures 8 and 9 underline that the future outlook is unclear.

Modelling work by Bruninx & Ovaere[19] has estimated the effect on the EU ETS emissions and prices of a more stringent intermediate reduction target (–55% in 2030) on the road to climate neutrality in 2050. They take into account the ETS correction mechanism (MSR), as well as the Covid-19 crisis, the European Green Deal objectives and the Recovery package (in the current EU ETS scope). They find that the price of allowances would increase to 67 euro/tonne of CO_2 and decrease the total emissions in the period 2020 – 2050 by 42% of the cumulative cap under current emissions. The 67 euro/tonne of CO_2 is a median value of a distribution of values and would be the value of a permit today if the market shared the same cost and demand information. This permit price would then increase with the interest rate.

1.2.3 Why road transport was not included up to now

The EU ETS addresses already, directly or indirectly, part of the GHG emissions of transport: it covers CO_2 emissions resulting from the production of electricity (used by trains and electric vehicles), the GHG emissions by refineries producing fuels and the CO_2 emissions from aviation (of flights within the European Economic Area).

But the emissions produced by the use of fossil fuels to power vehicles (and to heat buildings) are – up to now – not included in the EU ETS. A strong political argument relates probably to the current tax income that the transport sector yields. That is also the reason why some Member States are very reluctant towards allowing the European Union more to say in taxation policy. They need the tax revenue and want to keep control over its level and the way they can spend it.

The reasons for not including road transport which can be found in the legislative history of the EU ETS, are mainly of practical nature: the monitorability and the costs of verification and administration. https://ec.europa.eu/clima/policies/ets_en#tab-0-1

The EU ETS was launched in January 2005. At that moment it covered CO_2 emissions from a limited set of activities. The ETS Directive (art.30) required the European Commission to draw up a report **exploring whether inclusion of further activities or gases in Annex I of the Directive could enhance the cost-efficiency of the EU ETS**. Three activities emitting CO_2 are directly referred to in the Directive: the chemical industry, the aluminium industry **and the transport sectors**. This report[20] of 2006 states the following about road transport:

'Road transport accounts for 21% of total EU-25 emissions in 2003, with considerable increases for the various sub-sectors expected between 2010 – 2020, e.g. 19% for trucks. Emissions occur during use, but potential for emission reduction is not only on the side of car producers, i.e. through using hybrid motors, increased efficiency, fuel cells, etc. but also on the side of the user, by driving less and more efficiently. **The sector has a very large number of small emitters considerably varying in size, making monitorability low and costs high: data on the amount of gas combusted could of course be provided by the car holder, but verification and**

[18] Speculation by financial players on the EU ETS might have reinforced this price increase.
[19] See https://www.researchgate.net/publication/350124026_Waterbed_leakage_drives_EU_ETS_emissions_COVID-19_the_Green_Deal_the_recovery_plan
[20] https://ec.europa.eu/clima/sites/clima/files/ets/docs/ecofys_review_en.pdf

administration of such a large number of emitters seems virtually impossible. Approaching car manufacturers would be a way to reduce the number of players, but at the same time monitorability would be even lower, as emissions could only be estimated with high uncertainty. The sector is thus not considered for the second assessment step.'

1.2.4 European Green Deal: announcement of possible inclusion

The Communication from the European Commission on the European Green Deal of December 2019 announces the **possible extension of European emissions trading to new sectors**. It states: 'The Commission will also propose to revise by June 2021 the legislation on CO_2 emission performance standards for cars and vans, to ensure a clear pathway from 2025 onwards towards zero-emission mobility. In parallel, it will **consider applying European emissions trading to road transport**, as a complement to existing and future CO_2 emission performance standards for vehicles'.

In its Communication to the European Parliament of September 2020 on Stepping up Europe's 2030 climate ambition, the European Commission gives an argumentation for considering this option:

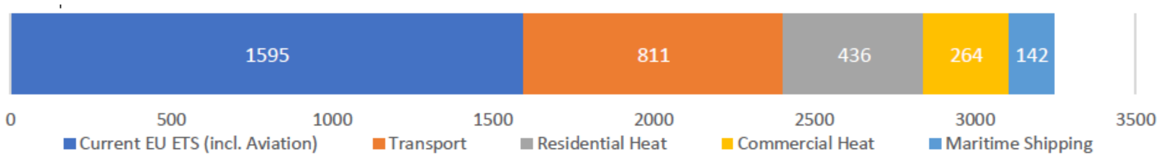
'The Commission sees important benefits in expanding the use of emissions trading in the EU, to deliver in an economically efficient manner an increased climate ambition of 55% greenhouse gas emissions reductions. **Emissions trading can achieve greenhouse gas emissions reductions cost-effectively. Its resulting carbon price internalises the climate externalities and gives consumers incentives to reduce greenhouse gas emissions. It guarantees environmental integrity in the form of the emissions cap and provides a strong price signal that influences daily operational and strategic investment decisions. At the same time, emissions trading raises revenues that can be re-invested in the economy leading to better overall economic outcomes**. (…) In **road transport**, emissions trading has the advantage **of capturing fleet emissions under the cap and simultaneously incentivising behavioural change with lasting effects on mobility solutions through the price signal**. At the same time, the CO_2 emissions performance standards for cars are the main driver to ensure the supply of modern and innovative clean vehicles, including electric cars. Ambitious CO_2 emissions standards for cars and vans will be needed to ensure a clear pathway towards zero emissions mobility.'

About the design of the system, this Communication states: 'An expanded emissions trading system **could be developed as an upstream trading system** regulating at the point of fuel distributors or tax warehouses and would need to appropriately address any risk of double counting, evasion or loopholes in relation to entities covered by the existing downstream system for the aviation, power and industrial sectors.'

The Inception Impact Assessment (29/10/2020) on the Amendment of the EU ETS provides an additional argument: 'Covering road transport emissions by the emissions trading would provide **a more level playing field in terms of carbon pricing of fossil-fuelled road transport and rail with electric vehicles and electrified rail**, which may lead to lower fuel consumption'.

If all the sectors mentioned in the European Green Deal as possible new EU ETS sectors were included – maritime transport, road transport and buildings – this could potentially **more than double the total volume of emissions covered by the EU ETS**, as shown in the next figure by ERCST et al. (2020) (with 'transport' covering both passenger and freight transport).

Figure 10: Volume increase due to expanding the scope of the EU ETS to other sectors



Source: ERCST, Wegener Center, BloombergNEF and Ecoact (2020)

1.2.5 Arguments of impacted sectors

The consultation of the European Commission on the Inception Impact Assessment on the updating of the EU ETS yielded 262 reactions. We made an overview (see annex 1) with a selection of the main EU-wide federations and organisations[21].

The next table summarises the arguments pro and contra, put forward by these stakeholders and by the European Commission in its various communications, on the enlargement of the EU ETS and specifically the introduction of road transport in the EU ETS.

[21] See https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12660-Climate-change-updating-the-EU-emissions-trading-system-ETS-. While this selection is not exhaustive, it gives a good view of the arguments of the main involved stakeholders.

Table 2: Summary of arguments pro and contra introduction of road transport in EU ETS expressed by the European Commission and by stakeholders in their reactions on the Inception Impact Assessment Updating of the EU ETS

	Pro	Contra
Economic arguments	• Most cost efficient solution (more cost efficiency the larger the scope of the EU ETS, also level playing field for electricity versus fossil fuels). • Guarantees effectiveness, reliable, incentivises behavioural change through price signal • Higher CO_2 price will drive real change • Strong price signal will spur investment in green technology • All sectors will participate in the financing of defossilisation • Emissions trading raises revenues that can be re-invested in the economy leading to better overall economic outcomes	• Will increase the price of mobility • Not effective for road transport (command and control measures more effective) • Transport in existing EU ETS will increase the CO_2 price (too high for energy intensive industries – jeopardise existing ETS) • Will hit the low income population most • Will not lead to fuel switching and timely investment to achieve 2050 target last ICE car should be sold in 2035.
Impact on decision making process at EU and national level	• Can simplify future decision making, with the long-term goal to replace sector specific climate goals and regulations across EU Member States with one overarching EU ETS target for all sectors.	• CO_2 price (additional fuel tax) will cause pressure on MS to reduce existing fuel taxes and thus undermine the effectiveness (domestic compensations e.g. for lorries) • If transport out of ESR MS will do less effort for green transport policies • If transport out of ESR MS will give less support to ambitious EU regulatory measures (e.g. CO_2 standards).
Practical arguments		• MRV procedures are not yet established. • Practicability of upstream to be tested.

1.3 Current policies to reduce CO_2 emissions in the road transport sector

This section describes the main policies that are in place at the EU and national level to reduce the CO_2 emissions from the road transport sector. The following table presents an overview of the policy instruments that are discussed, with an indication of their type, and in the case of EU policies, whether they are considered for revision under the European Green Deal.

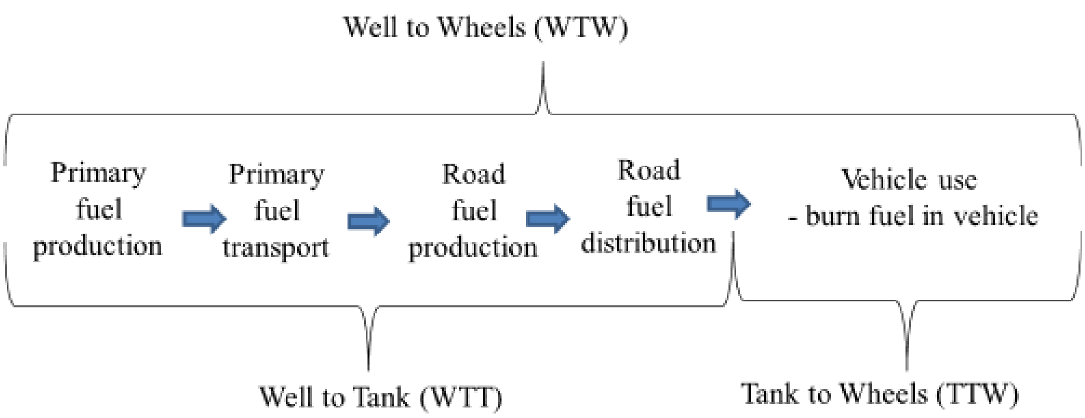
The general characteristics of each of these policies are described below.

Table 3: Overview of EU and national policies affecting CO_2 emissions road transport

	Main policy instruments	Category	Under revision under European Green Deal?
EU	Effort sharing regulation	Target setting	yes
	Renewable Energy Directive (recast) (RED II)	Target setting	yes
	Energy Efficiency Directive	Target setting	yes
	Energy Taxation Directive	Pricing	yes
	Eurovignette Directive	Pricing	yes
	CO_2 emission standards vehicles	Product standard	yes
	Fuel Quality Directive	Product standard	no
	Alternative Fuel Infrastructure Directive	Infrastructure	yes
	EU funding programmes	Infrastructure and innovation	yes
	Car Labelling Directive	Awareness raising	no
	Directive on Combined Transport of goods between Member States	Legislative	yes
National[22]	Fuel taxes	Pricing	
	Other taxes and charges: vehicle taxes and subsidies, road charges, tolls, parking tariffs	Pricing	
	Other policies for CO_2 reduction	Infrastructure, land use planning, awareness raising…	

Before entering into the different policy instruments, it is useful to explain the type of **GHG emissions according to the place in the fuel chain they are generated**. The next figure shows this fuel chain. All emissions generated before they are actually burned in the motor of a vehicle are called well-to-tank emissions (WTT). The emissions that are generated by burning the fuel in the vehicle are called tank-to-wheel emissions (TTW).

Figure 11: Phases included in the well-to-wheel analysis



Source: Burchart-Korol D. et.al.(2018)

In the (international and European) **climate accounting**, GHG emissions are accounted at the place and the moment where they are released, so the **registration happens at the level of the direct GHG emissions**. These are e.g. the CO_2 emissions from burning fuels to heat buildings or to propagate vehicles. **For road transport these are the TTW emissions, the emissions**

[22] See further in §1.3.5 for more details on the national policy instruments.

coming out tailpipe of vehicles. These TTW emissions are the GHG emissions attributed to road transport in the GHG inventory and would be the emissions attributed to road transport when road transport would be included in an ETS.

The emissions released in the earlier phases, e.g. during the refining processes will be attributed to the refineries which emit those emissions and are, if they are situated in the EU, included in the EU ETS. The emissions related to the production of crude oil imported in the EU will not enter in the European GHG register, but in the climate accounting of the countries where this production takes place.

For electric vehicles the picture is as follows: the emissions related to electricity production are attributed to the electricity plants, and thus covered by the EU ETS. The **use of this electricity** in the vehicles generates no GHG emissions, driving an electric vehicle generates no CO_2 emissions, they are **attributed zero emissions** in the climate accounting (and thus also in the ESR).

The **use of biofuels is considered to be climate neutral and therefore attributed an emission factor of zero** in the climate accounting (so one can say that the users/consumers of the fuels are benefitting from the climate advantages of low carbon fuels, thanks to this zero emission factor).

There are however scientific concerns about this assumption that biofuels are climate neutral and doubts are issued whether the sustainability criteria foreseen in the RED and Fuel Quality Directive are sufficient to guarantee that biofuels are effectively climate neutral[23]. This discussion about the definition and scope of climate neutrality goes beyond the scope of this report and is not further discussed.

1.3.1 EU Target setting for GHG emission reduction, Renewable Energy and Energy Efficiency

1.3.1.1 Effort Sharing Regulation

Policy

Transport is part of the non-ETS sector for which the 2030 climate and energy framework sets an objective of **30% reduction compared to 2005**. This target has to be achieved by the Effort Sharing Regulation which attributes **binding national non-ETS reduction targets** (in the form of annual emission trajectories) to all Member States. This regulation covers currently all GHG emissions which are not covered by the EU Emissions Trading System (ETS) nor by the Regulation on Land Use, Land Use Change and Forestry (LULUCF) and defines targets, flexibilities and compliance rules. The non-ETS sectors are transport (except aviation and maritime shipping), buildings, agriculture, small industrial installations and waste. All Member States had to elaborate (by the end of 2019) **National Energy and Climate Plans (NECPs)** for the period 2021 – 2030, which set targets for the different dimensions (decarbonisation, energy efficiency, security of supply, research, innovation and competitiveness, and the internal energy market) and sectors and describe the foreseen policies and measures to achieve them.

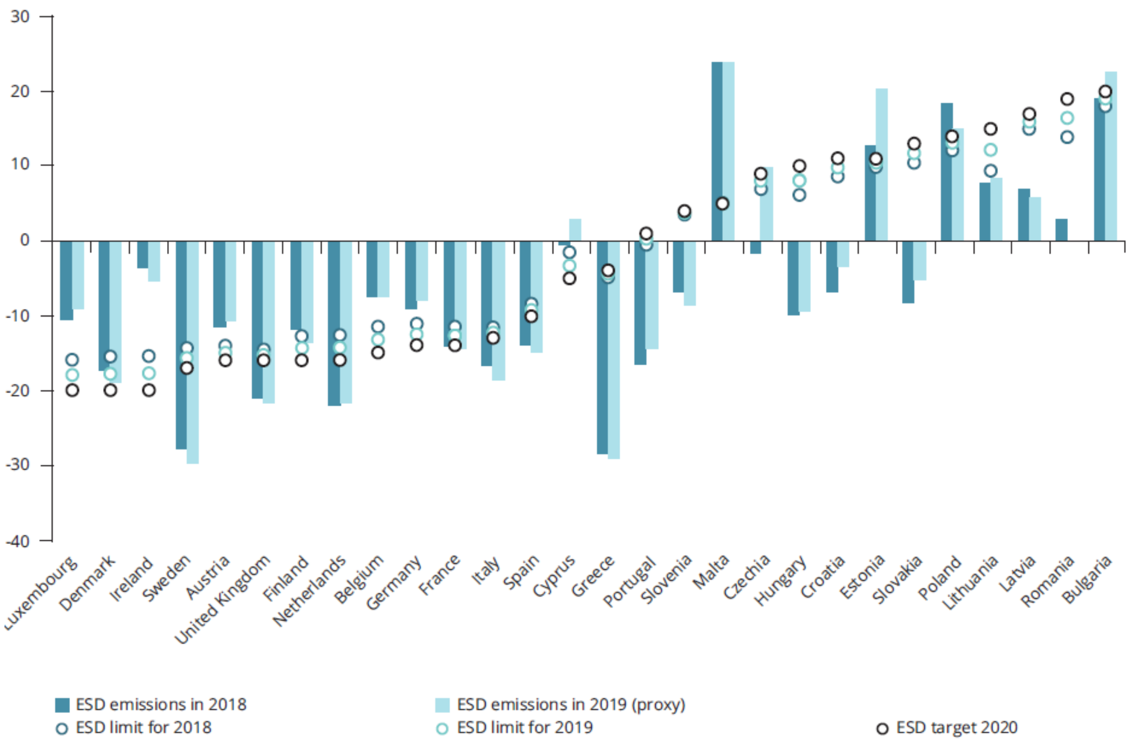
[23] See e.g. https://www.euractiv.com/section/emissions-trading-scheme/news/scientists-call-on-eu-to-correct-biomass-carbon-accounting-rules/and https://www.transportenvironment.org/sites/te/files/publications/2015%2001%20biomass%20ets_rating_FINAL.pdf.

Impact

Figure 1 shows the aggregate EU emission trend and projection towards 2030. Between 2005 and 2018, the EU-28 countries **reduced their combined Effort Sharing emissions by an average of 0.4% per year**. To jointly reach the reduction targets **for 2030**, the EU-27 countries will need to achieve a combined average reduction of **1.4% per year between 2018 and 2030**.

The national Effort Sharing targets for 2020 vary among the European countries, as they were set according to their gross domestic product (GDP) per capita. The next figure of the EEA presents the annual targets for 2018, 2019 and 2020 and the non-ETS emissions of the EU countries. In 2018, 17 countries stayed within their emission allocations without making use of flexibilities. But the emissions in 11 countries (Austria, Belgium, Bulgaria, Cyprus, Estonia, Finland, Germany, Ireland, Luxembourg, Malta and Poland) were greater than their respective annual Effort Sharing emission allocations in 2018, in 2019 this would be 12 countries as Czechia joined the above-mentioned Member States with emission levels greater than their annual emission allocations (based on preliminary data).

Figure 12: Progress of EU countries towards their ESD targets (in percentage change comparted to 2005 base year emissions)



Source: EEA, Trends and Projections 2020.

Future plans

To achieve the increased 2030 ambition, the European Commission is in the process of revising the Effort Sharing Regulation. The inception impact assessment for this revision foresees 3 main options:

1. Phase out the Effort Sharing Regulation as a consequence of extending emissions trading and merging both the non-energy related ESR emissions from agriculture and the GHG

emissions/removals under the LULUCF Regulation under a single climate policy instrument
2. Keep current ESR sectoral scope in parallel to extending emissions trading, either with increased national non-ETS targets or not increasing Member States' targets (and putting the additional efforts on emission trading, LULUCF sectors and/or sector specific policies).
3. Maintain in the ESR only the sectors not covered by emission trading.

1.3.1.2 REDII

Policy

The revised Renewable Energy Directive, which entered into force in December 2018, sets the overall EU target for Renewable Energy Sources consumption by **2030 at 32% of renewable energy** in the EU's gross final energy consumption. This target is not translated in specific targets per Member State and therefore, to ensure compliance, Member States shall notify their respective contributions to the overall target as part of their NECP (National Energy and Climate Plans). Member States' respective share of renewable energy shall not be lower from 2021 onwards than the binding target set for 2020 by the previous RED.

For transport, which still relies for 94% on oil supplies, a **sub-target** is included. Member States must require fuel suppliers to supply a minimum of **14% of the energy consumed in road and rail transport by 2030 as renewable energy**. This sub target was 10% in 2020. The RED II defines a series of **sustainability and GHG emission criteria**, that bioliquids used in transport must comply with to be counted towards the overall 14% target and to be eligible for financial support by public authorities. While biofuels are important in helping the EU meet its greenhouse gas reductions targets, biofuel production typically takes place on cropland that was previously used for other agriculture such as growing food or feed. Since this agricultural production is still necessary, it may lead to the extension of agriculture land into non-cropland, possibly including areas with high carbon stock such as forests, wetlands and peatlands. This process is known as **indirect land use change (ILUC)**. As this may cause the release of CO_2 stored in trees and soil, indirect land use change risks negating the greenhouse gas savings that result from increased biofuels. To address the issue REDII sets **limits on high ILUC-risk biofuels, bioliquids and biomass fuels with a significant expansion in land with high carbon stock**. Within the 14% transport sub-target, there is a dedicated target for **advanced biofuels produced from feedstocks**: their contribution, as a share of final consumption of energy in the transport sector, shall be at least 0.2% in 2022, at least 1% in 2025 and at least 3.5% in 2030.

The achievement of the target is facilitated by **several multipliers on energy content**:

- a multiplier of 4 for renewable electricity consumed in road transport
- a multiplier of 1.5 for renewable electricity consumed in rail transport
- a multiplier of 1.2 for renewable fuels consumed in maritime and aviation transport
- a multiplier of 2 for advanced biofuels and biogas.

Impact

The EEA estimates that the share of renewable energy use in transport grew from 7.4% in 2017 to 8.1% in 2018. The share of renewable energy in transport varied across countries: from 32% (Sweden) to close to 0.4% (Estonia). Finland and Sweden are the only two Member States that have already reached the goal of a 10% share of energy from renewable sources in transport.

Future plans

The impact assessment accompanying the 2030 Climate Target Plan indicates that the share of **renewable energy in transport would have to constitute around 24% in 2030** (calculated according to the methodology above).

Achieving at least 55% net GHG emissions reductions would require an accelerated clean energy transition with renewable energy seeing its share reaching **38% to 40% of gross final energy consumption by 2030**. This is higher than the binding Union level target for 2030 of at least 32% introduced by RED II. It is also higher than the share of renewables, between 33.1% and 33.7%, that would be achieved if Member States complied with the national contributions set in their NECPs for 2030. That is why the European Commission started a **review process** for RED II to assess whether a revision is needed and how it would be most appropriate.

1.3.1.3 Energy Efficiency Directive

Policy

The Energy Efficiency Directive (adopted in 2012 and revised in 2018) sets an **efficiency target of at least 32.5%** to be achieved collectively across the EU. It also includes an extension to the energy savings obligation in end use, introduced in the 2012 directive. Under the amending directive, EU countries will have to achieve new energy savings of 0.8% each year of final energy consumption for the 2021 – 2030 period. As for renewable energy, Member States have to outline in their NECP how much they will contribute to this energy efficiency target and how they will achieve this.

Energy use by transport is included in this target, but there is no specific sub-target for transport energy use.

Impact

The assessment of Member States' national contributions to 32.5% target in the NECPs shows **insufficient level of ambition in terms of energy efficiency**. The **gap** is equal to 2.8% for primary energy consumption and at 3.1% for final energy consumption.

In terms of energy consumption, **transport** is the sector with the highest energy consumption accounting for **34% of final energy consumption** in 2018. It is followed by industry and the residential sectors with both representing 25%, and the services' sector representing 13% of final energy consumption.

Following a gradual decrease between 2007 and 2014, energy consumption has started to increase in recent years (among others caused by an increase in transport), and is now slightly above the linear trajectory for the 2020 targets.

Future plans

In view of the increased climate ambition of the European Green Deal, the European Commission is preparing a review and revision of the Energy Efficiency Directive.

1.3.2 EU Pricing instruments

1.3.2.1 Energy Taxation Directive

Policy

The Energy Taxation Directive of 2003/96 establishes the EU rules and the minimum excise duty rates that Member States must apply to energy products for fuel and transport, and electricity.

In 2011, the European Commission already presented a revision of the present Directive with a view, among others, to better align the Directive to the energy market and climate challenges. After inconclusive discussions, the European Commission withdrew its proposal in 2015.

Future plans

The European Green Deal announces a revision of this directive as of the policy reforms to deliver on the increased climate ambition for 2030. The aims are to tackle the persistence of fossil fuel subsidies in many Member States (via numerous exemptions and reductions), to bring the ETD in line with the EU climate and energy objectives and to enhance the proper functioning of the internal market. The policy options put forward in the inception impact assessment include:

1. The minimum excise rates – the review will take into account various aspects impacting excise rates, such as inflation, energy content (to make energy taxation least distortive possible), link to greenhouse gas emissions (to complement the price signal outside the EU Emission Trading System) in order to better align the minimum tax rates to the EU's climate and energy policies.

2. Sectoral tax differentiation – the review will consider motor fuel vs. heating fuel differentiation, revising and streamlining the current possibilities to apply differentiated rates, exemptions and reductions, e.g. for the maritime and aviation sectors which currently exempt aviation kerosene and fuel used by ships from taxation. The focus will be on tackling fossil fuel subsidies and avoiding inconsistencies between taxation and, among others, the Emission Trading System as well as the Renewables Directive and the Energy Efficiency Directive.

3. Product coverage. The use of a number of new energy products is currently discouraged since they can be taxed in the same way as the traditional ones (e.g. advanced alternative fuels in transport, which can include electricity). In this context, the European Commission will also analyse how best to reconcile the energy and climate objectives with the objective of generating tax revenue.

1.3.2.2 Eurovignette Directive

Policy

The Eurovignette Directive 1999/62/EC provides a detailed legal framework for charging heavy goods vehicles (HGVs) for the use of certain roads. The Directive aims to eliminate distortions of competition between transport undertakings. It notably sets minimum levels of vehicle charges for HGVs and specifies the detailed rules of infrastructure charging, including the variation of charges according to the environmental performance of vehicles.

Future plans

In May 2017 the European Commission adopted a proposal for amending this directive, this has not been adopted yet by the European Parliament and Council. In the European Green Deal, the European Commission called on the European Parliament and Council to maintain the high level of ambition of its original proposal but expressed also its readiness to withdraw its proposal if necessary and to propose alternative measures.

The revision wants to **extend the scope of the directive to passenger cars**, minibuses and vans as well as coaches and buses. The purpose is to gradually **replace time-based user charges** (vignettes) **by distance-based charges** which are considered fairer, more efficient and more effective. The revised Directive also proposes to phase out the variation of charges according to the Euro emission class of the vehicle and to, instead, introduce a **variation of charges according to CO_2 emissions** of HDVs. For LDVs, such a variation would be based on emissions of both CO_2 and air pollutants. The European Commission text is also proposing to allow the application of congestion charges, on top of infrastructure charge, to address the issue of interurban congestion.

The position of the European Parliament is different. The text adopted by the Parliament mentions that road charging imposed by Member States would need to become distance-based from 2023 for HDVs and larger goods vans and from end of 2027 for LDVs. Passenger cars were removed from the definition of LDVs[24].

1.3.3 Standards for vehicles and fuels

1.3.3.1 Standards for CO_2 emissions from new passenger cars and vans

Policy

Regulation (EC) 443/2009 sets mandatory emission reduction targets for new cars. The first target fully applied from 2015 onward and a new target will be phased in in 2020 and fully apply from 2021 onward. Following a phase in from 2012 onward, a target of 130 grams of CO_2 per kilometre applied for the EU fleet-wide average emission of new passenger cars between 2015 and 2019.

From 2021, phased in from 2020, the EU fleet-wide average emission target for new cars will be **95 g CO_2/km**. This emission level corresponds to a fuel consumption of around 4.1 l/100 km of petrol or 3.6 l/100 km of diesel.

These targets are implemented via a **binding specific emission target that has applied annually for each manufacturer**. The target is set according to the average mass of the manufacturer's newly registered vehicles using a limit value curve. This means that manufacturers of heavier cars are allowed higher emissions than manufacturers of lighter cars. For each manufacturer, the average specific emissions of its fleet of newly registered vehicles in the EU that year, are compared with the manufacturer's specific emission target. Manufacturers can **group together** and act jointly to meet their emissions target.

[24] See https://www.europarl.europa.eu/legislative-train/api/stages/report/06-2020/theme/a-european-green-deal/file/jd-eurovignette-directive-revision

Since 2019 there are also standards in force for **heavy duty vehicles**: manufacturers will have to achieve a 15% CO_2 reduction in their fleet-wide average of heavy trucks (for other heavy duty vehicles such as busses standards will be set later), which increases towards 30% from 2030 onwards.

The **Car Labelling Directive** (Directive 1999/94/EC) requiring EU countries to ensure that relevant information on the cars' fuel efficiency and CO_2 emissions is provided to consumers, is a demand-side policy helping manufacturers to meet their CO_2 emission targets. In 2016 the European Commission completed an evaluation of the Car Labelling Directive showed that the Directive is relevant, has some impact, but could be improved. In 2017 the European Commission published a recommendation to make use of the new test procedure (WLTP) in a coordinated way to provide improved information to consumers.

Impact

Emissions of 130 g CO_2/km correspond to a fuel consumption of around 5.6 litres per 100 km (l/100 km) of petrol or 4.9 l/100 km of diesel. This EU fleet-wide target was already reached in 2013, two years ahead of schedule. In its latest Monitoring Report on the CO_2 emissions from passenger cars and vans, the EEA noticed however that, for the second consecutive year, the average CO_2 emissions from new passenger cars increased in 2018 and reached 120.8 g CO_2/km. After a steady decline from 2010 to 2016 by almost 22 g CO_2/km, average emissions increased in 2017 by 0.4 g CO_2/km. Provisional EEA data indicate that in **2019** in the EU-28, Iceland and Norway this increased further to **122.4 g CO_2/km**.

The main factors contributing to that increase include the growing share of petrol cars in new registrations, in particular in the sport utility vehicle (SUV) segment. Moreover, the market penetration of zero and low emission vehicles, including electric cars, remained low in 2018.

Also for vans the average CO_2 emissions from new vehicles were higher than in the previous year: 157.9 g CO_2/km in 2018 against 156.1 g CO_2/km in 2017. Whereas between 2012 – 2017 average CO_2 emissions decreased by 24 g CO_2/km, in 2018 emissions have increased by almost 2 g CO_2/km compared to 2017. The EU average emissions are, however, still 10% below the EU target of 175 g CO_2/km and only 7% above the 2020 target.

Future plans

A regulatory proposal is expected from the European Commission in mid-2021 which will **strengthen the CO_2 targets for passenger cars and light commercial vehicles** to bring them in line with the EU's ambition to cut greenhouse gas emissions by at least 55% by 2030.

1.3.3.2 Standards for fuels

Policy

The Fuel Quality Directive of 2009 requires a **reduction of the greenhouse gas intensity of transport fuels by a minimum of 6% by 2020**. Member States are obliged to ensure that suppliers respect the target of 6% after the year 2020.

The greenhouse gas intensity of fuels is calculated on a **life-cycle basis**, covering emissions from extraction, processing and distribution. Emissions reductions are calculated against a 2010 baseline of 94.1 g CO_{2eq}/MJ.

The 6% reduction target is likely to be achieved primarily through:

- the use of **biofuels**, **electricity, less carbon intense fossil fuels,** and **renewable fuels of non-biological origin (such as e-fuels)**
- a **reduction of upstream emissions** (such as flaring and venting) at the extraction stage of fossil feedstocks.

Together with the Renewable Energy Directive, it also regulates the sustainability of biofuels. For biofuels to count towards the greenhouse gas emission reduction targets, they must meet certain sustainability criteria to minimise negative impacts in their production phase. As in the REDII, indirect land use change is taken into account.

Impact

The EEA estimates, based on data from 22 Member States, that the average GHG intensity of fuels in 2017 was 3.4% lower than it was in 2010. This is well below the intermediate reduction target of 4%, which Member States may require suppliers to comply with to ensure that they meet the 2020 target. EU fuel suppliers are therefore not on track to achieve their objective of reducing the GHG intensity of transport fuels by 6% by 2020, compared with 2010.

Future plans

The EC does not plan to extend the GHG reduction target beyond 2020. Instead, the European Commission addressed the issue of the decarbonisation of transport fuels after 2020 in the RED II.

1.3.4 Infrastructure

1.3.4.1 Alternative Fuel Infrastructure Directive

Policy

The Alternative Fuels Infrastructure Directive was adopted in 2014 to encourage the development of alternative fuel filling stations and charging points in EU countries, and required Member States to put in place development plans for alternative fuels infrastructure. The Directive aims to improve coordination of alternative fuel infrastructure development to provide the long-term security needed for investment in the technology for alternative fuels and alternative fuel vehicles.

Impact

According to a 2017 European Commission evaluation, the plans did not provide sufficient certainty for fully developing the alternative fuels infrastructure network, and development has been uneven across the EU.

Vehicle manufacturers and alternative fuels producers, clean energy campaigners and the European Parliament have called for the revision of the Directive, to ensure that sufficient infrastructure is in place in line with efforts to reduce emissions in the transport sector and to help meet the climate and environment goals set out in the Paris Agreement and the European Green Deal.

Future plans

In the Action Plan accompanying the European Green Deal, the review of the Alternative Fuels Infrastructure Directive (and the Trans European Network – Transport Regulation) is included in the action plan for 2021. In its recovery plan, of May 2020, the European Commission puts a lot of focus on developing alternative fuel infrastructure, electric vehicles, hydrogen technology and renewable energy and repeated its intention to review the 2014 Directive.

1.3.4.2 EU funding programmes

Policy

The Connecting Europe Facility (which is the funding instrument for the implementation of TEN-T) and other funds make considerable efforts to scale-up investments in the infrastructure needed for low-emission transport. Also the ETS Modernisation Fund, benefitting the 10 Member States with the lowest income, has been used for energy efficiency in transport.

Future plans

In the European Green Deal the target of 25% climate mainstreaming across all EU budgetary programmes is announced, as well as the strengthening of the Innovation and Modernisation Funds for deploying innovative and climate neutral solutions across the EU. Also, instruments financed by the EU budget, including Horizon Europe and the Just Transition Fund have the potential to further incentivise innovation and research in sustainable technology, products and processes in all sectors, including road transport. The European Green Deal announced in its roadmap also a review of the Trans European Network – Transport Regulation.

The EU budget, together with the Next Generation EU package and the related proposed national recovery and resilience plans will be considered as a driver for transformation and leverage sustainable private and public investment, and are also designed in a way to address distributional concerns between Member States in order to ensure a fair transition.

1.3.4.3 Directive on Combined Transport of Goods between Member States

Policy

The Combined transport directive is the only EU legal instrument that directly supports the shift from road freight to lower emission transport modes (inland waterways, maritime transport and rail). The Directive seeks to promote Combined Transport operations through the elimination of authorisation procedures and quantitative restrictions for Combined Transport operations, it clarifies the non-application of road cabotage restrictions on road legs and provides financial support through fiscal incentives for certain Combined Transport operations.

Impact

For more than 25 years, the directive has helped to shift a considerable amount of freight away from road. However, shortcomings in its implementation (ambiguous language, outdated provisions and limited support measures) have diminished its impact.

Future plans

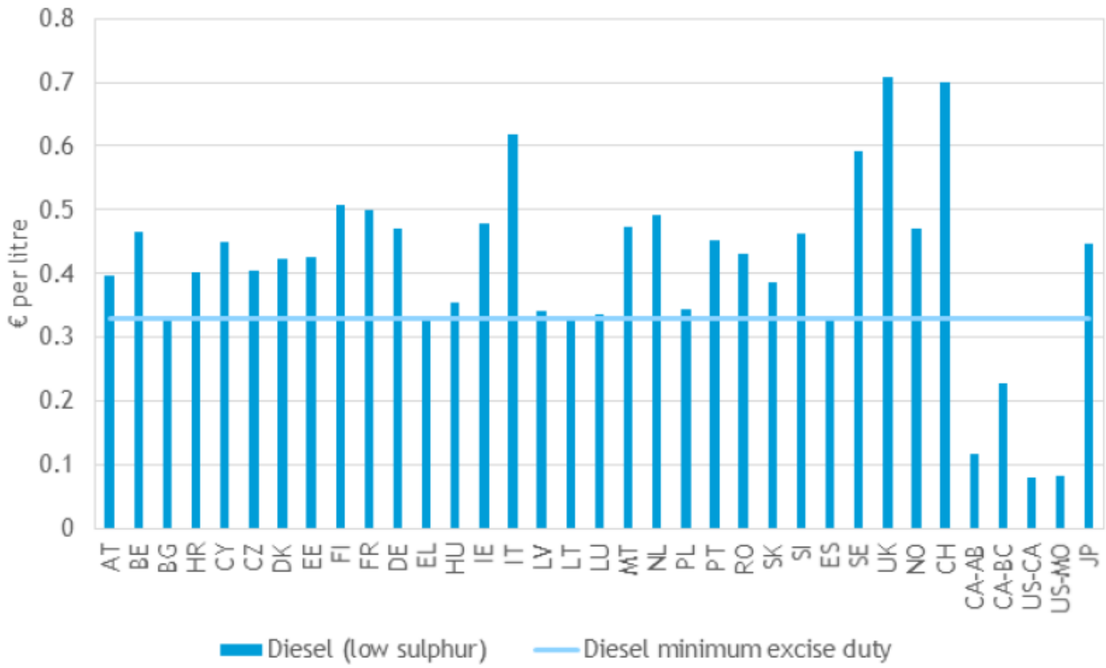
The European Commission put forward a revised text in 2017. The legislative process was slowed down by close interconnections of this file with the lengthy negotiations on the 'Mobility package' files concerning rules for truck drivers. The European Commission decided to withdraw this proposal and announced in the European Green Deal action plan that it would put forward a second revised proposal, supported with an impact assessment, in 2021.

1.3.5 National CO_2 policies for road transport

1.3.5.1 Taxes and charges

All EU Member States apply **taxes on fuels** for passenger and freight transport, complying with the minima set in the Energy Taxation Directive and often well above these minima (that have remained constant over time) as illustrated for diesel in the graph below.

Figure 13: Diesel tax levels in 2016 compared to the European minimum excise duty levels

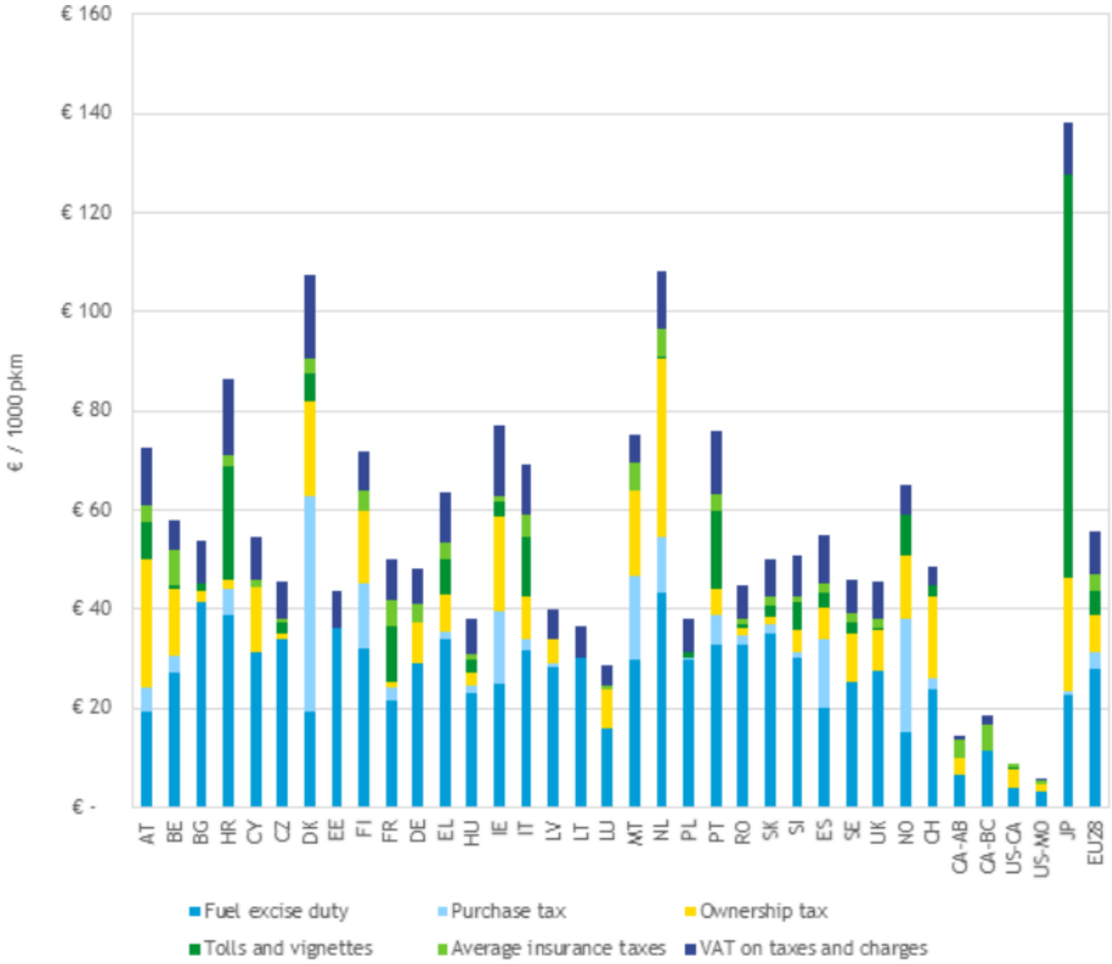


Source: CE Delft (2019)

Next to fuel taxes, most countries apply **taxes on the purchase of a vehicle, on the yearly ownership and on the insurance of the vehicle**. In many EU countries distance-based or time-based **road charges** apply, or **tolls** on specific parts of the network. Apart from Norway there are very few cities that apply urban road pricing schemes. **Parking charges** are also very commonly used and may also significantly contribute to the total revenue of transport taxes and charges.

A detailed overview of the different taxes and charges is given in CE Delft (2019). The resulting average revenue from taxes and charges on road transport are shown in this summarising table:

Figure 14: Average revenue from taxes and charges for passenger cars in 2016 (euro/1000pkm, PPS adjusted)



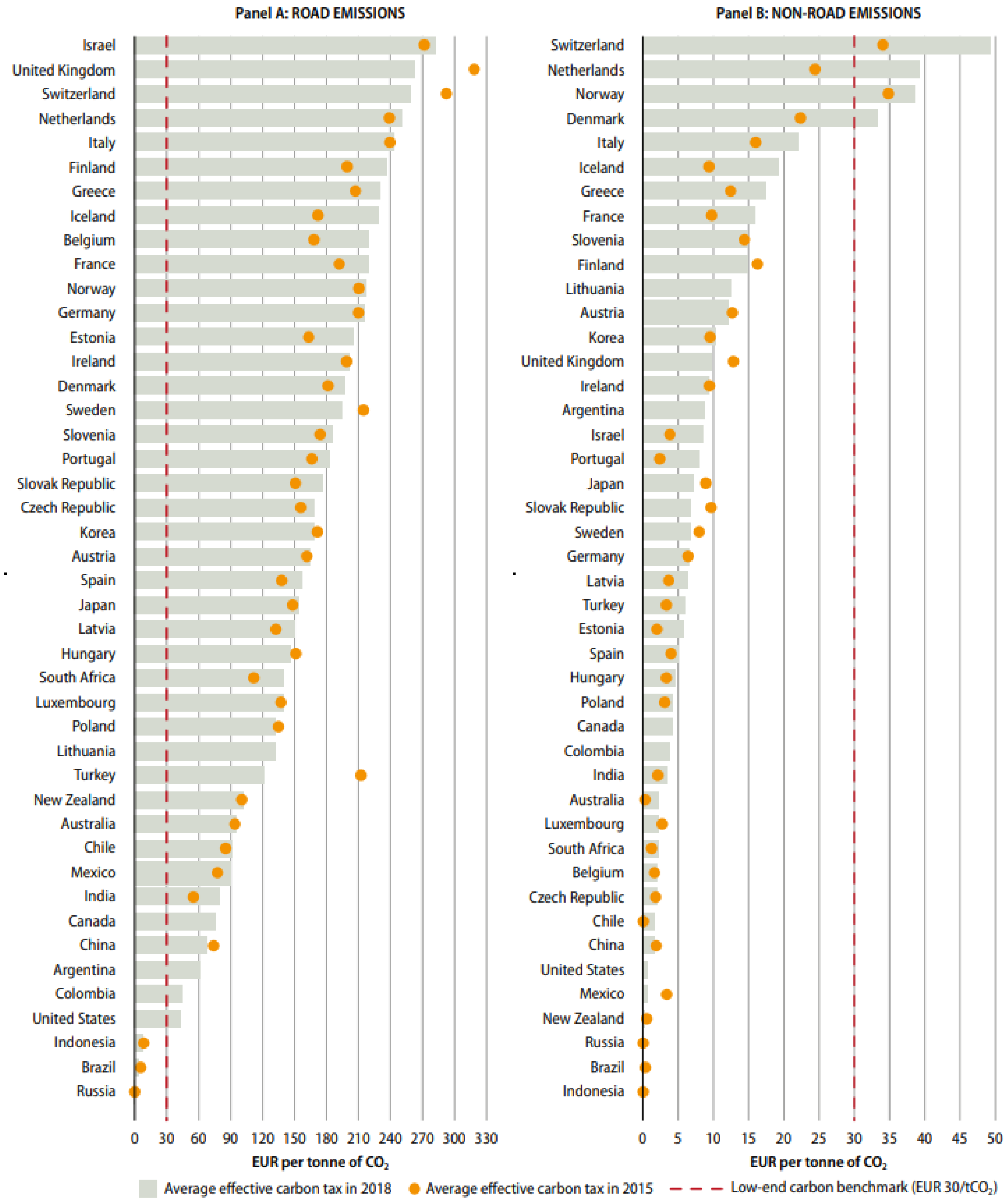
Source: CE Delft (2019)

The above graph with average costs per 1000 km, is instructive to give a view of the **total charges**[25] on road transport. However, to assess the taxation's impact on CO_2 emissions the concept of the effective carbon tax is more useful. The OECD uses this concept to measure how policies change the relative price of CO_2 emissions from energy use. It is expressed in euro/tonne of CO_2. The effective carbon tax considers carbon taxes, emission permit prices and specific taxes on energy use. The latter are typically set per physical unit or unit of energy, but can be translated into effective tax rates based on the carbon content of each form of energy. Non-variable taxes like ownership taxes, or taxes which apply to all products (and not only energy products) like VAT or insurance taxes are not considered in this effective carbon tax.

The figure below by OECD (2019) shows that in road transport, the effective carbon rates are significantly higher than in other sectors. This figure also shows that in EU-countries the effective carbon rate for road emissions is well above the minimal benchmark of 30 euro/tonne (and even above 120 euro/tonne).

[25] This analysis does not include fines or penalty payments for non-compliance with regulations on energy efficiency, fuel quality or CO_2 targets for vehicles as extra charges because they are in principle temporary and exceptional payments. These regulations do however increase the production costs of fuels and vehicles and these abatements costs are passed-through to the consumers. This will be further discussed in the last part of this report.

Figure 15: Average effective carbon taxes (in euro/tonne CO_2) in 2015 and 2018



Source: OECD Taxing Energy Use 2019 brochure

1.3.5.2 Other national policies for CO_2 reduction in road transport

Apart of the pricing of fuels, vehicles and infrastructure, all national and local authorities deploy an extensive array of climate policies and measures. As transport emissions constitute the largest share of the non-ETS emissions in each Member State, this sector is well considered in all NECPs. The implemented and planned measures, on top of the implementation of EU policies, consist of measures to stimulate modal shift to environmentally friendly transport modes (public transport provision, investment in infrastructure for walking and cycling, improved interconnectivity…), parking policies, spatial and urban planning oriented towards decreasing the number of motorised trips, stimulation of electromobility (subsidies, provision of alternative fuel infrastructure, mobility plans of companies (with promotion of car sharing etc.), local transport plans stimulating active transport modes and public transport, measures to promote eco-driving, speed limits… Also for the road freight transport there are specific measures to promote rail and inland shipping, to increase the efficiency of the logistic system, to promote green city distribution systems etc.

The European Environment Agency's database on policies and measures provides a detailed overview per country and per sector[26].

1.3.6 Conclusions on the existing EU and national policy framework

Many policies are in place, both at EU and at national and local level, but the transportation sector seems to be the toughest sector to decrease CO_2 emissions. Some policies have yielded significant results in the past, but these successes are cancelled out by the growing tendency towards heavier vehicles, a smaller share of diesel and higher transport demand both for passenger and freight transport. This has resulted in increasing emissions of the transport sector as a whole and of road transport in particular. The income elasticity of transport demand[27] is close to one. This means that the demand for transport services increases (more or less) proportionally as people become richer. This is the reason why it becomes attractive to look for a policy instrument which guarantees total emissions to decrease, and not only relative emissions; and also for a policy instrument that takes into account the possibilities to trade efforts with sectors that can reduce emissions at lower cost while guarantying that the overall climate targets are met.

In view of the targets of 55% GHG emission reduction by 2030 and climate neutrality by 2050, it is reasonable to search for cost-effective instruments to curb the trend in the sector which is responsible for a quarter of the EU's GHG emissions.

This can be done either by reviewing and revising the existing policy instruments, or by introducing a new instrument viz the EU ETS or by combinations of these.

In the next part of this study we will look at these policy options.

[26] https://www.eea.europa.eu/themes/climate/national-policies-and-measures/national-policies-and-measures-on-1

[27] The literature (see Tod Litman 2013, p. 18) suggests that a real income increase of 10% would lead to an increase of the number of vehicles and the total amount of fuel they consume by 4% in the short run and by 10% in the longer run. Traffic volume would increase by 2% (and by 5% in the longer run), indicating that the additional vehicles are driven less than average mileage. RAND (2014) mentions an income elasticity of passenger transport of 0,5 to 1,4. For freight transport the elasticity estimates of economic activity are mainly in the range 0,5 to 1,5.

2 Part 2: Options to introduce road transport in the EU ETS

In this part we list and briefly describe the different options for the inclusion of road transport (and the building sector) in the EU ETS, we first look at the various system options and in the second part we analyse the interactions with the existing policy framework.

2.1 System options

This section gives an overview of the different options that can be envisaged to include transport in the EU ETS, with a short discussion of their advantages and disadvantages. The following aspects are covered:

- Separate or integrated system
- National versus EU-wide system
- Upstream versus downstream approach
- Allowance allocation model
- The treatment of alternative fuels
- The treatment of passenger and freight road transport.

2.1.1 *Inclusion of road transport in existing EU ETS or a new system for the other sectors including transport.*

The first system option choice to be made concerns the relation with the current EU ETS: will road transport become fully integrated in the existing scheme or will a separate ETS be established for the current non-ETS sectors together (buildings and road transport) or separately (only for road transport). Via a gateway, as was done when introducing aviation in the EU ETS[28], a semi-open system can be created. This would imply that the transport (and building) sector can buy allowances from the existing EU ETS entities, but not the other way around, meaning that transport (and building) allowances cannot be used by the existing EU ETS-entities.

The German national emission trading system is a closed system, for heating and transport fuels combined. It complements the EU ETS because the CO_2 price (initially via a tax and in the second phase via auctions) will only apply to fuels used in the transport sector and for heating purposes, it will be charged to fuel distributers and suppliers. There is no gateway foreseen in Germany between its national system and the existing EU ETS.

[28] Given that no assigned amount units can be issued in respect of international aviation emissions, it was necessary to ensure coherency between the accounting systems of the EU ETS and the Kyoto Protocol. For this reason, aviation allowances are fully tradable but not able to be used by operators from other sectors to fulfil their compliance obligations.

	Advantages	Drawbacks
Closed road transport ETS (and possibly a second closed heating fuels ETS)	• Sets a cap on road transport emissions; • Price incentive with potential impact on vehicle km, carbon content of fuel and the fuel efficiency of vehicles; • Issues specific to road transport can be taken into account more easily.	• Less efficient than full integration because the possibility to reduce emissions via cheaper abatement measures in other sectors is not possible. So overall more costly. • Risk of strategic considerations[29] because of limited number of actors in the market (if organised upstream). • New system has to be set up.
Closed combined road transport and heating fuels ETS	• Sets a cap on the combined emissions for road transport and heating of buildings (the 2 largest sectors of the ESR) • Price incentive with potential impact on vehicle km, carbon content of fuel and the fuel efficiency of vehicles. The price incentive is expected to be lower than in the closed system for transport alone with a comparable cap (as there are cheaper abatement options in building sector). • More efficient than separate ETS for road transport only because a wider range of (cheaper) abatement options.	• Still less efficient than full integration. • Same risk of strategic behaviour if organised upstream (because same number of actors) as for ETS for transport alone. • More or less the same legislative costs and time needed for system set-up as for ETS for transport alone.
Full integration	• Most cost efficient option • Lower price volatility thanks to greater volume of trade and hence more market liquidity. • Institutional base is available as a working system with reporting mechanisms and trading institutions	• Possibly little abatement in transport sector because of relatively high abatement cost and small price elasticity (depending on other transport policies). This is (at least in the short run) not a problem for CO_2 as it will be reduced by the other sectors under the cap (for climate change the origin of the GHG does not matter) • Possibly higher CO_2 price for the current EU ETS firms and thus increased abatement costs and possibly risk of carbon leakage. • Requires adaptation of current EU ETS (with risk of compromising the current working system).
Semi-open system: transport can buy existing EU ETS allowances but not vice versa	• More cost efficient than closed system: as abatement costs in transport are higher than in EU ETS, transport entities will buy ETS allowances and reach compliance at lower cost. • Possibly useful in transition phase when the impact of the expansion on the price is very uncertain: prevents large price reductions in case of e.g. a swift uptake of electric vehicles • In a transition phase a semi-open system could allow to decrease the yearly volume of transport allowances at a slower rate than the linear reduction path of the existing EU ETS sectors to smoothen the transition.	• Less efficient than full integration: in case transport abatement cost would decrease the EU ETS entities would not be able to use these cheaper reduction opportunities.

[29] E.g. strategic trading could take place: firms could hold excess carbon allowances in order raise the allowance price and put competitors under pressure (see https://www.econstor.eu/bitstream/10419/111452/1/826581412.pdf p.40)

2.1.2 What is the scope: national or EU-wide?

The introduction of transport in the existing EU ETS at national level is not really a new policy option because the ETS Directive makes it possible already for Member States to include non-ETS sectors in the EU ETS (art.24 allows for the inclusion of any non-ETS sector in the EU ETS if a Member State so chooses). So a unilateral inclusion of road transport in the existing EU ETS by one or more Member States is theoretically possible.

Alternatively, it is feasible to organise, at national level, a closed separate ETS for transport. As said, Germany launched a separate, closed, national ETS for heating and transport fuels in 2021. Their long-term goal is to establish emissions trading in the transport and heating sectors at EU level.

	Advantages	Drawbacks
National	• Member States who unilaterally introduce road transport in an ETS can take into account their specific national preferences (especially in case of a closed national ETS for transport, not connected to the EU ETS, as is the case for the new German system), e.g. with respect to the subsectors to be covered. • Can possibly be introduced faster than an EU-wide system	• Limited scope if at national level a separate system[30] would be set up (depending on the number of countries who adopt the system and possibly connect their national systems), so more limited contribution to cost efficiency. • Limited number of market players causes risk for strategic behaviour. • Possible distortions when national systems are not connected and have different carbon prices (like fuel tourism in border regions). • High legislative and transaction costs (in each country that wants to introduce a national ETS)
EU-wide	• An EU-wide system enables to grasp the full cost-efficiency gains. • Distortions intra-EU will be limited (possible issues at EU outer frontiers remain). • Less legislative and transaction costs when 1 system applies to all.	• Less room for specific national requirements

2.1.3 Who is the regulated entity: upstream versus downstream

An important option is the designation of the regulated entity: who will be made responsible for monitoring and reporting emissions and for surrendering the emission allowances for the CO_2 emissions of road transport? In principle all entities in the transport fuel supply chain could be designated as regulated entity, from importers and extractors to refineries, tax warehouses, filling

[30] If at national level it is decided to integrate its transport sector in the existing EU ETS, the drawbacks of limited scope and limited number of market players do not hold, because they would be added to the existing EU ETS scope and market players.

stations to vehicle owners. The table beneath shows the various possibilities and gives a rough estimation of the number of entities involved.

Table 4 First order estimation of the number of emitters per regulated entity in Europe

Regulated entity	Number of emitters
Extractor/importer of raw materials	500 + large number of small biomass producers
Refinery + importer of transport fuels/fuel blenders	500 – 1000
Fuel blenders	500 – 2000
Tax warehouse keepers	5000 – 10 000
Fuel suppliers	5000 – 10 000
Filling stations	Ca. 134 000
Vehicles	Ca. 307 million

Source: CE Delft (2014) and Statistical Pocketbook 2019 (for number of vehicles in 2018)

Ideally the carbon **price incentive** is given to the actor in the economic system who can make the decisions that determine the CO_2 emission: the actor who can chose to drive or not, to choose which transport mode, the type of vehicle/fuel etc. That is an argument in favour of a maximal downstream implementation, making each **vehicle owner** responsible for acquiring and submitting emission allowances for the fuel they use to drive their vehicle. One could imagine a system in which consumers would be equipped with chip cards loaded with a specific number of CO_2 permits which can be surrendered at the moment of fuel purchase[31].

This argument in favour of downstream prices must be put in perspective: in theory an upstream system can be as steering towards decisions by vehicle owners as the downstream system, if the cost pass-through to the final prices paid by the households is close to 100%. Economic theory says that pass-through of industry-wide cost changes will depend on the level of competition and on whether the demand side or the supply side is more price sensitive[32]: the more inelastic the demand, the more cost pass-through. There is a lot of competition on the supply side of fuels, the supply is very elastic as there is a world market[33] of refinery products and the demand is rather inelastic. So the cost pass-through will be close to 100%.

This result holds, in economic theory, regardless of whether the emission allowances are (partly) auctioned or given away at zero cost, since at the margin carbon costs are the same for auctioned and free allowances. There are several studies on the cost pass-through in the EU ETS in the context of the discussion on the extent of (indirect) carbon leakage. From an econometric analysis undertaken on behalf of the European Commission, for six sectors, it is learned that for refineries, the degree of cost pass-through is very high: ranging from 80 – 100% for petrol and over 100% for diesel and gasoil[34].

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[31] These ideas are explored in a recent paper (2020) by Enzmann and Ringel in Sustainability.

[32] Suppose, for example, that consumers are extremely price-sensitive such that any price increase at all would destroy the market for the goods in question. In this case, output would be reduced in response to an increase in supply costs and some firm exit may occur, but there would be no pass-through to prices (otherwise demand would collapse to zero). On the other hand, if the overall level of demand is entirely insensitive to price then cost changes will be fully passed through (with no change in output). For intermediate cases, pass-through will be greater the less price-sensitive is the demand side of the market relative to the supply side. Intuitively, the impact of the cost increase is borne most by the side that values the market the most (if consumers value the market relatively more than producers, they will be relatively insensitive to price and so will bear a greater burden of the cost rise).

[33] This may not always hold at national level however, there oligopoly situations are possible. See e.g. https://www.bundeskartellamt.de/DE/Wirtschaftsbereiche/Mineral%C3%B6l/mineraloel_node.html

[34] Gasoil is the fuel used for heating.

On the other hand, the more downstream the chain, the more entities are involved and the higher the transaction costs. These involve the cost of implementation (e.g. the cost to equip consumers with chip cards loaded with a specific number of CO_2 permits which can be surrendered at the moment of fuel purchase or the cost of another implementation system), the administrative costs of monitoring, reporting and verification and the costs of informing the consumers on the functioning of the system. Also the risk of errors and fraud might increase with an increasing number of market participants. This is a strong argument in favour of an upstream system.

The theoretical option to implement the ETS at the level of the car manufacturer is less interesting as it does not allow to simultaneously incentivise abatement by fuel suppliers and consumers.

	Advantages	Drawbacks
Downstream (vehicle owners)	Direct price signal, visible carbon cost for vehicle owners, high awareness raising effect which can stimulate behavioural change.	Very high transaction costs because of high number of regulated entities (307 million vehicle owners)
Upstream (tax warehouse keepers and fuel suppliers, or extractors and importers of oil and transmission system operators of gas)	Similar price signal (cost pass-through expected to be close to 100%). Lower transaction costs because much less additional regulated entities (or even less than in existing EU ETS if all fuel combustion included at the level of the importers/extractors. Moreover many of the regulated entities (like refineries) are already familiar with the EU ETS.	Awareness raising effect might be smaller because the carbon price is obscured by overall fuel costs and thus less visible.

Practically, an upstream system could be implemented in different ways, a study by CE Delft (2014) commissioned by the European Commission withheld two options as the most promising:

1. An **upstream** system via the existing **tax warehouse keepers** in the Member States for liquid fuels and the **fuel supplier** for solid (coal) and gaseous fuels. These tax warehouse keepers release fuels for sale on the market through excise duty points, the register all transport fuel flows and are subject to strict monitoring requirements.
2. An **ultra-upstream system**, where **all the emissions arising from the combustion of fuels in the EU ETS are included as far upstream as possible**. This variant would have significant consequences for the existing EU ETS, it would change from a system where entities are responsible for the greenhouse gases emitted from their own installations, to a system where entities are responsible for the carbon they bring in the EU. The regulated entities would be **extractors and importers of raw materials** for fuels, and for gas **the transmission system operators (TSOs)**. This would substantially reduce the number of entities under the EU ETS: from about 11 000 now to less than 3000.

As the European Commission in its Inception Impact Assessment (October 2020) and its Communication on Stepping up Europe's 2030 climate ambition (September 2020) refers to respectively '*the extension to all fossil fuels combustion and waste incineration*' and '*an expanded emissions trading system could be developed as an upstream trading system regulating at the point of fuel distributors or tax warehouses*', an upstream approach seems to be most realistic for the European Commission. In the rest of the analysis we will **only focus on this upstream approach (in one or another form)** and not consider a downstream option at the level of vehicle owners or filling stations because of the high number of entities and thus the high transaction costs and risks of errors and fraud.

2.1.4 Allowance allocation method

In theory the available options are:

- free allocation on the basis of historic emissions (also called grandfathering)
- free allocation on the basis of a benchmark
- auctioning.

As described in part 1, in the current EU ETS a combination of auctioning and free allocation, on the basis of benchmarks, is used. For stationary sources, in phase 4 (from 2021 – 2030), free allocation will focus on sectors at the highest risk of relocating their production outside of the EU. The level of carbon leakage exposure of sectors is assessed on the basis of an indicator reflecting trade and emissions intensity. Highly exposed sectors are placed on the carbon leakage list and will receive allowances equivalent to 100% of the relevant benchmark for free. For less exposed sectors, free allocation will amount to 30% up to 2026 and will be phased out thereafter by 2030.

In the aviation sector, in the current system, 82% of the allocations are granted for free on the basis of a single, sector wide efficiency benchmark (expressed as emissions per tonne-kilometre), 15% are auctioned and 3% is in a special reserve for distribution to fast growing airlines and new entrants.

For the extension of the EU ETS to road transport, all 3 possible allocation methods are possible for transport in the EU ETS and could concretely take this form:

- allocation of free allowances to tax warehouse keepers/fuel suppliers on the basis of their historic emissions. This implies that historic fuel sales need to be verified and reported, and that allocation plans need to be established.
- allocation of free allowances to tax warehouse keepers/fuel suppliers on the basis of an efficiency benchmark. The benchmark can be expressed in CO_2 per Joule and could be based on the most efficient fuel (which is in line with the product benchmark approach in the current EU ETS). The amount of allowances received will be equal to its historic fuel supply (in Joule) multiplied by the benchmark. Here also historic fuel sales verification and reporting and an allocation plan will be needed.

The advantage of benchmarking compared to grandfathering is that it rewards early action. E.g. if an entity in the past sold a large share of biofuels, it will receive relatively less permits in the grandfathering system, but relatively more in the benchmarking system. Benchmarking is also more in line with the existing EU ETS and seems thus the most realistic option if free allocation would be chosen.

- auctioning: the entities would have to buy the CO_2 allowances they need on an auction (or on the secondary market,). This has many practical advantages as it is not needed to determine historic emissions or to develop benchmarks and the auctioning infrastructure is available already. There is no risk for punishing early action nor windfall profits (this was an issue when the electricity sector in the early EU ETS phases was receiving free allocation but still passed through the opportunity cost of these free allowances in the electricity price). In the road transport sector there is no risk for carbon leakage, so the advantage of auctioning is also that it is in line with the phase 4 rules for the current EU ETS installations that limit free allocation to sectors at the highest risk of carbon leakage.

	Advantages	Drawbacks
Free allocation on the basis of historic emissions	• Every existing entity receives a free allocation	• This punishes early action • Requires reporting and verification of historic fuel sales and allocation plans • Possibility of windfall gains • No government income • Not in line with current EU ETS.
Free allocation on the basis of a benchmark	• Rewards early action. • Direct incentive for fuel suppliers to choose low carbon fuels (on top of the incentive given by the ETS market itself). • More in line with current EU ETS than free allocation on the basis of historic emissions.	• Requires reporting and verification of historic fuel sales and allocation plans • Requires the development of a benchmark • Possibility of windfall gains. • No government income
Auction	• No risk of windfall profits • In line with existing EU ETS • Government income from the auctions can be reinvested in low carbon innovation, infrastructure and flanking measures (or to compensate for decreasing fuel tax revenues).	• All entities face upfront costs (and not only opportunity cost of foregone income by selling allowances)

From the point of view of the consumer, it is expected that the type of allocation will not make a difference as full cost pass-through is expected (see further under 3.4.2).

2.1.5 Treatment of alternative fuels

As clarified earlier (under 1.3) the **use of biofuels and electricity is attributed an emission factor of zero** in the climate accounting. This is also the logic followed in the EU registration of emissions under the existing ESR and EU ETS. An EU ETS installation has to surrender allowances only for its direct emissions, not for the emissions generated by its suppliers of inputs during the production process of these inputs. So if e.g. an industrial installation functions on 100% electricity or biofuels, this is considered as a zero emission installation and will not be required to surrender CO_2 allowances. Whether a fuel is produced in the EU of outside the EU does not make a difference for the users of the fuel, if it is a biofuel the applied emission factor is zero in either case. The difference occurs at the level of the production process: fuel producers in the EU are submitted to the EU ETS for the emissions they generate during their production process, whereas foreign fuel producers are not. That is why in the EU ETS carbon leakage protection is in place (with free allocation of allowances) and a **carbon border adjustment mechanism** is being prepared[35].

To **benefit from the characteristic of emission trading to be technology neutral and to lead to abatement where it is the cheapest**, the best option is to **include all transport fuels in an ETS for road transport**.

[35] The European Green Deal states that "should differences in levels of ambition worldwide persist, as the EU increases its climate ambition, the Commission will propose a carbon border adjustment mechanism, for selected sectors, to reduce the risk of carbon leakage". The Commission is now preparing a proposal for a directive and a public consultation is upcoming, see https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12228-Carbon-Border-Adjustment-Mechanism

What would be the impact for the supply of biofuels? An upstream introduced ETS will make fuel producers responsible for the carbon in the fuels they sell. The fuel suppliers will have to acquire and surrender CO_2 permits each year to cover the carbon content of the fuels they have sold that year. This will give an incentive to fuel producers to lower the carbon content of their fuels, which they can do by supplying alternative fuels (or fuel mixtures). The higher production costs of low carbon fuels will thus (at least partly) be compensated by its lower carbon costs. In this way low carbon fuels (and fuel mixtures) will become cheaper for the consumers compared to 100% fossil fuels, enlarging the market for these low carbon fuels.

However, this extension of low carbon fuels will probably stay limited in the short run, with a relatively low EU ETS price. So in the meantime it can be useful to maintain standards to guarantee a supply of low carbon fuels (see further in 2.2.4).

As mentioned in section 1.3, there are concerns about the validity of the assumption that biofuels would be climate-neutral fuels and therefore the emission factor of zero could be adapted in the future. In that case, it would be important that transport fuels are treated in the same way as the use of biofuels or biomass in other sectors.

2.1.6 Treatment of passenger and freight road transport

Lorries, buses and coaches are responsible for about a quarter of CO_2 emissions from road transport in the EU and for some 6% of total EU emissions. Despite some improvements in fuel consumption efficiency in recent years, these emissions are still rising, mainly due to increasing road freight traffic.

When considering to apply the EU ETS to road transport, it has to be decided whether this would apply to both passenger and freight transport or if special provisions are required for one of these subsectors.

As a general rule, the more different (sub)sectors with different abatements opportunities and costs are included in the EU ETS, the larger the efficiency gains. This is an argument **to best include both passenger and freight transport, this will have the most impact on the climate objective**.

However, there can be some issues with freight transport as it might be more inclined to tank tourism: with its large fuel tank, a lorry can be fuelled in the cheapest country it passes. This has been at the origin of minimum excise duties as well as the use of distance charges. Adding the cost of emission permits to the price of diesel will imbalance this system when it would be applied **nationally and different national carbon prices would apply**. Countries that can easily achieve their reduction target for the non-ETS sector will have a lower permit price. This means that those countries become interesting to fuel the lorry for international journeys. This generates extra fuel excise revenues but may also, depending on the accounting system, make the achievement of the national targets more difficult[36].

[36] So if national ETS systems would be set up, it would be advisable that all countries apply the same carbon prices to avoid this tank tourism.

2.2 Interaction with other policy instruments

The interactions are difficult to assess precisely, because not only the scope of the EU ETS is on the reform-table, almost all EU climate policy instruments are currently being looked at to be reviewed and/or reformed to better contribute to the European Green Deal objectives (as presented in part 1).

At first view, with the existing extensive policy framework affecting the CO_2 emissions of road transport, adding road transport to the EU ETS seems to lead to policy overlap. On this question it is most relevant to check whether the **regulations work in the same direction or undermine one another.** In the first phases of the EU ETS, the renewable energy legislation and the energy efficiency legislation might have contributed[37] to the oversupply of emission allowances, and hence carbon prices which were too low to form an incentive for reductions. The Market Stability Reserve is put in place to mitigate this type of effects. For example, a large uptake of zero emission vehicles in the future, would significantly decrease the demand for CO_2 permits, but this would trigger the MSR to absorb (part of) the oversupply. So fears that sectoral regulations in the transport sector would structurally lead to unbalances between demand and supply in the EU ETS market do not seem to be grounded (Delbeke 2019 and CERRE 2020).

There are not many elements in the literature that indicate that transport CO_2 regulation would undermine the extended EU ETS. On the contrary, by **enlarging the number and variety of emission sources** it would **increase the cost-effectiveness** of the system and **improve the functioning of the market by providing more liquidity**.

But would an ETS be complementary and (possibly) strengthen the existing (and in the near future reinforced) CO_2 legislation for road transport? We focus here on complementarity with respect to GHG reduction. Many transport policy instruments are complementary to an ETS for road transport in the sense that they may solve other transport externalities (such as congestion, accidents, noise and air pollution), but this is not the focus of this study.

We will have a closer look at the main instruments in what follows and conclude this section with a summarising table.

2.2.1 Effort sharing regulation

The EU ETS and the Effort Sharing Regulation (ESR) together cover all EU GHG emissions and act as communicating valves: if the scope of the EU ETS becomes larger, the scope of the ESR narrows[38]. The consequence of an **extension of the current EU ETS with transport implies that transport emissions are removed from the ESR scope**. This removal of road transport from the scope of the ESR could have the disadvantage that Member States are not motivated any more to use all means to reduce road transport CO_2 emissions. Purely from a climate point of view, this must not be a problem, because emission reductions will be realised in the other EU ETS sectors (and for the climate the origin of the emission plays no role). It is of course needed that

[37] Along side other factors such as the financial economic crisis and the instream of international emission credits.
[38] To ensure consistency of the EU-wide 2030 emissions target, article 10 of the ESR states that changes in the scope of the ETS need to be mirrored by a corresponding adjustment of the scope of the ESR. The climate accounting system requires that Member states (for the emissions by ESR-sectors) and ETS-installation (for the emissions by ETS-sectors) yearly surrender annual emission allowances corresponding to the yearly emissions. So there can be no overlap between the two systems.

Member States improve road transport conditions and curb road transport externalities, but this requires other policies than climate policies.

If only one Member State (or several) unilaterally want to opt-in their transport sector emissions in the existing EU ETS this would equally remove its road transport emissions from its ESR scope. Art.24 of the ETS Directive sets out the procedures for unilateral inclusion of additional activities and gases.

The European Commission considers the option of combining the extended EU ETS and keeping the new ETS sectors at the same time in the ESR. How this would be organised at the level of responsibility and registration is not yet clear. This policy overlap seems to make the picture unnecessarily complicated and confusing.

If a **separate ETS system for transport** (and buildings) would be created, it will need to be enquired whether it would be possible to keep these emissions under the authority of the Member States (or whether the ETS entities will be responsible for surrendering the yearly emission allocations). The same considerations with respect to responsibility for reductions can be made as in the case of an integrated system.

2.2.2 Energy Efficiency Directive

The relation between the EU ETS and the Energy Efficiency Directive (EED) is different: the existing EU ETS sectors are also included in the scope of the Energy Efficiency Directive: the directive contains all energy use, also by industrial installations.

As long as energy efficiency is considered as an objective in its own right (e.g. to reduce EU oil import dependence), there is no reason to withdraw EU ETS sectors from its scope. Therefore it seems logic to also keep new EU ETS sectors (transport and buildings) in the scope of the EED.

If, energy efficiency is only considered as an instrument to achieve GHG reductions, it can be questioned whether it makes sense to keep road transport (and the other EU ETS sectors) in its scope. So from a mere CO_2 perspective the energy efficiency directive would not be complementary to an ETS for transport.

2.2.3 CO_2 vehicle standards

A general concern and well-known result from economic theory is that emission standards usually fail to meet the environmental target at minimum cost, because vehicle manufacturers have to fulfil the prescribed standard, no matter what their marginal abatement costs are. However, the design of the EU CO_2 standards for vehicles offers flexibilities which address (at least partly) this inefficiency: by working with average norms per manufacturer to be attained and by allowing pooling between manufacturers.

The real concerns that EU vehicle CO_2 emission standards pose are the following:

- they focus only on the new car fleet, but provide no incentive for used car drivers to change their driving behaviour;

- they provoke a rebound effect: everything else equal, drivers of new, fuel-efficient cars are incentivised to use their car for more and longer trips, as driving becomes relatively cheaper, reducing the expected environmental benefit of the fuel efficiency improvement. As the share of electric cars increases this rebound effect will become smaller[39].
- there is also some empirical evidence that car manufacturers have adapted to the standard as it is currently designed by making their car models heavier, which counteracts part of the CO_2 gains;
- measurement issues: there is a gap between official (lab-based) and real-world emissions, which will probably be only partly cured via the introduction of the new measurement methodology (WLTP). E.g. the CO_2 emissions of plug-in hybrid cars depend on the share of vehicle km driven on electricity. This depends not only on the technical range of the vehicle, but also on the behaviour of the driver.

A **carbon price via the ETS** (or via fuel taxation[40]) **would contribute to curbing these problems**: it gives an incentive to all vehicle users to lower their CO_2 emissions via all possible abatement options: reducing the number of vehicle kilometres they drive, chose more efficient vehicles (also to phase out older unregulated vehicles) and/or less carbon intensive fuels.

Is it still needed to **maintain CO_2 standards if an ETS would apply to road transport**?

One often cited reason to maintain standards, even in the presence of a perfect carbon price signal is the so-called **consumer myopia**: consumers would not invest in vehicles/technologies which result in net reductions on the total cost of ownership because of the high upfront investment costs. This consumer myopia is however not always confirmed by empirical research[41]. Nevertheless, consumers often consider other characteristics, safety and size of the vehicle, as more important than fuel costs when buying a new vehicle. Company cars, which receive in most EU countries a favourable fiscal treatment, can cause split incentives when the driver does not have to pay the (entire) fuel bill for private use. It has been demonstrated[42] that they lead to larger, more fuel consuming cars. This gives arguments for maintaining vehicle CO_2 standards[43] for road transport, next to a carbon price.

This is to a lesser extent valid for freight transport. International lorries drive large distances and for haulers the fuel cost is a very important part of the total costs. But some commercial users and freight companies face barriers such as information asymmetries of SMEs compared to suppliers, limited access to finance and for lorries often also split incentives as the drivers do not pay the fuel costs. These barriers cannot always be overcome by a carbon price alone and standards (and other policies) are useful to address them.

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[39] However, it will still exist for other transport externalities such as congestion, accidents or non-exhaust emissions of air pollutants

[40] As elaborated in 2.2.6, the existing fuel taxes take up this role already (even if they do not perfectly reflect the carbon content of the different fuels) as they imply relatively high carbon prices for road transport.

[41] Grigolon, L., M. Reynaert and F. Verboven (2018) find only modest undervaluation of future savings: for one euro saving in discounted future fuel costs, consumers are willing to pay 0.91 euro in the form of a higher initial purchase price.

[42] See e.g. Copenhagen Economics (2010)

[43] Although the vehicle CO_2 standards only apply to new vehicles, in the long run this also leads to a better CO_2 performance of second-hand vehicles. So standards benefit also consumers who can only afford second hand cars.

Another issue is the **dynamic efficiency of ETS: will it spur innovation or are vehicle CO_2 emission standards needed to stimulate R&D and its uptake?** There are several elements which suggest that the ETS alone will not (sufficiently) lead to development and adoption of innovative, alternative technologies in road transport.

In the first place, the EU ETS carbon price at its current level would provide little additional incentives (on top of the existing fuel taxes which already give a strong incentive for vehicle efficiency) to invest in research and development. In addition, possible CO_2 price volatility would further decrease this incentive.

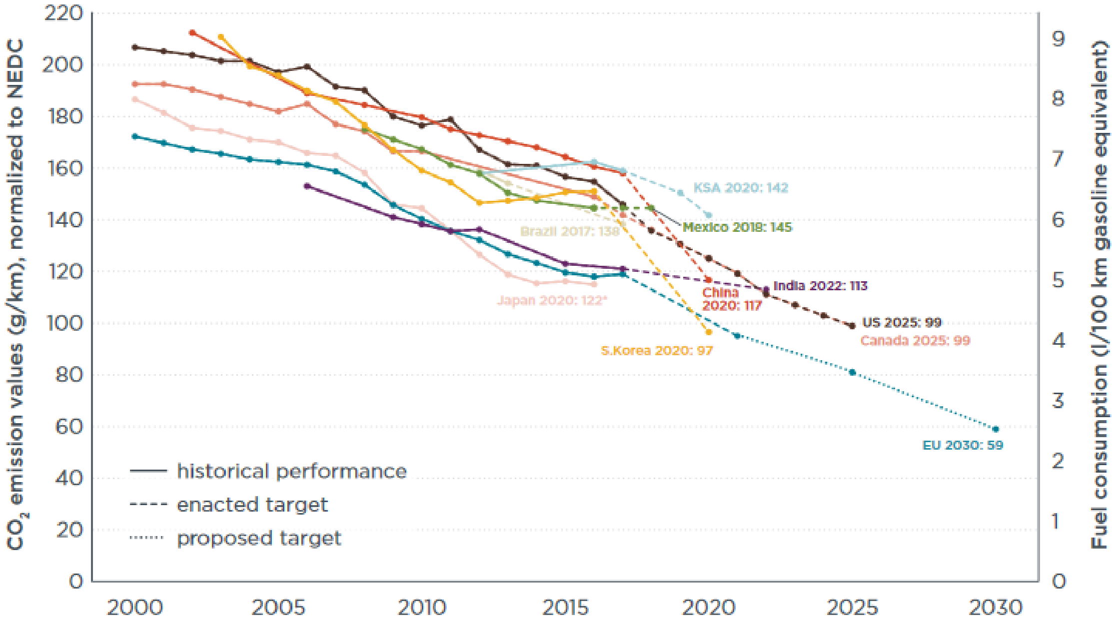
However, the **long term CO_2 price signal is important for this dynamic efficiency**. The current EU ETS aims to limit cumulative emissions and reach zero emissions in 2050. This is done by supplying a decreasing number of permits over time. The permits are bankable, so they can be used in different periods. This makes permits a stock of a scarce good. Any user or investor in permits will decide whether he decides to use it now or later. The permit will only be used later if the price increases with the interest rate. Depending on the risk aversion of the user or investor he may ask a higher premium to keep the asset another year[44]. This intertemporal linking also guarantees the intertemporal efficiency of the abatement efforts.

The literature also points at the possible prevalence of path dependencies (because of sunk costs manufacturers continue investing in improvements in existing technology rather than switching to a new technology) and knowledge spill-overs which call for additional policy incentives for innovation. CO_2 standards can (partly) fulfil this role (together with other instruments such as R&D subsidies) as they provide a long-term perspective for vehicle manufacturers towards which they can align their R&D efforts and are thus complementary to carbon pricing.

A last and important argument for the complementarity of vehicle standards to the objective of dynamic efficiency is the important spillover to the rest of the world in terms of technology transfer. The figure beneath compares the worldwide emission standards. The EU is a leader, and this implies that car manufacturers in the rest of the world are forced to follow this standard when they want to sell cars in the EU. This spillover effect may be more important for worldwide emissions than the emission reduction in the EU (Barla & Proost, 2012).

[44] This long term market signal that links the different yearly permit markets and leads to intertemporal efficiency is referred to as the Hotelling rule.

Figure 16: Comparison of global CO_2 regulations for new passenger cars



Source: ICCT (2019)

2.2.4 *Fuel Quality Directive and REDII*

The EU ETS price could **reinforce** the envisaged increase of low carbon fuels by making them relatively cheaper compared with fuels with a higher carbon content.

The Fuel Quality Directive and RED II would also be **complementary** to an ETS carbon price for transport because they also address, via their sustainability criteria, the well-to-tank (WTT) emissions, whereas the EU ETS would only tackle tank-to-wheel (TTW) emissions.

To some extent these WTT emissions are already covered by the EU ETS if they occur in the EU (the emissions from refining and processing fuels), but WTT emissions outside the EU and/or related to land use are not.

But apart of these sustainability criteria which are very justified, it can be **questioned if it is still needed to impose an obligation to have a minimum share of sustainable fuels and/or renewable energy** in road transport if a correct carbon price (via ETS or fuel taxes) would be introduced. As explained in 2.1.5 the carbon price would give the incentive to supply more sustainable fuel (mixtures). As the carbon price might in the short run not be high enough to give a strong incentive, it can be useful to maintain the standards for renewable and sustainable fuels in the short run.

In the same way as the CO_2 standards are stimulating R&D by car manufacturers, the targets for sustainable and renewable energy are **contributing to innovation** towards these goals in the fuel sector. From an efficiency point of view it seems however preferable to **set these targets at a high level – sector-wide or even economy-wide – instead of imposing specific sub-targets for road fuels**. Targets at a higher level would give the freedom to economic actors to use the low-carbon fuels at the place where their value added is the highest.

2.2.5 Flanking EU policies: Alternative Fuel Infrastructure Directive, Funding programmes, Car Labelling Directive and Directive on Combined Transport of goods

A particular feature of transport is the so-called network externality. Alternative fuel vehicles such as electric vehicles require charging capacity in a network corresponding to the road network. The construction of such a network requires substantial infrastructure investments, which may not take place as long as it is unclear which technology will come out on top to dominate the future transport market. The missing infrastructure in turn inhibits the development of such technologies (conventional fuel lock-in). This gives arguments why the **alternative fuel infrastructure directive** and related **funding programmes would be complementary with ETS for road transport**.

Also the Car Labelling Directive which improves information and awareness raising towards car buyers and the Directive on Combined Transport of Goods[45] between Member States which removes regulatory barriers for modal shift in freight transport can complement an ETS scheme for road transport.

All these policies make it easier, more feasible and/or less costly to shift towards more efficient, lower carbon-intensive, vehicles and transport modes and can be considered as useful flanking policies. A carbon price and these flanking policies can be mutually reinforcing.

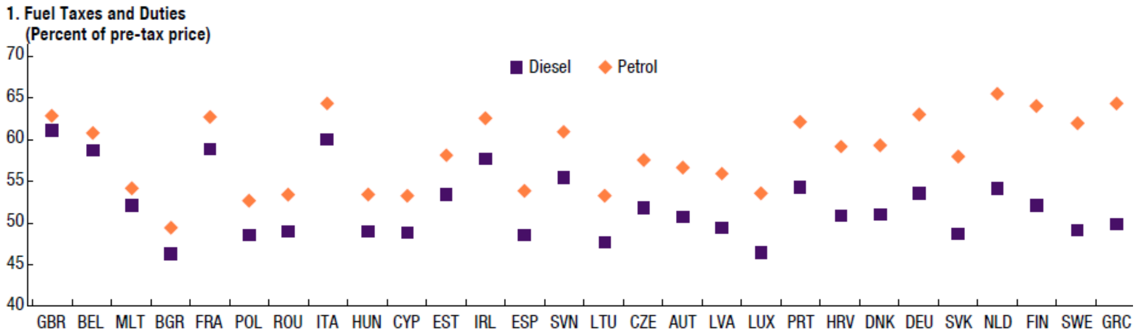
2.2.6 Energy Taxation Directive (ETD) and National Fuel Taxes

The ETD sets minimum excise duty levels for all energy products in the EU, including motor fuels. As mentioned in part 1, the discussion on the ETD reform is ongoing, as part of the European Green Deal. One of the aims is to restructure the way energy products are taxed, by taking into account both their CO_2 emissions and energy content.

At this moment, the applied national fuel taxes do not correctly reflect the relative CO_2 content of the fuels. This can be illustrated by the petrol-diesel tax gap: diesel has a higher carbon content per litre, but the ETD sets +/- the same minimum level of excise per litre for petrol and diesel. On top of that, in most European countries, diesel taxes per litre are lower than for petrol, as shown in the next figures.

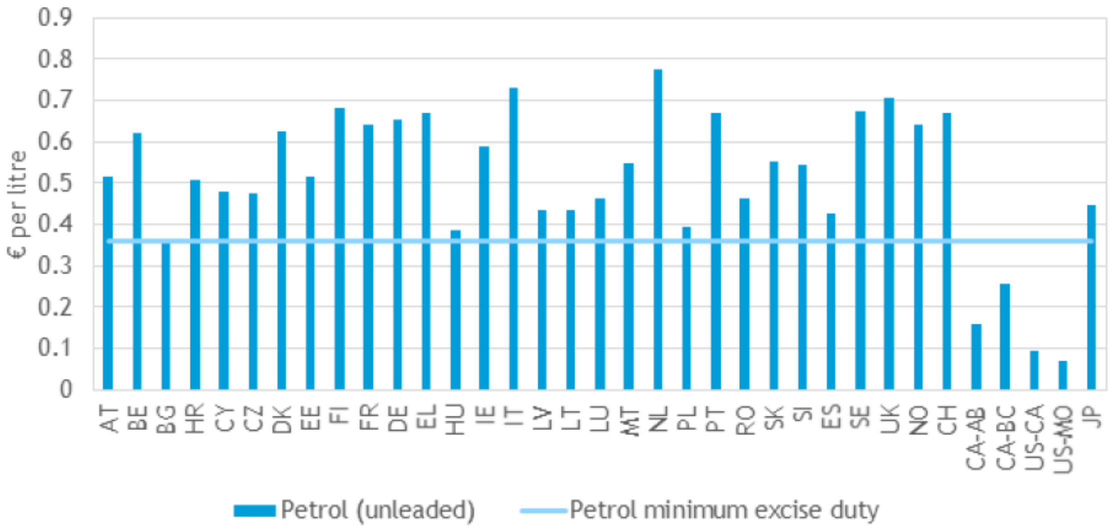
[45] This is Directive 92/106/EEC.

Figure 17: Fuel taxes 2017 in % of the pre-tax price, compared for diesel and petrol



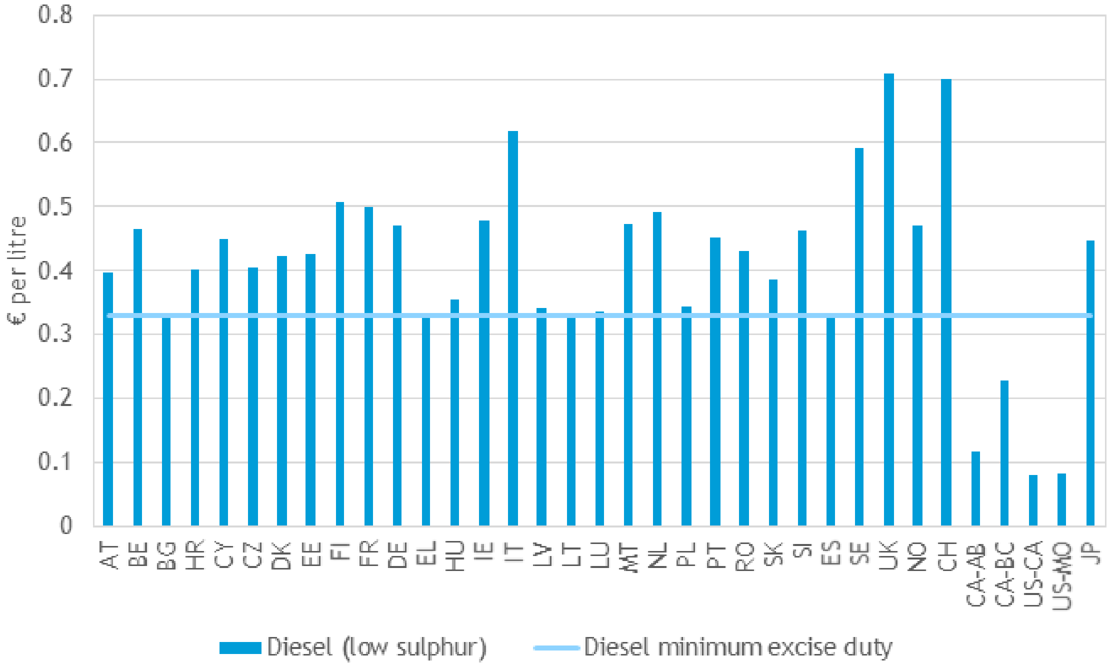
Source: IMF (2020)

Figure 18: Petrol tax levels in 2016 compared to the EU minimum excise duty levels



Source: CE Delft (2019)

Figure 19: Diesel tax levels in 2016 compared to EU minimum excise duty levels

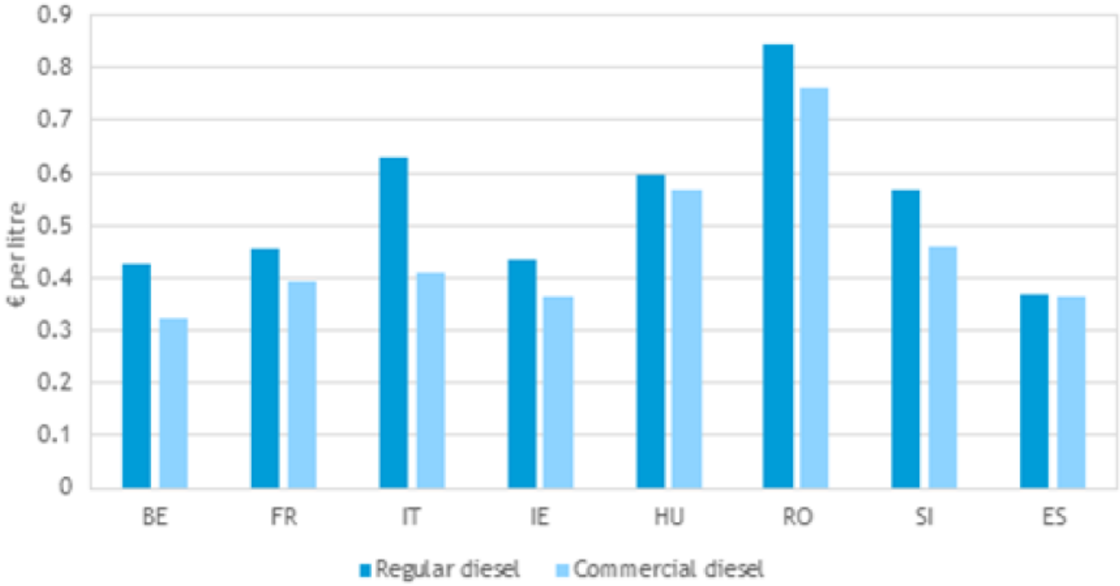


Source: CE Delft (2019)

Additionally, the ETD does not differentiate between fossil fuels and biofuels. As its taxation is purely based on volumes, it can lead to a higher tax burden on renewable fuel for the same energy content, as renewable fuels have a lower energy content. Not all Member States remediate this by applying lower excise rates for biofuels to reflect their lower carbon content (as is allowed by the ETD). Also for hydrogen and other sustainable transport fuels the ETD does not ensure preferential tax treatment. These problems are recognised by the European Commission in its evaluation of the ETD (2019).

Moreover, in some EU countries a refund scheme exists, for part of the excise duty that is used for commercial purposes (as is allowed by the Energy Taxation Directive). In these countries this is an additional deviation of actual fuel taxation (different tariffs according to the type of user: passenger cars or HDV) from the relative carbon content of the fuels (which is the same per litre, irrespective of whether it is used by a car or a HDV). This is illustrated by the next figure.

Figure 20: Differentiated tax levels for regular and commercial use of diesel in several EU countries (PPS corrected)



Source: CE Delft (2019)

As mentioned already in part 1, in **road transport the effective carbon taxes are much higher than in the other energy using sectors**. The minimum tax levels imposed by the ETD[46] are much higher for transport than for fuel use in heating, industrial and commercial use.

So it can be argued that transport is not the priority sector to increase carbon prices via an emission trading system on top of the existing fuel taxes. The existing inefficiencies, due to current fuel taxes not reflecting the carbon content of the fuels, will not be taken away by simply adding an ETS carbon price on top of the existing taxation.

The ETD and the inclusion of transport in an ETS **highly overlap** with respect to the abatement options stimulated (particularly if the intended ETD review would be achieved). Both instruments provide – in the end – vehicle owners a generic price incentive to reduce the CO_2 impact of their mobility behaviour. With respect to the CO_2 reduction target[47] CO_2 taxes and a carbon price via an ETS scheme seem to be substitutes.

With the current national tax levels, **the EU-27 unweighted *average* of implicit carbon tax rates amounts to around 240 euro for petrol and around 160 euro for diesel**[48], this is much higher than the current EU ETS price. This average is high, but as said, the underlying tax levels do not well reflect the relative carbon content of the different fuel uses.

[46] E.g. the minimum tax level for gasoil in transport is 330 euro/1000 litres, whereas it is 21 euro/1000 litres for other purposes.
[47] Fuel taxes have, next to the internalisation of the carbon costs, other rationales: in the first place revenue raising. This is justified as economic theory recommends to tax most those goods which are most inelastic, to minimise tax distortions. But governments can also raise revenues in a less distortionary way, e.g. via vehicle taxation. In the second place fuel taxes can contribute to curbing the other externalities caused by road transport, but they are not the best instrument to address these other externalities.
[48] See calculation in Commission Impact Assessment on the Step up of the 2030 Climate ambition, based on the Taxes in Europe database.

The important added value of an ETS (instead of fuel taxes) is that it not only provides a price incentive, but also puts a cap on absolute emissions and allows trading across sectors.

As will be elaborated in section 3.2 (about the impact on abatement costs), **keeping the fuel taxes at their current high level would decrease the possible efficiency gains of the introduction of road transport in the EU ETS.** The reason is that in other sectors (the building sector and the existing EU ETS sectors), there are abatement options available which cost less than emission reductions in the transport sector. The other sectors do not implement these options already because they face relatively low carbon prices (for the existing EU ETS sectors around 40 euro/tonne CO_2, for buildings even less), so paying the carbon price is cheaper than undertaking the abatement. In the road transport sector, with an implicit carbon price of around 200 euro/tonne CO_2, the cheap reduction options are already used and further reductions are relatively expensive. To reach the total CO_2 reduction objective for all sectors in the cheapest way, we need more, relatively cheap, reductions in the other EU ETS sectors. This could be reached by **lowering the existing fuel prices at the moment that road transport is included in the EU ETS**. In this way the carbon costs for the road transport user does not increase, there will be no extra abatement in road transport (in the short run) and the inclusion of road transport will increase the demand for permits. This in turn will increase the EU ETS price. The higher carbon price will stimulate the other EU ETS sectors to activate their (relatively cheap) reduction options. So the same total reduction can be reached at lower costs, compared to the situation in which road transport carbon prices are increased by adding the permit price on top of the existing fuel taxes.

In the long run all sectors will face the same (high) carbon price, ensuring the most cost efficient total CO_2 reduction.

We can conclude that the **existing transport energy taxation needs to be reformed, both at EU level (via a revision of the ETD) and at national level, because just adding a carbon price on top of the existing taxation will not cure the wrong incentives it currently gives**.

2.2.7 *Infrastructure and congestion charging*

As mentioned in part 1 of this study the Eurovignette Directive provides the legal framework for infrastructure charging for heavy goods vehicles and in many EU countries distance-based or time-based road charges or tolls apply.

The intended revision of the Eurovignette Directive would also introduce a variation of charges according to the CO_2 emissions of heavy duty vehicles and both CO_2 and air pollutant emissions of light duty vehicles. This would rather form **a substitute** than a complement to carbon pricing, with the disadvantage that the road pricing would only apply in specific regions, whereas an EU carbon price would give a carbon signal to all road transport users. And again, an ETS would provide an absolute cap on emissions, next to the price signal.

2.2.8 *Other national climate pricing instruments for road transport*

Next to fuel taxes, most EU countries also use **other price instruments to steer vehicle purchasing decisions**. As can be seen in the next overview table, in many countries the registration or purchase taxes and recurring ownership taxes are CO_2 related. On top of this, several countries subsidise low/zero emission vehicles. The effectiveness of these instruments varies:

- acquisition taxes which are CO_2 related (e.g. giving exemptions to zero emission vehicles) may play a role if people react more strongly to higher upfront costs than to future lower running costs (especially when they are highly graduated according to CO_2). The scope of this instrument is limited however because a high tax on the acquisition of new cars could discourage people from replacing their old car with a newer/cleaner one. They **can thus be complementary** to carbon pricing (either via ETS or via fuel taxation).

- recurring CO_2 related ownership taxes are probably less effective in steering towards less CO_2 emitting vehicles (its environmental effectiveness appears dominated by a combination of fuel duties and acquisition taxes), so for climate purposes they **do not need to be maintained**
- vehicle purchase subsidies for low emission vehicles work in the same way as the CO_2 related acquisition taxes (lowering upfront costs of low CO_2 vehicles). They can however result in higher ownership and additional vehicle mileage (and emissions). This undesirable impact can be cured by increasing carbon prices (via fuel taxes or an ETS system). Both instruments can thus be **complementary**.

Figure 21: Passenger Car CO_2 and Proxy-Based Taxation in 2018

Country	Registration/Purchase		Ownership		Subsidies for low/zero emissions?
Austria	✓ (red)	*	✓	*	yes
Belgium	✓ (red)	*	✓ (red)		yes
Bulgaria	n.a.		✓	*	
Croatia	✓ (red)		✓		
Cyprus	✓ (red)	*	✓ (red)		
Czech Republic	n.a.		✓		
Denmark	✓ (red)	*	✓ (red)		
Estonia	n.a.		n.a.		
Finland	✓ (red)	*	✓ (red)		
France	✓ (red)	*	✓ (red)		yes
Germany	n.a.		✓ (red)	*	yes
Greece	✓ (red)	*	✓ (red)	*	
Hungary	✓	*	✓	*	
Ireland	✓ (red)	*	✓ (red)	*	yes
Italy	✓		✓	*	
Latvia	✓		✓		
Lithuania	n.a.		n.a.		
Luxembourg	n.a.		✓ (red)	*	yes
Malta	✓ (red)	*	✓ (red)		
Netherlands	✓ (red)	*	✓ (red)	*	
Norway	✓ (red)	*	✓		yes
Poland	✓		n.a.		
Portugal	✓ (red)	*	✓ (red)		
Romania	✓ (red)		✓	*	yes
Slovakia	✓	*	✓		
Slovenia	✓ (red)		✓	*	yes
Spain	✓ (red)		✓	*	
Sweden	n.a.		✓ (red)	*	yes
Switzerland	n.a.		✓	*	
United Kingdom	✓ (red)	*	✓	*	yes

*Note: ✓ (red) denotes CO_2 or fuel consumption based, ✓ denotes based on other characteristic, n.a. denotes instrument is not used, * denotes benefits for low/zero emissions vehicles.*

Source: IMF (2020)

2.2.9 *Other national and local climate policies and measures for road transport*

As mentioned in part 1, national and local authorities deploy many policies directly or indirectly contributing to reduce the CO_2 emissions of road transport. These policies are complementary to carbon prices because they can help road users to find alternatives (modal shift, cleaner vehicles…) to reduce their CO_2 emissions and hence to reduce their expenditures on carbon taxes . The other way round, appropriate carbon prices can reinforce their effectiveness (e.g. a carbon tax would increase the demand for public transport which is complementary to supply side measures for public transport).

- Supply side measures to stimulate modal shift both in passenger and freight transport are very much complementary to carbon prices steering the demand towards transport modes which are less carbon intensive.
- Spatial and urban planning and local transport oriented towards decreasing the need for motorised (passenger and freight) trips, can be considered as a necessary flanking policy measures;
- Also awareness raising measures such as the provision of information on the CO_2 impact of road transport and its alternatives, campaigns for company mobility plans, eco-driving etc. are very much complementary to carbon pricing and both type of instruments are mutually reinforcing.

Additionally it is worthwhile to mention that through the implementation of the Energy Efficiency Directive and the Fuel Quality Directive, **Member States may impose a sort of implicit carbon pricing on fuel/energy suppliers**. According to the provisions of the fuel quality directive, Member States shall oblige fuel suppliers to reduce the life cycle GHG emissions per unit of energy from fuel and energy supplied by up to 10% and shall determine penalties for noncompliance. These penalties can be function of the amount of CO_2 reduction not being achieved, e.g. in Austria[49] the penalty is 15 euro/tonne CO_2 for non-compliance with the obligation to reduce GHG emissions by 6%.

Also the Energy Efficiency Directive contains provisions on penalties for non-compliance, which can be considered (depending on the design of the penalty payment) as indirect carbon pricing.

These implicit carbon prices cannot be considered as substitutes for an ETS carbon price for road transport however. The problem is firstly that they are not applied at the same fine level in all Member States. Secondly it is not certain that the fines will be paid, e.g. an evaluation of the Fuel Quality Directive (CE Delft 2017) indicates that, because of lacking strong national enforcement systems, non-compliance does not always lead to penalties.

2.2.10 Summary of policy interactions

The next overview summarises the expected interactions of an ETS for road transport with the other existing policy instruments affecting CO_2 emissions of road transport.

[49] See Kraftstoffverordnung 2012, Fassung vom 13.11.2020

	Policy instrument	Complementary to transport in ETS?
EU	Effort sharing regulation	No, ESR and ETS are in principle mutually exclusive. In case a separate closed ETS for transport (and building) emissions, different accounting rules might be established which allow these sectors to stay within the ESR scope[50], this could lead to unnecessary policy overlap.
	Renewable Energy Directive (recast) (RED II)	Yes, RED is useful to complement ETS for well-to-tank emissions (via sustainability criteria) and RED can provide incentives for innovation towards renewable fuels/energy for transport. But not efficient to maintain sub-target for transport.
	Energy Efficiency Directive	No, if EE is considered merely as an instrument to decrease CO_2 emissions it is not useful to maintain the EED for road transport energy use.
	Energy Taxation Directive	No, energy taxation can be a substitute for an ETS carbon price, if reflecting the relative carbon content of the fuels. But it sets no cap on absolute quantity of emissions and does not allow trade with other sectors.
	Eurovignette Directive (proposed reform to introduce a CO_2 element)	No, the proposed introduction of a CO_2 element could form a substitute for transport in ETS (only if applied everywhere in the EU). But sets no cap on absolute quantity of emissions.
	CO_2 emission standards vehicles	Yes, both are needed to give the right incentives to consumers and car manufacturers and to stimulate innovation. Standards will put a downward pressure the CO_2 price in the ETS.
	Fuel Quality Directive	Yes, useful to complement ETS for well-to-tank emissions via sustainability criteria.
	Alternative Fuel Infrastructure Directive, EU funding programmes, Car Labelling Directive, Directive on Combined Transport of goods between Member States	Yes, they are flanking policies which can be mutually reinforcing with transport in ETS
National	Fuel taxes	No, national energy taxation is already a substitute for an ETS carbon price, if reflecting the relative carbon content of the fuels correctly. But fuel taxes set no cap on absolute quantity of emissions and allow no trade across sectors. Maintaining the current high levels of fuel taxation would decrease the efficiency gains of an ETS for road transport.
	CO_2 related vehicle taxes and subsidies	Yes, CO_2 related acquisition taxes and subsidies are complementary to an ETS carbon price by providing an extra incentive at the moment of vehicle purchase. CO_2 related ownership taxes are less steering towards low emission vehicles.
	Other policies for CO_2 reduction	Yes, flanking policy which can be mutually reinforcing with transport in ETS.

[50] This is suggested in the Commission Inception Impact Assessment of the extension of ETS and in the Impact Assessment of the stepping up of the 2030 climate target.

So we can conclude that, for the purpose of CO_2 reduction, many of the existing climate policies for road transport are complementary to an ETS for road transport.

This is not the case for the Effort Sharing Regulation and the Energy Efficiency Directive and neither for the Energy Taxation Directive, the proposed introduction of a CO_2 element in the Eurovignette Directive and the national fuel taxes. The inclusion of road transport in the Effort Sharing Regulation and in the Energy Efficiency Directive, on top of a road transport ETS, can be considered as overlapping policies. Whereas the pricing instruments are imperfect substitutes for an ETS carbon price, in the sense that they can give a correct price signal (if properly reformed), but do not set a cap on the absolute emissions and neither offer the possibility of trade to make use of the cheaper abatement options in other sectors.

3 Part 3: Impacts of the most relevant policy options

In this last part of the study we investigate the possible impacts of the options which we deem most realistic and relevant based on the elements discussed in part 2. We basically look at the impact of the introduction of an **EU-wide, upstream cap and trade system for all transport fuels (including alternative fuels) and for both passenger and freight transport**. The variations still left open are:

- full integration in existing EU ETS **or** a closed or semi-open system for transport (and heating) fuels (in transition phase);
- auction allocations or free allocation based on benchmarks (in transition phase).

The impacts we want to consider are:

- the impact on CO_2 emissions
- the impact on abatement costs
- the incentives for technological innovation and its uptake
- the economic and social impact for:
    - the road transport users
    - the fuel suppliers
    - the other EU ETS sectors
    - the national governments.

At this moment there is relatively limited literature available which quantifies the impacts of an ETS for road transport with modelling studies (the main sources are the Impact assessment on stepping up Europe's 2030 climate ambition of the EU (EU COM September 2020[51]) and Cambridge Econometrics (June2020). Other sources such as CERRE (Dec2020) and ZEW (2015) discuss the possible impacts based on existing theoretical & empirical literature and previous modelling studies. Based on this literature, combined with basic economic insights, we can indicate the (relative) impacts of the different options.

3.1 Impact on CO_2 emissions

Total CO_2 emissions included in the EU ETS will decrease at the pace of the yearly decreasing cap on the number of allowances[52], irrespective of the system options chosen. The decrease of the road transport emissions will not be affected by the choices concerning the distribution of the allowances (auctioning or free allocation). The ETS design options with respect to the scope however, will affect the impact on the road transport CO_2 emissions in the following ways:

- **Option 1**: with a **separate ETS for road transport only**, the cap applies to road transport emissions only and their reduction will be determined by the tightness of the cap and the rate at which it is decreasing in the future years;

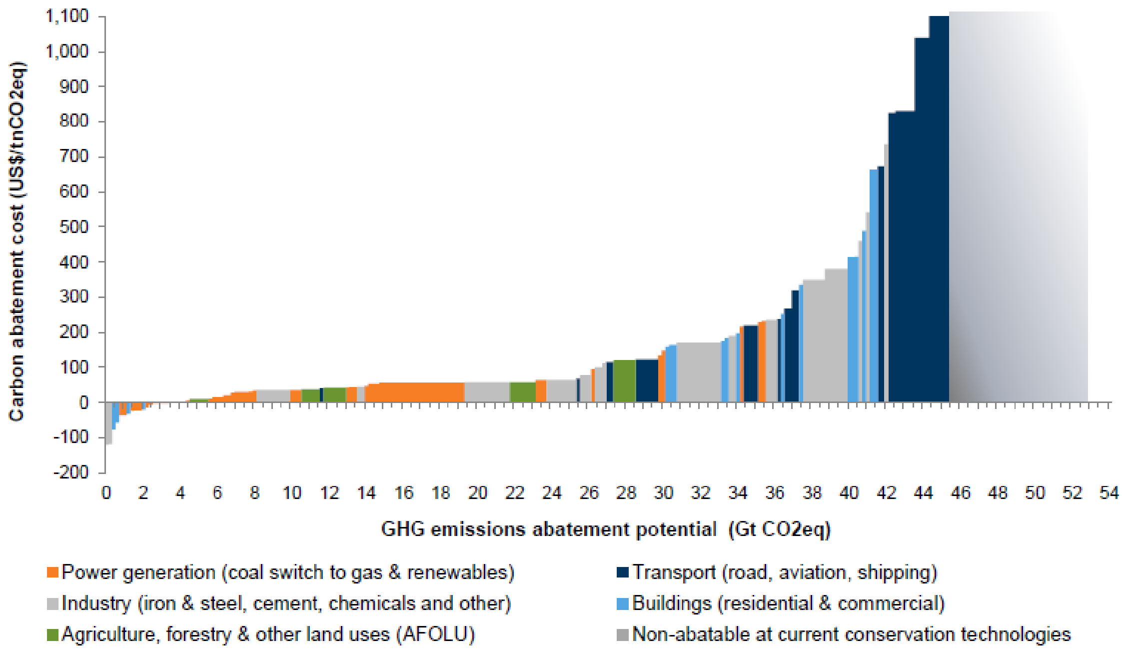
[51] In this Impact Assessment the modelled options do not only vary to the extent that they extend the ETS or not. At the same time also the energy efficiency, renewables and transport policies change, with makes it impossible to disentangle the effect of the ETS extension.

[52] It will also depend on the functioning of the MSR, in case the surplus is so large that a cancellation of allowances is applied.

- **Option 2**: with a **separate ETS for road transport and heating fuels**, the additional reductions will probably, at least in the short run, mostly take place in the building sector, because this sector offers more relatively cheap abatement possibilities, such as insulation, fuel switch and more efficient boilers. Because of the relatively high fuel taxes for road transport, it was already profitable to invest in energy efficiency improvements for road transport and hence this 'low fruit has been picked already'. This is confirmed by the modelling outcomes by Cambridge Economics (2020). In their scenario with a linked carbon price for transport and buildings, at the EU aggregate level, the additional reduction in road transport compared to the baseline is small, while in the buildings sector it is expected to have a more substantial response.
- **Option 3**: if a **fully integrated system** is chosen, again, we expect that most of the additional abatement will take place in the other EU ETS sectors and much less in the road transport sector, for the same reasons, because also compared to other sectors, the fuel prices for road transport are relatively high. Again this is confirmed by the modelling by Cambridge Econometrics.

This argument is well illustrated by a recent global GHG abatement cost curve developed in Carbonomics, by Goldman Sachs Global Investment Research (2020). The dark blue bars indicate transport abatement (including road transport, aviation and shipping).

Figure 22: Global decarbonisation cost curve



Source: Goldman Sachs Global Investment Research (2020)[53]

Almost all road transport abatement options are situated above 200 US$/tonne CO_2, which corresponds with approximately 160 euro/tonne CO_2[54] . Whereas in power generation, industry

[53] We received all necessary approvals to use this exhibit in our report on 21/04/2021. The views of Transport & Mobility Leuven do not represent the views of Goldman Sachs nor are the views expressed endorsed by Goldman Sachs.
[54] Using the exchange rate of 6/4/2021.

and agriculture, large volumes can be abated at costs below 84 euro/tonne CO_2, e.g. by fuel switch in electricity generation, efficiency gains in industry and building insulation. The underlying figures of the graph show that the only cheap transport options included are situated in aviation and shipping[55], and next, at modest costs, come electric city buses (at 97 euro/tonne CO_2 in the base case) and electric trucks for short distances (at 103 euro/tonne CO_2 in the base case).

Not only are the abatement options in transport more expensive than in other sectors, emission reductions induced by decreasing demand for road transport are also expected to be low because of the **low fuel price elasticity.**

We looked at a series of overview studies of empirical work on price elasticities and found that the fuel price elasticity varies between **-0.25 for the short run** (1 year) and **-0.7 for the long run** (meaning 5 to 10 years). This means that in the short run an increase of the fuel price by 10% would reduce the fuel consumption by 2.5%. This short run fuel consumption is reduced through a combination of reactions: a limited decrease of vehicle travel, shifts to more fuel efficient vehicles in multi-vehicle households and reduced speed. In the long run, this 10% fuel price increase would make fuel consumption decline by 7%, again due to a combination of reactions: some more vehicle travel decline[56] than in the short run and due to the purchase of more fuel efficient vehicles.

These elasticities must be used with **caution to predict future fuel demand changes** because they are based on historic observations of demand for fossil fuel vehicles. In the future, when zero-emission cars become much more available and affordable, **we can expect more elastic fuel demand responses**.

3.2 Impact on abatement costs

For this impact, again, the design options with respect to the allocation of the allowances (auctioning or free allocation) play no role. The price signal is in place, no matter if the allowances have to be bought or are received for free.

The scope of the ETS does matter, and we can follow the same lines of reasoning as in the previous paragraph. The **larger the scope of the ETS**, the more efficient the system, and thus the lower the **overall abatement costs** for a given CO_2 reduction.

It has to be noted however that, as long as the large **discrepancy in fuel taxes** (and thus implicit carbon taxes) **between road transport and the other sectors** of the economy prevails, **the theoretical solution with the lowest overall total costs – which economists call 'full optimum' – will not be reached** (see also explanation in section 2.2.6). As said before, a carbon price on top of the existing taxation is not able to correct the relative prices and to remove the distortions caused by these differences in implicit carbon prices: transport will still abate more and the other sectors less, compared to this full optimum where the carbon prices would be perfectly equalised.

Turning to the **abatement costs of the road transport sector specifically**, we consider the impacts of the different design options:

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[55] These are 'switch aircraft to one of highest efficiency' at 33.6 euro/tonne and 'LNG fuel in shipping' at 57 euro/tonne CO_2 in the base case.

[56] Estimated at 3-5%, split between reduced car ownership and per-vehicle use, from Todd Litman 2013.

- Option 1 – a separate ETS for road transport only: we want to compare this situation (namely a decreasing cap on road transport emissions only), with a situation without this instrument, but where the same reductions have to be achieved by other policies. We can expect that, for the same amount of CO_2 reduction, the ETS carbon price will lead to lower road transport abatement costs compared to the situation without a carbon price. The additional carbon price will give incentives to undertake first the cheaper road transport abatement options, in the places where they cost least. Think of reductions in the number of trips, modal shift, carpooling etc. Existing distortions, like the exemption of commercial diesel, would be partially cured by having freight transport pay the same carbon price as passenger transport. These efficiency gains stay limited however, because there are already high road transport fuel taxes in place (which could be reformed to reflect better the relative carbon content of transport fuels) and because cheaper abatement options, in other sectors, cannot be used.

- Option 2 – a separate ETS for road transport and heating fuels: there would be less abatement in road transport and hence lower road transport abatement costs compared to option 1. Again, the high existing fuel taxes limit the efficiency gains, the same total amount of abatement could be achieved at lower costs if existing fuel taxes were lowered.

- Option 3: if a fully integrated system is chosen, we expect the abatement effort and hence abatement costs in road transport to be lowest (of these 3 options), as cheaper abatement options in the other EU ETS sectors will be available and used first. As said, this will not lead to the full optimum solutions, as road transport will still undertake more expensive abatement measures than the other sectors, because of the pre-existing high fuel prices.

3.3 Incentives for technological innovation by car and fuel producers

We have discussed the so-called dynamic efficiency (the efficiency over a longer period of time) of an ETS for transport when analysing the policy interactions of an ETS for road transport with CO_2 standards. Basically an increased carbon price for road transport will make vehicle users more interested in fuel efficiency, low carbon fuels and low carbon vehicles when purchasing a new car or when fuelling. This enlarges the willingness-to-pay for such low-carbon cars/fuels, which will give incentives for car manufacturers and fuel producers to innovate, to be able to supply more of these improved technologies in the future.

The different design options can influence this dynamic efficiency: in principle we expect that the **higher and the more stable the carbon price for road transport, the stronger the incentive for innovation**. This is an argument in favour of the inclusion of road transport in an integrated EU ETS.

It is important that the CO_2 permits are **bankable**, as they are in the current EU ETS. This enables the intertemporal linking of the carbon price and also guarantees the intertemporal efficiency of the abatement efforts, this is probably the best way to synthesise the information on future abatement costs. In this way, car and fuel manufacturers would take into account the future scarcity of permits in their investment decisions today. The **long term price signal** of permits would, in theory, spur sufficient additional innovation efforts.

The price signal will be captured in a direct way by the fuel suppliers, as they will be the responsible entities in an upstream ETS for road transport. For vehicle manufacturers the ETS price only indirectly has an impact via the road users considering to buy a new vehicle. The more expensive fuel price they face, will stimulate them to search for affordable low/zero emission vehicles.

This puts the worry in perspective that, in an integrated EU ETS where abatement will first take place in the other EU ETS sectors, **delayed action** in the road transport sector might lower its innovation speed and effort.

Additionally, the presence of **other policy instruments can also have a strong impact on the incentives to innovate** in the vehicle and fuel sector. These other instruments are in the first place the CO_2 standards for vehicles, the targets for renewable and sustainable fuels, subsidies for R&D and demonstration projects, but also investments in alternative charging/fuelling infrastructure. They are important to trigger innovation in an early stage, to avoid that technology development starts too late and faces unrealistic timeframes in the future and to avoid carbon lock-ins.

A transitionary separate ETS for road transport (and buildings) can have the disadvantage that it creates uncertainty about the long term CO_2 price for road transport, and hence disturbs the long term price signal for innovation efforts this sector.

3.4 Economic and social impacts

3.4.1 *Impact on the carbon allowance price*

To be able to discuss the economic and social impacts of an ETS for road transport, it is necessary to get an idea of the level of the carbon price this would involve.

When the option would be chosen to extend the existing EU ETS, this would increase the demand for allowances. The European Commission will have to decide to which extent she will increase also the supply of allowances (i.e. on how to adjust the cap) and this will be decisive for the initial price when the extended system starts. It is expected that the Commission will try to adjust the cap in such a way that the price remains at its current level and that there is no immediate price shock.

How will the price further evolve in an extended ETS compared to the existing policy framework? In Cambridge Econometrics (2020) different scenarios are computed and the resulting carbon prices of **extending the EU ETS to transport and buildings** (our option 3) evolves towards **70 euro/tonne in 2030**[57]. AgoraEnergieWende (2020) mentions an equilibrium price **well above 60 euro/tonne** in an integrated EU ETS scenario. Also in ZEW (2015) it is argued that, based on previous modelling, a price rise is to be expected if transport is integrated into the existing EU ETS.

CERRE(2020) puts these price expectations in perspective. This study recognises that, in theory, given the high upfront cost of substantial GHG abatement options in road transport and heating as well as low price elasticity of emissions for road transport and heating fuels, a high EUA price is a

[57] As the baseline in this study is the EU reference scenario, we interpret that this study assumes that existing fuel taxes are maintained. This means that for road transport 70 euro/tonne would be the carbon price on top of the existing implicit carbon prices embedded in the current fuel taxes.

plausible outcome. But they emphasise the need to consider the more realistic case where the EU ETS **co-exists with other 'complementary' policies that would put downward pressure on equilibrium EUA prices** (in the same way that the Renewable Energy Directive did in the second and third phases of the EU ETS).

Recent experience from the California Cap-and-Trade (CaT) programme provides some empirical evidence supporting that view. The GHG emissions from California CaT sectors, which include road transport and heating fuels, would be capped at 200 Mt in 2030, a 47% reduction compared to their 1990 levels. California's emissions structure is similar to that of the EU-28, with an even larger share of road transport. California also has a similar set of 'complementary' policies to the EU, with e.g. vehicle CO_2 emission performance standards targeting the road transport sector, but much lower excise taxes on motor fuels. As evidenced by modelling calibrated to the California economy, the presence of these policies does reduce the level of the expected equilibrium price of CaT allowances (estimated at 50$/tonne). It is also likely that the presence of these policies has played a role in keeping past prices low.

So also in the EU, complementary policies such as the vehicle CO_2 performance standards, can be expected to secure long term emissions reduction (and associated investment), which in turn reduces the demand for allowances in the market and puts downward pressure on the CO_2 allowance price. It must be realised that these complementary policies impose extra costs on the transport sector. They may reduce the permit price, but this will come at the expense of costly abatement in the transport sector.

The evidence thus points towards a **likely rise in allowance prices in the run up to 2030, and further rise after as the emissions cap for EU ETS sectors is tightened, if road transport (and heating fuels) are included in its scope**. This rise could be reduced through (strengthened) complementary policies. Also the market stability reserve will play a role in tempering sharp price rises (if the number of allowances in circulation falls below a lower threshold, it is foreseen that allowances are released from the reserve).

It is even more difficult to say what the carbon price would be **in a separate transport (and buildings) ETS**. This will again depend on the level of the cap on these emissions and on the (enforced or reduced) complementary policies. It seems reasonable to expect that the cap on this new ETS will be set to obtain a significant reduction (otherwise there would be no need to set up a new system). Combined with high marginal abatement costs and an inelastic demand in road transport this will lead to a **higher CO_2 price in a separate ETS for transport alone**. The **addition of buildings in this separate ETS would attenuate the carbon price** thanks to the cheaper abatement options available in the buildings sector.

Before moving on to the impacts on the different affected actors, the next table summarises the main expected impacts of the three possible design options, relating to the scope of a road transport ETS.

Impact on	**Separate Road transport ETS**	**Separate Road transport and Buildings ETS**	**Integrated EU ETS**
Road transport CO_2 emissions	Depending on tightness of cap and its future decrease	Relatively less reductions in road transport (and more in buildings)	Relatively lesser reductions in road transport (and more in the other EU ETS sectors)

Abatement costs	High transport abatement costs (but lower than when same CO_2 reduction in road transport would have to be achieved without a carbon price)	Lower transport abatement costs (which could be lowered further if fuel taxes would decrease)	Lowest overall abatement costs and lowest road transport abatement costs (which could be lowered further if fuel taxes would decrease).
Permit price	Probably high, to achieve reductions in presence of high abatement costs and low price elasticity	Lower price than a separate ETS for transport only.	Probably lower than in a separate ETS for road transport and/or buildings. Probably higher than in the current EU ETS scope (without transport and buildings).

3.4.2 *Impact on road transport users*

What would be the impact of an ETS carbon price on the road transport users in the EU?

As said, we expect a **100% cost pass-through** by the fuel producers (who would be the responsible entities to surrender allowances in a transport ETS) in the price of the fuel they sell. And this is expected to be the case even when (part of the) allowances are allocated for free. This was empirically noted in the beginning of the EU ETS for the electricity sector, where evidence emerged that free allocation was not stopping the incorporation of the carbon price in the price of electricity sold (and this was one of the principal reasons to make the shift to auctioning for that sector).

A carbon price of **40 euro/tonne CO_2** would cost an additional **0.1 euro/litre.**

This calculation assumes that the existing national transport fuel taxes remain in place. These existing fuel prices are high compared to the current (and expected) EU ETS price. The EU-27 unweighted average of implicit carbon prices of **current Member States nominal energy and carbon tax rates amounts to around 240 euro/tonne CO_2 for petrol and around 160 euro/tonne CO_2 for diesel**[58].

These **current fuel taxes will not necessarily be maintained**. It can be expected that some Member States will want to lower fuel taxes and hence diminish the effect of the carbon price, to make an extension of the EU ETS appealing to voters[59]. We saw (in part 1.3 of this report) that most EU countries apply higher fuel taxes than the minima set in the Energy Taxation Directive, so it is **legally possible for many countries to lower their tariffs**. It is hard to say what Member States will do. For many of them fuel taxation is an important source of revenues. In an ETS system for road transport where the allowances are auctioned, the bulk of this auction revenue is expected to be distributed to the Member States, so in principle they can compensate decreased revenues from fuel taxation by increased auction revenues (from an expanded or additional ETS).

[58] See calculation in Commission Impact Assessment on the Step up of the 2030 Climate ambition, based on the Taxes in Europe database.

[59] This argument is given in CERRE (2020) and illustrated by the cases of France and Sweden: when France introduced a carbon tax in 2014 it fully sterilised the effect of this introduction by reducing the other components of the tax. Sweden removed industry stationary sources covered by the EU ETS from the scope of its national carbon tax in 2005.

In sum, we can expect that the **ETS for transport will make the fuel price increase though not necessarily by the total allowance price**, as Member States might decrease their existing fuel taxes to (partly) compensate this increase.

The **impact of higher fuel prices on the road transport users is expected to be uneven**. In general, it is observed that carbon pricing is regressive, because carbon-intensive spending as a share of income is higher for poorer households. But within this large category of 'carbon-intensive spending' the picture differs per sector. It is observed that the **share of income spent on transport increases with income**, so this reason for regressive effects is not valid for transport in general. It has been shown that car ownership is a major driver of the regressive effect in transport. If the poor households disproportionately own and use cars with low fuel efficiency (especially for commuting) this can cause regressivity – this is the 'gilets jaunes' effect. By definition this can only be true in relatively rich countries where lower-income deciles can afford a car[60], so for poorer and middle income countries transport fuel taxation is progressive (see CERRE 2020).

Another factor affecting the degressive or progressive character of carbon prices in transport is the price elasticity. The **price elasticity of transport increases as income increases**; this can be attributed to the reduced role of 'essential' consumption as incomes increase. The number of trips taken by the lowest income households are already limited, a higher proportion of their trips will be for 'essential' purposes, such as commuting, and discretionary use will be lower. In the short run, up to 2030, it is unlikely that large volumes of second-hand electric vehicles will be available to purchase for low-income households. These factors combined make that the lowest income households have less room to adapt their behaviour to escape the fuel cost increase and will face a higher transport bill.

To illustrate this, based on the elasticities of German households estimated by ZEW(2016), a household with a single adult in the lowest income quarter would have a transport price elasticity[61] of -0.29, a 10% fuel price increase would decrease its transport use (car fuel and public transport are taken together in this research) by 2.9% and thus increase its fuel bill by 7.1% . The same household type in the highest income quarter has an estimated price elasticity of -0.7, hence a 10% fuel price increase would reduce its transport demand by 7% and increase its transport bill by only 3%.

But **distributional effects can also vary within income groups**. For example, significant variation has been found within income categories in Sweden, particularly between those living in rural and urban areas or between city centres and suburbs in lower-income groups (see Eliasson 2020).

Moreover, the impact on road users will be **uneven depending on the Member State where they live**. We can expect that Member States with a more positive budgetary situations will be more inclined to decrease fuel taxes to compensate the additional ETS price for road transport. The effect of an ETS carbon price for road transport users in Member States with better public transport, a higher market penetration of low emission vehicles, more EV load infrastructure etc., will be easier to accommodate than in Member States where these alternatives are less available.

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[60] E.g. in Flanders, one of the wealthiest EU regions, only 38% of the families in the lowest income decile do not own a car (Hendrickx et al. 2019).

[61] In this study 'transport' is the commodity group car fuel and public transport. So it concerns the elasticity of the expenditures for car fuel and public transport with respect to the price of this commodity group.

Finally, the impact will also depend on the way ETS auctioning revenues are used in each Member State.

To conclude this section on the impact on road transport users, it must be noted that the **alternative to an ETS for road transport, which would mean CO_2 abatement through the (strengthening) of existing policy instruments is also entailing significant costs for road transport users**. The higher costs of low carbon vehicles and low carbon fuels are ultimately passed on to the consumers. We can expect that costs of e.g. electric vehicles will further decline in the coming years, but currently they imply an additional investment cost, born by the driver and/or the tax payer (in case part of the extra cost is subsidised).

3.4.3 Impact on fuel suppliers

The fuel suppliers will probably be the entities who will be responsible for acquiring and surrendering emission allowances to cover the CO_2 emissions of the fuels. As mentioned already (under 2.1.3 and 3.4.2), they are expected to **pass through 100% of the costs of the CO_2 allowances** to the consumers via the fuel price. Whether the ETS for road transport is a separate system or integrated in the existing EU ETS does not play a role in this cost pass-through. In the short run there will be no impact on the economic profit of the fuel suppliers because their supply is 100% elastic (they have a horizontal supply curve).

Fuel suppliers will be confronted with **transaction costs**. As discussed earlier (in 2.1.4) we can expect transaction costs to be higher in a system with free allocation, as it will require the reporting and verification of historic fuel sales and the allocation plans. If fuel suppliers do not register the destination of their sales (for heating, transport, industrial use…) already, the set-up of an ETS for road transport only, might require additional administration to separate out transport fuel sales. In this report we do not enquire the precise implementation options of an ETS for road transport in sufficiently detail to say much more about the level of the transaction costs for fuel suppliers in different administrative settings. The CE Delft (2014) study referred to in section 2.1.3 suggests that the practical implementation via tax warehouses keepers is the most feasible solution and would not entail much extra transaction costs for these entities.

Another issue for fuel suppliers could be the **competition with fuel suppliers outside the EU**. The Impact Assessment of the 2030 step up of climate ambition recognises that an increase in fuel prices in road transport could decrease the competitiveness of filling stations on the EU borders vis-à-vis filling stations just outside the EU borders. They state however that cross-border differences in fuel prices are already considerable and therefore estimate that the EU ETS will only have a modest impact on the scale of this.

3.4.4 Impacts on other EU ETS sectors

Here we concentrate on scoping option 3, so the option which is including transport (and buildings) into the existing EU ETS. A separate new ETS for transport (and buildings) is not expected to have much impact on the existing EU ETS sectors.

We have discussed the abatement effort by the transport sector in section 3.1. It is likely that including emissions from road transport and buildings in the ETS will result in a different sectoral distribution of abatement across sectors than under the current policy framework. Specifically, given the relatively higher cost of emissions reduction in these sectors (compared to incumbent EU ETS sectors), one can expect, all else equal, that for a given equilibrium EUA price **more emission** reductions would occur in sectors currently included in the scope of the EU ETS and relatively few emissions reductions in the road transport and heating sectors**, at least in the short to medium term (i.e. to 2030).

The impact of an extension of the EU ETS on the price of allowances is hard to predict (as discussed in 3.4.1). Several studies expect a price increase towards 2030 (compared to the situation without the extension), which will be tempered by the complementary policy framework. A price increase will of course impact the existing EU ETS sectors. The following figure illustrates this for the power sector. If the EU ETS price would rise above 60 euro/tonne, it would reach the price level needed for a fast decarbonisation of the European power sector. In that case, coal would be phased out faster and renewable electricity production would be cheaper than any fossil power plant.

Figure 23: Costs for switching fuels in the continental European power market

Source: Agora Energiewende (2020)

Higher carbon prices could however pose **challenges to energy-intensive companies**, especially in the subsectors facing the risk of carbon leakage. That is why it remains important to foresee protection for carbon leakage in the policy framework, by means of free allocation to the subsectors which are in this situation and/or by the introduction of carbon border adjustment mechanism, which is being prepared[62].

3.4.5 *Impacts for governments*

A change in the existing EU climate policy architecture, which takes into account the **different income levels of Member States** in various ways, could affect the distribution of efforts and costs between Member States. E.g. the Effort Sharing Regulation has distributed the 2030 emission reduction effort over the Member States according to GDP/capita, this means that the richest Member States are required to deliver the strongest non-ETS emission reductions. By removing a large part from the ESR (transport and possibly also heating), this way of taking into account

[62] The Commission is preparing a proposal for a directive and a public consultation is upcoming, see https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12228-Carbon-Border-Adjustment-Mechanism

income differences between Member States would be truncated. So it will be necessary to find other mechanisms to alleviate the burden on the lowest income countries. This can be done in a transparent way by re-allocating the permit auction revenues.

What will be the **impact of a road transport ETS for national governments** and the various options on how it can be implemented?

The option of a separate new ETS or an integration of road transport in the existing EU ETS is, at first view, not expected to have important consequences for its impact on national governments. But if the first alternative would enable to keep transport both in the ESR and ETS scope, in contrast to the second option this would make a difference. If transport emissions would remain in the ESR scope, Member States would stay responsible for its emission reduction and would be stimulated to strengthen their climate policy package for road transport.

The introduction of a road transport ETS can have a **large impact on national government revenue**. There are two components influencing government revenue: the impact on auction income and the impact on the existing fuel taxation revenue.

- The impacts on auction revenues are straightforward. In the case of free allocation there will be no increase of the EU ETS auction revenues for Member States. In the case of auctioning this extra revenue stream is the volume of transport allowances multiplied by the EU ETS price, e.g. starting from the current (EU-27 emission in 2018) 786 Mt CO_2 emissions from road transport, a carbon price of 40 euro/tonne would generate 31 billion euro in the first year. In further years this auction income will depend on the interplay of increasing carbon prices of the one hand and decreasing allocations on the other hand.
- The impact on the existing fuel tax revenues cannot be ignored however. As we said the average implicit carbon tax of the existing fuel taxation is around 240 euro/tonne for petrol and around 160 euro/tonne for diesel. So **each tonne of CO_2 reduction reduces the existing excise income of national governments with on average 200 euro**. This loss of excise income might be more important than the extra income thanks to the auction revenues from road transport.

On the path towards carbon neutrality, road transport fuel consumption – and excise tax revenues – will substantially be lowered, irrespective of whether this fuel consumption decrease is achieved via an ETS or via other policy instruments. The advantage (from the point of view of national Finance ministries) of the ETS with auctioning is that 1) the loss of excise income is (partially, fully or more than fully, depending on the circumstances) compensated by auction revenues, and 2) that, in the short run, abatement is expected to take place more in the other sectors and hence fuel consumption reduction and thus tax income reduction are delayed.

This highlights again the need for a substantial reform road transport taxation: the existing fuel taxation is not only distorting the efficient allocation of abatement efforts, it is a revenue source which is drying up.

National governments can use the auction income for various objectives.

- As said, it could be desirable to use this income to finance a downward adjustment of the current level of their existing fuel duties. This could neutralise/sterilise the effect of the policy change for road users upon introduction of the ETS and allow for a smoother transition into the new policy regime.

- National governments could use the additional auction revenue to alleviate the distributional impacts for certain groups of households or freight transport drivers/companies, via income transfers or specific instruments.
- It could also be desirable to use this revenue to expand and/or strengthen the complementary road transport policies, such as investments in alternative fuel infrastructure, public transport supply, infrastructure for non-motorised transport modes and support for research and development for low/zero carbon road transport.

4 Summary and conclusions

1. The EU has set a GHG reduction target of 55% in 2030 and climate neutrality in 2050, therefore a decrease of transport emissions by 90% would be needed in 2050. Road transport is responsible for 71% of total transport emissions and this amounts to 786.2 Mt CO_2 in 2018. Between 1990 and 2018 **road transport emissions have increased by 27%.** Existing policies are not expected to reach the targets. A new policy framework that targets not only relative emissions but also reverses the evolution of the absolute emissions is needed. **A cap on the emissions could provide this.**

2. Abatement costs in the road transport sector are, at this moment, much higher than in other sectors. This is the result of the high road fuel taxes that act as effective carbon taxes. The EU-27 unweighted average of **implicit carbon prices of current nominal energy and carbon tax rates amounts to around 240 euro/tonne CO_2 for petrol and around 160 euro/tonne CO_2 for diesel**. This can be compared with **abatement costs in the EU ETS sector of 30 to 40 euro/tonne CO_2** and sometimes even less in the building sector. **So trade would be useful.**

3. Including the transport sector and the other sectors in an ETS system has the advantage of putting an **absolute cap** on emissions which can be set to strongly decrease in the long term. In theory it can contribute to **a more cost-efficient distribution of the abatement efforts** but the current high fuel taxes for road transport preclude a perfect cost-efficient distribution of abatement efforts.

Indeed, as long as current high fuel taxes remain in place, a simple integration of the transport sector in an ETS system would imply adding the permit price to the existing fuel (carbon) taxes and would increase the cost of abatement in the transport sector without any guarantee of a more efficient European climate policy.

A **tax reform is needed to lower progressively the existing fuel taxes so that carbon permit prices can really play their role**. A tax revision is needed anyway as the future reduction of transport fuel use will erode the tax base and strongly reduce tax revenues.

4. On the design options we find that an **EU-wide, upstream system, including al transport fuels and both for passenger and freight transport** has the most advantages. The allocation of allowances via **auctioning** is preferable over free allocation as a free allocation would lead to large rents (windfall profits) for the fuel distributors. Auctioning would generate a substantial extra income stream for national governments, but this needs to be corrected for the decrease of their national fuel taxes. The net effect on the fuel price for the consumers is rather unclear as an efficient carbon market would bring the abatement costs in the transport sector (160 – 240 euro/tonne CO_2) closer to the abatement costs in other sectors (30 à 40 euro/tonne CO_2).

5. If one does not correct for the already high carbon taxes in the transport sector, **fuel prices for consumers are expected to increase**, and the increase of the fuel transport bill will depend on the income category and situation of households. Poorer households, owning an inefficient car and living in remote areas with less alternatives for car use will be hit most. So **flanking policies are necessary**.

6. Setting up **an ETS system for road transport alone is not useful**, as the abatement costs are already high in all subsectors (freight, passengers and petrol, diesel). One would forego the

possibility to trade with cheaper options in other sectors. The only advantage left would be the absolute cap on road transport emissions.

In terms of cost-efficiency, the **inclusion of road transport in the existing EU ETS** seems the best scoping option if one reduces the existing road fuel taxes. This option would enable the **largest efficiency gains, limit transaction costs and could strengthen the existing EU ETS by improving market liquidity**.

7. A more efficient larger carbon market requires a reduction of existing motor fuel taxes and some consider this as a **risk that can delay the innovation and its uptake** in the road transport sector. There are however **two important counterforces**. First, there are the **CO_2 standards** for vehicles that reduce the emissions for all new cars and trucks. These standards also generate important spill-overs to the rest of the world in terms of technology transfer. Second the permits are bankable and this creates a **long term price signal** that will guide car manufacturers and consumers in their innovation decisions. This is an economy wide signal that will **reallocate efforts across sectors and intertemporally in an efficient way**, if governments stick to their climate policy goals.

8. To limit other potential risks (outside supply-demand unbalances, there can be risks concerning the correct monitoring, reporting and verification etc.) of hampering the functioning of the EU ETS, it can be an option to foresee a **transitionary phase with a separate ETS for buildings and road transport fuels** alone, which will evolve to a fully integrated system.

9. Concerning the interaction with other policy instruments, we conclude that, for the purpose of CO_2 reduction, **many of the existing climate policies for road transport are complementary to an inclusion of road transport in an ETS**. In the first place the CO_2 standards for vehicles, they help to make consumers to choose for fuel efficient vehicles (also in the presence of split incentives). Additionally they foster R&D. The other complementary policies set sustainability criteria for alternative and renewable fuels/energy, help to inform consumers, take away barriers and supply alternatives to car use. From an economic efficiency perspective it is better to set the targets for renewable and sustainable fuels at a high economy-wide level, without a specific sub-target for road transport.

10. Road transport should be **removed from the Effort Sharing Regulation and the Energy Efficiency Directive if included in an ETS**, as a European wide ETS takes over this function. The **pricing instruments (the Energy Taxation Directive, national fuel taxes and the proposal to introduce a CO_2 element in the Eurovignette Directive) are to be revised as the EU ETS carbon price is now taking over the climate policy function in a more efficient way.**

The **inclusion of road transport in the EU ETS**, combined with a **decrease of the existing fuel taxes**, has the advantage of setting a **cap on the absolute emissions**, to make use of the cheaper abatement options in other sectors and hence to **reallocate efforts across sectors and intertemporally in the most efficient way**.

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Annex 1: Answers on the consultation of the Inception Impact Assessment of the European Commission on updating the EU emissions trading system (EU ETS)

This overview is a selection from the 262 reactions received by the European Commission. All answers are available on https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12660-Climate-change-updating-the-EU-emissions-trading-system-ETS-

FIA answer to the consultation of the Inception Impact Assessment (26/11/2020)

Envisaging to include road transport into the EU emissions trading system (EU ETS) must then go hand in hand with an assessment of all the tools that contribute to limiting the emission of greenhouse gases and, to benefit most from the market mechanism, carbon emissions should be priced equally, wherever they are generated.

The inclusion of road transport into the EU ETS addresses an objective currently covered by a number of policies (Energy Taxation Directive etc), which would need to be adapted accordingly for the reform to be financially neutral for the consumer, as adding a burden can have a significant impact on the price of mobility. This statement is especially true when it comes to rural areas, due to the higher distances and the lower quality of public transport services.

FIA Region I therefore recommends that vehicle energy efficiency standards, and the promotion of alternative fuelled vehicles and fuels, should remain a priority of action in climate policy. Indeed, the FIA Bureau recently published research confirming that technology, investment, command, and control measures are most effective in further reducing greenhouse gas emissions.

Tesla

Tesla recommends not to extend the Emissions Trading System to road transport for the following reasons:

• The EU CO_2 regulations for cars, vans and trucks has proven to be the single most important driver for emission reductions in the transport sector and for accelerating the transition to an electrified fleet in the EU. Tightening and refining these pieces of legislation should be the focus for transport decarbonisation policies. Inclusion of transport in the ETS will inevitably cause policy competition;

• Should a pricing system for transport fuels be implemented, the resulting price signal cannot be expected to generate effective incentives for drivers to switch to zero emission vehicles. Europe's fuel taxes are in excess of EUR 200/tonne CO_2 already, without a notable impact on the uptake of EVs. In addition, an EU-imposed, de facto additional fuel tax will cause pressure on national governments to soften its impact on the electorate (i.e. reduce the existing fuel tax by a similar amount), further undermining the already very limited effectiveness of the policy.

• If the inclusion of road transport in the ETS is accompanied with taking the transport sector out of the Effort Sharing Regulation, national governments would be exempted from designing and enforcing green transport policies. This would further undermine a fundamental driver for effective climate policy in transport.

Eurometaux

While we welcome the increased focus on non-ETS sectors to accelerate their contribution to emission reductions, which do not support including sectors such as road transport and buildings in the EU ETS. These sectors have considerably higher carbon abatement costs than the EU ETS, and thus would likely considerably drive up the EU ETS price. We thus believe that separate carbon pricing schemes for these new sectors would be a more suitable solution. In particular the extension of emissions trading to maritime emissions, should be evaluated based on the maritime sectors abatement cost possibilities, meaning the delta between present abatement solutions in the existing ETS sectors and maritime sector. Furthermore, extending the EU ETS to emissions from buildings and road transport or all fossil fuels combustion and waste incineration, should neither be carried out before sufficient MRV procedures have been established for each of the sectors. For some sectors, as the transport sector, pricing the cost of emissions is not enough to require making a difference. The first steps should therefore be developing parallel system. Linking of the systems should be evaluated at a later stage, also to avoid market shocks due to the very different nature and abatement costs of these sectors.

German Association for the Automotive Industry VDA

In the transport sector, the current approach of regulation, is neither effective in terms of reaching the climate goal, nor efficient in terms of least cost avoidance. The desired mitigation cannot be reached solely by CO_2 reduction of new cars, and avoidance cost is completely out of scope, compared to other sectors. A clear pathway towards an extensive and market-based emission trading system covering all sectors would solve this problem. In the interest of a reliable achievement of the climate goals, the VDA welcomes the recent communications by the Commission which opens for the idea of an expanded emission trading system and would like to encourage the installation of a powerful and comprehensive emissions trading system (ETS) for a 2030 ambition level setting and a prospective policy design towards 2050. Principles of an emission trading system:

1. CO_2 pricing should become a crucial basis and core element of defossilisation in Europe to support the transformation towards carbon neutrality by differentiating between fossil and renewable energy carriers.
2. A clear pathway towards an extensive and market-based emission trading system (ETS) covering all sectors should be established. A consequent introduction of an ETS is the only approach, which guarantees both effectiveness as well as efficiency. Further, due to the extension of ETS more participants will pay for allowances. That means all sectors participate in the financing the defossilisation.
3. An emission trading system should set a pathway towards 2050. The number of GHG allowances ("CAP") should be aligned towards this goal stepwise for the upcoming years, there should be a free market for allowances ("TRADE").
4. Climate protection costs money and requires effort in terms of investment and innovation, but it is money well spent. The function of an ETS is to minimise these costs to a necessary amount ("least cost avoidance").

5. A clear commitment towards a substantial price signal can ensure long-term planning certainty and can thus spur investment in green technology.
6. In order to reduce these costs, a future ETS should include as many emissions (sectors) as possible and should be designed towards a gradual spatial (worldwide) expansion.
7. The ETS should consider (only) the fossil carbon content of all energy carriers. Renewable energy must be exempt from the allowance requirement due to its irrelevance for climate change.
8. A convergence between ETS and energy tax systems should be aimed for. However, in a long-term perspective, only one overarching system for the whole European Union should set a price for CO_2 emissions and that should be the ETS.
9. The administrational overhead should be minimised as far as possible. Therefore, an upstream-approach is favoured.
10. Transitional elements (a "bridge" between today and the future) with ambitious targets are required, which take existing national schemes into account and lead to a harmonised CO_2 price and planning security for industry and customers. At the end of the transition period an alignment to the EU ETS ambition level must be achieved. This includes appropriate measures to prevent carbon-leakage.
11. The long-term goal must be to replace sector specific climate goals and regulations across EU Member States with one overarching EU ETS target for all sectors.

FuelsEurope

We support the long-term aim of a global CO_2 market across the whole economy based on a uniform carbon price. However, in the meantime we acknowledge that more than one market may coexist as long as there is a significant difference in marginal abatement cost across the different sectors of the economy. In line with the Clean Fuels for All campaign, we support the application of an ETS to road transport only in the form of a dedicated separate ETS scheme with its own carbon price. The emission factor for biogenic CO_2 (from sustainable biofuels) and circular CO_2 (from e-fuels and Waste-to-fuel) emitted during the combustion of fuels shall be zero. Concerning the maritime sector, FuelsEurope prefers a global carbon pricing system through the IMO. If an EU cap-and-trade option were to be introduced in the shipping sector, we would prefer a dedicated ETS scheme where the ship operators or owners are the obligated party. This approach can then pave the way for a future global system. To extend the scope of the EU ETS, we would request the Commission to impact assess: - the possible economic consequences of having different coexisting ETS schemes (either a main ETS with a secondary grouping new sectors or a main ETS with three individual ones for road transport, maritime and buildings respectively). - the effectiveness of any redesign of the ETS in achieving decarbonisation objectives.

European Automobile Manufacturers Association (ACEA)

We welcome the recent communications by the Commission which open up the possibility for an expanded ETS which could be developed as an upstream trading system regulating at the point of fuel distributors or tax warehouses. CO_2 pricing should become a crucial basis and core element of decarbonisation in Europe to improve the competitiveness of renewable energy and support the transformation towards carbon neutrality. The more sectors that are included in the ETS, the more reliably and economically efficient the overall emissions targets can be achieved. Stricter caps and such an ETS extension will likely increase CO_2 allowance prices to a level that starts to drive real change. A broad market uptake of alternatively powered vehicles across all segments can only be expected if the carbon content of all energy carriers and CO_2 emissions are priced appropriately. All energy carriers should therefore be part of a stronger EU ETS. Like electricity, where any decarbonisation is mainly driven by the system of ETS allowances, fuels should be part of the ETS trading system to provide a cost-efficient market tool to reduce emissions. Based on a thorough impact assessment, the exact form of the inclusion of fuels in the ETS needs to be considered. A carefully extended and modified ETS can then be considered a complementary system to help all sectors reach given targets in a holistic and cost-efficient way.

Transport & Environment

Analysing the three options described in this consultation, T&E expresses concerns. The Commission seriously envisions the possibility to repeal national targets and integrate road transport, as well as buildings into the ETS - a scenario based on carbon pricing theories, designed by economists and that deliver emissions reductions only on paper, but not in the real world. The risk is high that the whole architecture may crumble for lack of ambition. In these conditions, the target of 55%, although adopted on paper, may never be achieved by 2050.

T&E regrets that the Commission did not include the option of maintaining the current architecture by raising both the ambition of the ETS and the ESR. The ESR has proved to be an efficient tool to incentivise climate action:

● At national level, the targets have been - and will continue to be - an important driver for domestic investment in infrastructures such as charging, low emission zones and building renovation. They have led to ambitious taxation reform in some countries (see graph below)

● At EU level, Member States have supported ambitious EU regulatory measures (e.g. CO_2 standards) to more easily achieve their national objective.

<u>Repealing the ESR</u>

● National targets at risk. The ESR contributed to the adoption of national policies, and more will be needed this decade. The EC must factor the risk of domestic policies to slow down in the case where national targets would be repealed.

● EU policies in danger. The repealing of the ESR will also alter the motivation of the Council to adopt ambitious EU sectoral measures. The Commission should factor the potential for an extended ETS to jeopardise increased ambition in many other climate regulations.

<u>Extended ETS</u>

● Inefficient measure for the climate. Analysis shows that under an extended ETS, additional emissions reduction in road transport will be about zero in 2030 and less than 10% in 2050 due to its inelastic demand (see graph below). Additionally, within an extended ETS, a carbon price significant enough for road transport would be exorbitant for energy intensive industries.

● The fuel price increase resulting from the inclusion of road transport into the ETS will hit the low-income population the most, without addressing existing market barriers. The EC should really consider if it wants to link the Green Deal with impacts on the most vulnerable.

● Carbon pricing in road transport does not lead to fuel switching or timely investments into zero emission technology. To achieve 2050 targets, the last ICE car should be sold in 2035 at the latest. The Impact Assessment of the Climate Target Plan shows that ambitious CO_2 standards compete politically with the road ETS. Standards have been the only tool that brought the transition from combustion to electric cars.

● A European-wide ETS will leave the door open to domestic compensations, as illustrated by the German system. Starting in 2021, Germany will start a "cap and trade" for road transport. While this cap and trade resemble a tax (the CO_2 price is determined by law - unlike), compensation measures have already been announced by the German ministry to compensate lorries for the additional cost.

<u>Option 2: Limited damage under conditions</u>

A carefully-crafted and fair carbon pricing could be explored for road transport if some conditions are met: ● If national targets remain in place and are strengthened. ● If car CO_2 standards become annual and reach 65% in 2030. Other measures must be taken to accelerate road transport CO_2 cuts. If not, the carbon price will spiral out of control. ● If it is a system exclusively for road transport, with clear considerations on how the revenues could be used to contribute to the transition in the sector, particularly the most vulnerable. ● If no flexibility exists between this system and LULUCF and the EU ETS. Administratively, it is possible to maintain road transport in the ESR and create a separate carbon pricing mechanism. Article 2 should be modified to integrate the list of sectors covered in the ESR, using UNFCCC categories.

Business Europe

Extension of scope: The envisaged extension to other sectors, such as maritime, road transport and buildings, is a sensitive undertaking and must be considered very carefully. In any cases, an immediate inclusion of new sectors into the existing ETS would cause disruptions that risk jeopardizing the existing carbon market. Therefore, only separate emissions trading schemes could be envisaged at the beginning, with a view of possibly merging the systems towards 2050.

Expansion to other sectors: As sectors have quite different exposure, price elasticities and abatement costs and thus would price carbon quite differently, forcing a single carbon market within the next few years would cause severe distortions in the existing system. Therefore, one needs to start with parallel systems, with a view of possibly merging the systems towards 2050. In this context, it will also be important to evaluate the practicability of upstream emissions trading and to address emerging issues with the effort sharing regulation.

Abbreviations, symbols and units

CaT	California Cap-and-Trade programme
CO_2	Carbon dioxide
CO_2 eq	Carbon dioxide equivalent
COVID	Coronavirus disease
EC	European Commission
EEA	European Environment Agency
EED	Energy Efficiency Directive
EFTA	European Free Trade Association
ESR	Effort Sharing Regulation
ETD	Energy Taxation Directive
ETS	Emissions Trading System
EUA	EU Emission Allowance
EUAA	EU Aviation Allowance
GDP	Gross domestic product
GHG	Greenhouse gas
HDV	Heavy Duty Vehicle
ICAO	International Civil Aviation Organisation
kg	Kilogram(s)
km	Kilometre(s)
LDV	Light Duty Vehicle
LULUCF	Land Use, Land-Use Change and Forestry
MJ	Megajoule
MSR	Market Stability Reserve
Mt	Million tonnes
N_2O	Nitrous oxide
NECP	National Energy and Climate Plans

R&D	Research and Development
RED	Renewable Energy Directive
SME	Small and Medium Enterprises
SUV	Sport Utility Vehicle
TEN-T	Trans European Transport Network
TNAC	Total Number of Allowances in Circulation
TTW	Tank-to-Wheel
UN	United Nations
WAM	With additional measures
WLTP	Worldwide Harmonised Light Vehicles Test Procedure
WTT	Well-to-Tank
WTW	Well-to-Wheel