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a look at ...

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Greenhouse gas emissions in the road transport sector: moving towards inclusion in the European system of CO_2 allowances?

In the year 2000, out of 41.8 Gt of global greenhouse gas (GHG) emissions, almost 10% came from transports sector. In Europe, this share of transports GHG emissions rises to 21% and emissions are forecast to rise. Against this background, should the road transport sector be included in the European Union Emissions Trading Scheme and thereby contribute to national GHG emission reduction targets?

Is it legally possible to include road transport in the EU ETS?

The idea of extending the scope of the European Union Emissions Trading Scheme (EU ETS) to sectors other than energy and industry is not new. Since 2012, after many difficulties, CO_2 equivalent emissions (CO_2e) of the European air transport sector are finally to be restricted. The political objective of the European Union (EU) was to triggered discussions within the International Civil Aviation Organization, with a view to implementing an international agreement on CO_2 emissions in the aviation sector after 2020.

In addition to these efforts, the issue of extending the scope of the EU ETS to road transport has been analyzed since 2007 in a European Parliament report[1]. In particular, the study recommends targeting fuel suppliers. But at that time, the European Commission (EC) considered that controlling the CO_2e emissions of road transport would entail high transaction costs.

In 2012, when the imbalance between supply and demand for allowances is constantly worsening, the idea of including transport in the EU ETS came up again. The EC published a report on the state of the EU ETS in 2012[2] presenting six options for reform. One of these included extension of the scope of the EU ETS to CO_2 emissions directly related to the use of fuels. New proposals published by the EC[3] on operation of the EU ETS for 2030 are discussed.

In the EU ETS Directive[4], the road transport sector can only be included in the EU ETS *via* the opt-in provision (art. 24). This gives Member States the option of introducing, voluntarily and unilaterally, new GHG or new sectors. Denmark, for instance (whose CO_2e emissions from road transport represent over 24% of total GHG emissions in 2012) is the first European State to express, in September 2014, its wish to include the road transport sector in its national ETS target.

In preparation for post-2020, the European Council of October 2014[5], in its conclusions, confirms the option for a Member State to include transport in the EU ETS by the opt-in process. While certain Member States have clearly announced their opposition to the introduction of transport sector CO_2e emissions in the EU ETS, Denmark could become the first country to experiment with such inclusion if the EC agrees to its request. In addition, the European Council has confirmed the EC proposal to

(1) European Parliament, Department for Economic and Scientific Policy, The Future Elements of the EU Emissions Trading Scheme (IP/A/ITRE/FWC/2006-087/lot 4/C1/SC3)

(2) European Commission, The State of the European Carbon Market in 2012, November 2012
(3) European Commission, Communication for a European Union Energy and Climate Policy Framework for 2030
(4) Directive 2009/29/EC, Article 24
(5) European Council, 23 and 24 October 2014

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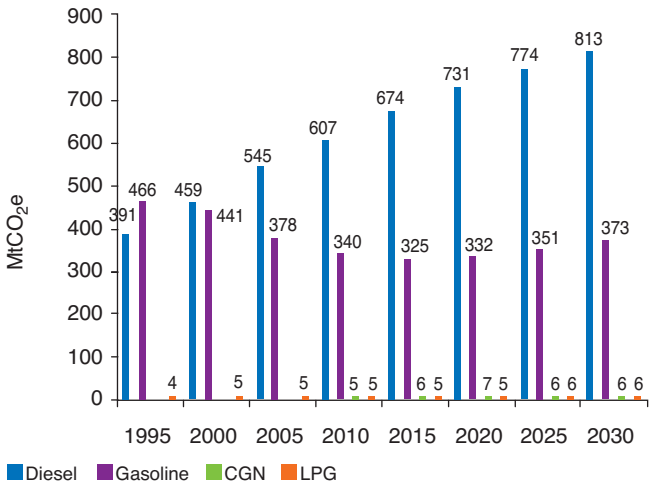
reduce its GHG emissions by 40% by 2030 by comparison with 1990 levels, and the reductions expected *via* the EU ETS are set at 43% in 2030 by comparison with 2005 levels. Against this background of future revision of the EU ETS directive, the question of including the transport sector in the EU ETS arises.

What do the GHG emissions of the road transport sector represent in Europe?

In 2011, EU-28 emitted a total of 4.6 Gt of CO_2e for all sectors combined, down by 18.4% since 1990. While in 2011, industries and energy providers are the main emitters with over half of GHG emissions, the transport sector is in second position with 21% of total emissions[6]. Between 1990 and 2011, the transport sector is the only sector whose GHG emissions increased by 150 Mt of CO_2e ($MtCO_2e$).

In 2000, road transport GHG emissions came mainly from two fossil fuels: gasoline and diesel; emissions from compressed natural gas (CNG) and from liquefied petroleum gas (LPG) were extremely low (Fig. 1). Since 2000, the relative share of GHG emissions from gasoline and diesel has been reversed, and emissions related to diesel combustion dominate for the first time. This trend is growing fast: in 2013, GHG emissions from diesel were twice as high as those related to gasoline, and EC projections — Business as Usual or baseline scenario (BAU) — show this gap widening.

Fig. 1 – GHG emissions by type of fuel in Europe (Road transport – all vehicle types)

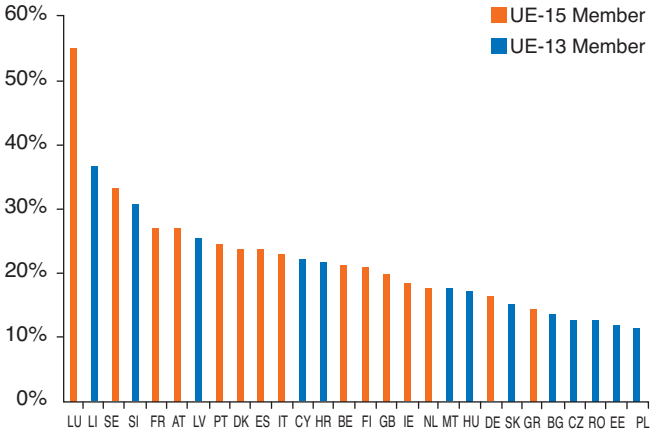


Source: Tremove (www.tremove.org)

Within the automobile fleet, GHG emissions from passenger cars are the majority. In 2010 for instance, European GHG emissions from the passenger fleet are three times higher (729 $MtCO_2e$) than emissions from the freight transportation (227 $MtCO_2e$). By 2030, the EC anticipates a continuation of this trend in its baseline scenario.

However, the share of GHG emissions due to transport is not the same in all European countries. In 2010 for instance, road transport GHG emissions in the EU-15 countries[7] represented 90% of road transport GHG emissions of all EU-28. This difference is partly due to the higher number of vehicles and distances travelled per vehicle in EU-15. In the same way, the percentage of road transport GHG emissions in national emissions can vary considerably. For instance within EU-28, 18 countries have road transport GHG emissions of over 21%, which is the European average; and five countries (Liechtenstein, Luxembourg, Slovenia, Sweden and Switzerland) have GHG emissions from road transport accounting for over 30% of their total emissions (Fig. 2).

Fig. 2 – Share of road transport GHG emissions in all the country's emissions in 2012



Source: European Environment Agency

Decarbonizing the European automobile fleet is a challenge for meeting the 2030 reduction target. The share of fossil fuels, the demand for personal transport and the energy efficiency of transport are key factors to be controlled. Different measures have already been put in place by European constructors, such as CO_2/km emissions of new vehicles, reduction targets of consumption in L/km by 2021, and the target of a 6% reduction in fuel intensity by 2020[8]. For countries whose share of road transport GHG

(6) 99% of road transport emissions are CO_2

(7) EU-15: the first 15 EU Member States

(8) Fuel Quality Directive 98/70/EC

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emissions represents over 30% of their GHG emissions, this is a major challenge: the reduction effort could be not only significant, but also very costly.

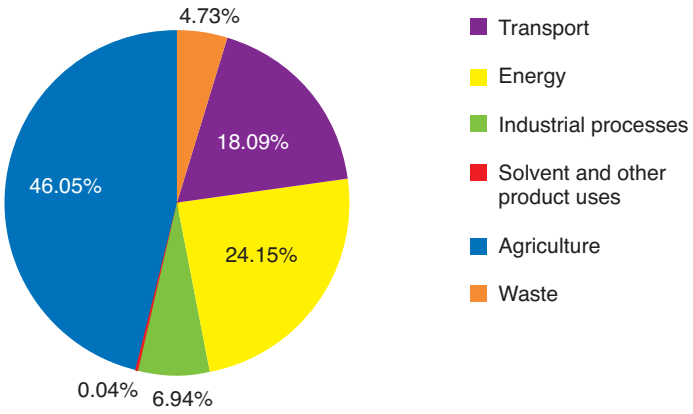
Internationally, three ETS include or plan to include the road transport sector

Since the implementation of the EU ETS in 2005, other ETS have been developed but only a small number include or envisage including road transport within their scope.

New Zealand since 2008

The New Zealand emissions trading system was launched in 2008. It is the first system in the world to include the road transport sector. Since January 2010, liquid fossil fuel suppliers have been required to declare their CO_2 emissions, and since 1 July 2010, compliance has been mandatory.

Fig. 3 – 2012 sectoral distribution of GHG emissions in New Zealand, excluding LULUCF[9]



Source: New Zealand NIR, UNFCCC, 2014

In 2012, transport CO_2e emissions in New Zealand represented 18% of national emissions of CO_2e and 43% of CO_2e emissions of the energy sector[10] (Fig. 3). In transport, road transport emissions dominate with 91% of CO_2e emissions in 2012. Because the national effort for reduction of GHG emissions is – 5% in 2020 *versus* 1990 levels, and because the New Zealand ETS is the main instrument for emission reductions, it could be difficult to avoid taking the road sector into account.

The constraint concerns liquid fossil fuel producers and importers

The New Zealand ETS covers liquid fossil fuel suppliers[11] in terms of producers and importers having produced or imported over 50,000 litres of liquid fossil fuels per year. A voluntary opt-in procedure is authorized for the main fuel distributors, selling over 35 million litres (ML) per year or over 10 ML of aviation fuel. The fuels covered are petrol, diesel, natural gas and kerosene for aviation, together with domestic fuels. LPG and biofuels are exempt, together with fuel marines and kerosene used for international flights.

Calculation of emissions: two methodologies and two types of emission factor

The calculation of CO_2 emissions determining the compliance obligation varies according to the type of participation: compulsory or voluntary. The calculation of emissions for a fuel supplier required to comply is determined by the volume of each fuel, after deduction of the biofuel content, multiplied by the emission factor assigned to each fuel. The calculation of CO_2 emissions for a voluntary participant (e.g. a fuel distributor) is different: only the CO_2 emissions from fuels purchased from suppliers covered by the ETS must be calculated.

Two types of emission factor are proposed: the first is based on default emission factors set by legislation; the second is a single emission factor calculated specifically by the subjected entity and validated by the administration.

Compliance achieved by the purchase of one unit for two units of emissions

Liquid fossil fuel suppliers do not receive a free allowance for their compliance. One of the specific features of the New Zealand system is its lack of a reduction target. The entities covered can emit as much as they wish, on condition that each ton of emissions is accompanied by the purchase of an " emission unit" which may be a New Zealand allowance (NZU) or an international credit[12]. The New Zealand allowance is an allowance assigned to the forestry sector or to industrial sectors.

Since 2008, two transitional arrangements have been applied to liquid fossil fuel suppliers to reduce their compliance costs. The first is the authorization to offset 2 t of CO_2e emissions by a single emission unit. The second is the option of buying an NZU allowance directly from

(9) LULUCF : Land Use, Land-Use Change and Forestry
(10) New Zealand's Greenhouse Gas Inventory 1990-2012, Ministry of the Environment, April 2014, National Inventory Report submitted to the UNFCCC

(11) Five in number: BP, Caltex, Gull, Mobil and Shell
(12) International credits are credits authorized by the Kyoto protocol: Certified Emission Reductions (CER), Emissions Reductions Units (ERU), Removal Units (forestry credits) and Assigned Allowances Units.

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the government at the fixed price of 25 NZ$ (15.8). This fixed price purchase option is equivalent to an NZU ceiling price, and therefore to a ceiling price of a ton of CO_2e at 12.5 NZ$ (7.9). These transitional measures were intended to finish at the end of 2012 but have been extended until at least 2016.

California from 2015

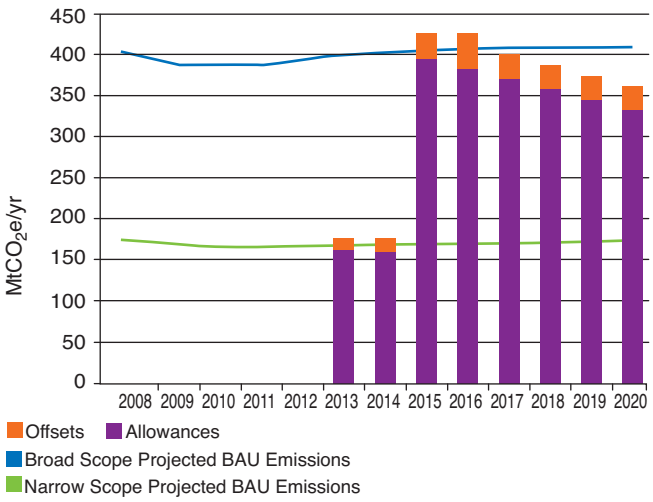
The Californian Global Warming Solutions Act (AB32 - 2006) sets a restrictive target for 2020 GHG emissions, equivalent to emissions in 1990, *i.e.* a maximum of 431 $MtCO_2$e. In reality this target corresponds to a 15% net Californian emissions reduction in relation to the counterfactual baseline scenario.

In this context, the Californian CO_2e allowances trading system, alongside other sectoral GHG reduction measures, has contributed since 1 January 2013 to the 2020 reduction effort. The expected reductions *via* the allowances system are estimated at 23 $MtCO_2$, or almost 30% of the reductions required to reach the 2020 target. By comparison, the expected reductions from the sectoral measures, excluding ETS, are estimated at 55 $MtCO_2$ in 2020 (whose half from the transport sector alone). This means that twice the reductions are expected from the sectoral measures than from the carbon market. Carbon market is a tool that supports sectoral measures.

In transports sector, California has adopted different public policies. These include measures for vehicle engine efficiency, development of zero emission technologies, reduction of fuel carbon content and improvement of land use. Since 1 January 2014, the California and Quebec allowances systems have been connected *via* the Western Climate Initiative, including transports sector.

In 2015, after inclusion of transports sector, almost 85% of Californian GHG emissions, from 600 entities, will be included in the ETS, representing approximately 395 $MtCO_2$e (Fig. 4). In addition to industrial sites, energy sites and sites generating and importing electricity, suppliers of Reformulated gasoline Blendstock for Oxygenate Blending (RBOB) and distillate fuel oil, LPG, mixed fuels and liquefied natural gas (LNG), together with all suppliers of CO_2, will have an obligation of compliance. Fuel distributors will be subject to carbon market requirements as soon as the annual threshold of 25 kt of CO_2e of emissions[13] is reached, including CO_2e emissions associated with fuels imported under the Californian ETS.

Fig. 4 – Difference between projected GHG emissions in California and profile of carbon credits and allowances



Source: CARB, California Cap and Trade Regulation

During the first phase (2013-2014)[14], on average 90% of allowances were allocated free of charge based on the product or on the energy benchmark – mainly to electricity providers and to industries exposed to international competition, such as refineries. In 2013, out of 175 $MtCO_2$e emissions were covered by the system, and 162.8 million allowances were allocated free of charge. From 2015, with the arrival of fuel suppliers, the number of allowances will be increased to 394.5 $MtCO_2$e. This allocation will be reduced, to reach 334.2 $MtCO_2$e in 2020. The fuel suppliers will be the points of regulation for the transport sector, each ton of CO_2e emissions will have to be offseted and they will not receive any free allowance. They will have to buy allowances or offset credits on the market at auction, which will increase fuel prices.

The Californian ETS was launched in 2012 with a floor price at auction of US$10. This floor price increases by 5% per year (plus inflation). In parallel, from 2013, a reserve of allowances is set up every year. This reserve should allow marketing, in the event of a shortage, of additional allowances at a floor price of between 40 and US$50. This reserve price will also increase by 5% per year plus inflation.

To achieve compliance, the sites can use WCI allowances and certain types of carbon credit. These credits must be approved by the California Air Resource Board (CARB) and must not exceed 8% of the total allowances held by a site. Credits issued under the Kyoto Protocol (CERs and ERUs)

(13) Related to the complete combustion or oxidation of fuels

(14) Phase 1: 2013-2014, Phase 2: 2015-2017, Phase 3: 2018-2020

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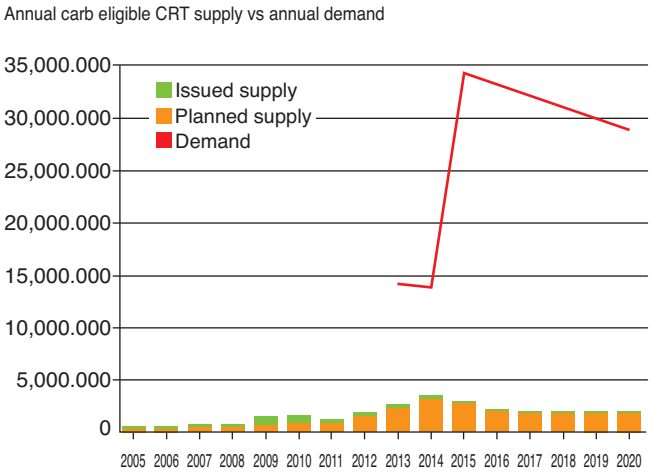
are not accepted on the Californian or Quebec markets. With the inclusion of the transport sector, the number of carbon credits available on the market will probably not be sufficient to meet the demand for credits, estimated at 232 $MtCO_2e$ between 2013 and 2020 (Fig. 5). The sites will therefore have to make greater use of allowances auctioned, which will increase the cost of compliance in the longer term.

Fig. 5 – Supply and demand for eligible carbon credits in the Californian ETS



Source: Point Carbon, Project Manager North America – Thomson Reuters

The Chinese pilot ETS in Shenzhen under consideration

The aim of the Shenzhen pilot ETS is a 19% reduction in GHG emissions per unit of GDP in 2015, compared with 2005 levels. Discussions on the inclusion of road transport CO_2 emissions started in April 2014, when the Shenzhen municipal authority announced its willingness to include the CO_2 emissions of buses and taxis in its pilot ETS. This inclusion of road transport in its ETS can be explained by the fact that in 2010, 27.9% of the city' s CO_2 emissions came from the transport sector. This consideration is even more important that the share of CO_2 emissions due to transport for 2015 is projected to be 40% of the total emissions of Shenzhen. Analyses are currently under way to determine the impact of including the CO_2 emissions of buses and taxis. In July 2014, a cooperation initiative was inaugurated between the Shenzhen Municipal Transport Committee and the German cooperation agency, in order to create a platform for the calculation of road transport CO_2 emissions.

Are these methods of including the transport sector in an ETS compatible in Europe?

What place for the carbon market in GHG reduction policies?

While all these carbon markets have in common is to contribute to GHG reduction targets, they are not all considered to be the main tool of public policy. For instance, by contrast with the choice made by the EU and New Zealand, the Californian ETS complements other public measures for GHG reduction, even though the CO_2e emissions of the transport sector represent 37% of the State' s CO_2 emissions. In the final analysis, the Californian ETS guarantees the final GHG reduction target.

Note however that in Europe, since 2008, many programmes aimed at controlling the energy consumption of transports, developing electric vehicles, improving engine performance, developing biofuels, etc. have been implemented, without however succeeding in reducing the absolute emissions of the sector.

An intelligent mix between ETS and public policies for transport GHG reduction needs to be found, in line with the marginal reduction cost in the sector.

A significant share of transport emissions in total emissions

If the share of GHG emissions by the road transport sector is higher than 20-25% of global emissions, and if this share is rising sharply, then in the long term it could threaten the GHG emissions reduction target. In New Zealand, for instance, 18% of GHG emissions are from transport; this figure is 37% in California and 27.9% in Shenzhen. In Europe, the share of transport GHG emissions was not negligible in 2011 (21%) and is on the increase, while the EU ETS GHG emissions reduction target (proposed in January 2014) is – 43% in 2030.

Dominant fossil fuel emissions and unrestricted biomass

For all these markets, the share of CO_2e emissions from fossil fuels (gasoline and diesel) is predominant. The other fuels, whose fossil carbon content at combustion is lower (LPG, CNG), or non-existent (biomass), represent a very small percentage of fuel consumption.

In all the markets studied, the CO_2 emissions associated

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with the combustion of biomass in engines and/or its oxidation are accounted for as equal to zero for site compliance. In the EU ETS, generally speaking, biomass emissions are also accounted for as equal to zero for site compliance.

Fuel suppliers are the points of regulation

Whether in California or New Zealand, the point of regulation is at the level of fuel suppliers (and importers). The restriction is calculated on the basis of emissions associated with quantities of fuels sold (based on the fuel carbon content). It must not be mistaken with refinery emissions, which are calculated on the basis of the Complexity Weighted Barrel[15] (CWB). This results (or will result), in both California and New Zealand, in a rise in retail fuel prices, although this will be very modest in NZ: about 1.9 cents per litre for gasoline and 2 cents per litre for diesel.

International credits play a key role in site compliance

The biggest difference between carbon markets probably is concerning the permission of using international credits.

While in California, credits resulting from the Kyoto Protocol cannot be used for compliance (since the United States has not ratified the protocol), they are by contrast the main units used for compliance in the New Zealand ETS! In Europe, from 2020, the EU ETS will no longer allow any carbon credits from Kyoto projects.

However, the possibility, provided by the Californian ETS, for achieving compliance by buying credits validated by the California Air Resources Board (CARB) and raised or generated from projects such as ozone layer protection or reforestation projects that are not necessarily implemented on Californian territory, clearly raises the issue of measurement of national effort and the fungibility of CARB credits at the international level. In other words, this raises the central issue, common to all markets, of standardization — or not — of the system used for Monitoring, Reporting and Verification (MRV) of CO_2e emissions. The importance of an MRV methodology recognized in all ETS becomes crucial.

Conclusion

Each country or region wishing to include the transport sector in its ETS must not only take into account its specific features in terms of GHG emissions and its own GHG reduction path, but must also consider the options envisaged for bringing the transport sector into compliance. The choice given to sites to meet compliance requirements through the use of offset credits could lead to a reduction in global emissions at low cost. This is very broadly, what is done by New Zealand and what will be done, to a certain extent, by California.

In the short term, in Europe, without any other option than to purchase European allowances, the inclusion of transport will have a two-fold consequence: a direct rise in fuel prices *via* inclusion of the allowance cost in the retail price, and a rise in the CO_2 allowance price caused by increased allowance demand from the road transport sector.

In 2011, the transport sector represented 21% of Europe' s total GHG emissions, i.e. a total of 950 $MtCO_2e$. Within the transport sector, the share of emissions due to road transport is predominant (94%) and represents almost 893 $MtCO_2e$. By comparison, in the same year, the emissions of sites included in the EU ETS represented almost 1,900 $MtCO_2e$. This means that including the European road transport sector in the EU ETS would amount to increasing the demand for allowances by half.

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(15) CWB: Solomon index used to calculate the allowances of a refinery