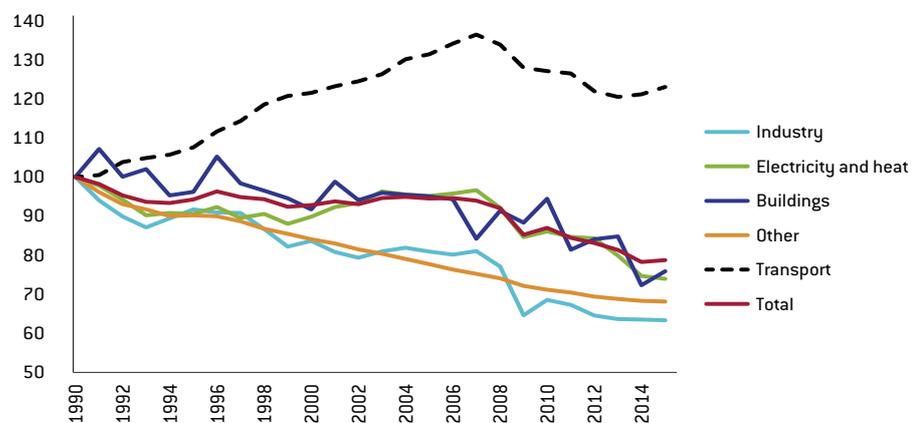


ADDRESSING EUROPE'S FAILURE TO CLEAN UP THE TRANSPORT SECTOR

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TRANSPORT: THE ONLY SECTOR IN WHICH EUROPE'S CO₂ EMISSIONS ARE ON THE RISE



Source: Bruegel based on EEA (2017). Note: 1990 = 100.

THE ISSUE

Under the Paris Agreement, the European Union has committed to cut its greenhouse gas emissions to 40 percent below 1990 levels by 2030. Between 1990 and 2015, emissions decreased significantly in all sectors with the exception of transport, which has seen a 20 percent increase. Transport is thus becoming a key obstacle to EU decarbonisation and more aggressive policies are needed to decarbonise this sector. A particular focus should be decarbonisation of road transport because it is responsible for more than 70 percent of overall transport emissions. Decarbonising road transport would also improve air quality in cities, which remains a fundamental challenge for better public health in Europe.

POLICY CHALLENGE

So far, national and EU policies have failed to foster road transport decarbonisation. However, this trend can be reversed by adopting a new EU post-2020 strategy with three main components. First, the EU should foster political momentum and encourage countries and cities to adopt plans to ban all diesel and petrol vehicles by 2030-2040. This would be a strong signal to the automotive industry to invest more strongly in clean vehicles, and to citizens to adopt more sustainable transport modes. The EU should provide support to countries and cities that take this route through a new EU Clean Transport Fund. Second, the EU should promote a Europe-wide discussion about the future of transport taxation. Third, the EU should focus its transport-related research and innovation funding on supporting new clean technologies that are not yet viable, but are potentially key to ensure deep decarbonisation of road transport in the longer term.

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1 TRANSPORT: A MAJOR OBSTACLE TO EUROPEAN DECARBONISATION

The European Union has the long-term vision to reduce its greenhouse gas emissions by 80-95 percent by 2050 compared to 1990 (European Commission, 2011a). In this framework, it adopted in 2014 a binding 40 percent emissions reduction target to be achieved by 2030 compared to 1990 – a target that also represents the EU's international commitment to the Paris Agreement. Meeting these targets requires a profound transformation in all the EU's key greenhouse gas emitting sectors: electricity and heat generation (currently responsible for 27 percent of EU emissions), transport (26 percent), industry (19 percent) and buildings (12 percent)¹.

Between 1990 and 2015, greenhouse gas emissions from the main emitting sector – electricity and heat – decreased by 26 percent, partly as a result of the sector's transformation underpinned by rapid advances in renewable energy technologies and by decarbonisation policies.

In the same period, greenhouse gas emissions from industry decreased by 36 percent, from agriculture and waste by 32 percent and from buildings by 24 percent. The only sector with rising emissions has been transport, with a 23 percent increase over the period.

Transport is therefore set to become the main obstacle to the achievement of the EU's decarbonisation goals, especially as transport activities are expected to grow in Europe, by 42 percent between 2010 and 2050 for passenger transport

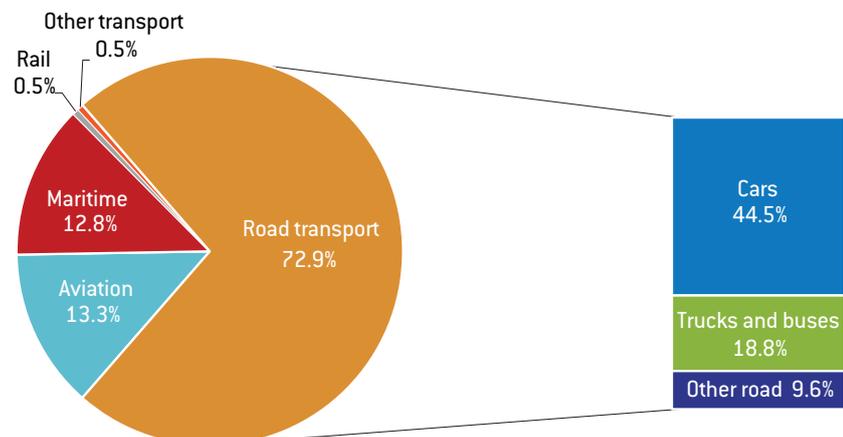
and by 60 percent over the same period for freight transport (European Commission, 2017a). To meet the current 2050 target of reducing transport emissions by 60 percent compared to 1990 (European Commission, 2011b), stronger policies are already required. However, to achieve net-zero emissions by mid-century – as implied by the Paris Agreement – transport would actually have to be completely decarbonised shortly after 2050. This obligation cannot be met without much stronger policies. Under current policies, emissions from the transport sector are projected to exceed 1990 levels by 15 percent in 2050 (EEA, 2016).

Policy should primarily focus on road transport, which is responsible for 73 percent of the EU transport sector's emissions (Figure 1). Decarbonising road transport is also decisive to improve air quality in cities, which remains a fundamental challenge for public health in Europe. Air pollution is responsible for more than 400,000 premature deaths each year in Europe (EEA, 2016). Pollution from road transport, including sulphur dioxide, nitrogen dioxide and particulate matter, is a key contributor to this problem, notably in urban areas with high traffic volume².

Though necessary, decarbonising road transport is difficult. The two toughest challenges are fostering technological innovation and deployment of clean vehicles, and promoting a modal shift.

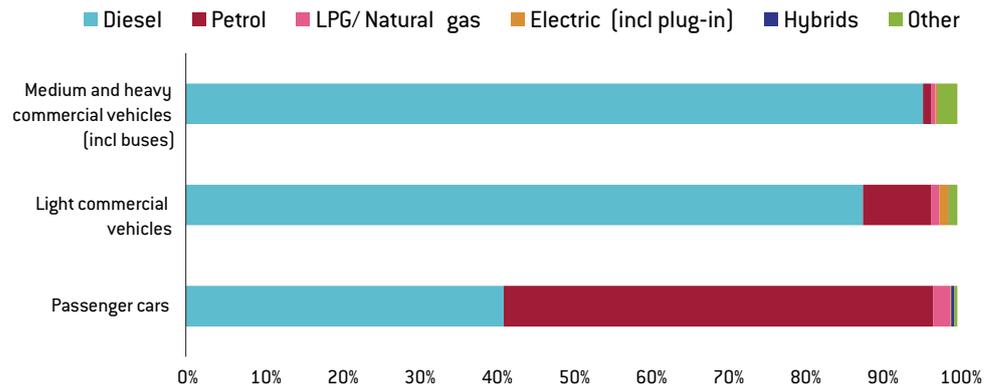
1. Other sources account for 16 percent of the EU's greenhouse gas emissions.
2. "The annual EU limit value for nitrogen dioxide, one of the main air quality pollutants of concern and typically associated with vehicle emissions, was widely exceeded across Europe in 2014, with 94 percent of all exceedances occurring at road-side monitoring locations. Also, in 2014, about 16 percent of the EU urban population was exposed to PM10 [fine particles] above the EU daily limit value" (EEA, 2016).

Figure 1: EU transport greenhouse gas emissions by mode, 2015



Source: Bruegel based on EEA (2017).

Figure 2: EU vehicle fleet by technology, 2015



Source: Bruegel based on ACEA (2017a).

2 FOSTERING TECHNOLOGICAL INNOVATION AND DEPLOYMENT OF CLEAN VEHICLES

Technological development in principle can enable a switch from fossil-fuelled vehicles to clean vehicles. Electric vehicles (EVs) combined with renewable electricity generation are seen as a promising approach to decarbonise a substantial fraction of road transportation. However, further technological breakthroughs to reduce the cost and increase the range of EVs might be needed if EVs are to replace a significant proportion of fossil-fuelled vehicles. EVs represent only 0.2 percent of the EU's total vehicle fleet (Figure 2). If EVs continue to penetrate the market at the current growth rate, it will take around 60 years for them to reach 50 percent of the current passenger car total fleet³.

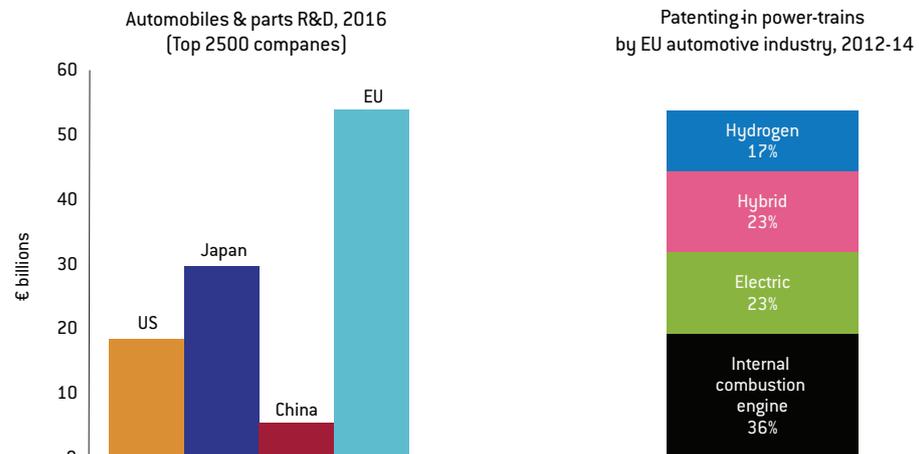
In addition to EVs, other clean technologies might emerge in the future.

This will only happen based on major research and development investment in clean vehicles by the automotive industry.

The good news for Europe is that it is by far the world's largest investor in automotive R&D, with €54 billion spent in 2016 compared to €30 billion in Japan, €18 billion in the US and €5 billion in China (Figure 3).

However, in terms of the patenting activity resulting from this investment the European automotive industry still appears to be primarily focused on further developing internal combustion engines rather than on advancing hybrid, electric or hydrogen technologies (Figure 3). This represents a risk not only to road transport decarbonisation in Europe, but also to the longer-term competitiveness of the European automotive industry.

Figure 3: EU automotive industry, R&D investment and patenting activity



Source: Bruegel based on European Commission (2017b) and OECD (2017).

3. Between 2015 and 2016, new registrations of electric passenger cars grew by 11 percent (EEA, 2018).

3 PROMOTING A MODAL SHIFT

A more structural approach to de-carbonise road transport would be to replace the kilometres travelled by road vehicles. This entails promoting public transport, alternative transport modes such as walking and cycling, and more integrated modes of mobility. New mobility such as 'mobility-as-a-service' can be enabled by ongoing developments in digital technologies (Transport & Environment, 2018). For instance, smartphone apps can allow information about transportation services from public and private providers to be better combined through a single gateway that creates and manages the trip, for which users can pay via a single account. New approaches could help overcome a major comparative disadvantage of public transport – the longer door-to-door travel times – which mainly arise from the first and the last mile in the transport chain. The environmental impact of freight transport could be reduced by promoting a switch from road to rail and maritime, and including the environmental cost of transport in the final purchase price of goods.

But all this is challenging, as reducing demand for transport means changing people's daily habits and taking an integrated policy approach. The governance issue is particularly relevant, considering that road transport

is governed by a complex series of policy frameworks developed separately at different levels – cities, national and EU (Table 1). And national and local policies on taxation, infrastructure choices and other matters seem to determine road transport demand. For example, Belgians used 741 kilogrammes of oil equivalent of diesel and gasoline in 2016, which was 30 percent more than the EU average, while Germans used 623kg and French drivers only used 581kg.

Cities are responsible for a wide range of transport policies, such as public transport, enabling car-sharing, congestion charges, parking management and cycling and walking zones. EU countries have different transport taxes and charges, and different policies in relation to the development of transport infrastructure and the creation of alternatives to road transport for freight and in urban areas. On top of this, the EU has developed a wide range of policies aimed at making European transport systems more connected, competitive and sustainable. Such fragmented governance risks impeding the decarbonisation of transport because policy measures implemented at the various levels without coordination can neutralise or even hinder each other.

Table 1: The governance of road transport: who regulates what?

	City level	Country level	EU level
Ban on diesel and petrol vehicles			
Emissions standards			
Alternative fuels infrastructure			
Car-sharing			
Car-pooling			
Ride-sharing			
Walking and biking			
Public transport			
Public procurement			
Parking fee			
Congestion areas			
Speed limits			
Energy taxation			
Road charging			
Spatial planning			
Rail activity			
Maritime activity			

Source: Bruegel. Note: red for direct competence, orange for indirect competence.

A notable example of the variety of approaches that could be adopted by countries and cities in decarbonising transport is the introduction of bans on diesel and petrol cars. In 2017, France and the United Kingdom announced plans to ban the sales of diesel and petrol cars and vans by 2040 (Petroff, 2017).

These plans are mainly driven by a political commitment to reduce air pollution, and are based on the expectation that the already underway shift to clean vehicles will continue to gather pace over the coming years. These plans are also meant to provide a strong signal to the EU automotive industry, encouraging it to innovate and become a global player in clean vehicles.

Cities are also starting to move in this direction, notably to fight air pollution. Paris is developing a plan to completely phase out diesel cars by 2024 and petrol cars by 2030 (Paris, 2018). Copenhagen is discussing a proposal to ban diesel cars by 2019 (Embury-Dennis, 2017), while Madrid and Athens are considering similar proposals to be applied by 2025 (Brunsden, 2017).

4 REVERSING EUROPE'S FAILURE IN DECARBONISING TRANSPORT

The EU has the potential to encourage innovation in low-carbon transport technologies and promote a reduction in

road-kilometres. But to do so, it needs to reshape its transport policies.

The EU has mainly tried to promote road transport decarbonisation by introducing mandatory emissions standards for new cars and light commercial vehicles, and by introducing a 10 percent renewable energy target for transport fuel by 2020 (Table 2).

However, emissions reductions have been much less than intended and tighter vehicle fuel economy standards have not delivered. In terms of renewable fuels, the use of food-based biofuels might even have led to a net increase in CO₂ emissions if indirect emissions (ie emissions generated from indirect land-use change) are taken into account (Valin *et al*, 2016).

In November 2017, the European Commission (2017c) proposed the 'Clean Mobility Package', a new set of policies to decarbonise transport, including new CO₂ emission standards, new rules for public procurement of clean vehicles, new rules to promote the combined use of different modes for freight transport and measures on batteries. These measures, which are at time of writing under discussion in the European Parliament and Council of the EU, represent a positive attempt to make EU policies more effective.

Table 2: EU transport targets and emissions standards, year of adoption and enforcement

Emission standards		
130 gCO ₂ /km target by 2015	2009	
95 gCO ₂ /km target by 2021	2014	Non-compliant manufacturers can be fined
175 gCO ₂ /km target by 2017	2011	
147 gCO ₂ /km target by 2020		
Targets		
60% greenhouse gas emissions reduction for transport in 2050 compared to 1990	2011	
20% greenhouse gas emissions reduction for transport in 2030 compared to 2008	2011	Not binding
10% of transport fuel to come from renewable sources by 2020	2009	

Source: Bruegel based on European Union (2009a, 2009b, 2011, 2014), European Commission (2011a, 2011b). Note: gCO₂/km = grams of carbon dioxide per kilometre.

The measures should be promptly approved and implemented.

However, this set of rules might still not be sufficient to ensure road transport decarbonisation. In the past, the Council has resisted stricter car emission standards because of resistance from some countries, such as Germany (Carrington, 2013). Europe needs to overcome this political barrier, allowing some member states to move ahead in decarbonising road transport – and allowing cities in all EU countries to also move ahead, and to take advantage of incentives put in place by the EU. The EU therefore needs to develop a new post-2020 road transport strategy. This strategy should have three pillars:

4.1 ENCOURAGE EU COUNTRIES AND CITIES TO ADOPT PLANS TO BAN DIESEL AND PETROL VEHICLES

More EU countries should follow the example of France and the United Kingdom, and adopt plans to ban diesel and petrol vehicles by 2040 or, even better, by 2030.

The more EU countries that make these commitments, the stronger the signal will be to the European automotive industry that it should invest more in the development of clean vehicles.

That is, these commitments should also be seen as a simple but effective tool to provide investment certainty to the European automotive industry, and to foster its focus on clean vehicles. Clear planning of these commitments would leave the automotive industry a window of 10-20 years to fully switch from the traditional internal combustion engine business model to the new clean vehicles and clean mobility business models.

Cities should also be encouraged to adopt plans to ban the circulation of diesel and petrol cars, which could be a major factor in inducing behavioural change on behalf of citizens and promoting modal shift.

For example, an EU Clean Transport Fund could be established to provide dedicated financial support to countries and cities committed to the phase-out of diesel and petrol vehicles. This

fund should allow cities to bid for EU money to support measures such as the deployment of alternative fuels infrastructure, zero-carbon public buses, sharing and pooling solutions allowing a reduction in car ownership or the promotion of more sustainable modes of transport such as cycling⁴.

Such a fund could be created by making better use of existing financial resources, such as from the Connecting Europe Facility for Transport (CEF-T) or from the Structural and Cohesion Funds. For the period 2014-20, CEF-T has a budget of €24 billion (European Commission, 2018a), while the Cohesion Fund and the European Regional Development Fund have a budget for transport and energy network infrastructure of €71 billion⁵.

4.2 STIMULATE AN EU-WIDE REFLECTION ON THE FUTURE OF TRANSPORT TAXATION

Taxation is a key policy tool to foster road transport decarbonisation. Different taxes apply throughout the transport system, from the initial purchase of a vehicle, to ownership taxes (eg annual registration tax, company car taxation) and usage taxes (eg taxes on fuel, tolls, roadspace, parking, commuter tax deductions) (Green Fiscal Commission, 2010).

These taxes can be used to influence user decisions, and possibly also to influence the automotive industry's strategies. For instance, to promote the deployment of clean vehicles, taxes can be differentiated on the basis of vehicles' carbon emissions, or simply allow for deductions or other special provisions (eg subsidies, grants, tax credits, tax exemptions).

European countries still have very different transport taxation regimes. For example, only ten countries take into account CO₂ emissions in the composition of their vehicle registration taxes (ACEA, 2017b). Fuel cost savings – which largely arise from the different taxation of gasoline and electricity – provide EVs with an important cost advantage. Savings are significant in Norway where running an electric

4. The EU LIFE programme already provides some support to urban mobility projects, mainly aimed at reducing transport impacts in order to improve air quality.

5. These funds have mainly targeted Poland (€28 billion), Romania (€8 billion), the Czech Republic (€7 billion), Slovakia (€4 billion) and Hungary (€4 billion). See European Commission (2018b).

vehicle can cost 64 percent less than running a diesel or petrol vehicle. In Germany, by contrast, the difference is only 25 percent (Lévay *et al*, 2017).

Given the importance of this policy tool in delivering decarbonisation, the EU should promote a new discussion among EU countries on the future of transport taxation, as is being done in the field of digital taxation (European Council, 2017).

4.3 MORE FOCUSED AND IMPACTFUL RESEARCH AND INNOVATION FUNDING FOR TRANSPORT

After 2020, the EU should improve its transport research and innovation funding. In particular, it should carefully allocate this money, targeting areas in which it can truly have leverage. EU transport research and innovation funding should become mission-oriented, or directed at solving specific problems, as more generally suggested by Mazzucato (2018).

The introduction of bans on diesel and petrol vehicles by countries and cities could lead to a quick take-up of already commercially-viable clean vehicles, such as EVs. Though necessary to foster road transport decarbonisation in the short-to-medium term, this should not prevent currently less-mature technologies from developing and demonstrating their longer-term potential to contribute to road transport decarbonisation.

To avoid this risk, the EU should focus its post-2020 transport-related research and innovation funding on early-phase technologies, such as hydrogen, solid-state batteries or electrofuels (liquid fuels produced from CO₂, water and electricity). This would be the most sensible way to invest the limited available resources (equivalent to 0.2 percent of the European automotive industry's total investment in research and innovation) in areas that otherwise might not find adequate private funding.

5 CONCLUSIONS

Cleaning up road transport is a fundamental prerequisite if the European economy is to be decarbonised, if air quality is to be improved and if – indirectly – the European automotive industry is to have a sustainable future.

Given the still-limited level of ambition at national level, Europe would greatly benefit from stronger EU action on road transport. For this reason, the EU should foster political momentum and promote the collective adoption of bans on diesel and petrol vehicles by 2030-40 by European countries and cities.

This will provide a strong signal to the European automotive industry that it should invest more in clean vehicles, thus contributing to the industry's long-term competitiveness and sustainability. This will also provide a signal to citizens to adopt more sustainable transport modes.

The EU can provide support to countries and cities in deploying already viable clean transport options by making better use of its transport-related funding through a new EU Clean Transport Fund.

Through the launch of an EU-wide reflection on the future of transport taxation and its central role in decarbonisation, the EU can promote more ambitious and coordinated actions by member states.

Through better use of its transport-related research and innovation funding, the EU can also support the development of new clean technologies that might otherwise never be explored.

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