Energy efficiency trends in transport in EU countries

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Key questions

- What are the main energy efficiency trends in transport in EU countries?
- What are the main drivers of the transport’s energy consumption variation since 2000?

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Decreasing energy consumption since 2007

Since 2007 and in contrast with the 2000-2007 period, the energy consumption of the transport sector\(^1\) has been decreasing at EU level (by 1.2% per year from 2007 to 2014) and in the five largest EU countries (Figure 1). There is still however a regular progression in some EU member states during the same period (e.g. Poland by around 1.5% per year). Several factors have contributed to this trend that the brief will analyse: energy efficiency improvements, the economic slowdown and change in the share of transport modes (“modal shift”).

Figure 1: Energy consumption of the transport sector

![Graph showing energy consumption of transport sector from 2000 to 2014 for Germany, France, UK, Italy, Spain, Poland, and EU](Source: ODYSSEE)

Half of the energy consumption for cars and 30% for trucks and light duty vehicles

Cars account for 49% of the sector’s consumption and road freight transport (trucks and light-duty vehicles) for 29% (Figure 2). Therefore, the analysis of energy efficiency trends will focus on road transport.

Figure 2: Decomposition of transport consumption by mode

![Diagram showing the breakdown of transport consumption by mode: Cars 49%, Trucks & light vehicles 29%, Buses 3%, Rail 2%, Inland waterways 2%, Air 14%, Motorcycles 1%](Source: ODYSSEE)

1 Transport consumption includes international air transport (Eurostat definition). EU corresponds to EU 28.
The energy efficiency of new cars has improved more rapidly since 2007

The specific fuel consumption of new cars has been decreasing since 2000 and was 1.8 l/100km lower in 2014 at EU level\(^2\). From 2007, the rate of decrease has accelerated significantly (3.2% per year compared to 1.2% before, Figure 3), mainly because of EU regulations on labelling and emission standards, as well as new emission-based taxes, that provided incentives for the purchase of low emission cars.

Figure 3: Trends in the specific consumption of new cars

Source: ODYSSEE, based on CO\(_2\) emission data from EEA

The specific consumption of new cars differs among countries with a difference of 2 l/100km between the extreme values in 2014. There is an increasing number of countries (13 countries in 2014) with an average specific consumption below 5 l/100km for new cars, with Portugal, the Netherlands and Denmark in the lower range (Figure 4). The high share of diesel cars, which have a lower specific consumption than gasoline cars, largely explains the good performances of these countries, as diesel cars made up more than 70% of new registrations. For Denmark and the Netherlands, the low specific consumption is also related to the registration of relatively small cars: the average mass of new cars in these countries is below 1,300 kg in 2014 (1400 kg for the EU average). In addition, Denmark is among the EU countries with the lowest engine capacity (cm\(^3\)); it also has the lowest average engine power (kW), followed by Italy, France, the Netherlands and Portugal.

Almost all EU countries are in line with the target of the EU Directive set for new cars (130gCO\(_2\)/km by 2015) (Figure 5).

Figure 4: Specific consumption of new cars (2014)

Source: Enerdata based on data from EEA on gCO\(_2\)/km

More efficient new cars improved the average performance of the car fleet

As over 90% of the cars on the road in 2014 were produced after 2000 and 45% since 2007, the energy efficiency gains achieved with new cars had a major impact on the average performance of the car fleet: the average specific consumption of the EU car fleet decreased from 7.8 l/100 km in 2000 to 6.7 l/100 km in 2014. The economic crisis since 2008 has however slowed down the flow of new cars, which represented just under 5% of the car fleet in 2014 compared to 8% in 2000, and thus the energy efficiency improvement.

\(^2\) Based on data collected by EEA from car manufacturers and based on test values. They therefore differ from real consumption on road.
Lower efficiency of road freight transport since 2007

Until 2007, the specific consumption per tonne-km of trucks and light vehicles was decreasing, which means that the efficiency of road transport of freight was regularly improving (by 1.2%/year, Figure 6). These energy efficiency improvements were driven both by an increase in the efficiency of vehicles and by a more efficient management of freight transport (increase in the ratio tonne-km/vehicle). The latter trend is the result of higher load factors and a shift to larger trucks, driven by a rapid growth in the volume of traffic (nearly 5%/year in tonne-km). However, with the economic crisis since 2007, the energy consumption per tonne-km has been decreasing at a much slower rate (-0.2%/year). Even though the efficiency of vehicles did not stop improving, the fall in traffic (by 2.5%/year over 2007-2014) led to a less efficient operation of the vehicle fleet, as shown by the sharp decrease in load factors: i.e. trucks were less loaded and empty running increased.

Regular improvement of 1%/year in the energy efficiency of transport in the EU

The energy efficiency of transport in the EU improved by 1%/year between 2000 and 2014, as measured by the ODEX indicator that combines the energy efficiency trends of the different modes of transport. Greater energy efficiency progress was achieved for both cars and airplanes than in the rest of the sector (Figure 7). Energy efficiency progress slowed down for trucks and light vehicles since 2005, with no more efficiency progress since 2007 because of the economic crisis.

### Modal shift: a potential source of energy savings, but still insignificant

Energy efficiency improvements for passenger transport can come from more efficient vehicles, as well as from modal shift, i.e. shift from cars to public transport or from road to rail and water for goods.

For passengers, all countries are implementing national and local measures to change the present modal split that is dominated by cars and raise the share of public transport and active mobility (walking and cycling). At EU level, the share of public transport (rail, metro, buses) in total passenger traffic in 2014 was the same as in 2000 (18.5%) (Figure 8).

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3 The index is calculated at the level of eight modes: cars, trucks, light vehicles, motorcycles, buses, air, rail and water transport.

4 Water transport, buses and motorcycles are taken into account but not shown on the graph.

5 Selected EU countries
This stability is the result of opposite trends in EU Member States with a decrease in the majority of countries but an increase in some countries, among which are some of the largest countries (e.g. Italy +4 percentage points, UK +2 and France +2). The share of public transport now exceeds 20% in some countries like Italy, Poland, Austria and Belgium. For freight transport, the share of efficient modes, namely rail and water, is decreasing. In other words, the trend is moving in the opposite direction promoted by policy makers (Figure 9). The greatest reduction can be seen in new EU member countries, especially in Poland. In 2014, the share of rail and water varied greatly among countries, ranging from 10% in Italy for instance to above 40% in the Netherlands and Sweden (54% and 47% respectively) that are also the countries where this share is progressing.

**Figure 9: Share of rail and water in total freight traffic in selected EU countries**

Source: ODYSSEE, year 2013 for Belgium

**Energy consumption trends are also impacted by variations in passenger and freight traffic**

Since 2007, the economic crisis resulted in a remarkable drop in the traffic of goods which was in 2014 11% lower than in 2007 at EU level (Figure 10). Despite population growth, passenger traffic remained stable because of a slight decrease in passenger mobility (decrease by 3% of km travelled per capita per year). In addition, in most countries the average annual distance travelled by cars has been decreasing since 2007.

**Energy savings balanced the effect of growth in traffic of passengers and goods since 2000**

The energy consumption of transport can be broken down into three explanatory effects presented above: activity effect (increase in traffic), modal shift effect (between cars or trucks and public transport) and energy savings linked to more efficient transport modes (lower specific consumption per unit of traffic). As shown in the introduction, transport energy consumption was only slightly higher in 2014 than in 2000. This trend is due to the fact that energy savings (around 70 Mtoe) balanced the effect of the growth in traffic of passengers or goods (almost +50 Mtoe, Figure 11). Since 2007, the energy consumption of transport has decreased thanks to a combined effect of a decrease in activity, due to the economic crisis, and continuous energy savings.

**Figure 10: Traffic of passengers and goods (EU)**

Source: ODYSSEE

**Figure 11: Decomposition of energy consumption variation of transport (EU)**

Source: ODYSSEE decomposition tool, air transport included

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