



Energy Efficiency Trends in Transport in the EU

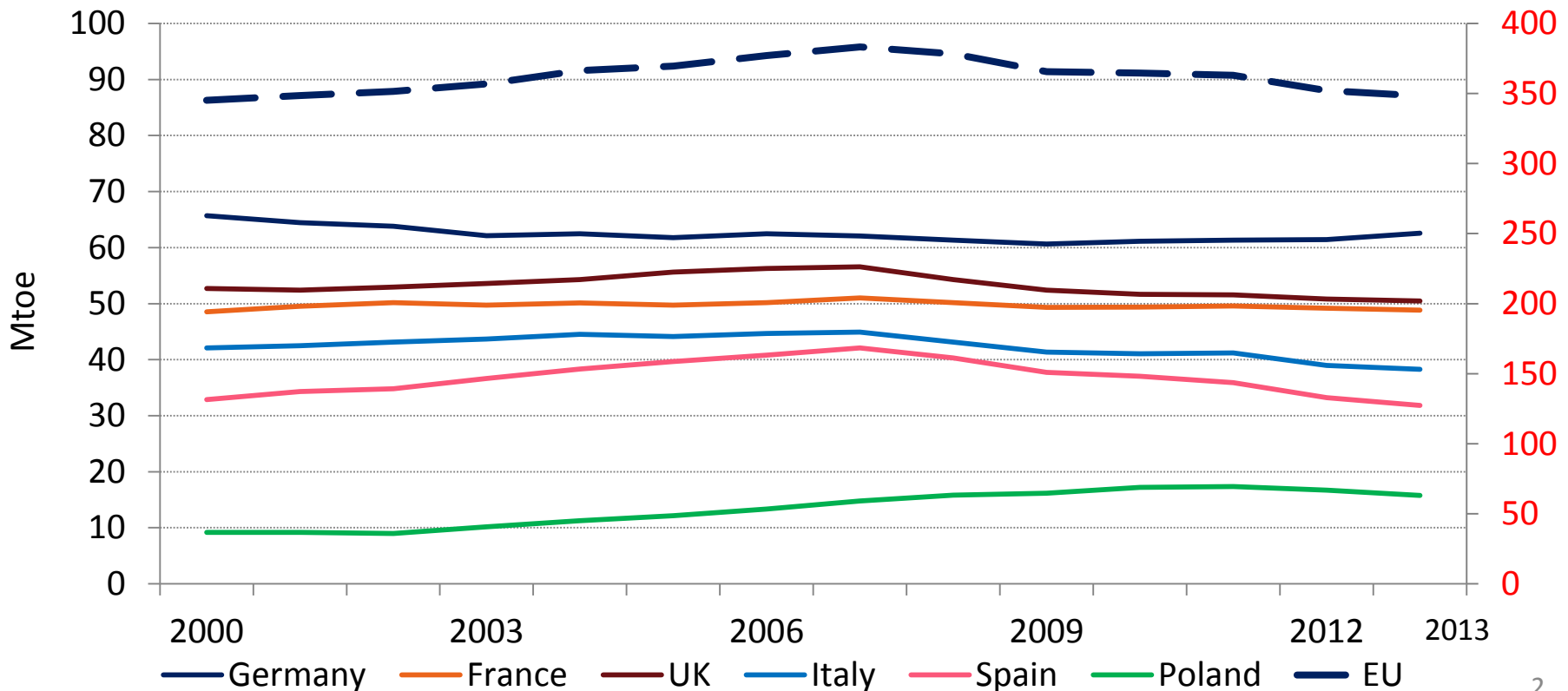


Authors: Bruno Lapillonne, Karine Pollier (June 2015)

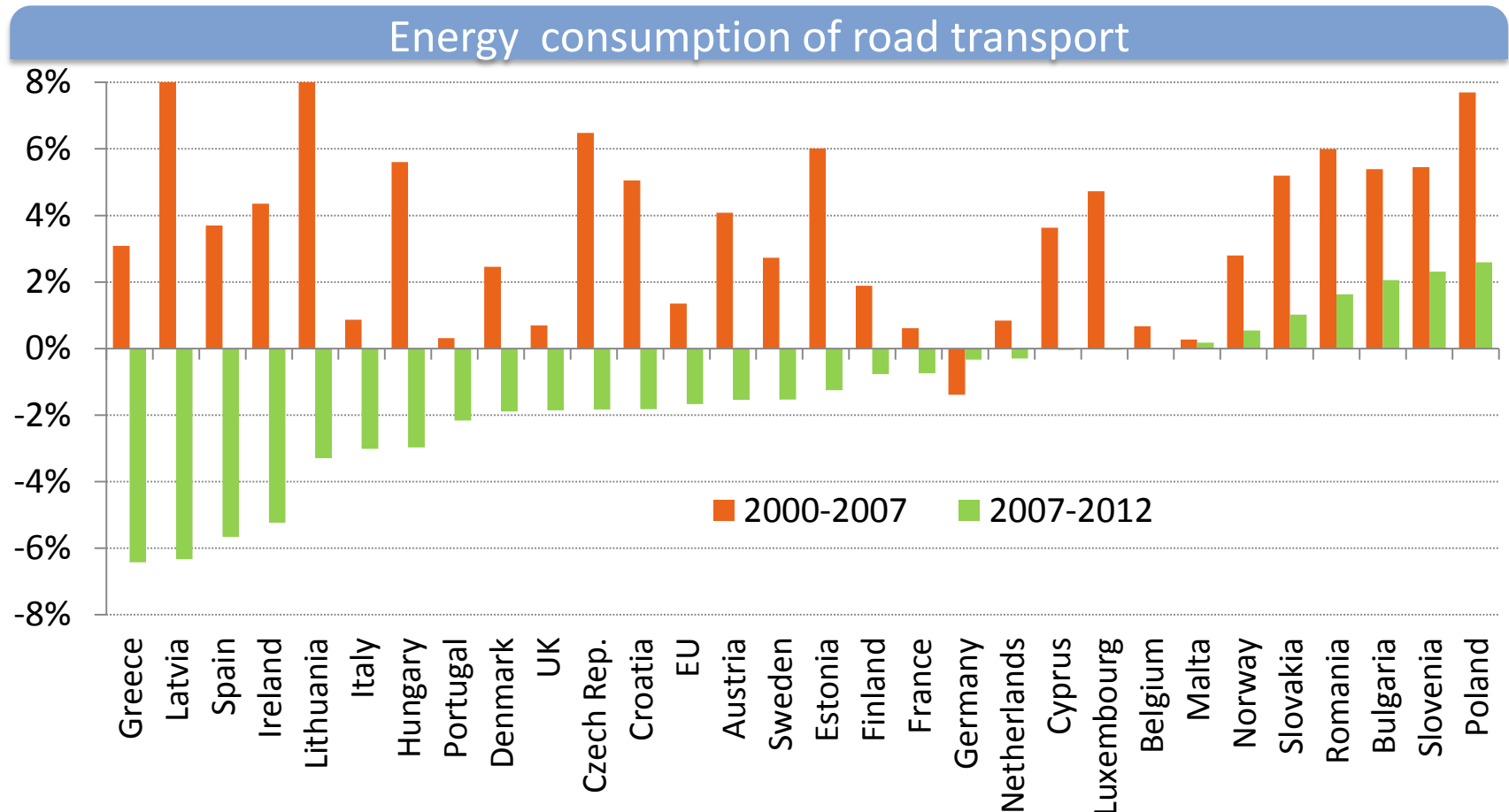


- Decreasing trend since 2007 at EU level (-1.6%/year from 2007 to 2013), due to a stable or decreasing consumption in the largest EU countries: -4.5%/y in Spain, -2.6%/y in Italy and -1.9%/yr in UK.
- Over the period 2000-2007, increasing energy consumption in most countries, except Germany (+1.5%/year for the EU as a whole).
- In 2013, the consumption in transport is almost back to its 2000 level.

Energy consumption trends in transport

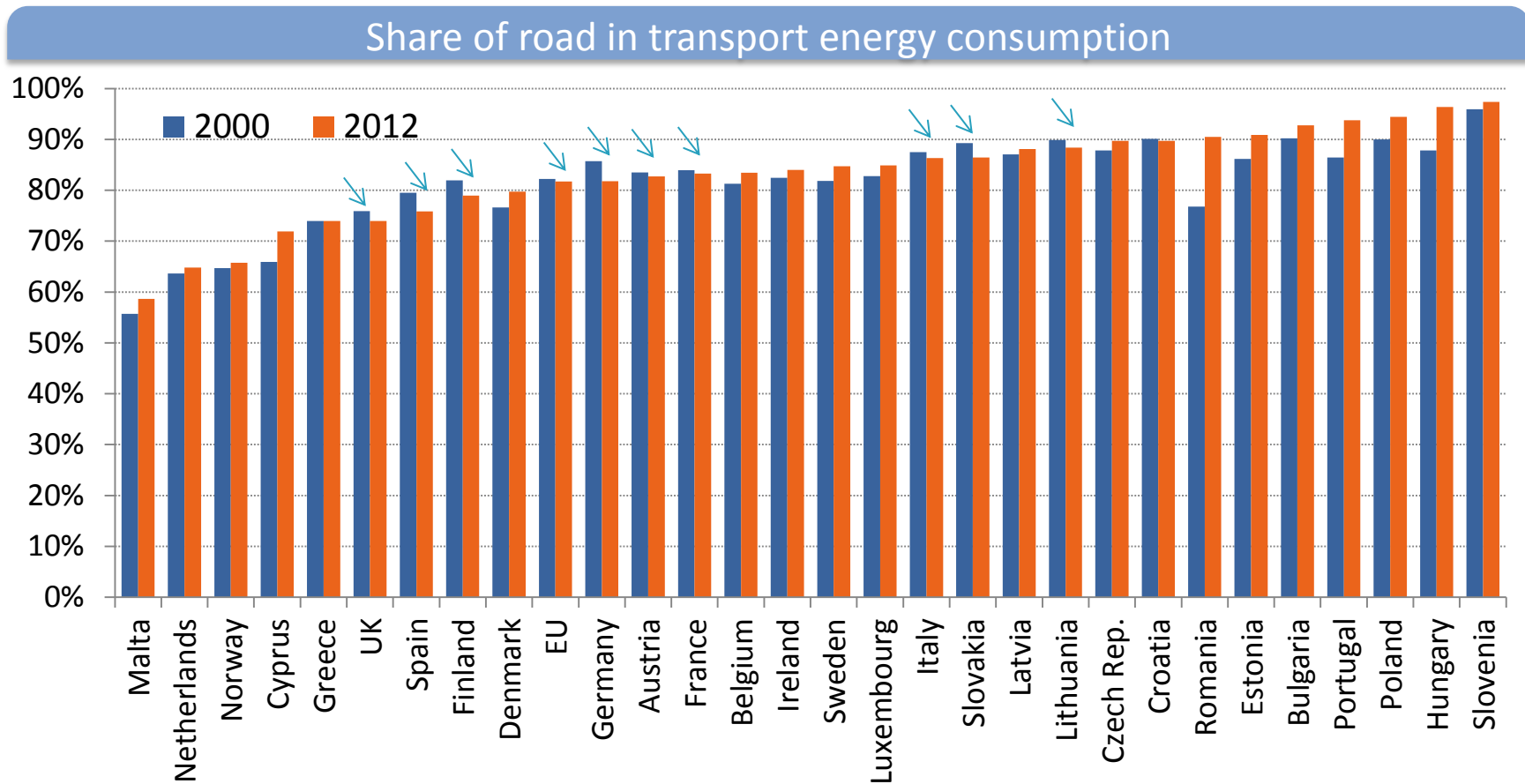


- Decreasing trends in of road transport consumption in almost all countries since 2007, except in 7 countries (mostly new MCs)
- Strong contrasts compared to the 2000-2007 period in countries hit by the economic crisis (e.g. Greece, Spain, Ireland and Baltic countries).



Source ODYSSEE

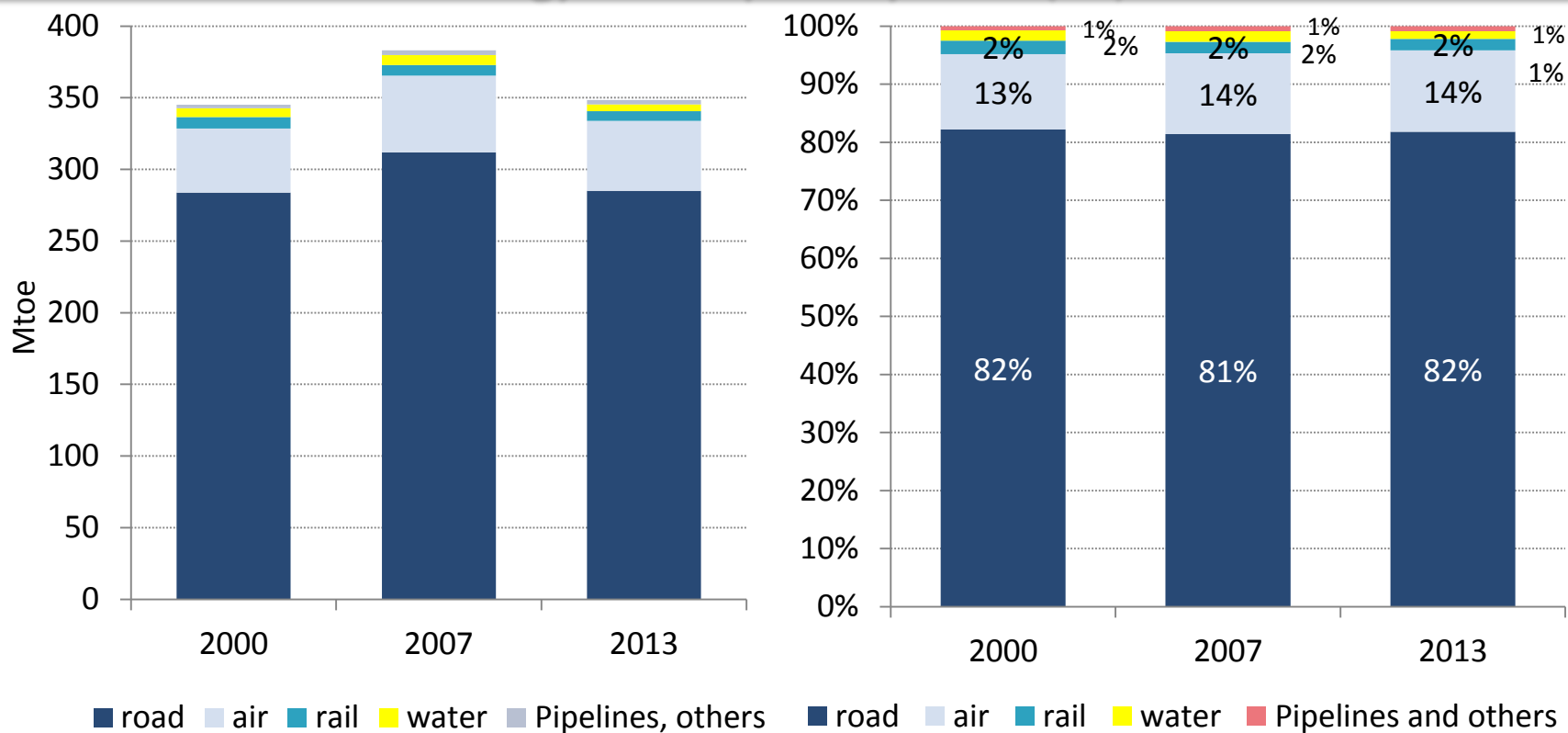
- Road transport absorbs on average 82% of the total energy consumption of transport in the EU (range of 64-97%).
- Increasing share of road in total transport in 2/3 of countries



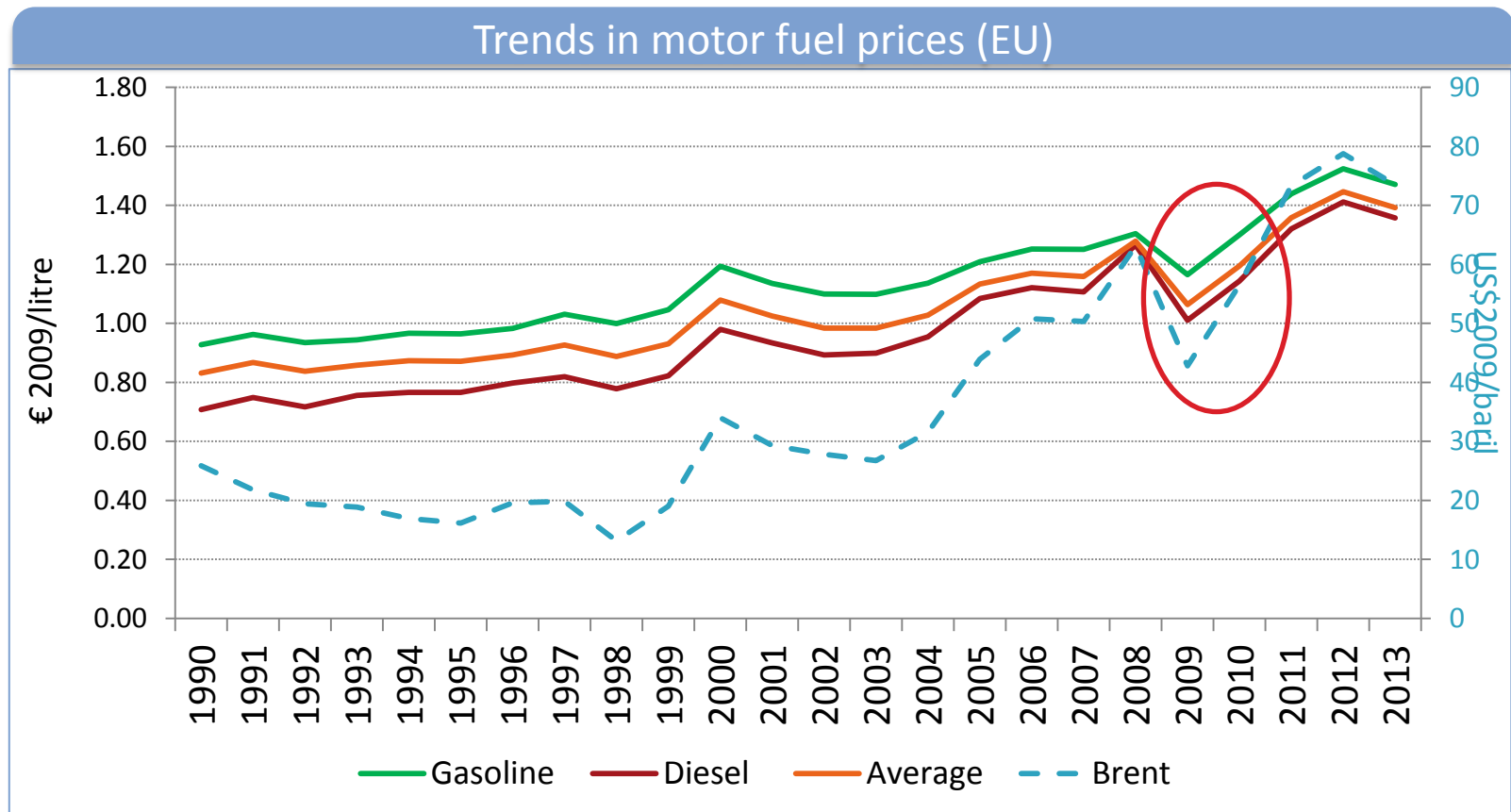
Source ODYSSEE

- Stable distribution by mode since 2000
- Cars represent about half of total consumption; they are followed by trucks & light vehicles (30%) and air transport (14%); rail and water only represent 2% and 1% respectively.
- Road and air consumption have decreased similarly since 2007 (-1.5%/year), due to 2 main factors: low economic growth and more efficient vehicles and planes

Energy consumption by mode (EU)



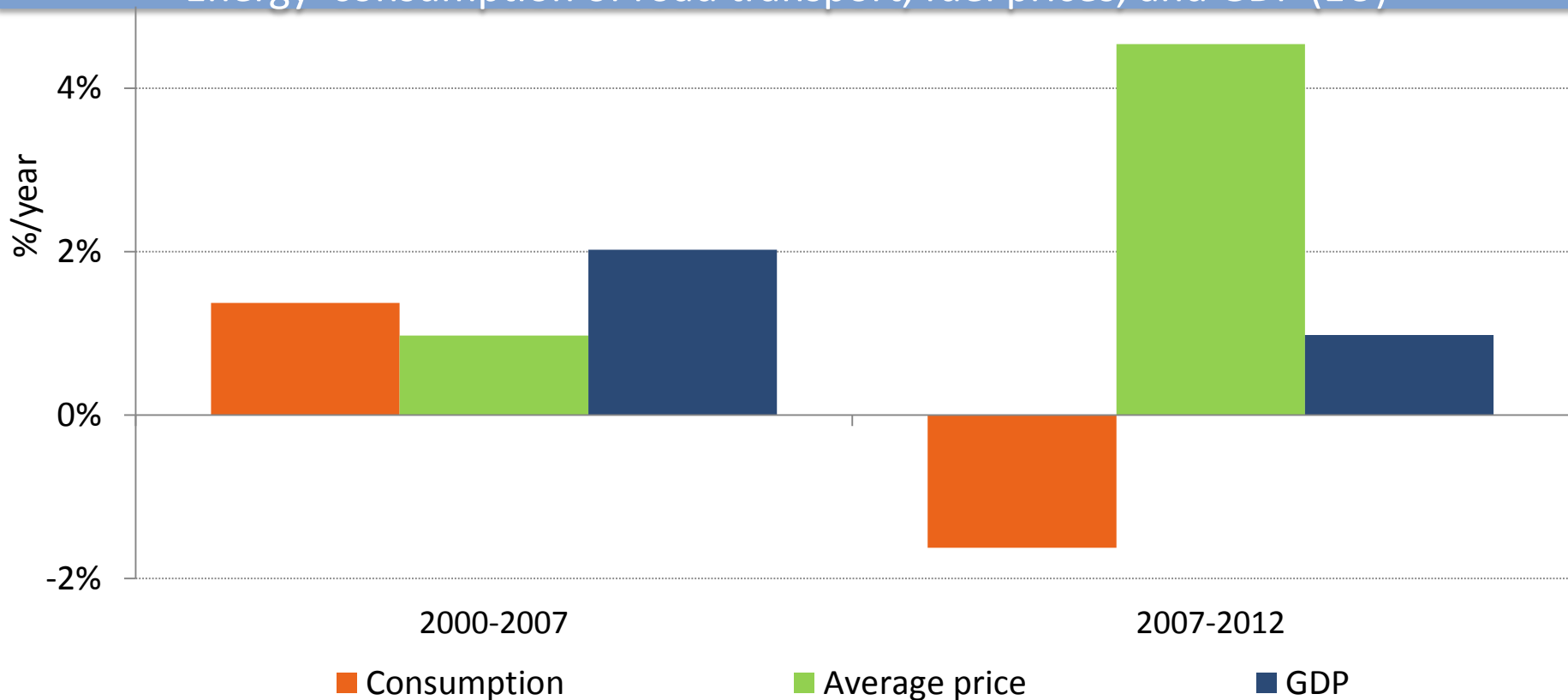
- Strong increase in motor fuel prices between 2009 and 2012 crisis (> 10%/year) with a decrease in 2013 (-4%).
- Significant drop in 2009 (-17% on average).
- Motor fuel prices are almost 70% higher in 2013 than in 1990 (+60% for gasoline, a factor 2 for diesel)



Source: ENERDATA from Eurostat/IEA; weighted average of diesel and gasoline; real prices corrected for inflation

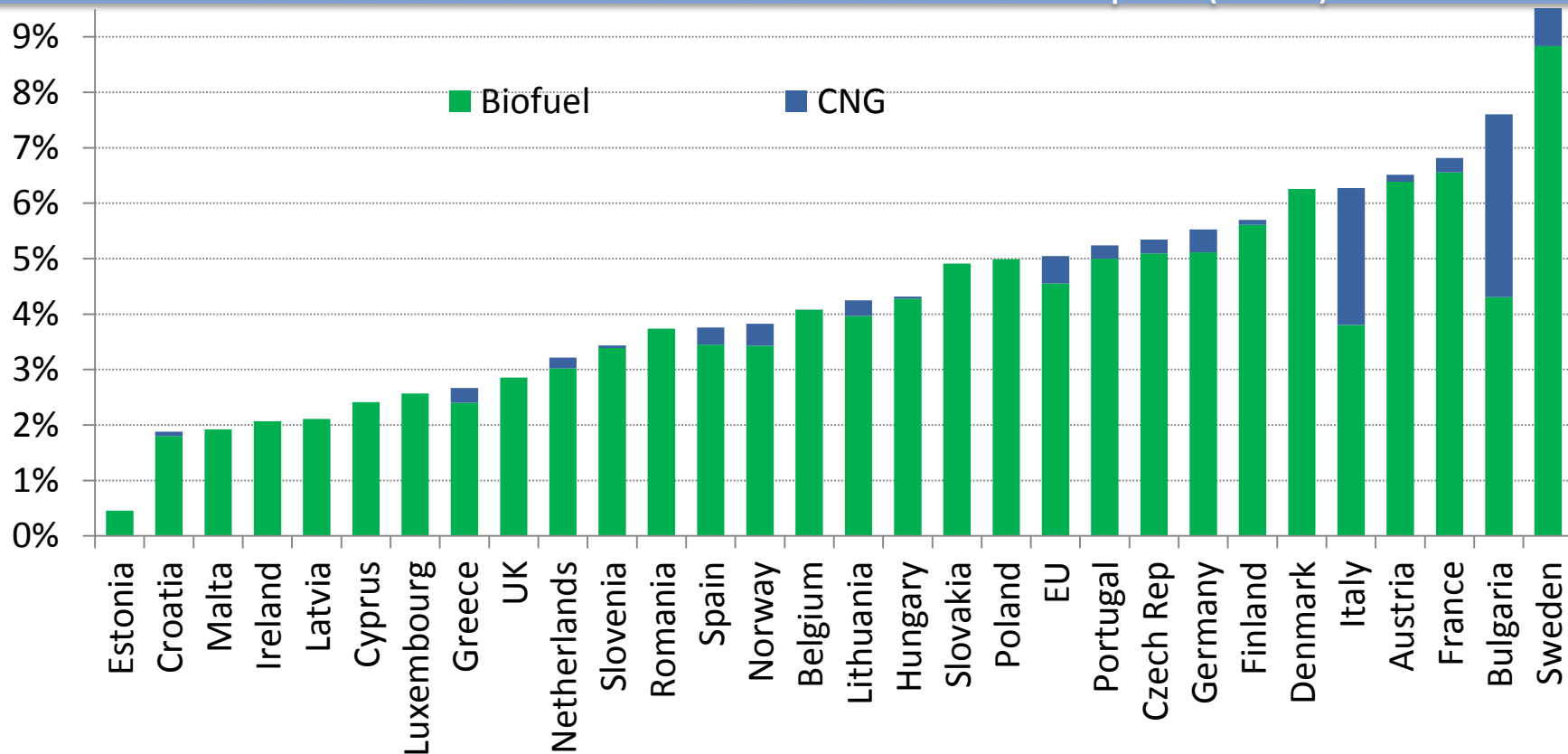
- Road transport absorbs on average 81% of the total energy consumption of transport in the EU , with a stable share since 2000.
- Its consumption has decreased since 2007 (-1.6%/year), due to 3 main factors: strong increase in motor fuel prices (except in 2009), low economic growth since 2008 and more efficient vehicles.

Energy consumption of road transport, fuel prices, and GDP (EU)



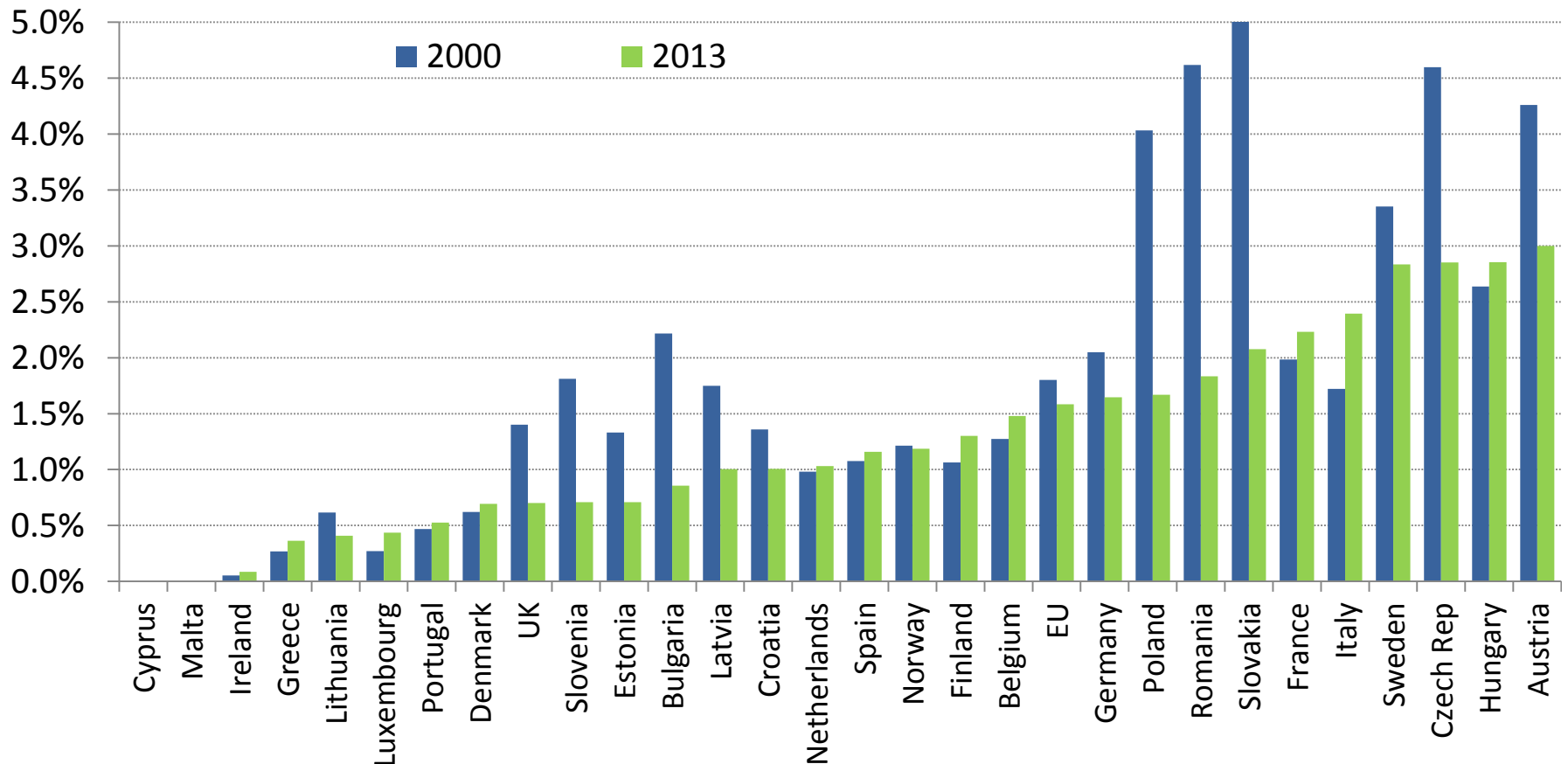
- Alternative fuels (natural gas and biofuels) supplied 5% of the consumption of road transport in the EU, of which 90% of biofuels.
- Sweden is the leader followed by France and Bulgaria (respectively 9.5%, 7.5% and 7%);
- Bulgaria and Italy have the highest penetration of CNG (respectively 3.3% and 2.5%) and Sweden the highest share of biofuels (9%), followed by France, Austria and Denmark (~7%).
- Around ¾ of the biofuel is biodiesel.

Share of alternative fuels to oil in road transport (2013)



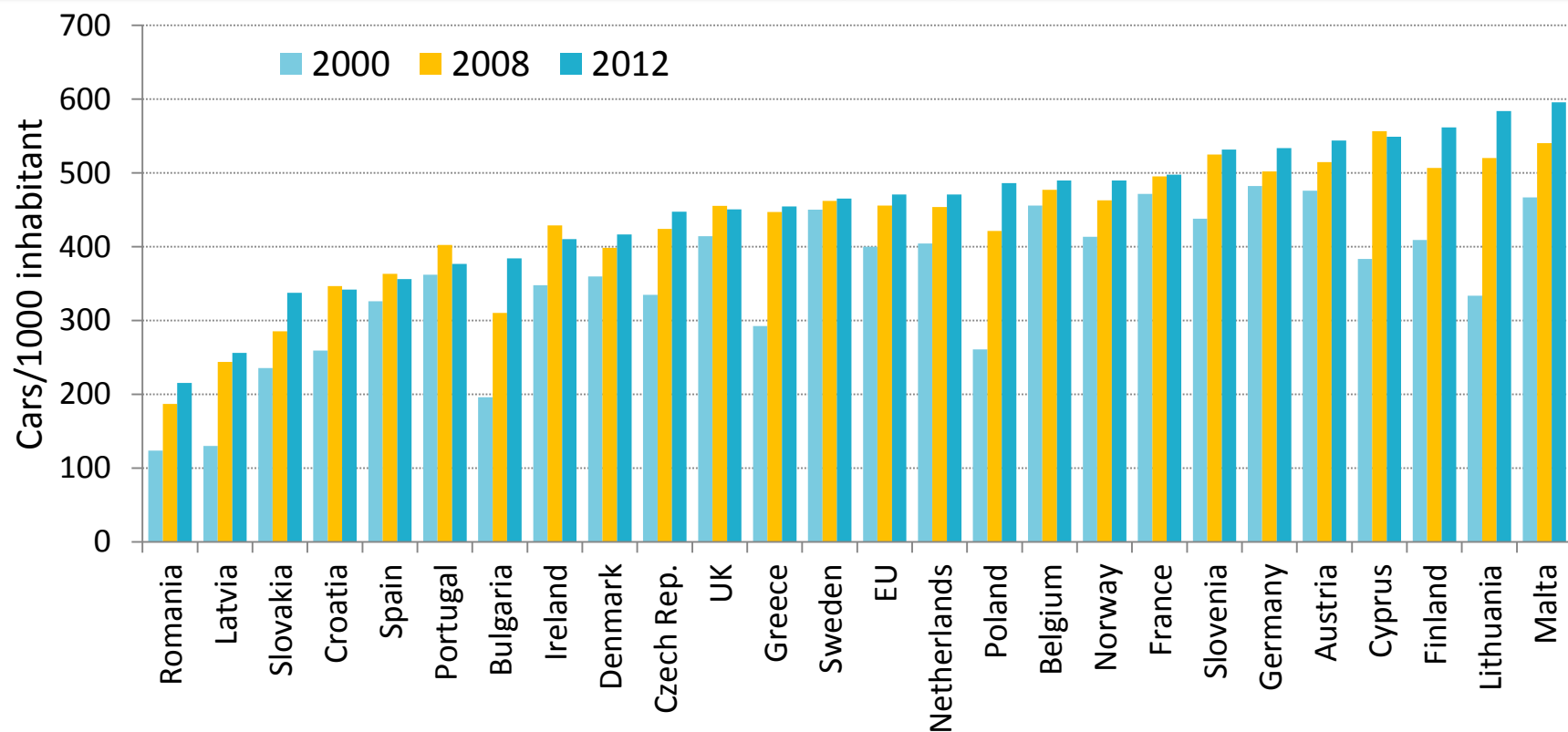
- Electricity supplied less than 2% of the consumption of transport in the EU in 2013.
- Highest share in Sweden, Czech Republic and Austria... but only at 3% and this share is decreasing, as in more than half of EU countries (15).
- Highest but moderate progression in Finland, Italy, France and Hungary.

Share of electricity in total transport consumption

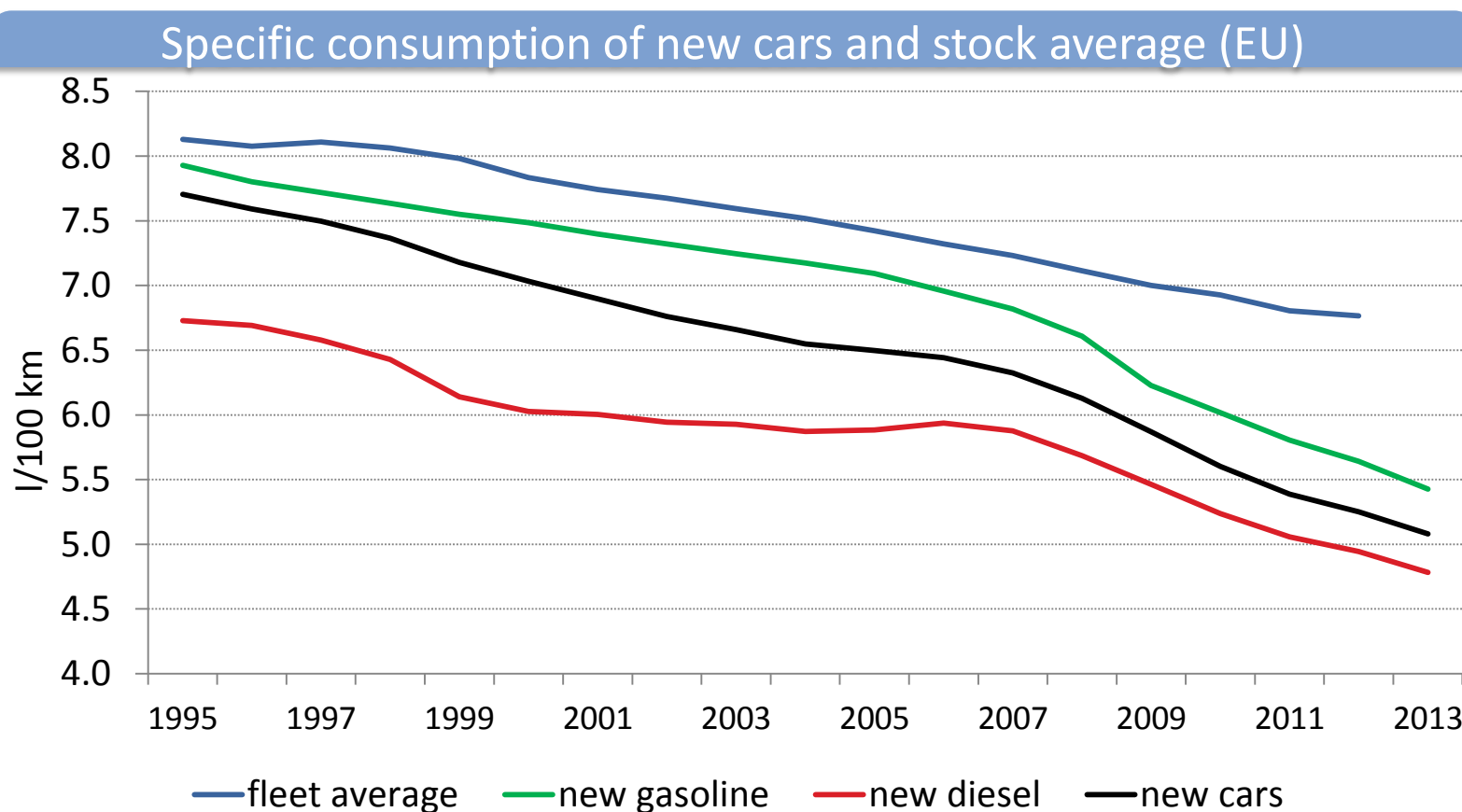


- Low progression in car ownership since 2008 and even decrease in 7 countries
- Very rapid growth in new member countries because of their lower car density with 4 countries with a progression above 5%/year (Bulgaria, Latvia, Lithuania, Poland)
- Low progression since 2000 in some EU-15 countries due to saturation, especially in UK, Sweden, France and Belgium

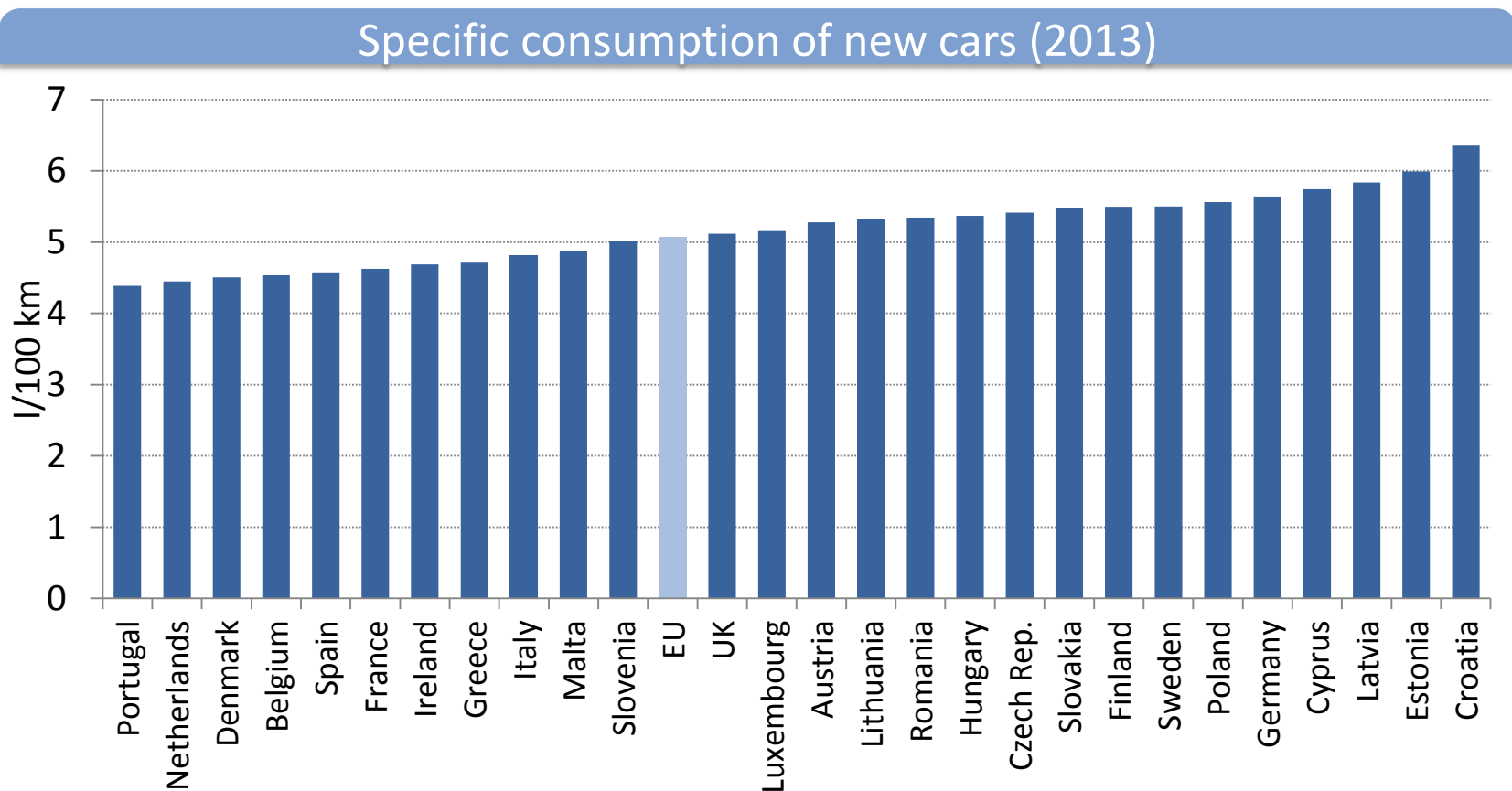
Number of cars per capita



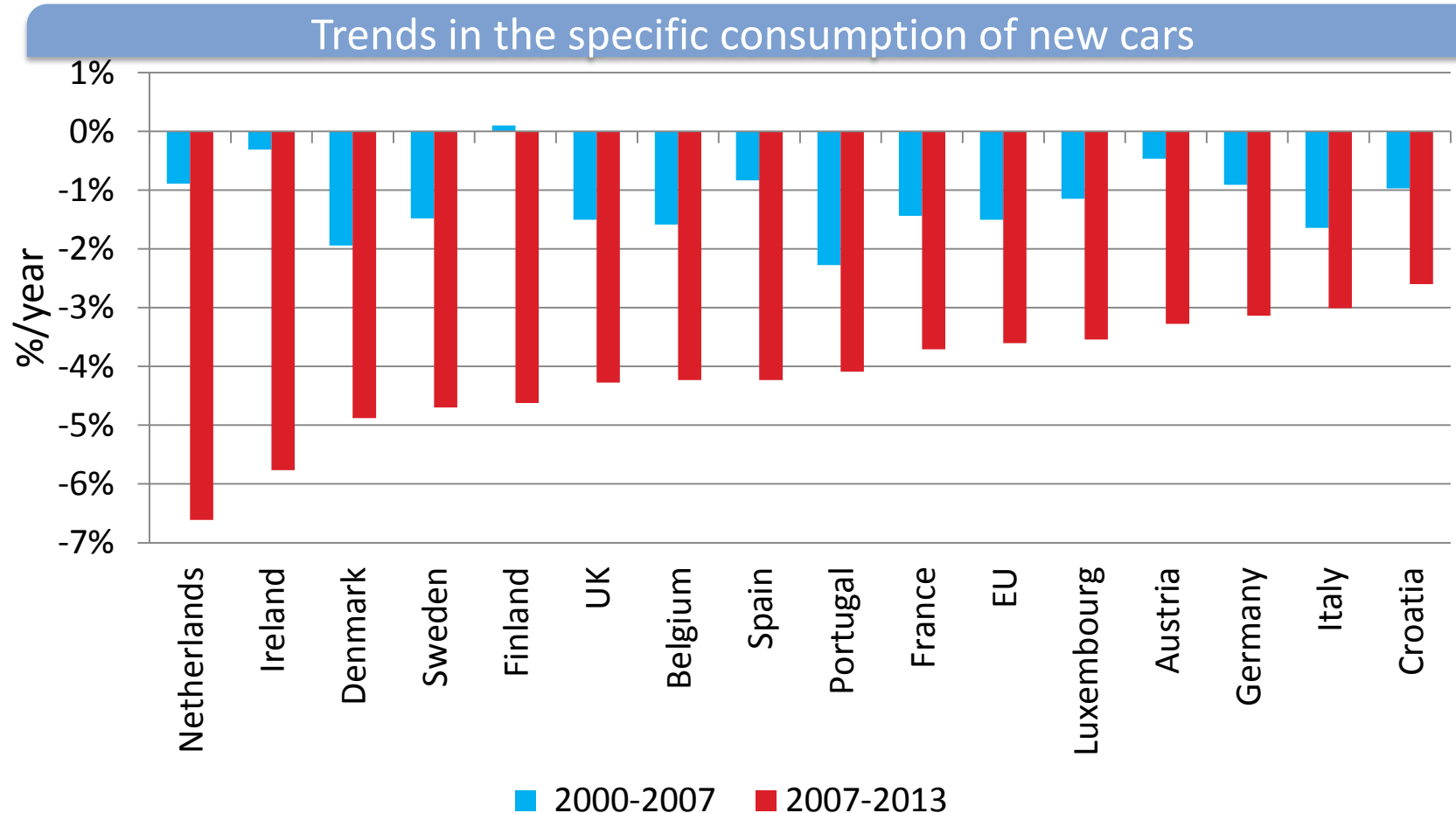
- New cars consume 2.6 l/100km less in 2013 than in 1995 (5.1 vs 7.7 l/100km);
- Acceleration of the reduction in the specific consumption of new cars since 2007 (3.6%/year compared to 1.5% between 2000 and 2007), as a result of EU regulations (labeling and standard), national fiscal incentives and higher fuel prices .
- Regular decrease of the average specific consumption of the car stock from 8.1 l/100km in 1995 to 6.8 l/100km in 2012.



- 10 countries below 5 l/100km with Portugal and Netherlands in the lower range.
- Convergence in the specific consumption of new cars: 2 l/100km difference between extremes values in 2013 compared to 2.4 l in 2000.



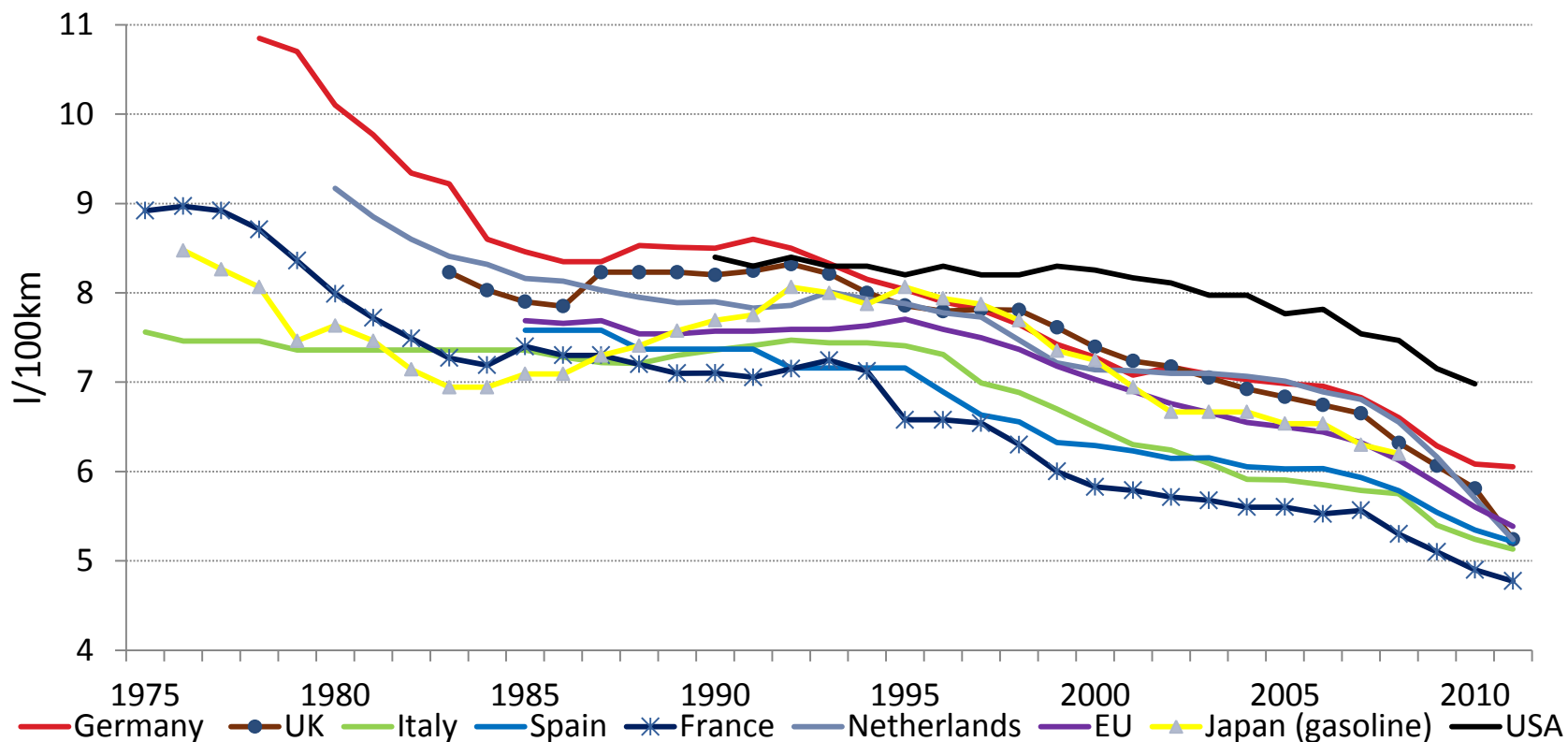
- Rapid progress since 2007 in all countries, especially in The Netherlands Ireland, Sweden, Denmark, Finland and UK (around or above 4%/year)
- Progress due to the spread of smaller vehicles, with the implementation of national policies and standards for car manufacturers



Source: EEA, Odyssee

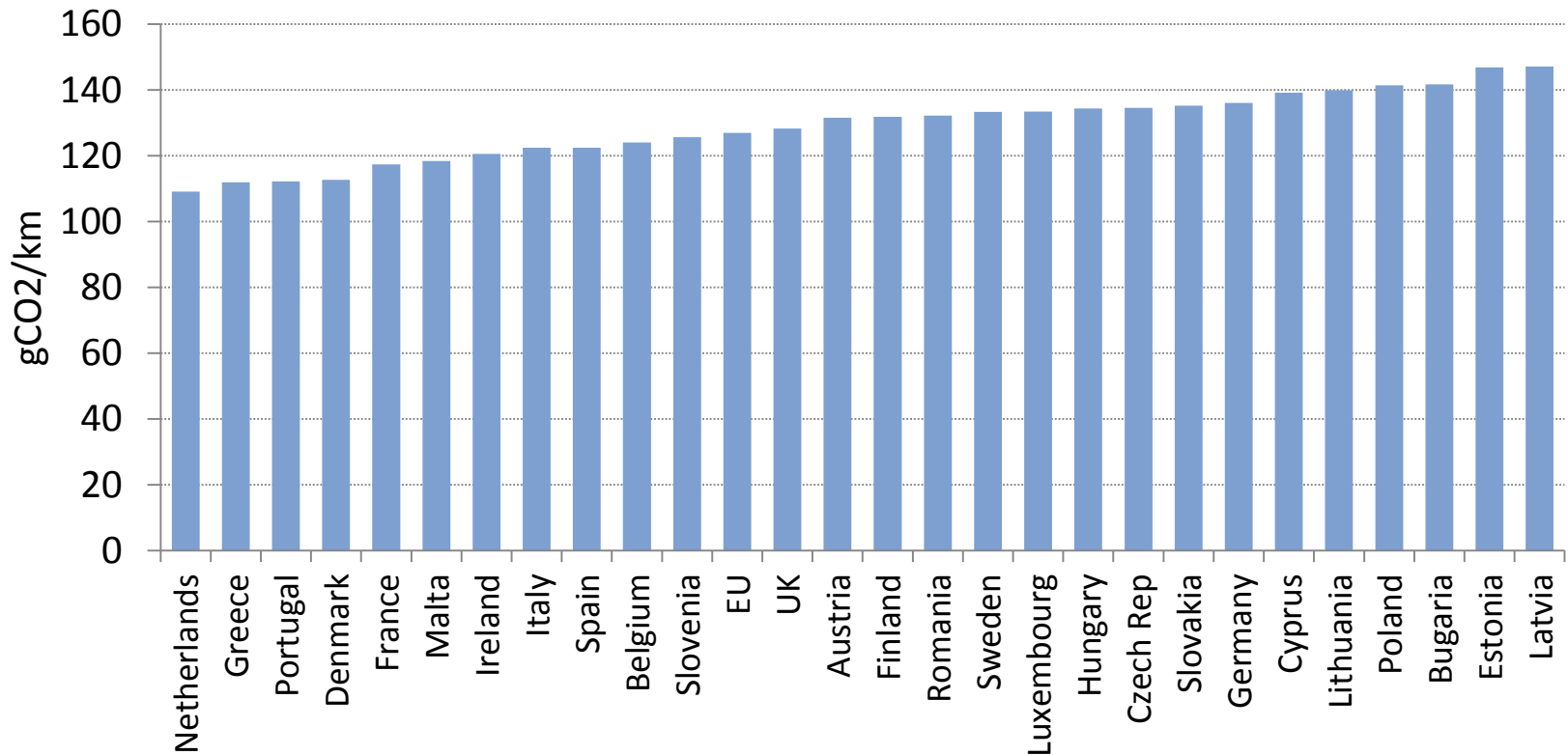
- Regular decrease since 1995 in all countries => ACEA, JAMA & KAMA agreement
- No real convergence: the reduction has been stronger in the countries with the lowest values (France, Italy and Spain)

Specific consumption of new cars (l/100 km)

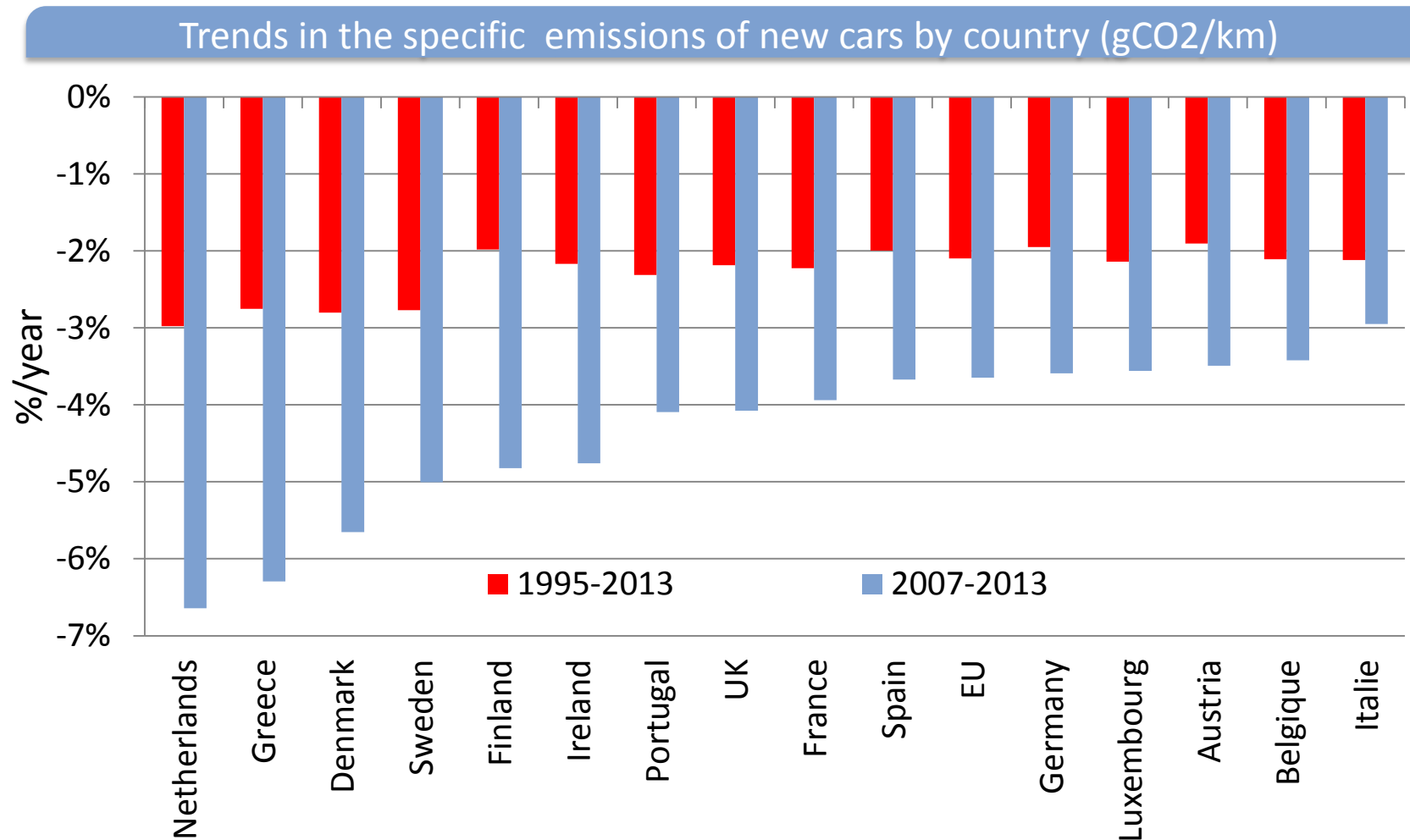


- Large discrepancy in the specific emission of new cars among countries: a 30% gap between the two extreme group of countries: from 110 gCO₂/km (3 lowest) to 145 g for the 3 highest average.
- 127 gCO₂/km for EU average in 2013.
- Six countries below 120 g (Netherlands, Greece, Portugal, Denmark, France and Malta)
- Half of the countries below the mandatory limit of 130g for 2015 for cars manufacturers.

Specific emissions of new cars (2013)



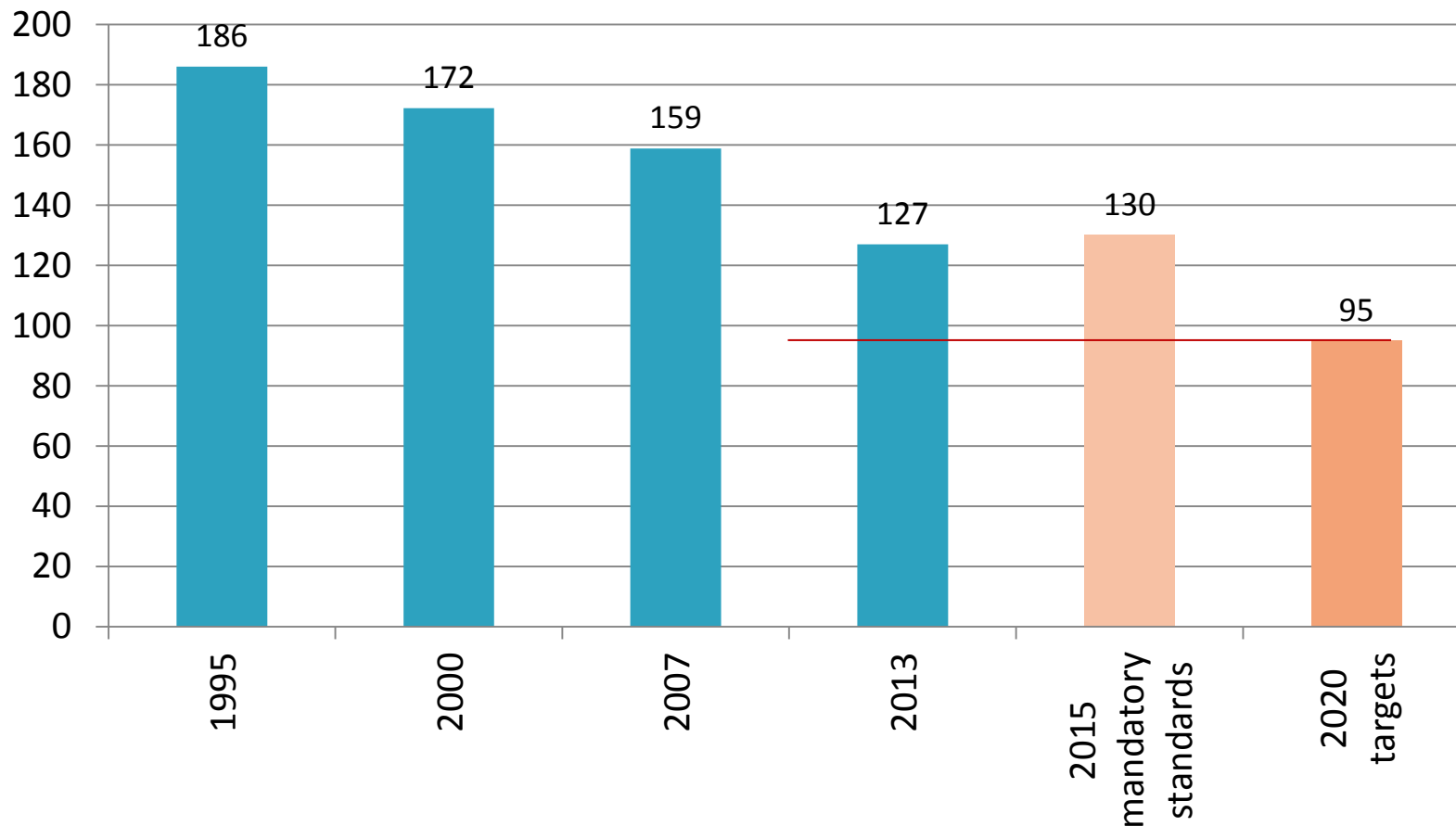
- Rapid progress since 2007 in all countries, especially in The Netherlands Greece, Denmark, Sweden, Finland and Ireland (around or above 5%/year)
- Progress due to the spread of smaller vehicles, with the implementation of national policies and standards for car manufacturers



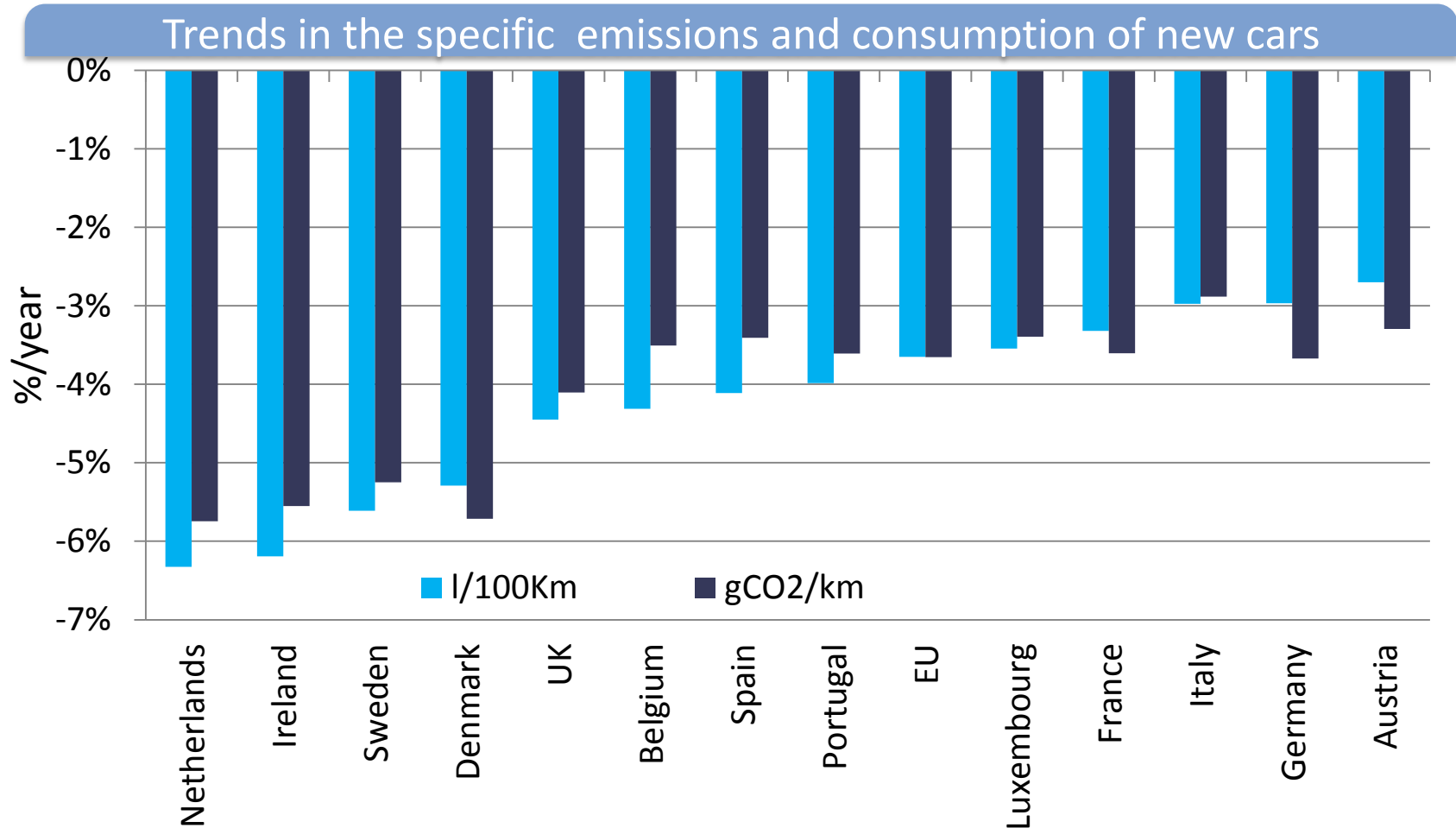
Source: EEA, « Monitoring CO₂ emissions from new passenger cars in the EU »

- 2013 exceeded the 2015 mandatory standards with 127 gCO₂/km
- To reach the 2020 target, the CO₂ emissions of new cars have to decreased by 4%/year, i.e. at about the same rate as observed since 2007 and 2013.

CO₂ emissions of new cars: observed values versus target (EU)



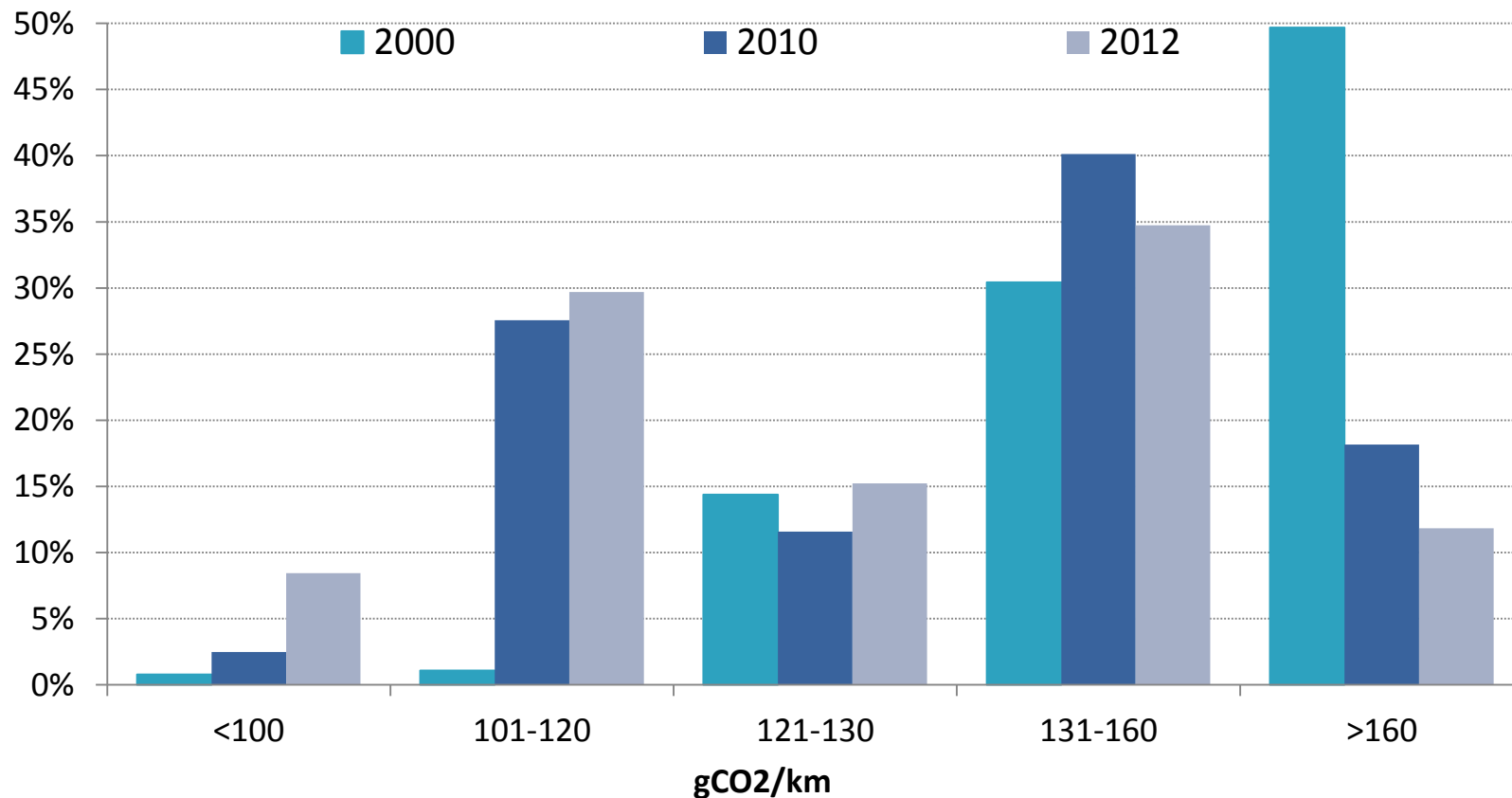
- Trends in specific consumption in l/100 km and specific emissions in gCO₂/km are quite similar
- At EU level the variation is exactly the same
- Specific consumption is decreasing slightly faster than specific emissions in half of the countries



Source: EEA, Odyssee

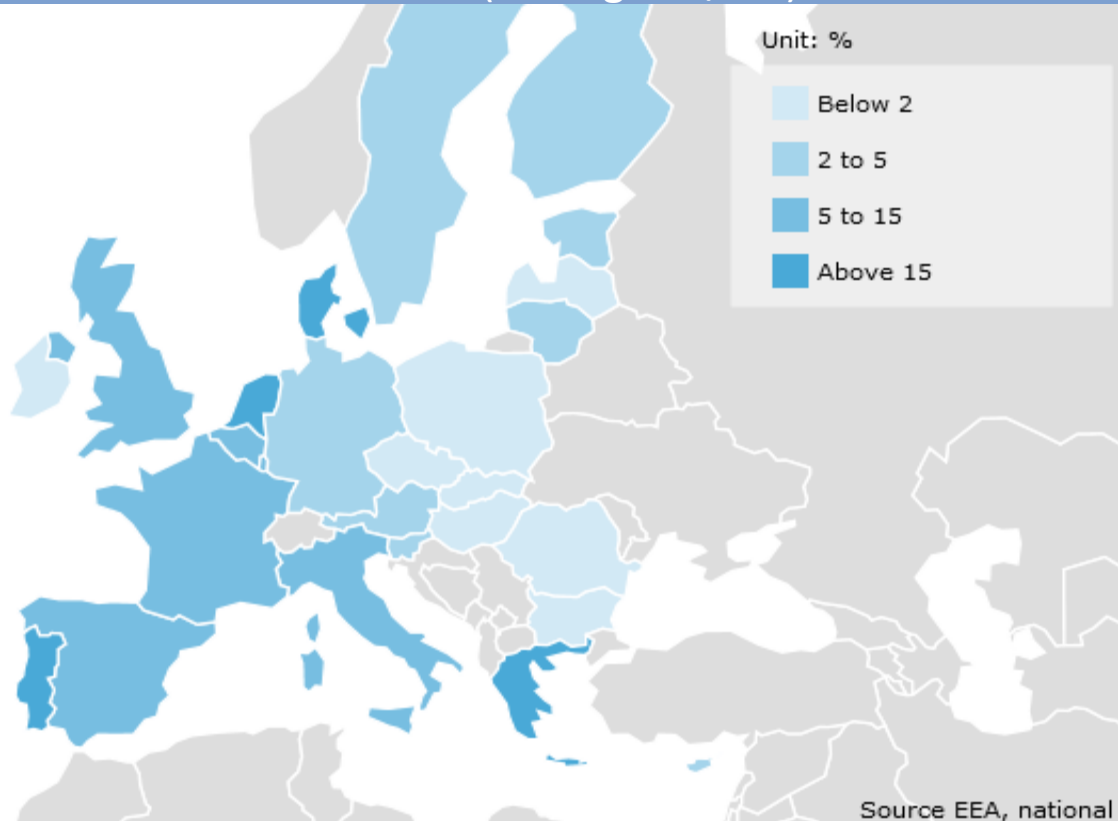
- Increasing share of new cars emitting less than 130 gCO₂/km between 2000 and 2012: from 16% in 2000 to 53% in 2012.
- In 2012, 8% of newly EU registered cars had CO₂ specific emissions below 100 gCO₂/km compared to 2.5% in 2010.

Share of new cars by emission band (EU average)

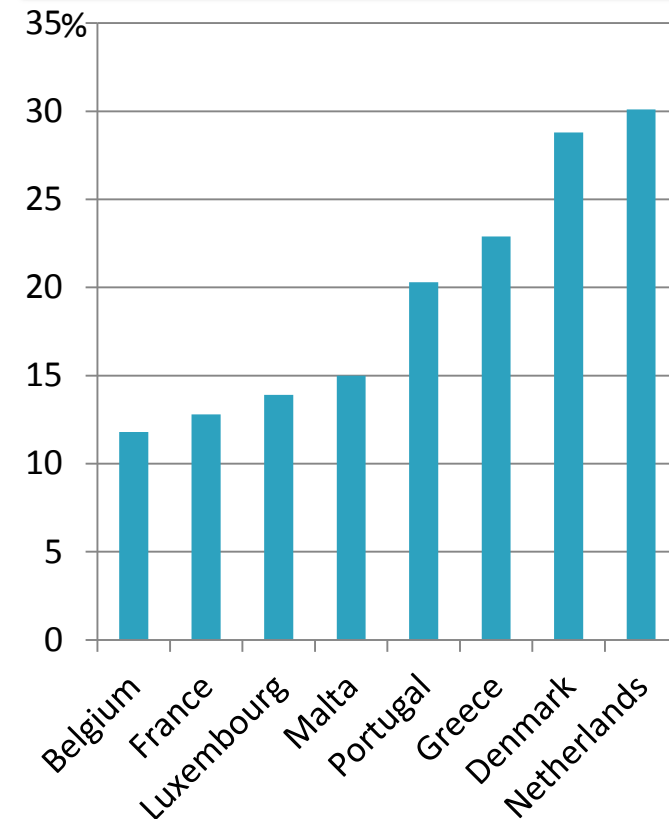


- 8-countries with more than 10% of new vehicles emitting less than 100 gCO₂/km in 2012, and even 4 (Portugal, Greece, Denmark and Netherlands) with more than 20% of new cars <100 gCO₂/km.

Share of efficient cars (<100 gCO₂/km) in total sales

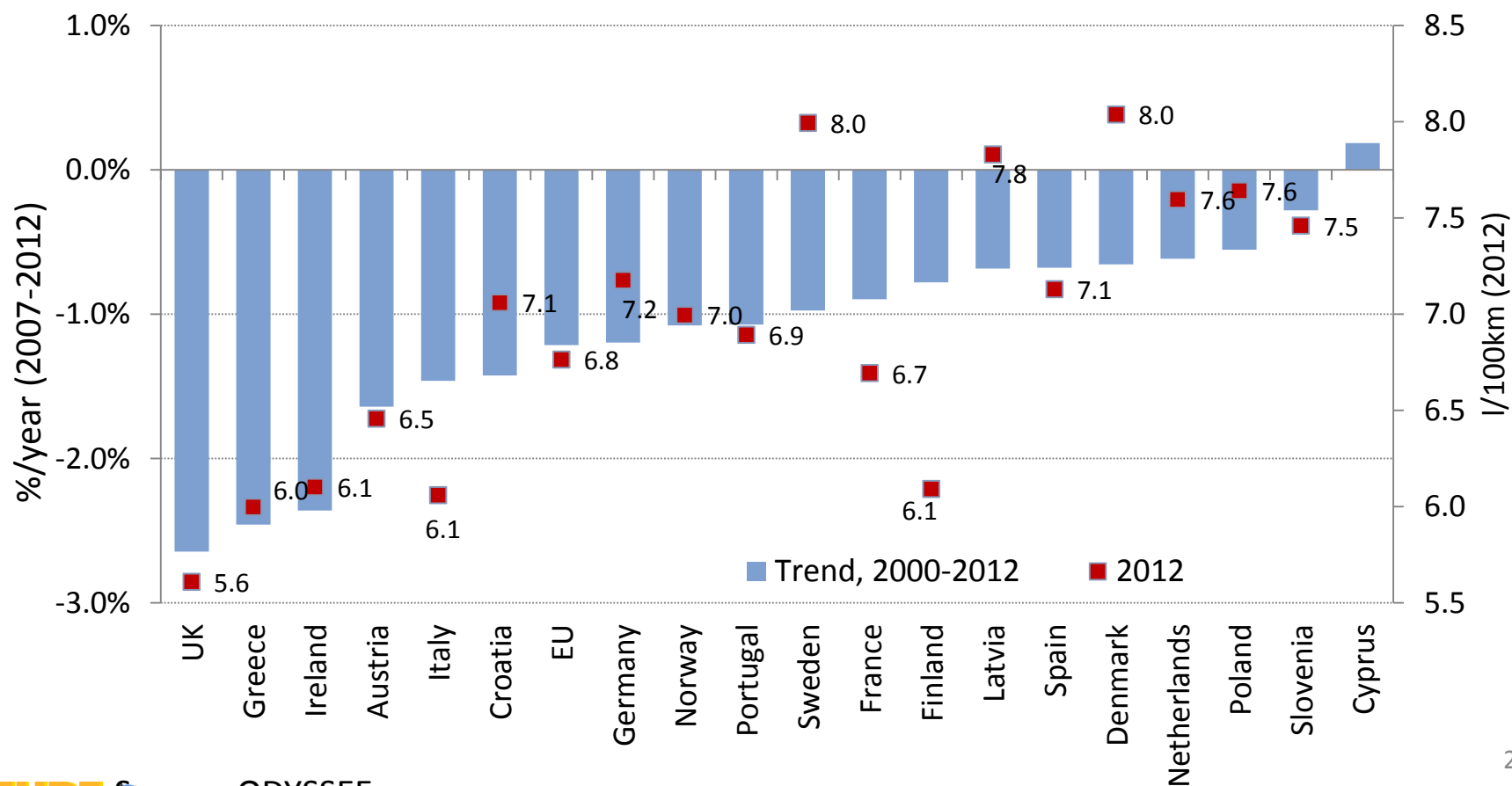


Top countries with highest share of efficient cars (2012)

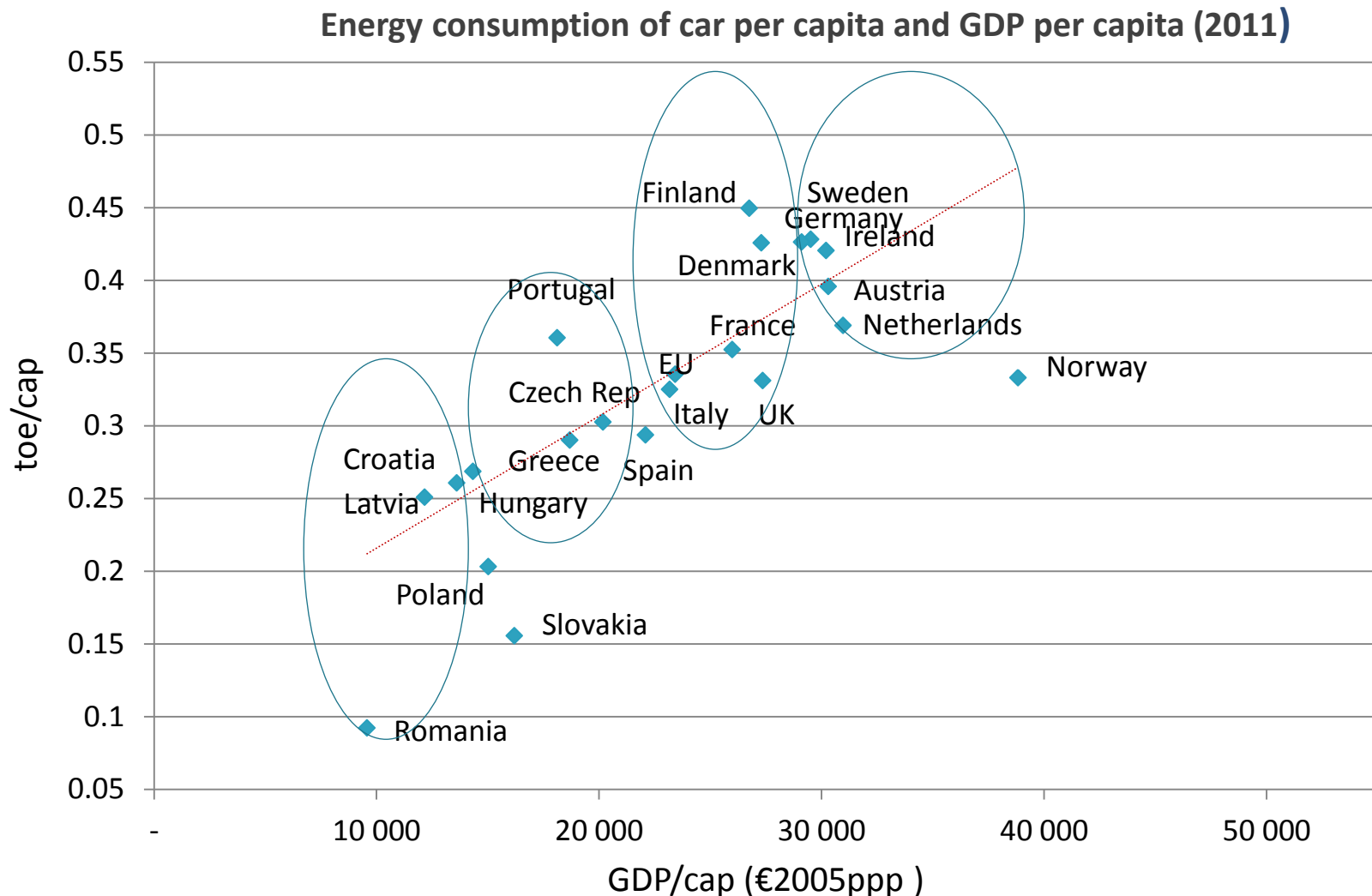


- Decrease of the average specific consumption of the car stock (l/100km) in all countries, by 1.2%/year on average at EU level since 2000.
- Large difference between countries regarding the level of l/100 km due to lower and more efficient cars
- Different trends across countries from a rate of reduction above 2.5%/year in UK, Greece and Ireland

Level and trends in the specific consumption of cars by country

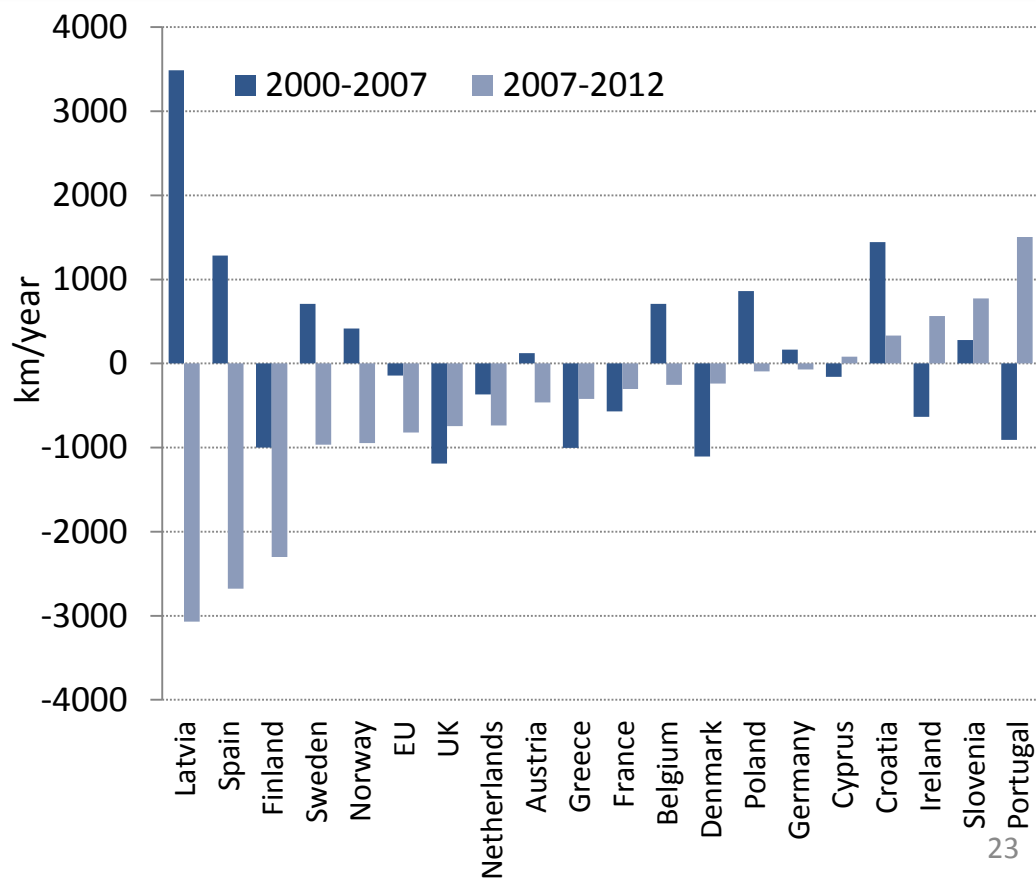
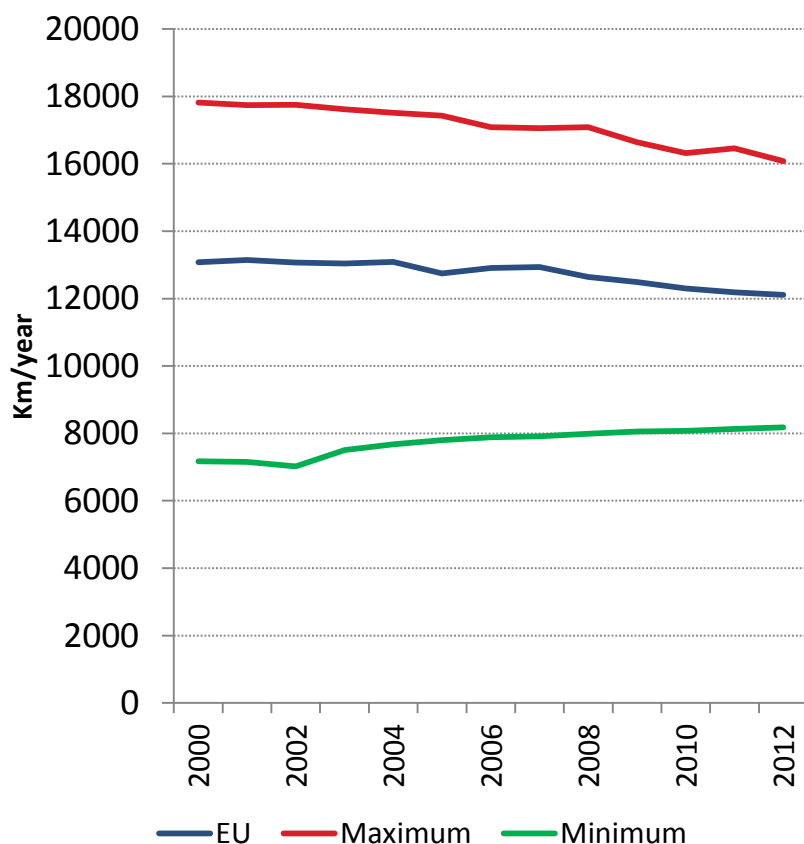


- For a given level of income, range of 20 to 40% in the average consumption of cars, reflecting differences in the fuel efficiency of cars , in the distance travelled and the car ownership



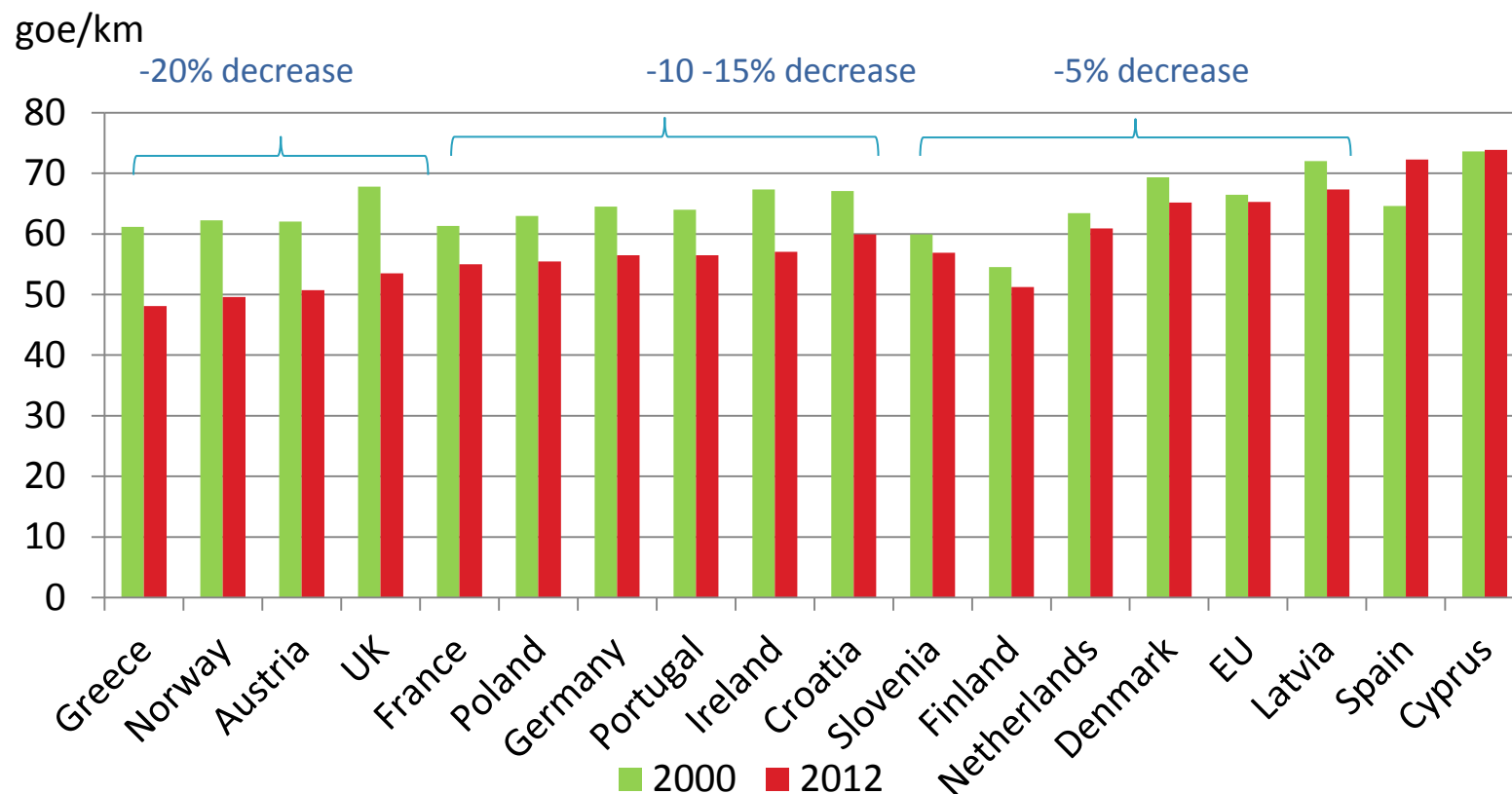
- Decrease in distance travelled by car since 2007 in almost all countries (- 820 km/year from 2007 to 2012 at EU level).
- Large discrepancy between countries, on average 12 200 km/year for the EU .
- On the opposite progression in some countries, such as Croatia, Ireland, Slovenia and Portugal.

Change in distance travelled by car km/year



- Decreasing trends in energy consumption of cars per km except for Spain and Cyprus. Around 10 to 15% decrease in most of countries between 2000 and 2012

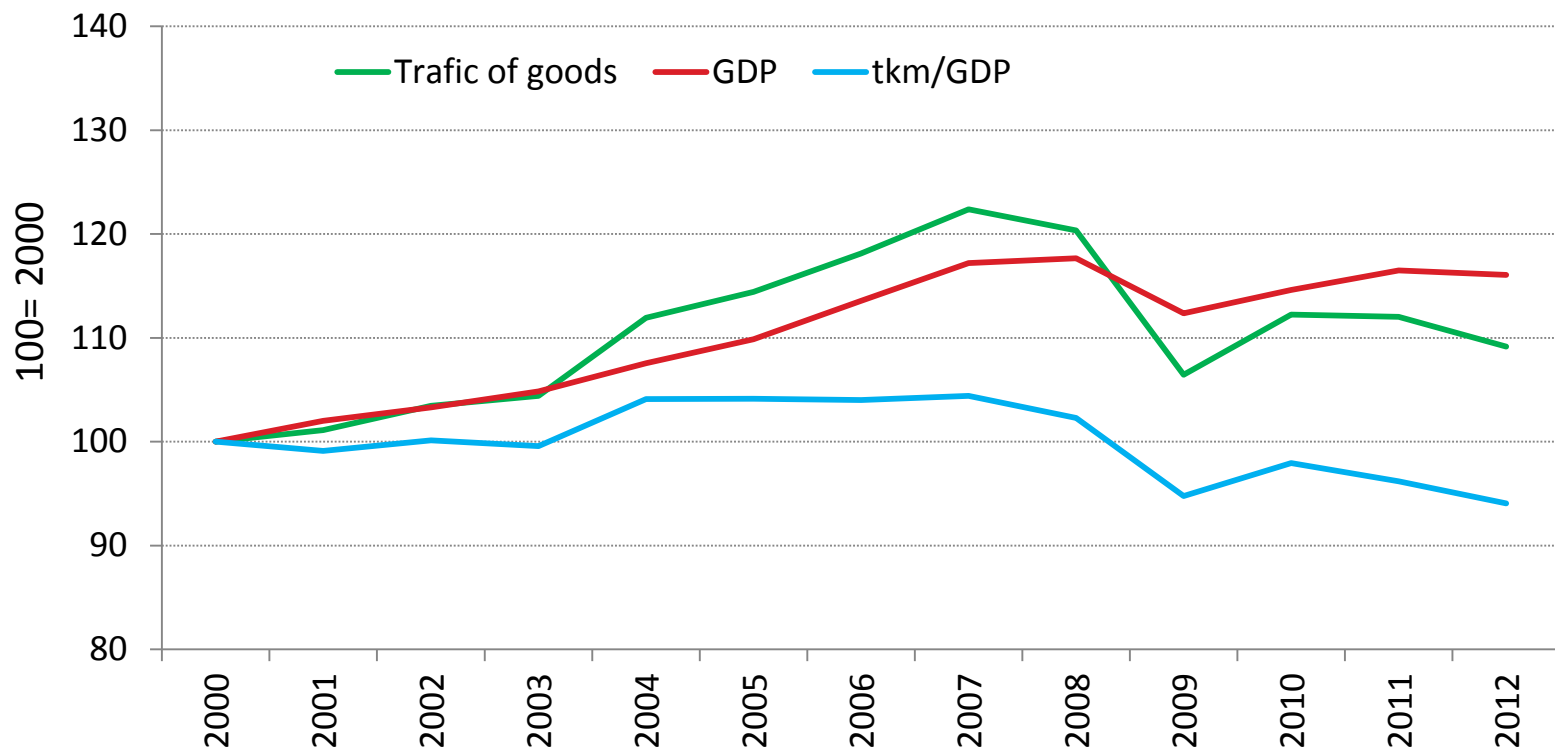
Energy consumption of cars per km (goe/km)



The freight traffic has increased much faster than GDP at EU level until 2007; the intensity of freight traffic per unit of GDP was around 20% higher in 2007 than in 2000.

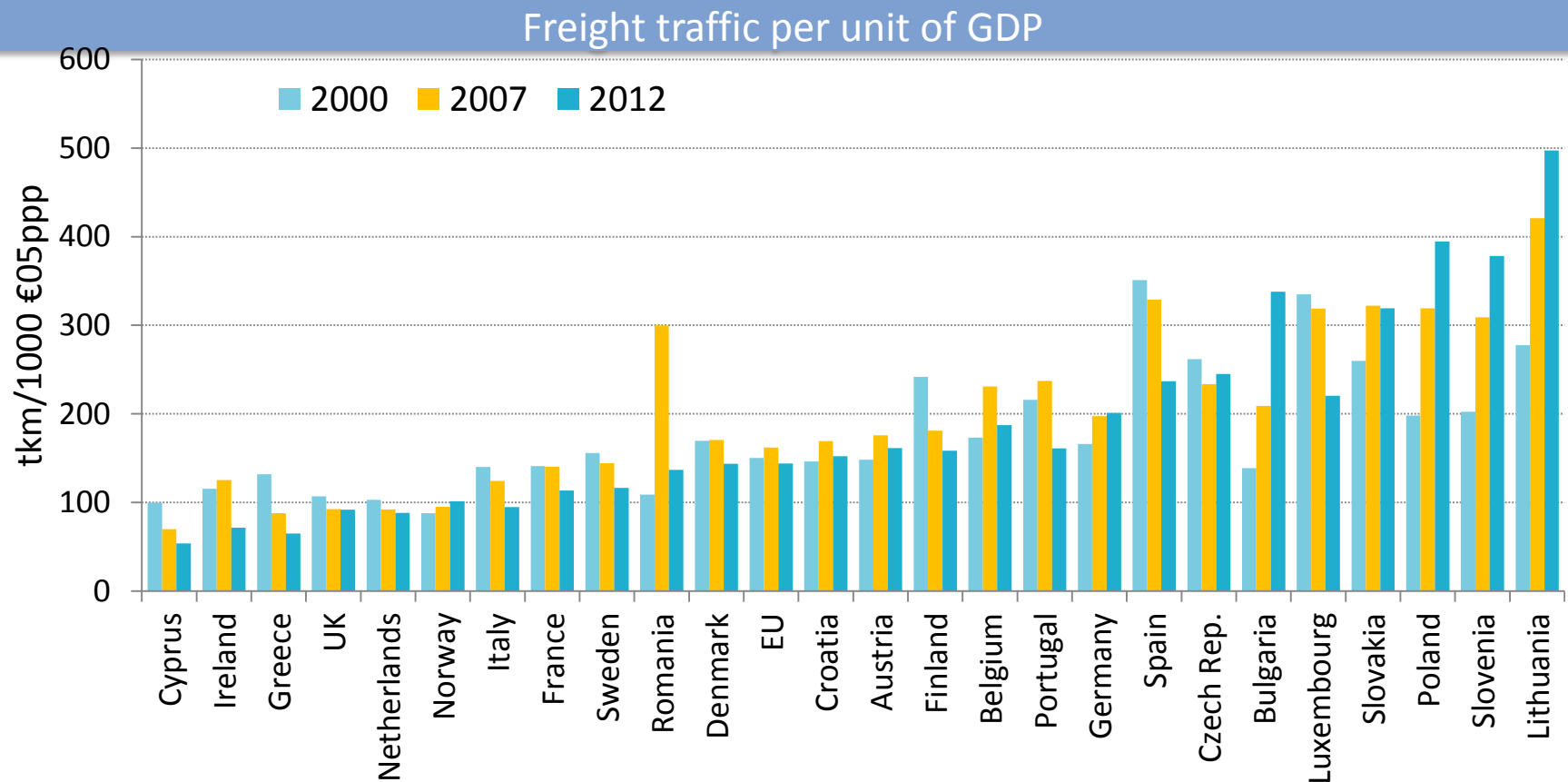
Since the crisis, the traffic has decreased more rapidly than GDP .

Trends in freight traffic and GDP at EU level

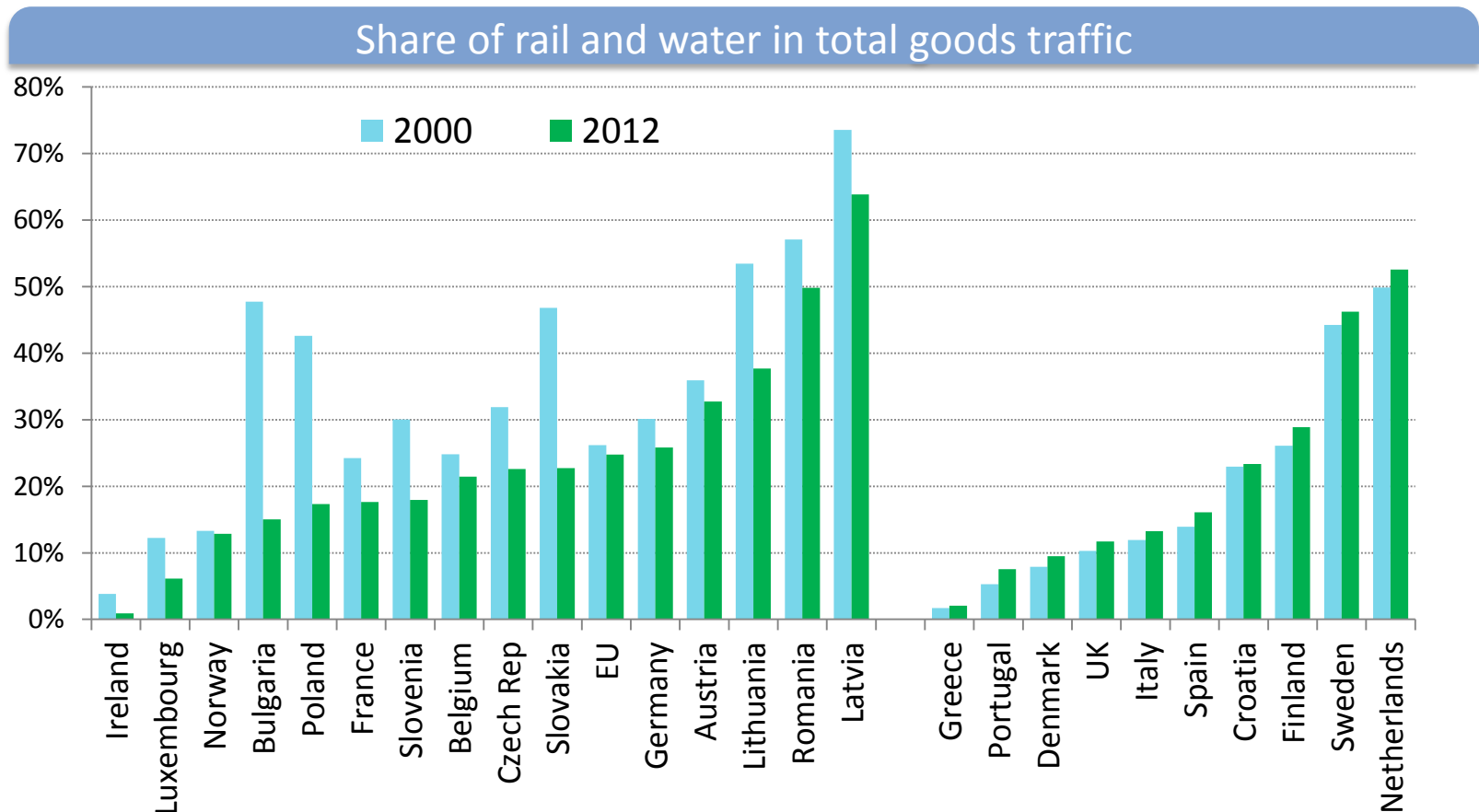


Three different patterns for the change in the freight traffic per unit of GDP:

- 9 countries with an increasing traffic intensity before the crisis and a reduction after, with a very sharp decrease after 2008 in 3 of them (Ireland, Romania and Portugal)
- 9 countries with a decrease since 2000 with for some of them a much large reduction since 2008 (Italy, Spain and Sweden)
- 7 countries with an increase



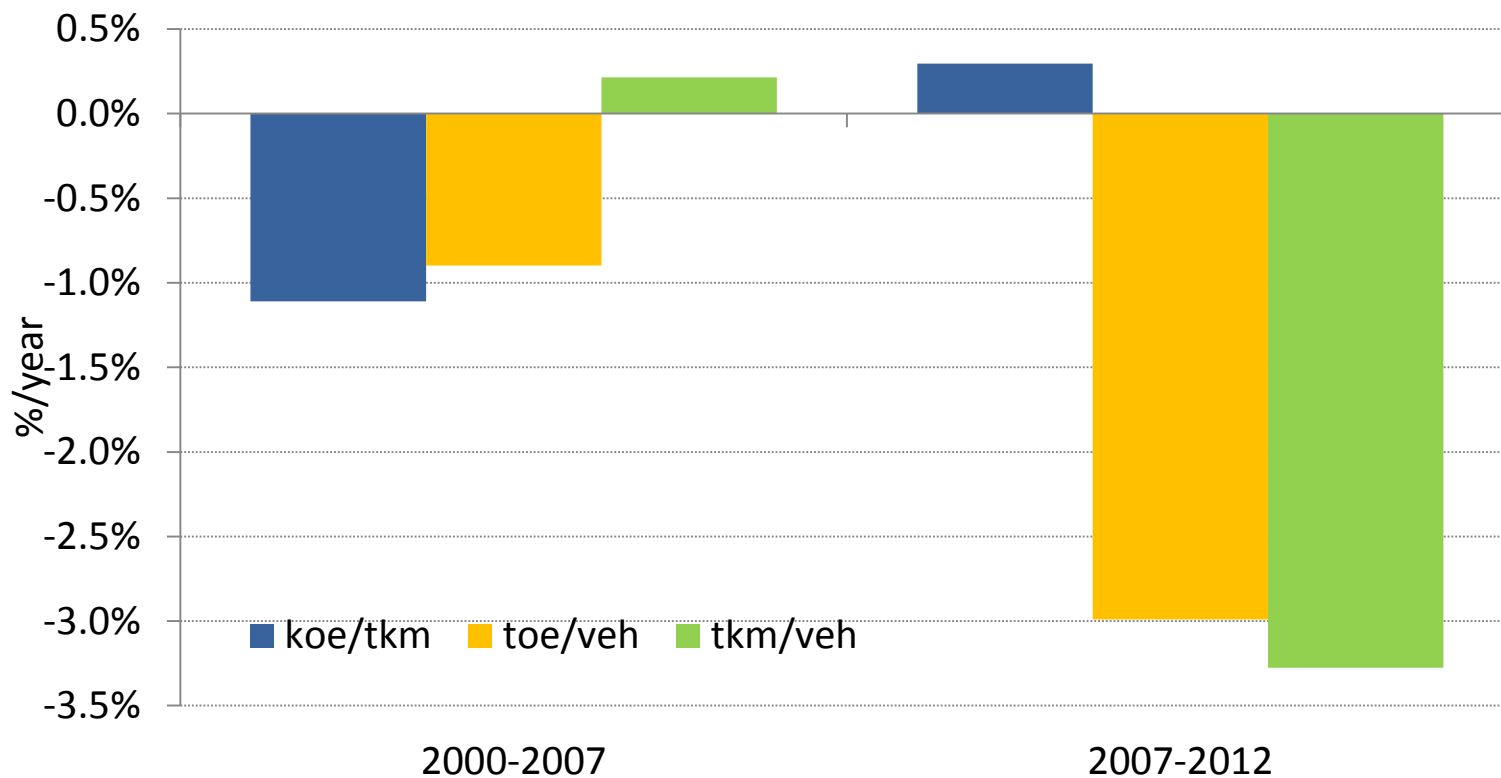
- Decreasing share of rail and water in the traffic of goods in 2/3 of countries. At EU level on average, 25% of goods traffic is carried by rail and boats. Sweden and The Netherlands have the highest share (>40%) and highest progression (=2 and +3 points) to water transport in The Netherlands and rail in Sweden.



Traffic of goods measured in tkm

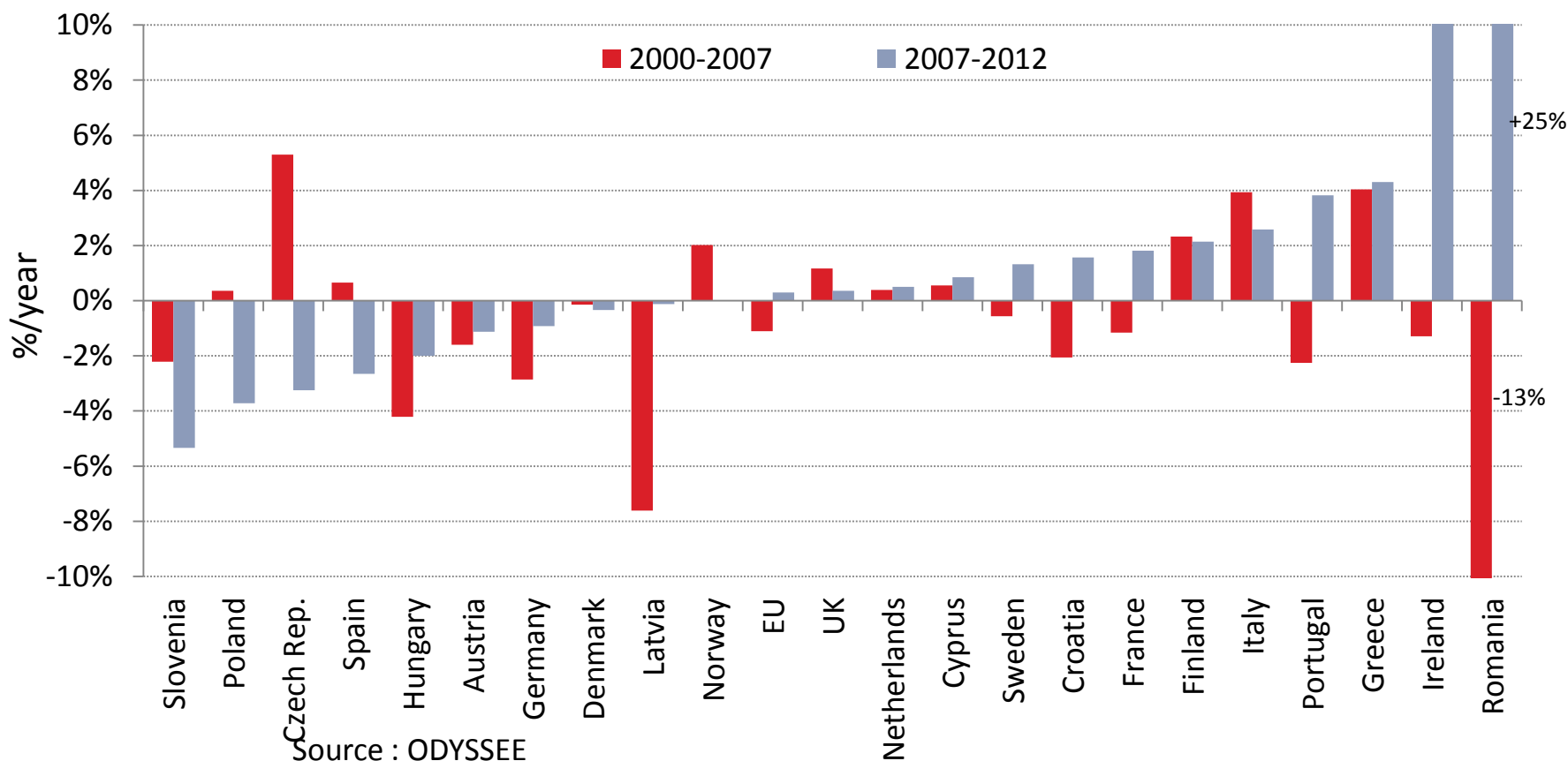
- Lower efficiency of road freight transport since 2007 (+0.3%/year) even if the vehicles are consuming less (-3%/year) .
- This is due to the drop in traffic of goods in 2007/2008 and the slow growth since then, resulting in a sharp decrease in load factors (tkm/veh) :
 - each truck is on average less loaded and empty running is increasing
 - since 2007, the ton-km carried out by trucks have decreased by 2.5%/year)

Change in the unit consumption of road freight transport (EU)



- Reverse trends since 2007 with a deterioration of the energy efficiency trends of road freight transport in around 2/3 of countries.
- Lower efficiency for the other countries except Slovenia, Poland, Czech Rep and Spain.

Unit consumption of road transport of goods (goe/tkm)

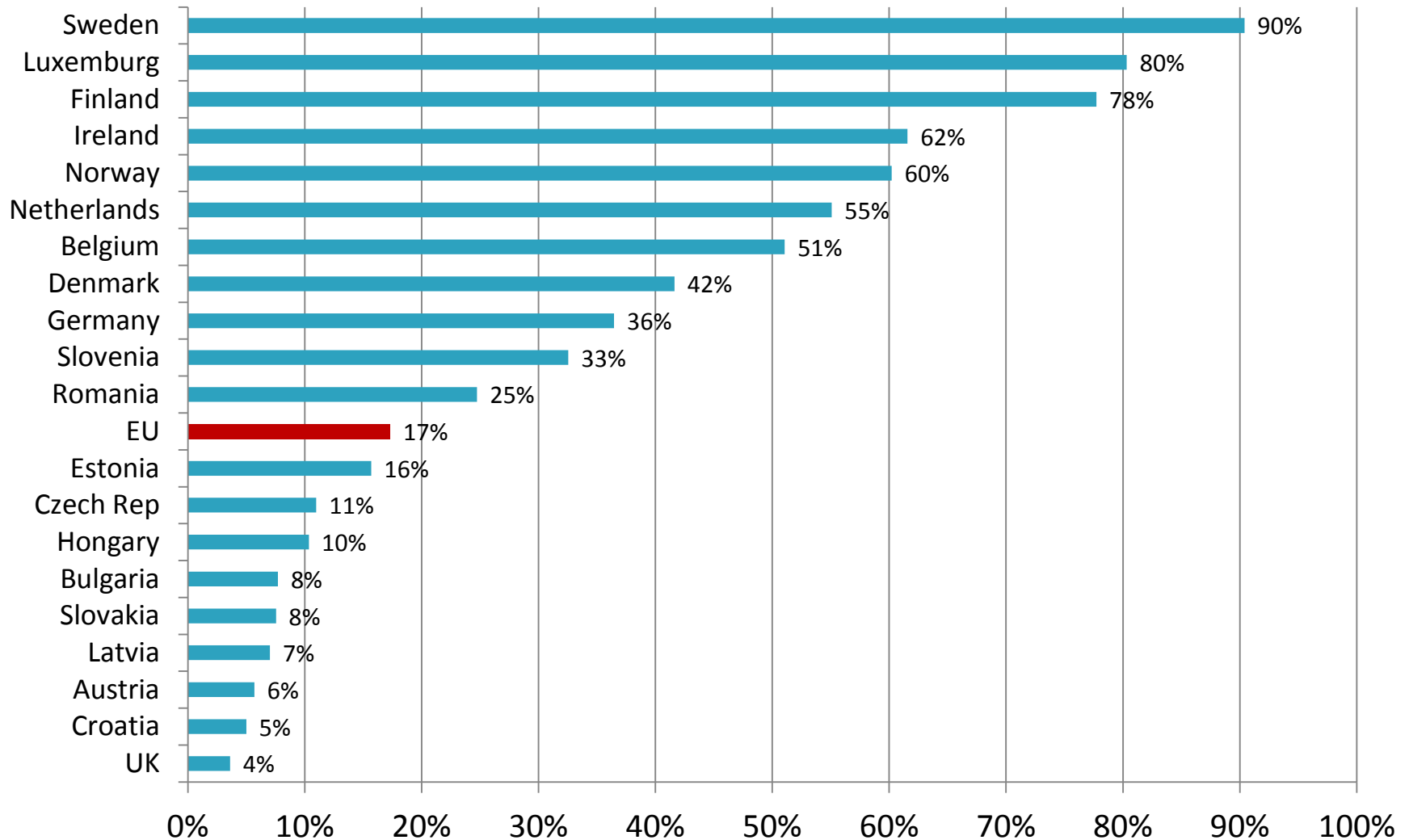


Source : ODYSSEE

2011 for Germany, Croatia, Poland and Romania

Large discrepancies in the share of heavy trucks among countries : from less than 10 % for UK and most eastern countries to more than 60% in Nordic countries.

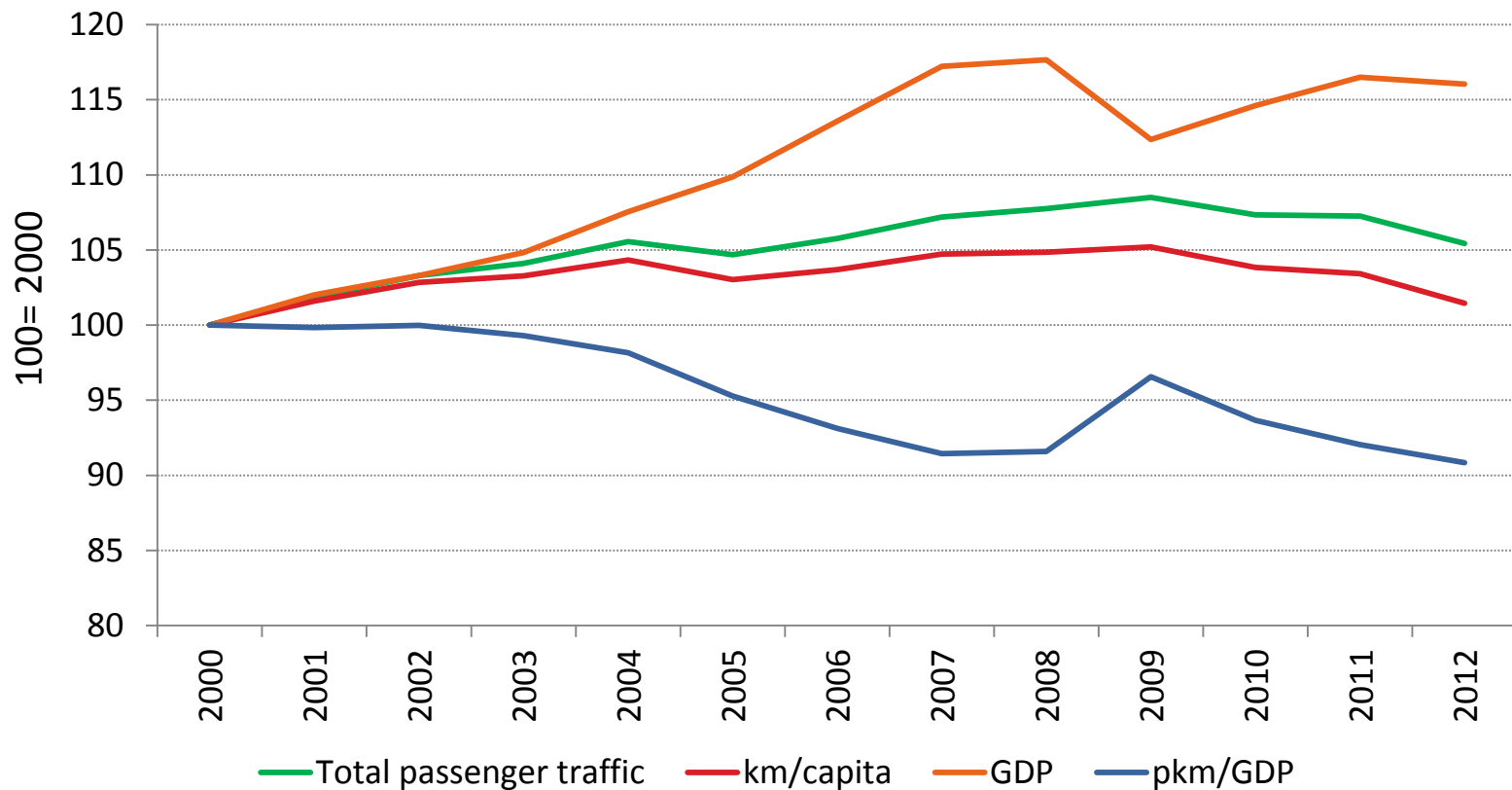
Share of heavy trucks (> 30.5t) in goods traffic



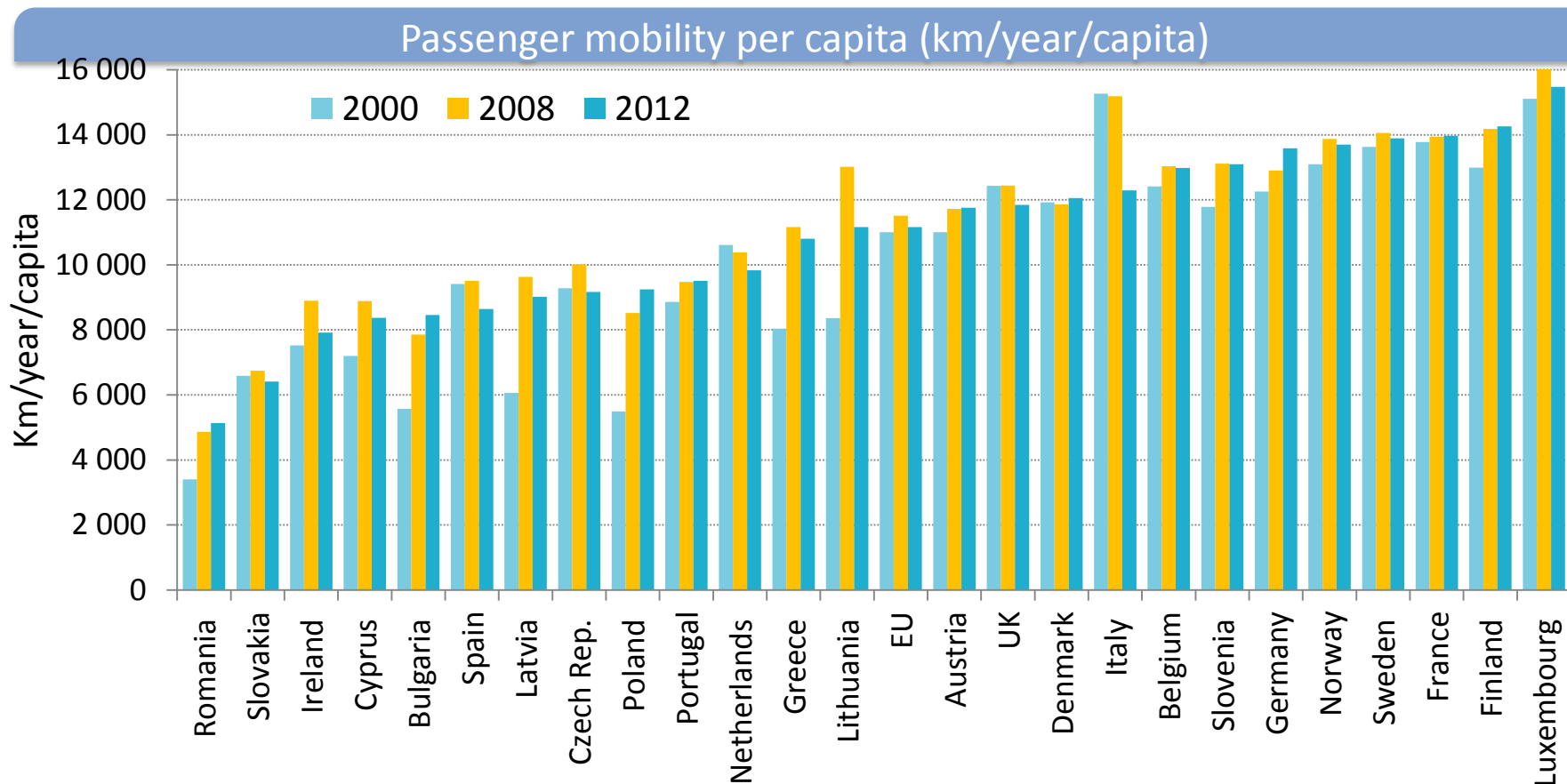
Source : Eurostat

- Passenger traffic is growing slower than GDP
- Decrease in mobility per capita since the economic crisis and low progression before

Passenger traffic and GDP at EU level

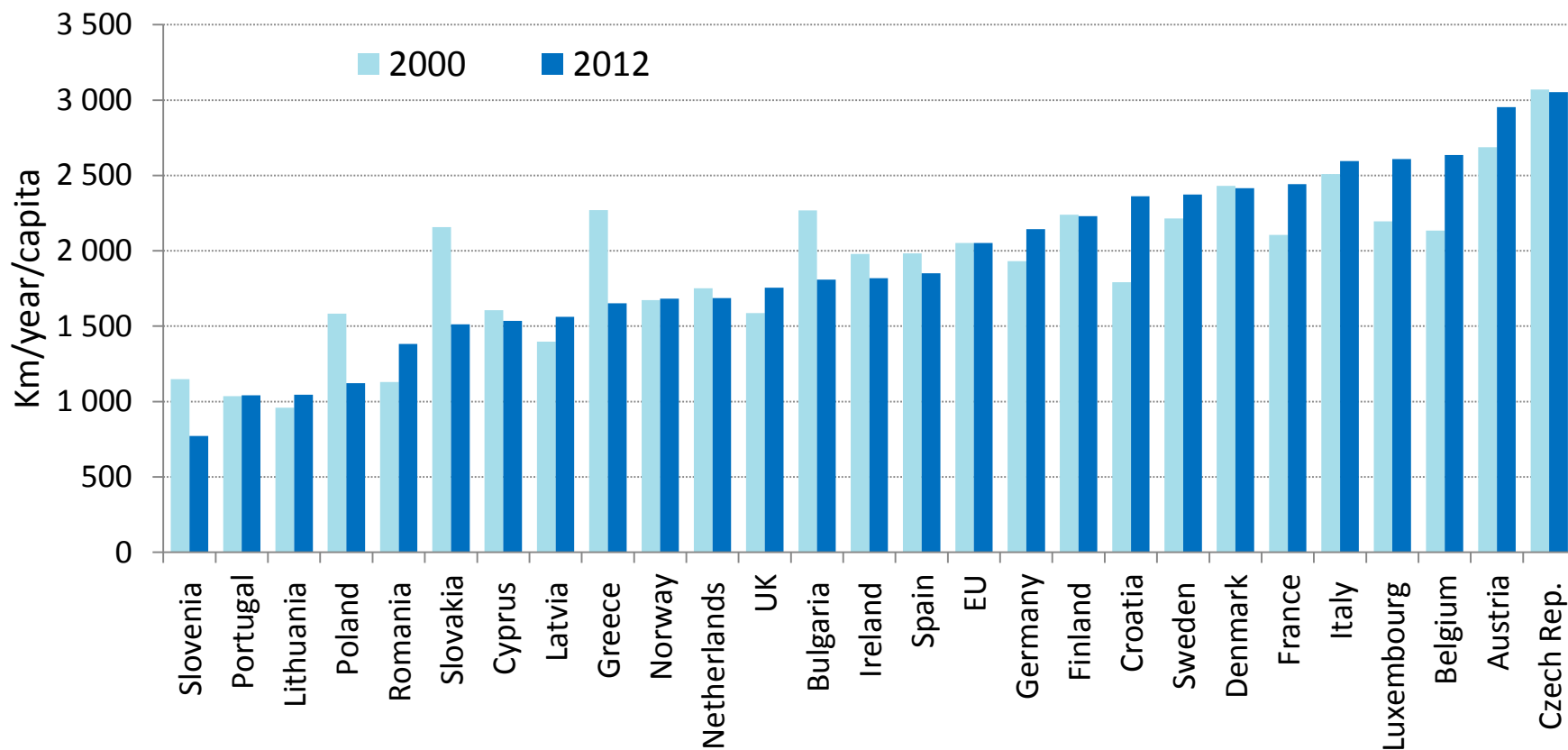


- Decrease or no more progression in most countries (~80%) since 2008
- Very rapid growth in new member countries between 2000 and 2008 (+200 to 600 km/yr), i.e. mostly in countries with the lowest mobility
- Large dispersion in passenger mobility from 6500 km/yr (for the lowest 3 to 14000 km/yr (highest 3 average).



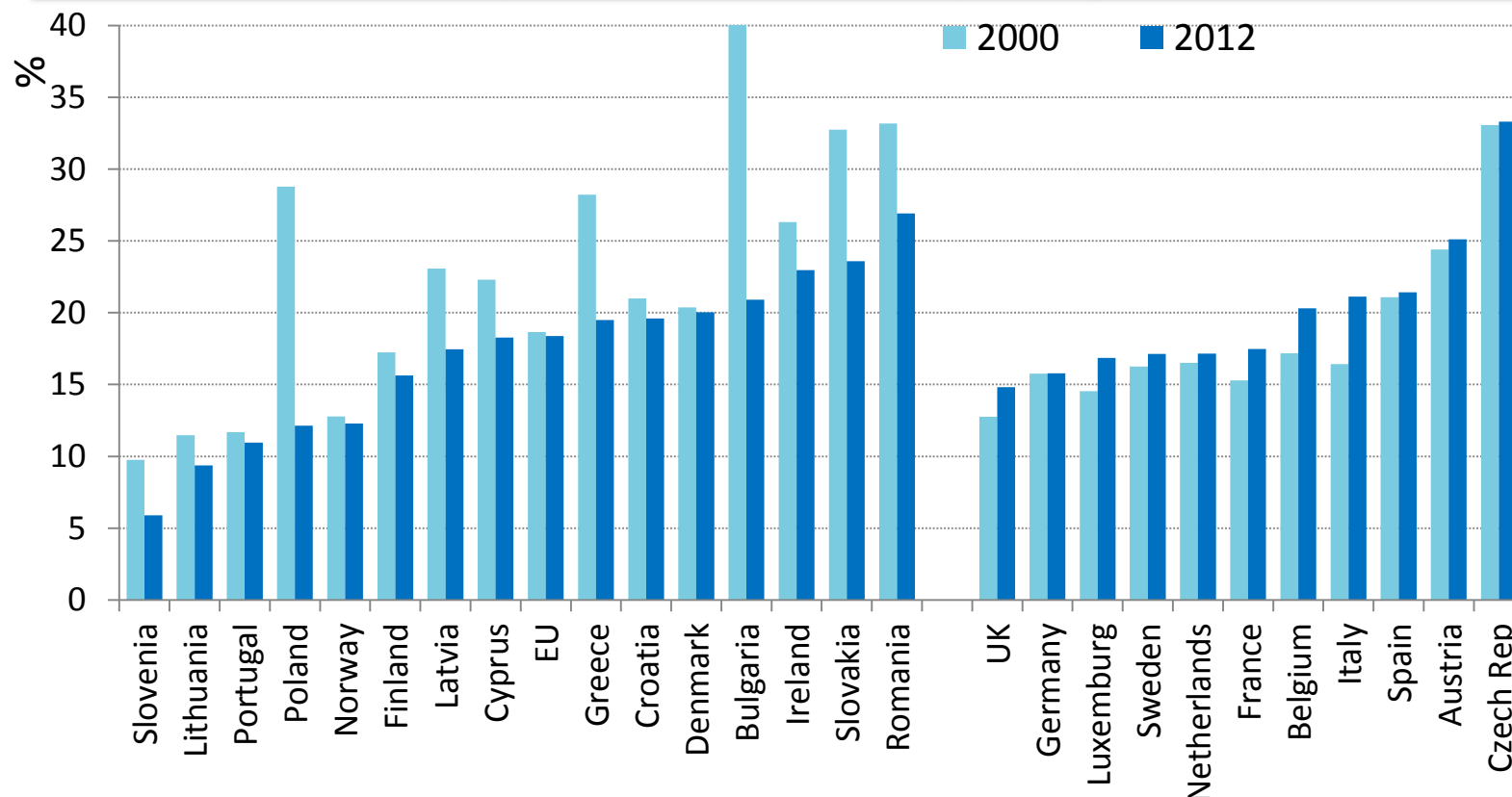
- The Czech Republic and Austria have the highest use of public transport modes (around 3000 km/year), compared to an EU average of around 2000 km .
- Belgium and Croatia recorded the highest increase over the period 2000-2012 (over 30%).

Mobility of public transport per capita (km/year/capita)



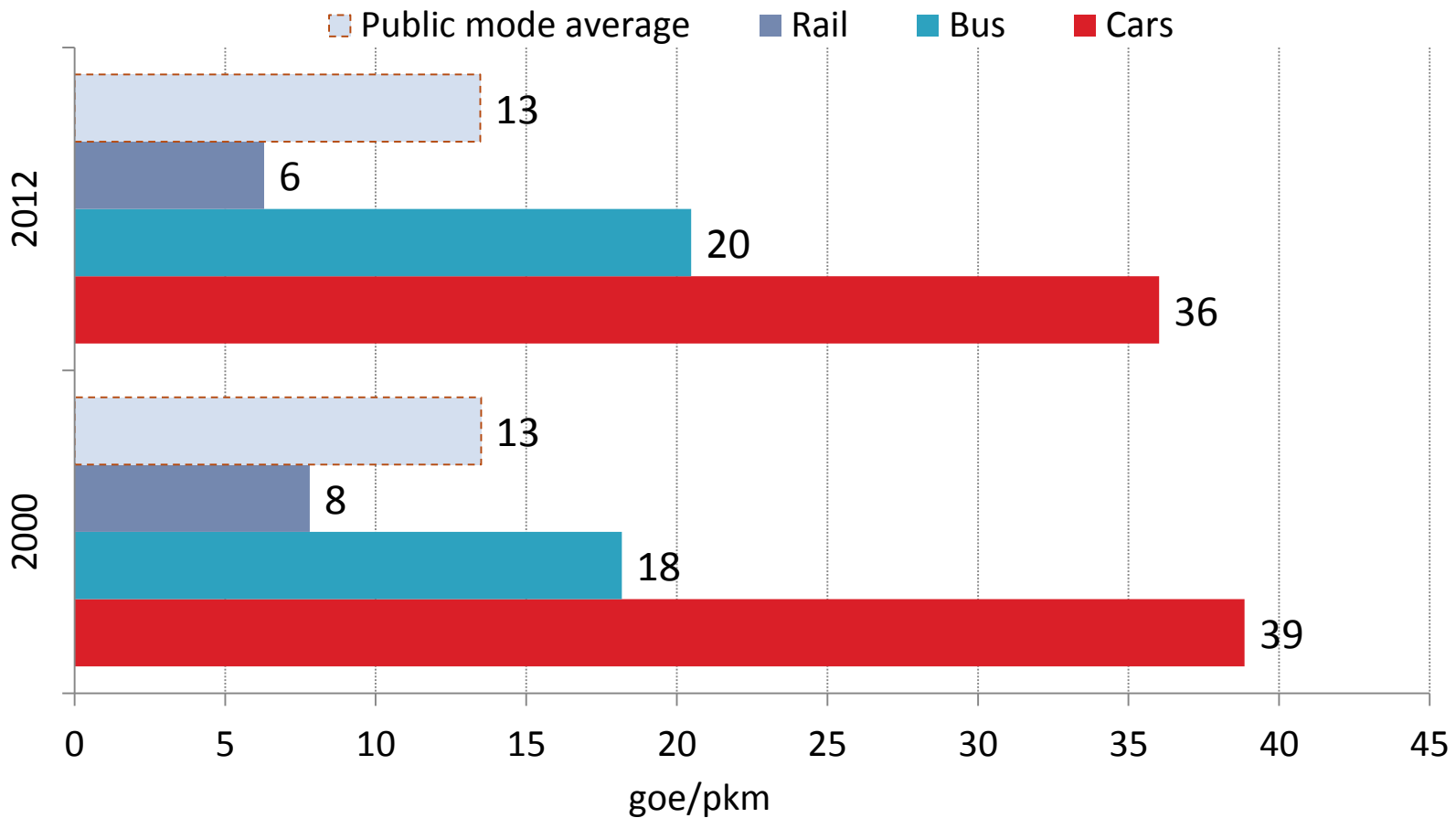
- Decreasing share of public transport in passenger traffic, except in 11 countries
- Stable share at EU level (18.5%)
- Highest progression in Italy (+ 4 points), Belgium (+3) France, UK, Luxembourg (+2).
- Four countries with a share of public transport > 20% (Italy, Spain, Austria and Czech Rep.)
- Rapid reduction in new member countries, where public transport used to be dominant (especially in Poland, Latvia, Slovakia and Bulgaria).

Share of public transport in total passenger traffic



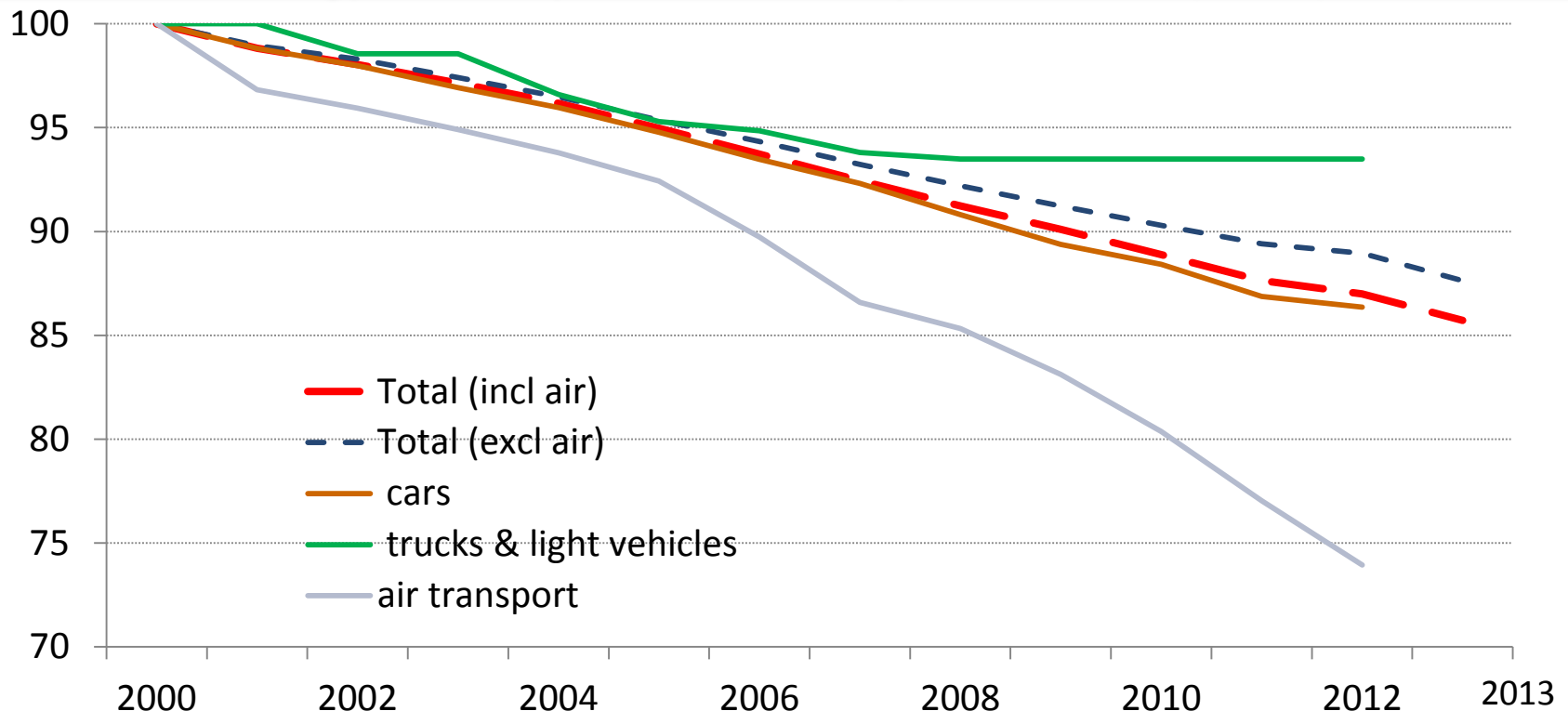
- Cars require almost 3 times more energy per passenger-km than public transport (rail and buses), and 6 times more than rail transport. The specific consumption of domestic air transport is around twice the value of cars but almost the same if international flights are included

Specific energy consumption by transport mode (EU average)



- Regular improvement of the energy efficiency of transport since 2000, by 1.2%/year (1% /year excluding air)
- Regular improvement for cars and larger gains for air transport
- No more progress in the efficiency of trucks and light vehicles since 2007;

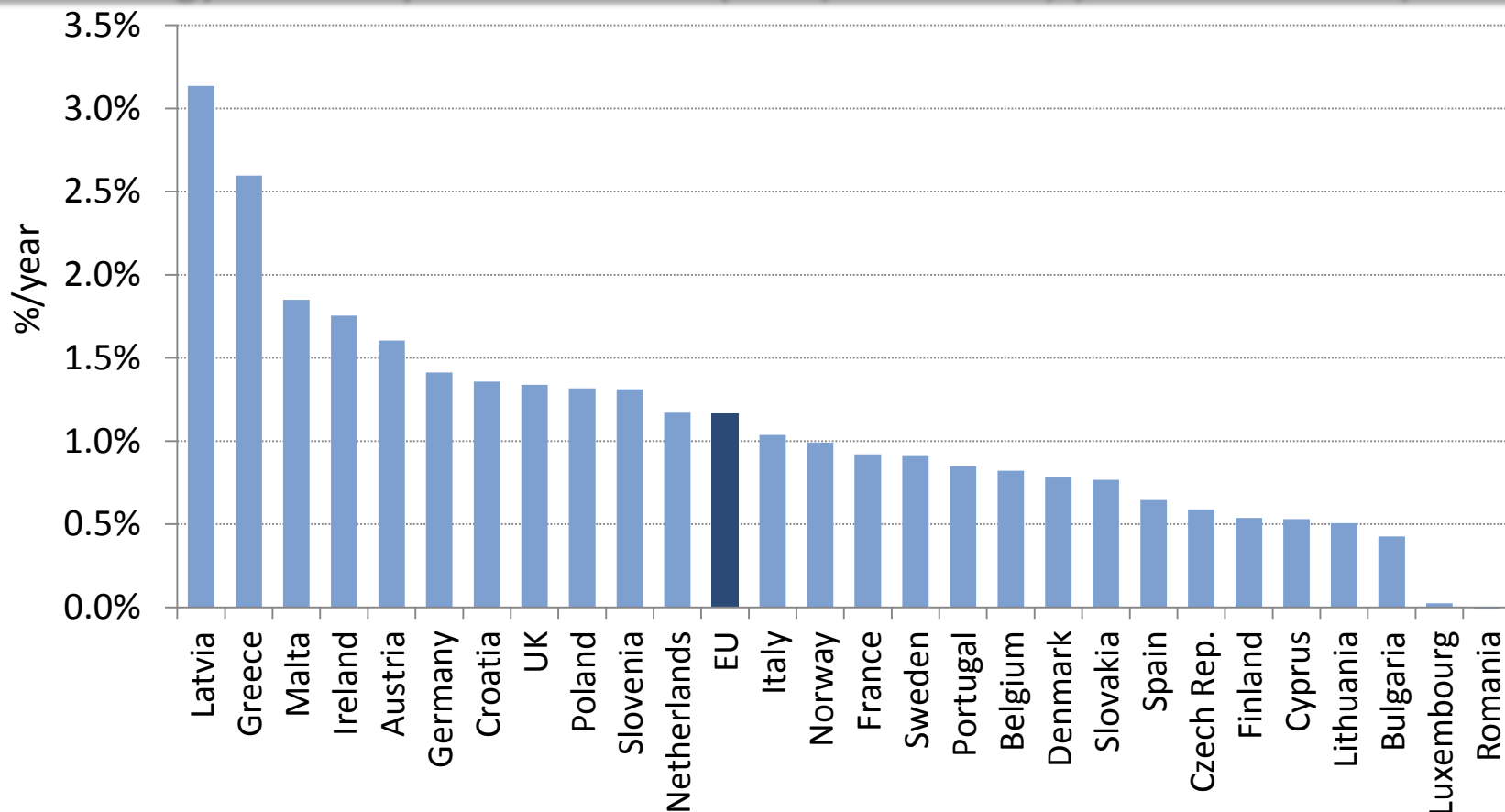
Energy efficiency trends for transport in the EU (ODEX)



ODEX calculated on 7 modes: cars (litres/km), trucks & light vehicles (toe per tkm), air (toe per passenger); rail, water (toe/ tkm); motorcycles, buses (toe/vehicle)
 2013 for overall ODEX estimated based on short term indicators

- Discrepancies in energy efficiency gains in EU countries: from around 2.5-3%/year in Greece and Latvia to 0.5%/year in Lithuania and Bulgaria and almost no savings in Luxembourg and Romania.

Energy efficiency trends in transport (2000-2012) (based on ODEX)

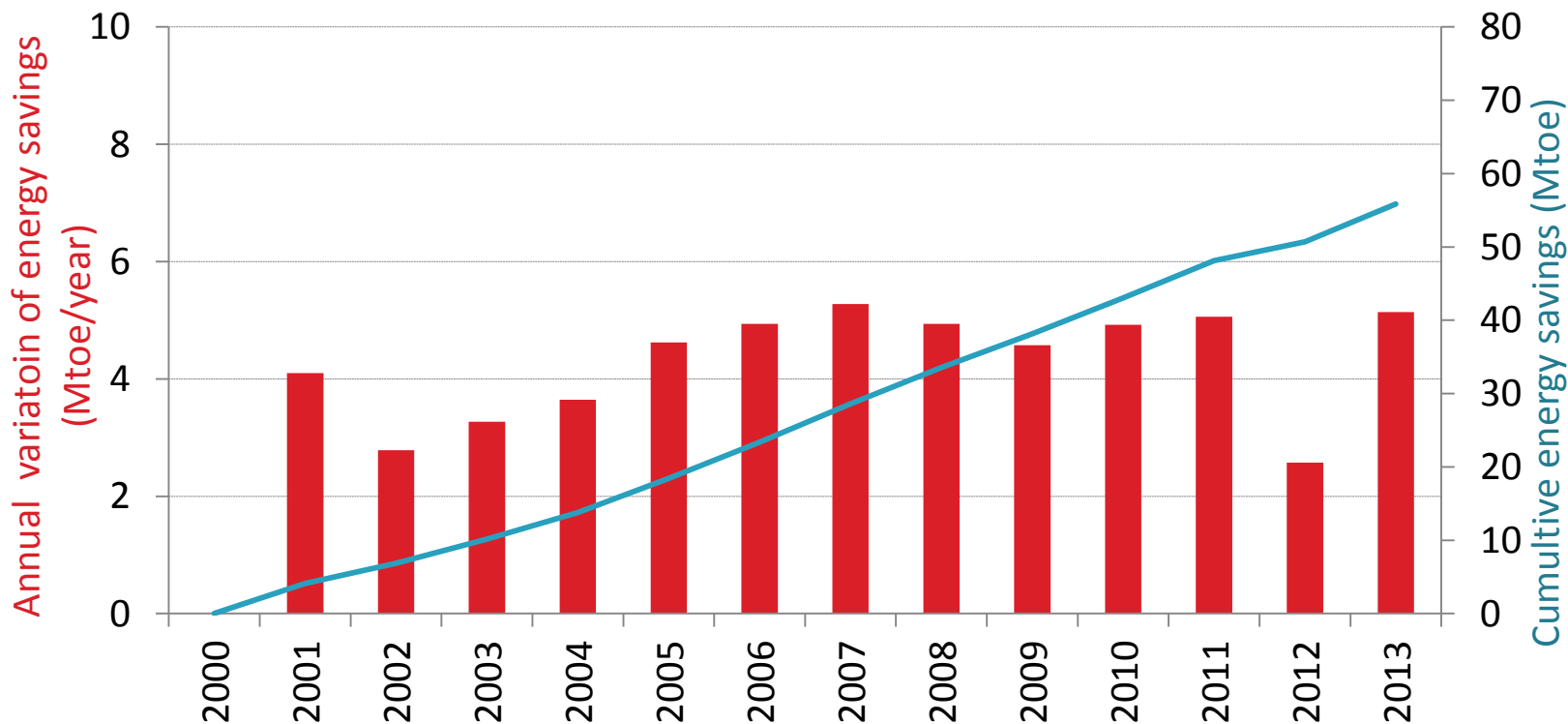


Source : ODYSSEE

■ In 2013, energy savings in transport almost reached 56 Mtoe: without energy efficiency improvement, the energy consumption would have been higher by 56 Mtoe.

Slowdown in energy savings after 2007, mainly due to no more progress for goods transport as a consequence of the economic recession.

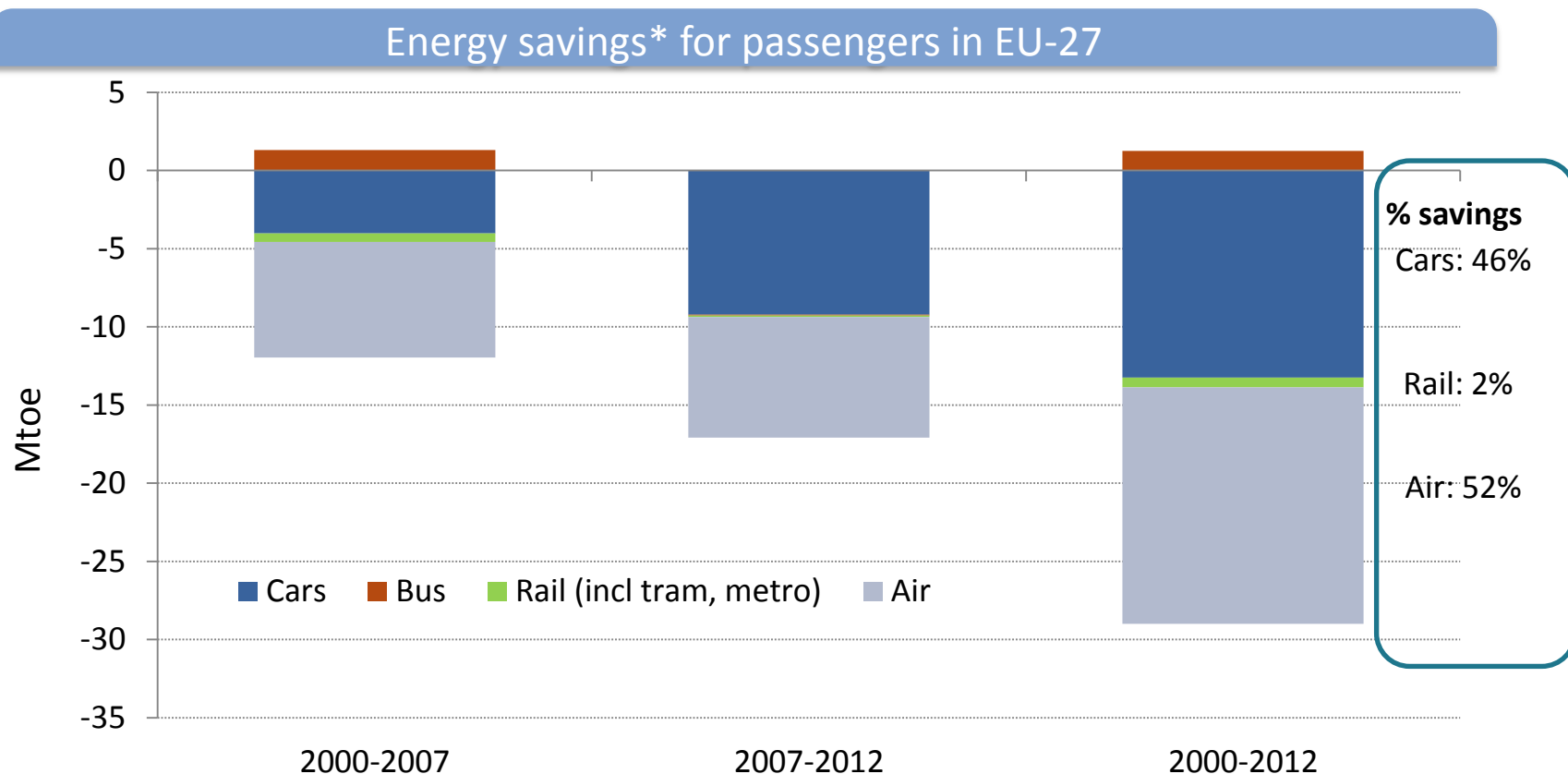
Energy savings in transport (EU)



* Air included

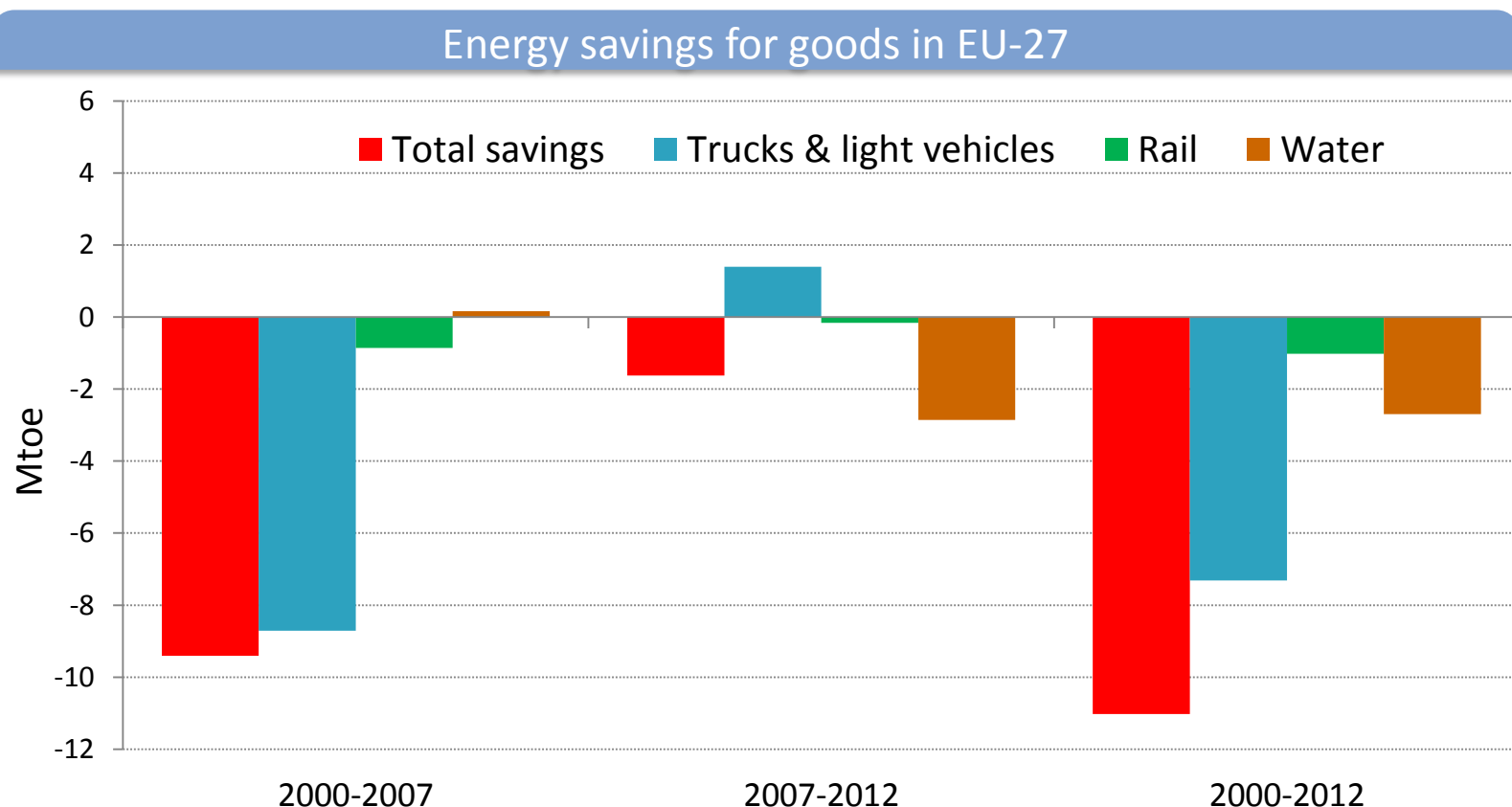
Source : ODYSSEE

Energy savings for passengers (28 Mtoe in 2012 compared to 2000) are mainly due to cars due to a technological effect (decrease in specific consumption in l/100km and a reduction in the annual distance travelled per car) and air. Negative savings for bus (as measured by the ratio goe/pkm)



*Savings by modes calculated on the basis on passenger-km changes

Energy savings for goods (11 Mtoe in 2012 compared to 2000) are mainly due to savings from trucks and light vehicles due to a decrease in specific consumption per tonne-km before 2007;
Since 2007 no more savings for road goods and even reverse trends .



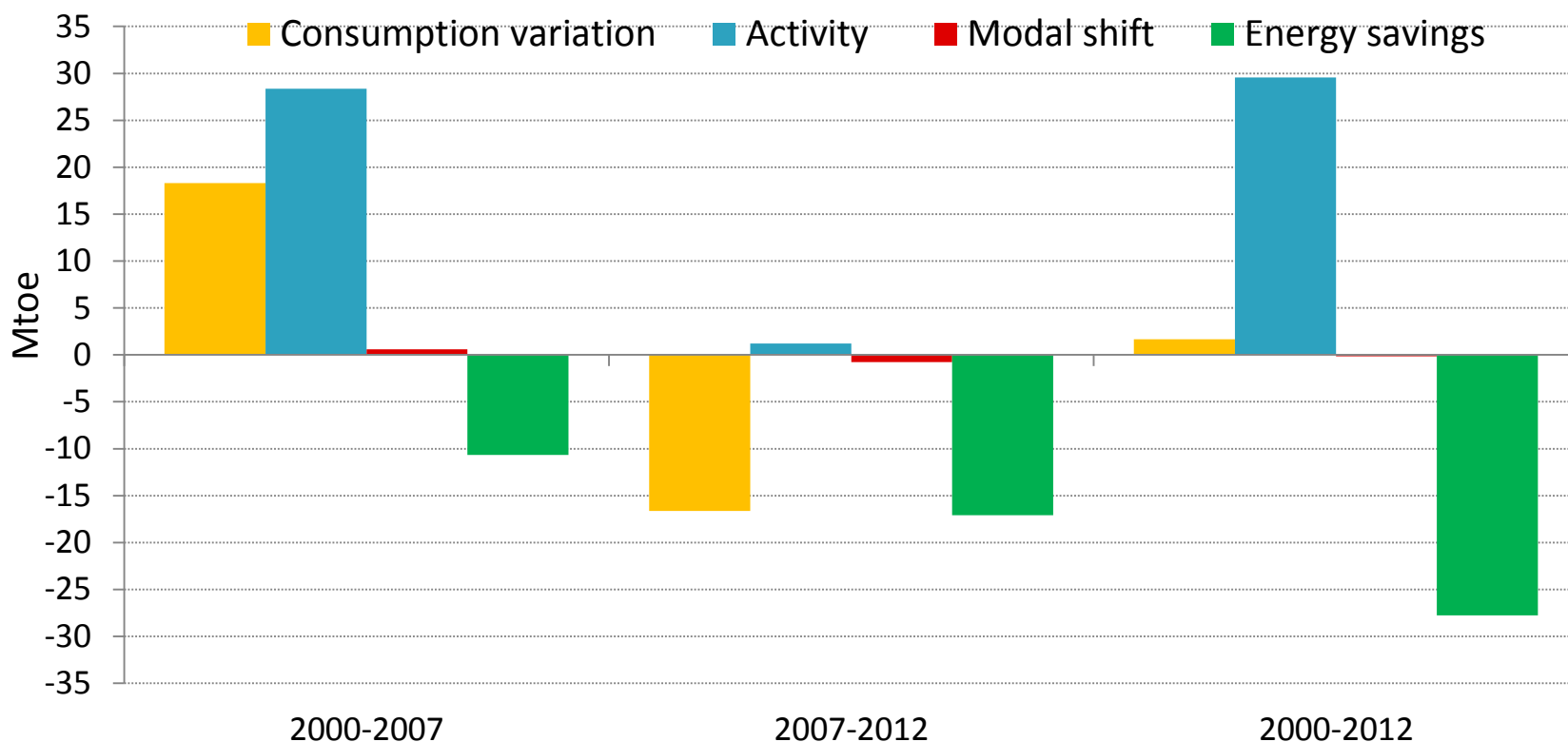
- Decreasing consumption of transport since 2007 by more than 30 Mtoe at EU level
- Around 40% of that reduction is due to the economic recession, with a decrease in freight traffic and the stability of passenger traffic, and almost 60% to energy savings, mostly for passenger cars.
- Almost no efficiency improvements for road freight transport since 2007, because linked to the reduction in traffic .

Decomposition of energy consumption variation of transport: EU (2000-2012)



Decreasing energy consumption for passenger since 2007 mainly due to energy savings (17 Mtoe) (change in specific consumption per unit of traffic) that more than offset growth in traffic. On average energy consumption of passengers has increased by around 1.7 Mtoe since 2000 due to an increase in traffic (30 Mtoe) and modal shift (0.2 Mtoe) but offset by energy savings (28 Mtoe). Negative but marginal impact of modal split due to a decreasing share of public transport in passenger traffic (or a shift from public transport to car).

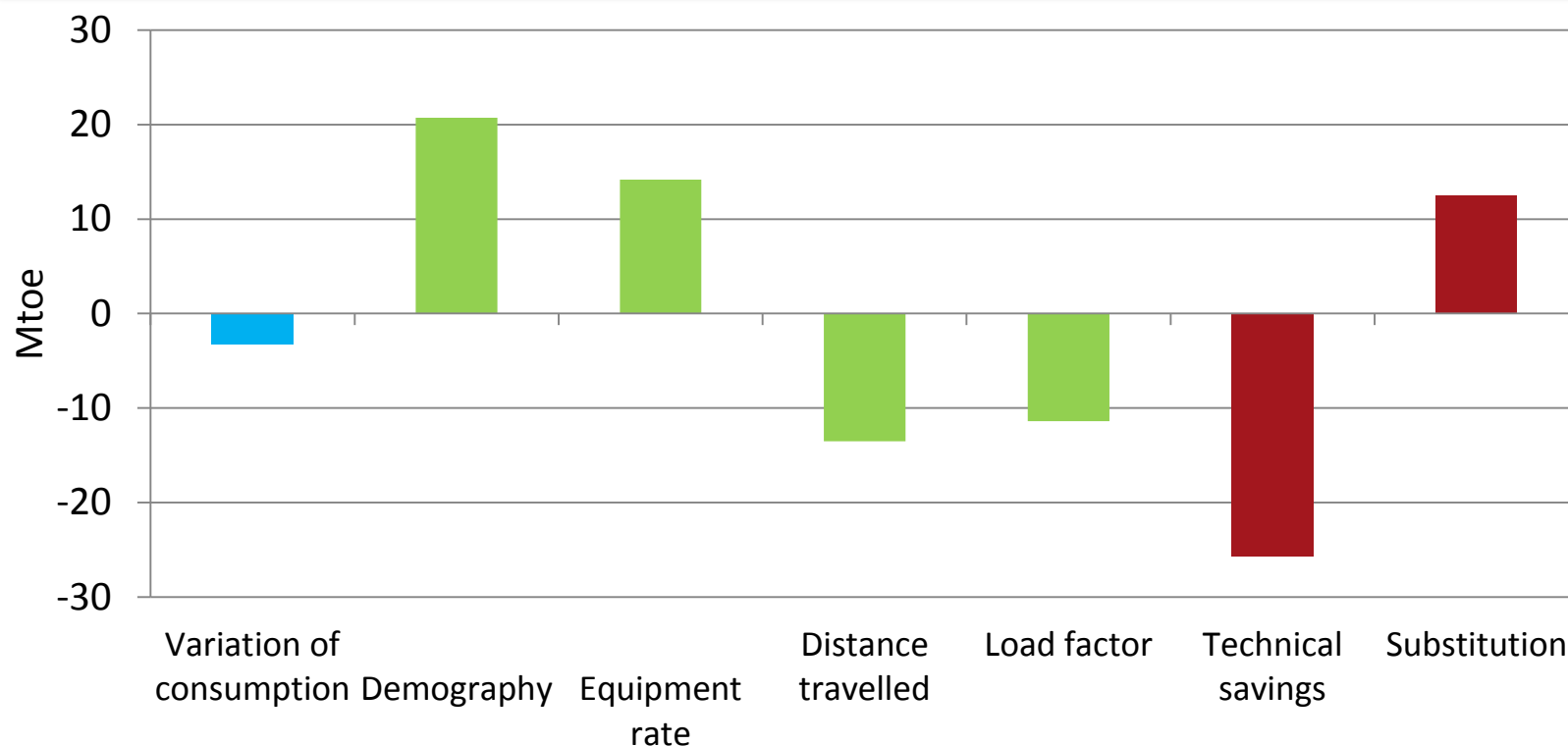
Decomposition of energy consumption for passengers: EU-27



- Between 2000 and 2012, the increase in the stock of cars should have raised the energy consumption of cars by 34 Mtoe, of which 21 Mtoe are due to an increase of population (“demography”) and 14 Mtoe to an increase in car ownership per capita (465 cars per 1000 inhabitants at EU level in 2012, +1.3%/year since 2000).

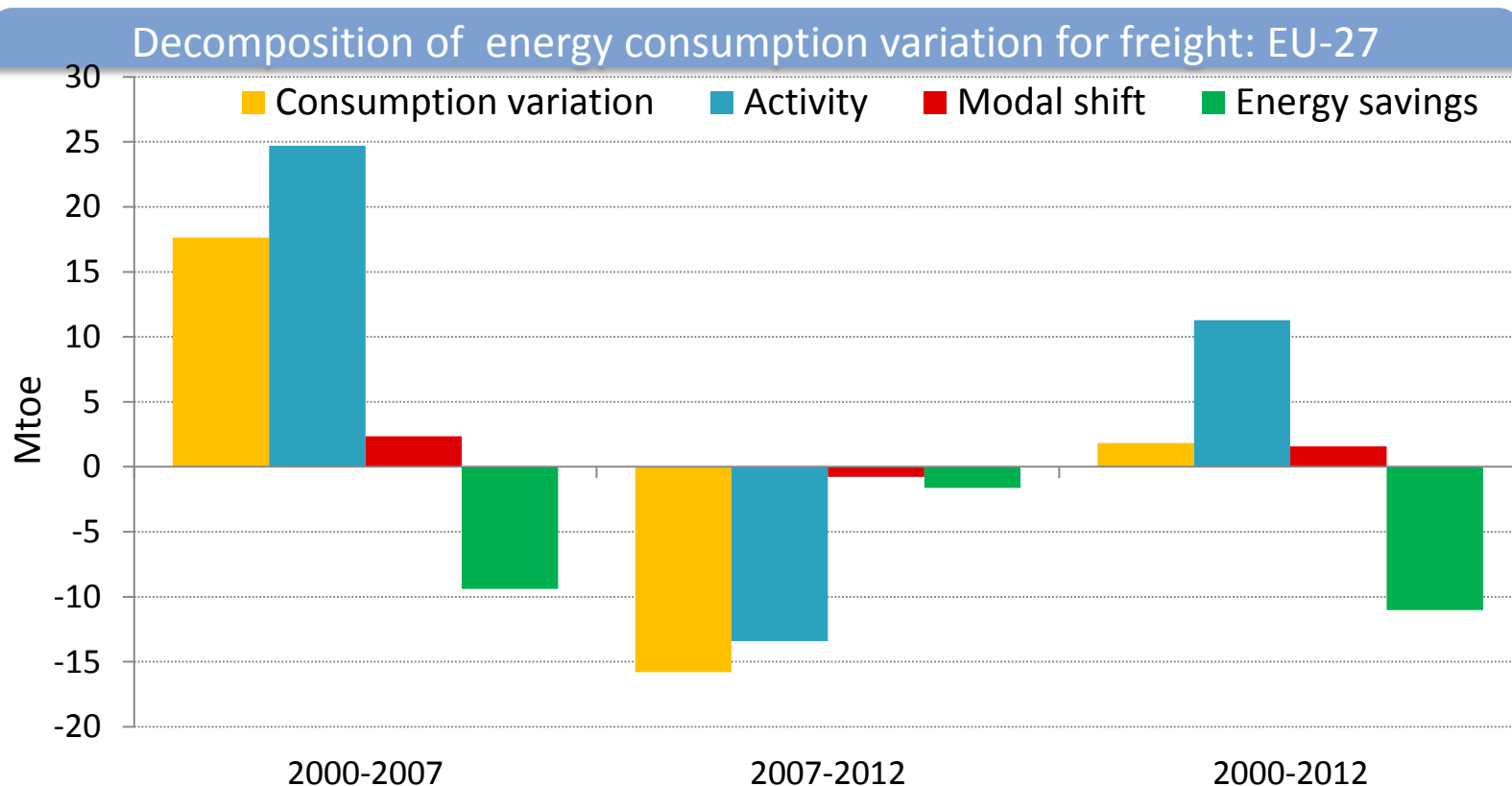
The penetration of biofuels also increased the consumption (+ 12 Mtoe).
On the opposite several factors contributed to reduce the consumption: energy savings (reduction in the energy consumption per pkm) (- 26 Mtoe) , decrease in distance travelled (-14 Mtoe) and increase rate of occupancy (-11 Mtoe).

Decomposition of energy consumption variation for cars in EU (2000-2012)



Decreasing energy consumption of freight transport since 2007 mainly due a decrease in the traffic in ton-km and in lesser extend due to modal shift. On the opposite reverse trends in energy savings because of an increase in the energy consumed per tonne –km.

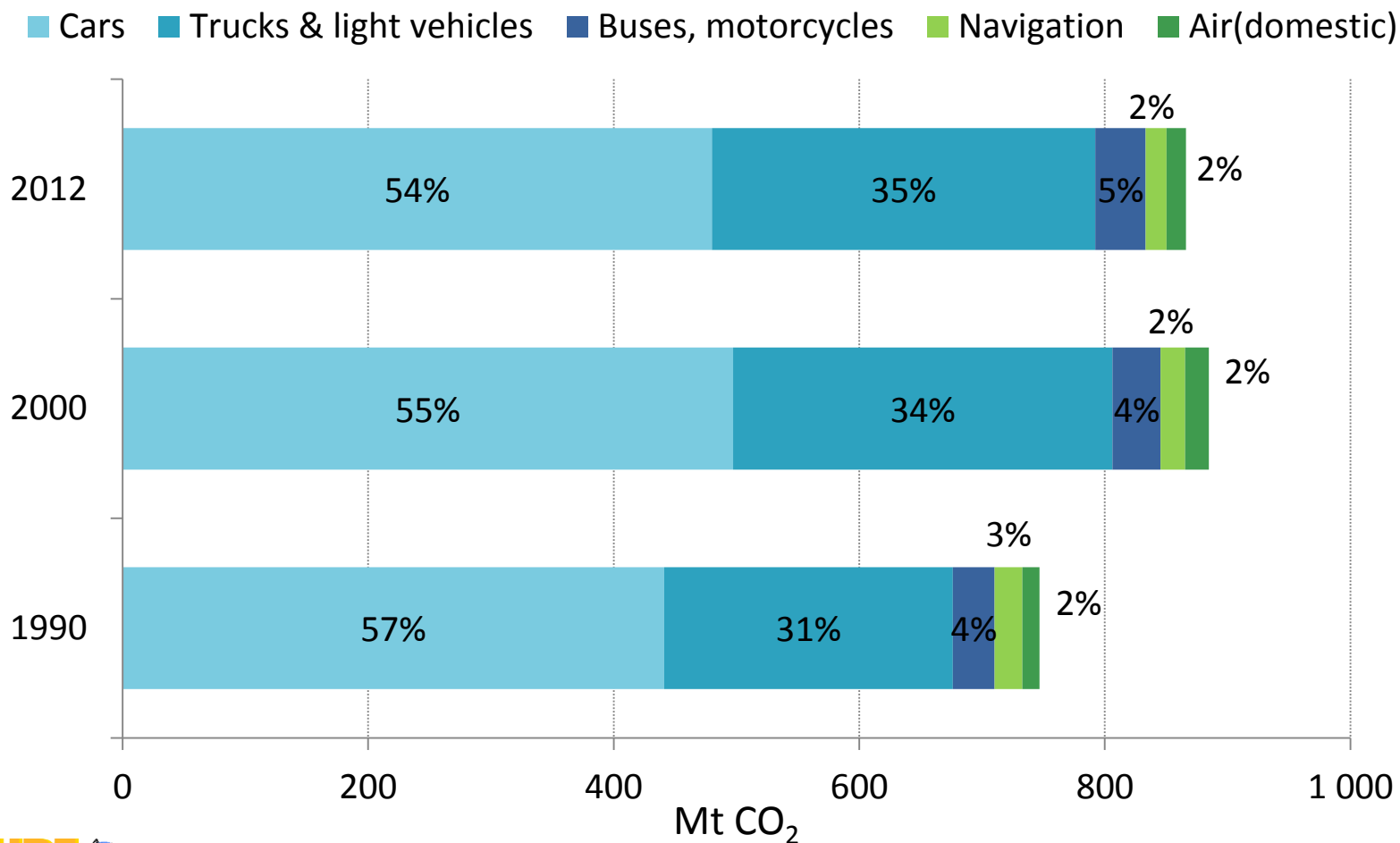
On average energy consumption of road freight only increased by 1.8 Mtoe since 2000 due to an increase in traffic (11.3 Mtoe) and modal shift (1.6 Mtoe) but offset by energy savings (11 Mtoe).



An increasing share of transport in total CO2 emissions (energy related): from 19% in 1990 to 25% in 2012 .

CO2 emissions of transport have slight decreased since 2000 (-20 Mt or -2%) ;
All modes participated to that reduction, except trucks & light vehicles (+2%).

CO2 emissions from transport



Around 86 Mt of CO₂ emissions avoided in 2012, which has more than offset the effect of increase in traffic (activity effect) .

