

## **International comparisons of energy efficiency indicators**

### **Introduction**

International comparisons of energy efficiency are a helpful way to measure performance of the UK relative to other countries and understand the key energy demands of the UK economy. This article presents indicators for each of the main energy consuming sectors based on data published by the ODYSSEE European energy efficiency indicators project. These indicators are designed to make meaningful comparisons between countries but care must be taken when making comparisons regarding efficiency due to differences in the types of energy used in different countries, and differences in heating demand, building type and structure of industry that cannot be fully controlled for.

Data are taken from the ODYSSEE database unless otherwise noted. The ODYSSEE project is a European Commission supported project made up of partners from EU Member States together with Norway to produce detailed energy efficiency indicators for European countries. The majority of European Union (EU) countries have data covering at least 2000 to 2012. However, in some cases where a country does not have 2012 data available yet 2011 data has been used. For Estonia and Hungary all data are for 2010. If a country is not displayed on a cross-European chart, it is because that country has not reported data for that indicator at the time of writing.

This article provides a brief overview of energy efficiency in each major sector.

### **Domestic**

The indicator in Chart 1 shows average energy consumption per dwelling, adjusted for climatic differences across the EU. This indicator uses climate corrected data, which enables better comparisons to be made across countries by adjusting some key energy uses (e.g. heating demand) based on modelled variation both over time and to standard EU climate; for instance a household that lives in a country with a cooler climate may use more energy to heat their home than a household living in a warm climate. In 2012, UK average consumption per dwelling when adjusted to the EU climate<sup>1</sup> was 16,630 kWh per dwelling, 2 per cent higher than the EU<sup>2</sup> average of 16,280 kWh per dwelling. It is sometimes useful to make comparisons to countries that are similar to the UK both in climate and economic factors. In 2012, UK average consumption per dwelling was 9 per cent more than Germany but 26 per cent lower than France after climate adjustment.

UK domestic energy use per household rose by 1 per cent between 2011 and 2012, but in 2013 was 4 per cent lower than in 2012 (based on national data reporting, adjusted to standard UK climate).<sup>3</sup>

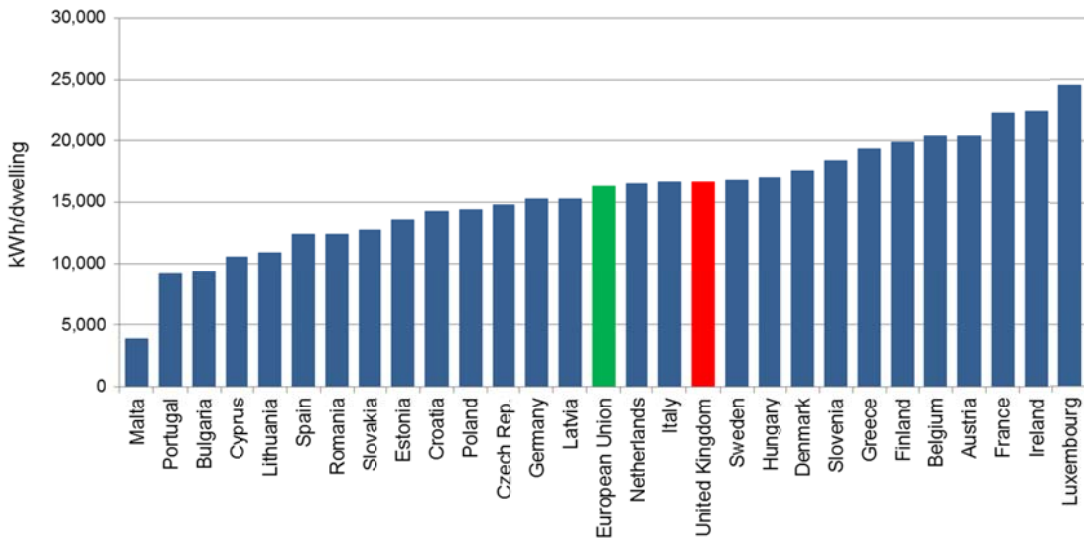
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<sup>1</sup> Temperature correction of a country's energy consumption data adjusted for difference in temperature compared to the average EU climate.

<sup>2</sup> The EU statistics refer to a weighted average of 27 of the 28 member states. Croatia is shown throughout this chapter but is not included in the calculation of the EU average statistics by ODYSSEE. For certain indicators, not all EU member states will have data points for 2012 and therefore wouldn't be included in the average. Cases with missing 2012 data are noted.

<sup>3</sup> Calculated using domestic energy consumption data in Table 1.3 in Energy Trends: December 2014, and household data in Table 3.07 in Energy Consumption in the UK 2014 update.

**Chart 1: Domestic energy consumption per dwelling adjusted to the EU climate, 2012**

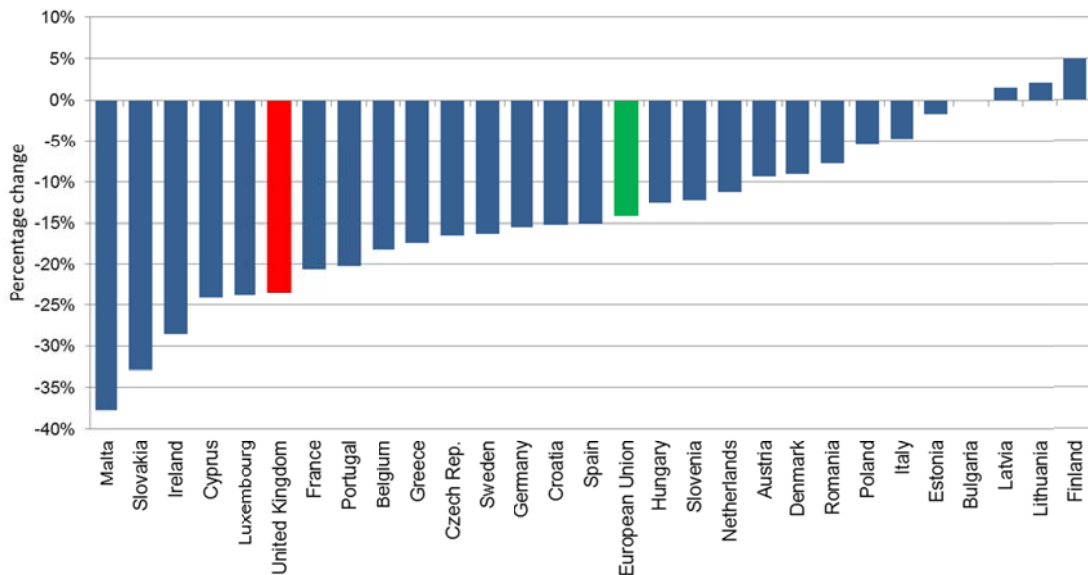


Source: ODYSSEE

Note: Data for Belgium and Romania are for 2011.

Overall, UK energy consumption per dwelling fell by 24 per cent between 2002 and 2012. By comparison, the EU average fell by 14 per cent over the same period, with energy consumption per dwelling falling in the majority of EU countries over this period.

**Chart 2: Change in domestic energy consumption per dwelling adjusted to the EU climate from 2002 to 2012**



Source: ODYSSEE

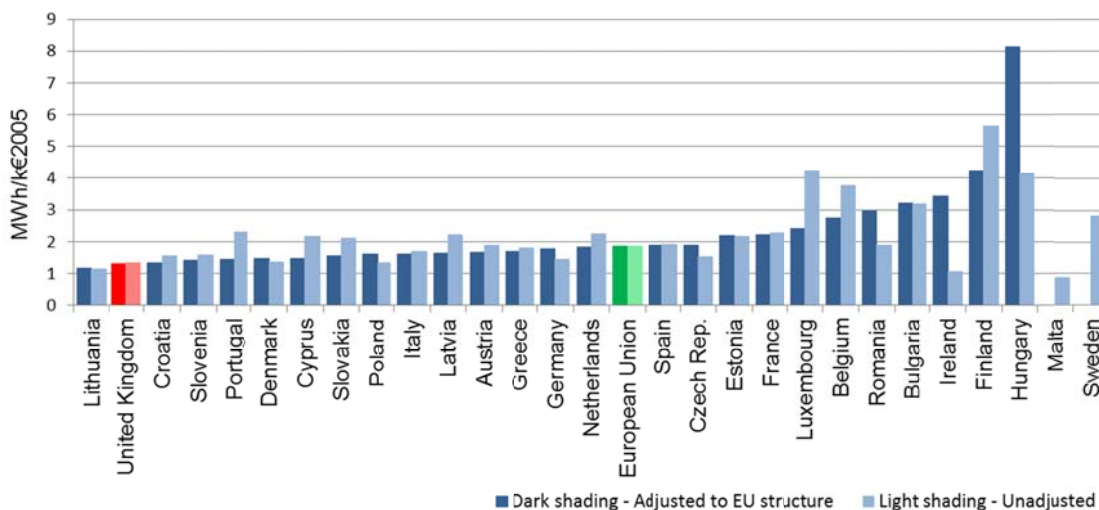
Note: Data for Belgium and Romania are for 2002 to 2011.

## Manufacturing

Manufacturing intensity is measured by the amount of energy required to add one unit of gross value added (GVA) to the gross domestic product. As shown in Chart 3 the UK has the fifth lowest manufacturing intensity in Europe, 28 per cent below the EU average relative to gross value added.<sup>4,5</sup>

A key issue in determining the energy intensity of manufacturing is the share of each manufacturing sub-sector within the overall industry in each country. In 2012, UK energy intensity was 2 per cent lower once adjusted to the EU standard share of each sub-sector, reflecting that the structure of UK manufacturing is slightly more energy intensive than the EU average. After adjusting for EU structure, the UK has the second lowest manufacturing energy intensity in Europe, 29 per cent below the EU average relative to gross value added.<sup>4,5</sup>

**Chart 3: Manufacturing energy consumption per unit of GVA 2012 for unadjusted data and adjusted to EU structure (PPP adjusted)**



Source: ODYSSEE

Note: Manufacturing intensity data adjusted at EU structure is calculated by taking actual sub-sectoral intensities of the country and the share of each branch in the value added of manufacturing of the EU. Data not adjusted to EU structure for Belgium, Cyprus, France, Greece and Romania are for 2011. Data adjusted to EU structure for Belgium, France, Poland, Portugal and Romania are for 2011.

Since 2002 UK manufacturing energy intensity at EU structure has fallen by 34 per cent, and by 40 per cent when adjusted for EU structure. The EU as a whole has reduced its manufacturing energy intensity by 22 per cent in the same period. Between 2002 and 2012, the GVA of the UK's manufacturing industry fell by 4 per cent<sup>6</sup> and in 2012 manufacturing only accounted for 10 per cent of the UK's GVA.<sup>7</sup>

When the energy intensity of industry has been adjusted for EU structure the UK has made the sixth largest reduction in the EU, and the largest reduction in manufacturing energy intensity out of countries in the EU 15 (Chart 4).

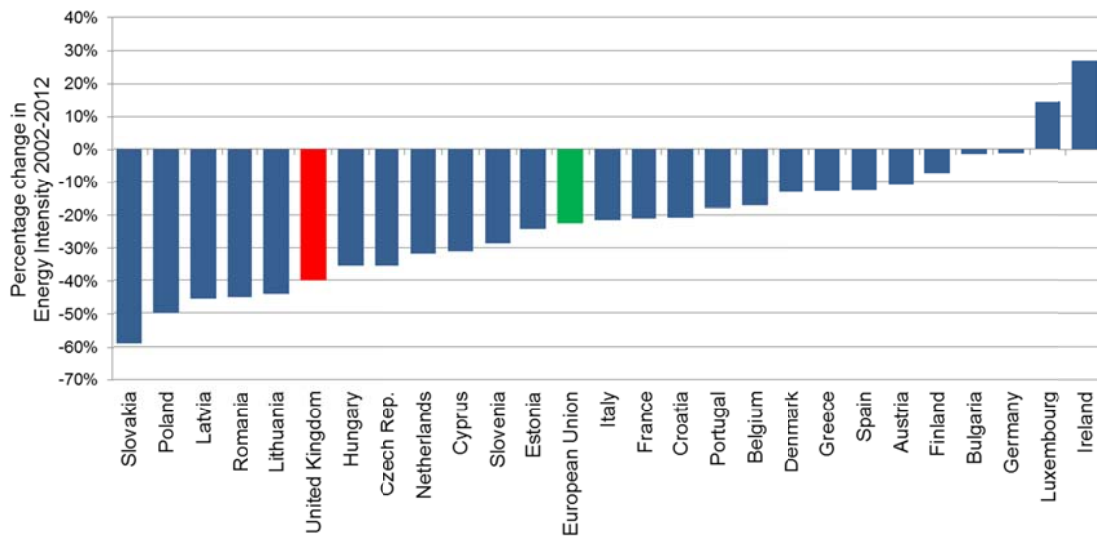
<sup>4</sup> Adjusted for purchasing power parity (PPP).

<sup>5</sup> Data for manufacturing intensity at the EU structure has not been reported for Malta or Sweden at the time of writing.

<sup>6</sup> [www.ons.gov.uk/ons/rel/naa2/quarterly-national-accounts/q3-2014/rft-data-ref-tables-qna-q3-2014.xls](http://www.ons.gov.uk/ons/rel/naa2/quarterly-national-accounts/q3-2014/rft-data-ref-tables-qna-q3-2014.xls)

<sup>7</sup> ONS series: KL8A (total economy).

**Chart 4: Change in manufacturing energy consumption per unit of GVA, 2002-2012 (PPP adjusted at EU structure)**



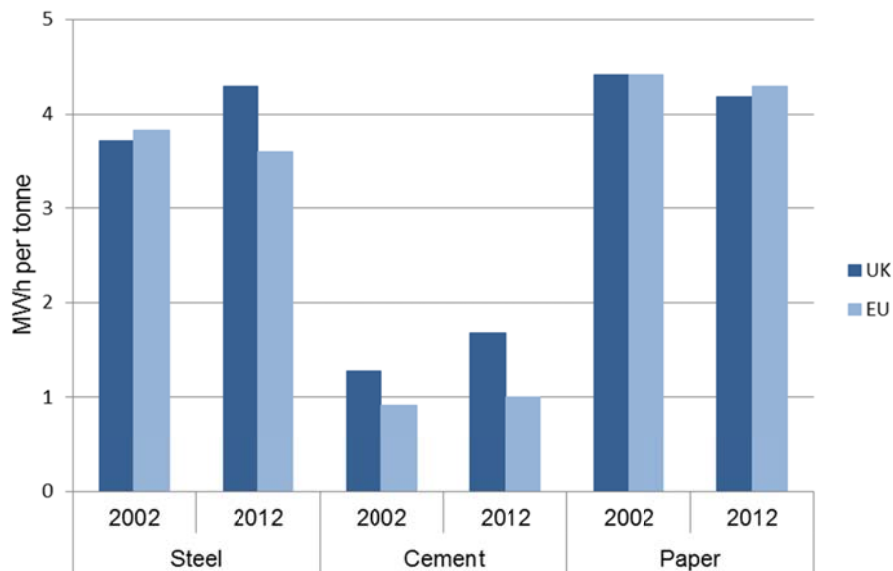
Source: ODYSSEE

Note: Manufacturing intensity data adjusted at EU structure is calculated by taking actual sub-sectoral intensities of the country and the share of each branch in the value added of manufacturing of the EU. Data for Belgium, France, Poland, Portugal and Romania are for 2011.

While the broad indicator of manufacturing intensity shows overall intensity it is important to also compare relative efficiencies of manufacturing sub-sectors across countries. Care should be taken whilst making international comparisons of manufacturing because the type and quality of products produced varies between countries. For example in the steel industry, energy intensity will vary depending on the share of coke that is manufactured on-site compared to the share that is purchased.

Energy intensity in the cement, steel and paper sectors are measured by energy consumption by tonne of output (as opposed to GVA). Using this measure for these energy intensive sectors the UK is generally shown to be more energy intensive than the EU as a whole. In 2012, the UK was 67 per cent more energy intensive than the EU in cement and by 39 per cent in steel as shown in Chart 5. However in paper manufacturing, the UK was 3 per cent less energy intensive than the EU average. The UK's energy intensity in cement increased by 31 per cent and steel by 16 per cent between 2002 and 2012; this may be partly due to a decline in output from the sectors which is likely to reduce the overall efficiency of production. UK output of the cement sector fell 32 per cent between 2002 and 2012, whilst the paper sector fell 29 per cent and the steel sector 36 per cent over the same time period.

Chart 5: Energy intensity by manufacturing sector, UK and EU, 2002 and 2012



Source: ODYSSEE

### Commercial and Public Sector Services

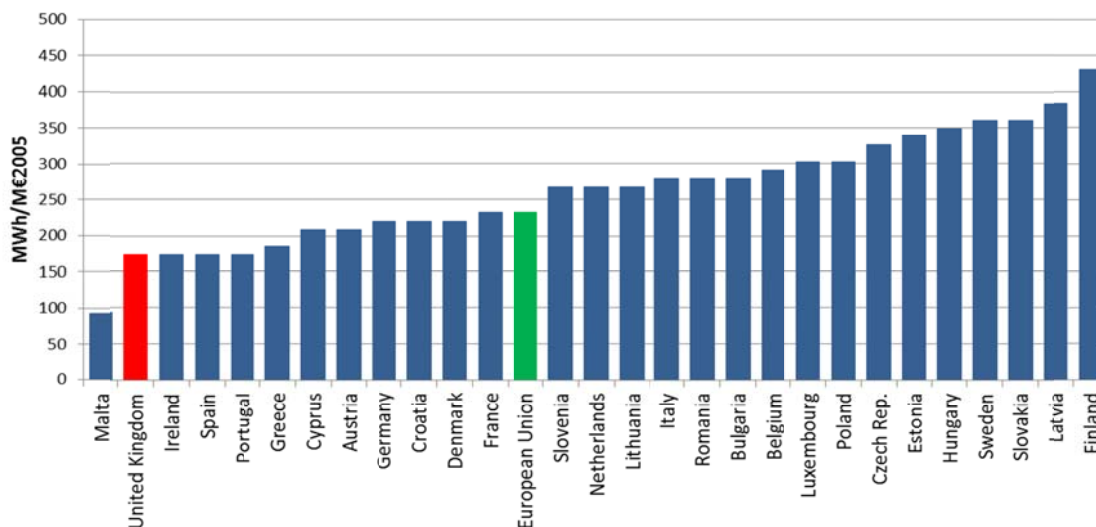
The UK has one of the least energy intensive service sectors in the EU as measured by energy consumption per unit of GVA, shown in Chart 6. The UK performs particularly well on this indicator due to the high-value professional services that generate high GVA for relatively low energy use. UK service sector energy consumption per unit of GVA was 17 per cent lower than the EU average in 2012. The UK service sector is the dominant sector of the UK economy, contributing 78 per cent of GDP output in 2013.<sup>8</sup>

Between 2002 and 2012, the UK's service sector energy intensity fell 32 per cent, compared to a fall of 25 per cent in the EU as a whole. Over the same time period, the GVA of the service sector in the UK increased 25 per cent.<sup>9</sup>

<sup>8</sup> United Kingdom National Accounts, The Blue Book, 2013 Edition: [www.ons.gov.uk/ons/rel/naa1-rd/united-kingdom-national-accounts/the-blue-book--2013-edition/chapter-01--national-accounts-at-a-glance.html](http://www.ons.gov.uk/ons/rel/naa1-rd/united-kingdom-national-accounts/the-blue-book--2013-edition/chapter-01--national-accounts-at-a-glance.html)

<sup>9</sup> ONS Quarterly National Accounts, Q3 2014: [www.ons.gov.uk/ons/rel/naa2/quarterly-national-accounts/q3-2014/rft-data-ref-tables-qna-q3-2014.xls](http://www.ons.gov.uk/ons/rel/naa2/quarterly-national-accounts/q3-2014/rft-data-ref-tables-qna-q3-2014.xls)

**Chart 6: Service Sector energy consumption per unit of GVA, 2012 (PPP adjusted)**



Source: ODYSSEE

Note: Data for Belgium and Romania are for 2011.

## Transport

The energy efficiency of vehicles is measured by the amount of fuel needed to cover 100km. Newer vehicles tend to be more energy efficient, so new cars and vehicle fleet as a whole are considered separately. For the vehicle fleet as a whole, the UK continues to have the lowest consumption rate of 5.6 litres/100km (equivalent to 50 miles per gallon), which is 17 per cent below the EU average. The UK new car consumption rate is 5.29 litres/100km (equivalent to 53 miles per gallon), comparable to the EU average of 5.25 litre/100km. Chart 7 shows the average energy consumption (litres) per 100 km travelled for cars in EU countries, where figures are available.

In the UK energy consumption for new cars decreased by 26 per cent, and for the car fleet as a whole by 25 per cent, between 2002 and 2012. This is compared to an EU average of 22 per cent for new cars and 12 per cent for all cars. In the UK the average number of years since 1<sup>st</sup> registration for cars was 7.9 years in 2013,<sup>10</sup> and is again comparable to 8.2 years for the European Economic Area in 2009 (the last data available).<sup>11</sup> Diesel is more efficient fuel than petrol, and the share of the whole fleet in the UK propelled by diesel was 33 per cent in 2012, up 18 percentage points from 15 per cent in 2002.<sup>12</sup> While this is still lower than the EU average of 37 per cent (last reported in 2010) the UK has been increasing its share of diesel cars at a faster rate than the EU as a whole.

<sup>10</sup> Department for Transport Road Traffic Survey -

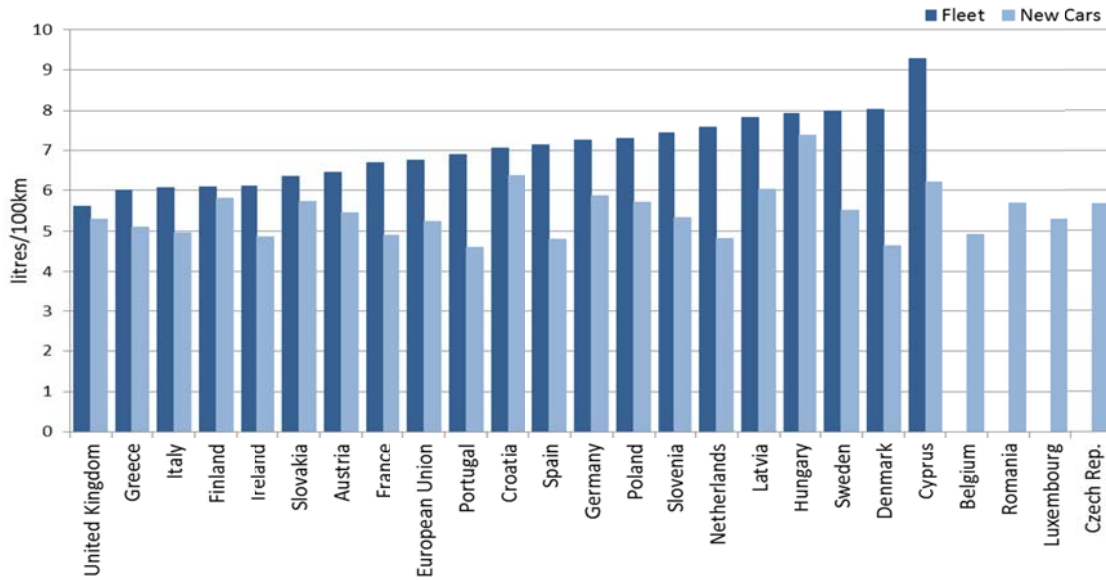
[www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/184161/veh0211.xls](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/184161/veh0211.xls)

<sup>11</sup> [www.eea.europa.eu/data-and-maps/indicators/average-age-of-the-vehicle-fleet/average-age-of-the-vehicle-3](http://www.eea.europa.eu/data-and-maps/indicators/average-age-of-the-vehicle-fleet/average-age-of-the-vehicle-3)

<sup>12</sup> Department for Transport Table VEH0203:

[www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/301636/veh0203.xls](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/301636/veh0203.xls)

**Chart 7: Specific consumption of litres/100 km for new cars and total fleet, 2012**

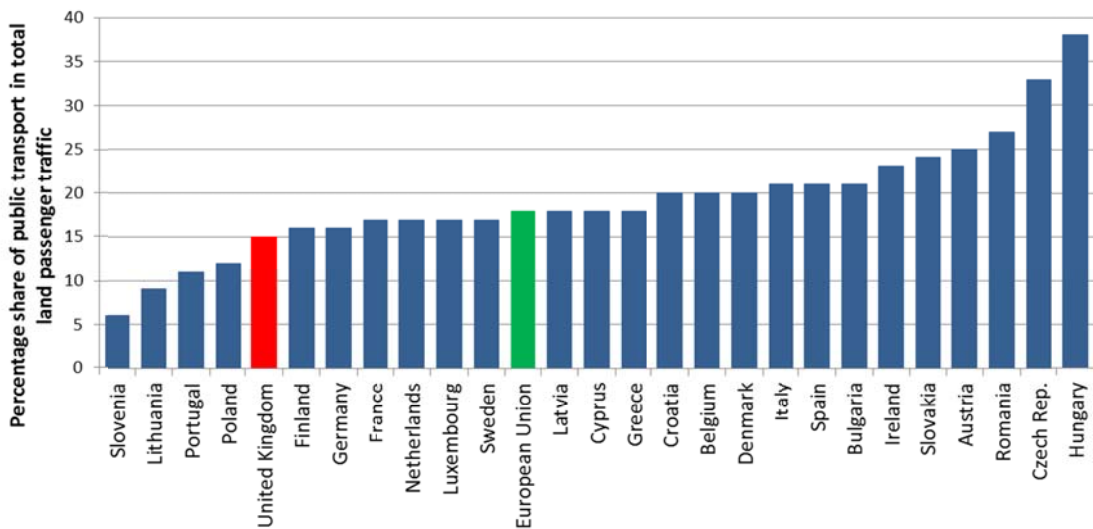


Source: ODYSSEE

Note: Data for total fleet consumption in Germany and Poland data are for 2011, for Slovakia data are for 2010. For new cars data for Belgium, Cyprus and Romania are for 2011.

The UK has the fifth lowest percentage share of public transport in total land passenger transport, accounting for 15 per cent of all traffic. This has increased 3 percentage points from 12 per cent in 2002. The EU average remained stable at 18 per cent of public transport in total land passenger from 2002 to 2012.

**Chart 8: Percentage share of public transport in total land passenger transport, 2012**



Source: ODYSSEE

Note: Data for Belgium, Poland and Romania are for 2011.

## **Conclusion**

Energy consumption in the UK has reduced in each main sector over the 10 years between 2002 and 2012.

In the domestic sector, the UK was marginally more energy intensive in 2012 than the EU average, but there has been a greater reduction in domestic energy intensity in the 10 years between 2002 and 2012 in the UK (24 per cent) compared to the EU (14 per cent).

The energy intensity of manufacturing in the subsectors of cement and steel has increased from 2002 to 2012, likely because of the decline in each of these industries. After adjusting for structural changes within manufacturing, the UK energy intensity fell by 30 per cent.

Improvements in energy efficiency in the service sector have meant that while this sector has increased its GVA by 25 per cent between 2002 and 2012, energy intensity has been reduced by one-third (32 per cent).

In transport, the intensity of the car fleet as a whole has been reduced by one quarter in the UK compared to 12 per cent in the EU. In the UK the percentage of the fleet fuelled by diesel more than doubled between 2002 and 2012, and average time since first registration is just 7.9 years. Faster replacement of the car stock leads to a more energy efficient fleet, contributing to the fact that UK average energy consumption for the entire car fleet is the lowest in the EU.

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