Transport Statistics Great Britain: 2010

Notes and Definitions: Energy and the Environment

This section provides notes and definitions for Energy and the Environment and is part of Transport Statistics Great Britain published on 25 November 2010.

Notes and Definitions Include:

- Information on sources
- Information on "accuracy".
- Definitions.
- General information the tables including links to background information.

Petroleum consumption by transport mode and fuel type: ENV0101

Petrol (All grades): One tonne = 300 gallons or 1,362 litres

Diesel (0.005% or less sulphur): One tonne = 264 gallons or 1,195 litres

Petroleum consumption figures are published in table 3.2 of the *Digest of United Kingdom Energy Statistics* (DUKES) by the Department for Energy and Climate Change (DECC) and can be found at: www.decc.gov.uk/en/content/cms/statistics/source/oil/oil.aspx.

Road transport
Deliveries of petrol and diesel fuel for use in road vehicles of all kinds.
As part of their work to compile the UK emissions inventory, AEA has constructed estimates for the consumption of road transport fuels by vehicle type. The methodology used to produce the most recent estimates involves combining fuel consumption factors (g fuel/km) for different vehicle types, driving conditions and road types with vehicle kilometres travelled taken from DfT's traffic statistics. The methodology has been improved and is described in detail in the Annex to the UK Greenhouse Gas Inventory report (pages 381-419) which can be found at: www.naei.org.uk/report_link.php?report_id=593

The most significant changes were the use of a new set of functions relating fuel consumption factors (g fuel/km) to average speed for a wide range of vehicle classes following release of the new DfT/TRL emission equations in 2009; use of fuel consumption data for buses from the DfT's

Bus Service Operators Grant (BSOG) system; and adoption of a new method for reconciling estimates of fuel consumption for each vehicle type with total sales of petrol and diesel, published in DUKES.

In this reconciliation process, account is taken that a small proportion of motor spirit and diesel is not used by road vehicles. These fuels are excluded in ENV0101 but are included in the total DECC published figures for motor spirit and diesel used. Other uses of these fuels include off-road machinery such as lawn mowers and other garden machinery and portable generators.

An account is also taken of the amount of biofuels consumed by road vehicles and not included in the DECC published figures on petrol and diesel sales. The figures in this table exclude the consumption of biofuels. Consumption of Liquefied Petroleum Gas (LPG) is included, but cannot be assigned to specific vehicle types.

More information on the methodology used by AEA to construct the breakdown of road transport fuel consumption by vehicle type can be found in the Annex to the UK Greenhouse Gas Inventory report (page 389 of the annex) which can be found at:
www.airquality.co.uk/reports/reports.php?report_id=593

Railways
Deliveries of gas/diesel oil to railways are based on estimates produced by AEA as part of their work to compile the UK Greenhouse Gas Inventory.

National navigation
Fuel oil and gas/diesel oil delivered, other than under international bunker contracts, for fishing vessels, UK oil and gas exploration and production, coastal and inland shipping and for use in ports and harbours.

Air transport
Total inland deliveries of aviation turbine fuel and aviation spirit.
The figures cover deliveries of aviation fuels in the United Kingdom to international and other airlines, British and foreign Governments (including armed services) and for private flying.

More information of petroleum consumption can be found in DUKES at:
www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

Energy consumption by transport mode and energy source: ENV0102

This is the energy content of fuels delivered to consumers, excluding non-energy use of fuels. The data measures the energy content of the fuels, both primary and secondary, supplied to final users. Thus it is net of fuel industry own use and conversion, transmission and distribution losses, but it includes conversion losses by final users.

Detailed data for individual fuels are converted from original units to tonnes of oil equivalent using gross calorific values and conversion factors appropriate to each category of fuel. The results are then aggregated according to the categories used in the tables. Gross calorific values represent the total energy content of the fuel, including the energy needed to evaporate the water present in the fuel.

1 tonne of oil equivalent (toe):

= 10^7 kilocalories
= 396.83 therms
= 41.868 Gigajoules (GJ)
= 11,630 Kilowatt hours (kWh).

This unit should be regarded as a measure of energy content rather than a physical quantity. There is no intention to represent an actual physical tonne of oil. One tonne of oil is not equal to one tonne of oil equivalent.

Gross calorific values are reviewed each year in collaboration with the fuel industries. Estimated average gross calorific values in 2009 for road transport are:

47.1 GJ per tonne of motor spirit (petrol)
45.6 GJ per tonne of DERV (diesel)
49.2 GJ per tonne of LPG

The full set of estimates average gross calorific values are published in table A2 of the UK Digest Energy Statistics (DUKES) and can be found at:
www.decc.gov.uk/en/content/cms/statistics/source/cv/cv.aspx

For railways, data are based on estimates produced by AEA as part of their work to compile the UK Greenhouse Gas Inventory.

More information on UK energy consumption can be found in the Digest of UK Energy Statistics (DUKES) at: www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx

Average new car fuel consumption: ENV0103

These figures are based on all types of passenger cars registered including high performance cars, 4x4's and MPV's. They are calculated from new registration weighted average CO_2 emissions for petrol and diesel cars and the typical carbon content of petrol and diesel. This approach accounts for the relative sales of different models of car. The registration weighted average CO_2 figures are produced to monitor trends in average petrol and diesel car CO_2 emissions from year to year. From 2001 onwards new car CO_2 has been recorded on the DVLA's registration database and figures for these years are calculated from the DVLA's data. Earlier figures are based on the Society of Motor Manufacturers & Traders (SMMT) car registration database, which has recorded CO_2 since 1997. The CO_2 figures for individual vehicle models used in both databases are obtained under carefully controlled laboratory conditions in order to ensure repeatability and a fair comparison between models. The actual fuel consumption achieved on the road will reflect many extraneous factors such as cold starts, different driving conditions, weather conditions, different loads carried, gradients, use of electrical accessories etc. The data shown here represents fuel economy on the current standard test used to obtain comparative data on the relative fuel economy of vehicles (a drive cycle simulating urban and extra-urban driving, effectively with a single occupant, on a level road and without heaters or lights on).

Average heavy goods vehicle fuel consumption: ENV0104

The miles per gallon figures in ENV0104 are for Great Britain-registered HGVs carrying freight within the United Kingdom (or travelling empty as part of their normal business). The figures exclude non-freight carrying HGVs such as recovery vehicles or fire engines.

The figures are produced from data collected by the DfT Continuing Survey of Road Goods Transport (CSRGT), based on returns on the amount of fuel purchased by road hauliers or taken from their own supplies for a surveyed vehicle, and the mileage covered by that vehicle, during a given survey week.

During a given survey week, for some hauliers the amount of fuel purchased for a vehicle may be less than the amount actually used during the survey week (for example, if they had filled up the tank just prior to the survey week and then topped up during the week with a smaller amount), while for others the amount of fuel purchased may be much more than the fuel actually used during the week. It is believed that over the whole survey these two scenarios balance out giving unbiased estimates of the average miles per gallon.

Petrol and diesel prices and duties: ENV0105

The price estimates are based on information provided by oil marketing companies and super/hypermarket chains and are representative of prices paid (inclusive of taxes) on or about the 15th of the month. Changes in fuel duty usually occur during the month in which a Budget is held. VAT is rebated to business users.

Greenhouse and carbon dioxide emissions by transport mode: ENV0201 and ENV0202

The data in tables ENV0201 and ENV0202 are presented in terms of weight of carbon dioxide emitted.

Greenhouse gas emissions:
The basket of six greenhouse gases are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride (CO_2, CH_4, N_2O, HFC, PFC and SF_6). In reporting greenhouse gas emissions, the emission units are presented in 'million tonnes of carbon dioxide equivalent'. This is in line with international reporting and carbon trading protocols. This is the equivalent weight of carbon dioxide that would need to be emitted into the atmosphere to produce the same estimated radiative forcing (the extent to which a given concentration of a greenhouse gas raises global average temperature). This warming influence of gases is known as global warming potential (GWP). More information on global warming potential can be found at: http://www.decc.gov.uk/en/content/cms/what_we_do/change_energy/what_is_cc/grhouse_gases/grhouse_gases.aspx

Carbon dioxide:
Carbon dioxide is the most important greenhouse gas and is estimated to account for about two thirds of man made global warming. Although its global warming potential is much less per tonne than the other greenhouse gases it is present in the atmosphere in vastly greater quantities.

By source and by final user - UK Greenhouse Gas Inventory (GHGI)

These figures include emissions from Crown Dependencies of Jersey, Guernsey and Isle of Man, and exclude emissions from overseas territories. The figures are reported on the 'national communications' basis. This means that unlike the figures previously reported in this table (which were reported on the IPCC basis), emissions from 'military aircraft and shipping' are now included under transport (under "Other" in parts (a) and (b) of tables ENV0201 and ENV0202).

By source:
The **source** breakdown splits emissions by the sector producing them.

By final user:
The **final user** breakdown also shows emissions by the sector responsible for them, but redistributes emissions from power stations and other fuel processing industries to end users on an approximate basis according to their use of the fuel. Emissions by final user are subject to more uncertainty than emissions by source and should only be used as a broad indication.

Carbon dioxide is reported in terms of 'net emissions', which means total emissions minus total removals of CO_2 from the atmosphere by carbon sinks. Carbon sinks are incorporated within the Land Use, Land Use Change and Forestry (LULUCF) sector, which covers afforestation, reforestation, deforestation and forest management.

Emissions from road transport are calculated either from a combination of total fuel consumption data and fuel properties or from a combination of drive related emission factors and road traffic data. The section on road transport (on page 1) describes the improvements made to the current version of the Greenhouse Gas Inventory.

Details of how greenhouse gas emissions are estimated are given in the Annex to the UK Greenhouse Gas Inventory report, which can be found at: www.airquality.co.uk/reports/reports.php?report_id=593 (see pages 381-419 of the annex for the details of the methodology for transport emissions)

More information about greenhouse gas emissions and additional data, are published by the Department of Energy and Climate Change (DECC) at: www.decc.gov.uk/en/content/cms/statistics/climate_change/climate_change.aspx

By Industry - Environmental Accounts (EA)

The Environmental Accounts provide information on the demands that UK economic activity places on the Environment and on the importance of natural resources to the economy. These demands include the emission of greenhouse gases and air pollutants.

The statistics presented in the Environmental Accounts are on a **UK residents** basis, as opposed to being based on fuel purchases in the UK. This means that they measure the emissions caused by people residing in the UK, and UK-registered businesses. The principle is that this is the same basis on which the National Accounts are produced, so environmental impacts can be directly compared with economic benefits.

The UK transport industries comprise of: railways, buses and coaches, tubes and trams, taxis, road freight, water transport, air transport, and transport via pipelines. The road freight industry covers road haulage companies as opposed to all types of road freight. Lorries owned by retailers for instance are allocated to the retail industry.

Further information on Environmental Accounts can be found on the Office for National Statistics (ONS) website at: www.statistics.gov.uk/statbase/Product.asp?vlnk=3698

The main differences between the GHGI and EA are:

- ONS apply a cross-boundary adjustment to remove purchases by overseas residents of UK fuel, and then add purchases by UK residents of foreign fuel.
- Environmental Accounts include international aviation and shipping.
- The Environmental Accounts breaks down emissions using the Eurostat industry classification, which looks at the economic sector of the person or company responsible for the activity, rather than the activity itself.

Air pollutant emissions by transport mode: ENV0301

Emissions of other pollutants including those that affect air quality, human health and ecosystems are reported by the National Atmospheric Emissions Inventory (NAEI) at: www.naei.org.uk/

Figures shown in table ENV0301 are based on United Nations Economic Commission for Europe (UNECE) definitions. Emissions from aviation (cruise, both domestic and international) and international shipping are not included in the national total that is reported to UNECE but reported separately as memo items in accordance with UNECE emission reporting guidelines under the Convention on Long Range Transport of Air Pollution. Emissions from aircraft cruising at altitude or from international shipping in sea territories distant from the UK make a relatively small contribution to ground-level air quality in the UK compared with emissions occurring during take-off and landing and from domestic shipping around UK coastal waters, but they do contribute to global air pollution.

The section on road transport (page 1) describes the improvements made to the current version of the NAEI. The most significant ones were the use of a new set of functions relating emission factors to average speed for a wide range of vehicle classes following release of the new DfT/TRL emission equations in 2009; revisions to the vehicle survival rates assumed, affecting the turnover and mix of different vehicle classes in the fleet; major changes in the assumptions made about the proportion of petrol vehicles with failed catalyst systems in the fleet, based on new evidence obtained from DfT suggesting a higher rate of failure than had previously been assumed; changes in the methodology for estimating cold start emissions following the recommendations of the study by TRL published in 2009.

Details of the methodology used in the NAEI are given in the UK Informative Inventory Report which can be found at: www.airquality.co.uk/reports/reports.php?report_id=597
as well as in the Annex to the UK Greenhouse Gas Inventory report (pages 381-419 for transport) www.airquality.co.uk/reports/reports.php?report_id=593.

Air pollutant emissions, including more detail about the estimates and additional data, are published at e-Digest Statistics by the Department for Environment, Food and Rural Affairs (DEFRA) at: www.defra.gov.uk/evidence/statistics/Environment/airqual/index.htm

Average emissions from road vehicles in urban conditions: ENV0302

This table takes into account emission factors for cars, light vans, heavy goods vehicles (HGVs), 'buses and coaches' and motorcycles of different ages, meeting different legislative emission standards, and indexes them against a baseline emissions from a pre-1993 petrol car without a three-way catalyst (=100). The emission factors, in units of grams of pollutant per kilometre travelled (g/km), are from the latest version of the National Atmospheric Emissions Inventory and Greenhouse Gas Inventory programmes, maintained by AEA on behalf of DEFRA and DECC. The factors are based on the new compilation of equations derived by the Transport Research Laboratory (TRL) on behalf of DfT and published in 2009, relating emission factor to average vehicle speed: www.dft.gov.uk/pgr/roads/Environment/emissions/

The equations are derived from a database of emissions measured from actual in-service vehicles, the measurements being carried out by different laboratories in the UK and the rest of Europe over different drive cycles.

Particulate emissions (these are fine particles less than 10 micrometres or 0.01 millimetres diameter) are much lower from vehicles with petrol engines than they are from vehicles with diesel engines. For this pollutant, the index is against emissions from a pre-1993 diesel car (=100). Measurements have been made of emissions from vehicles of different sizes within each vehicle category. The figures shown here reflect average values of emission factors at a typical urban speed, weighted by the mix of sizes of vehicles in the fleet.

Since January 1993, all new cars have had to meet new EC emission standards. This resulted in the use of three way catalysts for petrol cars to meet those standards (EC Directive 91/441/EEC). A series of successively tighter standards, known as the Euro emission standards, has generally led to further reductions in pollutant emissions from all vehicle types and fuels. The legislative standards have not applied to CO_2 emissions, but measurements have shown that average factors have been changing over time.

Indices for CO_2 emissions from HGVs shown in part (b) of ENV0302 relative to pre-1993 petrol cars are based on year-on-year changes in the fleet averaged fuel economy of HGVs using data from DfT's Continuing Survey of Road Goods Transport (CSRGT). Similarly for buses part (b) provides indices for CO_2 emissions (g CO_2/km) are derived from figures on fuel consumed by local bus services collated in DfT's Bus Service Operators Grant (BSOG) system. The CO_2 indices for HGVs and buses are corrected for urban driving conditions for comparison with indices in part (a).

Aircraft noise: ENV0303

Air transport movements are landings or take-offs of aircraft engaged in transport of passengers or cargo on commercial terms. All scheduled service movements (whether loaded or empty) are included, as well as charter movements transporting passengers or cargo. Air taxi movements are excluded.

The equivalent continuous sound level (Leq) is an index of aircraft noise exposure. It is a measure of the equivalent continuous sound level averaged over a 16 hour day from 0700 to 2300 hours BST and is calculated during the peak summer months mid-June to mid-September.

The contours referred to are broadly comparable with the previous Noise and Number Index (NNI) - The change was announced by the Minister for Aviation on 4 September 1990. 57dBA Leq represents the approximate onset of significant community disturbance (comparable with 35 NNI at the time), 63dBA Leq moderate disturbance and 69dBA Leq high disturbance. Leq is correlated with community response to aircraft noise, but it is recognised that the reactions of different individuals to aircraft noise can vary considerably. Changes in wind direction from year to year influence the area affected by aircraft noise.

The methodology underlying the calculation of the aircraft noise Leq contours is published in: *The CAA Leq Aircraft Noise Contour Model: ANCON Version 1* (DORA Report DR 9120), *The UK Civil Aircraft Noise Contour Model ANCON: Improvements in Version 2* (R&D Report 9842) and *The CAA Aircraft Noise Contour Model: ANCON Version 2.3* (ERCD Report 0606).

At the time of compilation the 2009 data for Heathrow, Gatwick and Stansted were not yet published. The on-line version of table 3.10 will be updated when data are published. Further information on the annual contour reports for Heathrow, Gatwick and Stansted can be found on DfT website at: http://www.dft.gov.uk/pgr/aviation/environmentalissues/nec/

An updated version of the Integrated Noise Model (INM) was used to estimate noise contours for Luton airport in 2008 and this was further updated to produce the contours for 2009. As a result, any year on year comparison since 2007 should be treated with caution, although the difference in outcome between the methodologies used for 2008 and 2009 is small. Further information can be found in Luton's Annual Monitoring Reports at: http://www.londonluton.co.uk/en/content/8/162/annual-monitoring-report.html .

These notes and definitions relate to the detailed statistics (tables and charts) on "Energy and the Environment" can be found on the Energy and the Environment web page. Table numbers ENV0101 to ENV0303 make up Chapter 3 of Transport Statistics Great Britain.