Office for National Statistics

Statistical bulletin

UK Environmental Accounts: 2014

Satellite accounts to the main UK National Accounts measuring the contribution of the environment to the economy, the impact of economic activity on the environment, and society's response to environmental issues.

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Next release:
9 July 2015

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1. Key points

- In 2012, 45 million tonnes of oil and 37 billion cubic metres of gas were extracted in the UK, 13.5% and 14.0% lower than extraction levels in 2011, respectively
- Total energy consumption increased by 1.2% in 2012, contrary to the overall declining trend, which was largely due to the average air temperature being 0.9°C lower than in 2011
- Greenhouse gas emissions have generally decreased since the mid-1990s, falling from a peak of 822.9 million tonnes of CO2 equivalent (CO2e) in 1991 to 642.0 million tonnes of CO2e in 2011, the lowest point in the series. In 2012, greenhouse gas emissions increased by 2.2% to 656.3 million tonnes of CO2e
- Greenhouse gas emissions intensity was 37.7% lower in 2012 (0.38 thousand tonnes of CO2e per £ million) compared with 1997 (0.61 thousand tonnes of CO2e per £ million)
- Revenue from environmentally related taxes (in current prices) has gradually increased over the past two decades, peaking at £43.0 billion in 2013. This represented 7.5% of total revenue from taxes and social contributions in the UK and was equivalent to 2.7% of Gross Domestic Product (GDP)
- In 2012, the UK government spent £14.2 billion on environmental protection activities, of which £11.5 billion (81.3%) was spent on the collection, treatment and disposal of waste

2. Overview

Environmental accounts show how the environment contributes to the economy (for example, through the extraction of raw materials), the impacts that the economy has on the environment (for example, energy consumption and air emissions), and how society responds to environmental issues (for example, through taxation and expenditure on environmental protection).

Environmental accounts are ‘satellite accounts’ to the main National Accounts and they are compiled in accordance with the System of Environmental Economic Accounting (SEEA), which closely follows the UN System of National Accounts (SNA). This means that they are comparable with economic indicators such as Gross Domestic Product (GDP).

Environmental accounts are used nationally and internationally, primarily by governments, development organisations and researchers, to inform sustainable development policy, to evaluate the environmental impacts of different sectors of the economy, and to model impacts of fiscal or monetary measures.

In this release

The environmental accounts included in this release have been divided into the following categories:

Natural capital accounts:

- oil and gas reserves

Physical flow accounts:

- fuel use and energy consumption
- atmospheric emissions
- material flows
- water use

Monetary accounts:

- environmental taxes
- environmental protection expenditure

Experimental natural capital accounts

- land use
- forestry

There is also a ‘Revisions’ section that details improvements that have been made since UK Environmental Accounts, 2013 was published last year.

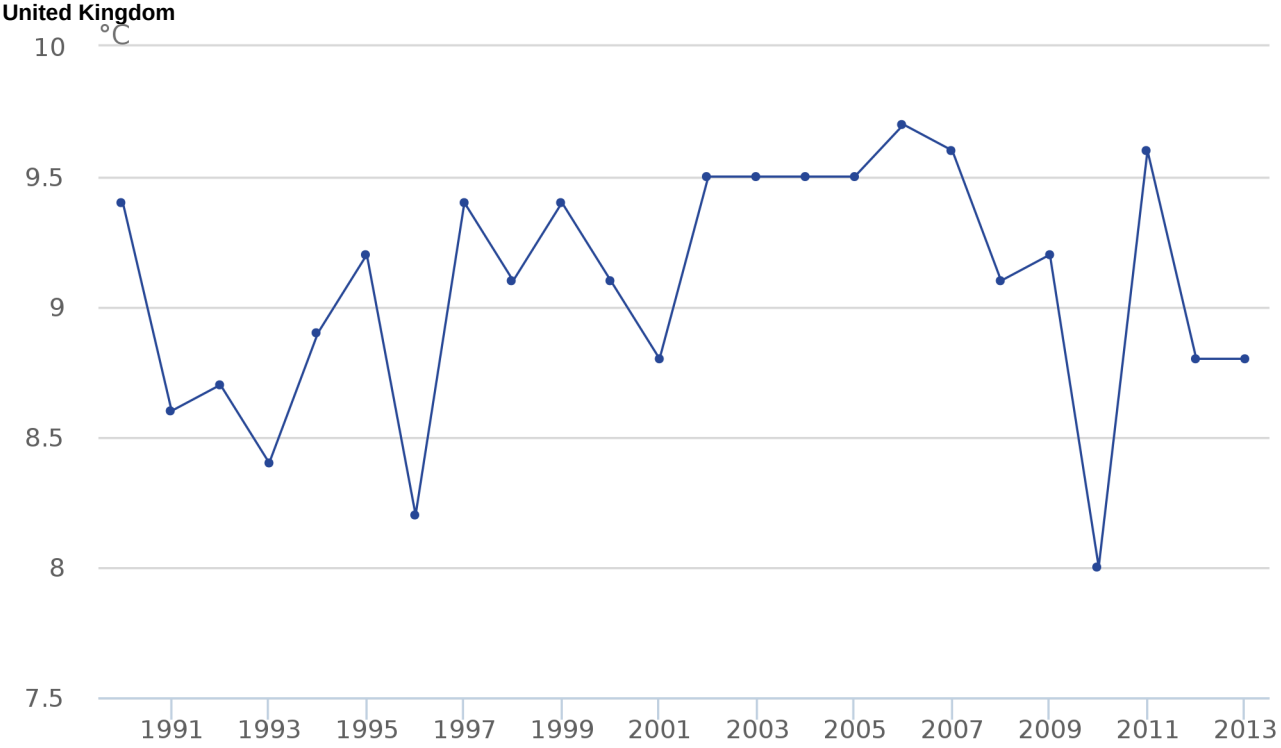
3. Changes in environmental and economic measures

Figures 1 and 2 show changes in mean air temperature and Gross Domestic Product (GDP) from 1990 to 2013. These measures help to contextualise some of the changes observed across the environmental accounts. For example, the average temperature fell in 2010 to 8.0°C from 9.2°C in 2009, which contributed to the increases in energy consumption and greenhouse gas emissions observed during that year. At the same time, GDP started to recover following the economic downturn, which may also explain the increases in energy consumption and emissions.

The relationships between the environment and the economy are explored further throughout this bulletin.

Figure 1: Mean air temperature, 1990 to 2013

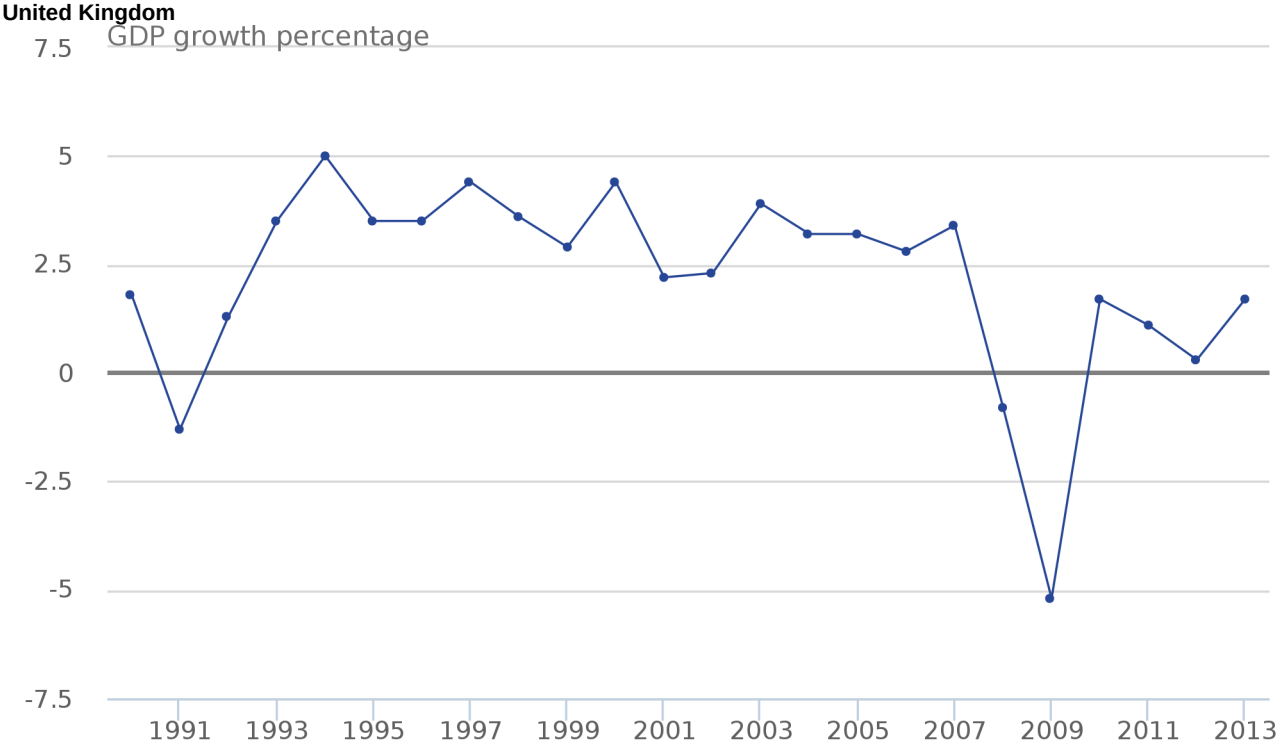
United Kingdom



Source: Met Office

Figure 2: Gross Domestic Product (GDP), 1990 to 2013

United Kingdom



Source: Office for National Statistics

Notes:

1. GDP: Year on Year Growth: Chained Volume Measure, in constant prices (2010-based)

4. Oil and gas

The following presents non-monetary analysis of the UK's oil and gas discovered reserves and undiscovered resources. Discovered reserves refer to estimates of oil and gas that are expected to be technically and commercially producible. On the other hand, undiscovered resources refer to estimates of potentially recoverable oil and gas resources that have not yet been discovered.

Estimates of oil and gas reserves and resources are prepared and published annually by the Department of Energy & Climate Change (DECC).

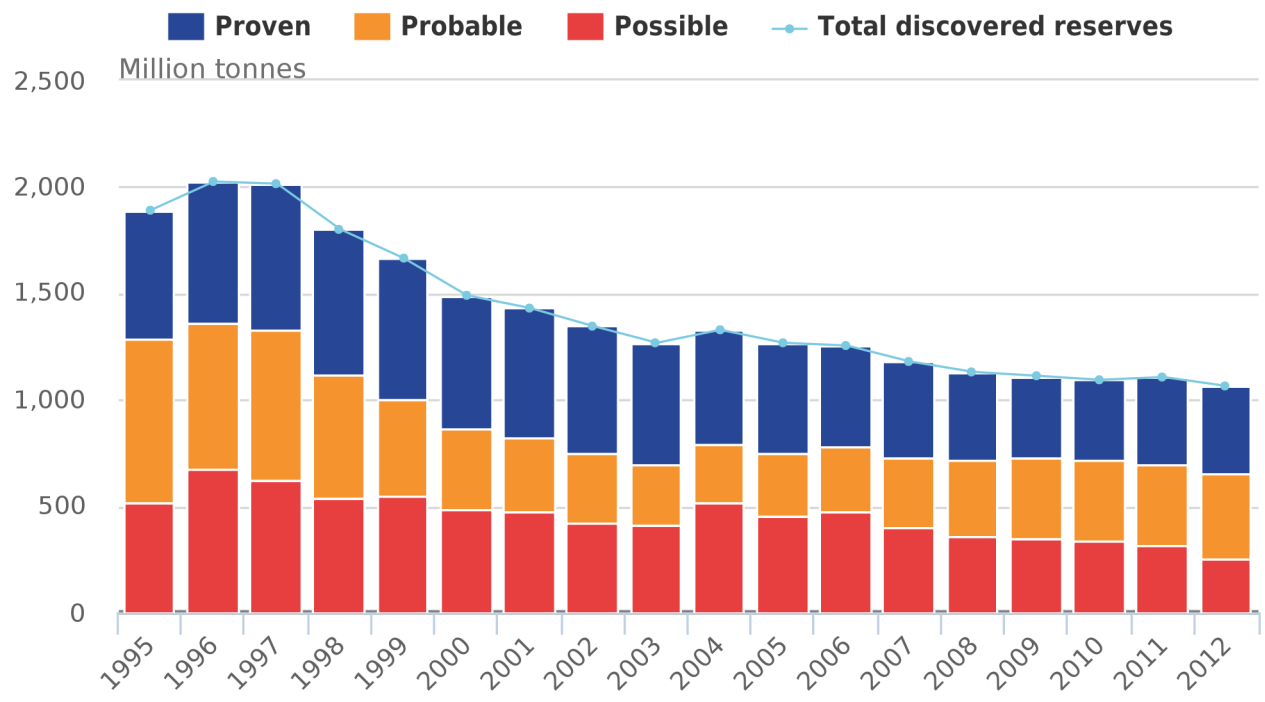
Oil Reserves and Resources

Oil is defined in the estimates as both oil and the liquids that can be obtained from gas fields. Shale oil is not included in these estimates.

At the end of 2012, the upper range of total oil reserves and resources was 2,406 million tonnes (mt). This is calculated as the sum of discovered reserves and the upper estimate of undiscovered resources. This figure is down 0.9%, or 21 mt, compared with 2011. Also in 2012, the lower range of total oil reserves and resources increased to 860 mt, up by 3.0%, from 835 mt in 2011.

Figure 3: Estimates of discovered oil reserves, 1995 to 2012

United Kingdom



Source: Energy and Climate Change

Notes:

1. Total discovered reserves are the sum of proven, probable and possible reserves

Oil reserves are split into three categories. Proven reserves have a 90% chance or greater of being technically and commercially producible. Probable reserves are not yet proven, but have a greater than 50% chance of being technically and commercially producible. Possible reserves have a chance of being produced, but at a probability of less than 50%.

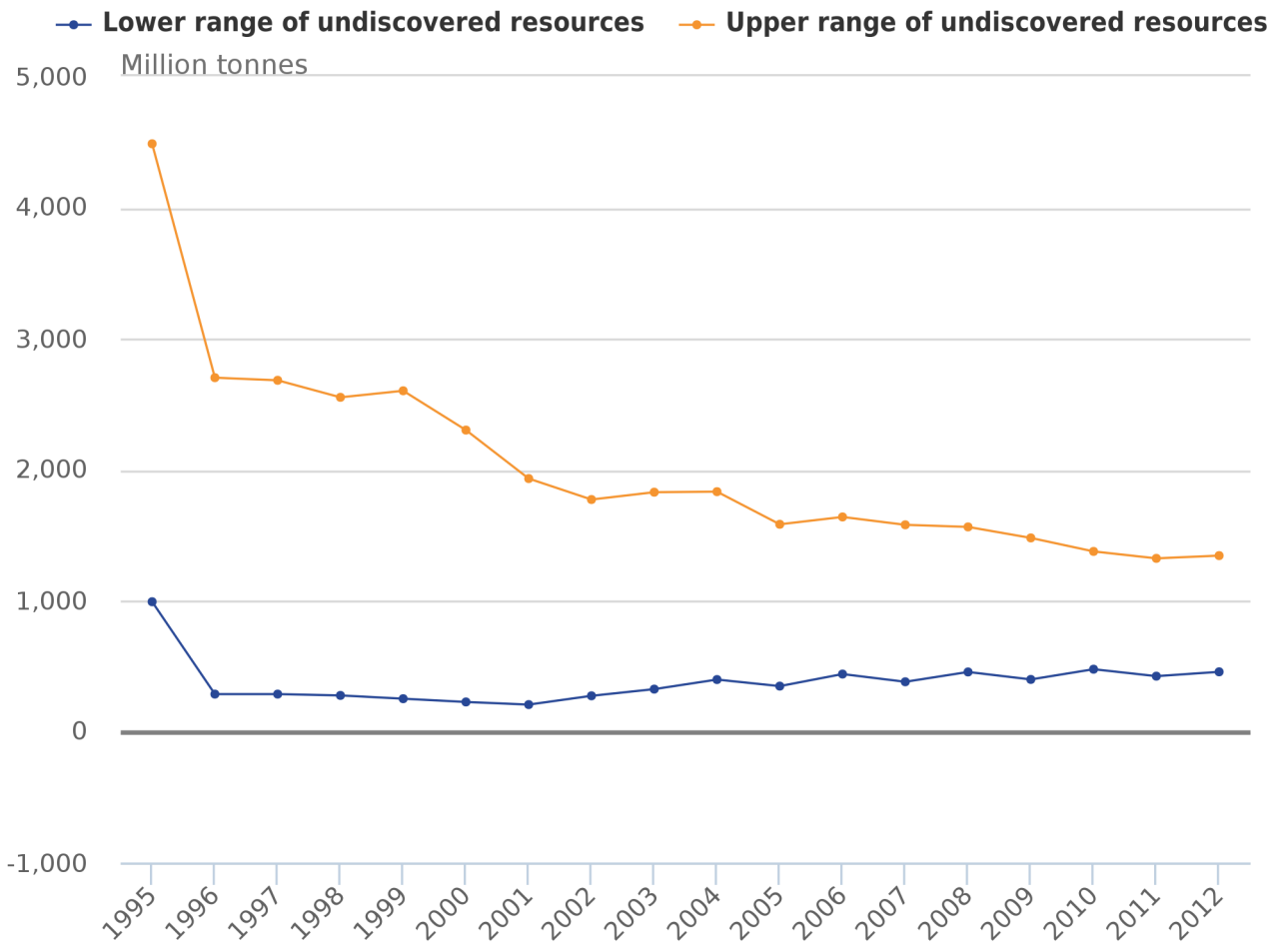
The expected level of reserves is the sum of proven and probable reserves. In 2012, this was equal to 811 mt, an increase of 2.9% from 788 mt in 2011. Extraction of oil during 2012 was estimated to be 45 mt, down 13.5% from 52 mt in 2011. Comparing 2012 to 2011:

- proven reserves fell 1.9% to 405 mt. Although extraction was 45 mt in 2012, there was a net transfer of 37 mt from probable reserves to proven reserves, due to development approval of 12 new oil fields being granted
- probable reserves rose by 8.3% to 405 mt
- possible oil reserves decreased by 66 mt to 253 mt, a fall of 20.7%. The majority of this fall was due to the reallocation of possible reserves to probable reserves, as well as downward revisions to possible reserves

The maximum level of discovered oil reserves that could be recovered are the sum of proven, probable and possible reserves. This was equal to 1,064 mt in 2012, down by 3.8% from 1,106 mt in 2011.

Figure 4. Estimates of undiscovered oil resources, 1995 to 2012

United Kingdom



Source: Energy and Climate Change

Estimates of undiscovered resources are split by a lower range and an upper range. Undiscovered estimates provide a broad indication of potential oil resources that could be extracted in the future.

In 2012, the lower range estimate of undiscovered oil resources was 455 mt, an increase of 7.8% compared to 2011. The upper range estimates of undiscovered oil resources also increased to 1,342 mt, or 1.6%, from 1,321 mt in 2011.

The increase in undiscovered oil resources is due to the addition of new extraction prospects discovered with the granting of further offshore licenses in 2012. Some existing prospects were re-assessed, reducing the overall increase in undiscovered oil resources.

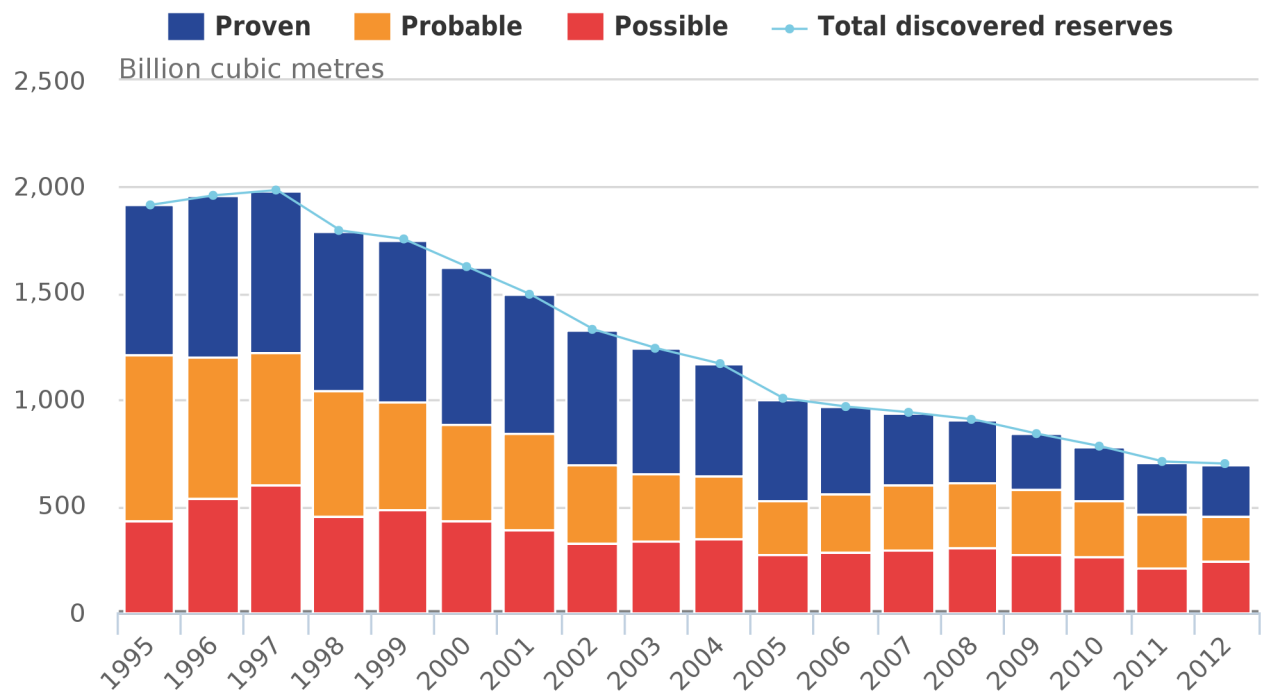
Gas reserves and resources

Gas is defined as gas expected to be available for sale from dry gas fields, gas condensate fields, oil fields with associated gas, and a small amount from coal bed methane projects. Shale gas is not included in these estimates.

In 2012, the upper range of total gas reserves and resources was 1,709 billion cubic metres (bcm). This is calculated as the sum of discovered reserves and the upper estimate of undiscovered resources. This is an increase of 1.4%, or 23 bcm compared with 2011. Also in 2012, the lower range of total gas reserves and resources increased to 613 bcm, up by 2.3% from 599 bcm in 2011.

Figure 5: Estimates of discovered gas reserves, 1995 to 2012

United Kingdom



Source: Energy and Climate Change

Notes:

1. Total discovered reserves are the sum of proven, probable and possible reserves

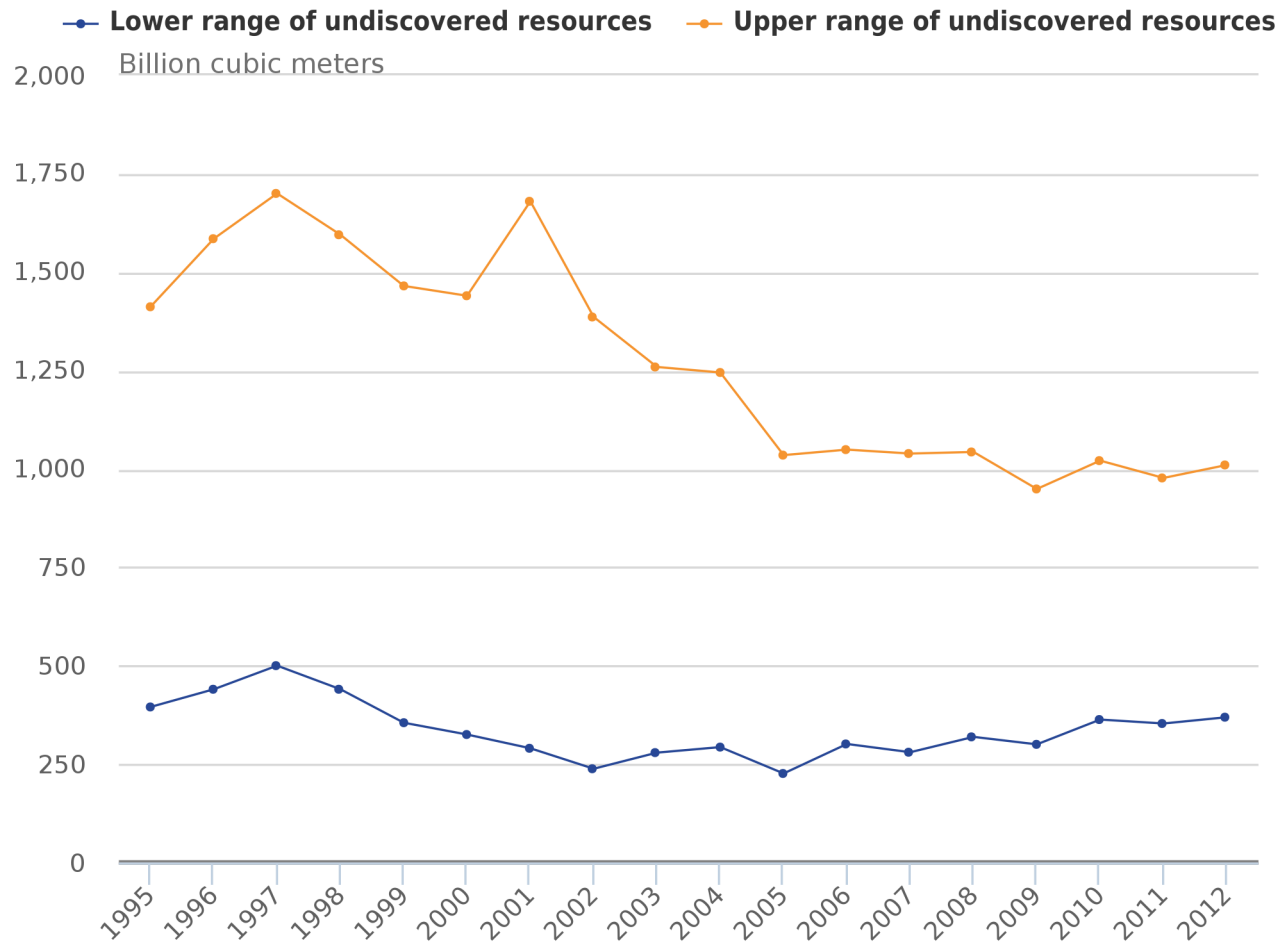
As with oil, gas reserves are split into three categories: proven, probable, and possible reserves. The expected level of reserves is equal to proven plus probable gas reserves. In 2012, this was estimated to be 461 bcm, down 6.5% from 493 bcm in 2011. Extraction of gas in 2012 was 37 bcm, decreasing from 43 bcm in 2011. Further, comparing 2012 against 2011:

- the level of proven gas reserves fell by 0.8% to 244 bcm in 2012. During 2012, development approval was granted for nine offshore gas fields, increasing the level of proven reserves, as a result, 35 bcm was transferred from probable to proven reserves. This largely offset the extraction of 37 bcm
- the level of probable gas reserves fell to 217 bcm at the end of 2012, a decrease of 11.8% compared to 2011. Although there was a small allocation from possible to probable reserves, this was not as high as the reallocation of reserves from probable to proven
- possible gas reserves increased 10.2% to 238 bcm in 2012, an increase from 216 bcm in 2011

The maximum level of discovered gas reserves that could be recovered equals proven, probable and possible reserves. This was equal to 699 bcm in 2012, down from 709 bcm in 2011.

Figure 6. Estimates of undiscovered gas resources, 1995 to 2012

United Kingdom



Source: Energy and Climate Change

As with undiscovered oil resources, estimates of undiscovered gas resources are split by a lower range and an upper range. Undiscovered estimates provide a broad indication of potential gas resources that could be extracted in the future.

At the end of 2012, the lower range estimates of undiscovered gas resources was 369 bcm, an increase of 16 bcm from 2011 (or 4.5%). The upper range estimates of undiscovered gas resources increased by 3.4% to 1,010 bcm compared with 2011. As with oil, the increase in undiscovered gas resources is due to the addition of new extraction prospects discovered with the granting of further offshore licenses in 2012. Some existing prospects were re-assessed, reducing the overall increase in undiscovered gas resources.

Estimates of undiscovered resources must be treated with caution. They provide only a broad indication of the ultimate remaining potential resources. The limits of these ranges should not be regarded as minima or maxima or implying any particular level of probability.

Experimental monetary estimates of oil and gas reserves

Since 2011, ONS has been developing methodology to estimate the monetary value of UK Continental Shelf (UKCS) oil and gas reserves. The latest methodology and estimates can be found on the Environmental Accounts: Natural resources methodology pages on the ONS website.

5. Fuel use

A fuel is a combustible material and when burned it can produce energy. Total fuel use differs from energy consumption as some fuels are consumed for non-energy purposes, such as to produce chemicals or other fuels. In addition, energy consumption includes other sources of energy that are not combustible (nuclear, imports, primary renewable electricity) and therefore the energy inputs have no calorific value; as a result these are not included here within fuel use. For the purposes of this publication, ‘Fuel use’ is defined also to exclude combustible renewable and waste fuels.

The methodology of the fuel use accounts are based on a UK ‘residency’ basis (as opposed to a ‘territorial’ basis) in line with the National Accounts, which includes fuel use by UK resident persons and businesses visiting other countries, but exclude fuel use caused by visiting foreign persons and businesses in the UK.

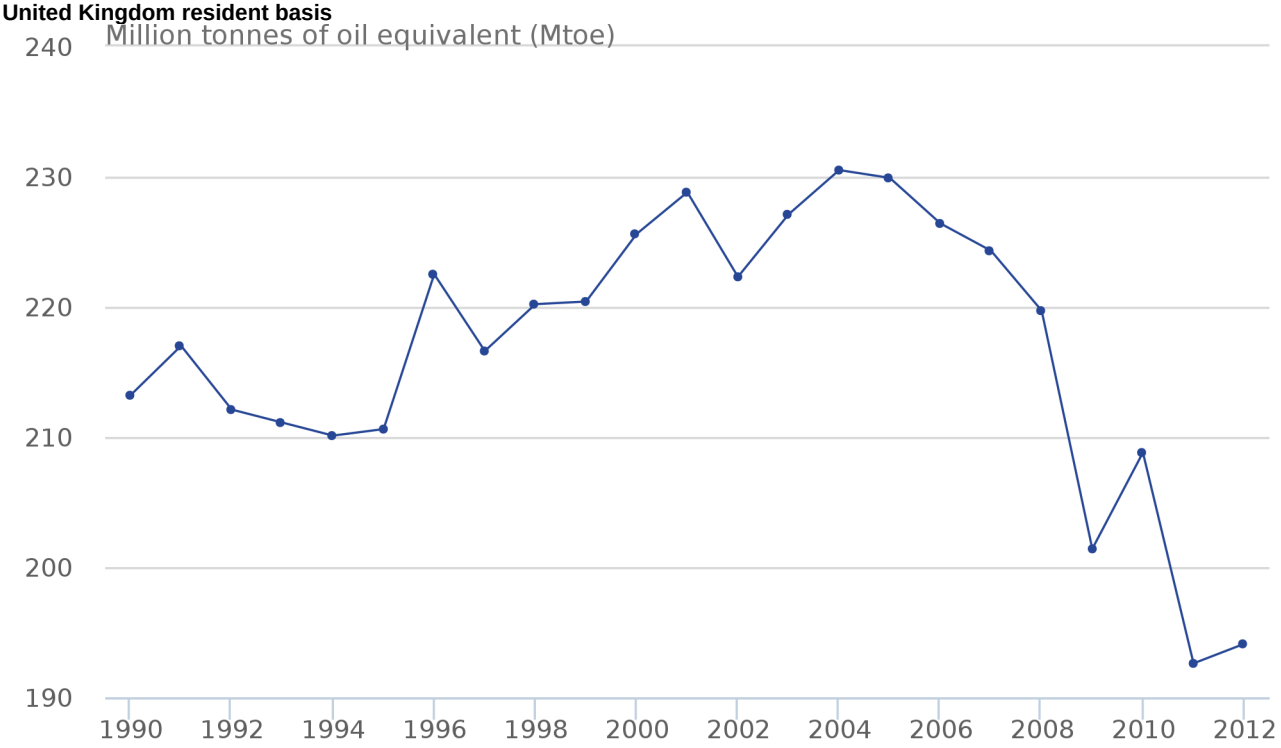
Key points

- Fuel use increased slightly between 2011 and 2012 by 0.8%, in contrast to the overall declining trend since 2004, largely as a result of cooler air temperatures demanding greater fuel consumption
- In 2012, coal use increased by 24.3% whilst natural gas use continued to decline, reflecting the recent price increase of gas relative to coal

Total fuel use in 2012 was 194.1 Mtoe, an increase of 0.8% from 2011, when total fuel use reached its lowest since the series began in 1990 (Figure 7). Fuel use in 2012 was 19.1 Mtoe (9.0%) lower than in 1990 and 15.8% lower than its peak in 2004 at 230.5 Mtoe. Since 2004, fuel use has been on a downward trend as a result of a move towards more efficient use of fuel and alternative sources of energy that are renewable and sustainable. A few exceptions to this trend occurred in 2010 and again in 2012 when cooler temperatures demanded more fuel usage for energy consumption.

Figure 7: Total fuel use, 1990 to 2012

United Kingdom resident basis



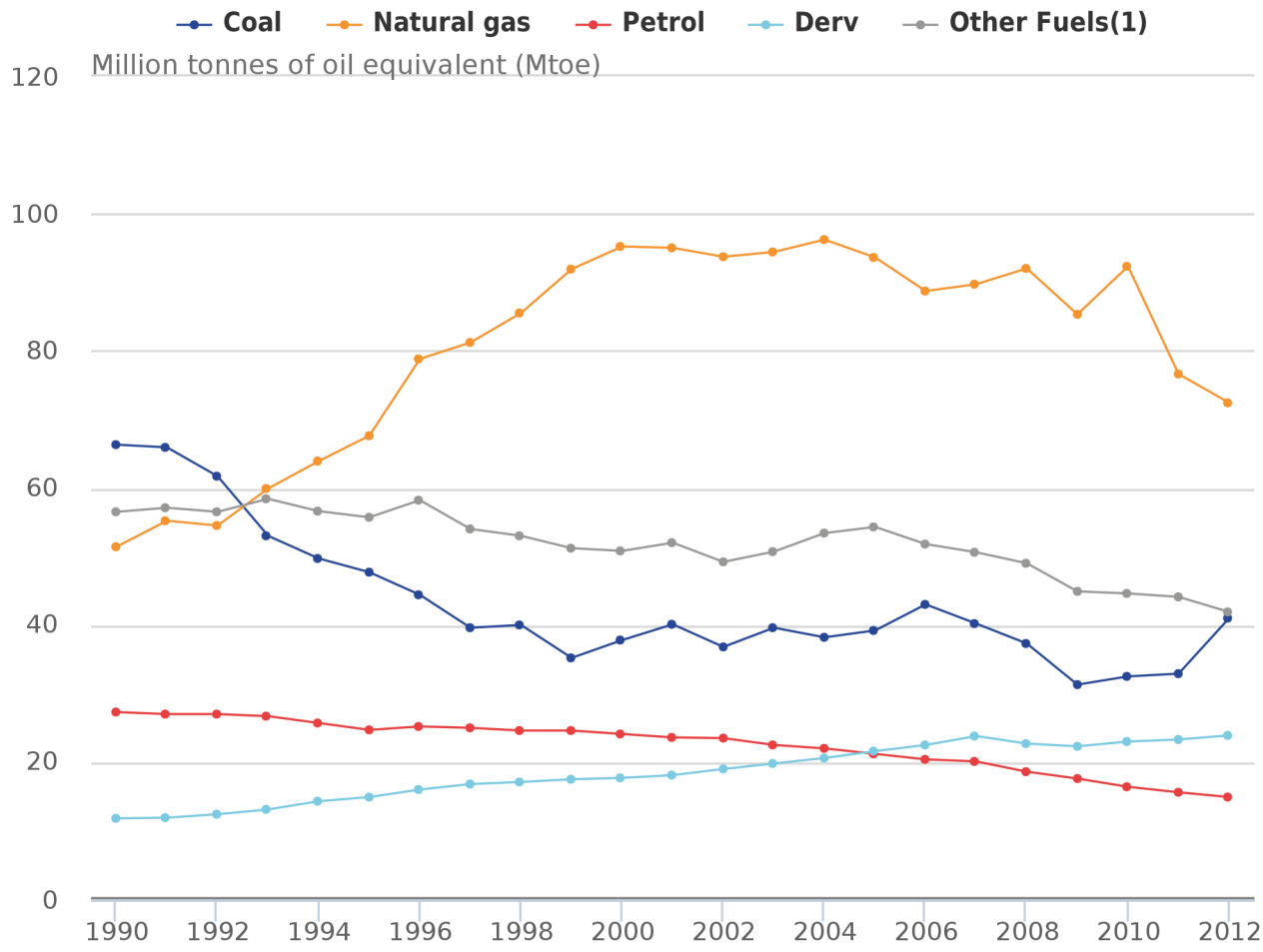
Source: Ricardo-AEA, Office for National Statistics

Since 1993 natural gas has been the most used fuel, increasing from 59.9 Mtoe in 1993 to 96.2 Mtoe in 2004, after which total fuel use began to follow a general declining trend, and in 2012 natural gas use was 72.4 Mtoe (Figure 8), comprising 37.3% of total fuels.

Consumption of other types of fuel in Figure 8 have also been declining since about 2004, apart from DERV (road-diesel), which gradually increased to 23.9 Mtoe in 2012. In contrast, petrol use declined by 32.2% between 2004 and 2012, which may indicate a switch to more fuel efficient fuels for on-road use.

Figure 8: Fuel use: by type, 1990 to 2012

United Kingdom resident basis



Source: Ricardo-AEA, Office for National Statistics

Notes:

1. 'Other fuels' includes mainly fuel oil, gas oil, aviation fuel, as well as more minor fuels (anthracite, blast furnace gas, coke, coke oven gas, colliery methane, LPG, lubricants, naphtha, OPG, orimulsion, peat, petroleum coke, refinery miscellaneous, sour gas, SSF, town gas, vaporising oil, waste oils and waste solvent)

Between 2011 and 2012, coal use increased the greatest, from 32.9 Mtoe to 41.0 Mtoe, a 24.3% increase and accounting for 21.1% of total fuel use in 2012. Coal use has generally declined since 1990, the reason for the increase in 2012 may reflect a change from natural gas use, which declined by 5.5% between 2011 and 2012, to cheaper coal use.

Generally, the other fuels[1] have been declining since the series began from 56.5 Mtoe in 1990 to 41.9 Mtoe in 2012, a 25.8% decrease. On closer inspection of the other fuels, use of aviation fuels has been increasing whilst usage of the other contributing fuels declined.

For more detailed fuel use data see the Fuel use by type (130.5 Kb Excel sheet) and Fuel use by industry, source and fuel type (599.5 Kb Excel sheet) datasets.

Notes for Fuel use

1. Other fuels include fuel oil, gas oil, aviation fuel and other fuels (anthracite, blast furnace gas, coke, coke oven gas, colliery methane, LPG, lubricants, naphtha, OPG, orimulsion, peat, petroleum coke, refinery miscellaneous, sour gas, SSF, town gas, vaporising oil, waste oils and waste solvent)

6. Energy consumption

Energy consumption is the use of energy for power generation, heating and transport. Energy is essential to all economic activities, for example, as input for production processes and as a consumer commodity.

In this release, 'direct use of energy' refers to the energy content of consumed fuel in its original state, before any transformation to other forms of energy occurs, allocated to the original purchasers and consumers of fuels. Whereas, for 'reallocated use of energy' the losses incurred during transformation [1] and distribution[2] are allocated to the final consumer of the energy rather than incorporating it all in the electricity generation sector.

The methodology of the energy accounts are based on a UK 'residency' basis (as opposed to a 'territorial' basis) in line with the National Accounts, which includes energy consumed by UK resident persons and businesses visiting other countries, but excludes energy consumption by visiting foreign persons and businesses in the UK.

Key points

- Total energy consumption increased by 1.2% from 2011 to 2012, contrary to the general declining trend since 2005, largely due to average air temperatures being 1 degree Celsius lower in 2012
- Between 2011 and 2012, energy consumption from renewable and waste sources increased by 11.1%, increasing from 8.7 to 9.6 Million tonnes of oil equivalent (Mtoe) and contributing 4.5% of total energy consumption
- The rate at which energy intensity has declined has slowed-down since 2007, thought to reflect the downturn in the economy

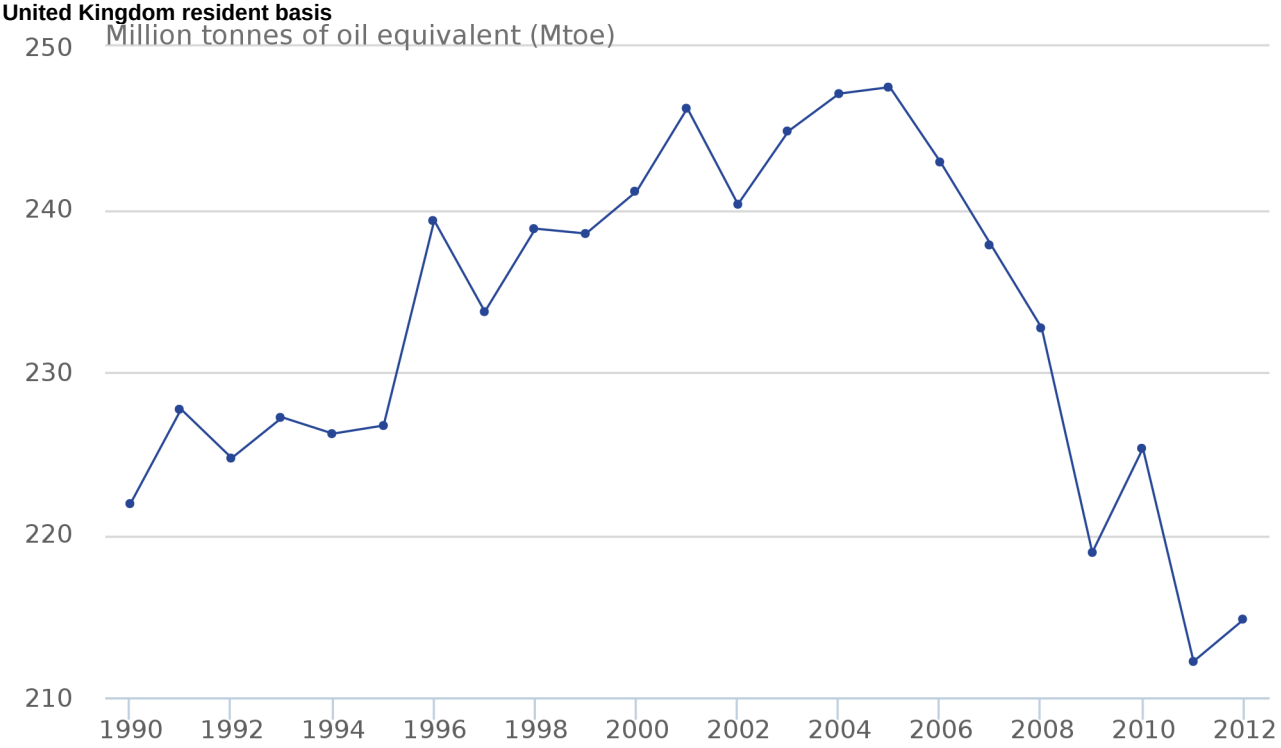
Total energy consumption

In 2012, total energy consumption of primary fuels and equivalents was 214.8 Mtoe, 1.2% higher consumption than in 2011 (212.2 Mtoe) (Figure 9). Energy consumption, particularly by households, is closely related to air temperature (DECC, 2013a). The growth observed in 2012 was mainly driven by colder weather compared to that experienced in 2011, with average air temperature being 1 degree Celsius lower (DECC, 2013b).

Since 2005, the general trend of total energy consumption of primary fuels and equivalents has declined. Deviations from this trend occurred in 2010 and 2012, with a 2.9% and 1.2% increase of total energy consumed on the previous year, respectively (Figure 9). The large excursion observed in 2010 reflects the particularly cold weather experienced that year.

Figure 9: Total energy consumption of primary fuels and equivalents, 1990 to 2012

United Kingdom resident basis



Source: Ricardo-AEA, Office for National Statistics

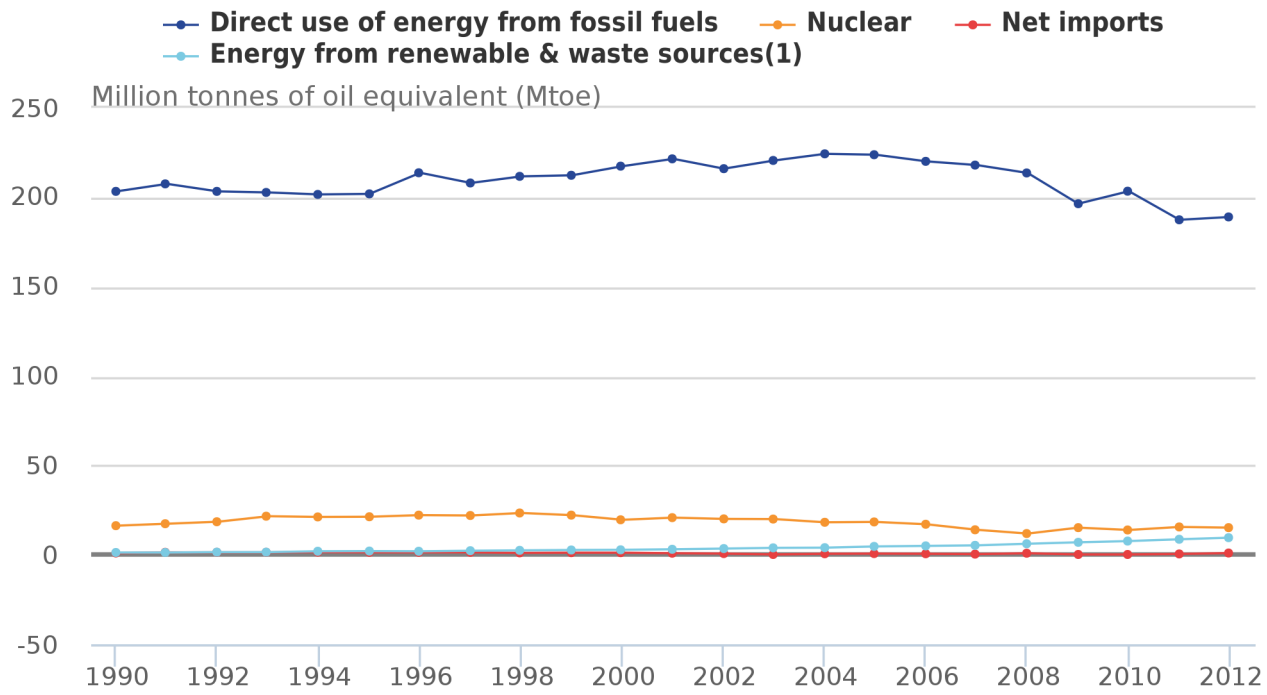
Notes:

1. 'Other fuels' includes mainly fuel oil, gas oil, aviation fuel, as well as more minor fuels (anthracite, blast furnace gas, coke, coke oven gas, colliery methane, LPG, lubricants, naphtha, OPG, orimulsion, peat, petroleum coke, refinery miscellaneous, sour gas, SSF, town gas, vaporising oil, waste oils and waste solvent)

The decline in total energy consumption of primary fuels and equivalents since 2005 (Figure 9), is also reflected in the decline of energy consumption from fossil fuels (Figure 10). In 2008 energy consumption from fossil fuels dramatically declined, however from 2009 a gradual increase in energy consumption from other sources occurred, particularly in nuclear, renewables and waste sources (Figure 10). A peak in fossil fuel consumption in 2010 may reflect the colder weather of 2010 resulting in increased consumption by ‘households’. At the same time a slight decline in energy from other sources was observed. In 2012, direct use of energy from fossil fuels was 189.0 Mtoe, an increase of 0.9% on the year before. Energy from other sources (imports, nuclear, renewables and waste sources) also increased from 24.8 Mtoe to 25.9 Mtoe, a 4.4% increase compared to 2011.

Figure 10: Energy consumption of primary fuels and equivalents: by source, 1990-2012

United Kingdom resident basis



Source: Ricardo-AEA, Office for National Statistics

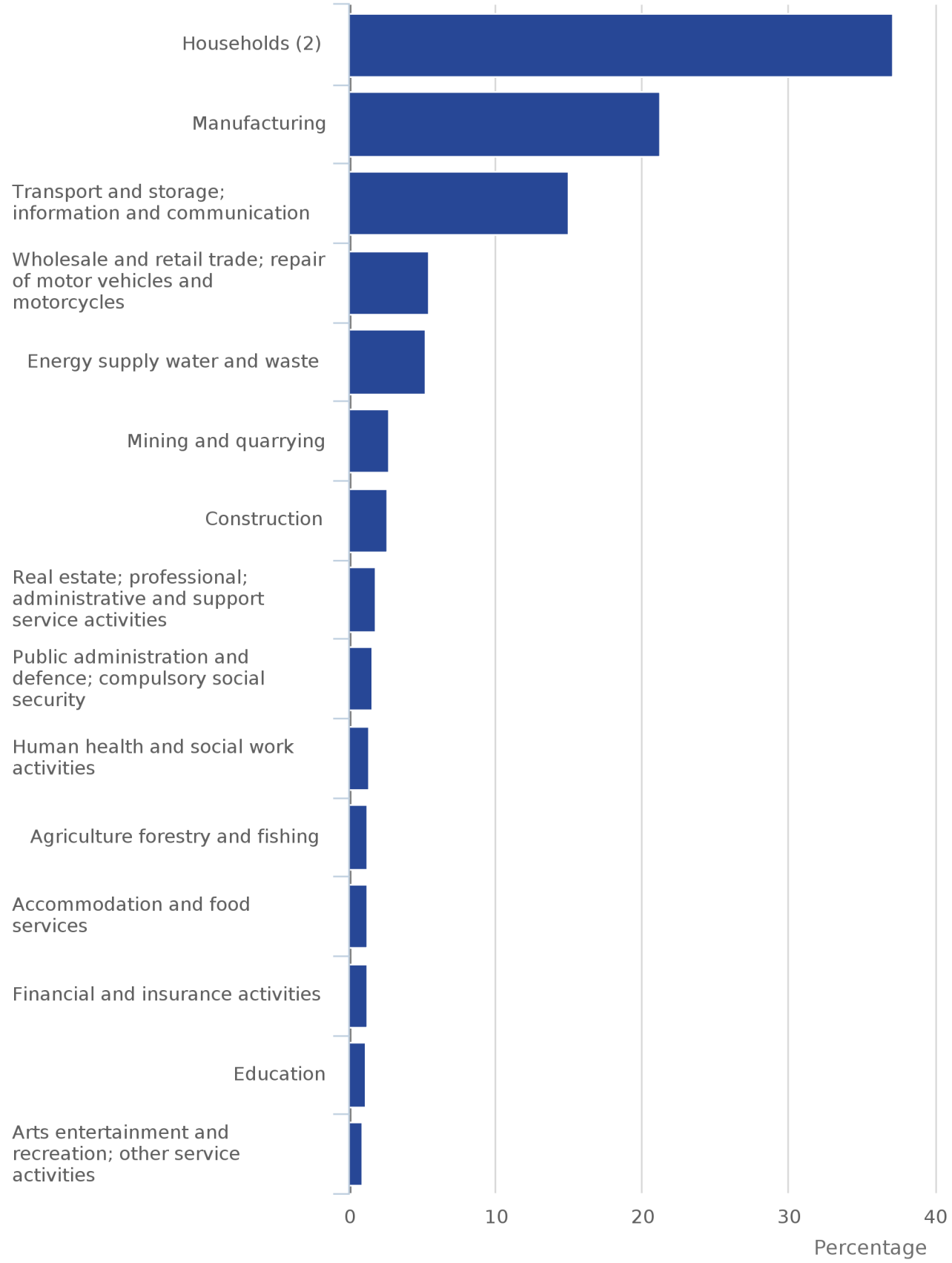
Notes:

1. Renewable and waste sources includes hydroelectric power, solar photovoltaic, geothermal aquifers, energy from wind, wave and tide, wood, charcoal, straw, liquid biofuels, biogas from anaerobic digestion, bioethanol and biodiesel, biomass combustion, sewage gas, landfill gas, poultry litter and municipal solid waste

The energy consumption of primary fuels and equivalents is reallocated[3] by final consumer industry sector. In 2012, the 'household'[4] sector used the largest proportion of the energy consumed at 37.2% (79.9 Mtoe), with 'manufacturing' (45.7 Mtoe), 'transport and storage; information and communication' (32.3 Mtoe), 'wholesale and retail trade; repair of motor vehicles' (11.9 Mtoe) sectors using a further 41.9% (Figure 11).

Figure 11: Reallocated energy consumption: by industrial sector, 2012

United Kingdom resident basis



Source: Ricardo-AEA, Office for National Statistics

Notes:

1. These industry aggregations are based on the Standard Industrial Classification (SIC) 2007

2. The household category includes consumer expenditure and activities of households as employers; undifferentiated goods and services-producing activities of households for own use

For more detailed energy data see: Energy consumption (164.5 Kb Excel sheet) , Energy use and intensity by industry, (242.5 Kb Excel sheet) and Energy by industry, source and fuel (1.55 Mb Excel sheet) .

Reconciling environmental accounts estimates with Department of Energy & Climate Change (DECC) estimates

Environmental Accounts estimates follow the UN System of Environmental Economic Accounts (SEEA) framework which is an internationally agreed standard[5].

They are not reported on the same basis as published by the Department of Energy & Climate Change (DECC) in the Digest of UK Energy Statistics (DUKES) which follow Eurostat, and IEA guidelines and the United Nations International Recommendations for Energy Statistics. The National Accounts measure includes energy consumed by UK companies and households abroad and excludes energy consumption by foreign residents in the UK as well as further differences in definition. As a result of this and other differences the DUKES measure for UK energy consumption is 0.9 Mtoe lower than the environmental accounts measure in 2012.

The Energy bridging table (195.5 Kb Excel sheet) shows the differences between the two estimates. Further information about the relationship between environmental accounts measures and those released by DECC is available in an energy bridging table and methodology article.

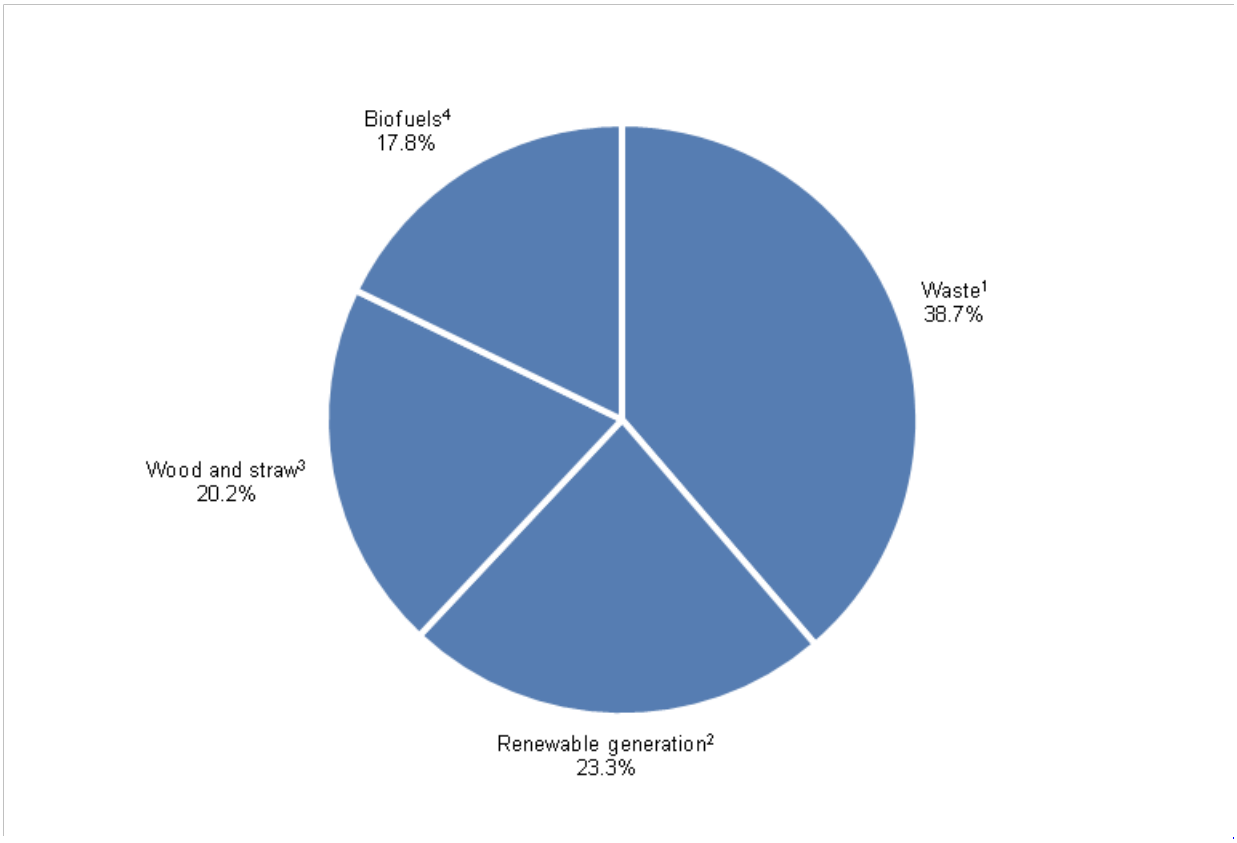
Energy consumption of renewable and waste sources In 2012, 9.6 Mtoe of energy was consumed from renewable and waste sources (Figure 10), contributing 4.5% of total energy consumption.

Energy consumption from renewable and waste sources in 2012 was 7.1 times greater than in 1990, when the time series began. In 2004, and again in 2007, energy consumption from renewable and waste sources rapidly increased. Between 2011 and 2012, an 11.1% increase was observed, from 8.7 to 9.6 Mtoe.

In 2012, 38.7% (3.7 Mtoe) of energy consumed from renewable and waste sources came from waste6, 23.3% (2.2 Mtoe) from renewable generation7, 20.2% (1.9 Mtoe) from wood and straw8 and 17.8% (1.7 Mtoe) from biofuels9 (Figure 12).

Figure 12: Energy consumption from renewable and waste sources, 2012

United Kingdom resident basis



Source: Ricardo-AEA, Office for National Statistics

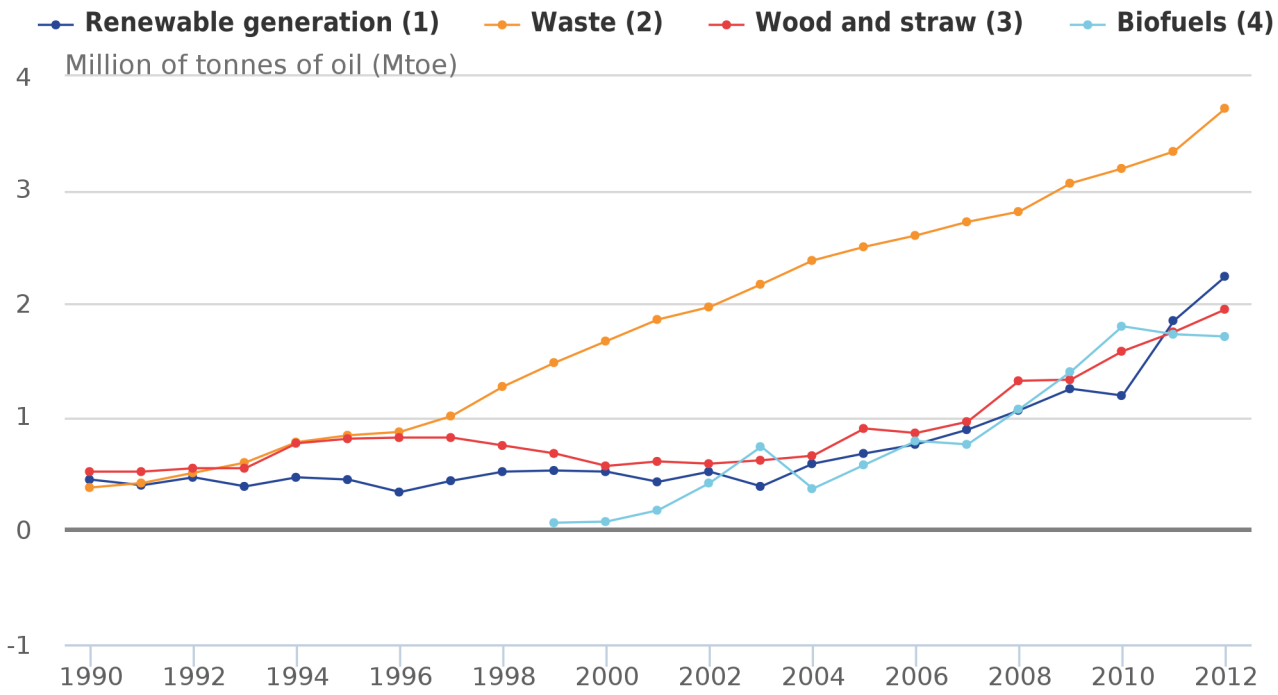
Notes:

1. Waste includes landfill gas, sewage gas and municipal solid waste (MSW) and poultry litter
2. Renewable generation includes hydroelectric power, wind, wave and tidal, solar photovoltaic, and geothermal aquifers
3. Wood and straw includes wood, straw and charcoal
4. Biofuels includes liquid biofuels used in power stations, bioethanol and biodiesel used in transport, biomass combustion in industry and biogas from anaerobic digestion used in autogeneration

Since 1996, energy consumption from waste sources has increased by 331.5% from 0.9 Mtoe to 3.7 Mtoe (Figure 13), predominately due to a rise in energy consumption from landfill gas and municipal solid waste (MSW). The greatest increase of energy consumption from waste sources occurred between 2011 and 2012, from 3.3 to 3.7 Mtoe due to a 32.5% increase in energy consumption from MSW. Energy consumption from renewable generation, wood and straw and biofuels energy notably increased from about 2004 onwards, largely as a result of increases in energy consumption from wind energy, wood, and road-transport biofuels, respectively.

Figure 13: Energy consumption from renewable and waste sources, 1990 to 2012

United Kingdom resident basis



Source: Ricardo-AEA, Office for National Statistics

Notes:

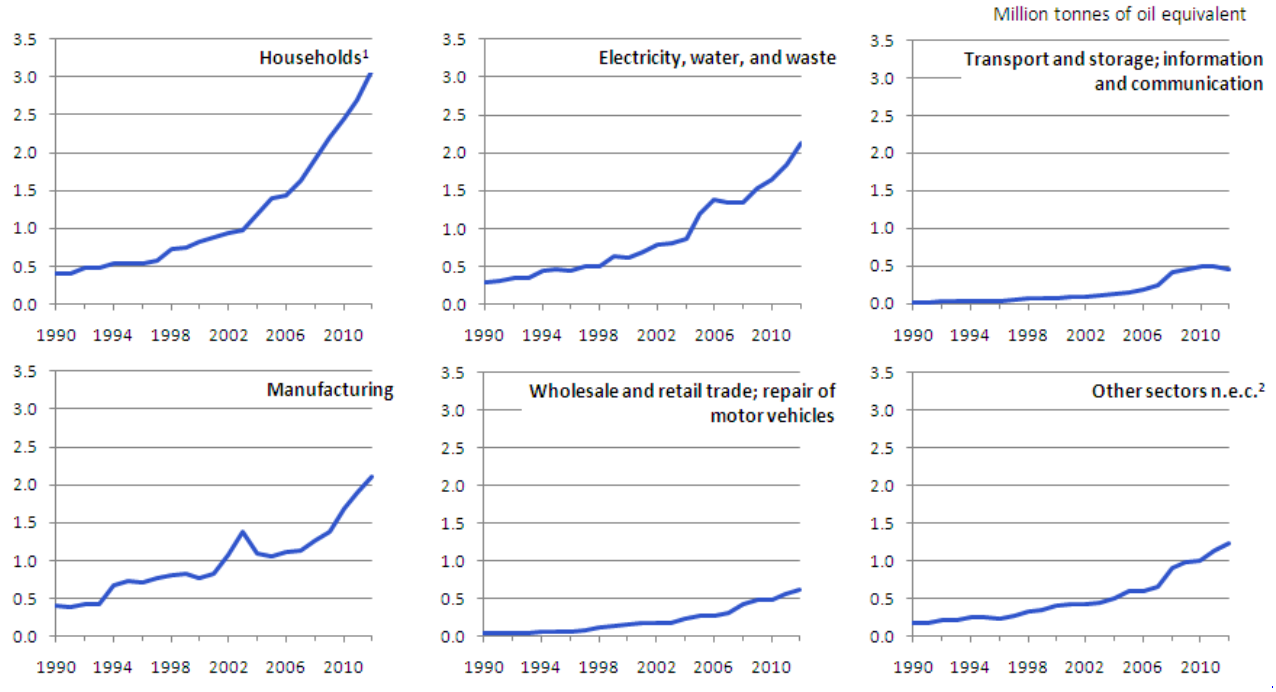
1. Waste includes landfill gas, sewage gas and municipal solid waste (MSW) and poultry litter
2. Renewable generation includes hydroelectric power, wind, wave and tidal, solar photovoltaic, and geothermal aquifers
3. Wood and straw includes wood, straw and charcoal
4. Biofuels includes liquid biofuels used in power stations, bioethanol and biodiesel used in transport, biomass combustion in industry and biogas from anaerobic digestion used in autogeneration

Since the time series began in 1990, the largest consumers of renewable and waste energy have been 'households'[4], 'energy supply, water, and waste' industries, and the 'manufacturing' sector (Figure 14). Since 2004, 'households' have been the largest consumers, rising from 1.2 Mtoe to 3.1 Mtoe in 2012, an overall increase of 162.0% and accounting for 32.0% of energy consumed from renewable and waste sources in 2012. The rise in energy consumption of renewable and waste sources by 'households' since 2004 is primarily due to an increase in biofuel usage in road transport and consumption of renewable primary electricity (particularly wind, wave and tidal energy).

The 'energy supply, water, and waste sector' was the second largest consumer of energy from renewable and waste sources, with 22.0% consumed (2.1 Mtoe) in 2012. A sharp increase in 2004 and a rise in 2008 represent increased combustion of MSW. In 2012, the 'manufacturing' sector was the third largest consumer, using 2.1 Mtoe and accounting for 21.9% of energy from renewable and waste sources. A peak in energy consumption from renewable and waste sources in the 'manufacturing' sector in 2003 reflects a rise in biomass production in industrial plants that year. Many of the other sectors have increased their consumption of energy from renewable and waste resources, particularly since 2004 onwards, largely from landfill gas, MSW, wood, biofuels, and renewable primary electricity.

Figure 14: Reallocated energy consumption from renewable and waste sources: by industry group, 1990 to 2012

United Kingdom resident basis



Notes:

1. The household category includes 'consumer expenditure' and 'activities of households as employers; undifferentiated goods and services-producing activities of households for own use'

2. Other sectors n.e.c. includes the following sectors: 'agriculture, forestry and fishing', 'mining and quarrying', 'construction', 'accommodation and food services', 'financial and insurance activities', 'real estate activities; professional, scientific and technical activities; administrative and support service activities', 'public administration and defence; compulsory social security', 'education', 'human health and social work activities', 'arts, entertainment and recreation; other service activities'

For more data, see Energy consumption from renewable and waste sources (170.5 Kb Excel sheet) and Energy consumption from renewable sources used to generate heat (141.5 Kb Excel sheet).

Notes for Energy consumption

1. Transformation losses are the differences between total input and output of energy in the transformation of one energy product to another

2. Distribution losses are losses of energy product during transportation (including losses of electricity in the grid) between the supplier and the user of the energy

3. Energy consumption includes energy used during the process of transformation into electricity, and the energy lost in distributing the electricity to end users, either directly allocated to the electricity generation sector, or indirectly to the consumers of the energy ‘Direct use of energy including electricity’ allocates the consumption of energy directly to the immediate consumer of the energy while ‘reallocated energy’ allocates these ‘electricity overheads’ to the end user of the electricity

4. The ‘household’ category includes ‘consumer expenditure’ and ‘activities of households as employers; undifferentiated goods and services-producing activities of households for own use’

5. For more information see http://unstats.un.org/unsd/envaccounting/seea.asp

6. 'Waste' includes landfill gas, sewage gas and municipal solid waste (MSW) and poultry litter

7. 'Renewable generation' includes hydroelectric power, wind, wave and tidal, solar photovoltaic, and geothermal aquifers

8. 'Wood and straw' includes wood, straw and charcoal

9. 'Biofuels' includes liquid biofuels used in power stations, bioethanol and biodiesel used in transport, biomass combustion in industry and biogas from anaerobic digestion used in autogeneration

7. Energy intensity

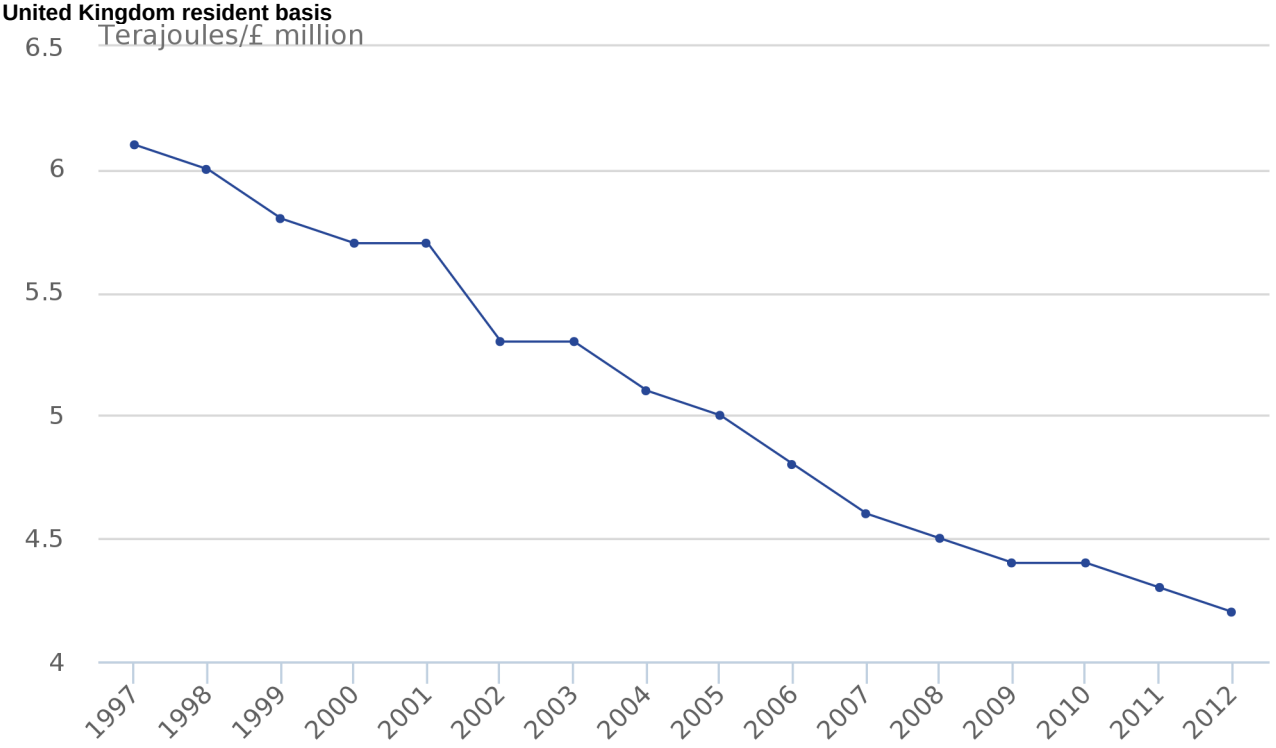
Energy intensity[1], energy use per unit of value added (constant price level), can be an indicator of the energy efficiency of the economy. A reduction in energy intensity may indicate a more efficient use of energy in production process but it may also reflect changes to the structure of the economy, for example, a change from manufacturing industries to services.

Since 1997, when the time series began, energy intensity of the UK economy, excluding consumer expenditure, has been following a downward trend from 6.1 TJ/£m in 1997 to 4.2 TJ/£m in 2012; a 31.0% decrease in energy intensity (Figure 15). Between 2000 and 2001, and again in 2009 to 2010, energy intensity plateaued at 5.7 and 4.4 TJ/£m, respectively. This was due to an increase in energy use relative to GVA in 2001 and in 2010, likely driven by lower average annual air temperatures in those years. Since 2007, the rate at which energy intensity has decreased has slowed down; this is thought to reflect the impact of the recent financial crisis on the economy.

Energy intensity across most industrial sectors has remained fairly constant since 2007, although the ‘manufacturing’ and ‘transport and storage; information and communication’ sectors showing a notable decline. This is likely due to a combination of energy efficiency improvements in production processes and transport, and also a decline in activity of more energy intensive industries such as cement, iron and steel. Since 2007, the ‘mining and quarrying’ industry has shown a large increase in energy intensity of 28.3% due to a decline in value added from this sector.

Figure 15: Energy intensity, 1997 to 2012

United Kingdom resident basis

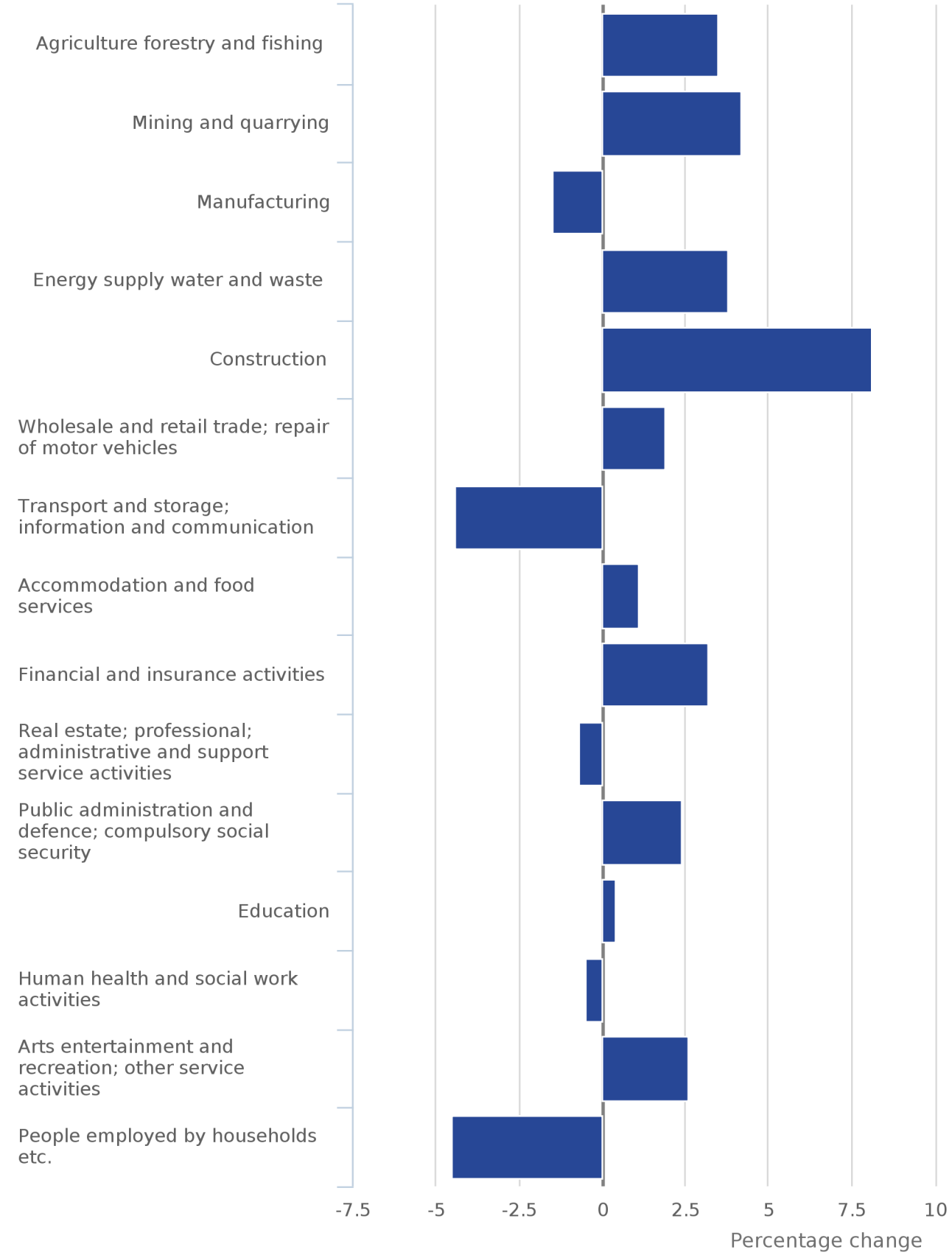


Source: Ricardo-AEA, Office for National Statistics

Some of the largest increases in energy intensity between 2011 and 2012 were in the ‘construction’, ‘mining and quarrying’, and ‘agriculture, forestry and fishing’ sectors (Figure 16), due to GVA falling faster than energy consumption. ‘Energy supply, water, and waste’, ‘financial and insurance activities’ and the ‘arts, entertainment and recreation; other service activities’ also experienced increases in energy intensity but as a result of rises in energy consumption relative to GVA. In contrast, ‘activities of households as employers’ experienced a decline in energy intensity due to an increase in GVA. ‘Transport and storage; information and communication’, and ‘manufacturing’ industries also saw a decline in energy intensity between 2011 and 2012 but as a result of falling energy consumption relative to GVA. This could be due to a drop in production levels requiring less energy.

Figure 16: Percentage change in energy intensity by: industry between 2011 and 2012

United Kingdom resident basis



Source: Ricardo-AEA, Office for National Statistics

Notes:

1. These industry aggregations are based on the Standard Industrial Classification (SIC) 2007

For more detailed energy intensity data see: Energy use and intensity by industry (242.5 Kb Excel sheet) .

Notes for Energy intensity

1. Energy intensity is calculated by dividing Reallocated Energy Consumption by Gross Value Added (GVA). GVA is the difference between output and intermediate consumption for any given sector/industry. That is, the difference between the value of goods and services produced (the output) and the cost of raw materials and other inputs which are used up in production (the intermediate consumption). Data are in constant prices with 2010 defined as the base year. Energy intensity calculations include reallocated energy from wood and straw, renewable generation, biofuels and waste sources. Energy use per unit of value added is in the United Nations (UN) energy intensity indicators as defined in the UN sustainable development indicators, although consumer expenditure is included by the UN. The Organisation for Economic Co-operation and Development (OECD) Green Growth indicators include the inverse, energy productivity, i.e. GDP per unit of energy supply. All energy intensity figures exclude consumer expenditure

8. Atmospheric emissions

Atmospheric (air) emissions show the physical flow of gaseous or particulate materials from the national economy (through production or consumption processes) to the atmosphere. Air emissions data included in this release are based on a UK ‘residency’ basis (as opposed to a ‘territorial’ basis)1, which includes emissions that UK resident persons and businesses are directly responsible for in other countries (dominated by emissions related to travel and transport overseas), but exclude emissions caused by visiting foreign persons and businesses in the UK. The main use of air emissions accounts is to inform sustainable development policy and to evaluate the environmental impact of different industries.

Key points

- Greenhouse gas emissions have generally decreased since the mid-1990s, falling from a peak of 822.9 million tonnes of CO_2 equivalent (CO_2e) in 1991 to 642.0 million tonnes of CO_2e in 2011, the lowest point in the series
- In 2012, greenhouse gas emissions increased by 2.2% to 656.3 million tonnes of CO_2e
- Over the past two decades, acid rain precursor (ARP) emissions have decreased sharply, falling by 70.5% from 6.9 million tonnes of SO2 equivalent (SO_2e) in 1990 to 2.0 million tonnes of SO_2e in 2012

Air emissions are divided into greenhouse gas emissions, acid rain precursors, heavy metal pollutants, and other pollutants. Emissions related to fuel sources used by road transport are also included.

Greenhouse gas emissions

Atmospheric emissions of greenhouse gases are widely believed to contribute to global warming and climate change. They include:

- carbon dioxide (CO_2)
- methane (CH_4)
- nitrous oxide (N_2O)
- hydro-fluorocarbons (HFC)
- perfluorocarbons (PFC)
- sulphur hexafluoride (SF_6)

The potential of each greenhouse gas to cause global warming is assessed in relation to a given weight of carbon dioxide. Consequently, all greenhouse gas emissions are measured as CO_2 equivalents (CO_2e).

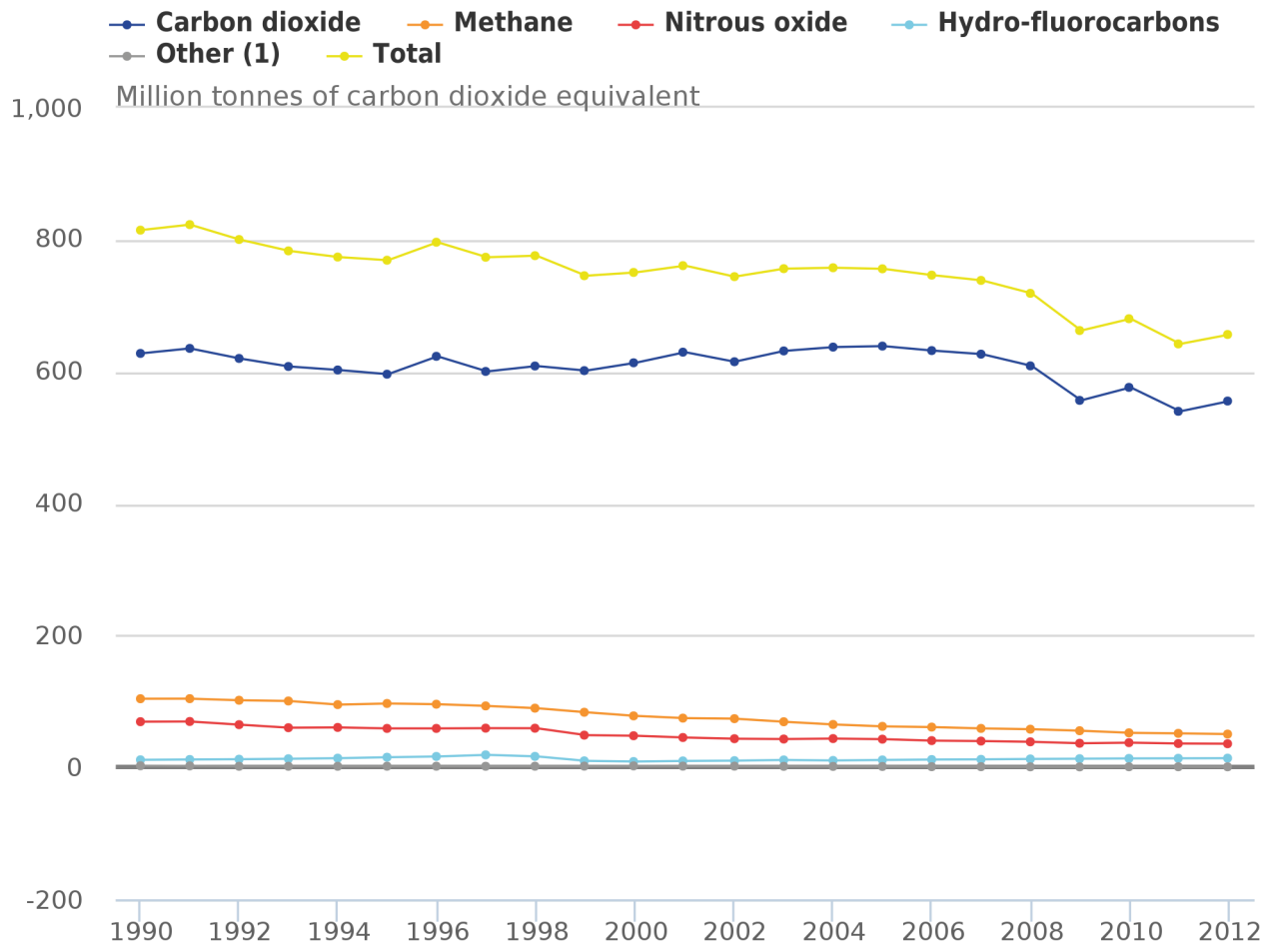
Since the mid-1990s, greenhouse gas emissions have generally decreased, falling from a peak of 822.9 million tonnes of CO_2e in 1991 to 642.0 million tonnes of CO_2e in 2011, the lowest point in the series. This was primarily due to decreases within the ‘manufacturing’ and ‘energy supply, water and waste’ sectors. The greatest fall occurred in 2009 following the start of the economic recession in 2008, when emissions decreased by 7.8% from 718.7 to 662.3 million tonnes of CO_2e.

In 2012, greenhouse gas emissions increased by 2.2% from 2011 to 656.3 million tonnes of CO2e. This consisted of:

- 555.4 million tonnes (84.6%) of carbon dioxide
- 50.4 million tonnes (7.7%) of methane (CO_2e)
- 35.8 million tonnes (5.4%) of nitrous oxide (CO_2e)
- 13.9 million tonnes (2.1%) of hydro-fluorocarbons (CO_2e)
- 0.8 million tonnes (0.1%) of other greenhouse gases (CO_2e)

Figure 17: Greenhouse gas emissions: by type of gas, 1990 to 2012

United Kingdom



Source: Ricardo-AEA, Office for National Statistics

Notes:

1. Other greenhouse gases are not included on the chart as the numbers are small

On average, carbon dioxide emissions represented approximately four-fifths (81.3%) of total greenhouse gas emissions between 1990 and 2012. Methane emissions represented 10.2%, nitrous oxide represented 6.6% and other greenhouse gases represented 1.9%.

Compared with 1990, Figure 17 shows that emissions of all greenhouse gases (apart from hydro-fluorocarbons) were lower in 2012. The main reasons for the reductions are:

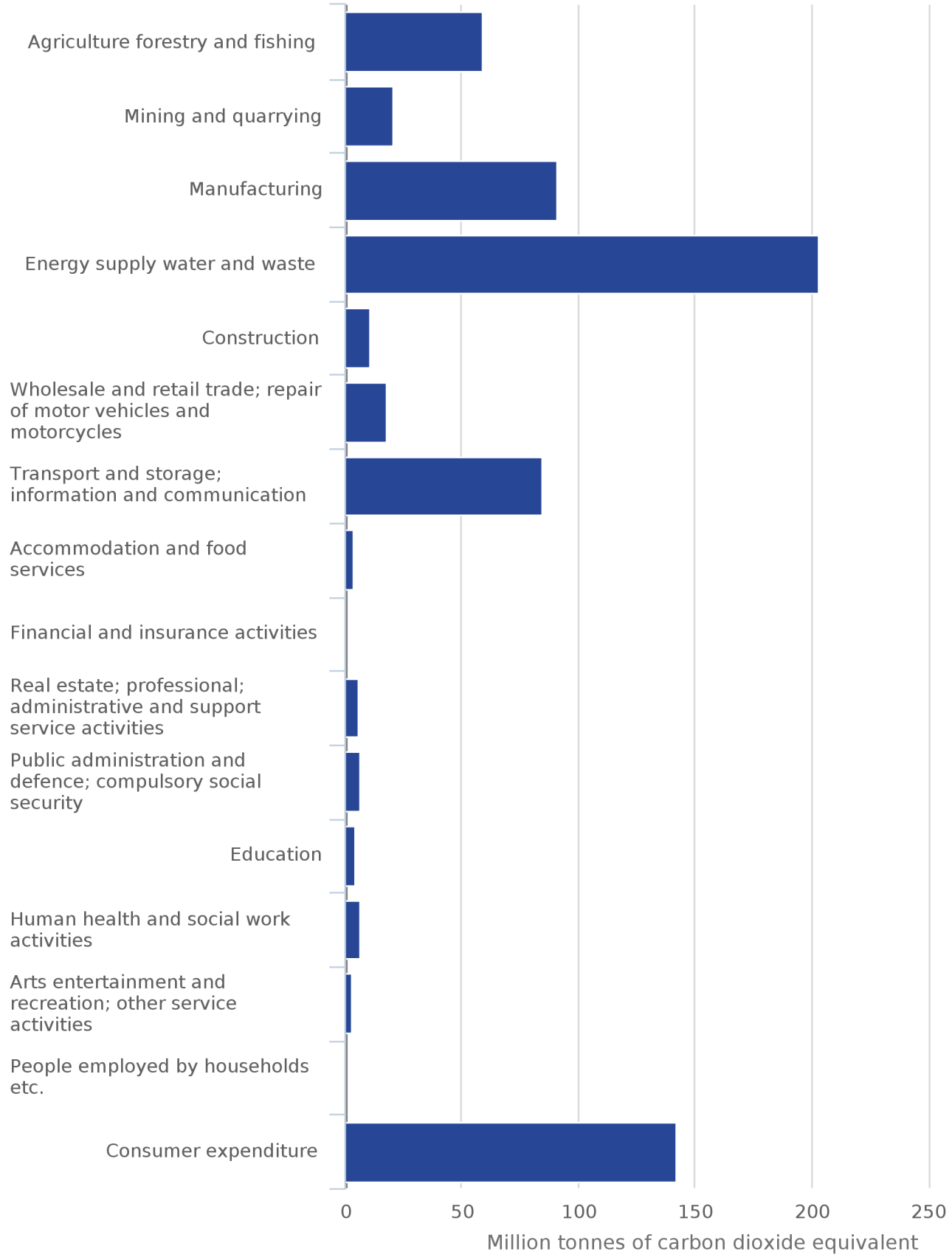
- the 11.5% fall in carbon dioxide emissions was primarily due to a 35.5% decrease in the manufacturing sector, caused mainly by a large decline in emissions from fuel-oil combustion
- the 51.5% decline in methane emissions was largely caused by a 54.7% reduction in the ‘energy supply, water and waste’ sectors, driven by a large decrease in emissions from landfill
- the 48.3% fall in nitrous oxide emissions was due mainly to a 97.3% fall in the manufacturing sector, which was largely due to the cessation of industrial adipic acid production in the UK during 2009

Figure 18 shows that the ‘energy supply, water and waste’ sectors emitted the greatest amount of greenhouse gases in 2012 (203.1 million tonnes of CO_2e). There was an 8.7% increase in CO_2 emissions in this sector in 2012 to 176.2 million tonnes from 162.1 million tonnes in 2011, which was primarily caused by an increase in emissions from coal use in power stations. However, at the same time, methane emissions in this sector fell by 4.3% from 25.1 million tonnes of CO_2e in 2011 to 24.0 million tonnes of CO_2e in 2012, which was mainly due to a decrease in emissions from landfill.

Consumer expenditure accounted for the second highest amount of greenhouse gas emissions in 2012 at 141.7 million tonnes of CO_2e, of which 136.1 million tonnes (96.1%) were carbon dioxide emissions. This includes emissions caused by household expenditure on fuel.

Figure 18: Greenhouse gas emissions: by economic sector, 2012

United Kingdom



Source: Ricardo-AEA, Office for National Statistics

Notes:

1. These industry aggregations are based on the Standard Industrial Classification (SIC) 2007

Greenhouse gas emissions data by economic sector are available in the Atmospheric emissions: Greenhouse gas emissions (439 Kb Excel sheet) dataset.

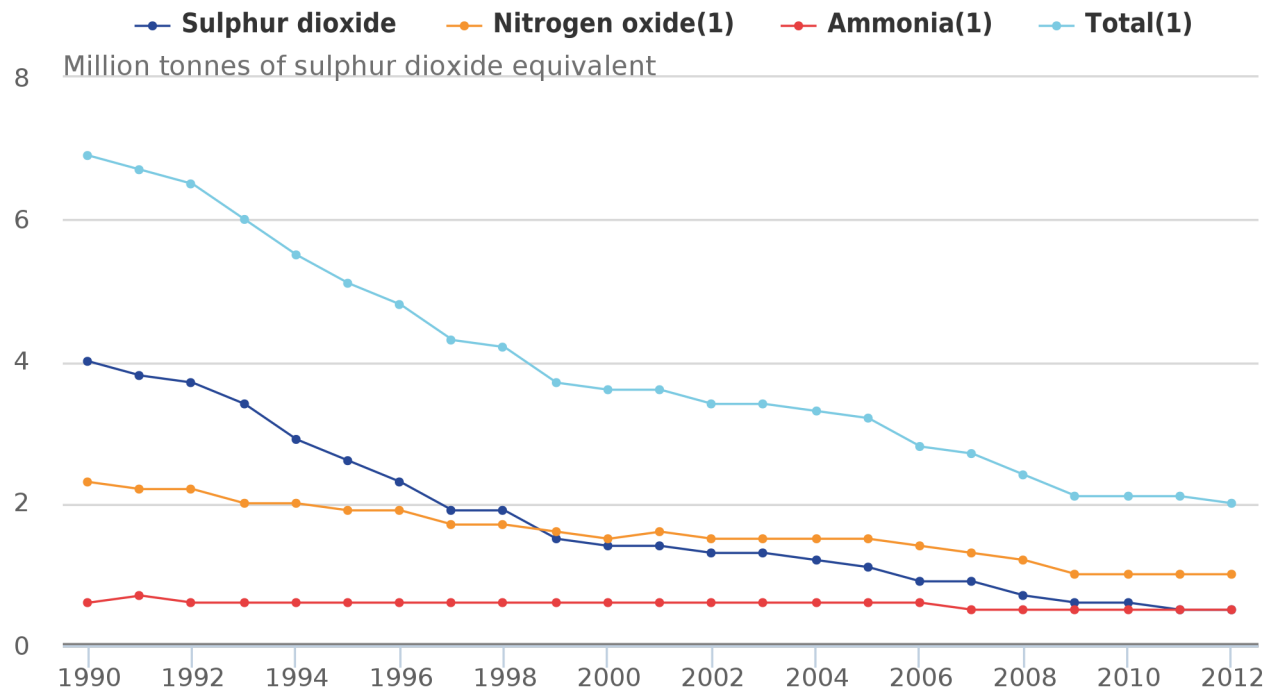
Acid rain precursor emissions

Acid rain can have harmful effects on the environment and is caused primarily by emissions of sulphur dioxide (SO_2), nitrogen oxide (NO_X) and ammonia (NH_3). For comparability, all figures are presented as sulphur dioxide equivalents (SO_2e).

Over the past two decades, acid rain precursor (ARP) emissions (excluding natural world) have decreased sharply, falling by 70.5% from 6.9 million tonnes of SO_2e in 1990 to 2.0 million tonnes of SO_2e in 2012. ARP emissions have remained stable at approximately 2.1 million tonnes of SO_2e each year since 2009.

Figure 19: Acid rain precursor emissions: by type of gas, 1990 to 2012

United Kingdom



Source: Ricardo-AEA, Office for National Statistics

Notes:

1. Excluding natural world

Sulphur dioxide emissions were 86.3% lower in 2012 compared with 1990. This was largely due to decreases in emissions from coal use in power stations within the 'energy supply, water and waste' sectors. However, sulphur dioxide emissions increased by 6.0% in 2012 to 547.1 thousand tonnes of SO_2e from 516.2 thousand tonnes of SO_2e in 2011.

Emissions of nitrogen oxide declined by 58.0% between 1990 and 2012, which was primarily due to a large decrease in emissions from petrol use in cars. In 2012, nitrogen oxide emissions reduced by 4.3% from 996.9 thousand tonnes of SO_2e in 2011 to 954.4 thousand tonnes of SO_2e.

Ammonia emissions fell by 17.5% between 1990 and 2012, which was due in part to a decrease in emissions from agricultural soils in the 'agriculture, forestry and fishing' sector. Emissions increased slightly in 2009, 2010 and 2011, but fell to 530.9 thousand tonnes of SO_2e in 2012.

Acid rain precursor emissions data by economic sector are available in the Atmospheric emissions: Acid rain precursor emissions (302 Kb Excel sheet) dataset.

Heavy metal pollutants

Emissions of heavy metal pollutants can affect air quality and health. Table 1 shows emissions of heavy metal pollutants in 1990 and 2012.

Table 1: Emissions of heavy metal pollutants, 1990 and 2012

United Kingdom

		Tonnes
Heavy metal	1990	2012
Arsenic	51.6	17.4
Cadmium	23.8	3.1
Chromium	162.5	29.8
Copper	148.0	58.6
Lead	3,053.4	63.5
Mercury	37.9	5.8
Nickel	420.9	165.7
Selenium	77.7	34.3
Vanadium	1,283.9	735.3
Zinc	1,065.2	381.6

Source: Ricardo-AEA, Office for National Statistics

Emissions of all heavy metal pollutants declined between 1990 and 2012. The most notable reduction was in emissions of lead, which fell by 97.9% from 3,053.4 tonnes in 1990 to 63.5 tonnes in 2012. This was mostly due to the decrease in the use of leaded petrol, the marketing of which was prohibited within the EU from 2000.

Emissions of heavy metal pollutants data by economic sector are available in the Atmostpheric emissions: Heavy metal pollutant emissions (846 Kb Excel sheet) dataset.

Other pollutants

There are a number of other pollutants that affect air quality. Table 2 shows emissions of other pollutants in 1990 and 2012.

Table 2: Emissions of other pollutants, 1990 and 2012

United Kingdom

		Thousand tonnes
Pollutant	1990	2012
PM10[1]	303.3	136.6
PM2.5[1]	237.2	99.5
Carbon monoxide	9,147.1	2,029.0
Non-methane volatile organic compound	2,870.5	912.2
Benzene	40.0	9.8
1,3-Butadiene	14.7	1.5

Source: Ricardo-AEA, Office for National Statistics

Notes:

1. PM – Particulate matter. PM is classified according to its size. For example, PM10 broadly represents the concentration of particles that are less than 10 µm in diameter

Carbon monoxide (CO) emissions were 77.8% lower in 2012 compared with 1990. During the same period, emissions of non-methane volatile organic compound (NMVOC) fell by 68.2%. These decreases were mainly due to reductions in road transport emissions, which fell by 89.8% for CO and 95.8% for NMVOC over the period. This is a result of a large switch from petrol to diesel cars, as petrol engines emit more CO and NMVOC than diesel engines.

Airborne Particulate Matter (PM) consists of solid and/or liquid materials that are generated from both manmade and natural sources. PM_{10} and PM_{2} . 5 emissions decreased by 55.0% and 58.1% respectively between 1990 and 2012. Residential and industrial coal combustion had been a major source of PM emissions in the UK. However, the Clean Air Act 1993 restricted coal combustion and this accounts for reductions in emissions across many sectors.

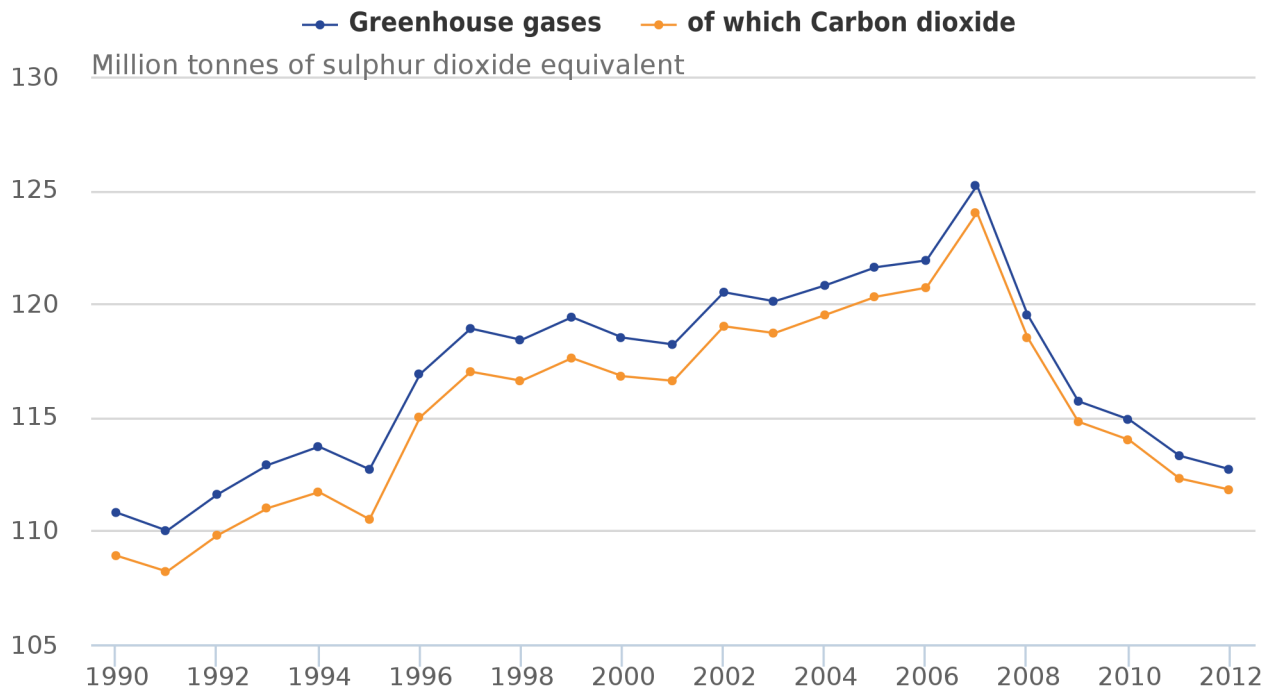
Emissions of other pollutants data by economic sector are available in the Atmospheric emissions: Emissions of other pollutants (567.5 Kb Excel sheet) dataset.

Road transport emissions

Various pollutants are emitted from road transport into the atmosphere. Figure 20 shows greenhouse gas emissions generated from fuel sources used by road vehicles from 1990 to 2012.

Figure 20: Greenhouse gas emissions produced by fuel sources used by road vehicles, 1990 to 2012

United Kingdom



Source: Ricardo-AEA, Office for National Statistics

Greenhouse gas emissions related to road transport generally increased from the early 1990s until 2007. However, since 2008 emissions have declined, which in part reflects the economic downturn and an increase in more energy efficient vehicles.

In 2012, road transport emissions accounted for 17.2% (112.7 million tonnes of CO_2e) of total greenhouse gas emissions (656.3 million tonnes of CO_2e). This consisted of:

- 111.8 million tonnes of CO_2
- 0.05 million tonnes (CO_2e) of methane
- 0.9 million tonnes (CO_2e) of nitrous oxide

Road transport emissions of acid raid precursors decreased by 73.1% between 1990 and 2012 from 932.6 to 250.6 thousand tonnes of SO_2e respectively.

PM emissions related to road transport peaked in 1996 and then continuously decreased to their lowest levels in 2012, at 22.8 thousand tonnes for PM_{10} and 16.2 thousand tonnes for $PM_{2.5}$. Diesel engine vehicles emit a greater mass of PM per kilometre than petrol engine vehicles. Since 1992, diesel vehicles have had to meet tighter PM emission regulations. This has led to reductions in PM emissions, despite the use of diesel vehicles increasing.

More detailed road transport emissions data are available in the Atmospheric emissions: Road transport emissions (116.5 Kb Excel sheet) dataset.

Reconciling environmental accounts with UNECE and UNFCCC estimates

Estimates within Environmental Accounts are produced in accordance with the UN System of Environmental-Economic Accounting (SEEA), which is an internationally agreed standard. UK Environmental Accounts are reported on a UK 'residency' basis, which include emissions that UK resident persons and businesses are directly responsible for in other countries (dominated by travel and transport overseas), but exclude emissions caused by visiting foreign persons and businesses in the UK. This is consistent with UK National Accounts and enables comparison with economic indicators such as Gross Domestic Product (GDP).

UK air emissions estimates that are reported internationally to the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Economic Commission for Europe (UNECE) are reported on a 'territory' basis, which only include emissions that occur within the UK's territorial boundaries.

Tables that illustrates the differences between UK Environmental Accounts estimates and UNFCCC and UNECE estimates can be found in the Emissions bridging table (321.5 Kb Excel sheet) dataset.

Notes for Atmospheric emissions

1. Information on alternative approaches to reporting UK greenhouse gas emissions is available on the Department of Energy & Climate Change's website

2. Figures exclude emissions arising from the natural world

9. Greenhouse gas emissions intensity

Greenhouse gas emissions intensity measures the level of emissions per unit of economic output. [1] It can be used to examine the relationship between economic growth and greenhouse gas emissions, a measure of sustainability.

Key points

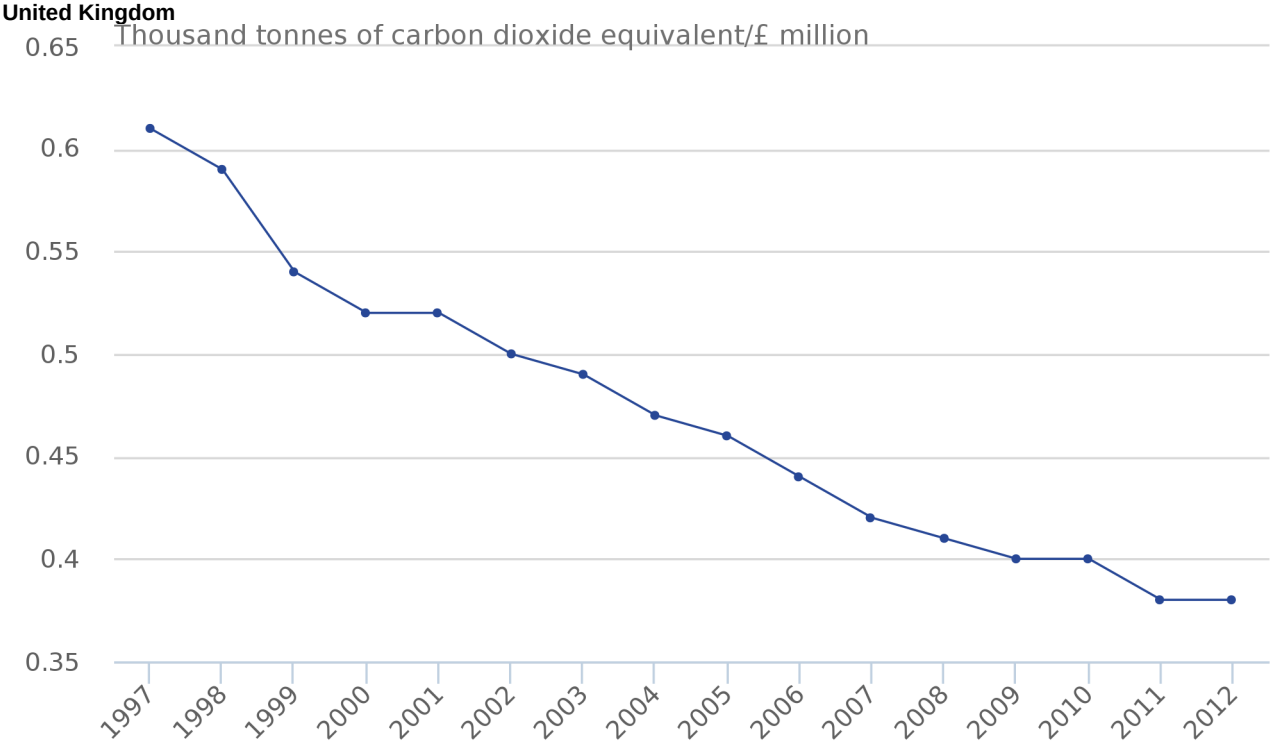
- Greenhouse gas emissions intensity was 37.7% lower in 2012 (0.38 thousand tonnes of CO_2e per £ million) compared with 1997 (0.61 thousand tonnes of CO_2e per £ million)

- Emissions intensity is greatest in the 'agriculture, forestry and fishing' and 'energy supply, water and waste' sectors

Figure 21 shows that greenhouse gas emissions intensity has followed a downward trend since the series began, declining by 37.7% between 1997 (0.61 thousand tonnes of CO_2e per £ million value added) and 2012 (0.38 thousand tonnes of CO_2e per £ million value added). Although economic output (Gross Value Added (GVA)) has generally increased, greenhouse gas emissions have generally decreased, which has led to the falls in emissions intensity.

Figure 21: Greenhouse gas emissions intensity, 1997 to 2012

United Kingdom

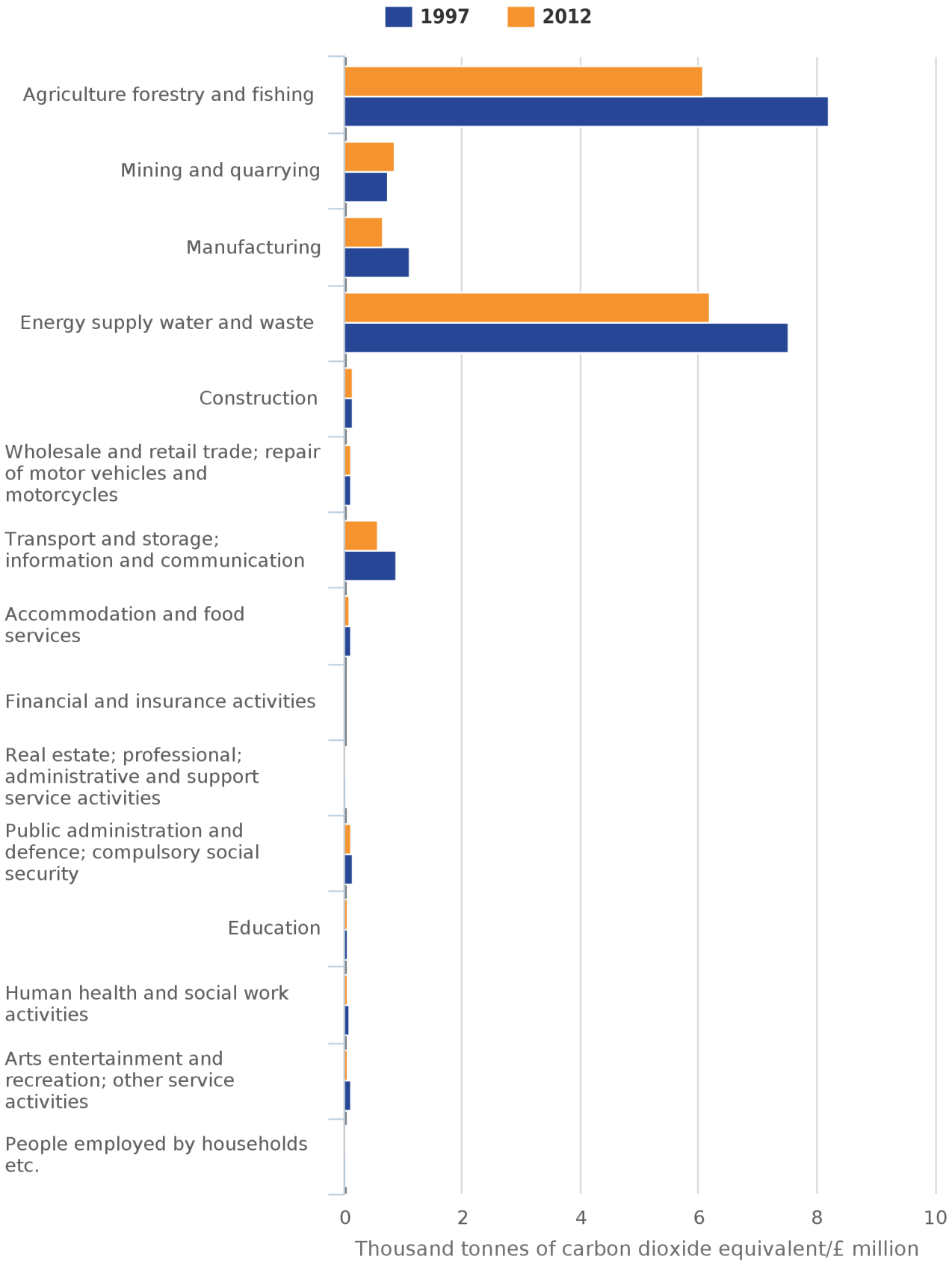


Source: Ricardo-AEA, Office for National Statistics

Greenhouse gas emissions intensity is greatest in the ‘agriculture, forestry and fishing’ and ‘energy supply, water and waste’ sectors. Figure 22 shows that intensity levels in these sectors were lower in 2012 compared with 1997, although there were increases in both between 2011 and 2012: emissions intensity increased from 5.91 to 6.07 thousand tonnes CO_2e per £million (2.71%) in the ‘agriculture, forestry and fishing’ industry and from 5.76 to 6.18 thousand tonnes CO_2e per £million (7.29%) in the ‘energy supply, water and waste’ industries.

Figure 22: Greenhouse gas emissions intensity: by industry, 1997 and 2012

United Kingdom



Source: Ricardo-AEA, Office for National Statistics

Notes:

1. These industry aggregations are based on the Standard Industrial Classification (SIC) 2007

Compared with 1997, greenhouse gas emissions intensity was higher in 2012 in only three sectors:

- ‘Mining and quarrying’ (0.75 to 0.86 thousand tonnes CO_2e per £million)
- ‘Wholesale and retail trade; repair of motor vehicles and motorcycles’ (0.11 to 0.12 thousand tonnes CO_2e per £million)
- ‘Households as employers’ (0.03 to 0.04 thousand tonnes CO_2e per £million)

More detailed greenhouse gas emissions intensity data are available in the Atmospheric emissions: Greenhouse gas emissions intensity (125 Kb Excel sheet) dataset.

Notes for Greenhouse gas emissions intensity

1. Greenhouse gas emissions intensity is calculated by dividing the level of greenhouse gas emissions by Gross Value Added (GVA) in constant prices. This is the difference between output and intermediate consumption for any given industry/sector. This means the difference between the value of goods and services produced (output) and the cost of raw materials and other inputs which are used up in production (intermediate consumption). Data are in constant prices with 2010 defined as the base year. All emissions intensity figures exclude consumer expenditure

10. Material flows

Material flow accounts show the quantity of raw materials extracted within the UK (domestic extraction), as well as the imports and exports of these items in their raw, semi-manufactured and finished product forms. This information is used to calculate indicators showing the quantity of materials that are available for use and that are consumed within the economy.

Key points

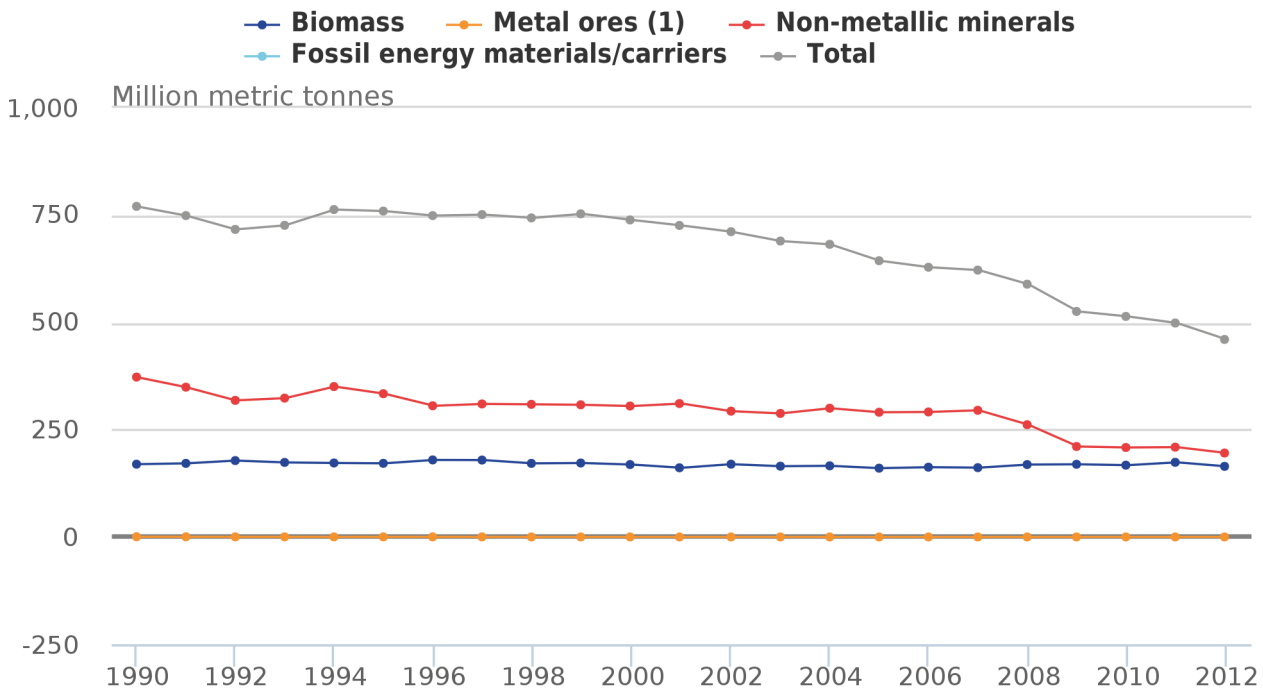
- Extraction of raw materials in the UK has continually declined since 2000, reaching 460.3 million metric tonnes in 2012
- The decline in extraction has been partly offset in recent years by a rise in physical imports (to 286.8 million tonnes in 2012) and a fall in exports (to 157.0 million tonnes in 2012)
- The total amount of materials available for use (Direct Material Input – DMI) and consumption (Domestic Material Consumption – DMC) in the UK economy has declined since the start of the economic downturn in 2008. In 2012, DMI was 747.1 million tonnes (11.7 tonnes per capita) and DMC was 590.2 million tonnes (9.3 tonnes per capita)

Domestic extraction

Since 2000, the quantity of materials extracted for use1 in the UK has gradually declined and fell to 460.3 million metric tonnes in 2012, 7.7% lower than in 2011 (498.6 million tonnes). This represented 7.2 tonnes per capita (per person) in 2012.

Figure 23: Quantity of raw materials extracted, 1990 to 2012

United Kingdom



Source: Department for Environment, Food and Rural Affairs; Food and Agriculture Organization of the United Nations; Eurostat; European Forest Institute; Kentish Cobnuts Association; British Geological Survey

Notes:

1. Metal ores are not included on the chart as the quantity extracted is small

Broadly, domestic extraction is divided into four categories:

- **biomass** (material of biological origin that is not from fossil, including crops, wood and wild fish catch)
- **non-metallic minerals** (consist mainly of construction and industrial minerals, including sand and gravel, limestone and gypsum, and clays)
- **fossil energy materials/carriers** (including coal, peat, crude oil and natural gas)
- **metal ores** (including iron and non-ferrous metals)

Since 1990, the quantity of biomass extracted in the UK has remained fairly steady. In 2012, 164.5 million tonnes were extracted, 5.4% lower than in 2011 (173.9 million tonnes). Of this, crop residues, fodder crops and grazed biomass accounted for 73.1% (120.3 million tonnes).[2]

Figure 23 shows that the extraction of non-metallic minerals has considerably declined over the time series. In 2012, 195.6 million tonnes were extracted in comparison with 372.6 million tonnes in 1990. The majority of this fall is a result of falling demand for aggregates (granular material formed from natural rock substances). This is due to a combination of a decline in infrastructure projects, increased use of non-aggregate materials in buildings, less waste, and increased use of recycled aggregates in construction. The rapid decline observed from 2007 is related to the global economic downturn, which greatly reduced construction and demand for aggregates in the UK.

During the 1990s, extraction of fossil energy materials/carriers increased and peaked at 272.7 million tonnes in 1999. Since then, production has continually fallen and fell to 100.2 million tonnes in 2012, 13.1% lower than in 2011 (115.4 million tonnes). The decline in extraction of fossil energy materials is due primarily to a drop in North Sea oil and gas production, as major producing fields begin to decline and exploration of new fields is focused on smaller resources that are more difficult to exploit. The economic downturn has also had an effect.

Each year, a small quantity of metal ores is extracted in the UK, although this has notably decreased since 1990. The main metal extracted during the 1990's was tin, but this is currently only produced in minor quantities. Iron was extracted until 2008, but is now no longer produced. In 2012, there were just 1,000 tonnes of metal ores extracted in the UK, a fall of 71.5% from 3,507 tonnes in 2011.

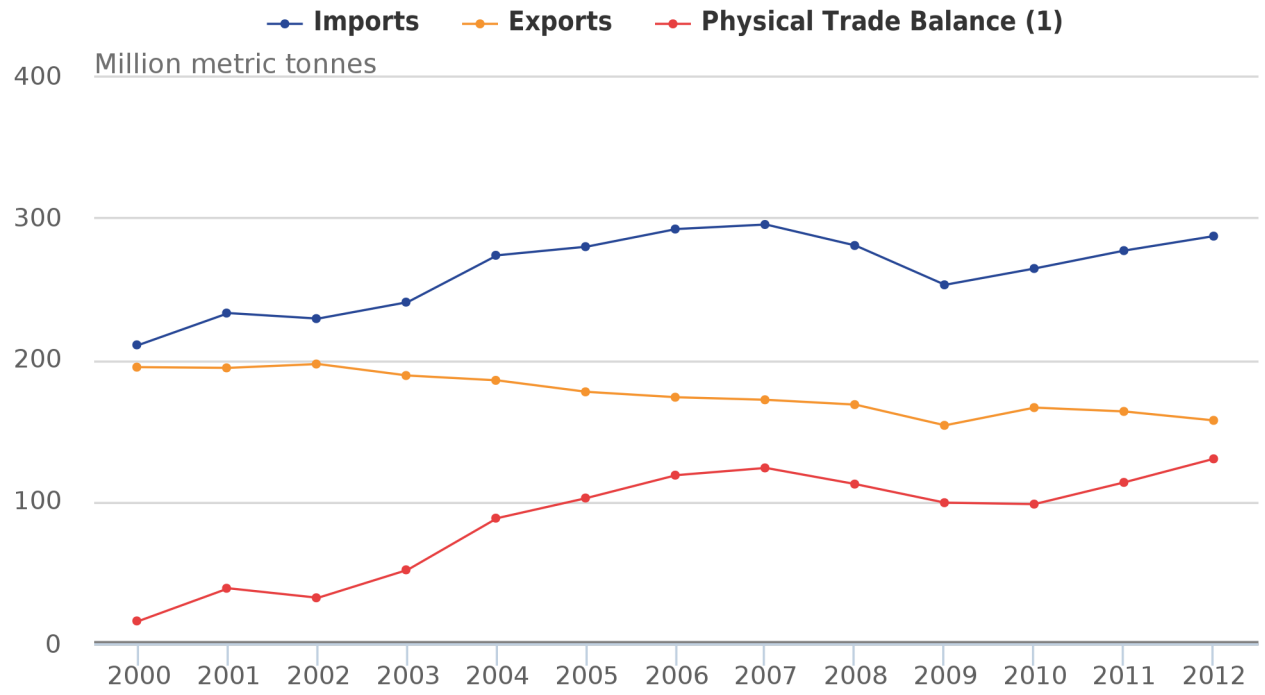
Imports and exports

Figure 24 shows the total quantity of materials imported to and exported from the UK. While physical imports have largely increased over the period (rising from 210.2 million tonnes in 2000 to a peak of 295.0 million tonnes in 2007, before falling and then rising again), physical exports have gradually decreased (peaking at 196.7 million tonnes in 2002 and falling to 153.5 million tonnes in 2009). The rise in imports partly offsets the decline in domestic extraction.

In 2012, there were 4.5 tonnes of imports per capita and 2.5 tonnes of exports per capita.

Figure 24: Total quantity of materials imported and exported, and the Physical Trade Balance, 2000 to 2012

United Kingdom



Source: HM Revenue and Customs, Office for National Statistics

Notes:

1. The Physical Trade Balance (Imports – Exports) is defined in reverse to the Monetary Trade Balance (Exports – Imports)

Across the 2000 to 2012 period, fossil energy materials/carriers were the largest component of UK imports and exports. Trade in other materials fluctuated over the series, particularly in 2009 when there was a sharp drop in the trade of metal ores and concentrates. Compared with 2008, imports of metal ores and concentrates fell by 36.7% and exports fell by 23.8%. This is likely to be due to the economic downturn.

The Physical Trade Balance (PTB) shows the relationship between imports and exports and is calculated by subtracting the weight of exports from the weight of imports.[3] The UK has a positive PTB, meaning that more materials and products are imported than are exported.

In 2000, the PTB was relatively small at 15.7 million tonnes. It generally increased until 2007, but then fell in 2008, 2009 and 2010 during the economic downturn. However, the PTB has since increased and peaked at 129.9 million tonnes in 2012. In 2012, the total mass of imports (286.8 million tonnes) was almost double the total mass of exports (157.0 million tonnes). The widening gap between physical imports and exports suggests that the UK is becoming more reliant on the production of materials in other countries.

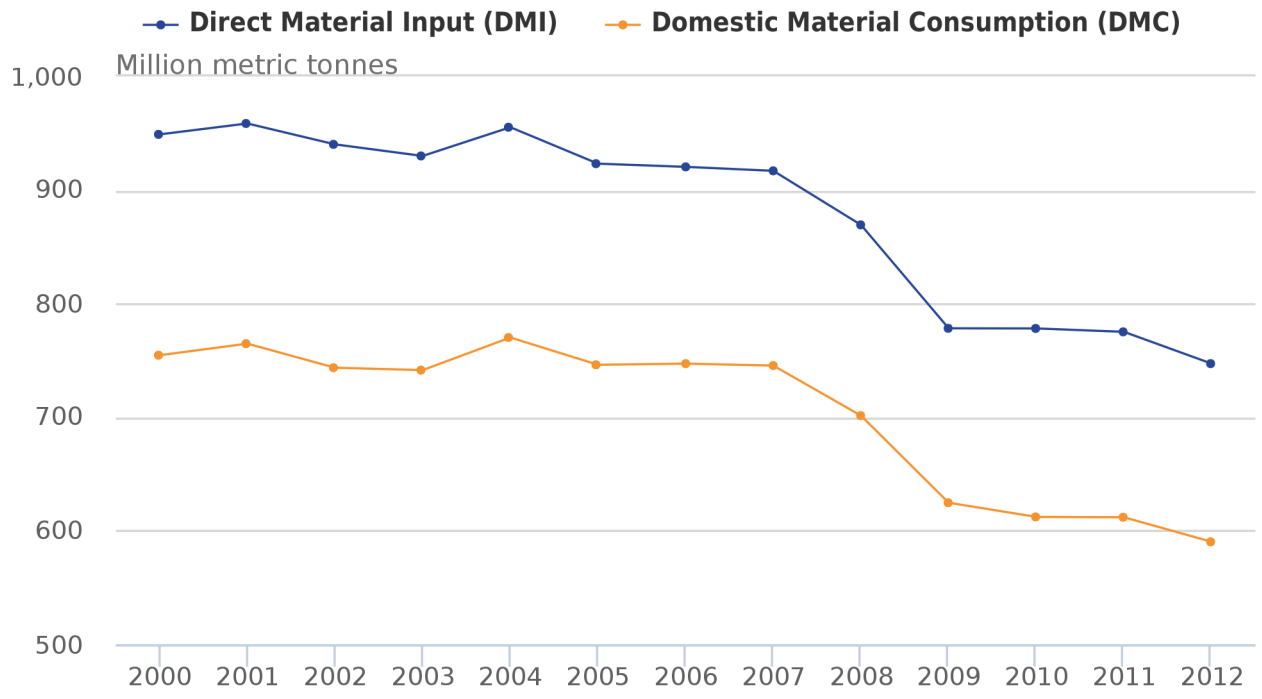
Direct material input and domestic material consumption

- Direct Material Input (DMI) (Domestic extraction + Imports) measures the total amount of materials that are available for use in the economy
- Domestic Material Consumption (DMC) (Domestic extraction + Imports – Exports) measures the amount of materials used in the economy, and is calculated by subtracting exports from DMI

Figure 25 shows that DMI and DMC were fairly stable between 2000 and 2007 but then gradually declined from 2008 at the start of the economic downturn, showing that fewer materials were being used and consumed in the UK economy. DMI and DMC fell most sharply in 2009, by 10.5% and 10.9% respectively. Since then, they have been steadier, although they fell slightly in 2012 to 747.1 million tonnes for DMI and 590.2 million tonnes for DMC, the lowest levels recorded across the series.

Figure 25: Direct Material Input (DMI) and Domestic Material Consumption (DMC) indicators, 2000 to 2012

United Kingdom



Source: Office for National Statistics

Within DMC, non-metallic minerals was the largest component over the 2000 to 2012 period, although their use fell sharply in 2009 and have since remained at a similar level to the consumption of biomass and fossil fuels. In 2012, non-metallic minerals and biomass each accounted for 33.0% and fossil fuels accounted for 31.0% of DMC. The remaining 2.9% consisted of metal ores and other products.

In 2012, DMI represented 11.7 tonnes per capita and DMC represented 9.3 tonnes per capita.

For more data on material flows and indicators, see the Material flows account (175.5 Kb Excel sheet) dataset.

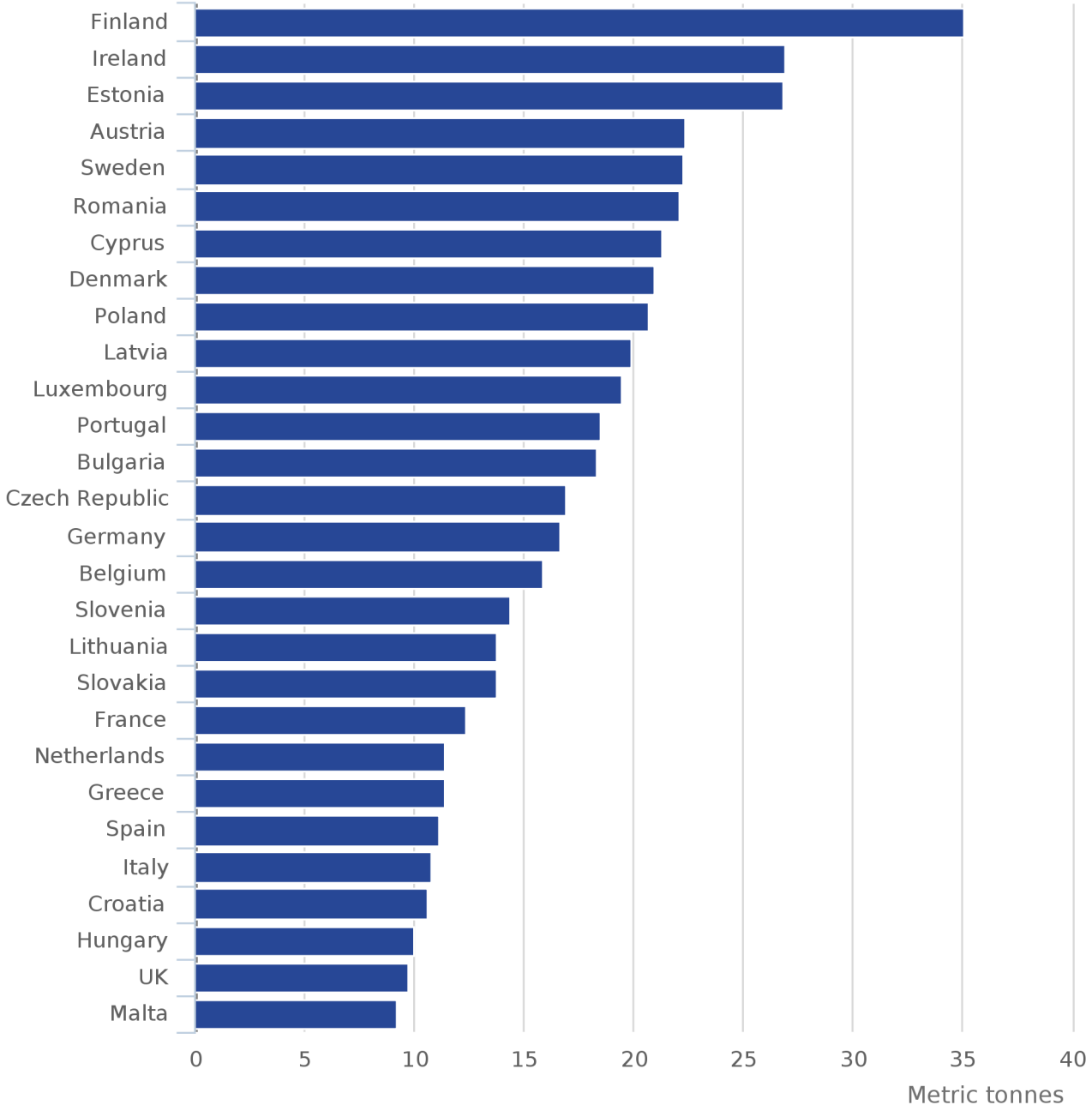
European comparison

At present, DMC is the most prominent material flows indicator used across Europe.

In 2011, aggregated DMC for the EU-27 member states equalled 7.4 billion tonnes, which represented 14.7 tonnes per capita. Germany had the highest DMC at 1.4 billion tonnes, followed by France and Poland at 0.8 billion tonnes, and Italy and the UK at 0.6 billion tonnes.

Figure 26 shows DMC per capita for each EU-28 member state in 2011. Finland had the highest DMC per capita at 35.1 tonnes, followed by Ireland (26.9 tonnes), Estonia (26.8 tonnes), Austria (22.4 tonnes) and Sweden (22.3 tonnes). Seventeen member states fell in the range of +/-5 tonnes of the EU-27 average. Densely populated countries, including the UK (9.7 tonnes per capita), often consume lower amounts of materials per person than the EU average.

Figure 26: Domestic Material Consumption (DMC) per capita for EU Member States, 2011



Source: Eurostat, Office for National Statistics

As well as variations in consumption rates, differences in quantities and composition of DMC between member states can also be explained according to different living standards and economic structures and development.

Experimental estimates of Raw Material Consumption using Raw Material Equivalents

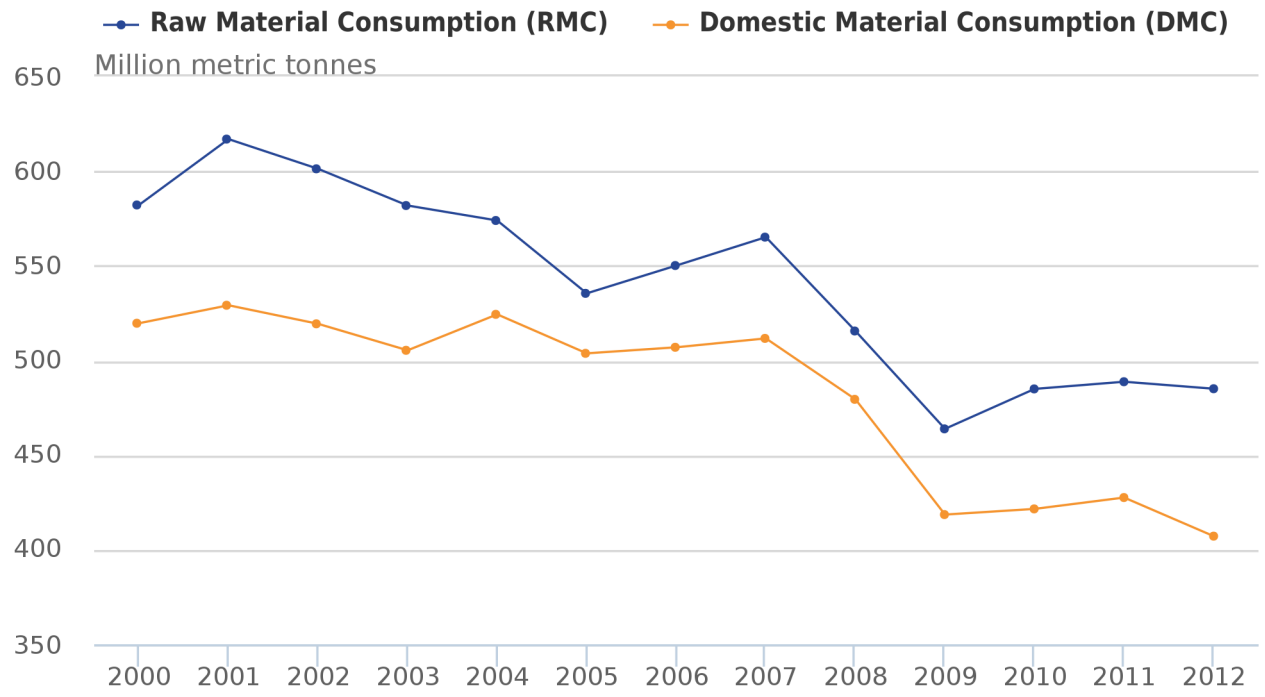
A limitation of the DMC indicator is its 'asymmetry': it measures the domestic extraction of material resources in tonnes of gross harvest and ore, whereas the imports are measured according to the weight of goods crossing the boundary independent of how far the imported products have been processed (Eurostat, 2012). [4]

The Raw Material Consumption (RMC) indicator is designed to overcome this asymmetry. In addition to domestic extraction, RMC includes imports expressed or converted into their Raw Material Equivalents (RME) (into equivalents of domestic extraction from the rest of the world to produce the respective goods).

Figure 27 shows the RMC indicator compared with the DMC indicator. Both exclude fossil energy materials /carriers.

Figure 27: Raw Material Consumption (RMC) and Domestic Material Consumption (DMC) indicators (excluding fossil energy materials/carriers), 2000 to 2012

United Kingdom



Source: Environment, Food and Rural Affairs, Office for National Statistics

Notes:

1. RMC estimates are experimental statistics and the methodology used to produce them is currently under development

RMC estimates peaked in 2001 at 616.9 million tonnes, which was 16.6% higher than DMC at 529.1 million tonnes.

In 2012, RMC was 485.0 million tonnes, which was 19.1% greater than DMC at 407.1 million tonnes. RMC consisted of:

- 207.9 million tonnes of biomass
- 54.6 million tonnes of metal ores
- 222.4 million tonnes of non-metallic minerals

DMC consisted of:

- 194.8 million tonnes of biomass
- 9.9 million tonnes of metal ores
- 195.0 million tonnes of non-metallic minerals
- 7.4 million tonnes of other products

Notes for Material flows

1. In Eurostat's Economy-Wide Material Flow Accounts Compilation Guide 2012 a distinction is made between 'used' and 'unused' domestic extraction. 'Used' refers to an input for use in any economy (for example, where a material acquires the status of a product) and 'unused' flows refer to materials that are extracted from the environment without the intention of using them. Only domestically extracted items that are 'used' are included within the UK's material flow accounts

2. The residual biomass from primary crop harvest, such as straw and leaves, is often subject to further economic use. A large fraction of crop residues is used as bedding material in livestock husbandry, but may also be used as animal feed, for energy production, or as industrial raw material

   Fodder crops consist of beets, cabbage, maize and turnips for fodder, as well as hay and silage from grass.

   The quantity of grazed biomass used is estimated according to demand for animal feed that cannot be met by fodder crops, and the area of grazing land available.

3. The Physical Trade Balance (Imports – Exports) is defined in reverse to the Monetary Trade Balance (Exports – Imports). Physical estimates can differ quite significantly to monetary estimates

4. Eurostat (2012) 'Project: Estimates for Raw Material Consumption (RMC) and Raw Material Equivalents (RME) conversion factors'

5. This year, a number of improvements have been made to the UK material flow account to align it with the requirements of Regulation (EU) No 691/2011. These are detailed in an 'Improvements to UK Environmental Accounts' (101.1 Kb Pdf) paper, published on the ONS website. The impact of the improvements are detailed within the 'Revisions' section of this statistical bulletin

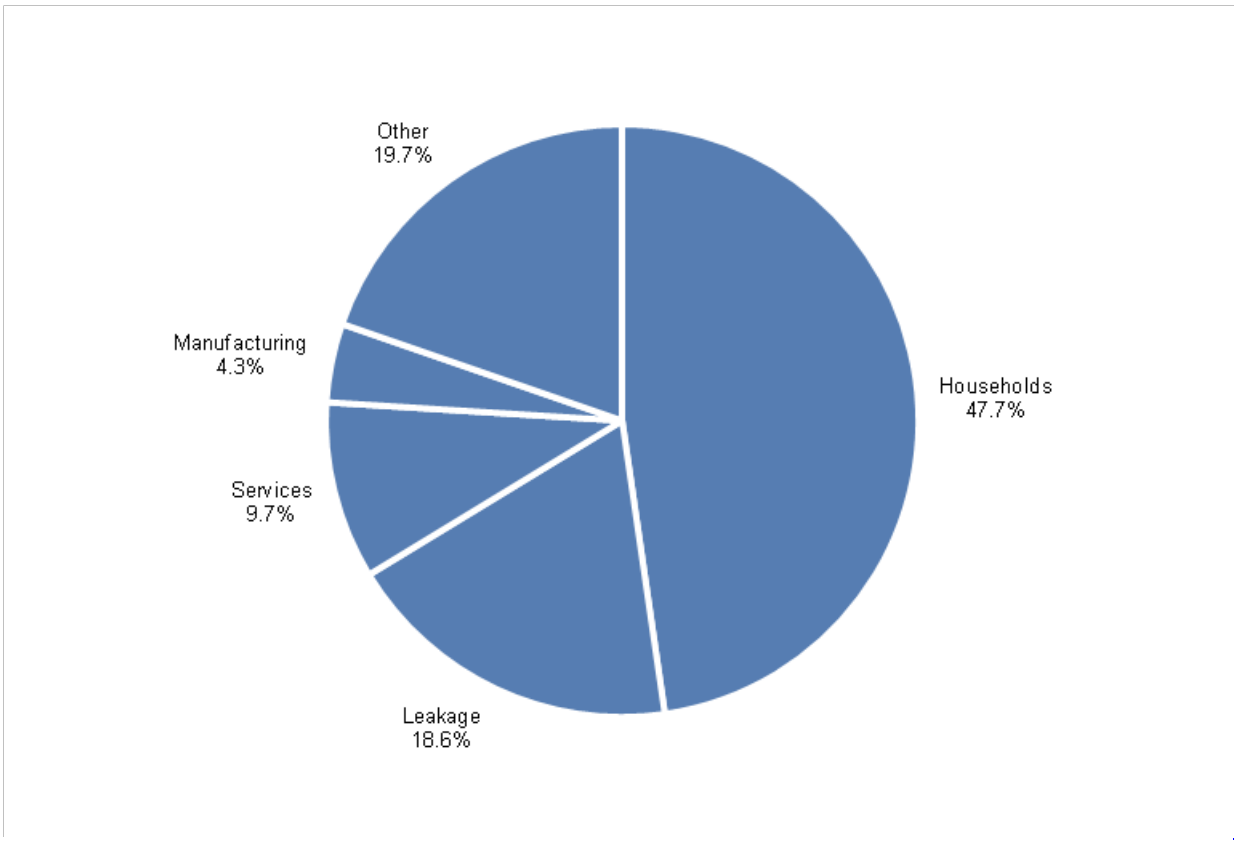
6. Estimates for indirect flows are currently under development and are likely to be included in UK Environmental Accounts, 2015. It has not therefore been possible to include the Total Material Requirement (TMR) (Direct Material Input + Indirect flows) indicator in this statistical bulletin

11. Water use

Water use is the physical amount of water removed (abstracted) from any source for consumption and production activities. In 2011, total water abstraction from freshwater (non-tidal) sources in England and Wales was 10,463 million cubic metres. Of this, 58.1% was for public water supply, while 41.9% was directly abstracted by different sectors of the economy.

Figure 28: Use of public water supply, 2011

England and Wales



Source: Department for Environment, Food and Rural Affairs; WRc; Waterwise; WaterUK

Notes:

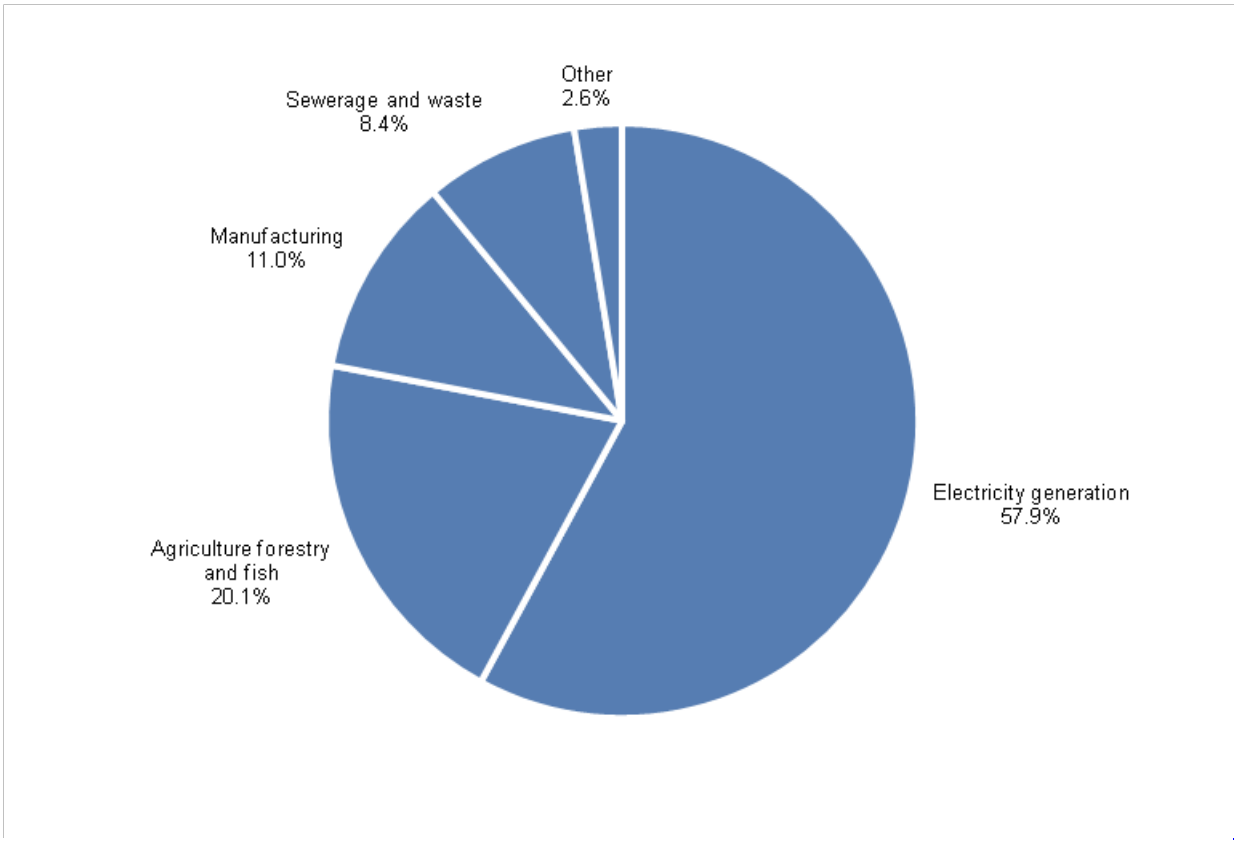
1. Private household estimated use of public water supply is based on the assumed rate of 150 litres per person per day (Source Waterwise)

Public water supply is the use of mains water supplied by water companies to various sectors of the economy, including households, the manufacturing sector, and services.

Of all public water supply, 47.7% was used by households, while non-domestic sectors accounted for the remaining 52.3% of public water use. The services sector used 9.7%, the manufacturing sector used 4.3%, while 18.6% was lost through leakage. Significant non-domestic users of the public water supply were the chemicals and chemical products sector (165.9 million cubic metres), and accommodation and food services sector (127.0 million cubic metres).

Figure 29: Direct abstractions from freshwater (non-tidal) waters, 2011

England and Wales



Source: Department for Environment, Food and Rural Affairs; WRc

Notes:

1. Estimates exclude abstractions for Public Water Supply and abstractions below the licensing threshold

In 2011, direct abstraction accounted for 41.9% of freshwater (non-tidal) abstraction in England and Wales.

The sector that directly abstracted the largest amount of water was electricity generation, directly abstracting 2,537.6 million cubic metres (57.9% of total direct abstraction). The agriculture, forestry and fishing sector was also a major user, with 878.7 million cubic metres directly abstracted (20.1% of total direct abstraction) in addition to the 120.5 million cubic metres taken from the public water supply. The manufacturing sector directly abstracted 11.0% of total direct abstraction, while also using 4.3% of the public water supply.

12. Environmental taxes

An environmental tax is a tax on a physical unit (for example, petrol or a passenger flight) that has a proven negative impact on the environment. Such taxes are important policy instruments for pollution control and natural resource management. Their main aim is to influence economic behaviour and reduce damaging effects on the environment.

Key points

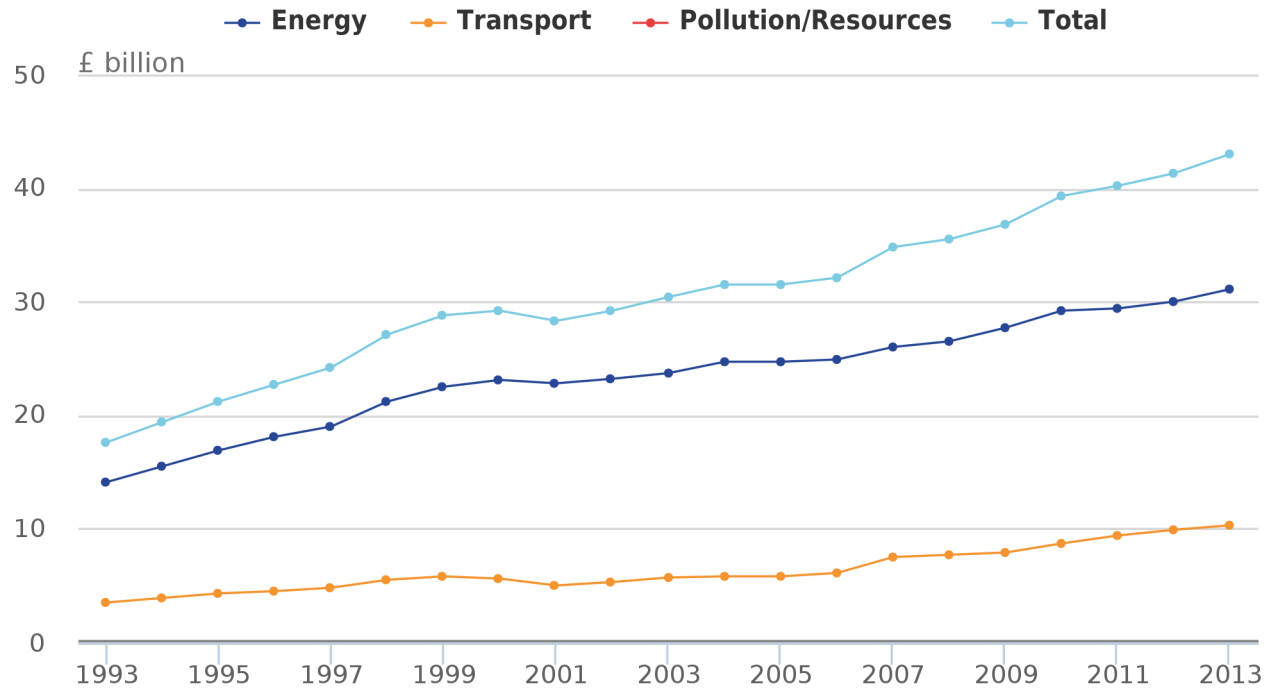
- Revenue from environmentally related taxes (in current prices) has gradually increased over the past two decades, peaking at £43.0 billion in 2013. This represented 7.5% of total revenue from taxes and social contributions in the UK and was equivalent to 2.7% of Gross Domestic Product (GDP)

- In 2013, total revenue from energy taxes was £31.1 billion, which represented 72.4% of total environmental taxes. The largest contributor to energy taxes was taxes on hydrocarbon oils (fuels) at £26.7 billion

Environmental taxes can be divided into three types: energy, transport, and pollution/resources.

Figure 30: Environmental tax revenue, 1993 to 2012

United Kingdom



Source: Office for National Statistics

Figure 30 shows that the amount of revenue received by the UK government from environmentally related taxes has gradually increased since the series began in 1993, peaking at £43.0 billion in 2013. This was 4.0% higher than in 2012, when revenue was £41.3 billion. This growth was driven by increases of 2.7 percentage points from energy taxes, 1.0 percentage point from transport taxes, and 0.3 percentage points from pollution/resource taxes.

The main exception to this trend occurred in 2001, where total environmental tax revenue decreased by 3.1% compared with the previous year. This was driven by a £1.0 billion decrease in taxes on hydrocarbon oils (fuels) and a £0.6 billion decrease in motor vehicle duties paid by businesses. This followed a series of national fuel protests in the autumn of 2000 and a change in the basis for vehicle tax (see Transport taxes below).

In 2013, revenue from environmentally related taxes was equivalent to 2.7% of Gross Domestic Product (GDP). In addition, they accounted for 7.5% of revenue from total taxes and social contributions in the UK.

Energy taxes

Energy taxes consist of taxes on energy production and on energy products used for both transport and stationary purposes. They include:

- taxes on hydrocarbon oils (fuels)
- climate change levy
- fossil fuel levy
- gas levy
- hydro-benefit
- renewable energy obligations
- emissions trading scheme (EU-ETS)
- carbon reduction commitments

although these were all introduced and collected at different times throughout the time series. [1]

In 2013, total revenue from energy taxes was £31.1 billion, an increase of 3.7% from £30.0 billion in 2012. This represented 72.4% of total environmental taxes. The increase in 2013 was due to large rises in revenue from the climate change levy (71.6%) and renewable energy obligations (29.6%).

The largest contributor to energy taxes is tax on hydrocarbon oils (including petrol and diesel). Over the past two decades, revenue from this tax has more than doubled, rising from £12.5 billion in 1993 to £26.7 billion in 2013. In 2013, this tax accounted for 85.8% of total energy tax revenue.

In 2013, revenue from energy taxes was equivalent to 1.9% of GDP.

Transport taxes

Transport taxes consist mainly of taxes related to the ownership and use of motor vehicles, although taxes on other transport and related transport services are also included.

Total revenue from transport taxes in 2013 was £10.3 billion, which represented a 4.2% increase from £9.9 billion in 2012. This was largely due to a 7.0% increase in revenue from air passenger duty. In 2013, transport taxes revenue accounted for 24.1% of total environmental taxes.

Revenue from transport taxes has generally increased over the 1993 to 2013 period, although there have been a few fluctuations. For example, in terms of decreases, there was a large fall in revenue from motor vehicle taxes paid by businesses in 2001. This may be due to the change from vehicle tax being based on engine size (for cars and light goods vehicles registered before 1 March 2001) to being based on fuel type and CO2 emissions (for cars and light goods vehicles registered on or after 1 March 2001). In terms of increases, for example, the rate of air passenger duty doubled in 2007, which contributed 5.9 percentage points to the 23.5% rise in transport tax revenue for that year.

The highest contributor to transport taxes is tax on motor vehicles from households. Since the start of the series, revenue from this tax has increased more than two-fold from £2.3 billion in 1993 to £5.1 billion in 2013. This tax accounted for 49.5% of total transport taxes revenue in 2013.

In 2013, revenue from transport taxes was equivalent to 0.6% of GDP.

Pollution and resource taxes

Pollution and resource taxes are related to the management of solid waste and activities linked to the extraction and use of natural resources. In the UK, they include landfill tax, aggregates levy (a tax on the commercial exploitation of rock, sand and gravel) and fishing licences.

Pollution and resource tax revenue contributes the smallest proportion to the total of environmental taxes. In 2013, revenue was £1.5 billion, a 10.3% increase from £1.4 billion in 2012. This increase was largely due to the increase in landfill tax revenue.

The largest contributor to pollution and resource tax revenue is landfill tax. Revenue has generally increased since its introduction in 1996 and peaked at £1.2 billion in 2013, which represented 80.3% of total pollution and resource taxes.

In 2013, revenue from pollution and resource taxes was equivalent to 0.1% of GDP.

For more data on environmental taxes, see the Environmental taxes (59.5 Kb Excel sheet) dataset.

European comparison

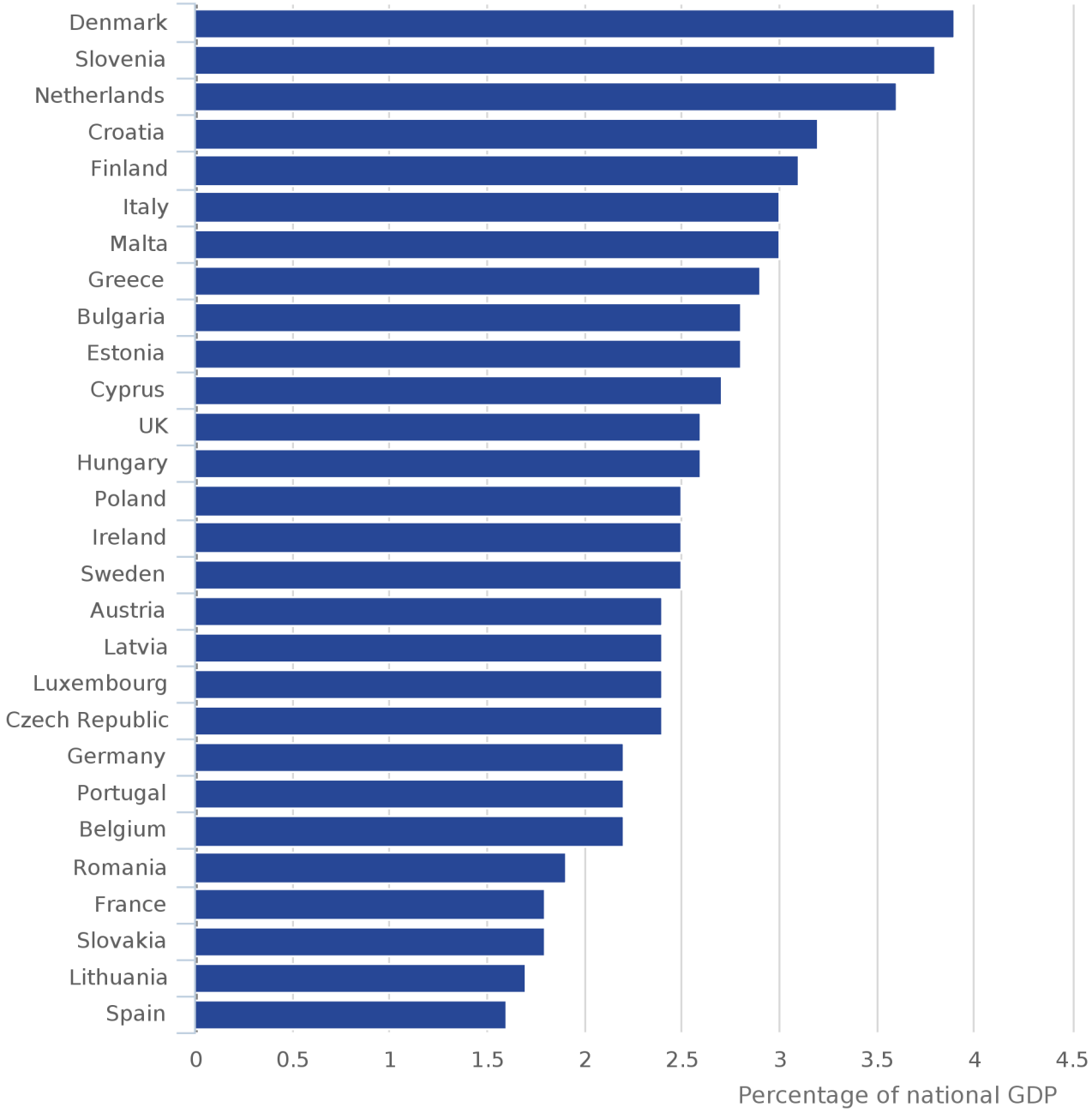
In 2012, the EU-28 raised a total of €311.7 billion from environmental taxes. [2] This was equivalent to 2.4% of Europe's GDP and represented 6.0% of total revenues from taxes and social contributions.

Germany had the highest revenue at €58.0 billion. This was followed by the UK (€50.7 billion), Italy (€47.3 billion), France (€37.2 billion) and the Netherlands (€21.3 billion).

Of the total environmental tax revenue for the EU-28 in 2012, energy taxes represented 75.0%, transport taxes represented 20.7% and pollution/resource taxes represented 4.3%.

Figure 31 shows the environmentally related tax revenue as an equivalent percentage of national GDP for the EU-28 member states in 2012. Denmark collected the highest proportion of taxes (3.9%), followed by Slovenia (3.8%), the Netherlands (3.6%), Croatia (3.2%) and Finland (3.1%). Spain (1.6%), Lithuania (1.7%), Slovakia (1.8%), France (1.8%) and Romania (1.9%) were the only countries where environmental taxes as a GDP equivalent were less than 2.0%.

Figure 31: Environmental tax revenue as an equivalent percentage of national GDP for EU-28 member states, 2012



Source: Eurostat, Office for National Statistics

Comparison with HM Treasury's definition of environmental taxes

Environmental taxes data produced by ONS are based on the definition outlined in Regulation (EU) No 691/2011 on European environmental economic accounts. To comply with this Regulation, ONS submits UK data to Eurostat (the European statistical office) annually.

In 2010, the UK's coalition government committed to increasing the proportion of revenue from environmental taxes.[3] To measure this, HM Treasury have developed a separate definition based on the following principles:

- the tax is explicitly linked to the government's environmental objectives
- the primary objective of the tax is to encourage environmentally positive behaviour change
- the tax is structured in relation to environmental objectives, for example: the more polluting the behaviour, the greater the tax levied

This definition includes the following six taxes: climate change levy, aggregates levy, landfill tax, EU emissions trading scheme (EU-ETS), carbon reduction commitment, and carbon price floor. This is narrower than the definition used by ONS (Table 3), meaning that total environmental taxes data published by HM Treasury are much lower than the figures included in this release. For example, HM Treasury's latest figures show that environmental tax revenue in 2011/12 was £3.1 billion. In contrast, ONS figures show that revenue from environmentally related taxes was £40.2 billion in 2011 and £41.3 billion in 2012.

Table 3: Definitions of environmental taxes used by ONS and HM Treasury

ONS definition	HM Treasury definition
Energy	Energy
Tax on Hydrocarbon oils	Carbon Price Floor1
Climate Change Levy1	Climate Change Levy
Fossil Fuel Levy	
Gas Levy	
Hydro-Benefit	
Renewable Energy Obligations	
Emissions Trading Scheme (EU-ETS)	Emissions Trading Scheme (EU-ETS)
Carbon Reduction Commitment	Carbon Reduction Commitments
Transport	Transport
Air Passenger Duty	
Rail Franchise Premia	
Northern Ireland Driver Vehicle Agency	
Motor Vehicle Duties Paid by Businesses	
Motor Vehicle Duty Paid by Households	
Boat Licences	
Pollution/Resources	Pollution/Resources
Land Fill Tax	Landfill tax
Fishing Licences	
Aggregates levy	Aggregates Levy

Source: Office for National Statistics, HM Treasury

Notes:

1. The carbon price floor (CPF) is a tax on fossil fuels used to generate electricity. It came into effect on 1 April 2013. It changes the existing Climate Change Levy (CCL) regime, by applying carbon price support (CPS) rates of CCL to gas, solid fuels and liquefied petroleum gas (LPG) used in electricity generation. In ONS data, CPF data is included in CCL as HMRC are unable to separate them

Notes for Environmental taxes

1. Environmental taxes data are currently available for 1993 to 2013. Some taxes were introduced and collected at different times throughout the time series. In terms of energy taxes:

   Taxes on hydrocarbon oils (fuels) – these have been collected throughout the whole time series. Rates are decided by the Chancellor on a budget-by-budget basis, taking relevant economic, social and environmental factors into account.

   Climate change levy - this is a tax on non-domestic use of energy and was introduced in April 2001 under the Finance Act 2000, forming part of the UK's Climate Change Programme. Data are included for 2001 onwards. From 1 April 2013, it also includes Carbon Price Floor taxes.

   Fossil fuel levy – this was effectively replaced by the climate change levy. Fossil fuel levy rates, controlled by OFGEM, have been set to zero since April 2002 in England and Wales and November 2002 in Scotland. Data are therefore included up to 2002.

   Gas levy – this was introduced following the Gas Levy Act 1981 but was later repealed by the Finance Act 1998. Data are therefore included up to 1998.

   Hydro-Benefit – this was introduced in 1991 to protect energy consumers in remote areas from excessive charges resulting from the increased costs of supplying those areas. However, it was abolished in 2004 because it contravened European law, although Scottish and Southern Energy continued the scheme on a voluntary basis until April 2005. Data are therefore included for 1993 to 2005.

   Renewable Energy Obligations – this was introduced in 2002 to provide incentives for the deployment of large scale renewable electricity in the UK. Data are therefore included for 2002 onwards.

   Emissions Trading Scheme (EU-ETS) – this is the largest multi-country, multi-sector greenhouse gas emissions trading scheme in the world and it is central to the EU meeting its emissions reduction target of 20% by 2020. Data are included for 2009 onwards.

   Carbon Reduction Commitment – this energy efficiency scheme is designed to improve energy efficiency and cut emissions in large public and private sector organisations. It targets emissions not already covered by Climate Change Agreements and the EU-ETS. Data are included for 2012 onwards.

2. For comparison purposes, figures for all European countries are reported in billion Euros (€)

3. HM Government (2010) The Coalition: Our programme for government

4. Most taxes in the UK are collected by HM Revenue & Customs (HMRC). HMRC provide monthly data to ONS detailing each individual tax they collect and the amount of revenue associated with that tax

13. Environmental Protection Expenditure

Environmental protection expenditure (EPE) includes all activities and actions which have as their main purpose the prevention, reduction, and elimination of pollution or any other degradation of the environment. The purpose of reporting EPE is to enable identification and measurement of society's response to environmental concerns through the supply of and demand for environmental protection services and through the adoption of production and consumption behaviour aimed at preventing environmental degradation.

Key points

- In 2012, the UK government spent £14.2 billion on environmental protection activities, of which £11.5 billion (81.3%) was spent on the collection, treatment and disposal of waste
- Government expenditure on environmental protection as an equivalent of Gross Domestic Product (GDP) has steadily increased since 1996 and despite the economic downturn it has remained equivalent to between 0.9 and 1.0% of GDP since 2006
- The extraction, manufacturing, and electricity, gas and water industries spent £3.2 billion on environmental protection in 2012, the greatest proportions of which were spent on waste water management (£956.5 million, 30.3%) and waste management (£853.5 million, 27.0%)

EPE is currently reported for two sectors: EPE by general government and EPE by industry. [1]

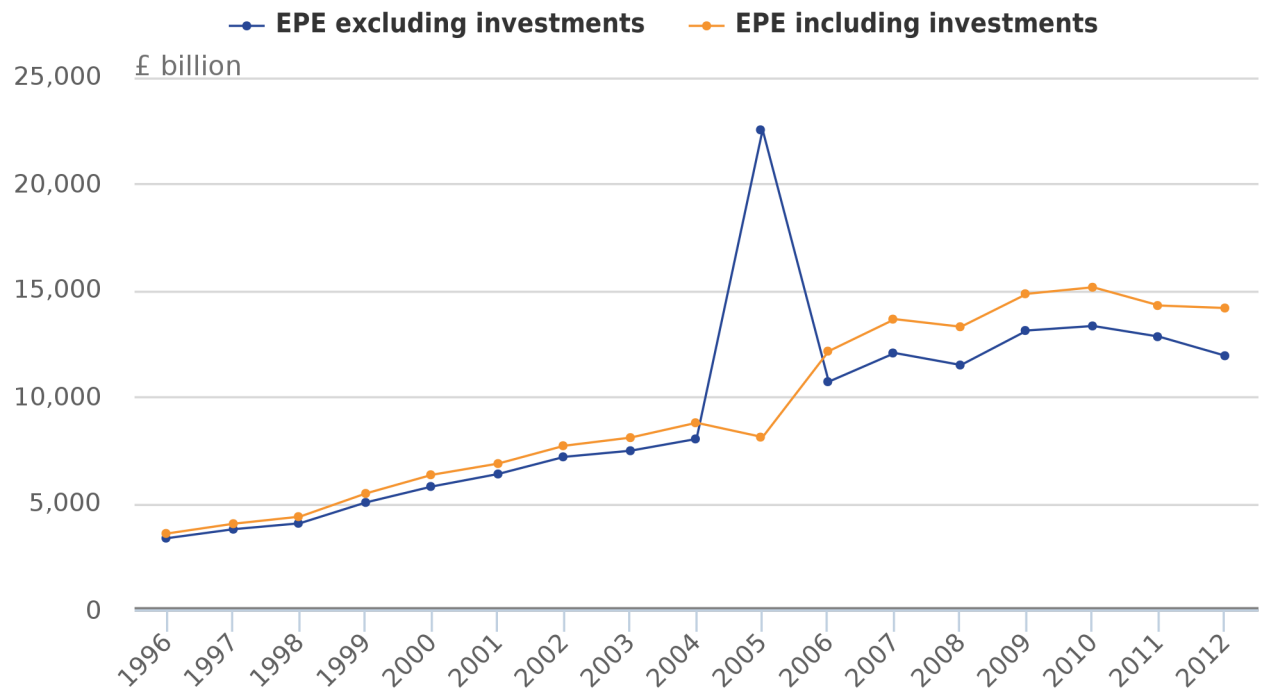
General government

EPE by general government figures are derived using annual expenditure data broken down by function using the Classification Of Functions Of Government (COFOG)[2], sourced from the UK National Accounts. At present, there are two methods for estimating EPE by general government in the UK. [3] The main difference relates to expenditure on investments.[4]

Figure 32 shows EPE by general government for 1996 to 2012. Both series (EPE including investments and EPE excluding investments) show that there has been a general increase in expenditure since 1996, apart from falls in 2005 (including investments), 2008, 2011 and 2012.

Figure 32: Environmental protection expenditure by general government, 1996 to 2012

United Kingdom



Source: Office for National Statistics

The most notable difference in EPE between the two series was observed in 2005 and is due to the decommissioning of British Nuclear Fuels plc (BNFL). In April 2005, BNFL (classified as a public corporation) transferred some nuclear reactors to the Nuclear Decommissioning Authority (NDA) (classified as central government). The value of the transfer was -£15.6 billion. The negative value reflects the fact that the reactors were at the end of their productive lives and had large decommissioning and clean-up liabilities. This transfer did not affect overall economic figures as it was an acquisition by one sector and a disposal by another. However, it particularly affects the investments element of the EPE series. Excluding investments, EPE by general government was £22.5 billion in 2005. But when investments are taken into account (-£14.4 billion), EPE was reduced to £8.1 billion.

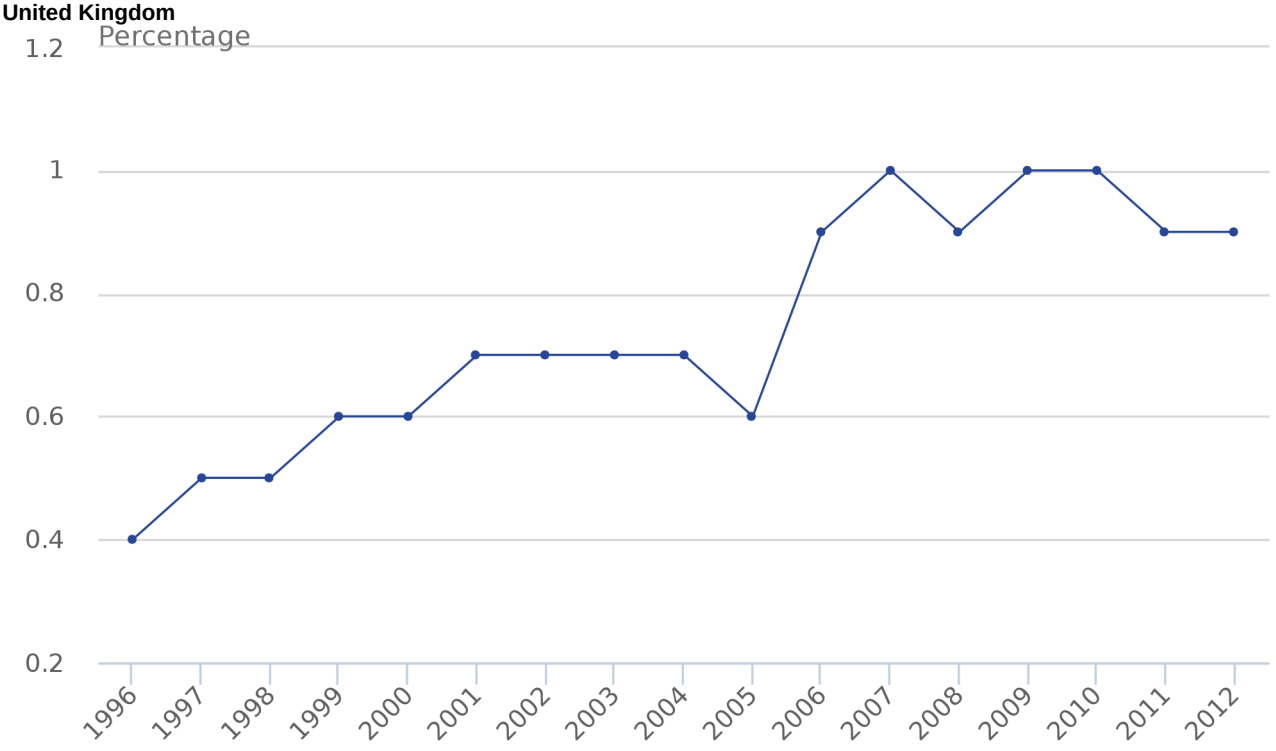
The preferred method in European environmental accounting for reporting EPE is to include investment expenditure and this series will be the focus of the remainder of this section.

In 2012, general government spent £14.2 billion on environmental protection, £0.1 billion less than in 2011 (£14.3 billion). This was equivalent to 0.9% of Gross Domestic Product (GDP).

EPE by general government peaked in 2010 at £15.1 billion, which was largely due to an increase in investment grants towards pollution abatement in that year.

Figure 33: Environmental protection expenditure by general government as an equivalent of Gross Domestic Product (GDP), 1996 to 2012

United Kingdom



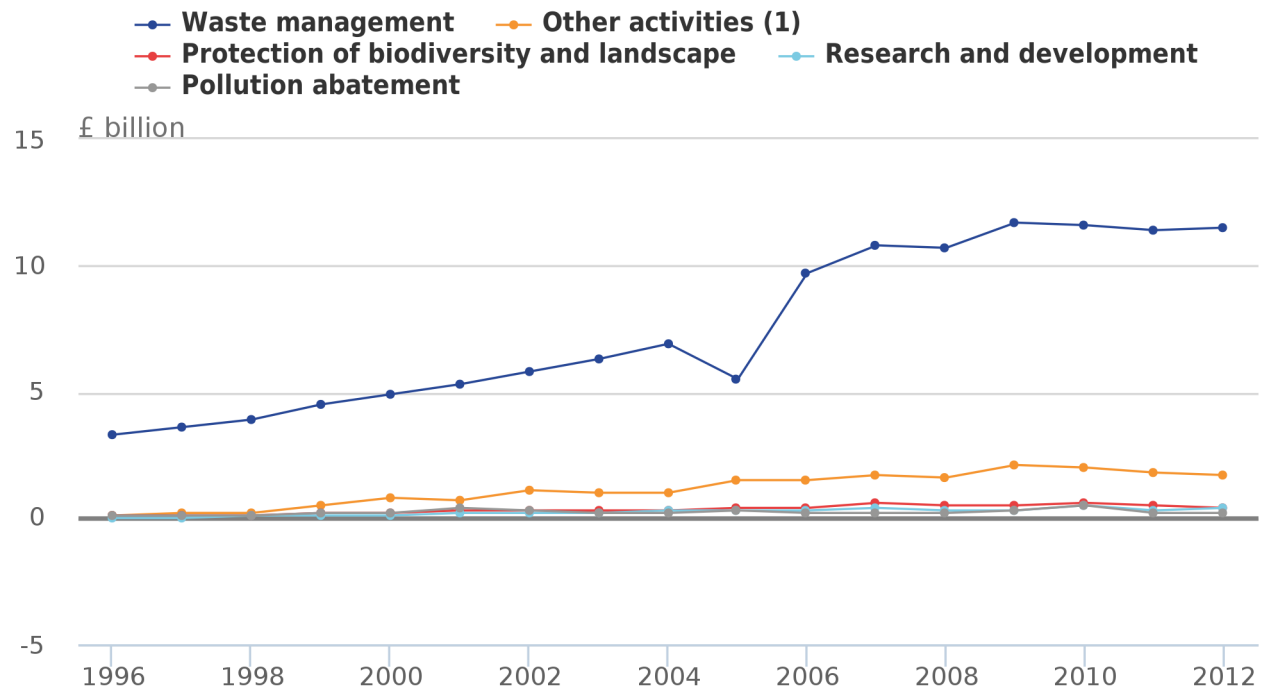
Source: Office for National Statistics

Figure 33 shows that EPE by general government as an equivalent of GDP has generally increased since 1996 (0.4%) (apart from in 2005 for the reason outlined above and in 2008) and despite the economic downturn, it has remained between 0.9% and 1.0% since 2006.

Figure 34 shows the main environmental protection activities funded by general government.

Figure 34: Environmental protection expenditure by general government: by activity, 1996 to 2012

United Kingdom



Source: Office for National Statistics

Notes:

1. 'Other activities' includes waste water management and the administration, management, regulation, operation and support of environmental protection activities

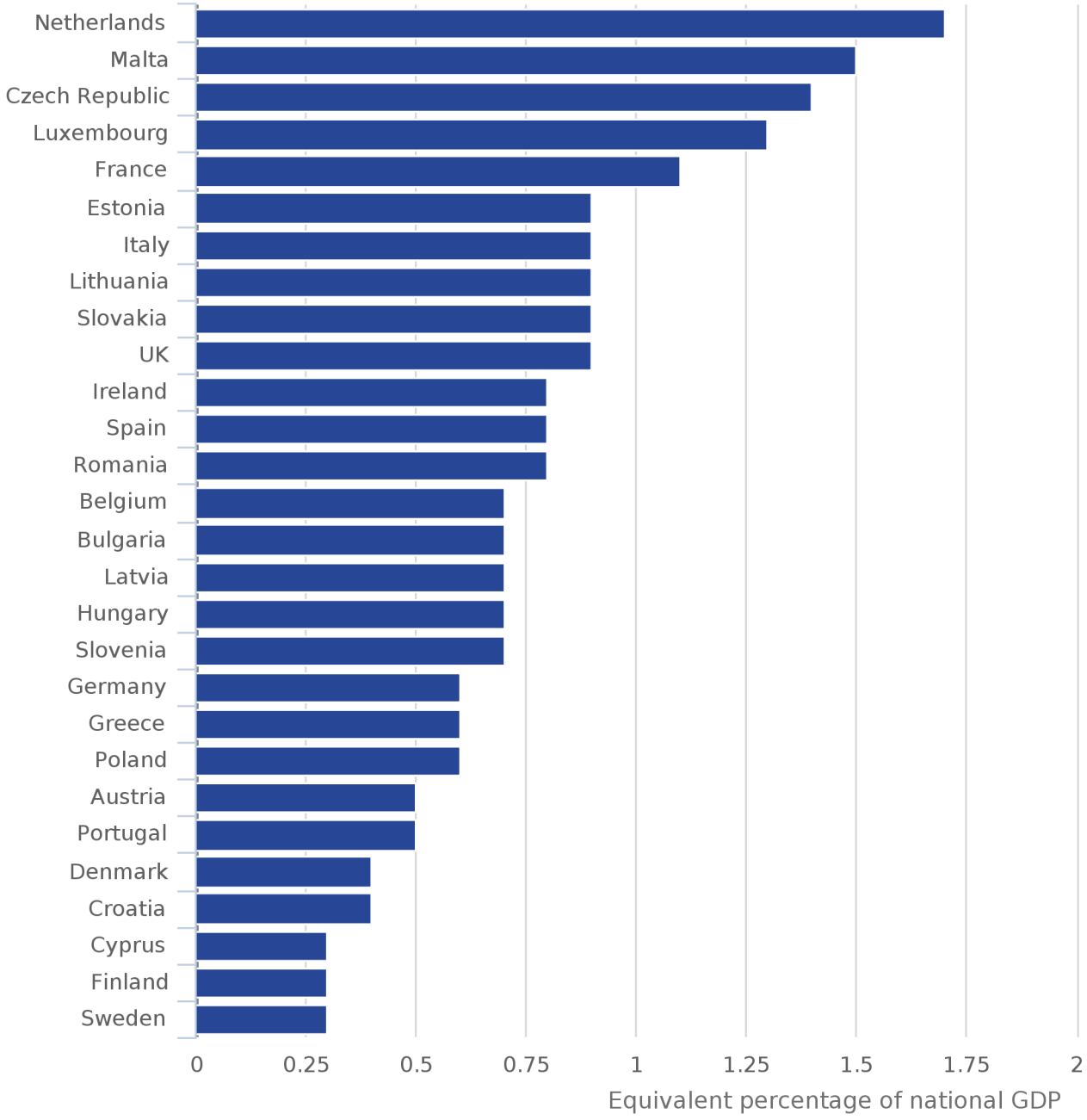
The largest amount of EPE is spent on waste management. This includes the collection, treatment and disposal of waste. There was a sharp increase in waste management expenditure in 2006, which reflects ongoing costs following the decommissioning of BNFL in 2005. In 2012, spending on waste management amounted to £11.5 billion, £0.1 billion more than in 2011 (£11.4 billion).

In 2012, a further £0.8 billion was spent on the protection of biodiversity and landscape (£0.4 billion) and research and development (£0.4 billion), and £0.2 billion was spent on pollution abatement. Of the remainder [2], general government spent £1.7 billion.

European comparison

Figure 35 shows EPE by general government for each of the EU-28 member states in 2012.

Figure 35: Environmental protection expenditure by general government as an equivalent percentage of national GDP for EU member states, 2012



Source: Eurostat, Office for National Statistics

In 2012, governments in the EU-28 spent a total of €106.5 billion on environmental protection activities. This was equivalent to 0.8% of Europe's GDP.

France spent the most on environmental protection at €22.3 billion, followed by the UK at €17.5 billion, Germany at €15.6 billion, Italy at €14.0 billion and the Netherlands at €10.0 billion.

As an equivalent of national GDP, Figure 35 shows that general government EPE was highest in the Netherlands at 1.7%, followed by Malta (1.5%), Czech Republic (1.4%), Luxembourg (1.3%) and France (1.1%). These were closely followed by the UK (0.9%).

Industry

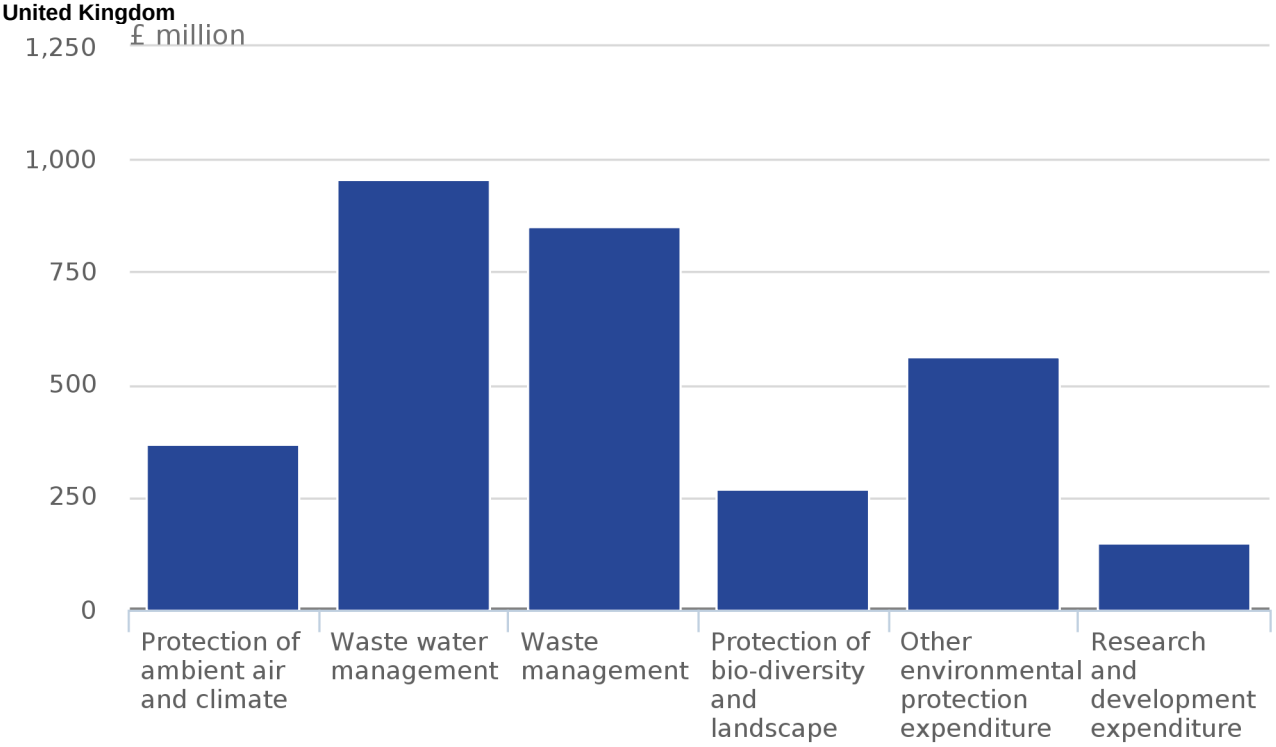
EPE by industry figures are estimated using the results of an annual survey commissioned by the Department for Environment, Food and Rural Affairs (Defra).[5]

In total, it is estimated that UK industries spent £3.2 billion on environmental protection activities in 2012. The electricity, gas and water supply industries spent the most at £759.6 million, followed by the food, beverages & tobacco products industries at £388.8 million.

Figure 36 shows total EPE by industry according to activity. In 2012, the greatest amount was directed towards waste water management at £956.5 million (30.3%). This was followed by expenditure on waste management at £853.5 million (27.0%).

Figure 36: Environmental protection expenditure by industry: by activity, 2012

United Kingdom



Source: Environment, Food and Rural Affairs

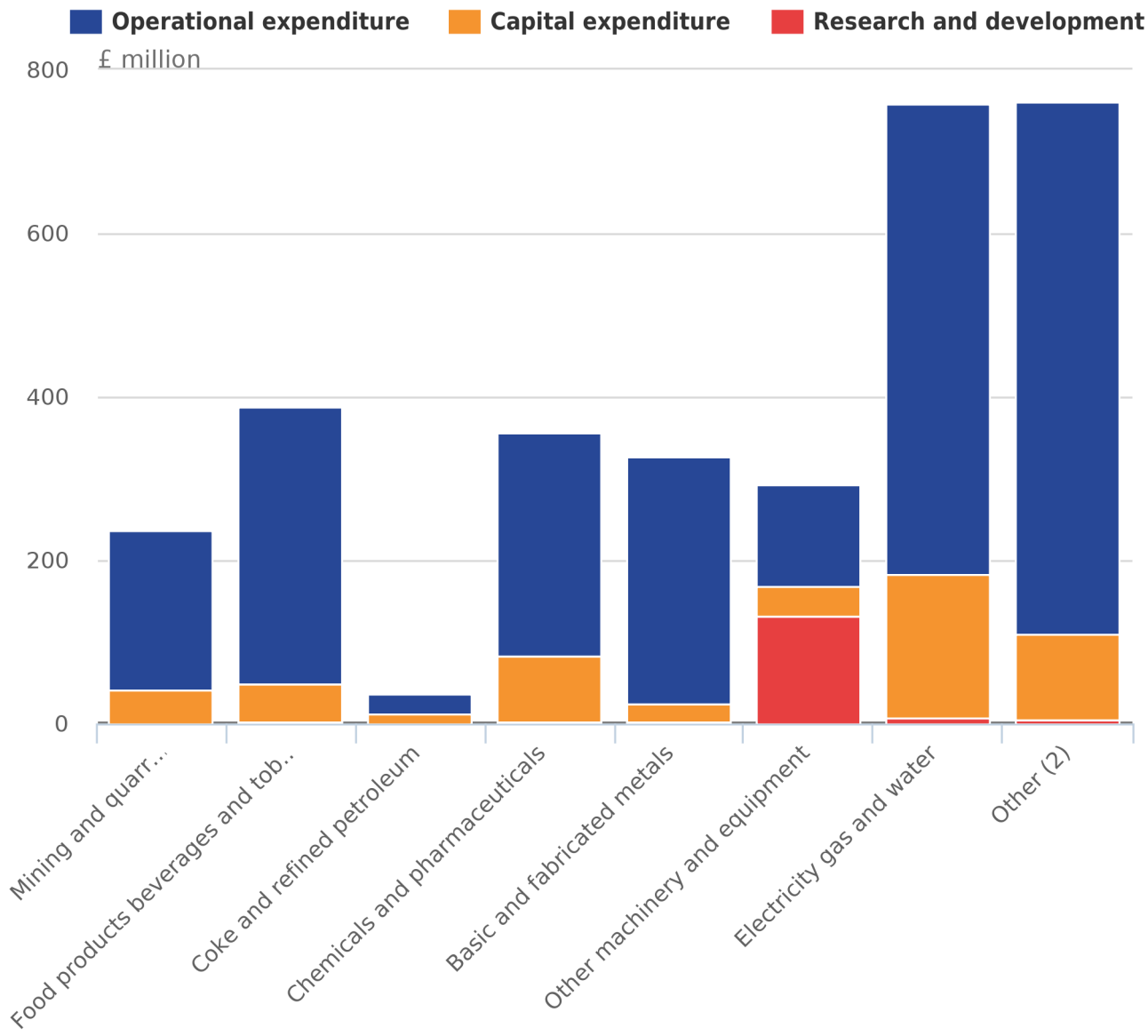
Notes:

1. These figures are not National Statistics. Comparisons with earlier years should be treated with caution due to changes in methodology

Figure 37 shows total EPE by industry in 2012, split by operating expenditure (Opex) (in-house operating costs of a company's own environmental protection activities), capital expenditure (Capex) (integrated and 'end of pipe' investments, for example the purchase of equipment to reduce or eliminate emissions as part of the production processes, or to clean up at the end), and expenditure on research and development.

Figure 37: Environmental protection expenditure by selected industries, 2012(1)

United Kingdom



Source: Environment, Food and Rural Affairs

Notes:

1. These figures are not National Statistics. Comparisons with earlier years should be treated with caution due to changes in methodology

2. Data for Other includes: Textiles, Clothing and Leather Products; Wood and Wood Products; Printing and Publishing; Rubber and Plastics; Non-Metallic Minerals; Computer, Electronic and Optical Products and Other Manufacturing; Paper and Pulp; Transport Equipment; Furniture Manufacture; Repair and Installation

Across most industries, Opex accounted for the greatest proportion of their EPE. The proportion of Opex was highest in the 'Basic and fabricated metals' industry at 92.6%, but lowest in the 'Other machinery and equipment' industries at 42.9%. Notably, the 'Other machinery and equipment' industries spent a similar proportion on research and development activities at 44.7%. The proportion of Capex was greatest within the 'Coke and refined petroleum' industry at 30.3%, although their total EPE was smallest at £37.3 million.

More data on EPE by general government are available in the Environmental protection expenditure: by general government (51.5 Kb Excel sheet) dataset.

More data and information on EPE by industry are available in the Environmental protection expenditure: by industry (90 Kb Excel sheet) dataset and on the Department for Environment, Food and Rural Affairs website.

Notes for Environmental Protection Expenditure

1. The total of EPE by general government and industry does not represent the total of EPE by all UK resident units. EPE data for specialised producers (public and private organisations producing environmental protection services as their principal activity) and households are not currently available, but estimates are being developed as part of ongoing work to bring the EPE account in line with Regulation (EU) No 538/2014, which makes EPE reporting to Eurostat (the European statistical office) mandatory from 2017

2. General government environmental protection activities are defined using COFOG category 05 Environmental Protection. This includes:

   05.1 Waste management – includes the collection, treatment and disposal of waste

   05.2 Waste water management – includes sewage system operations and waste water treatment

   05.3 Pollution abatement – includes activities relating to ambient air and climate protection, soil, and groundwater

   05.4 Protection of biodiversity and landscape – includes activities relating to the protection of fauna and flora species, the protection of habitats, and the protection of landscapes for their aesthetic value

   05.5 Research and development – includes administration and operation of government agencies engaged in applied research and experimental development related to environmental protection; grants, loans or subsidies to support applied research and experimental development related to environmental protection undertaken by non-government bodies such as research institutes and universities

   05.6 Environmental protection n.e.c. – includes administration, management, regulation, supervision, operation and support of activities such as formulation, administration, coordination and monitoring of overall policies, plans, programs and budgets for the promotion of environmental protection; preparation and enforcement of legislation and standards for the provision of environmental protection services; production and dissemination of general information, technical documentation and statistics on environmental protection

3. The method for producing estimates of EPE by general government is currently being developed as part of ongoing work to bring the EPE account in line with Regulation (EU) No 538/2014

4. In previous years, ONS has reported EPE by general government excluding investments. However, current European guidance requires investments expenditure to be included. For comparison purposes, EPE by general government series including and excluding investments have been reported this year

5. EPE by industry figures are not National Statistics. Comparisons with earlier years should be treated with caution due to changes in methodology

14. Revisions

Since the publication of UK Environmental Accounts 2013, there have been revisions and updates to some of the accounts. These are largely due to revisions in data sources and improvements to methodology.

Atmospheric emissions and energy consumption

Revisions to atmospheric emissions and energy data are primarily due to:

- revisions to the core energy statistics presented in the Digest of UK Energy Statistics (DUKES)
- revisions to the inventory methodologies and emission factors based on new evidence
- revisions to other datasets or to the additional details used to generate the detailed industry splits from the core UK inventory categories (for example, sharing road transport among the industry sectors)
- the adoption of methodologies to reflect inclusion of newly compiled sources

Updates, particularly those involving revised methodologies, may affect the whole time series, so estimates of emissions for a given year may differ from estimates of emissions for the same year reported previously.

Table 4 shows the differences in air emissions and energy consumption estimates published in UK Environmental Accounts, 2013 and 2014.

Table 4: Air emissions and energy consumption estimates published in UK Environmental Accounts, 2013 and 2014

Measure	1990	1995	2000	2005	2010	2011
Greenhouse gas emissions[1] 2013	806,495	754,413	734,055	739,458	671,152	634,765
Acid rain precursor emissions[2] 2013	6,910	5,090	3,542	3,156	2,164	2,101
Energy consumption[3] 2013	222	226	241	248	226	213
Greenhouse gas emissions[1] 2014	814,549	768,913	750,356	755,884	680,160	642,038
Acid rain precursor emissions[2] 2014	6,900	5,087	3,551	3,175	2,114	2,053
Energy consumption[3] 2014	222	227	241	248	225	212
Greenhouse gas emissions % change	1.0	1.9	2.2	2.2	1.3	1.1
Acid rain precursor emissions % change	-0.1	-0.1	0.2	0.6	-2.3	-2.3
Energy consumption % change	0.1	0.1	0.1	0.0	-0.3	-0.4

Source: Ricardo-AEA, Office for National Statistics

Notes:

1. Thousand tonnes of carbon dioxide equivalent

2. Thousand tonnes of sulphur dioxide equivalent, excluding natural world

3. Million tonnes of oil equivalent

Greenhouse gas emissions have been revised upwards. This is due to the inclusion of new sources (mainly autogenerators use of biogas from anaerobic digestion), and revisions and restructuring of existing sources (particularly agricultural livestock and landfill). However, at the same time, cross boundary sources (those used to make adjustments for the ‘residence’ principle) were revised downwards.

Acid rain precursor emissions have been revised downwards for 1990 to 1995, upwards for 1996 to 2007, and downwards for 2008 to 2011. The largest revisions were the downward revisions for the most recent years (-2.8% in 2008, -2.6% in 2009, and -2.3% in 2010 and 2011). This was mainly due to cross boundary revisions.

Energy consumption figures have remained fairly constant between 1990 and 2007, but were revised downwards in 2008 (-0.8%), 2009 (-0.2%), 2010 (-0.3%) and 2011 (-0.4%). These changes are due in most part to DUKES revisions in gas oil and fuel oil totals, which have been reduced by around 16-18%, as well as a smaller revision to natural gas use in 2008.

Material flows

An Improvements to UK Environmental Accounts (101.1 Kb Pdf) paper (published in May 2014) details the revisions that have been applied to the material flow account. In summary, changes have been made to data sources and methodology to bring the account in line with European regulation requirements.

Table 5 shows the differences between estimates published in UK Environmental Accounts, 2013 and 2014.

Table 5: Material flow estimates published in UK Environmental Accounts, 2013 and 2014

	Million metric tonnes			
Measure	2000	2005	2010	2011
Domestic extraction 2013	673	584	447	428
Imports 2013	209	277	262	278
Exports 2013	197	175	165	162
Direct Material Input (DMI) 2013	883	862	709	707
Domestic Material Consumption (DMC) 2013	686	687	544	545
Domestic extraction 2014	739	644	514	499
Imports 2014	210	279	264	277
Exports 2014	195	177	166	163
Direct Material Input (DMI) 2014	949	923	778	775
Domestic Material Consumption (DMC) 2014	755	746	612	612
Domestic extraction % change	9.7	10.2	15.1	16.4
Imports % change	0.8	0.9	0.7	-0.5
Exports % change	-1.1	1.3	0.5	0.8
Direct Material Input (DMI) % change	7.5	7.1	9.7	9.7
Domestic Material Consumption (DMC) % change	10	8.6	12.5	12.3

Source: Office for National Statistics

On average, domestic extraction figures increased by 12% each year between 2000 and 2011. This was largely due to increases in biomass totals, which rose by an average of 65% each year. This was mainly a result of the addition of fodder crops and crop residues (considered to be ‘used’ extraction as they have further economic uses), produced using an estimation tool developed by Eurostat.

As a result of the increases to domestic extraction, the Direct Material Input (DMI) and Domestic Material Consumption (DMC) indicators also increased, by 8% and 10% respectively each year on average.

An improved method was used to allocate physical imports and exports to material categories in 2014, but this only had a small impact on the figures when compared with those published in 2013.

Environmental taxes

An Improvements to UK Environmental Accounts (101.1 Kb Pdf) paper (published in May 2014) details the revisions that have been applied to the environmental taxes account. In summary, changes have been made to the list of taxes included to bring the account in line with European regulation requirements.

Table 6 shows the differences between estimates published in UK Environmental Accounts, 2013 and 2014.

Table 6: Environmental taxes published in UK Environmental Accounts, 2013 and 2014

£ million

Environmental taxes	1995	2000	2005	2010	2011
Total 2013	23,818	33,140	35,384	42,982	44,279
Total 2014	21,166	29,204	31,502	39,283	40,199
% change	-11.1	-11.9	-11	-8.6	-9.2

Source: Office for National Statistics, HM Treasury

Total environmental taxes decreased between 8% and 12% each year between 1993 and 2011. This was primarily due to the exclusion of VAT on duty in 2014 figures.

15. Experimental natural capital accounts

As part of the ONS Natural Capital Roadmap (786.5 Kb Pdf), ONS aims to incorporate natural capital fully in to the UK Environmental Accounts by 2020. In June 2013, ONS published experimental accounts and methodologies of UK land use (527.8 Kb Pdf), woodland area (197.6 Kb Pdf), non-monetary timber resources (197.6 Kb Pdf) , monetary timber resources (226.6 Kb Pdf), and woodland ecosystem assets and services (273.5 Kb Pdf). These accounts are included in this bulletin as experimental statistics. These are all prepared in accordance with the System of Environmental-Economic Accounting Central Framework (SEEA CF) and the System of Environmental-Economic Accounting Experimental Ecosystem Accounting (SEEA EEA).

These accounts are experimental and under development and therefore they should be interpreted in this context.

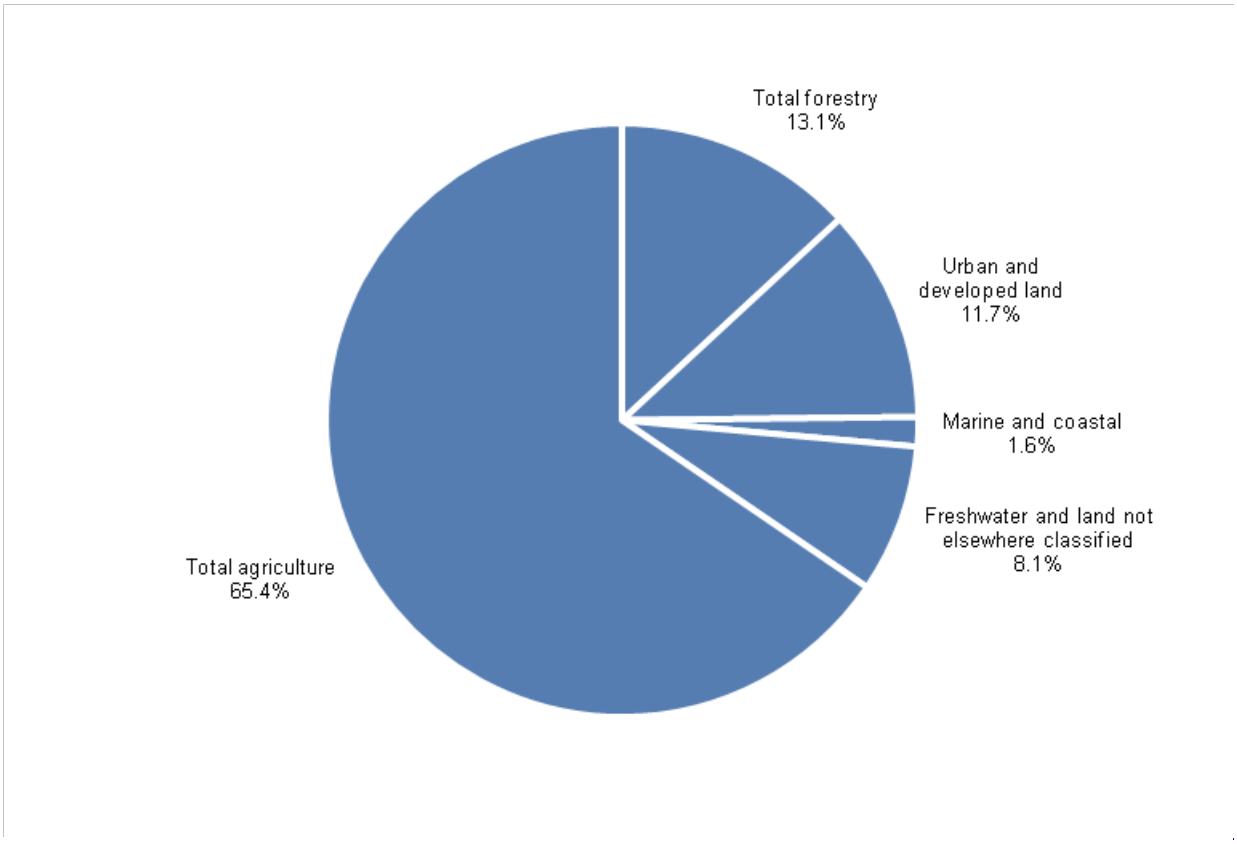
16. Land use - experimental

Land use can be defined as the activities undertaken, or the changes made to an area, for the purpose of economic production or for the maintenance and restoration of an environmental function (System of Environmental-Economic Accounting).

Table 7 (117 Kb Excel sheet) shows the non-monetary land use asset account for the UK for 2000 to 2010.

Figure 38 shows that agriculture[1] comprised the largest area of land use in the UK, which spanned 15.3 million hectares in 2010. This was equivalent to 65.4% of the total land area of the UK. Relative to its size, the area of land used for agriculture changed the least during the 2000 to 2010 period, with an overall increase of just 0.2% (equivalent to 35 thousand hectares).

Figure 38. Land use as a proportion of the UK area, 2010



Sources: Office for National Statistics; Centre for Social and Economic Research on the Global Environment; Forestry Commission

Within agriculture, the largest decrease in land use area proportional to its size was other farmland (for example, roads, buildings and yards). The total area of other farmland fell by 156 thousand hectares to 492 thousand hectares, a decrease of 24.1%.

Despite agriculture having the smallest relative change in area, it contains the two sub-categories with both the largest increase (permanent grassland) and decrease (rough grazing) in physical area. Permanent grassland had the largest physical increase in land use from 2000 to 2010, which increased by 505 thousand hectares (10.6%) [2]. The largest physical decrease in land use area during this period was rough grazing with a reduction of 297 thousand hectares (7.1%).

In 2010, forestry compromised 13.1% of total UK area, equivalent to 3.1 million hectares, and the second largest category of UK land use. Forestry can be split into broadleaved and coniferous woodland, which covered 1.4 million hectares (6.2% of total UK area) and 1.6 million hectares (6.8% of total UK area) respectively.

Freshwater comprised the smallest area of land used in the UK. Freshwater spanned 0.2 million hectares, which is equivalent to 1.1% of the total area of the UK. Relative to its size, freshwater increased the most from 2000 to 2010, with an increase of 17.5% (equivalent to 37 thousand hectares).

Notes for Land use - experimental

1. Agriculture includes land used for crops and bare fallow (including horticulture), rough grazing (sole right), permanent grassland, temporary grassland and other farmland including roads, buildings and yards

2. This is a result of the change of data source, and thus grassland definitions, in 2004, from the Integrated Administration and Control System (IACS) to the Single Payment Scheme (SPS). SPS includes significantly more overall grassland than IACS and has differing definitions for the grassland types, particularly temporary and permanent grassland. See Changes in the Area of Grassland in England , Defra, May 2010

17. Forestry - experimental

This section includes 4 accounts:

- woodland area
- non-monetary timber asset account
- monetary timber asset account
- non-monetary woodland ecosystem account

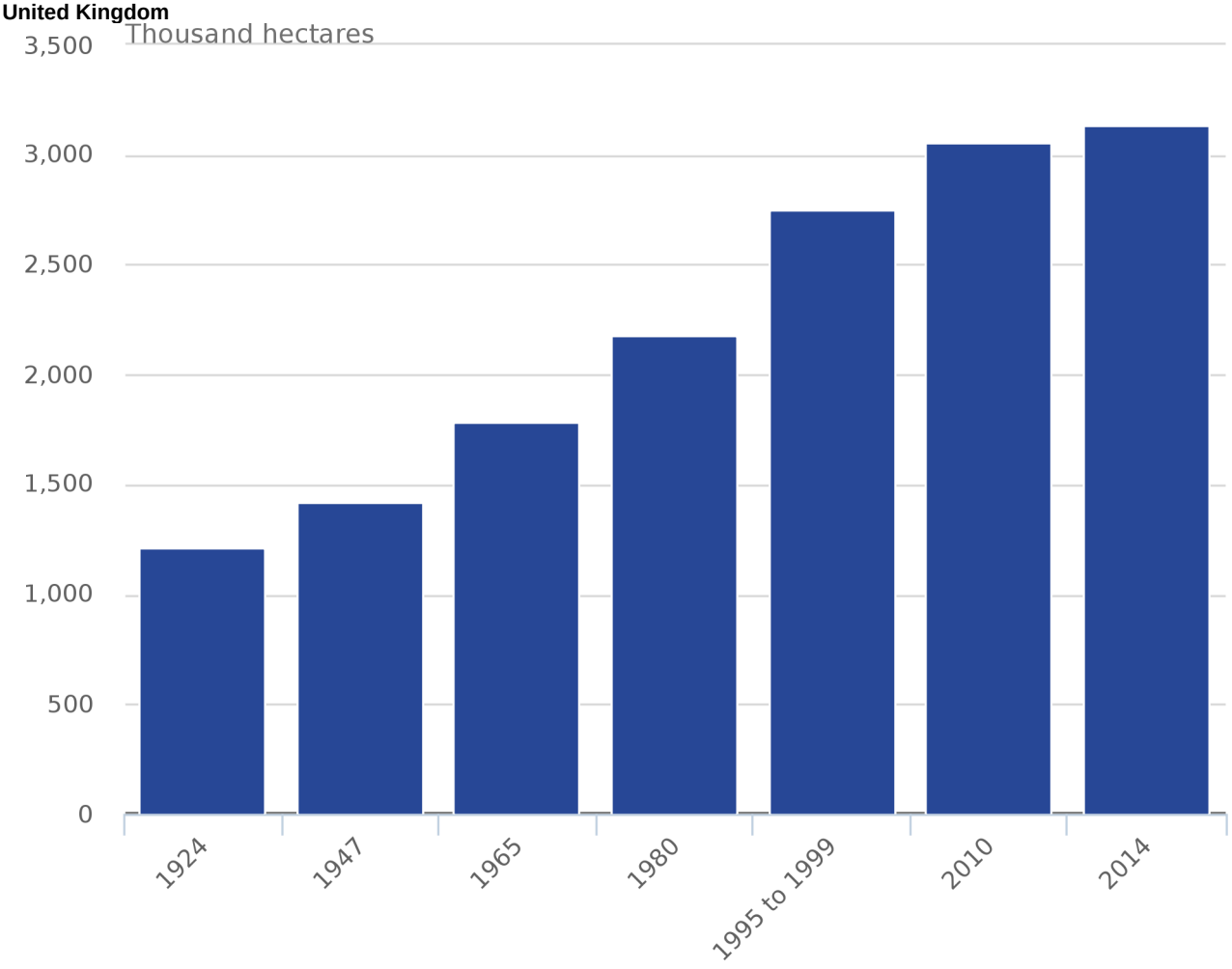
Woodland area[1]

The total woodland area in the UK was 3,138.4 thousand hectares in 2014. Of the total woodland area:

- 1,301.6 thousand hectares were located in England
- 306.3 thousand hectares were located in Wales
- 111.5 thousand hectares were located in Northern Ireland
- 1,419.0 thousand hectares were located in Scotland

Figure 39: Woodland area, 1924 to 2014

United Kingdom



Source: Forestry Commission and NI Forest Service publications - GB Censuses of Woodland 1924 to 1980; National Inventory of Woodland and Trees 1995-99; Woodland grant schemes; Woodland area, Planting and Restocking: 2014 edition; UK Standard Area Measurements (ONS)

Notes:

1. Percentage of the total surface area excluding inland water

The steady growth in UK woodland over the past century is shown in Figure 39. Much of the increase between 1924 and 2014 can be explained by new conifer plantations created between the 1950s and 1980s, although some apparent changes will have occurred as a result in changes in the definitions and methodology used by each woodland survey.

Table 8 (143.5 Kb Excel sheet) shows the UK woodland area account for 2013–2014, which is based on the methodology published by ONS in June 2013. This methodology paper explores the limitations of this approach and the need for a balancing item in more detail.

Additions to stock relate to new planting, with the largest increase coming from new planting of broadleaves in other woodland. Reliable estimates of reductions in stock (or woodland loss) are not available. A balancing item has been included to record any differences between the opening and closing stocks resulting from changes in ownership and changes in assumptions about the conifer/ broadleaf breakdown of this woodland area.

Non-monetary timber asset account

The total stock of standing timber resources in the UK was estimated at 585.3 million cubic metres overbark in 2011[2]. Of the total stock of standing timber resources in 2011:

- 268.5 million cubic metres overbark were located in England
- 60.5 million cubic metres overbark were located in Wales
- 246.4 million cubic metres overbark were located in Scotland
- 9.8 million cubic metres over

18. Background notes

1. **Context and use of the statistics**

   In the early 1990's, government research on resource accounting recommended satellite accounting and the Office for National Statistics (ONS) published an article on environmental issues and the National Accounts. ONS then established a small unit supported by an expert advisory panel and published pilot UK environmental accounts. In 1999, ONS published the first regular UK environmental accounts alongside National Accounts in the annual Blue Book. Since then, the accounts have continually developed in line with international best practice.

   Regulation (EU) No 691/2011 on European environmental economic accounts requires Member States to produce data on air emissions, environmental taxes, and economy-wide material flow accounts annually. These were required on an obligatory basis for the first time in 2013 (before this, the UK submitted data on a voluntary basis). European environmental accounts data can be found in Eurostat's environmental accounts databases.

   Regulation (EU) No 538/2014 (amending Regulation (EU) No 691/2011) on European environmental economic accounts adds a further three modules on environmental protection expenditure, the environmental goods and services sector, and physical energy flow accounts. These are currently under development and are required on an obligatory basis in 2017.

   Environmental accounts are used nationally and internationally, primarily by governments, development organisations and researchers, to inform sustainable development policy, to evaluate the environmental impacts of different sectors of the economy, and to model impacts of fiscal or monetary measures.

   Further information is available in the Uses of UK Environmental Accounts (19.6 Kb Pdf) document.

2. **Environmental Good and Services Sector**

   To comply with Regulation (EU) No 538/2014 by 2017, work is currently ongoing at ONS to produce estimates on the Environmental Goods and Services Sector (EGSS). The estimates will contain data on turnover, value added, employment and exports of the environmental goods and services sector. These will be published UK Environmental Accounts, 2015.

3. **Quality and methodology**

   Information on the quality and methodology of UK Environmental Accounts can be found on the ONS website. These documents are due to be updated during 2014–15.

4. **Industry classification**

   The industry classification used in UK Environmental Accounts, 2014 is the Standard Industrial Classification 2007.

5. **Measuring National Well-being**

   The UK Environmental Accounts are an output of the Measuring National Well-being Programme. The programme aims to produce accepted and trusted measures of the well-being of the nation and how the UK as a whole is doing.

   Find out more on the Measuring National Well-being pages on the ONS website.

6. Details of the policy governing the release of new data are available by visiting [www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html][8] or from the Media Relations Office email: [media.relations@ons.gsi.gov.uk][9]

   The United Kingdom Statistics Authority has designated these statistics as National Statistics, in accordance with the Statistics and Registration Service Act 2007 and signifying compliance with the Code of Practice for Official Statistics.

   Designation can be broadly interpreted to mean that the statistics:

   - meet identified user needs
   - are well explained and readily accessible
   - are produced according to sound methods
   - are managed impartially and objectively in the public interest

   Once statistics have been designated as National Statistics it is a statutory requirement that the Code of Practice shall continue to be observed.

[8]: http://www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html " [9]: http://mailto:media.relations@ons.gsi.gov.uk