Office for National Statistics

Statistical bulletin

UK Environmental Accounts: 2013

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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2 July 2014

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1. UK Environmental Accounts, 2013

- Total discovered gas reserves peaked at 1,985.0 billion cubic metres in 1997, and declined 64.3% to 709.0 billion cubic metres in 2011
- Fuel use of 193.6 Million tonnes of oil equivalent (Mtoe) in 2011 is the lowest since the series began in 1990. In 2011 fuel use was 9.3% lower than in 1990 and 7.7% lower than in 2010
- Natural gas use, the fuel used most since 1993, peaked in 2004 at 96.5 Mtoe, and has fluctuated since with 76.6 Mtoe consumed in 2011
- Energy consumption from fossil fuels declined 7.4% between 1990 and 2011 to 188.2 Mtoe, the lowest level since the series began in 1990. Between 2010 and 2011, energy consumption from fossil fuels fell 7.8%
- In 2011, 8.8 Mtoe of energy was consumed from renewable and waste sources, 6.5 times greater than in 1990. In 2011, this contributed 4.1% of total energy consumption
- Energy consumption from biofuels has increased from zero in 1990 to 1.9 Mtoe in 2011, and now contributes similar levels to energy consumption as other renewable sources
- Greenhouse gas emissions in 2011 were at their lowest level at 634.8 million tonnes of carbon dioxide equivalent, 21.3% lower than when the series began in 1990
- PM10 emissions, which are airborne particulate matter that can be caused by diesel engine vehicles and adversely affect health, fell 51.4% between 1990 and 2011, despite the use of diesel increasing
- Total material requirement, a measure of the economy's material needs, increased 5.5% from a record low between 2010 and 2011 to 1,730.5 million tonnes
- In 2012 the UK government received £44.5 billion from environmental taxes, equivalent to 2.9% of Gross Domestic Product

2. Overview

Environmental Accounts are "satellite accounts" to the main National Accounts. Satellite accounts are extensions to National Accounts, which facilitate analysis of the wider impact of economic change. They are compiled in accordance with the System of Integrated Environmental and Economic Accounting (SEEA), which closely follows the UN System of National Accounts (SNA).

Environmental Accounts measure what impacts the economy has on the environment (for example, pollution) and how the environment contributes to the economy (for example, use of raw materials and resource efficiency) by using the accounting framework and concepts of the national accounts.

UK Environmental Accounts are used to inform sustainable development policy, to model impacts of fiscal or monetary measures and to evaluate the environmental impacts of different sectors of the economy. Most data are provided in units of physical measurement (mass or volume), although some are in monetary units, where this is the most relevant or the only data available.

What is included in this release?

Environmental Accounts have been separated into three categories:

Natural resource accounts

Oil and gas reserves: providing information in physical terms.

Physical flow account

- Fossil fuel and energy consumption: a breakdown of fossil fuel use and energy consumption by source and industry
- Atmospheric emissions: a breakdown of greenhouse gas emissions by types of gases and industry
- Material flows: presents information on the total mass of natural resources and products used by the UK

Monetary accounts

- Environmental taxes: information on government revenue from environmental taxes
- Environmental protection expenditure: a breakdown of environmental protection expenditure by General Government and UK industry

3. Changes in key environmental and economic measures, 2010-2011

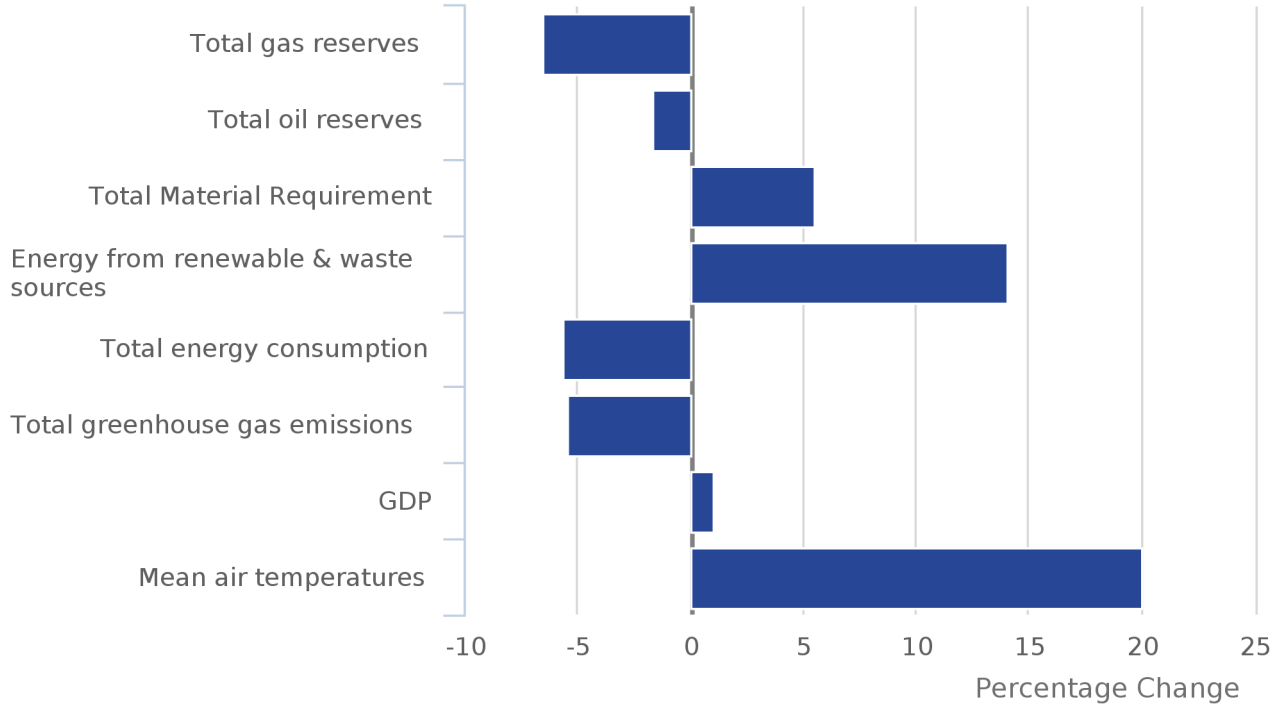
Changes in key environmental and economic measures, 2010-2011

The UK Gross Domestic Product (GDP) grew by 1.0% in 2011, compared with 2010. Average temperature in the UK rose by 20.0% during the same period. The warm weather contributed to UK energy consumption and Greenhouse gas (GHG) emissions decreasing, as demand for natural gas fell. A contrast with the average temperature in a particularly cold 2010 which fell by 11.4% compared with 2009.

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

Figure 1: Changes in key environment and economic measures, 2010-2011(1),(2),(3)

UK resident basis (Weather UK)



Source: Ricardo-AEA, Office for National Statistics, Met Office

Notes:

1. Weather data from Met office UK climate summaries http://www/metoffice.gov.uk/climate/uk/
2. Gross Domestic Product (GDP) at market prices, chained volume measure
3. Closing stock used for oil and gas reserves

4. Oil and gas reserves and resources

Oil reserves and resources[1]

At the end of 2011, the upper range of total oil reserves and resources (discovered reserves and undiscovered resources) was 2,427.0 million tonnes. This was 39.8 million tonnes lower (1.6%) than in 2010. This was due to a 53.0 million tonne fall in the upper range of undiscovered resources, which was partly offset by a 13.2 million tonne increase in maximum discovered reserves.

Discovered oil reserves

Total (maximum) discovered oil reserves increased by 13.2 million tonnes (1.2%) between 2010 and 2011 to 1,106.0 million tonnes. This was due to an increase in proven reserves.

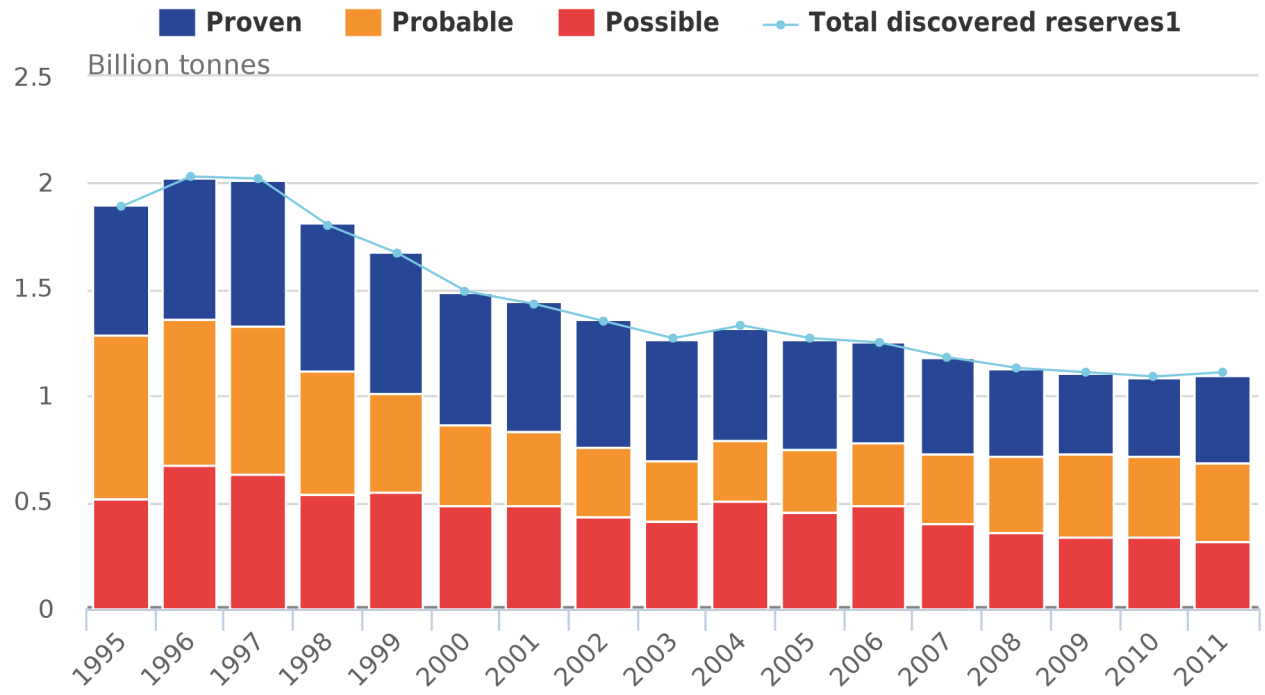
- Proven oil reserves rose by 39.3 million tonnes to 413.1 million tonnes
- Probable reserves fell by 2.3 million tonnes to 374.4 million tonnes
- Possible reserves fell by 23.8 million tonnes to 318.5 million tonnes

The increase in proven oil reserves was mainly due to development approval of several large oil projects in 2011.

Total discovered reserves peaked at 2,075.0 million tonnes in 1992 and 1994. Between 1994 and 2011 total discovered reserves declined by 46.7%. Most of this decline occurred in the mid 1990's when the extraction of oil reached its peak. Following the slow-down of extraction in the 2000s, the total discovered reserves have remained relatively stable between 2003 and 2011.

Figure 2: Estimates of discovered oil reserves, 1995-2011

United Kingdom



Source: Department of Energy & Climate Change

Notes:

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

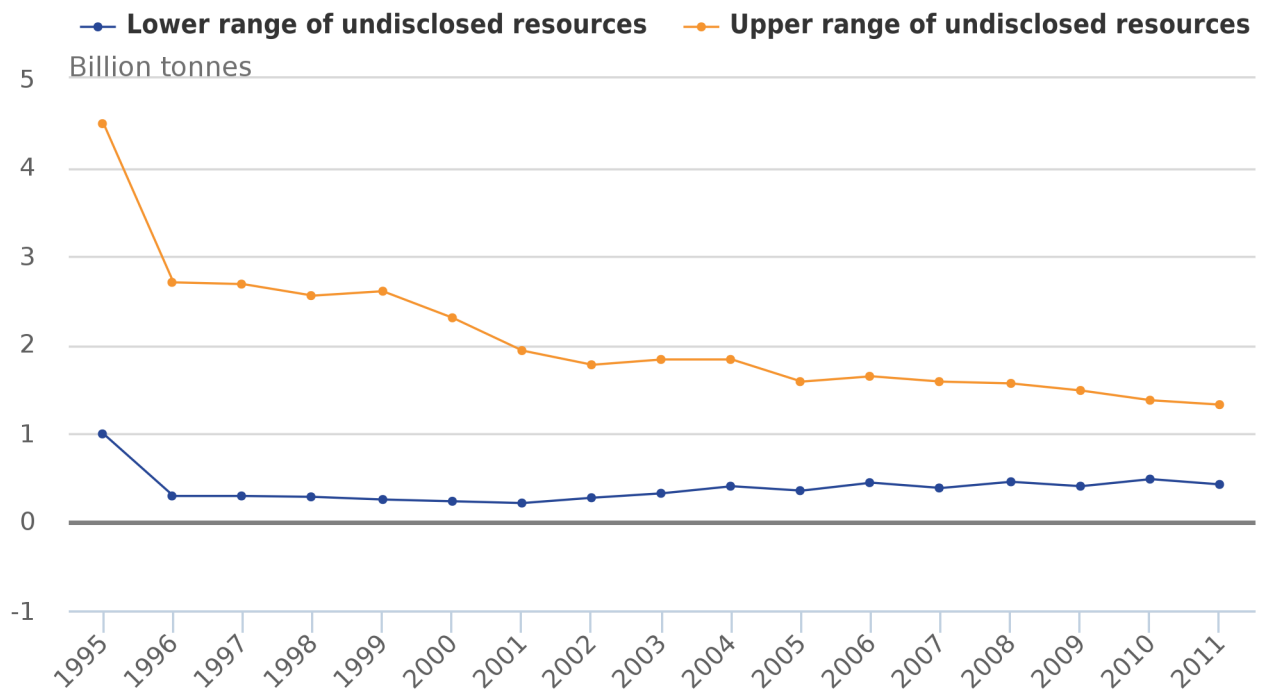
Undiscovered oil resources

The estimated upper range of the UK's undiscovered oil resources, decreased between 2010 and 2011 by 3.9% to 1,321.0 million tonnes. This was mainly due to the re-assessment of existing prospects and leads in the Central North Sea.

In the mid 1990s there were large declines in the upper range of undiscovered reserves. Notably, there was a 1,785 million tonne fall between 1995 and 1996.

Figure 3: Estimates of undiscovered oil resources, 1995-2011

United Kingdom



Source: Department of Energy & Climate Change

Extraction

Extraction of oil in 2011 fell 11.0 million tonnes to 52.0 million tonnes compared with 2010. The extraction of oil declined sharply between 2002 and 2006, but has since fallen at a slower rate. The extraction in 2011 is the lowest level since the record began in 1989.

Gas reserves and resources

At the end of 2011, the upper range of total gas reserves and resources were 1,686.0 billion cubic metres, down 116.3 billion cubic metres (6.5%) from 2010. This was due to a fall in both the upper range of undiscovered resources and total discovered reserves.

Discovered gas reserves

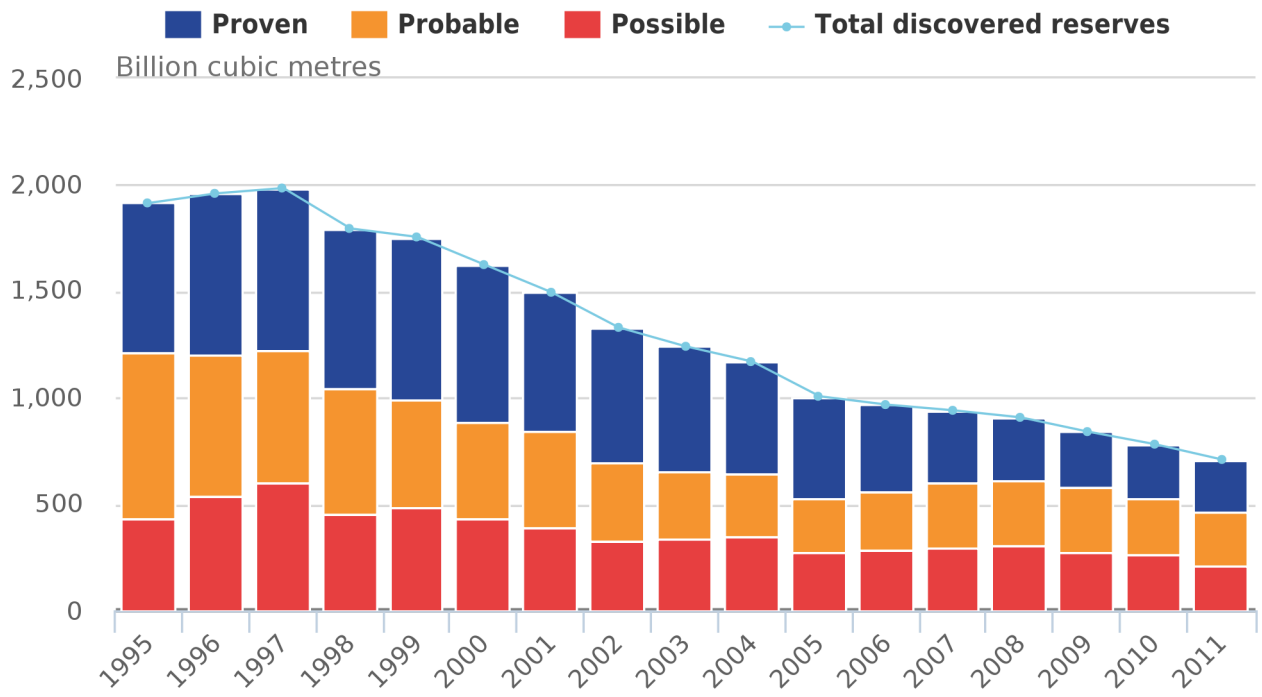
The downward trend in total discovered (maximum) reserves continued in 2011, falling by 72.3 billion cubic metres to 709.0 billion cubic metres when compared with 2010. Between 2010 and 2011:

- Proven reserves declined by 6.6 billion cubic metres to 246.0 billion cubic metres
- Probable reserves fell by 20.8 billion cubic metres to 246.5 billion cubic metres
- Possible reserves declined by 45.0 billion cubic metres to 216.4 billion cubic metres

Total discovered (maximum) reserves peaked at 1,985 billion metres in 1997. Between 1997 and 2011, total discovered (maximum) reserves declined 64.3% to 709.0 billion cubic metres.

Figure 4: Estimates of discovered gas reserves, 1995-2011

United Kingdom



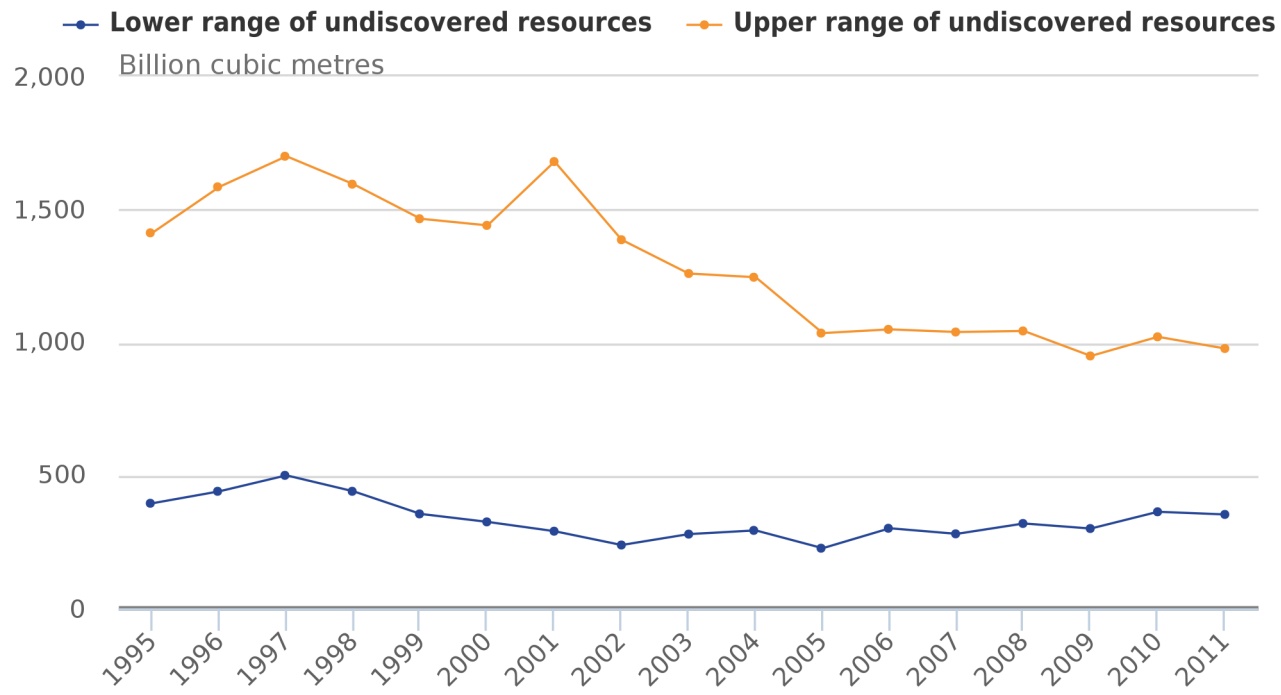
Source: Department of Energy & Climate Change

Undiscovered gas resources

The upper range of the UK's undiscovered gas resources decreased between 2010 and 2011 by 4.3% to 977.0 billion cubic metres. This was mainly due to re-assessment of existing prospects and leads in the Central North Sea.

Figure 5: Estimates of undiscovered gas resources, 1995-2011

United Kingdom



Source: Department of Energy & Climate Change

Extraction and expected level of reserves

Extraction of gas between 2010 and 2011 fell 11.6 billion cubic metres to 42.9 billion cubic metres. This is the lowest level since 1990. Gas extraction peaked in 2000 at 108.3 billion cubic metres and has gradually declined since.

Gas reserves have depleted more rapidly than oil reserves. Between 1995 and 2011, the expected level of gas reserves (proven and probable closing stocks) fell 66.7%. This is despite the fact that gas extraction has declined over the years. This partly reflects the fact that North Sea gas extraction is relatively mature. Development and extraction of the North Sea oil fields began almost a decade ago. More detail on Oil and Gas Reserves and Resources is available here: ‘ESTIMATES OF REMAINING RECOVERABLE OIL&GAS RESERVES’ (44.5 Kb Excel sheet)

Notes for Oil and gas reserves and resources

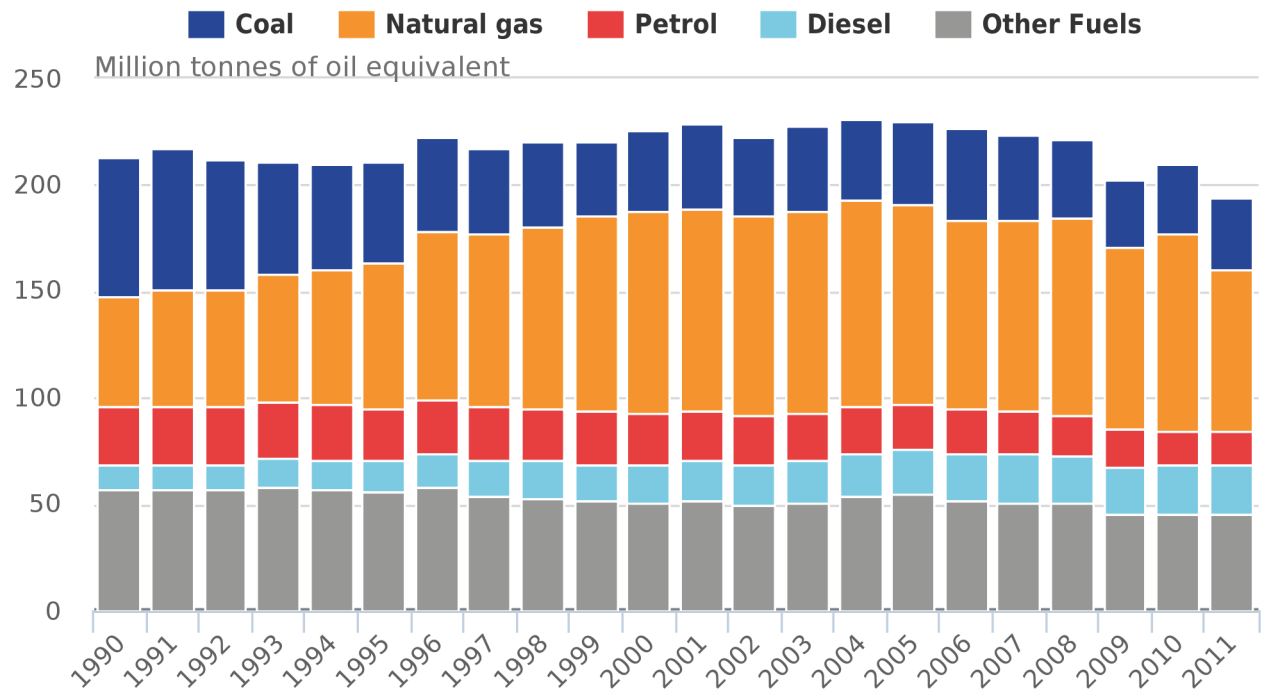
1. Oil and gas reserves are discovered, while oil and gas resources are undiscovered

5. Fuel use by type

Total fuel use[1] of 193.6 Million tonnes of oil equivalent (Mtoe) in 2011 is the lowest since the series began in 1990. In 2011 it was 9.3% lower than in 1990 and 7.7% lower than in 2010. The fall in 2011 is partly due to warmer weather, a contrast to the particularly cold 2010, which contributed to fuel use increasing 3.8% between 2009 and 2010.

Figure 6: Fuel use by type, 1990–2011

United Kingdom resident basis



Source: Ricardo - AEA, Office for National Statistics

Natural gas has been the fuel used most since 1993. The use of natural gas peaked in 2004 at 96.5 Mtoe, and has fluctuated since with only 76.6 Mtoe consumed in 2011.

- Between 2010 and 2011 natural gas use declined by 17.0% (15.7 Mtoe), the biggest fall in natural gas consumption since the series began in 1990
- The decline was due to a number of unexpected slowdowns and maintenance issues on the UK Continental Shelf

Coal use has declined from 66.2 Mtoe in 1990 to 33.0 Mtoe in 2011.

- This represents a 50.2% (33.3 Mtoe) reduction
- This is mainly due to switching from coal to natural gas
- Natural gas use increased 48.7% between 1990 and 2011 to 76.6 Mtoe

There has been a gradual shift from petrol to diesel since 1990.

- Use of petrol has decreased by 11.7 Mtoe (42.8%) to 15.6 Mtoe in 2011
- Diesel (Derv) has increased by 11.5 Mtoe (97.3%) to 23.3 Mtoe in 2011

Since the series began in 1990, use of other fuels has decreased by 11.6 Mtoe, (20.4%) to 45.1 Mtoe.

- Aviation fuel was the biggest other fuel in 2011. Use of Aviation Fuel increased 81.0% from 8.4 Mtoe in 1990 to 15.2 Mtoe in 2011 (to make up 33.7% of total other fuels)

For more detailed fuel use data see 'Fuel Use by Type' (14.4 Kb Excel sheet) and 'Energy by industry, source and fuel'. (1.75 Mb Excel sheet)

Notes for Fuel use by type

1. Total fuel use differs from energy consumption as some fuels are transformed before they are consumed. Energy consumption also includes energy from additional sources to those reported in this Fuel use section, such as nuclear, imports, renewables and waste

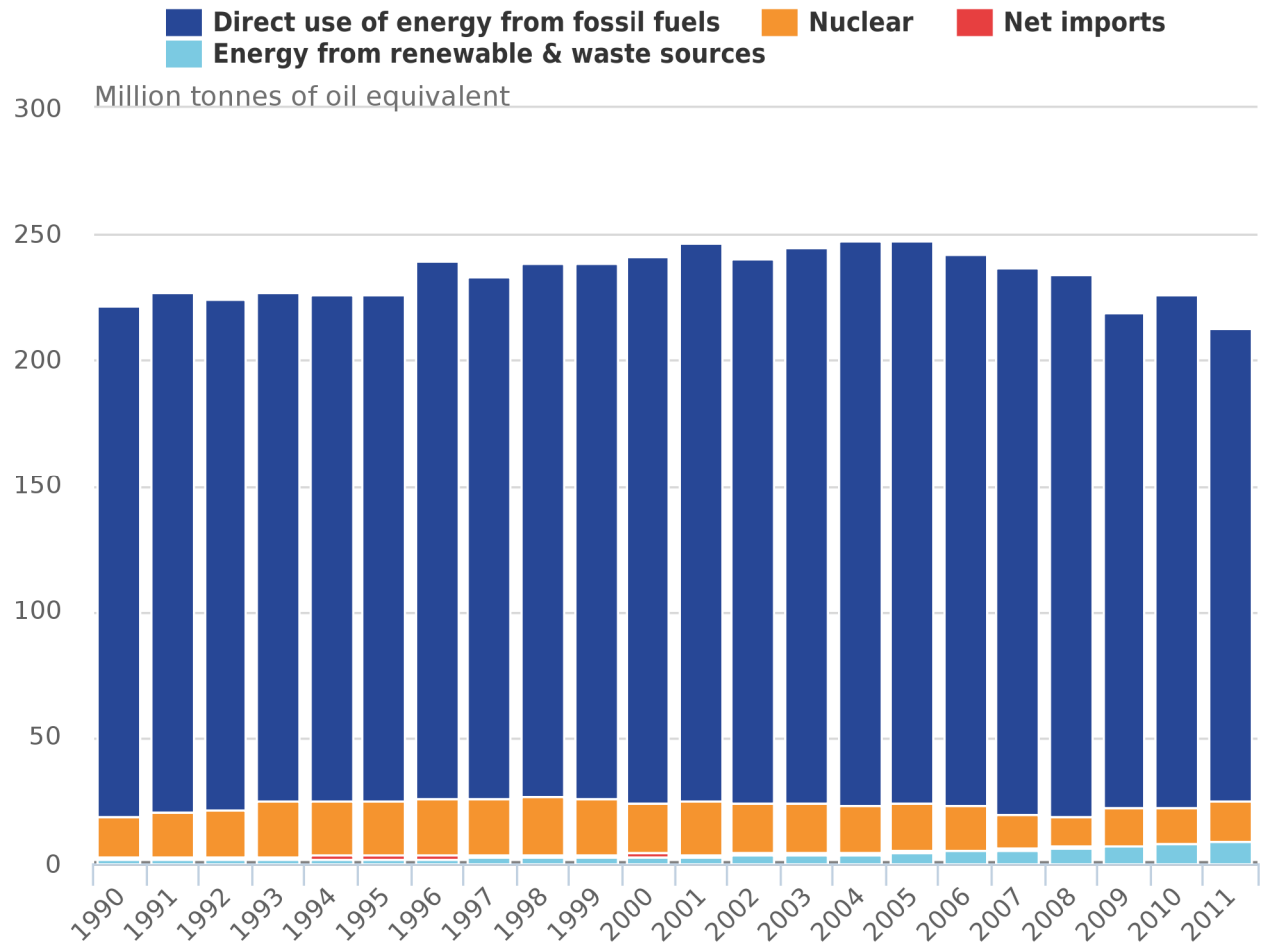
6. Energy consumption

Total energy consumption of primary fuels and equivalents is made up of the direct use of energy from fossil fuels, energy from renewable & waste sources, net imports of energy and nuclear energy.

- Total energy consumption in 2011 was 213.1 Million tonnes of oil equivalent (Mtoe), falling 12.8 Mtoe (5.6%) when compared with 2010
- This is the lowest level of energy consumption since the series began in 1990

Figure 7: Energy consumption of primary fuels and equivalents: by source, 1990–2011

United Kingdom resident basis



Source: icardo-AEA, Office for National Statistics

Fossil fuel use is by far the largest component of total direct use of energy, contributing 88.3% of total direct use in 2011.

- Energy consumption from fossil fuels fell to 188.2 Mtoe in 2011, the lowest point since the series began in 1990
- There has been a 15.0 Mtoe (7.4%) decrease in energy consumption from fossil fuels since 1990
- This decline is mostly due to a fall in coal combustion in coke production
- Between 2010 and 2011 fossil fuel use declined by 15.9 Mtoe (7.8%)

Total energy consumption from other sources, which include nuclear, net imports and renewable & waste sources, increased by 3.1 Mtoe (14.1%) between 2010 and 2011 to 24.9 Mtoe.

- In 2011 15.6 Mtoe of nuclear energy was used, contributing 7.3% of total energy consumption
- Since 1990 energy consumption from net imports has fallen from 1.0 Mtoe (when it accounted for 0.5% of total energy consumption) to 0.5 Mtoe (accounting for 0.2% of total energy consumption)

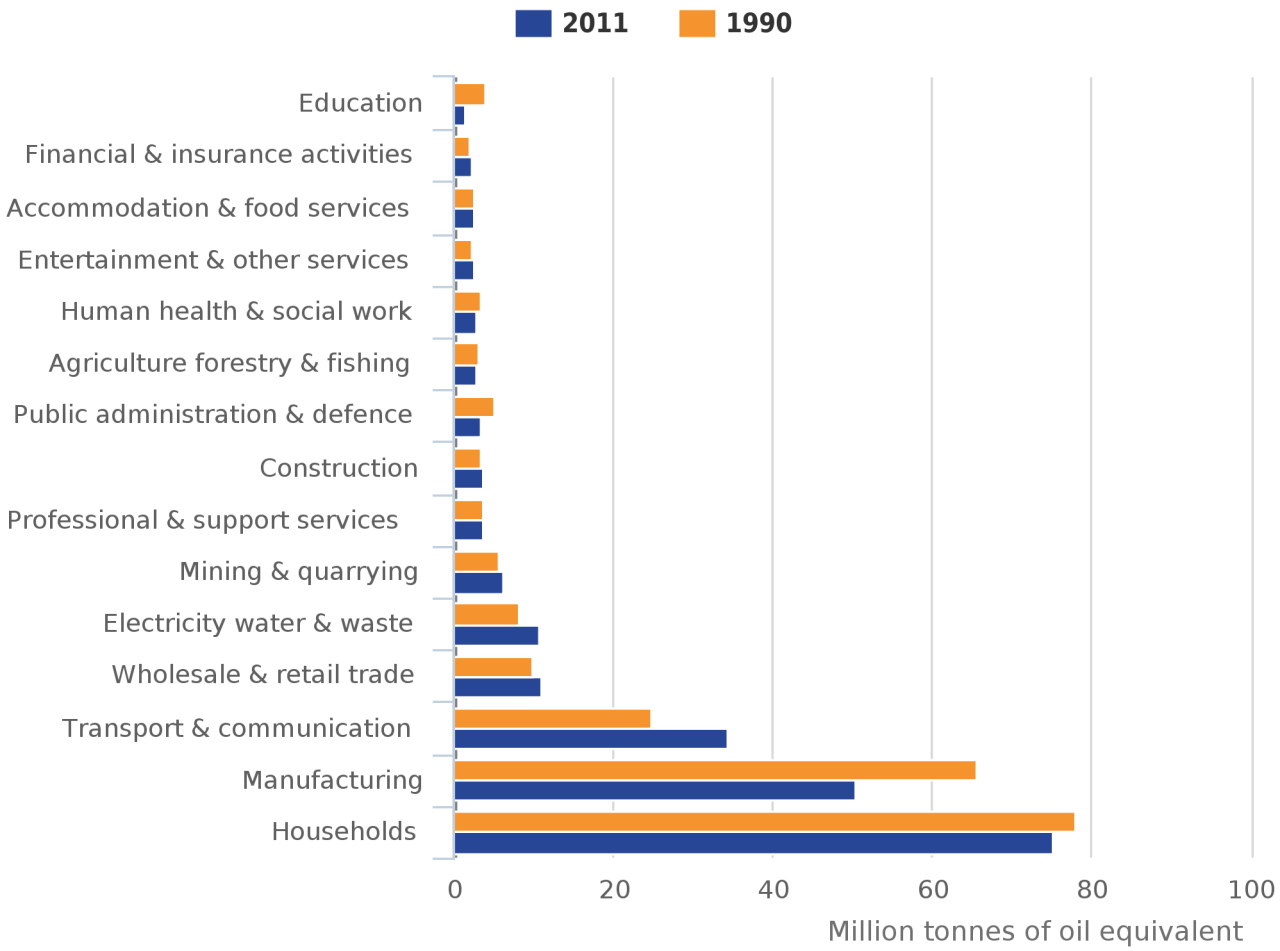
- On the other hand, energy consumption from renewable energy and waste source has increased from 1.4 Mtoe (when it accounted for 0.6% of total energy consumption) to 8.8 Mtoe (accounting for 4.1% of total energy consumption)

Reallocated energy consumption by industry group

The energy consumption of primary fuels and equivalents is reallocated[1] by final consumer industry group.

Figure 8: Reallocated energy consumption by industry group, 1990 & 2011

United Kingdom resident basis



Source: Ricardo–AEA, Office for National Statistics

Notes:

1. Household category includes Consumer expenditure and Activities of households as employers; undifferentiated goods and services-producing activities of household for own use

The sectors that contribute the most to reallocated energy consumption are household and manufacturing.

Households[2] were the greatest consumers of reallocated energy between 1990 and 2011, using 75.2 Mtoe in 2011.

- Compared to 2010, there was a 10.9 Mtoe (12.7%) decline in household energy consumption in 2011, the lowest figure since the series started in 1990

- Between 1990 and 2011, household energy consumption dropped 3.0 Mtoe (3.8%). This is mostly due to a decrease from domestic combustion of natural gas

The manufacturing industry was the second greatest user of reallocated energy between 1990 and 2011, consuming 50.5 Mtoe in 2011.

- There has been a 15.2 Mtoe decline (23.1%) in energy consumption in this industry since 1990
- Between 2010 and 2011, energy consumption in this industry increased 0.1%
- In 2009 this industry reported the lowest figure of energy consumption (49.4 Mtoe) since the series began in 1990
- Energy consumption has gradually risen again in this sector, increasing 2.2% between 2009 and 2011

In the transport & communication industry, reallocated energy consumption increased by 3.0% between 2010 and 2011 to 34.4 Mtoe.

- In this industry energy consumption peaked in 2005 at 38.3 Mtoe, after a gradual year on year increase. The figures have fluctuated slightly since
- Between 1990 and 2011, energy consumption in this sector increased 38.9%. The increase is mainly due to an increase in aviation turbine fuel consumption

Reallocated energy consumption in the electricity, water & waste sector declined by 2.3% between 2010 and 2011 to 10.7 Mtoe.

- The decline between 2010 and 2011 was mostly due to a reduction in natural gas combustion in power stations
- Since 1990 energy consumption in this industry has increased 32.1%

In the mining and quarrying sector there was a 9.7% fall in reallocated energy consumption between 2010 and 2011, declining to 6.2 Mtoe

- The decline in 2011 was due primarily to a decrease in natural gas combustion in upstream oil and gas production
- Since 1990 energy consumption in this industry has increased by 11.5%
- This is partly due to an increase in natural gas use in oil and gas production in this industry

For more detailed energy data see: 'Energy Consumption' (165.5 Kb Excel sheet) , 'Energy Use and Intensity by Industry' (110.1 Kb Excel sheet) and 'Energy by industry, source and fuel' (1.75 Mb Excel sheet)

Reconciling environmental accounts estimates with DECC estimates

Environmental Accounts estimates follow the UN System of Environmental Economic Accounts (SEEA) framework which is an internationally agreed standard[3].

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). The National Accounts measure includes energy consumed by UK companies and households abroad and excludes emissions 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 1.4 Mtoe lower than the environmental accounts measure in 2011.

The 'Energy bridging table' (27.8 Kb Excel sheet) shows the differences between the two estimates.

You can get further detail of the relationship between environmental accounts measures and those released by DECC from the 'energy bridging table and methodology article'.

Notes for Energy consumption

1. Energy consumption includes energy used during the process of transformation into electricity, and the energy lost in distributing electricity to end users, either directly to the electricity generation sector, or indirectly to the consumers of 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

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

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

7. Renewable and waste sources

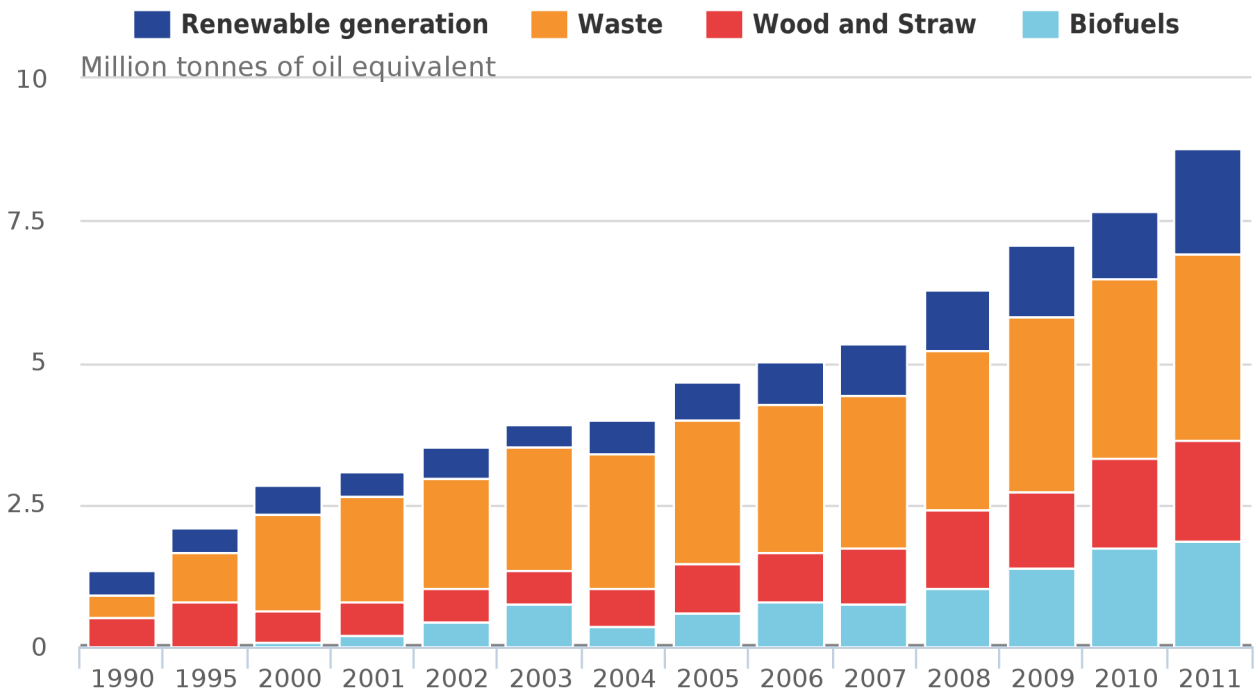
In 2011, 8.8 Million tonnes of oil equivalent (Mtoe) of energy was consumed from renewable and waste sources, contributing 4.1% of total energy consumption. Energy consumption from renewable and waste sources in 2011 was 6.5 times greater than in 1990. Total energy consumption from renewable and waste sources has risen year on year since 1991, with the exception of 1995 to 1996, where there was a 3.8% decrease.

There was a 14.0% increase between 2010 and 2011 in consumption from renewable and waste sources.

- Renewable generation[1] sources saw the greatest rise between 2010 and 2011, increasing 54.6% to 1.8 million tonnes of oil equivalent (Mtoe)
- Biofuels[2] increased 8.7% to 1.9 Mtoe
- Wood and straw[3] rose 10.1% to 1.8 Mtoe
- Waste[4] increased 3.8% to 3.3 Mtoe

Figure 9: Energy consumption of renewable and waste sources, 1990–2011

United Kingdom resident basis



Source: Ricardo–AEA, Office for National Statistics

Notes:

1. Renewable Generation includes Hydroelectric power, Wind, wave & tidal, Solar photovoltaic, and Geothermal aquifers
2. Waste includes Landfill gas, Sewage gas and Municipal solid waste and poultry litter
3. Wood and Straw includes Wood, Straw and Charcoal
4. Biofuels includes Liquid biofuels, Bioethanol, Biodiesel and Biomass

Renewable generation

Energy consumption from renewable generation sources has increased from 0.5 Mtoe to 1.8 Mtoe between 1990 and 2011. Within this category:

- Wind, wave & tidal has risen from 0.02 Mtoe in 1993 to 1.33 Mtoe in 2011, and is now the largest contributor to this category. A 51.1% rise occurred between 2010 and 2011
- A figure for Solar photovoltaic energy was reported for the first year in 2011 at 0.02 Mtoe

Waste

The contribution of waste sources to energy consumption increased from 0.4 Mtoe to 3.3 Mtoe between 1990-2011.

- This increase is largely due to landfill gas increasing by 1.6 Mtoe, and municipal solid waste (MSW) increasing by 1.0 Mtoe since 1990

Wood and straw

Energy consumption from wood and straw has increased by 1.2 Mtoe since the series began in 1990 to 1.8 Mtoe in 2011.

- Wood is the biggest contributor to this category, providing 1.5 Mtoe in 2011

Biofuels

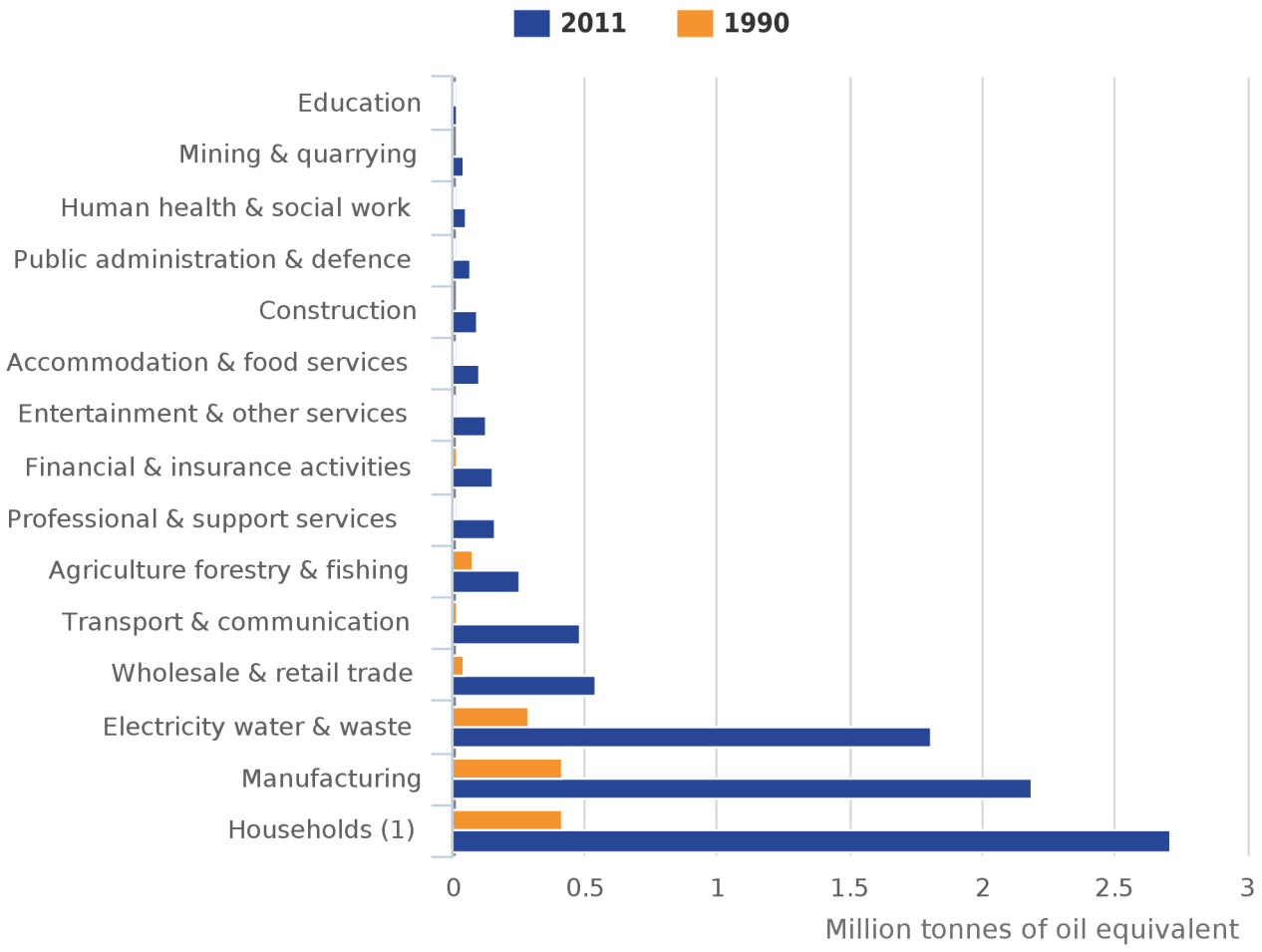
Energy consumption from biofuels has increased from zero in 1990 to 1.9 Mtoe in 2011.

- The first energy consumption from biodiesel was reported in 2003
- In 2011, biodiesel was the greatest contributor to the biofuels category, contributing 0.8 Mtoe (0.4%) of total energy consumption in 2011

Renewable & waste sources by industry

Figure 10: Reallocated energy from renewables and waste sources by industry group, 1990 & 2011

United Kingdom resident basis



Source: Ricardo-AEA, Office for National Statistics

Notes:

1. Household category includes Consumer expenditure and Activities of households as employers; undifferentiated goods and services-producing activities of households for own use

The sectors with the largest increases in energy consumption from renewable and waste sources are households, manufacturing and electricity, water & waste.

Since 2005 reallocated energy consumption from renewable and waste sources was greatest in the household sector.

- In 2011, households consumed 2.7 Mtoe of energy from renewable and waste sources, increasing 10.2% compared with 2010
- In 2011, 30.9% of total energy consumption from renewable and waste sources was by households
- This rise is due primarily to an increase from wood combustion in domestic combustion and from the introduction of biofuels in road transport

Manufacturing industry energy consumption from renewable and waste sources increased 26.6% between 2010 and 2011 to 2.2 Mtoe.

- In 2011, 24.9% of total energy consumption from renewable and waste sources was from the manufacturing industry
- Energy consumption from renewable and waste sources has increased by 1.8 Mtoe since 1990 in this sector
- The 1.8 Mtoe increase in renewable and waste sources energy consumption in this sector between 1990 and 2011, was partly due to an increase from industrial biomass combustion

In the electricity, water & waste industry, energy consumption from renewable and waste sources increased 11.0% between 2010 and 2011 to 1.8 Mtoe.

- Since 1990 renewable and waste source energy consumption in this sector was 6 times larger compared to 2011, increasing by 1.5 Mtoe
- This rise is due primarily to an increase from Municipal Solid waste (MSW) combustion in power stations

For more detailed energy data see: 'Energy consumption from renewables and waste' (120 Kb Excel sheet) , 'Energy Consumption from Renewable Sources used to generate heat (89.5 Kb Excel sheet) ' and 'Energy by industry, source and fuel' (1.75 Mb Excel sheet)

Notes for Renewable and waste sources

1. Renewable generation includes hydroelectric power, wind, wave & tidal, solar photovoltaic, and geothermal aquifers
2. Biofuels include liquid biofuels, bioethanol, biodiesel and biomass
3. Wood and straw includes wood, straw and charcoal
4. Waste includes landfill gas, sewage gas, municipal solid waste and poultry litter

8. Energy intensity

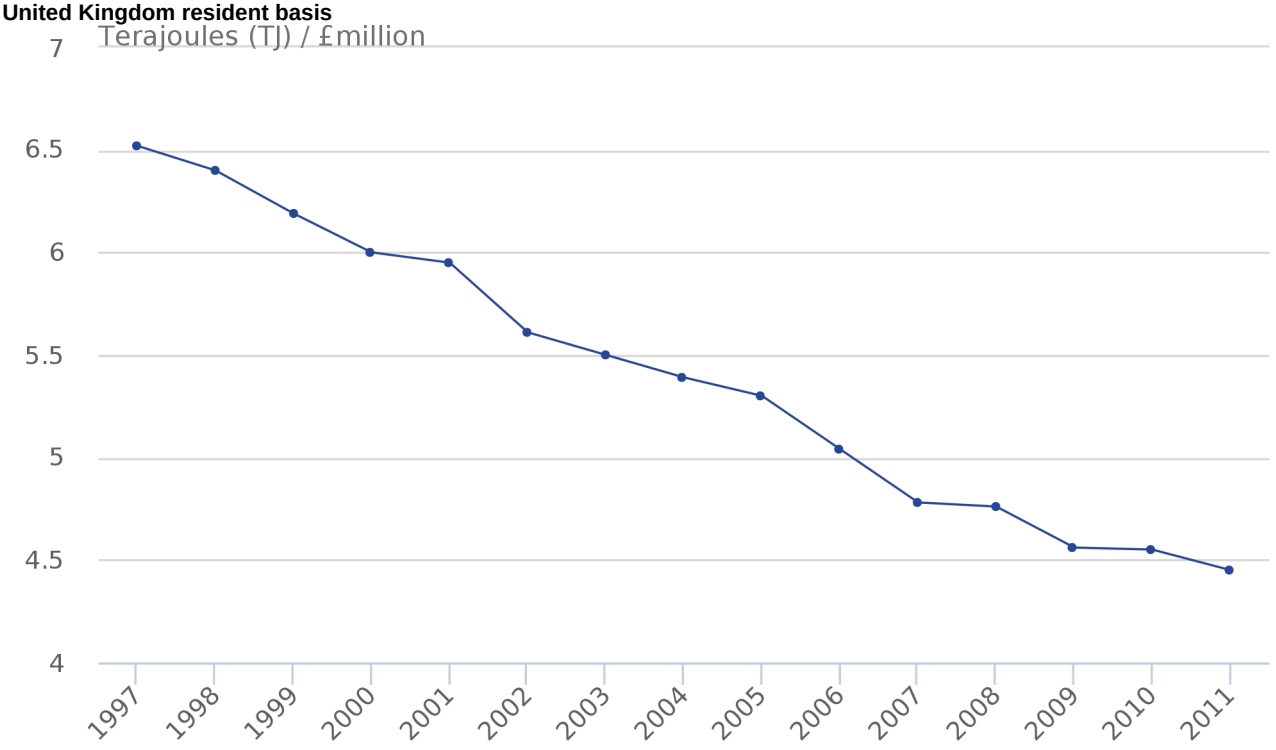
Energy intensity[1] (energy use per unit of value added) may be used to provide an indication of energy efficiency. A reduction in energy intensity may indicate a more efficient use of energy in production processes. It may also indicate changes to the structure of the economy.

Between 2010 and 2011 energy intensity of the UK economy, excluding consumer expenditure, declined 2.2% to 4.5 Terajoules (TJ)[2] per £ million value added.

- This means that a greater amount of output was produced for each unit of electricity consumed
- There was a much smaller fall of 0.2% between 2009 and 2010, following an increase in energy consumption due to a particularly cold winter

Figure 11: Energy intensity, 1997–2011

United Kingdom resident basis



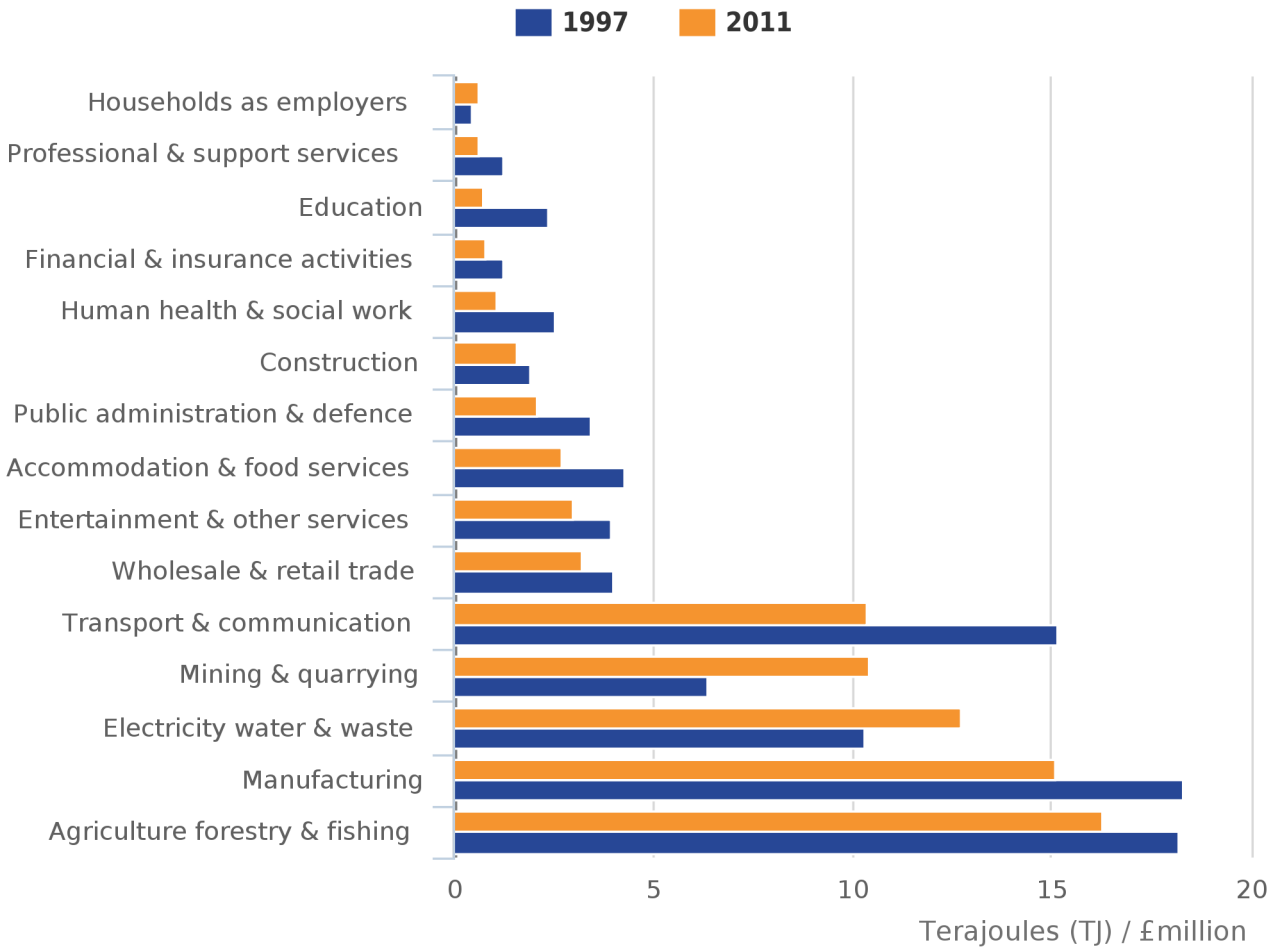
Source: Office for National Statistics

Energy intensity has been following a downward trend during the period examined.

- Between 1997, when the series began, and 2011 it has declined 31.8%
- During this period, non-household Gross Value Added (GVA) increased by 34.0%. Non-household energy consumption however, declined by 8.6%
- This suggests economic growth may be sustainable in terms of the impact on energy consumption

Figure 12: Energy intensity by industry group, 1997 & 2011

United Kingdom resident basis



Source: Office for National Statistics

Energy intensity data are available here: 'Energy intensity by industry' (16.5 Kb Excel sheet) .

Energy intensity in 1997 and 2011 was greatest in the agriculture, forestry & fishing and manufacturing industries.

- Since 1997, energy intensity declined 10.8% in the agriculture, forestry & fishing sector to 16.3 TJ per £ million value added
- In the manufacturing sector, energy intensity fell 17.7% between 1997 and 2011 to 15.1 TJ per £ million value added

Between 1997 and 2011 energy intensity increased in the electricity, water & waste and mining & quarrying industries.

- In the electricity, water & waste industry, energy intensity increased by 23.5% between 1997 and 2011 to 12.8 TJ per £ million value added
- In this sector, between 1997 and 2011, energy consumption increased at a faster rate than GVA
- However, between 2010 and 2011, energy intensity declined 2.1% in this sector
- In the mining & quarrying sector, energy intensity increased 64.0% between 1997 and 2011 to 10.4 TJ per £ million value added

- In this sector, between 1997 and 2011, energy consumption fell at a slower rate than the decline in GVA
- Energy intensity has been increasing in the mining & quarrying industry since 2007

There was a considerable fall in energy intensity of 31.6% in the transport & communication industry between 1997 and 2011.

- Between 2010 and 2011 however, energy intensity in this sector increased 2.6% to 10.4 TJ per £ million value added

For more detailed energy intensity data see: 'Energy use and Intensity by Industry' (110.1 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 2009 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
2. As energy use declined and GVA increased

9. Atmospheric emissions

Greenhouse gas emissions

Greenhouse gas[1] (GHG) emissions in 2011 were 634.8 million tonnes of carbon dioxide equivalent[2], 5.4% lower than in 2010. Compared to 1990 when the series began, they were 21.3% lower in 2011, the lowest level in the series. In 2011:

- carbon dioxide made up the greatest percentage of GHG emissions (85.5%)
- methane emissions made up 6.6%
- nitrous oxide contributed 5.5%
- other GHG emissions made up 2.4%

Many factors have contributed to changes in total GHG emissions in recent years.

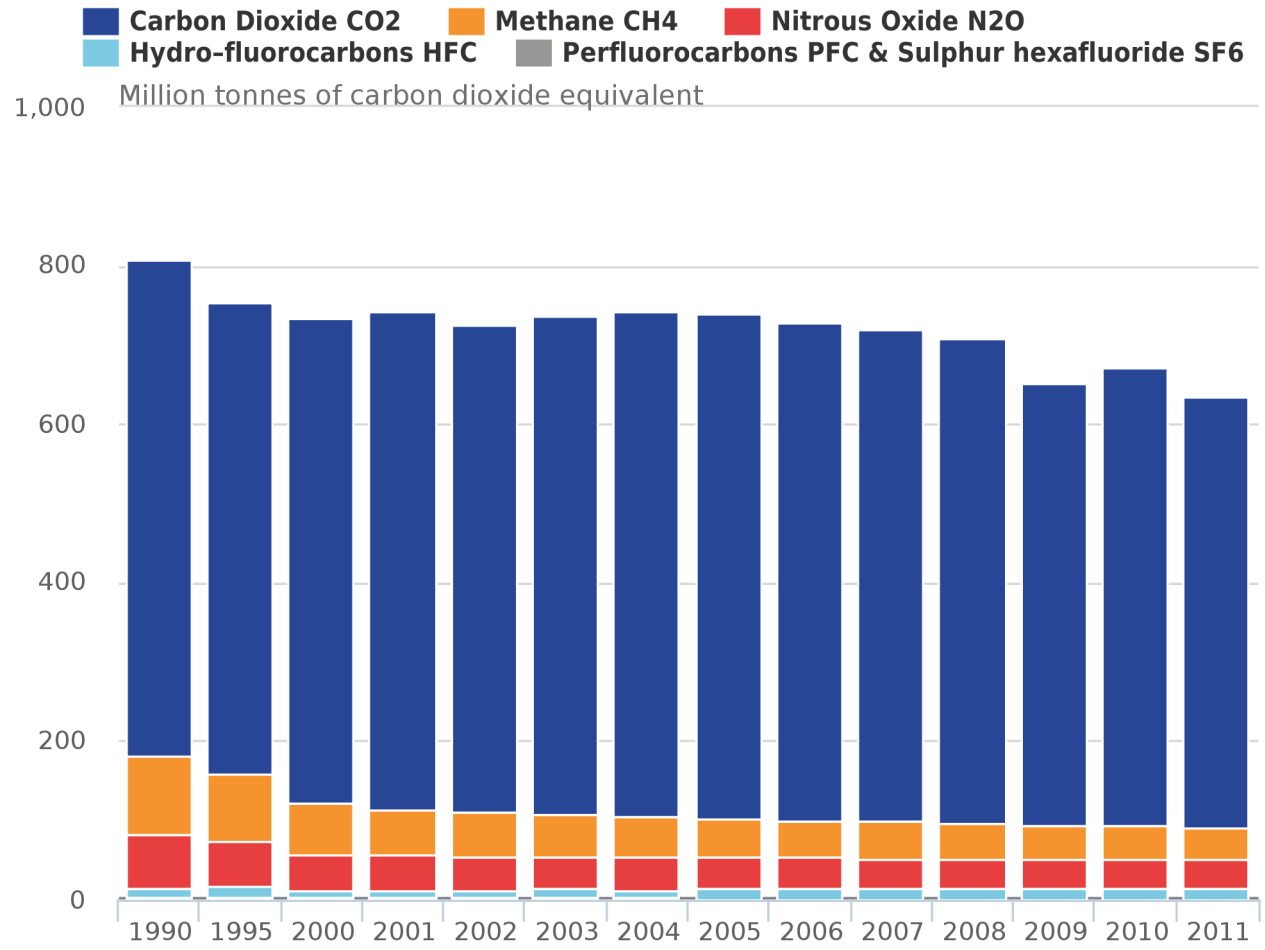
- Between 2007 and 2008 GHG emissions declined 1.5% to 708.9 million tonnes of carbon dioxide equivalent
- The economic downturn then contributed to an 8.1% fall between 2008 and 2009 to 651.5 million tonnes of carbon dioxide equivalent

- The post-downturn recovery and cold weather between 2009 and 2010 contributed to a 3.0% increase to 671.2 million tonnes of carbon dioxide equivalent

The 5.4% decline between 2010 and 2011 was partly driven by a reduction in GHG emissions from combustion [3]. In particular, emissions from natural gas combustion declined. A similar reduction in energy consumption was seen.

Figure 13: Greenhouse gas emissions: by type of gas, 1990–2011

United Kingdom resident basis



Source: Ricardo-AEA, Office for National Statistics

Carbon Dioxide (CO2) emissions declined 6.0% between 2010 and 2011 to 543.0 million tonnes. Between 1990 and 2011 there was a 13.3% fall.

- Coal combustion has fallen since 1990 in favour of natural gas combustion
- Emissions from natural gas combustion have increased overall since 1990, but have shown a general downward trend since 2004
- Between 2010 and 2011, emissions from natural gas combustion declined to the lowest level since 1995

In terms of industry CO2 emissions:

- CO2 emissions from the manufacturing sector declined 30.4% between 1990 and 2011. This was largely due to reductions in emissions from blast furnace gas

- Transport & communication sector CO2 emissions increased 39.7% between 1990 and 2011.This was mainly due to increases in emissions from aviation

Methane (CH4) emissions fell 2.2% between 2010 and 2011 to 41.7 million tonnes of CO2 equivalent

- Decreases in emissions between 2010 and 2011 in wholesale & retail trade (by 15.3%), accommodation & food services (11.2%) and consumer expenditure (by 9.5%), were all mainly due to reductions in emissions from natural gas
- Decreases in emissions from petrol cars in 2011 resulted in CH4 reductions in several industries, including wholesale & retail trade
- Between 1990 and 2011 reductions in emissions from petrol cars resulted in large declines in CH4 emissions in wholesale & retail trade (falling 81.2%) and real estate activities (76.4%)
- Electricity, water & waste sector CH4 emissions fell 63.0% between 1990 and 2011 due to reductions in emissions from landfill

Nitrous oxide (N2O) emissions in 2011 were 34.7 million tonnes of CO2 equivalent, falling 2.9% compared with 2010.

- The majority of the fall between 2010 and 2011 was due to decreases in emissions from nitric acid production[4] in the manufacturing sector (where N2O emissions fell 55.9%)
- This, combined with decreased emissions from adipic acid production, also resulted in a 96.6% reduction in emissions in the manufacturing sector between 1990 and 2011
- A decline in petrol car emissions also resulted in a 43.0% fall in consumer expenditure N2O emissions between 1990 and 2011

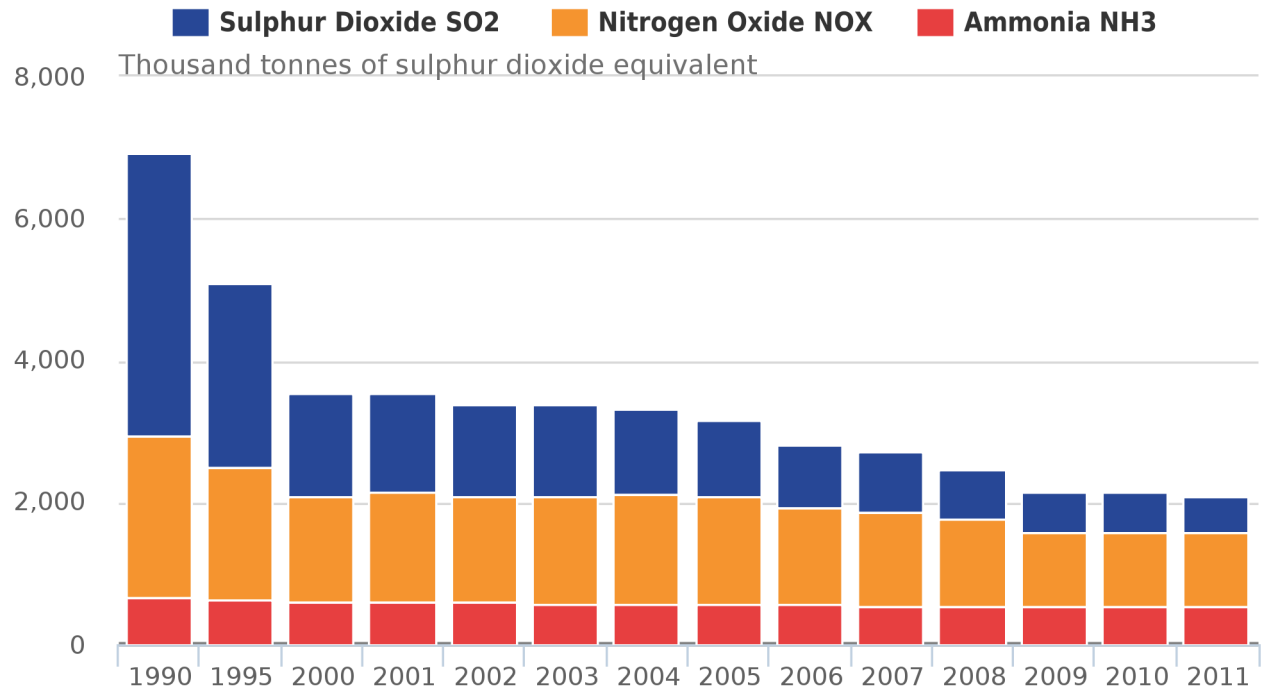
Detailed GHG emissions data are available here: 'Greenhouse Gas Emissions' (204.5 Kb Excel sheet)

Acid rain precursor emissions

Acid rain precursor[5] (ARP) emissions, excluding the natural world, fell 2.9% between 2010 and 2011 to 2101.0 thousand tonnes of sulphur dioxide equivalent[6]. Since 1990, ARP emissions have fallen 69.6%.

Figure 14: Acid rain precursor emissions: by type of gas, 1990–2011

United Kingdom resident basis



Source: Ricardo–AEA, Office for National Statistics

Sulphur dioxide (SO2) emissions fell by 8.3% between 2010 and 2011, and by 86.7% since 1990.

- The decline between 2010 and 2011 was mostly due to an 11.8% fall in the transport & communication sector. This was following a decrease in emissions from fuel oil use in international shipping in this sector
- Long-term reductions in SO2 emissions are partly due to the decline in coal combustion since 1990
- Improvements in combustion and filtration techniques have also reduced petrol and diesel SO2 emissions

Between 2010 and 2011 there was a 2.2% fall in Nitrogen oxides (NOX) emissions. NOX emissions have fallen 54.5% since 1990.

- Reductions in emissions from petrol cars have contributed to the decline in NOX emissions in many sectors since 1990
- As with SO2, the decline in coal combustion since 1990 also had an impact

Ammonia (NH3) emissions have been increasing since 2008. Between 2010 and 2011 they increased by 1.6% to 544.1 thousand tonnes of sulphur dioxide equivalent.

- Increases are largely due to rising emissions in the electricity, water & waste industry
- However, 2011 levels are still 18.1% below the 1990 emissions. This has been driven by falls in emissions from manufacturing of ammonia based fertiliser

Detailed ARP emissions data are available here: 'ARP Emissions' (199 Kb Excel sheet) .

Heavy metal pollutants

Emissions from a number of heavy metal pollutants[7] can also affect air quality.

- Lead emissions have fallen 97.9% between 1990 and 2011 from 2,897.9 tonnes to 61.5 tonnes. Similar reductions were reported in all industries
- The decline is mostly due to the reduction in use of leaded petrol, which was banned within the EU from 2000

Detailed heavy metal pollutant emissions data are available here: 'HeavyMetals' (235.5 Kb Excel sheet) .

Other pollutants

Of other pollutants affecting air quality[8] (excluding the natural world), between 2010 and 2011 emissions of Carbon monoxide (CO) fell 4.1% to 2,199.9 thousand tonnes. Emissions of Non-methane volatile organic compound (NMVOC) declined 2.1% to 837.6 thousand tonnes.

Since 1990 CO has fallen 76.0% and NMVOC 69.9%.

- This is mostly due to reductions in road transport emissions which fell 88.4% for CO and 95.3% for NMVOC
- This is due to switching from petrol to diesel cars, with petrol engines emitting more CO and NMVOC than diesel engines

Particulate matter (PM) is airborne particulate matter[9]. PM10 emissions (excluding the natural world) remained static between 2010 and 2011 at 147.0 thousand tonnes. PM2.5 increased 0.1% to 99.6 thousand tonnes. Emissions of both pollutants have declined since 1990. PM10 fell 51.4% and PM2.5 45.4%.

- Residential and industrial coal combustion had been a major source of PM emissions in the UK
- The Clean Air Act 1993 restricted coal combustion. This accounts for the reductions in emissions from consumer expenditure and many industries

Detailed other pollutant emissions data are available here: 'Other pollutants' (252 Kb Excel sheet) .

Road transport emissions

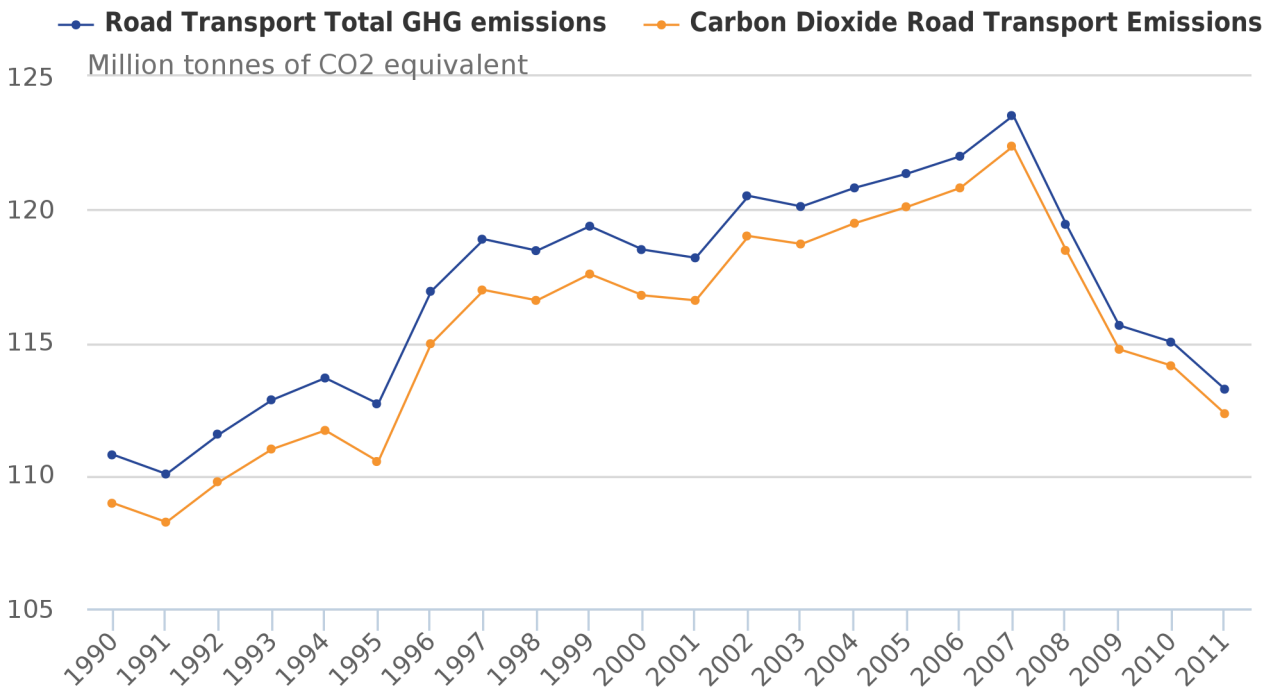
It is also possible to examine emissions that occur specifically from road transport.

Road transport emissions accounted for 17.8% of total GHG emissions in 2011.

- CO2 emissions are by far the largest fraction of GHG road transport pollution (contributing 99.2% in 2011)
- Between 2010 and 2011, CO2 road transport emissions fell 1.6% to 112.3 million tonnes
- Road transport GHG emissions followed an upward trend between 1990 and 2007, and a downward trend since 2007. This partly reflects the economic downturn between 2008 and 2009 as well as more energy efficient vehicles among other factors

Figure 15: Road transport greenhouse gas emissions, 1990–2011

United Kingdom resident basis



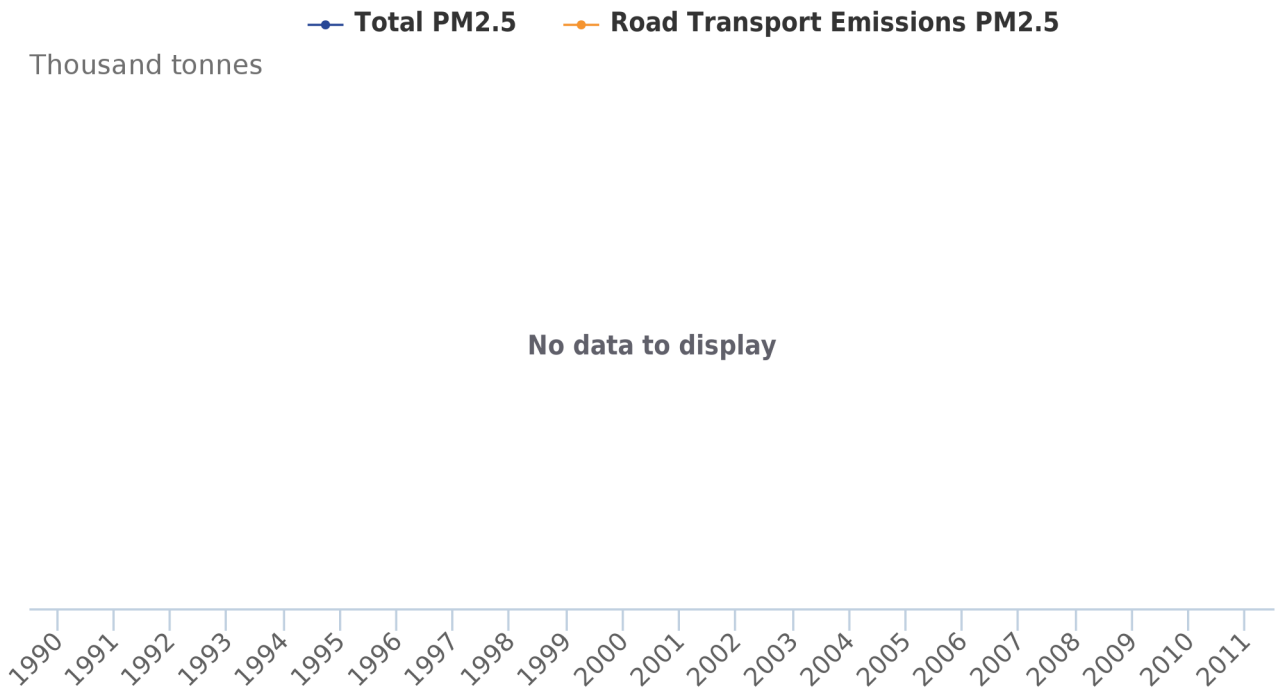
Source: Ricardo–AEA, Office for National Statistics

There have been notable reductions in PM road transport emissions over the years. PM emissions can be caused by diesel engine vehicles[10].

- Since 1992, diesel vehicles have had to meet tighter PM emission regulations. This has led to a reduction in diesel and therefore PM emissions
- Road transport PM10 emissions have fallen 32.0% and PM2.5 39.9% since 1990
- Reductions in PM emissions have been achieved despite diesel vehicle use increasing

Figure 16: PM2.5 total and road transport emissions, 1990–2011(1)

United Kingdom resident basis



Notes:

1. PM10 follows a similar trend, data can be found in 'Road Transport Emissions' table

Detailed road transport emissions data are available here: 'Road transport emissions' (15.3 Kb Excel sheet) .

Reconciling environmental accounts with UNECE and UNFCCC estimates

Environmental Accounts estimates follow the UN System of Environmental Economic Accounts (SEEA) framework which is an internationally agreed standard[11]. UK Environmental Accounts estimates are:

- Reported on a UK residence basis
- This means they include emissions by UK companies and households abroad and excludes emissions by foreign residents in the UK

For the UK submissions to the Kyoto protocol[12] of the United Nations Framework Convention for Climate Change (UNFCCC), and the United Nations Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution (LRTAP)[13].

- Estimates are reported on a territory basis
- This means they exclude emissions by UK residents and companies abroad, but include emissions in the UK by foreign residents

A bridging table has been compiled to illustrate the differences: 'Emissions bridging' (107.4 Kb Excel sheet) .

Notes for Atmospheric emissions

1. Atmospheric emissions from Greenhouse gases can contribute to global warming. Greenhouse Gases include Carbon dioxide (CO2), Methane (CH4), Nitrous oxide (N2O), Hydro-fluorocarbons (HFC) , Perfluorocarbons (PFC) and Sulphur hexafluoride (SF6)

2. The potential of each Greenhouse Gas (GHG) to cause global warming is assessed in relation to a given weight of carbon dioxide. Consequently, all GHG emissions are measured as carbon dioxide equivalents

3. This includes emissions from industrial combustion and also from the direct combustion of fuel for heating or cooking

4. N2O is generated as a by-product during the production of adipic and nitric acid

5. Acidifying pollutants that can react with water in the atmosphere to cause Acid rain are classified as Acid rain precursors. These include Ammonia (NH3), Nitrogen oxide (NOX) and Sulphur dioxide (SO2). Acid Rain can cause damage to buildings, in addition to forests, soils and fresh water

6. ARP emissions are presented as sulphur dioxide equivalent units to enable a comparison of the pollutants

7. Heavy metal pollutants, atmospheric emissions of which can damage health, include Lead, Mercury, Cadmium and Chromium

8. A number of other pollutants can adversely affect air quality, including Particulate matter less than 10 and 2.5 micrometres (PM10 and PM2.5), Carbon monoxide (CO) and Non-methane volatile organic compound (NMVOC)

9. PM10 is the fraction of suspended particulates that is thought most likely to be deposited in the lungs. The number refers to the mass of PM that is less than around 10 micron diameter

10. Diesel engine vehicles emit a greater mass of PM per vehicle kilometre than petrol engine vehicles

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

12. The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change, which sets internationally binding emissions reduction targets. See http://unfccc.int/kyoto_protocol/items/2830.php for more information

13. For more information on LRTAP see http://www.unece.org/env/lrtap/

10. Greenhouse gas emissions intensity

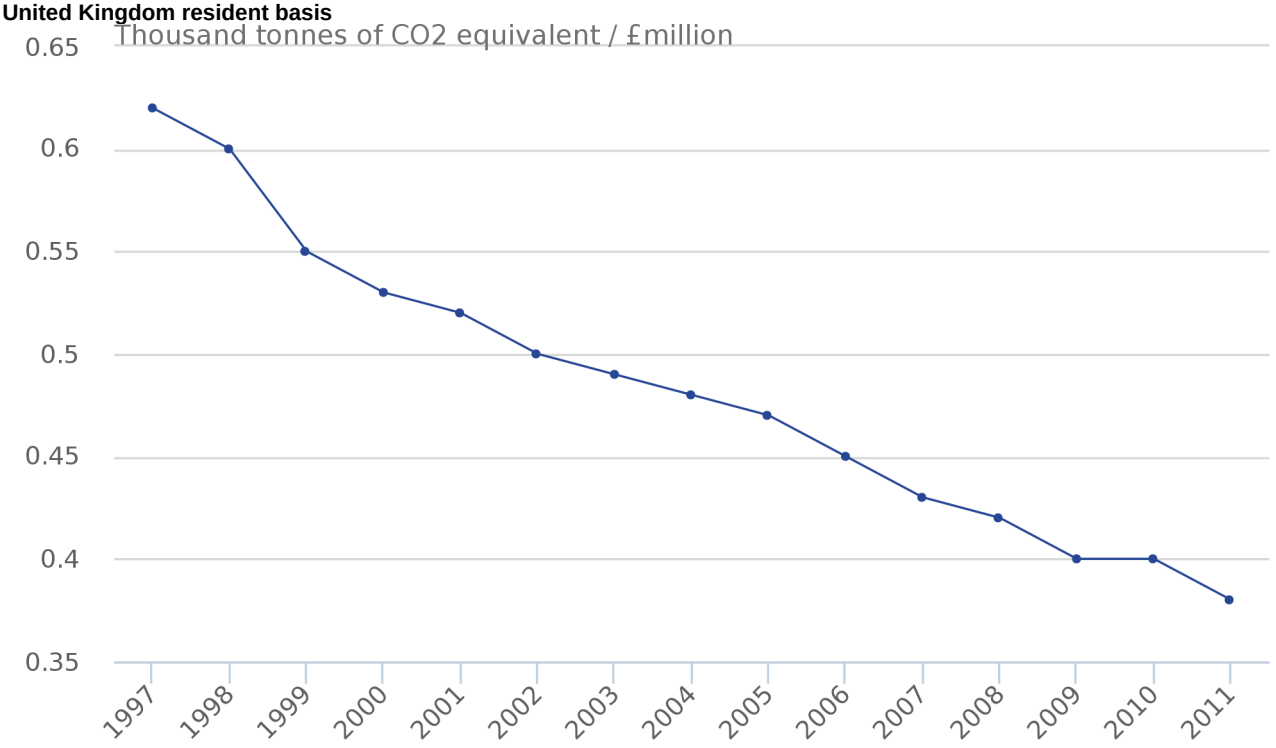
Greenhouse gas (GHG) emissions intensity[1] measures the level of GHG emissions per unit of economic output. It can be used to examine the relationship between economic growth and greenhouse gas emissions, a measure of sustainability.

Between 2010 and 2011 GHG emissions intensity fell by 5.0% to 0.38 thousand tonnes of CO2 equivalent per £ million value added[2].

GHG emissions intensity has been following a downward trend since the series began in 1997, declining by 38.7%. Over the period as a whole, although for the most part GVA increased, GHG emissions declined, which led to falls in emissions intensity.

Figure 17: Greenhouse gas emissions intensity, 1997–2011

United Kingdom resident basis



Source: Office for National Statistics

GHG emissions intensity in 2011 was greatest in agriculture, forestry & fishing and electricity, water & waste sectors. This may suggest growth in these industries is the least sustainable in terms of GHG air emission generation.

- Between 2010 and 2011, GHG emissions intensity increased by 2.0% in the agriculture, forestry & fishing sector to 7.0 thousand tonnes of CO2 equivalent per £ million value added
- Since 1997, GHG emissions intensity in the agriculture, forestry & fishing industry declined 19.6%
- Intensity declined by 6.4% in the electricity, water & waste industry between 2010 and 2011 to 5.2 thousand tonnes of CO2 equivalent per £ million value added
- Since 1997, electricity, water & waste sector GHG emissions intensity declined by 23.3%

GHG emissions intensity in the mining & quarrying industry increased between 1997 and 2011.

- Between 2010 and 2011 intensity increased by 7.5% to 0.9 thousand tonnes of CO2 equivalent per £ million value added
- Intensity has increased by 14.7% since 1997

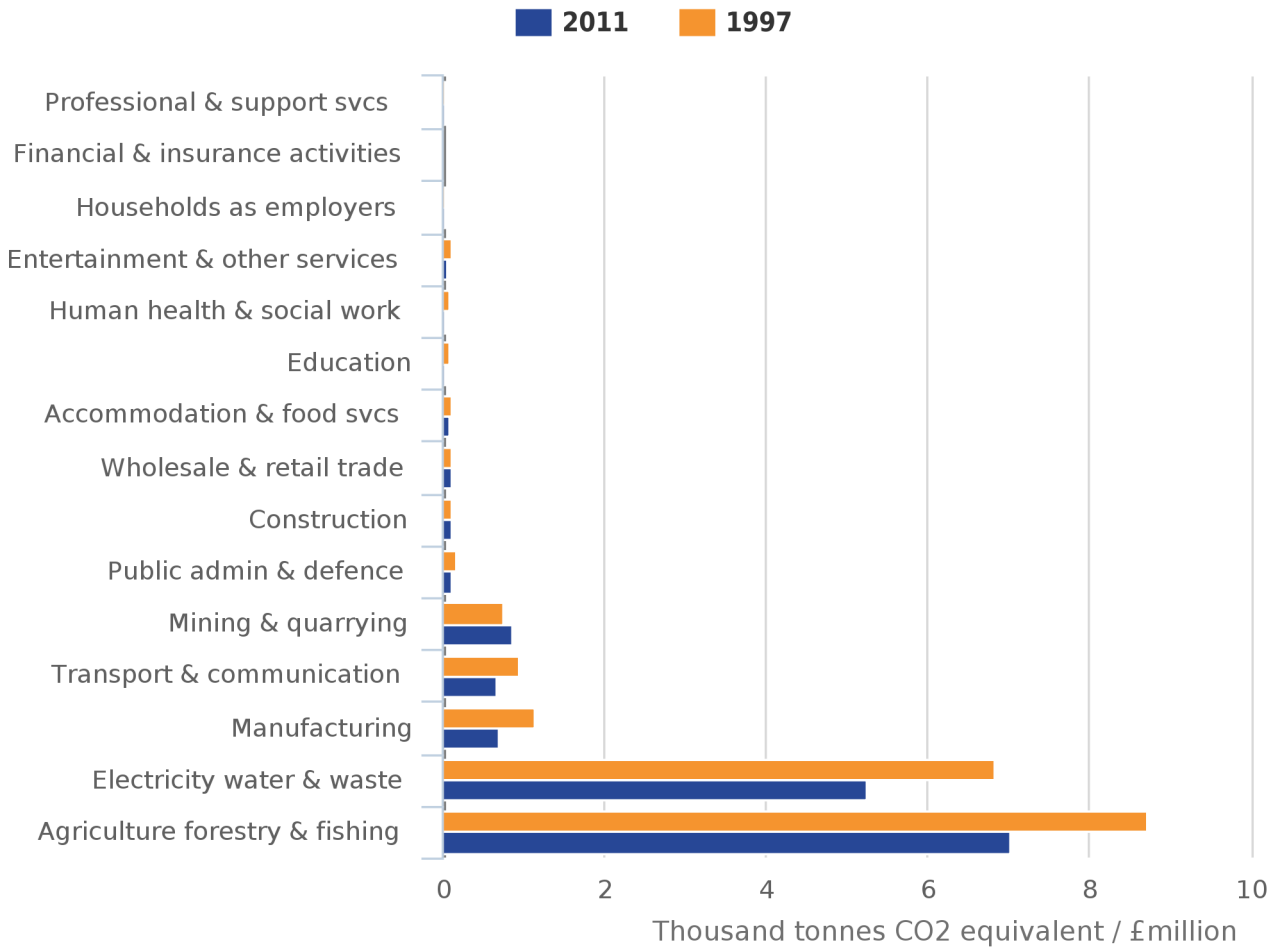
GHG emissions intensity has declined in the manufacturing and transport & communication industries between 1997 and 2011.

- Between 1997 and 2011, GHG emissions intensity declined by 38.6% in the manufacturing sector to 0.7 thousand tonnes of CO2 equivalent per £ million value added

- In the transport & communication industry, emissions intensity declined 30.5% to 0.7 thousand tonnes of CO2 equivalent per £ million added

Figure 18: Greenhouse gas emissions intensity: by industry group, 1997 & 2011

United Kingdom resident basis



Source: Office for National Statistics

GHG emissions intensity data are available here: 'GHG Emissions Intensity' (32.5 Kb Excel sheet) .

Notes for Greenhouse gas emissions intensity

1. Greenhouse gas emissions intensity is calculated by dividing the level of greenhouse gas emissions by constant price Gross Value Added (GVA). This 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 2009 defined as the base year. All emissions intensity figures exclude consumer expenditure

2. As GHG emissions declined and GVA increased

11. Material flows

The Material flows account presents a number of indicators to describe the amount of materials that are available and used in an economy.

Direct Material Input (DMI)[1] , which measures the amount of materials available to the UK economy, was reported as 706.7 million tonnes in 2011. This represents a 0.4% decline since 2010.

- Since 2009, DMI has been fairly stable
- Between 2008 and 2009 DMI fell 11.6% to 709.3 million tonnes
- Individual components of the DMI indicator have fluctuated

Domestic extraction, a component of DMI, fell 4.1% between 2010 and 2011 to 428.4 million tonnes. This is mainly due to a reduction in domestic extraction of fossil fuels

- Between 2010 and 2011 domestic extraction of fossil fuels fell 16.6% to 115.6 million tonnes. This is the lowest level since the series began in 1990

Domestic extraction of fossil fuels has been declining since 1999. Between 1999 and 2011 fossil fuel domestic extraction has fallen 57.7%

Domestic extraction of coal has gradually fallen between 1991 and 2011. The lowest level was reported in 2007 at 17.0 million tonnes.

- In 1991, 96.2 million tonnes of coal was domestically extracted (accounting for 42.1% of total fossil fuel domestic extraction)
- In 2011, 18.3 million tonnes of coal was domestically extracted (accounting for 15.9% of total fossil fuel domestic extraction)

Domestic extraction of natural gas gradually increased from 1989, peaked in 2000, and has since declined.

- In 1989, 38.5 million tonnes of natural gas was domestically extracted
- Natural gas domestic extraction then peaked in 2000 at 108.4 million tonnes
- Between 2000 and 2011 domestic extraction of natural gas fell 58.2% to 45.3 million tonnes

Domestic extraction of crude oil gradually increased from 1993, peaked in 1999, and has since declined.

- In 1993, 100.2 million tonnes of crude oil was domestically extracted
- Crude oil domestic extraction peaked at 137.1 million tonnes in 1999
- Between 1999 and 2011 domestic extraction of crude oil fell 62.1% to 52.0 million tonnes

Domestic Material Consumption (DMC)[2], the quantity of natural resources used by the UK economy, increased by 0.1% between 2010 and 2011 to 544.8 million tonnes.

- The increase between 2010 and 2011 was the first rise in DMC since 2004
- The fall in DMI but rise in DMC is due to exports falling
- DMC falls short of capturing the total mass of raw materials consumed. It only accounts for the mass of final goods imported, not the raw materials used to produce them

Between 2010 and 2011 the different components of DMC changed as follows:

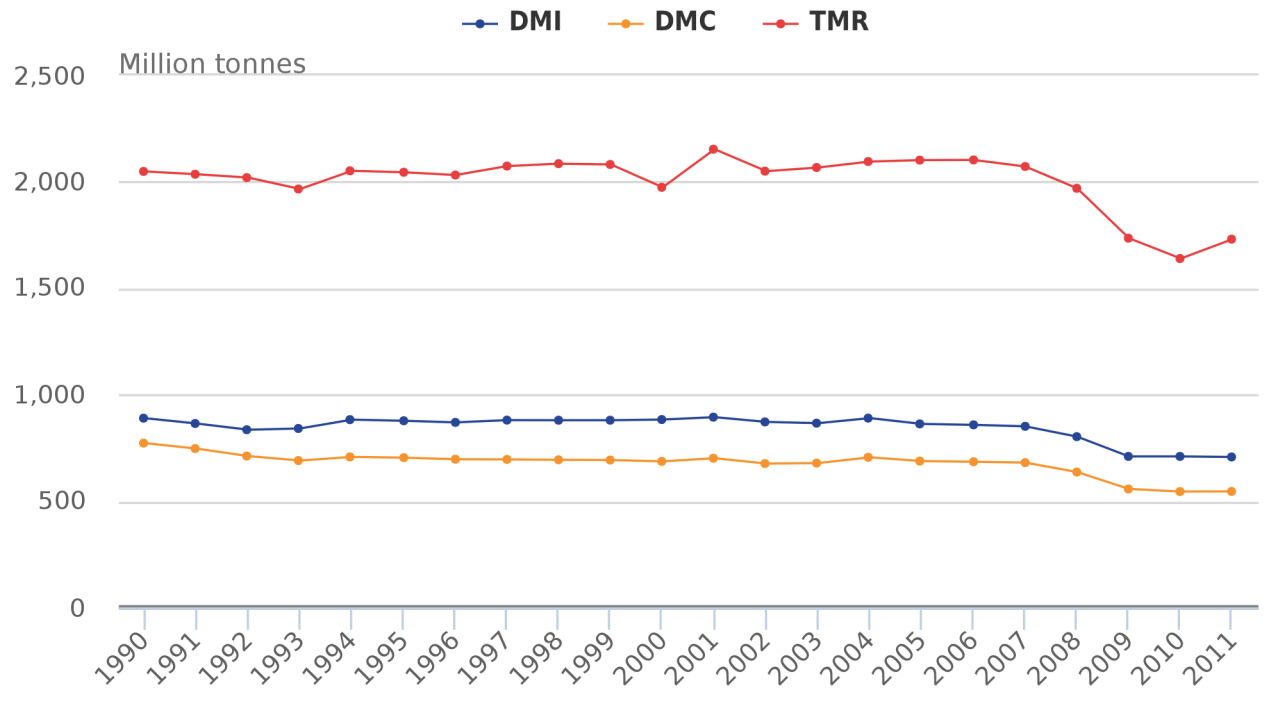
- DMC of biomass increased by 2.2% to 131.4 million tonnes
- DMC of minerals increased by 1.0% to 217.5 million tonnes
- DMC of fossil energy carriers fell 2.6% to 185.9 million tonnes

Total Material Requirement (TMR)[3] provides a wider measure of the economy's material needs by accounting for some of the indirect flows[4]. In the first rise since 2006, TMR increased by 5.5% between 2010 and 2011 to 1,730.5 million tonnes.

- The main driver of the increase in TMR is the 19.7% increase in indirect flows associated with imports of raw materials and semi-natural products, which rose to 525.6 million tonnes
- The 2011 TMR is slightly less than the TMR in 2009 of 1,735.1 million tonnes
- TMR had declined to a record low of 1,639.5 million tonnes in 2010

Figure 19: Material flows, 1990-2011

United Kingdom



Source: Office for National Statistics

Between 2010 and 2011 the UK economy **Physical Trade Balance** [5] increased by 19.5% to 116.0 million tonnes. This means the material imported exceeded the material exported.

- The increase between 2010 and 2011 was the first since 2007
- This was due to imported material increasing at a faster rate than exported material
- The balance is still below the 2007 peak of 122.4 million tonnes
- 1983 was the only year when the UK exported more material than it imported

Total imports increased by 6.0% between 2010 and 2011 to 277.9 million tonnes.

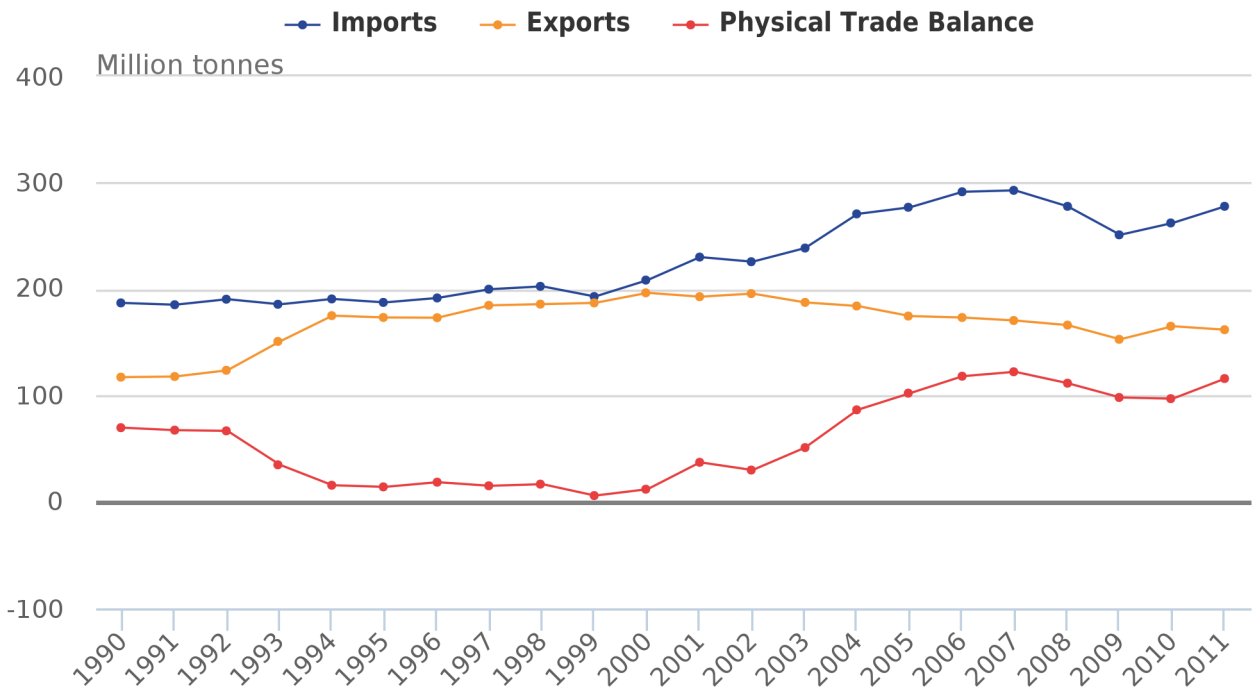
- The increase was largely due to a 9.8% rise in fossil fuel imports which increased to 162.5 million tonnes
- Fossil fuel imports in 2011 were at their highest level since the series began
- Total imports reached a peak of 292.9 million tonnes in 2007
- Between 2008 and 2009 material imports declined by 9.6% to 251.1 million tonnes, likely due to the recession

Total exports declined by 2.0% between 2010 and 2011 to 161.9 million tonnes.

- The fall was mainly due to a 3.6% decline in fossil fuel exports which fell to 92.2 million tonnes
- This is consistent with the fall in domestic extraction and increase in imports of fossil fuels
- Mineral exports increased by 3.2% between 2010 and 2011 to 40.7 million tonnes

Figure 20: Physical trade balance, 1990-2011

United Kingdom



Source: Office for National Statistics and HM Revenue & Customs

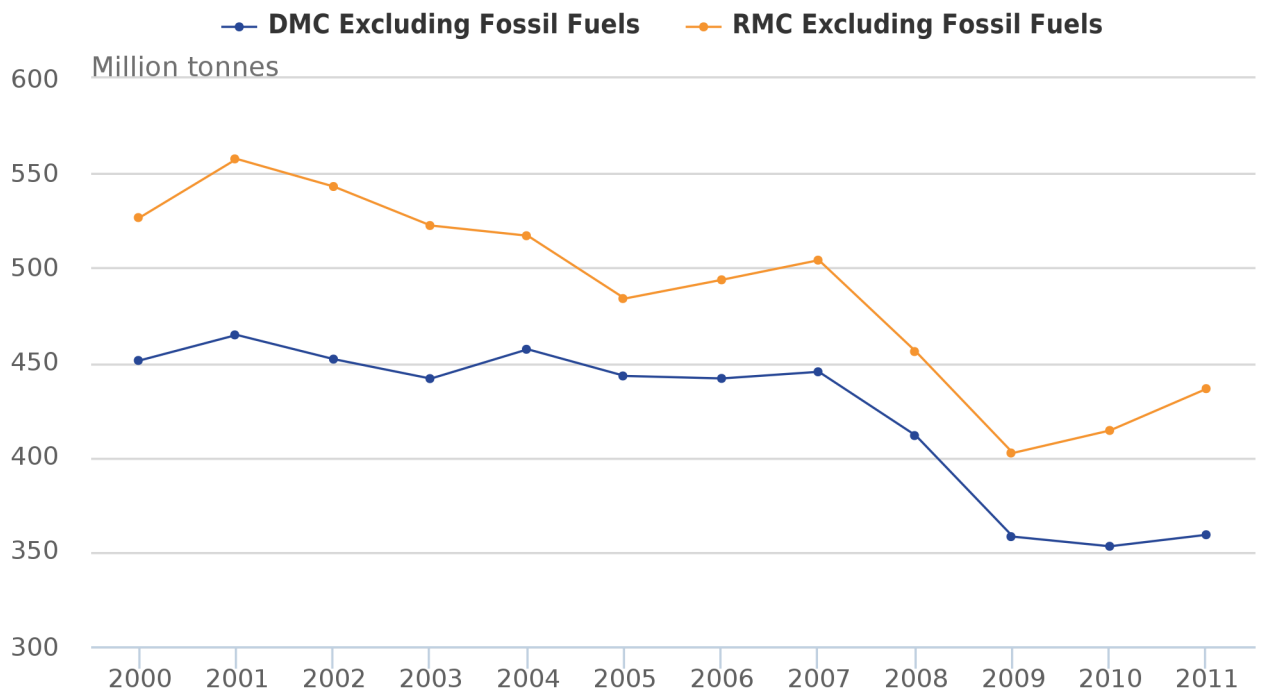
Detailed Material Flows account data are available here: 'Material Flow Account' (27.1 Kb Excel sheet)

Experimental estimates of resource use using raw material equivalents

Experimental estimates[6] of **Raw Material Consumption (RMC)**[7] , which account for the raw materials used to produce the mass of final goods imported, are presented.

Figure 21: Raw material and domestic material consumption, 2000-2011

United Kingdom



Source: Department for Environment, Food & Rural Affairs, Office for National Statistics

Between 2010 and 2011, RMC increased by 5.3% to 436.1 million tonnes.

- RMC rose 8.5% between 2009 and 2011 from an 11 year low in 2009 of 402.1 million tonnes
- DMC (excluding fossil fuels) increased at a slower rate than RMC, rising 0.3% between 2009 and 2011

All components of RMC increased between 2010 and 2011.

- The largest percentage increase was for RMC of minerals, which increased by 17.6% to 96.3 million tonnes
- RMC of construction materials increased by 2.5% to 197.5 million tonnes
- RMC of biomass increased by 1.9% to 142.2 million tonnes

More Raw Material Consumption data are available here: 'Raw Material Consumption' (11.7 Kb Excel sheet) .

Notes for Material flows

1. DMI is calculated by summing total domestic extraction used and Imports
2. DMC is calculated by subtracting exports from DMI
3. TMR is calculated by adding indirect flows, both imports and unused domestic extraction, to DMI
4. Indirect flows are the excess material associated with the extraction of materials within the UK, and also with the extraction of some of the raw and semi-natural products imported into the UK

5. The Physical Trade Balance is calculated imports minus exports. A positive physical trade balance indicates a net import of material into the UK. This calculation of the Physical Trade Balance differs from the National Accounts formula (exports – imports) because flows of materials and products are considered the inverse of the flows of money recorded in the National Accounts

6. Experimental statistics are now official statistics undergoing evaulation. They are published in order to involve users and stakeholders in their development and as a means to build in quality at an early stage

7. RMC estimates were first presented in Experimental Estimates of UK Resource Use using Raw Material Equivalents. The current raw material consumption estimates do not include fossil fuels or energy carriers. Estimates will be published annually in the UK Environmental Accounts to compliment DMC whilst methodology is improved

12. Environmental taxes

Environmental taxes

An environmental tax is defined as a tax on a physical unit (for example petrol or passenger flight) that has a proven, negative impact on the environment.

In 2012, the UK government received £44.5 billion from environmental taxes, £0.2 billion higher than in 2011. This is equivalent to 2.9% Gross Domestic Product (GDP) in current prices.

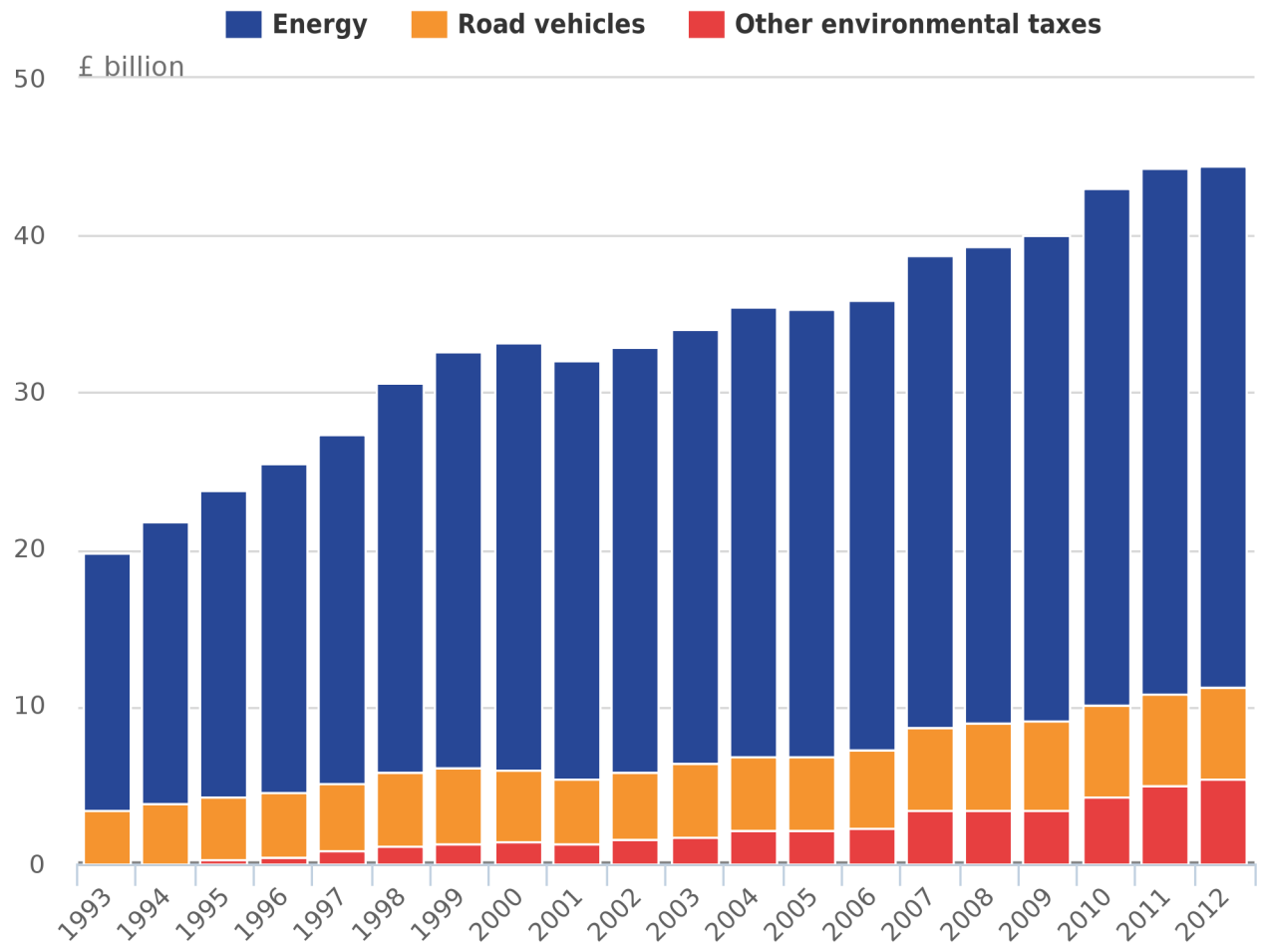
The increase in environmental tax receipts in 2012 was driven by an increase in other environmental taxes (including Air passenger duty and rail franchise premia) and road vehicle taxes.

- Other environmental tax revenue increased by 8.5% to £5.4 billion
- Road vehicle tax revenue increased by 0.9% to £5.9 billion
- These increases were partly offset by a 0.9% reduction in energy tax receipts, which fell to £33.2 billion

Environmental tax receipts accounted for 8.1% of revenue from total taxes and social contributions in 2012 and 2011, down from 8.3% in 2010.

Figure 22: Environmental tax revenue, 1993-2012

United Kingdom



Source: Office for National Statistics

Energy tax

Tax revenue from energy in 2012 was £33.2 billion. Compared with 2011, this represents a £0.3 billion decrease (0.9%), with the main reduction recorded in hydrocarbon oil duty. An increase of 1.8% in energy tax revenue was reported between 2010 and 2011.

In 2012, revenue from hydrocarbon oil decreased by £0.2 billion to £26.7 billion. However, duty on hydrocarbon oil remains the highest contributor to total environmental tax receipts. In 2012, 60.0% of total environmental tax revenue was from this tax. Compared with 2011, of receipts from duty on hydrocarbon oil:

- Receipts from petrol decreased by 5.3% to £10.1 billion. This was mainly driven by a reduction in fuel duty rates, as well as a decrease in demand for petrol
- Receipts from diesel increased by 2.2% to £14.7 billion, due to an increase in demand on diesel, partly offset by a fall in fuel duty rate

Receipts from total energy taxes were equivalent to 2.2% of GDP in 2012. They therefore contributed the most to environmental tax revenue (which were equivalent to 2.9% of GDP).

Road vehicles

Tax revenue from road vehicles was reported at £5.9 billion in 2012, the highest on record since the series began in 1993. Road vehicle tax revenue has shown an upward trend between 1993 and 2012, with the exception of 2000 where it fell by £0.3 billion (5.5%) and 2001 where it fell by £0.5 billion (10.9%).

Tax revenue from road vehicles were equivalent to 0.38% of GDP in 2012.

Other environmental taxes

Receipts from other environmental taxes have risen from £8.0 million in 1993 to £5.4 billion in 2012, showing an increase of £0.4 billion in 2012 from 2011.

- This was mainly driven by a 30.2% increase in Rail franchise premia revenue, which rose to £1.3 billion in 2012
- Air passenger duty revenue increased 6.2% to £2.8 billion

Receipts from other environmental taxes were equivalent to 0.35% of GDP.

More data on Environmental taxes are available here: ‘Environmental taxes’ (36 Kb Excel sheet)

13. Environmental Protection Expenditure (EPE)

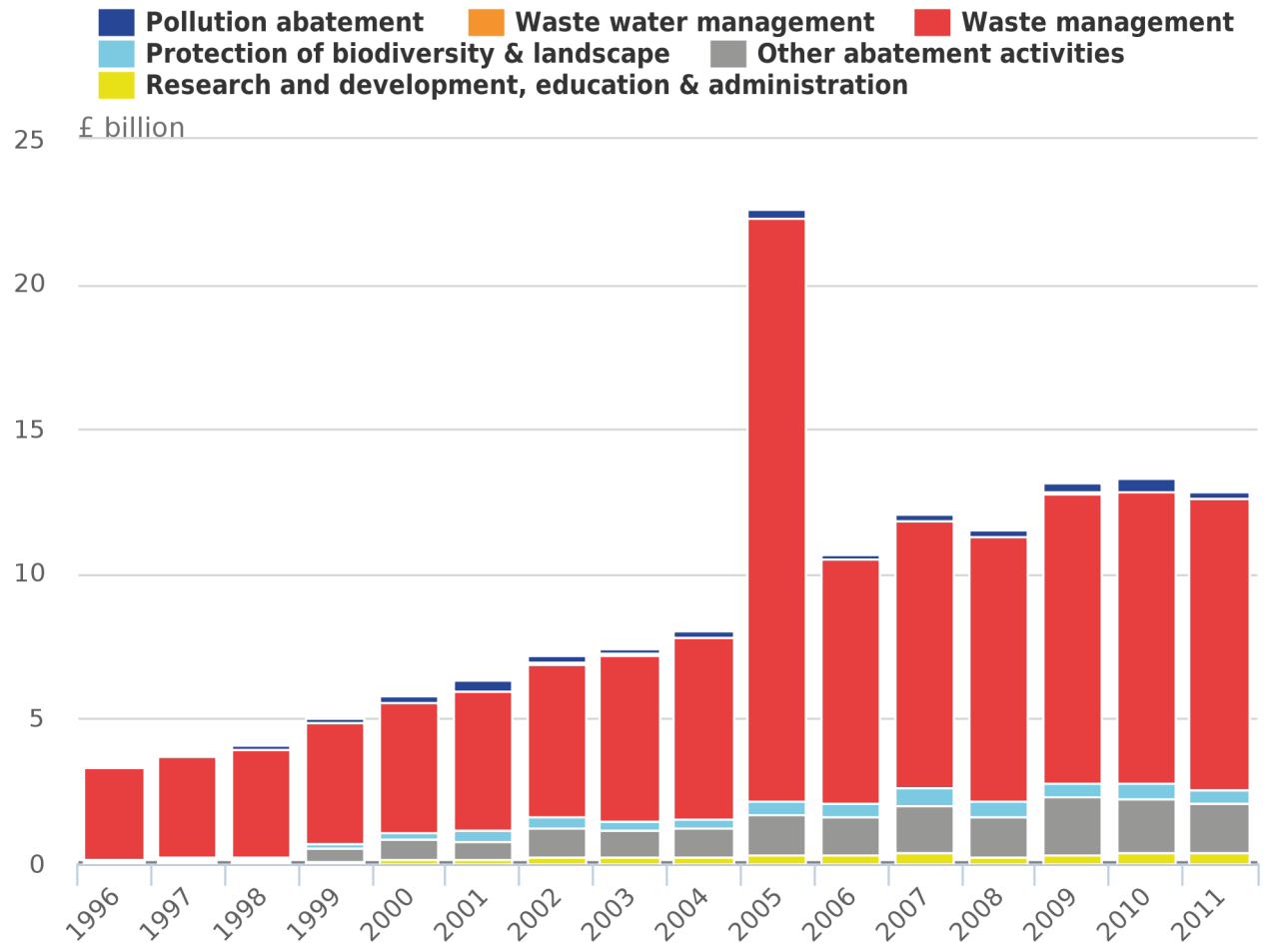
Environmental protection expenditure (EPE) is defined as spending on installations and processes which are environmentally beneficial1.

EPE accounts comprise of two different sections;

- General government EPE
- EPE by industry

Figure 23: General government environmental protection expenditure, 1996-2011(1),(2),(3)

United Kingdom



Source: HM Treasury, Office for National Statistics

Notes:

1. Components may not sum to totals due to rounding
2. Please note that summing total industry spend and total government spend for a given year will not equal whole economy data
3. Data has been updated due to revisions

General government protection expenditure

The UK government spent £12.9 billion on environmental protection in 2011. This was a decrease of £ 0.5 billion from £13.3 billion in 2010. Specifically, compared to 2010, expenditure on:

- Research & development, education & administration activities decreased by £51.0 million to £364.0 million
- Other abatement activities fell by £0.1 billion to £1.7 billion
- Protection of biodiversity & landscape fell by £67.0 million to £493.0 million
- Waste water management decreased by £6.0 million to £11.0 million

- Pollution abatement fell by £262.0 million (51.3%) to £249.0 million (following a 74.4% rise between 2009 and 2010)

These reductions were partly offset by expenditure on waste management increasing by £27.0 million, to £10.0 billion.

General government expenditure on EPE has shown an overall upward trend between 1996, when the series began and 2011, rising by £9.5 billion.

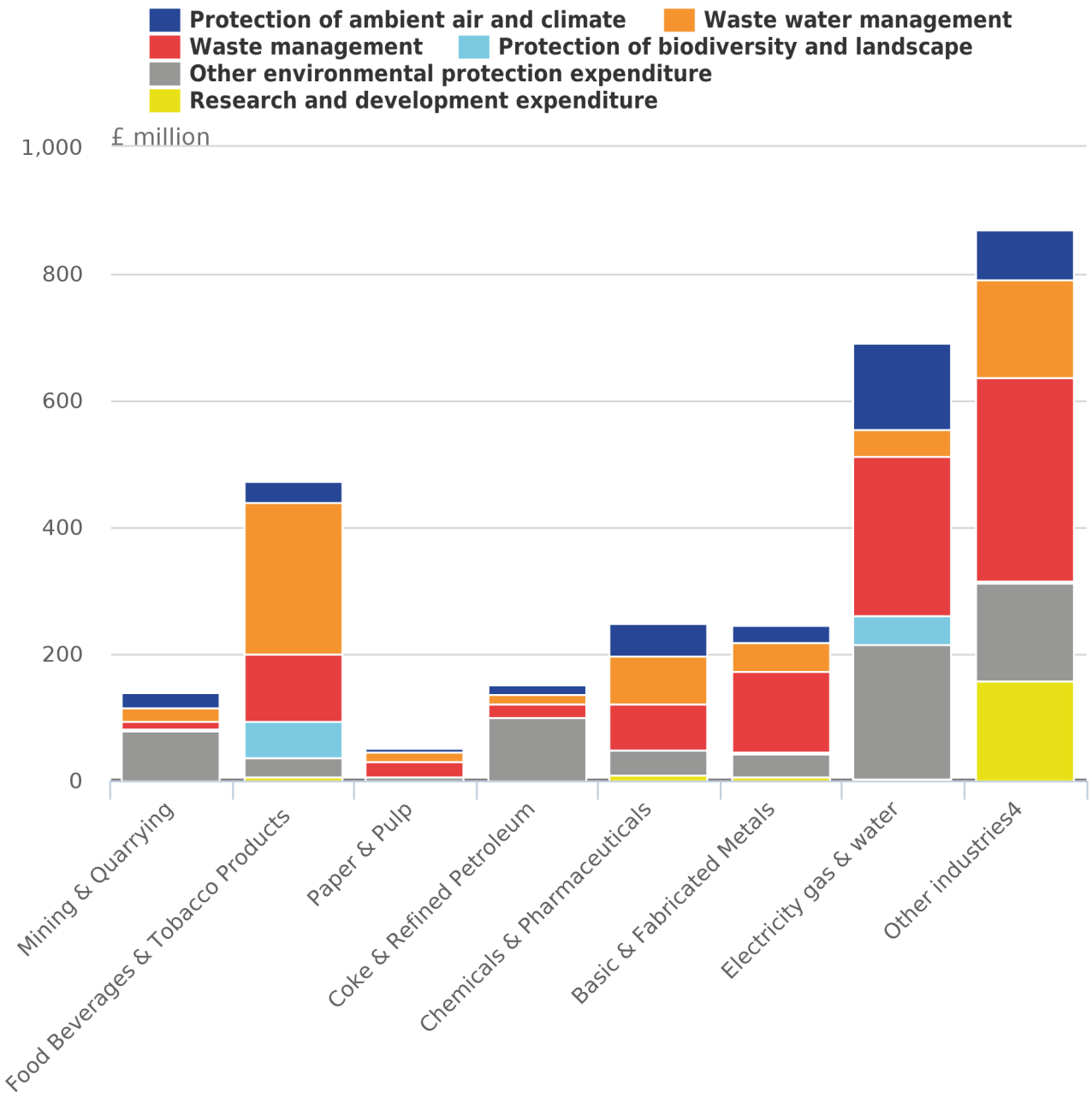
- The sharp increase in waste recorded in 2005, was due to the decommissioning of British Nuclear Fuels
- This decommissioning event was a singular occurrence
- Waste management has remained the largest expenditure in public sector EPE since 1996. In 2011, waste management accounted for 78.0% of total General government EPE

The equivalent of EPE towards Gross Domestic Product (GDP) has declined each year since 2009. In 2011 there was the equivalent proportion of 0.85% to GDP in current prices, the same as in 2007. This is compared with GDP equivalent of 0.91% in 2010 and 0.94% in 2009.

Environmental protection expenditure by industry

Figure 24: Environmental protection expenditure: by industry, 2010(1),(2),(3),(4)

United Kingdom



Source: Department of Environment, Food & Rural Affairs

Notes:

1. The figures in these tables fall outside the scope of National Statistics

2. From 2008 onwards, the EPE survey was conducted using the new Standard Industrial Classification (SIC2007). Previous years data were conducted using SIC2003 and have not been re-categorised

3. Comparisons between years should be treated with caution due to the changes in survey methodology

4. Data for other industries consists of the following industries; 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, Machinery and Electrical Equipment, Transport Equipment, Furniture Manufacture and Repair and Installation

In 2010[2], the total Environmental Protection Expenditure (EPE) by industry was estimated as £2.9 billion[3].

Most of the EPE was created by:

- Other industries, electricity, gas & water, and food, beverages & tobacco products
- These accounted for 30.3%, 24.0% and 16.4% respectively of total EPE in 2010

EPE can be divided into three categories: Operational expenditure (OPEX), Capital expenditure (CAPEX) and Research & development (R&D).

OPEX accounted for 70.3% of the total environmental expenditure in 2010. The largest contributors to operational expenditure were:

- Other industries which accounted for 28.1%
- Food, beverages & tobacco products which accounted for 20.3%
- Electricity, gas & water which contributed 15.2%

CAPEX accounted for 23.4% of the total environmental expenditure in 2010. The largest contributors were:

- Electricity, gas & water, which accounted for 56.8% of total capital expenditure
- Other industries, which contributed 21.4%
- Food, beverages & tobacco products which accounted for 8.4%

R&D accounted for 6.3 % of the total environmental expenditure in 2010. The largest contributors were:

- Other industries, which accounted for 87.5%
- Chemicals & pharmaceuticals which contributed 4.9%

Detailed data on EPE by industry are available here: 'Environmental Protection Expenditure in Specific Industries' (37.8 Kb Excel sheet)

Notes for Environmental Protection Expenditure (EPE)

1. United Nations System of Integrated Environmental and Economic Accounting (SEEA) defines EPE as expenditures whose primary purpose is the prevention, reduction and elimination of pollution and other forms of degradation of the environment
2. DEFRA have recently released EPE by industry data for 2011: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/200979/EPE_2011_statistics_release_final.pdf. This data was unavailable when UK Environmental Accounts were compiled
3. Environmental protection expenditure by industry statistics are not National Statistics. Comparisons with earlier years should be treated with caution due to changes in the methodology

14. Background notes

1. What's new?

A number of papers on natural capital are published alongside this Statistical Bulletin. In November 2011, in response to Natural Environment White Paper (NEWP) commitments, the Office for National Statistics (ONS) published a paper "Towards a sustainable environment – UK Natural Capital and Ecosystem Accounting" to outline its approach to deliver the 'early changes by 2013' to the UK Environmental Accounts. The paper suggested that a pilot study to produce a woodlands asset account should be prioritised in the first instance. In December 2012, ONS published a roadmap " Accounting for the value of nature in the UK" to incorporate natural capital into the UK Environmental Accounts. As part of the roadmap, the ONS set out a timetable to develop woodland ecosystem accounts and land use accounts.

ONS has published the following experimental statistics and methodological papers alongside this statistical bulletin:

1. Measuring UK woodland area and timber resources

This paper presents the experimental physical asset accounts for UK woodland area and timber resources for 2011-12. These accounts have been developed in accordance with the System of Environmental Economic Accounting (SEEA) Central Framework, while showing some flexibility in its implementation due to UK specific context and needs. The compilation of these physical asset accounts will help to monitor changes in UK woodlands and timber resources. This paper provides the methodology used to develop these accounts, discusses issues in implementing the SEEA and provides suggestions on improving these accounts over time.

2. Measuring UK woodland ecosystem assets and ecosystem services

This paper presents the initial experimental UK woodland ecosystem asset and services accounts. These accounts are developed in accordance with the System of Environmental Economic Accounting (SEEA) Experimental Ecosystem Accounting guidelines, while showing some flexibility in its implementation due to UK specific context and needs. This paper discusses the methodology used to develop these accounts, issues encountered and provides suggestions on improving these accounts over time.

3. Land use in the UK (527.8 Kb Pdf)

This paper presents the first experimental physical asset accounts for UK Land Use for 2000-2010. These accounts are developed in accordance with the System of Environmental Economic Accounting (SEEA) Central Framework, while showing some flexibility in its implementation for UK specific context. The compilation of these accounts will help to monitor the changes to the breakdown of UK land use over an accounting period. It also provides the methodology used to develop these accounts, discusses issues in implementing SEEA and provides suggestions on improving these accounts over time.

4. Monetary valuation of UK timber resources

The monetary value of UK timber resources at 1 April 2011 is estimated to be £6.7 billion. Using the Net Present Value method, applying the HM Treasury declining social discount rate and taking different age classes of timber resources into account, this paper presents the first experimental estimates of UK timber resources. These estimates are incorporated into an accounting structure to develop first experimental monetary asset account (balance sheet) for UK timber resources for 2011-12. This paper also provides the methodology and assumptions used to estimate the value of UK timber resources and provide suggestions on improving these estimates over time.

In the roadmap, ONS also set out a time table to fast-track work to improve the valuations of the natural capital element of the estimates of national wealth published by the World Bank and the UN – the so-called "top-down approach". ONS has published the following paper to share its plans for improving the natural capital estimates within the comprehensive wealth framework.

5. Towards wealth accounting – natural capital estimates within comprehensive wealth

The aim of this paper is to provide an overview of wealth accounting, the conceptual basis of including natural capital into extended income and wealth accounts, and to share the ONS plans for improving the natural capital estimates within the comprehensive wealth framework. This paper provides an approach on

developing the UK comprehensive wealth accounts by incorporating other capital areas – physical and human – into a wealth framework and suggests an indicator to measure the sustainability of the UK's economy.

In June 2012, the Office for National Statistics (ONS) announced in the UK Environmental Accounts that the methodology to value UK Continental Shelf oil & gas reserves will be reviewed to provide best possible estimates of the reserves. A full review of the methodology was carried out in 2012/13 and as a result new estimates are published in the following paper:

6. Monetary valuation of UK continental shelf oil & gas reserves (256.3 Kb Pdf)

The monetary value of UK Continental Shelf oil & gas reserves at 31 December 2011 is estimated to be £120 billion. This is £11 billion lower than the estimated value of the reserves at 31 December 2010. Using the Net Present Value method, applying the HM Treasury social discount rate and taking different asset lives of the reserves into account, this paper presents the monetary asset account (balance sheet) for UK Continental Shelf oil & gas reserves for 2011. This paper also provides the methodology and the assumptions used to estimate the value of UK oil & gas reserves and compares the previous estimates to those published by the Office for National Statistics in 2012.

7. Development of water statistics and water accounts in the UK

The Department for Environment, Food and Rural Affairs (Defra) has set up a project to improve the quality and availability of data on the stocks and flows of water and other water-related statistics in the UK. The project is due to complete in December 2013 and will be supported by an external consultant (WRc plc).

8. Updated estimates of UK Resource Use using raw material equivalents

In November 2011 the Department for Environment, Food and Rural Affairs (Defra) published some experimental estimates of UK resource use which took into account the raw materials used in the production of goods and services imported into the UK. This note updates those estimates and discusses some of the results.

2. What's coming up?

   Waste statistics are included within the Statistical Bulletin on a biennial basis. They were last published in 2011. The statistics provide estimates for household and non-household waste and are provided by the Department for Environment, Food & Rural Affairs (Defra).

   Defra are undertaking a review of the information required. Whilst the review is underway, the estimates will not appear in the ONS Statistical Bulletin.

3. Use of the Statistics

   The environmental accounts are used to make international comparisons of the impact of the economy on the environment. They inform sustainable development policy and will feed into the ONS National Well-being programme that considers environment and sustainability issues as well as the economy and quality of life. They are also used to model impacts of fiscal or monetary measures and to evaluate the environmental performance of different industrial sectors.

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

4. Coherence with other published sources

   Emissions and energy consumption presented in this bulletin differ from other estimates as explained in the relevant sections and bridging tables.

   The material flow accounts are based on information published by HM Revenue and Customs, the British Geological Survey and the Food and Agriculture Organisation of the United Nations. During the compilation process validation checks ensure that published ONS material flows data are consistent with the source data but it should be noted that a snapshot of the data are extracted at a single point in time and so may differ slightly from the latest information available from these sources.

5. Industry Classifications

   The Industry Classification used in the Environmental Accounts is the Standard Industrial Classification (SIC) 2007. Current standard classifications

   The UK transport sector, as defined on a SIC basis, comprise those enterprises whose dominant activity is the provision of transport services - railways, tubes and trams, buses and coaches, taxis and mini cabs, road freight, air transport, water transport and transport via pipelines. The road freight industry covers road haulage companies as opposed to all types of road freight. Lorries owned by retailers, for instance, are allocated to the retail industry. The use of private cars by households is allocated to the domestic sector.

6. Methodology

   Information on UK Environmental Accounts methodology is available on the Environmental Accounts guidance and methodology pages.

   The estimates of public sector environmental protection expenditure are derived from the Public Expenditure Statistics Analysis database produced by HM Treasury. The methodology for these statistics was reviewed in January 2012 in Developments in Environmental Protection Expenditure Accounts.

   In addition to restructured, updated data noted in the revisions section, air emissions and energy account methodology has been updated as follows:

   Energy consumption in the UK (ECUK) tables – changes to the published format of ECUK tables to represent the implementation of SIC07, have resulted in widespread improvements in the accuracy of mapping of combustion emissions from industrial combustion.

   Supply-use tables – revisions to the supply use data used to split emissions from manufacturing of wood, metal and plastic coatings, and use of solvents in surface cleaning, have resulted in significant reallocations of emissions of PM10, PM2.5 and NMVOC.

   Business Register and Employment Survey (BRES) Data – the accuracy of splits utilising employment data has been improved by the inclusion of information from the detailed official labour market statistics dataset for 2010/2011. This has been used to refine the historic trends derived from less detailed employment data for past years.

7. Summary Quality Reports

   Summary Quality Reports are available for Air Emissions accounts, Energy accounts, Environmental Taxes accounts and Material Flows accounts.

8. Accuracy and reliability

   ONS atmospheric emissions and energy consumption data are produced by contractors (Ricardo-AEA) based on the National Atmospheric Emissions Inventory (NAEI) and Greenhouse Gas Emissions Inventory and the latest available National Accounts and official statistics sources, for example, supply-use tables. Other elements of the environmental accounts also draw on National Accounts data and administrative sources.

9. Revisions

Reliability can partly be estimated by measuring revisions to previously published statistics. Very few statistical revisions arise as a result of ‘errors’ in the popular sense of the word. All estimates, by definition, are subject to statistical ‘error’ but, in this context, the word refers to the uncertainty in any process or calculation that uses sampling, estimation or modelling. Most revisions reflect either the adoption of new methodology or the incorporation of new information. Only rarely are there avoidable ‘errors’ such as human or system ‘errors’ and such mistakes are made clear when they are discovered and corrected.

Revisions since previous publication in 2012

The environmental accounts have been updated since the 2012 publication to incorporate recent information and revisions to previously published estimates. The following accounts have been either updated or revised:

Atmospheric emissions and energy consumption

Revisions to Atmospheric emissions are due to revisions in the NAEI activity data or emissions factors. Greenhouse gas emissions have been revised upwards. The largest revisions were a 1.0 per cent rise in 2009 and 2010.

- Revisions were partly due to new sources, especially for ‘other industrial combustion of biomass’ and ‘industrial waste water treatment’
- Other revisions were due to revisions and restructuring of existing sources, particularly in ‘road transport’ and ‘industrial combustion’

Acid Rain Precursor Emissions have been revised down for 1990-1998 and 2006-2010, and revised up for 1999-2005. The largest revisions were the downward revisions for the most recent years: 2.8 per cent for 2010, 2.4 per cent for 2009, and 2.2 per cent for 2008.

- Revisions to 2010 data were partly due to new sources for anaerobic digestion process emissions
- Other revisions were due to revisions and restructuring of existing sources, particularly for shipping

Energy consumption figures have been revised up. The greatest revisions were a 1.3 per cent increase for 2000 and a 1.2 per cent increase for 2005.

Environmental taxes

Total Environmental Taxes data have been revised up, due to the inclusion of additional taxes. Rail franchise premia, Boat licences and Fishing licences have been added to ‘Other environmental taxes’; ‘Northern Ireland driver vehicle agency’ have been added to the ‘Road vehicles’ category.

Material flows

There have been revisions to the Total material requirement (TMR) indicator. This is due to indirect flows figures increasing, particularly ‘soil excavation and dredging’ figures which are taken from construction statistics.

Table 1: Environmental Accounts, 2012 Publication

	1990	1995	2000	2005
Greenhouse Gas Emissions (thousand tonnes CO2 equivalent)	802,498	751,284	728,654	732,892
Acid Rain Precursor Emissions (thousand tonnes SO2 equivalent)	6,936	5,119	3,543	3,155
Energy Consumption (million tonnes oil equivalent)	220	224	238	245

	2000	2005	2007	2008
Environmental Taxes (£ million)	33,136	35,266	38,495	38,976

Material Flows	2004	2005	2006	2007
Domestic Material Input (million tonnes)	890	863	857	852
Domestic Material Consumption (million tonnes)	705	686	683	680
Total Material Requirement (million tonnes)	2,076	2,080	2,081	2,054

Source: Office for National Statistics

Table 3: Environmental Accounts, 2013 Publication

	1990	1995	2000	2005	2008	2009	2010	2011
Greenhouse Gas Emissions (thousand tonnes CO2 equivalent)	806,495	754,413	734,055	739,458	708,853	651,531	671,152	634,765
Acid Rain Precursor Emissions (thousand tonnes SO2 equivalent)	6,910	5,090	3,542	3,156	2,480	2,165	2,164	2,101
Energy Consumption (million tonnes oil equivalent)	222	226	241	248	235	219	226	213

	2000	2005	2007	2008	2009	2010	2011	2012
Environmental Taxes (£ million)	33,140	35,384	38,762	39,285	40,008	42,982	44,279	44,468

Material Flows	2004	2005	2006	2007	2008	2009	2010	2011
Domestic Material Input (million tonnes)	889	862	858	851	802	709	709	707
Domestic Material Consumption (million tonnes)	705	687	684	680	636	556	544	545
Total Material Requirement (million tonnes)	2,095	2,102	2,103	2,072	1,970	1,735	1,640	1,731

Source: Office for National Statistics

Table 2: Environmental Accounts Revision, 2013 Publication

	1990	1995	2000	2005	2008	2009	2010
Greenhouse Gas Emissions	0.5	0.4	0.7	0.9	0.8	1	1
Acid Rain Precursor Emissions	-0.1	-0.2	0.5	0.6	-2.2	-2.4	-2.8
Energy Consumption	0.9	0.9	1.3	1.2	0.9	0.9	0.9

	2000	2005	2007	2008	2009	2010	2011
Environmental Taxes	0	0.3	0.7	0.8	1.3	1.9	2.2

	2004	2005	2006	2007	2008	2009	2010
Domestic Material Input	-0.1	-0.1	0.1	-0.1	-0.1	0	-0.1
Domestic Material Consumption	0	0.1	0.1	0	0.2	0	-0.2
Total Material Requirement	0.9	1.1	1.1	0.9	1.1	1.6	1.5

Source: Office for National Statistics

10. Following ONS

    Follow ONS on Twitter and Facebook.

    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 website pages.

    Why not join StatsUserNet to contribute to the discussion?

    The next update to Environmental Accounts will be announced via the ONS release calendar.

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

    These National Statistics are produced to high professional standards and released according to the arrangements approved by the UK Statistics Authority.