Environment

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The environment in which we live has changed considerably over the last 200 years. The move from rural, agricultural communities into industrial towns has led to increasing pressures being put on the land, wildlife, atmosphere and water. The environment around us has a significant impact on the quality of our lives, for example, the cleanliness of our streets, air and water quality, energy consumption, climate change and access to green space. Individuals can demonstrate concern for the environment by undertaking personal environment protection activities, such as recycling and reducing their energy consumption. In addition households contribute the majority of UK environmental tax revenue.

Key points

Environmental attitudes and lifestyles

- After the economy and unemployment, the environment and pollution was the third most important issue that adults aged 16 and over in England felt the government should address when asked in 2009 (35 per cent)
- Around a third (32 per cent) of adults aged 16 and over in England reported in 2010 that they were environmentally-friendly in most or everything they did.

Energy

- Domestic energy consumption in the UK increased by 18 per cent between 1970 and 2009, from 37 to 44 million tonnes of oil equivalent
- Space heating accounted for over half (58 per cent) of all final domestic energy consumption in the UK in 2008, while cooking accounted for just 3 per cent
- In 2008, 5.6 per cent of gross electricity consumption in the UK was generated by renewable sources, compared with the EU-27 average of 16.7 per cent

Waste management

- Households in England generated around 24 million tonnes of waste in 2009/10, equivalent to around 460 kilograms per person
- In 2009/10, 40 per cent of household waste per person in England was recycled, composted or reused, compared with less than 1 per cent in 1983/84
- Local authorities in England dealt with nearly 947,000 incidents of fly-tipping in 2009/10, with nearly half (49 per cent) occurring near the highway

Pollution

- There were 22 days of moderate or higher air pollution in rural areas in the UK in 2010, the lowest since 1987. For urban areas there were 8 days of moderate or higher air pollution in 2010, the lowest since records began in 1993
- In 2009 there were 770 recorded serious (Category 1 or 2) pollution incidents in England and Wales, around half of the 1,500 serious incidents that were reported in 2002

Climate change

- Approximately half (46 per cent) of adults aged 16 and over in England disagreed with the statement ‘the effects of climate change are too far in the future to worry me’, while 37 per cent agreed with the statement.
- In 2009, UK emissions of the basket of greenhouse gases were estimated to be 566.3 million tonnes carbon dioxide equivalent, 8.7 per cent lower than in 2008 and 27.2 per cent lower than in 1990
- Since 1987 yearly average temperature in Central England has been consistently above the 1961–1990 average at 0.42°C in 2010
- Summer rainfall in the UK since 2006 has been at least 22 per cent higher than the 1961–1990 average and in 2010 was higher than it has been since 1892 (32.3 per cent higher than the 1961–1990 average)

Local environment, countryside and wildlife

- Over 8 in 10 (85 per cent) of adults aged 16 and over in England in 2011 felt that being proud of their local environment was important
- Dog fouling was considered to be the most problematic local environment quality issue to just over 4 in 10 (41 per cent) adults in England aged 16 and over in 2009, while just over a third (34 per cent) felt that litter was a problematic issue to some extent
- Over 6 in 10 (63 per cent) of adults aged 16 and over in England in 2011 reported that it was very important to have public gardens, commons or other green space nearby. Just over 7 in 10 (71 per cent) reported that the most important reason for visiting a green space was fresh air
- Wild bird populations remained relatively stable between 1970 and 2009, however breeding populations of some common farmland and woodland birds have decreased, while the seabird population has risen over the period

Environmental taxes

- Just over half (51 per cent) of adults aged 15 and over in Great Britain in 2007 supported ‘green’ taxes in principle, while just under a third (32 per cent) opposed them
- In 2008, UK households paid £20.9 billion in environmental taxes, over half (53.7 per cent) of total environmental tax revenue

Environmental attitudes and lifestyles

The environment and pollution was the third most important issue that adults aged 16 and over in England felt that the government should address according to the 2009 Survey of Public Attitudes and Behaviours towards the Environment carried out by the Department for Environment, Food and Rural Affairs (Defra). Over a third (35 per cent) felt that environment and pollution issues were important compared with 57 percent for the economy in general and 37 per cent for unemployment (Defra, 2011a).

Table 1 **Attitudes towards current lifestyle and the environment,¹ 2010**

England	Percentages ²		
	Agree ³	Neither agree or disagree	Disagree ³
The so-called 'environmental crisis' facing humanity has been greatly exaggerated	38	19	39
Being green is an alternative lifestyle it's not for the majority	36	17	44
I find it hard to change my habits to be more environmentally friendly	28	15	56
It's not worth me doing things to help the environment if others don't do the same	25	10	64
It's only worth doing environmentally friendly things if they save you money	23	11	64
It would embarrass me if my friends thought my lifestyle was purposefully environmentally friendly	11	13	74

1 1,712 adults aged 16 and over were asked in March 2010 how much they agreed or disagreed with the statements in the table.

2 Percentages do not sum to 100 as the table excludes those who responded 'Don't know'.

3 Strongly or tend to agree or disagree.

Source: 2010 Omnibus Survey on Public attitudes and behaviours towards the environment, Department for Environment, Food and Rural Affairs (Defra, 2011a)

Adults aged 16 and over in England were asked to agree or disagree with statements on the environment in 2010 (**Table 1**). Nearly 4 in 10 (38 per cent) agreed that the 'environmental crisis' facing humanity had been greatly exaggerated. Over a third (36 per cent) agreed that being green was an alternative lifestyle and was not for the majority of people. Similar proportions (39 per cent and 44 per cent) disagreed with these statements.

Just under 3 in 10 (28 per cent) agreed that it was hard to change their habits that so that they could be more environmentally friendly. Around a quarter of adults agreed that it was not worth doing things to help the environment if other people didn't do the same or if they didn't save money doing so (25 per cent and 23 per cent respectively). Just over 1 in 10 (11 per cent) agreed that they would feel embarrassed if their friends thought that their lifestyle was purposefully environmentally friendly. The majority of respondents disagreed with each of these four statements, however.

Table 2 **Environmentally friendly lifestyle, 2010¹**

England	Percentages
All aged 16 and over	
I do one or two things or quite a few things that are environmentally-friendly	64
I'm environmentally-friendly in most things or everything I do	32
I don't really do anything that is environmentally-friendly	3

¹ 1,712 adults aged 16 and over in March 2010 were shown a list and asked 'Which would you say best describes your lifestyle?'

Source: 2010 Omnibus Survey on Public attitudes and behaviours towards the environment, Department for Environment, Food and Rural Affairs (Defra, 2011a)

In 2010 when adults in England were asked what best described their lifestyle, just under a third (32 per cent) agreed that they were environmentally-friendly in most or everything they did (**Table 2**). Just under two-thirds (64 per cent) reported they had performed at least one environmentally-friendly task, while only 3 per cent reported that they didn't do anything environmentally-friendly.

Energy

The amount of energy consumption in domestic homes is important. Increased energy use depletes non-renewable resources. Further impacts can be climate change and rising energy bills.

Domestic energy consumption in the UK increased by 18 per cent between 1970 and 2009, from 37 to 44 million tonnes of oil equivalent. This change was affected by a number of factors such as the increase in number of households, changes in energy efficiency and external temperatures. In each year over the period 1970 to 2008, around 60 per cent of energy was consumed for heating purposes. This energy use shapes the total domestic energy consumption trend and makes it sensitive to year-on-year winter temperature fluctuations.

Figure 1 Domestic energy consumption: by household and per person

United Kingdom

Index numbers (1971=100)

Source: Department of Energy and Climate Change (DECC, 2010a)

Since total energy consumption depends on the population and number of households, it is useful to analyse the changes in energy use per person and per household in order to capture the energy efficiency changes occurring. The energy consumption per household decreased by 13 per cent (from 1.87 to 1.64 tonnes of oil equivalent) between 1971 and 2009, and by 9 per cent (from 1.79 tonnes of oil equivalent) from 1990 (**Figure 1**). This fall was accompanied by an increase in loft insulation, cavity walls insulation and double glazing. However, domestic energy consumption per person rose by 11 per cent from 637 to 705 kilograms of oil equivalent per person between 1971 and 2009.

The major factors affecting domestic energy consumption are:

- Household size: For example, the amount of energy required by two people living in two households is greater than the amount of energy required by two people living in the same

household. The proportion of one-person households in Great Britain increased from 18 per cent in 1971 to 29 per cent in 2010 (ONS, 2011)

- **Housing stock:** In Great Britain in 2007, 36 per cent of the housing stock was built before 1939, 38 per cent between 1939 and 1975, and 26 per cent after 1975. Newer houses have to conform to much higher energy efficiency standards than previous building stock. However, considerable improvements in insulation standards in existing homes have offset some of the energy losses that would have otherwise been incurred. For example, the number of households with loft insulation increased by nearly a third (32.7 per cent) between 1976 and 2008, while the proportion of housing stock with double glazing increased by 31.2 per cent between 1976 and 2007. (DECC, 2010a)
- **External temperature:** When it is cold outside, more energy is used in the home for space heating.
- **Internal temperature:** Households are also kept warmer than they were in 1970, but more households have central heating which has made internal temperatures easier to manage. In 1971, 6.4 million homes were centrally heated; this had increased to 23.5 million by 2007, accounting for over 90 per cent of all households in Great Britain. Average internal temperatures in centrally heated homes increased from 14°C in 1971 to 17°C in 2008 (DECC, 2010a)

Table 3 Domestic energy consumption: by final use

United Kingdom	Million tonnes of oil equivalent					
	1970	1980	1990	2000	2007	2008
Space heating ¹	22.1	23.8	23.7	28.7	24.9	26.5
Water heating	9.9	10.0	10.1	10.7	11.4	10.9
Lighting and appliances	2.7	4.1	5.5	6.1	7.2	7.3
Cooking	2.2	2.0	1.5	1.3	1.3	1.3
Total	36.9	39.8	40.8	46.9	44.9	46.0

¹ The heating of a space, usually enclosed, such as a house or room.

Source: Department of Energy and Climate Change; Building Research Establishment (DECC, 2010a)

Most domestic energy consumption is used for space heating, which accounted for 58 per cent (26.5 million tonnes of oil equivalent) of final domestic energy use in the UK in 2008 (**Table 3**). Water heating accounted for almost a quarter (24 per cent) of total domestic energy consumption. While the amount of domestic energy increased, the proportion of energy used for domestic space and water heating each year remained fairly steady over the period 1970 to 2008.

The other major areas of domestic energy consumption are lighting and appliances and cooking. In 1970, the energy used for household lighting and appliances accounted for 7 per cent of total domestic energy consumption, compared with 16 per cent in 2008 (2.7 compared to 7.3 million tonnes of oil equivalent). Energy use for cooking in the home fell from 6 per cent to 3 per cent of total domestic energy consumption over the same period, perhaps partly explained by changes in lifestyle with the greater availability of convenience food.

In 1970, nearly half (48.7 per cent) of domestic energy came from solid fuels such as coal, coke and breeze, while just under a quarter came from natural gas (24.2 per cent). Electricity and petroleum supplied 18.0 per cent and 9.1 per cent respectively. However, by 2009, two-thirds (66.0 per cent) of domestic energy came from natural gas with solid fuels supplying just 1.7 per cent. Electricity and petroleum supplied 24.2 per cent and 6.9 per cent respectively. Renewable sources and waste supplied 1.1 per cent of domestic energy (DECC, 2010a).

Renewable energy is used to describe a source of energy or power that has the capacity to replenish itself. In June 2009, the UK signed up to the EU Renewable Energy Directive, which includes a target whereby the UK has to provide 15 per cent of energy by 2020 (for electricity, heat and transport) from renewable sources. This target is equivalent to a seven-fold increase in UK renewable energy consumption from 2008 levels (DECC, 2010b).

In 2009, renewable energy accounted for 6.7 per cent of all electricity generated in the UK. This was equivalent to 2.2 million tonnes of oil equivalent, an increase of around 17 per cent since 2008 and more than three times the level in 1990. Biomassⁱ accounted for the largest proportion of electricity generated from renewable sources (0.9 million tonnes of oil equivalent) followed by wind and wave power (0.8 million tonnes of oil equivalent) and hydroelectricity (0.5 million tonnes of oil equivalent). Over recent years, wind and wave power has been the fastest growing major renewable source, with its use in electricity generation increasing by nearly 10 times since 2000 (DECC, 2010c).

At the end of 2009, the UK had 1,648 sites generating electricity from renewable sources. 939 sites were in England, 436 in Scotland, 143 in Wales and 130 in Northern Ireland. The sites consisted of 536 wind and wave, 421 landfill gas, 400 hydro, 177 sewage gas and 114 other biofuel sites (DECC, 2010d).

Table 4 Proportion of gross electricity consumption generated by renewable sources:¹ EU comparison

					Percentages				
	1990	1998	2007	2008		1990	1998	2007	2008
Austria	65.4	67.9	60.5	62.0	Greece	5.0	7.9	6.8	8.3
Sweden	51.4	52.4	52.0	55.5	Bulgaria	4.1	8.1	7.5	7.4
Latvia	43.9	68.2	36.4	41.2	United Kingdom	1.7	2.4	5.1	5.6
Finland	24.4	27.4	26.0	31.0	Hungary	0.5	0.7	4.6	5.6
Slovenia	25.8	29.2	22.1	29.1	Belgium	1.1	1.1	4.2	5.3
Denmark	2.6	11.7	29.0	28.7	Czech Republic	1.9	3.2	4.7	5.2
Romania	23.0	35.0	26.9	28.4	Lithuania	2.5	3.6	4.6	4.6
Portugal	34.5	36.0	30.1	26.9	Poland	1.4	2.1	3.5	4.2
Spain	17.2	18.6	19.7	20.6	Luxembourg	2.0	2.5	3.7	4.1
Italy	13.9	15.6	13.7	16.6	Estonia	0.0	0.2	1.5	2.0
Slovakia	6.4	15.5	16.6	15.5	Cyprus	0.0	0.0	0.1	0.3
Germany ²	3.8	4.8	14.8	15.4	Malta	0.0	0.0	0.0	0.0
France	14.8	14.4	13.3	14.4					
Ireland	4.8	5.5	9.3	11.7	EU-27 average	11.9	13.4	15.5	16.7
Netherlands	1.4	3.4	7.5	8.9					

1 Electricity produced from renewable energy sources comprises the electricity generation from hydro plants (excluding pumping), wind, solar, geothermal and electricity from biomass/wastes. Gross national electricity consumption comprises the total gross national electricity generation from all fuels (including autoproduction), plus electricity imports, minus exports.

2 Germany 1990 does not include former GDR.

Source: Eurostat, table tsdcc330 (Eurostat, 2011)

In the EU-27, 16.7 per cent of gross electricity consumption was generated by renewable sources in 2008 (the latest data available), nearly one and a half times more than in 1990 and nearly three times higher than the UK (**Table 4**). The proportion of renewable sources used to generate electricity varied greatly across the EU-27. Austria generated the most electricity from renewable sources at around 62.0 per cent, followed by Sweden and Latvia at 55.5 per cent and 41.2 per cent respectively. All three of these countries have significant hydropower. Just under half of all the countries in the EU-27 generated less than 10 per cent of electricity from renewable sources in 2008.

Waste Management

Recycling prevents waste of materials and reduces the consumption of new raw materials and the use of energy. It also reduces air pollution and water pollution from incineration and landfill respectively. According to the Defra 2010 Omnibus Survey, 86 per cent of adults in England agreed that people have a duty to recycle their waste (Defra, 2011a).

In 2009/10, households in England generated around 23.7 million tonnes of waste which was 457 kilograms per person. Just under half (48.3 per cent) of the waste came from regular household collections; 39.7 per cent from household recycling; 7.5 per cent from civic amenity sites; and 4.5 per cent from other household sources not collected as part of the ordinary waste collection service. (Defra, 2010a).

Figure 2 **Household waste and recycling¹**

England
Kilograms per person

¹ Recycling includes composting and reused waste.

Source: Department for Environment, Food and Rural Affairs (Defra, 2010a)

In 2009/10, 40 per cent (181 kilograms per person) of household waste was recycled, composted or reused, while the remainder (275 kilograms per person) went to landfill or was incinerated (**Figure 2**). By comparison, in 1983/84, an average of 397 kilograms per person of household waste was produced, of which less than 1 per cent (3 kilograms per person) was recycled, composted or reused.

In 2009/10, around 9.4 million tonnes of household waste was collected for recycling in England. Waste for compost constituted the largest proportion collected for recycling, accounting for 40 per cent of the total (over 3.7 million tonnes). The next largest proportion was co-mingled materials (20 per cent), where several recyclable materials are collected in the same box or bin, for example, paper, cans and plastics. This was followed by paper and card (14 per cent). (Defra, 2011b).

Table 5 **Household waste recycling rates:¹ by region and waste disposal authority, 2009/10**

United Kingdom

Percentages

	Regional rate	Waste disposal authority			
		Lowest rate within region		Highest rate within region	
England	40	Ashford Borough Council	15	Staffordshire Moorlands District Council	62
North East	35	Middlesbrough Borough Council	23	Redcar and Cleveland Borough Council	43
North West	38	Manchester City Council MBC ²	19	Cheshire East Council	49
Yorkshire and the Humber	37	Sheffield City Council	27	Ryedale District Council	52
East Midlands	46	Bassetlaw District Council	23	East Lindsey District Council	56
West Midlands	40	Wyre Forest District Council	26	Staffordshire Moorlands District Council	62
East	46	Great Yarmouth Borough Council	26	Rochford District Council	61
London	32	London Borough of Lewisham	17	London Borough of Bexley	51
South East	40	Ashford Borough Council	15	South Oxfordshire District Council	61
South West	43	Council of the Isles of Scilly	19	Cotswold District Council	60
Wales	40	Bridgend County Borough Council	30	Denbighshire County Council	53
Scotland ³	35	Glasgow City Council	16	South Ayrshire	48
Northern Ireland	36	Strabane District Council	26	Magherafelt District Council	50

1 Includes composting and reused waste.

2 MBC is Metropolitan Borough Council.

3 Data for Scotland is 2008/09.

Source: Department for Environment, Food and Rural Affairs; Welsh Government; Scottish Environment Protection Agency; Department of Environment, Northern Ireland (Defra, 2010b; WAG 2010a; SEPA, 2009; DOENI, 2010)

Total household recycling as a proportion of total household waste in England was around 40 per cent in 2009/10 – the same rate as in Wales (**Table 5**). In Northern Ireland 36 per cent of household waste was recycled, while in Scotland 35 per cent of waste was recycled in 2008/09 (the latest data available). There continued to be a wide variation in household recycling rates achieved by regions and waste disposal authorities or councils across the UK. Among the English regions, the highest recycling rate was in the East of England and the East Midlands (both 46 per cent), while London had the lowest recycling rate (32 per cent).

Across the waste disposal authorities or councils in England, recycling rates varied from 15 per cent in Ashford Borough Council, to 62 per cent in Staffordshire Moorlands District Council. The waste authority with the highest recycling rate in Wales was Denbighshire County Council, where over half (53 per cent) of all household waste was recycled, while the lowest was in Bridgend County Borough Council (30 per cent). In Northern Ireland the highest recycling rate was in Magherafelt District Council (50 per cent) and the lowest in Strabane District Council (26 per cent).

In Scotland, in 2008/09, the highest rate was in South Ayrshire (48 per cent) and the lowest in Glasgow City Council (16 per cent).

Some waste is disposed of illegally. Fly-tipping is the illegal deposit of any waste onto land or a highway that has no licence to accept it. It can cause pollution to surrounding land and waterways and damage wildlife and ecosystems. It can also damage perceptions of the local environment (see figure 10 on page 23). In 2009/10, local authorities in England dealt with nearly 947,000 incidents of fly-tipping, with nearly half (49 per cent) occurring on the highway. Nearly 6 in 10 (58 per cent) cases of fly-tipping dealt with by local authorities were recorded as being a car-boot load or less or a small van load and 63 per cent of fly-tipping cases consisting of household waste (Defra 2010b). In Wales there were 48,179 incidents of recorded fly-tipping in 2009/10. Since 2007/08 fly-tipping incidents in Wales have occurred mainly in urban local authorities, by the highway, and mostly involve household waste (WAG 2010b).

Pollution

Many everyday activities produce pollutants which can harm the environment and in turn affect human health. Pollutants can also have a detrimental impact on the quality of the local environment. Pollution can take the form of chemical substances or energy, such as noise, heat, or light and can affect air, land and water.

Figure 3 Emissions of selected air pollutants

United Kingdom

Million tonnes

¹ See endnote.ⁱⁱ

Source: Department for Environment, Food and Rural Affairs; AEA Energy and Environment (Defra, 2011c)

Emissions of the major air pollutants in the UK have been falling since the 1970s (**Figure 3**). Carbon monoxide is formed from incomplete combustion of fuels that contain carbon. This is mostly from transport but notable contributions also come from industry and households. Release of this pollutant into the atmosphere is a health issue as it reduces the capacity of the blood to carry oxygen around the body. Between 1970 and 2009 emissions of carbon monoxide have decreased by 77 per cent from 9.8 million tonnes to 2.3 million tonnes. The reduction is due to improved engine efficiency in transport and the introduction in the early 1990s of catalytic converters in petrol-driven cars (Defra 2011d).

Sulphur dioxide and Nitrogen oxides are pollutants that irritate the airways of the lungs, increasing the symptoms of those suffering from lung diseases. Sulphur dioxide is emitted by combustion of fuels containing sulphur such as coal and heavy oils, largely by power stations and refineries. Between 1970 and 2009, emissions of sulphur dioxide decreased by 94 per cent from 6.4 million tonnes to 0.4 million tonnes. Nitrogen oxides are emitted mainly by road transport. Between 1970 and 2009, emissions of nitrogen oxides decreased by 58 per cent from 2.6 million tonnes to 1.1 million tonnes. These decreases are a largely a result of cleaner power stations, less use of coal and again the use of catalytic converters in cars (Defra 2011d).

Volatile organic compounds (VOCs)ⁱⁱ are emitted as gases from certain solids or liquids. Solvents, production processes, and the extraction and distribution of fossil fuels are the primary sources of emissions. Concentrations of many VOCs are consistently higher indoors (up to 10 times higher) than outdoors and are emitted by a wide range of products such as paints and lacquers, paint strippers, and cleaning supplies. Human health may be affected by cancer, central nervous system disorders, liver and kidney damage, reproductive disorders, and birth defects. Emissions of volatile organic compounds reached a peak in 1990 at 2.7 million tonnes and has since decreased by 69 per cent to 0.8 million tonnes in 2009. The decrease in emissions since the early 1990s reflects stricter limits on emissions from various sectors (Defra 2011d).

Figure 4 shows the number of days between 1987 and 2010 when there was moderate or higher pollution in urban and rural areas across the UKⁱⁱⁱ. The results are based on five pollutants, three of which have already been referred to in this chapter (carbon monoxide, nitrogen dioxide and sulphur dioxide) and ozone and particulate matter (PM₁₀)^{iv}. Ground level is formed from chemical reactions between precursors such as nitrogen oxides and volatile organic compounds in the presence of sunlight and can worsen the symptoms of lung diseases. PM₁₀ is particulate matter that is less than 10 microns in diameter (about a seventh of the thickness of a human hair) and originates from man-made sources including vehicle exhaust emissions, coal combustion and industrial processes, and also from natural sources such as sand or sea-spray. Both these pollutants can cause breathing difficulties through long term exposure. Both these pollutants can cause breathing difficulties through long term exposure.

Figure 4 **Average number of days of moderate or higher air pollution**

United Kingdom
Number of days

Source: Department for Environment, Food and Rural Affairs (Defra, 2011e)

The average number of days of moderate or higher air pollution for rural areas decreased between 2009 and 2010 to 22 days, the lowest since 1987. For urban areas, there was an average of 8 pollution days, down from 10 in 2009, and the lowest since records began in 1993. The rural

results are mostly driven by ozone and the urban results from ozone and PM₁₀. Urban areas tend to have lower levels of ground level ozone than rural areas due to higher levels of nitric oxide, which can destroy ozone. Both ozone and PM₁₀ are strongly influenced by weather and so vary over time, for example the high levels during the hot summers of 2003 and 2006.

Pollution incidents of air, water and land are monitored by the Environment Agency. In 2009 there were 770 recorded Category 1 or Category 2 pollution incidents^v in England and Wales. The number of incidents have almost halved since 2002 when there were 1,468 serious incidents reported. Of these Category 1 or 2 incidents in 2009, 483 were water pollution, 206 land pollution and 144 air pollution (some incidents result in pollution to more than one medium).

Pollution from the land and rivers can also impact on the seas around the UK. Sewage effluent, storm water overflows and river-borne pollutants impact on the microbiological quality of bathing waters which could affect human health. The European Commission's (EC) Bathing Water Directive (76/160/EEC^{vi}) gives mandatory values and guideline values for a number of physical, chemical and microbiological parameters at bathing waters, among which total and faecal coliforms are considered to be the most important. Coliforms are bacteria which inhabit the intestines of humans and other vertebrates.

Figure 5 Bathing water quality¹

United Kingdom

Percentages

¹ Compliance with guideline EC Bathing Water Directive 76/160/EEC during the bathing season. Bathing waters which are closed for a season are excluded for that year. Inland bathing waters were identified for the first time in 1998.

Source: Environment Agency; Scottish Environment Protection Agency; Northern Ireland Environment Agency (Defra, 2011f)

In 2010, 571 of the 587 coastal bathing waters in the UK met the mandatory (basic) standards of the European Bathing Water Directive, while 421 reached the guideline standard. Bathing waters complying to guideline standards in England increased from 41.1 per cent in 1995 to 73.0 per cent in 2010 (**Figure 5**). Compliance in Scotland increased from 21.7 per cent to 53.2 per cent and in Wales from 38.2 per cent to 85.0 per cent during the same period. Compliance in Northern Ireland

was 66.7 per cent in 2010, while in 1995 it had been 75.0 per cent. Compliance in Northern Ireland is much more variable than in the other UK countries because it has only 4 per cent of the UK coastal bathing waters and just one failure will have a marked impact (Defra 2011f).

Climate change

Climate change is defined as any long-term change in the pattern of weather, temperature, wind and rainfall. Opinion on climate change is divided. According to the Defra 2010 Omnibus Survey nearly 4 in 10 (37 per cent) adults aged 16 and over in England agreed with the statement ‘the effects of climate change are too far in the future to really worry me’, while 46 per cent disagreed. Men were more likely to agree with this statement compared with women at 41 per cent and 34 per cent respectively (Defra, 2011a).

Climate change may result from both natural and human causes. Some studies of long-term climate change have shown a connection between the concentrations of key greenhouse gases – carbon dioxide, methane and nitrous oxide in the atmosphere and mean global temperature. The accumulation of these gases in the atmosphere may cause heat from the sun to be trapped near the Earth’s surface – known as the ‘greenhouse effect’.

The Kyoto Protocol is an international legally-binding agreement to reduce the emissions of greenhouse gases which was adopted in 1997 under the UN Framework Convention on Climate Change. Under the Protocol, the UK has a legally binding target to reduce its emissions of a ‘basket’ of six greenhouse gases by 12.5 per cent over the period 2008 to 2012. This reduction is against 1990 emission levels for carbon dioxide, methane and nitrous oxide, and 1995 levels for hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. This means that to meet the UK’s Kyoto commitment, greenhouse gas emissions must be below 682.4 million tonnes of carbon dioxide (CO₂) equivalent over the first five-year commitment of the protocol (2008–2012).

The UK Climate Change Act 2008 included targets for the UK to reduce its greenhouse gases by at least 80 per cent by 2050 and at least 34 per cent by 2020. Like the Kyoto protocol it uses 1990 as its base year. It also establishes a system of five-year carbon budgets towards these targets. The first carbon budget covers 2008–12 and requires that the total UK greenhouse gas emissions do not exceed 3,018 million tonnes CO₂ equivalent^{vii}. This is equivalent to 603.6 million tonnes CO₂ equivalent per year during that period. (DECC, 2008). As an additional pre 2050 target it was proposed in May 2011 that the UK would cut its emissions by 50 per cent against 1990 levels between 2023 and 2027^{vii} (DECC 2011b).

Table 6 **Progress towards meeting Kyoto target and 2008–2012 carbon budget target**

United Kingdom

Million tonnes of carbon dioxide equivalent

	All greenhouse gases Kyoto protocol coverage ¹		All greenhouse gases UK Carbon Budgets coverage ²	
	Actual emissions	Emissions with allowance for trading	Actual emissions	Emissions with allowance for trading
Baseline	779.9	779.9	783.1	783.1
Target (2008–12)	682.4		603.6	
1990	778.3	778.3		
2000	671.2	671.2		
2008	620.5	600.6	616.0	596.7
2009	566.3	580.0	561.8	575.3

1 The Kyoto Protocol target includes emissions from the UK, Crown Dependencies and UK Overseas Territories. The target uses a narrower definition for the Land Use, Land-Use Change and Forestry sector (LULUCF).

2 UK Carbon Budgets were introduced in 2008. Figures include emissions solely from the UK and exclude emissions from Crown Dependencies and UK Overseas Territories. Figures include a wider Land Use, Land-Use Change and Forestry sector (LULUCF).

Source: Department of Energy and Climate Change; AEA Energy and Environment (DECC, 2011a)

In 2009, UK emissions of the Kyoto basket of greenhouse gases were estimated to be 566.3 million tonnes of carbon dioxide equivalent without allowance for trading^{viii} (**Table 6**). This was 8.7 per cent lower than in 2008 (620.5 million tonnes) and 27.2 per cent lower than in 1990 (778.3 million tonnes). Carbon dioxide is the main greenhouse gas accounting for around 84 per cent of total greenhouse gas emissions in 2009, equivalent to 473.7 million tonnes. This was around 9.8 per cent lower than 2008 (525.1 million tonnes).

Table 6 also shows the UK's performance against both the Kyoto protocol and the carbon budget target. UK emissions of the basket of six greenhouse gases covered by the Kyoto Protocol (including allowances for trading) were 25.6 per cent lower in 2009 than in the base year from 779.9 to 580.0 million tonnes of carbon dioxide equivalent. For the carbon budget target, UK greenhouse gas emissions (including allowances for trading) were 26.5 per cent lower in 2009 than in the base year, down from 783.1 to 575.3 million tonnes of carbon dioxide equivalent (DECC, 2011c)

Figure 6 **Source of greenhouse gas emissions¹**

United Kingdom

Index numbers (1990 = 100)

¹ Carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbon and sulphur hexafluoride.

Source: Office for National Statistics; AEA Energy and Environment (ONS 2010)

According to the Office for National Statistics' Environmental Accounts^{ix}, between 1990 and 2009, emissions of greenhouse gases from the non-household sector (UK companies and the public sector) fell by 26.9 per cent, while the household sector rose by 1.9 per cent (**Figure 6**). The largest proportional fall in the non-household sector was in manufacturing (47.5 per cent, equivalent to 81.8 million tonnes of CO₂ equivalent). The largest increase was in the transport and communication sector (32.1 per cent, equivalent to 21.0 million tonnes of CO₂ equivalent). Between 2008 and 2009 emissions from the non-household sector fell by 9.6 per cent, while the household sector fell by 4.0 per cent. The faster fall in greenhouse gases emissions in 2009 compared to previous years may be due to the contraction in economic activity.

Examples of the impact of climate change include changes in surface temperature, in the thermal growing season, in annual precipitation and rises in sea levels.

Figure 7 **Difference in average surface temperature: deviation from 1961–1990 average¹**

Global and Central England²
Degrees Celsius

1 Data have been smoothed using a 21-point binomial filter to remove short-term variation from the time series and to get a clearer view of the underlying changes.

2 Central England temperature is representative of a roughly triangular area of the UK enclosed by Bristol, Lancashire and London.

Source: Hadley Centre for Climate Prediction and Research (DECC, 2010e)

Global thirty-year average surface temperatures^x have risen by around 0.7°C since the end of the 19th century. Since 1979 temperatures have been consistently above the 1961–1990 average temperature, increasing from 0.02°C above average in 1979 to 0.42°C above average in 2010 (**Figure 7**).

Average surface temperature in 'Central England' (a triangular area of the UK enclosed by Bristol, Lancashire and London) has risen by about 0.7°C since the mid 19th century. Since 1987 yearly average temperature has been consistently above the 1961–1990 average reaching a high of 0.98°C above in 2004 before decreasing to 0.42°C above in 2010. However, 2010 was the coldest year since 1986, mainly due to cold weather in January, February and December. The cold weather experienced in December made it one of the coldest calendar months since 1890.

The warmer temperatures over 'Central England' have resulted in the thermal growing season (a period of time each year during which plants can grow) generally becoming longer. The thermal growing season is defined as beginning when the temperature exceeds 5°C on five consecutive days and ending when the temperature is below 5°C for five consecutive days. There has been an increase in growing season length since 1980, largely due to the earlier onset of spring. The earliest start of the thermal growing season was in 2002 when it began on 13 January. The longest growing season in the 239-year series occurred in 2000 with 330 days. The shortest growing

season was 181 days in 1782 and 1859. In 2010 the thermal growing was 255 days (DECC, 2010e).

Higher temperatures and higher sea-surface temperatures caused by the increased emissions of greenhouse gases in turn increase the water holding capacity of the atmosphere resulting in more precipitation. Across the UK, average annual rainfall varies from around 5,000 millimetres in parts of the western highlands of Scotland to around 500 millimetres in parts of East Anglia and on the borders of the Thames estuary.

Figure 8 Winter and summer precipitation¹

England & Wales

Percentage change from 1961–1990 average

¹ Winter is December to March, summer is July to August. Data have been smoothed using a 21-point binomial filter to remove short-term variation from the time series and to get a clearer view of the underlying changes.

Source: Hadley Centre for Climate Prediction and Research (DECC, 2010e)

The past decade has seen a considerable rise in the amount of summer rainfall (July to August) in England and Wales and since 1996 it has increased year on year (**Figure 8**). Summer rainfall since 2006 has been at least 22 per cent higher than the 1961–1990 average and in 2010 was higher than it has been since 1892, at 32.3 per cent higher than the 1961–1990 average. There have been less rapid changes in winter rainfall (December to March). Since 2004 winter rainfall has been from 0.2 per cent to 6.5 per cent lower than the 1961–1990 average.

Since the mid-19th century, sea level around the world has been rising. Sea level change is a serious impact of climate change as so many people around the world live near or next to the sea. The three main reasons for this are thermal expansion^{xi}, the melting of glaciers and ice caps, and the loss of ice from the Greenland and West Antarctic ice sheets. A report by the Department for Energy and Climate Change looks at the sea level records at Aberdeen, Liverpool, Newlyn, North Shields and Sheerness as they are the longest sea level records available in the UK. In the past few decades, North Shields (in Newcastle) and Sheerness (in Kent) have seen the largest rises in sea level, compared with 1920 base levels. Since 1998, an increase of at least 190mm compared

with 1920 was seen at both these sites. Until the mid-1980s, sea levels in Aberdeen have varied with 1920 levels. On average, in the past two decades sea levels are more than 60 mm higher than the baseline. Between 2006 and 2008 sea levels have been on average higher than in 1920 by more than 100 mm. Sea levels in Liverpool have also increased dramatically in recent years (there is no data for 2005, 2006, 2008 or 2009). Since the 1980s, sea levels have regularly been more than 100 mm higher than 1920 levels. Two of the largest rises in sea level were in 2004 and 2007 (231 mm and 279 mm respectively) (DECC, 2010e).

Local environment, countryside and wildlife

According to the 2011 Lifestyle Omnibus Survey carried out by Defra, 85 per cent of adults aged 16 and over in England felt that being proud of their local environment was important (Defra, 2011a).

Figure 9 Problematic local environment issues,¹ 2009

England

Percentages

¹ Respondents (1,155 on-street face-to-face interviews April 2009) were shown a show card and asked 'Thinking now about what you actually see in your local area, please indicate how much of a problem each of the following issues are? Respondents had to score each issue on a scale of 1 to 5 where 5 was a major problem and 1 was no problem. The percentages shown in the chart are those that rated the issues as 5 or 4.

Source: *Keep Britain Tidy (KBT, 2009)*

There are many issues that affect the local environment and people's perceptions of it. Dog fouling was considered to be the most problematic local environment quality issue to some extent to just over 4 in 10 (41 per cent) adults in England aged 16 and over in 2009 (**Figure 9**). Just over a third (34 per cent) felt that litter was a problematic issue to some extent, while around a quarter reported that vandalism and fly-tipping was a problem to some extent (26 per cent and 23 per cent respectively). Conversely around 1 in 10 people reported that street lighting (13 per cent), fly-posting (12 per cent) and abandoned vehicles (10 per cent) were a problem to some extent. According to the same Keep Britain Tidy report, the most problematic litter types that were rated a

specific problem in the respondents local environment were cigarettes (54 per cent), confectionary wrappers (45 per cent), chewing gum or cans and bottles (both 44 per cent).

With the majority of people living in an urban area in the UK green space can be an important part of people's local environment. According to Defra, over 6 in 10 (63 per cent) of adults aged 16 and over in England in 2011 reported that it was very important to have public gardens, parks, commons or other green space nearby. A further 30 per cent stated it was fairly important. Over 9 in 10 (92 per cent) visited a green space at some time, while 56 per cent did so weekly or more frequently. Just under 3 in 10 (29 per cent) stated that they visited green space one or two days a week and 15 per cent reported that they visited three to five days a week (Defra, 2011a).

Figure 10 **Reasons for spending time in green spaces,¹ 2011**

England

Percentages

¹ 1,769 adults aged 16 and over were asked in March 2011 'What are the three most important reasons for spending time in public gardens, parks, commons or other green spaces'?

Source: Department for Environment, Food and Rural Affairs (Defra, 2011a)

Just over 7 in 10 (71 per cent) adults aged 16 and over in England 2011 reported that the most important reason for visiting a green space was fresh air (**Figure 10**). Over 4 in 10 (43 per cent) felt that the open space was an important reason to visit. Over a third (34 per cent) felt that scenery was important, while around a quarter reported that tranquillity, plants and wildlife and leisure opportunities were important reasons to visit a green space (26 per cent, 24 per cent and 23 per cent respectively). People in households with children were significantly more likely than people in households without children to visit green spaces for leisure opportunities (35 per cent and 18 per cent respectively). People in households without children were significantly more likely than people in households with children to visit green spaces for the scenery (37 per cent and 27 per cent respectively).

In 2010, just over half (51 per cent) of land in the UK was either grass or rough grazing, while a fifth (20 per cent) was covered by crops or left as bare fallow. Urban land or 'land not otherwise specified' made up 15 per cent of the UK, while around 13 per cent of the UK land area was forest and woodland. Inland water covered 1 per cent of UK land area.

Table 7 Woodland area: by UK country

United Kingdom

	Thousand hectares					Percentage of total surface area ¹				
	England	Wales	Scotland	Northern Ireland ²	United Kingdom	England	Wales	Scotland	Northern Ireland ²	United Kingdom
1905	681	88	351	15	1,140	5.2	4.2	4.5	1.1	4.7
1924	660	103	435	13	1,211	5.1	5.0	5.6	1.0	5.0
1947	755	128	513	23	1,419	5.8	6.2	6.6	1.7	5.9
1965	886	201	656	42	1,784	6.8	9.7	8.4	3.1	7.4
1980	948	241	920	67	2,175	7.3	11.6	11.8	4.9	9.0
1995–99	1,097	287	1,281	81	2,746	8.4	13.8	16.4	6.0	11.3
2010 ³	1,294	304	1,385	88	3,070	9.9	14.6	17.8	6.5	12.7
2011 ³	1,297	304	1,390	88	3,079	10.0	14.7	17.8	6.5	12.7

1 Percentage of the total surface area excluding inland water.

2 For Northern Ireland, 1905 figure is estimate for Ulster 1908.

3 Figures for England, Wales and Scotland are based on data obtained from the National Forest Inventory.

Source: Forestry Commission, Forest Service (FC, 2010)

At the end of March 2011, the area of woodland in the UK was 3.1 million hectares (**Table 6**). Just under half (45 per cent) was in Scotland (equivalent to 1.4 million hectares), 42 per cent in England (1.3 million hectares), 10 per cent in Wales (0.3 million hectares) and 0.1 million hectares in Northern Ireland. Since the early 1900s areas of woodland have increased in all the UK countries. Woodland in Scotland has increased by 1.0 million hectares between 1905 and 2011 and in England by 0.6 million hectares.

The Forestry Commission / Forest Service own around 28 per cent of the woodland in the UK but this proportion varies among UK countries. In Northern Ireland around 69 per cent of woodland was owned by the Forest Service, compared to 16 per cent owned by the Forestry Commission in England (FC, 2011).

Wild bird populations are a good indicator of the general state of the countryside and its associated wildlife. They occupy a range of different habitats and as they tend to be near to, or at the top of the food chain, their level of population reflects changes in insects, plants and other aspects of the environment.

Figure 11 Population of wild birds:¹ by species group

United Kingdom

Index numbers (1970=100)

¹ It was not possible to complete the Breeding Birds Survey in 2001 because of restrictions imposed during the outbreak of foot-and-mouth disease. Estimates for that year are based on the average for 2000 and 2002 for individual species. See endnote^{xii} for methodology and wild bird species.

Source: British Trust for Ornithology; Royal Society for the Protection of Birds; Department for Environment, Food and Rural Affairs (Defra, 2011g)

Between 1970 and 2009 the combined population for all wild-bird species^{xiii} in the UK has remained relatively stable (**Figure 11**). However, since the 1970s breeding populations of some common farmland and woodland birds have decreased, while the seabird population has risen.

The number of farmland birds declined by 49 per cent between 1970 and 2009. The decline was mostly driven by specialist farmland birds such as the grey partridge, turtle dove, starling, tree sparrow and corn bunting populations whose populations have declined by over 70 per cent over this period. The number of woodland birds has decreased by 24 per cent between 1970 and 2009. Populations of some specialist woodland birds such as the wood warbler, willow tit and tree pipit have declined by over 70 per cent since 1970. However some specialist species such as the blackcap, great spotted woodpecker, green woodpecker and nuthatch saw their population more than double over the same period. The seabird population has increased by around 28 per cent since 1970, but different species have had mixed fortunes. For example, kittiwakes have declined by around 45 per cent since 1970 but conversely guillemots have increased by 126 per cent over the same period (Defra, 2011g).

Fish are a vital element of the ocean's ecosystem. Estimates of spawning stock biomass (the total weight of all sexually mature fish in a population) are used to determine whether the population of each stock is at a sustainable level. Historical trends in spawning stock biomass vary from species to species and fluctuate over relatively short periods depending on the success of breeding from year to year. Some stocks are at or near historical low levels as a result of both over-exploitation and natural factors, while other stocks have recovered due to reductions in fishing activity and/or more favourable environmental conditions leading to more successful spawning. Pollution of the

sea has a much smaller impact on fish biomass than fishing or natural processes because concentrations of contaminants in sea water are generally low.

Figure 12 North sea fish stocks¹

¹ Spawning stock biomass (the total weight of all sexually mature fish in a population).

Source: Centre for Environment, Fisheries and Agriculture Science; International Council for the Exploration of the Sea

For fisheries to be both sustainable and productive, they must be managed in a way that minimises the risk of depleting spawning stocks so that the numbers of young fish produced each year is impaired. For example the spawning stock biomass of cod, a popular food in the UK, has declined substantially over time in waters around the UK due to a combination of overfishing and less favourable environmental conditions for spawning. The spawning stocks of cod in the North Sea and eastern English Channel declined from around 167,000 tonnes in 1964 to an all time low of 35,000 tonnes in 2006, a decrease of 79 per cent (**Figure 12**). The cod biomass recovered slightly by 2009 to around 69,000 tonnes. The North Sea herring stock was heavily over-fished in the 1970s resulting in a 98 per cent decline in spawning stock biomass from just over 2 million tonnes in 1964 to 48,000 tonnes in 1977. A closure of the fishery between 1978 and 1982 was followed by a rapid increase in biomass to over 1 million tonnes by the late 1980s. During the 1990s a combination of increasing fishing activity and declining numbers of young fish entering the stock caused another reduction in biomass. However, management actions reduced the amount of fishing after the mid 1990s and the stock recovered again to around 1.8 million tonnes by 2004, with a more recent decline due to environmental factors.

During 2010, the International Council for the Exploration of the Sea (ICES) provided quantitative advice on spawning stock biomass and fishing mortality for 16 finfish stocks in waters around the UK in relation to reference points for sustainability. These represent a wide range of different stocks and fisheries including demersal roundfish (cod, haddock, and saithe), flatfish (sole, plaice), pelagic (mackerel, herring) and widely dispersed (blue whiting). In 2009, 38 per cent of the 16 stocks were estimated to be at full reproductive capacity and being harvested sustainably. During

the period 1990 to 1999, the percentage varied around much lower values of 0 per cent to 20 per cent (ICES, 2010).

Environmental taxes

Environmental taxes include those on energy such as fossil fuel duty and climate change levy; taxes on transport such as air passenger duty and vehicle excise duty; those on pollution such as landfill tax and those on resources such as the aggregates levy. According to a survey conducted for the Green Fiscal Commission in 2007, just over half (51 per cent) of adults aged 15 and over in Great Britain supported 'green' taxes in principle, while just under a third (32 per cent) opposed them (GFC,2007).

Figure 13 Proportion of environmental taxes¹ paid: by industry sector, 2008

United Kingdom
Percentages

Environmental tax receipts amounted to £39.0 billion

¹ See endnote ^{vii} on environment taxes.

² Includes agriculture; education, health and social work; energy, gas and water supply; mining and quarrying; public administration; rest of the world; other business services and other services.

Source: *Environmental Accounts*, Office for National Statistics (ONS, 2010)

In 2008, environmental tax receipts amounted to £39.0 billion. UK households contributed the most towards environmental tax revenue, paying over half: £20.9 billion or 53.7 per cent (**Figure 13**). The transport and communication industries paid £6.3 billion (16.1 per cent), while the wholesale and retail trade paid £2.6 billion (6.6 per cent). The manufacturing sector paid £2.1 billion and the construction sector £1.7 billion.

Environmental tax receipts in 2010 were £41.4 billion, 8.0 per cent of all taxation revenue. The largest proportion of the environmental taxes were from duty on hydrocarbon oils, for example, petrol and diesel (at 65.3 per cent) followed by vehicle excise duty (13.8 per cent). Environmental taxation as a proportion of Gross Domestic Product (GDP)^{xiv} has fallen from 3.5 per cent in 1998 to 2.8 per cent in 2010.

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Notes

i Biomass

Biomass is organic materials, such as wood by-products and agricultural wastes, which can be burned to produce energy or converted into a gas and used for fuel.

ii Volatile organic compounds

Volatile organic compounds (VOCs) are ozone precursors and comprise a wide range of chemical compounds including hydrocarbons, oxygenates and halogen containing species. Methane (CH₄) is an important component of VOCs but its environmental impact derives principally from its contribution to global warming. The major environmental impact of non-methane VOCs lies in their involvement in the formation of ground level ozone. Most VOCs are non-toxic or are present at levels well below guideline values. Others such as benzene and 1, 3-butadiene, are of concern because of their potential impact on human health.

iii Types of monitoring sites

Rural sites are in the open country away from roads, industrial areas and where people live.

Urban background sites are in urban locations (for example, parks and urban residential areas) away from emission sources.

Roadside sites are sites with sample inlets between one metre of the edge of a busy road and the back of the pavement (usually five metres from the roadside).

iv PM₁₀

PM₁₀ is airborne particulate matter. Specifically, it is that fraction of 'black smoke' that is thought most likely to be deposited in the lungs. It can be defined as the fraction resulting from a collection from black smoke by a size selective sampler that collects smaller particles preferentially, capturing 50 per cent of 10 micron aerodynamic diameter particles, more than 95 per cent of 5 micron particles, and less than 5 per cent of 20 micron particles.

v Pollution incidents

The Environment Agency defines four categories of pollution incidents:

Category 1: The most severe incidents, which involve one or more of the following:

- potential or actual persistent effect on water quality or aquatic life
- closure of potable water, industrial or agricultural abstraction necessary
- major damage to aquatic ecosystems
- major damage to agriculture and/or commerce
- serious impact on man, or
- major effect on amenity value

Category 2: Severe incidents, which involve one or more of the following:

- notification to abstractors necessary
- significant damage to aquatic ecosystems
- significant effect on water quality
- damage to agriculture and/or commerce
- impact on man, or
- impact on amenity value to public, owners or users

Category 3: Minor incidents, involving one or more of the following:

- a minimal effect on water quality
- minor damage to aquatic ecosystems
- amenity value only marginally affected, or
- minimal impact on agriculture and/or commerce

Category 4: Incidents where no impact on the environment occurred.

vi Bathing waters

Bathing water can be any running or still freshwater and sea water (except for water intended for therapeutic purposes and water used in swimming pools) where bathing is explicitly authorised by national authorities and where bathing is traditionally practiced by a large number of bathers. Sampling begins two weeks before the start of the bathing season and is carried out every other week at places where the daily average of

bathers is highest throughout the season. The bathing season runs from the 15 May until 30 September in England and Wales and from 1 June to 15 September in Scotland and Northern Ireland.

Coliforms are microorganisms found in the intestinal tract of animals and human beings. When found in water it indicates fecal pollution and potentially hazardous bacterial contamination. Faecal streptococci are also natural inhabitants of the gut of humans and other warm-blooded animals. However, as they have a greater ability to survive outside of the gut, they could be used as an indicator of less recent contamination by sewage.

Directive 76/160/EEC concerning the quality of bathing waters sets the following mandatory standards for the coliform parameters:

- 10,000 per 100 millilitres for total coliforms
- 2,000 per 100 millilitres for faecal coliforms

The directive requires that at least 95 per cent of samples taken for each of these parameters over the bathing season must meet the mandatory values. In practice this has been interpreted in the following manner: where 20 samples are taken only one sample for each parameter may exceed the mandatory values for the water to pass the coliform standards; where less than 20 samples are taken none may exceed the mandatory values for the water to pass the coliform standards.

The Bathing Water Directive also sets more stringent guideline microbiological standards. To comply with the tightest guideline standard, bathing waters must not exceed values of 500 total coliforms per 100 millilitres and 100 faecal coliforms per 100 millilitres in 80 per cent of water quality samples, and 100 faecal streptococci per 100 millilitres in 90 per cent of samples taken.

The Bathing Water Directive is being updated by the revised Bathing Water Directive (2006/7/EC), which will be fully implemented by 2015. The revised Directive sets tighter water quality standards based on two parameters, E.coli and intestinal enterococci. There will be four water quality classifications based on a four year data set: Excellent, Good, Sufficient and Poor. The Environment Agency will begin monitoring using the new standards in 2012 and the first classifications under the revised Directive will be issued in 2015. Until 2014, Defra will continue to report the bathing water results using the current standards.

There will be a new requirement for information about water quality and potential sources of pollution to be available at all bathing waters, with effect from 2012.

vii **The UK Climate Change Act 2008**

This Act includes legally binding targets for the UK to reduce its greenhouse gas emissions by at least 80 per cent by 2050, and by at least 34 per cent by 2020, both below base year levels. It also establishes a system of binding five-year carbon budgets to set the trajectory towards these targets.

Like the Kyoto Protocol, the Act uses a base year which is comprised of 1990 for carbon dioxide, methane and nitrous oxide, and 1995 for fluorinated compounds. However, this baseline figure differs from that used for reporting against the Kyoto Protocol; the baseline in the Act is revised each year to incorporate revisions made, whereas the Kyoto Protocol baseline is fixed.

The Government set the first three carbon budgets in May 2009, covering the periods 2008-12, 2013-17 and 2018-2022. The first of these budgets requires that total UK greenhouse gas emissions do not exceed 3,018 million tonnes CO₂ equivalent over the five-year period 2008-12, which is about 23 per cent below the base year level on average over the period.

Summary of UK carbon Budgets, 2008-2022

	Base year	Budget 1	Budget 2	Budget 3
	(actual emissions)	2008-2012	2013-2017	2018-2022
Budget level Metric Tonne Carbon Dioxide Equivalent (MtCO ₂ e)		3018	2782	2544
Equivalent average annual emissions (MtCO ₂ e)	783.1	603.6	556.4	508.8
Percentage reduction below base year levels		23	29	35

A fourth carbon budget of 1950 MtCO₂e for the period 2023 to 2027 was proposed on 17th May 2011, for more information see http://www.decc.gov.uk/en/content/cms/news/pn11_41/pn11_41.aspx

viii **Emissions Trading**

The UK (as with all other Members States in the EU) has a cap (European Union Emissions Trading System – EU ETS) for emissions it can emit (this is mainly from power stations and heavy industry). For example, in 2009, the UK's total EU ETS emissions were less than its cap. This meant that the UK was able to either sell or carry over more emissions or allowances than they purchased or brought forward. For more detail about how the EU ETS works, see "Emissions Trading" section of the Statistics Release

www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=Statistics/climate_change/1214-stat-rel-uk-ghg-emissions-2009-final.pdf&minwidth=true

ix **Environmental accounts**

Environmental Accounts are satellite accounts to the National Accounts. As such they use similar concepts and classifications of industry to those employed in the National Accounts. They reflect the frameworks recommended by the European Union and United Nations for developing such accounts. For more information, please refer to the UK Environmental Accounts website.

ONS Environmental Accounts measure air emissions on a UK residents basis. This means that all emissions generated from transport at home and abroad by UK resident households and businesses are included. Emissions related to non-resident households and businesses travel and transport within the UK are excluded. Producing statistics on this basis allows for a more consistent comparison with key National Accounts indicators such as GDP and Gross Value Added.

x **Average temperatures and rainfall**

The World Meteorological Organisation (WMO) requires the calculation of average temperatures for consecutive periods of 30 years, with the latest covering the period 1961–90. Thirty years was chosen as a period long enough to eliminate year-to-year variations.

xi **Thermal expansion**

The oceans have an enormous heat storage capacity, but if global atmospheric temperatures rise, the oceans absorb heat and expand. This is called thermal expansion. A greater volume of ocean water due to thermal expansion will lead to a rise in sea level.

xii **Wild bird methodology**

The indices have been compiled in conjunction with the Royal Society for the Protection of Birds (RSPB), the British Trust for Ornithology (BTO) and the Joint Nature Conservation Committee (JNCC) from a wide range of sources, principally the Common Birds Census (from 1966 to 2000), the BTO/JNCC/RSPB Breeding Bird Survey (from 1994 to 2009), the BTO/Environment Agency for England and Wales (EA) Waterways Bird Survey (from 1974 to 2007), the BTO/EA Waterways Breeding Bird Survey (from 1998 to 2008), the BTO/Wildfowl & Wetland Trust/RSPB/JNCC Wetland Bird Survey counts, and the Seabird Monitoring Programme and the Periodic Seabird censuses supplied by JNCC, RSPB, the Seabird Group, SOTEAG (Shetland Oil Terminal Environmental Advisory Group) and other partners. The census sources provide an indication of the average annual rate of change between censuses for some species, and this is assumed to apply to each year between censuses.

xiii **Wild bird species**

Species in *italics* are specialists, while the remainder are generalists. A generalist species is able to thrive in a wide variety of environmental conditions and can make use of a variety of different resources. Specialist species can only thrive in a narrow range of environmental conditions and/or have a limited diet.

- **Woodland species (38):** Blackbird, *Blackcap*, Blue Tit, Bullfinch, *Capercaillie*, Chaffinch, *Chiffchaff*, Coal Tit, *Crossbill*, Dunnock, *Garden Warbler*, *Goldcrest*, *Great Spotted Woodpecker*, Great Tit, *Green Woodpecker*, *Hawfinch*, Jay, *Lesser Spotted Woodpecker*, *Lesser Redpoll*, Lesser Whitethroat, Long-tailed Tit, *Marsh Tit*, *Nightingale*, *Nuthatch*, *Pied flycatcher*, *Redstart*, Robin, *Siskin*, Song Thrush,

Sparrowhawk, Spotted Flycatcher, Tawny Owl, Tree Pipit, Treecreeper, Willow Tit, Willow Warbler, Wood Warbler, Wren.

- **Farmland species (19):** *Corn Bunting, Goldfinch, Greenfinch, Grey Partridge, Jackdaw, Kestrel, Lapwing, Linnet, Reed Bunting, Rook, Skylark, Starling, Stock Dove, Tree Sparrow, Turtle Dove, Whitethroat, Woodpigeon, Yellowhammer, Yellow Wagtail.*
- **Seabird species (19):** Arctic Skua, Arctic Tern, Atlantic Puffin, Black-headed Gull, Black-legged kittiwake, Common Guillemot, , Common Tern, European Shag, Great Black-backed Gull, Great Cormorant, Great Skua, Herring Gull, Lesser black-backed Gull, Little Tern, Mew Gull, Northern Fulmar, Northern Gannet, Razorbill, Sandwich Tern.

^{xiv} **Gross Domestic Product**

Gross Domestic Product is a measure of the total economic activity occurring in the UK. It can be measured in three ways:

- **Production**
Measures the Gross Domestic Product as the sum of all the Value Added by all activities which produce goods and services. (see Gross Value Added).
- **Income (GDP(I))**
Measures the Gross Domestic Product as the total of incomes earned from the production of goods and services.
- **Expenditure (GDP(E))**
Measures the Gross Domestic Product as the total of all expenditures made either in consuming finished goods and services or adding to wealth, less the cost of imports.