A National Statistics Publication for Scotland

Key Scottish Environment Statistics 2010

September 2010

natural scotland
SCOTTISH GOVERNMENT

Introduction

Welcome to the tenth edition of the annual publication **'Key Scottish Environment Statistics'**. This is now only available as a web publication.

This publication aims to provide an easily accessible reference document which offers information on a wide range of environmental topics. It covers key data sets on the state of the environment in Scotland, with an emphasis on the trends over time wherever possible. The data are supplemented by text providing brief background information on environmental impacts, relevant legislation and performance against national and international targets. A PowerPoint version of this publication is also available on our website.

http://www.scotland.gov.uk/Topics/Statistics/Browse/Environment/Publications

Revisions and Further Information

This publication provides a snapshot of the data as available at September 2010 and will not be revised throughout the year. An **internet database, Scottish Environment Statistics Online (SESO),** accompanies this publication and contains additional statistics to those presented here. Any data revisions will be made in SESO and identified in the Recent changes page. SESO also includes detailed metadata and information on data quality. This database is continually updated throughout the year so in order to obtain the most up-to-date statistics please refer to the address below.

http://www.scotland.gov.uk/seso

Data Quality

This is a National Statistics publication.

National Statistics are certified as meeting the high professional standards within the UK Statistics Authority's Code of Practice for Official Statistics:

http://www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html.

Not all of the figures included in this publication are designated as National Statistics. Some of the figures included are produced by other organisations but we have quality assured them and believe them to be of good quality. They have previously been available on request from these organisations. Further information on the source of a dataset can be obtained via the source links at the bottom of each page in the publication.

Sources of Further Environmental Statistics

A general directory of websites that provide environmental statistics for Scotland is available at:

http://www.scotland.gov.uk/Topics/Statistics/Browse/Environment/Links

For some of the statistics included in the publication, reference is made to targets set by the Scottish Government; more details can be found on the Scotland Performs website at:

http://www.scotland.gov.uk/About/scotPerforms

Further environmental statistics, including some data at the local authority level and more detailed geographies, can be found on Scottish Neighbourhood Statistics.

http://www.sns.gov.uk/

Publication Key

Through out this publication, a '**-**' represents figures that are not available and '**R**' indicates that figures have been revised since previous publications. An '**R**' in the page title indicates that the full time series has been revised since the previous publication. A '**P**' indicates that data is provisional and subject to confirmation. It should also be noted that throughout this publication, figures and percentages may not sum exactly due to rounding. In tables, percentages are shown in italics.

User Feedback

Our aim is to produce a user-friendly and useful publication. It would be helpful to us and we would be very grateful if you would let us know what you think about *Key Scottish Environment Statistics* and how you make use of our statistics. If you also wish to send further comments on the format and contents of this publication they would be most welcome. If there are any other environmental statistics that you wish to be included in this publication or published elsewhere, please use the below details to contact us.

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Contents

Background

Public Attitudes

Global Atmosphere

Air Quality

Water

Marine

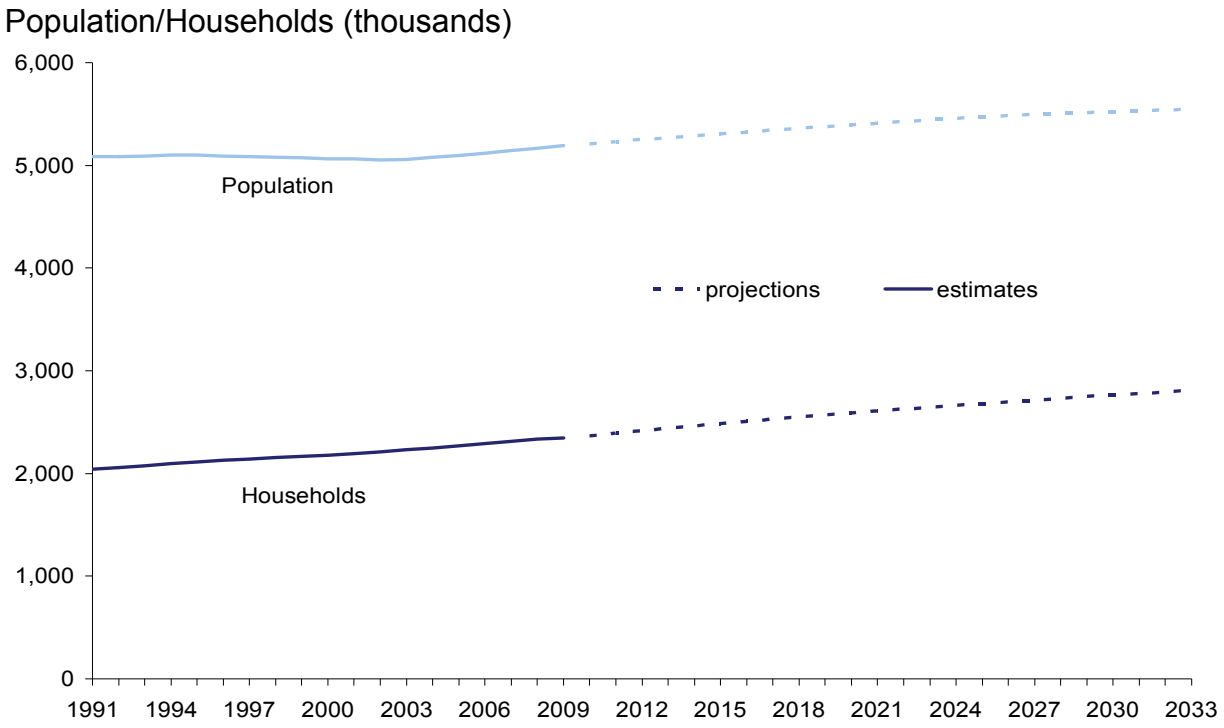
Radioactivity

Waste

Land

Biodiversity

Population and Households: 1991-2033



Thousands

	Mid-year Estimates					Projections
	1991	**2000**	**2007**	**2008**	**2009**	**2033**
Population	5,083	5,063	5,144	5,169	5,194	5,544
Households	2,043	2,177	2,314	2,331	2,344	2,813

Population and households are important consumers of energy and water and therefore have implications for the environment. The population of Scotland declined steadily through most of the 1980s, followed by small increases in the seven years up to 1995. The population then decreased to 5.05 million in 2002 but has since increased to 5.19 million in 2009.

The 2008-based projections indicate that population will rise by 7% to 5.54 million between 2008 and 2033, whereas the overall UK population is set to increase by 17% in the same period.[1]

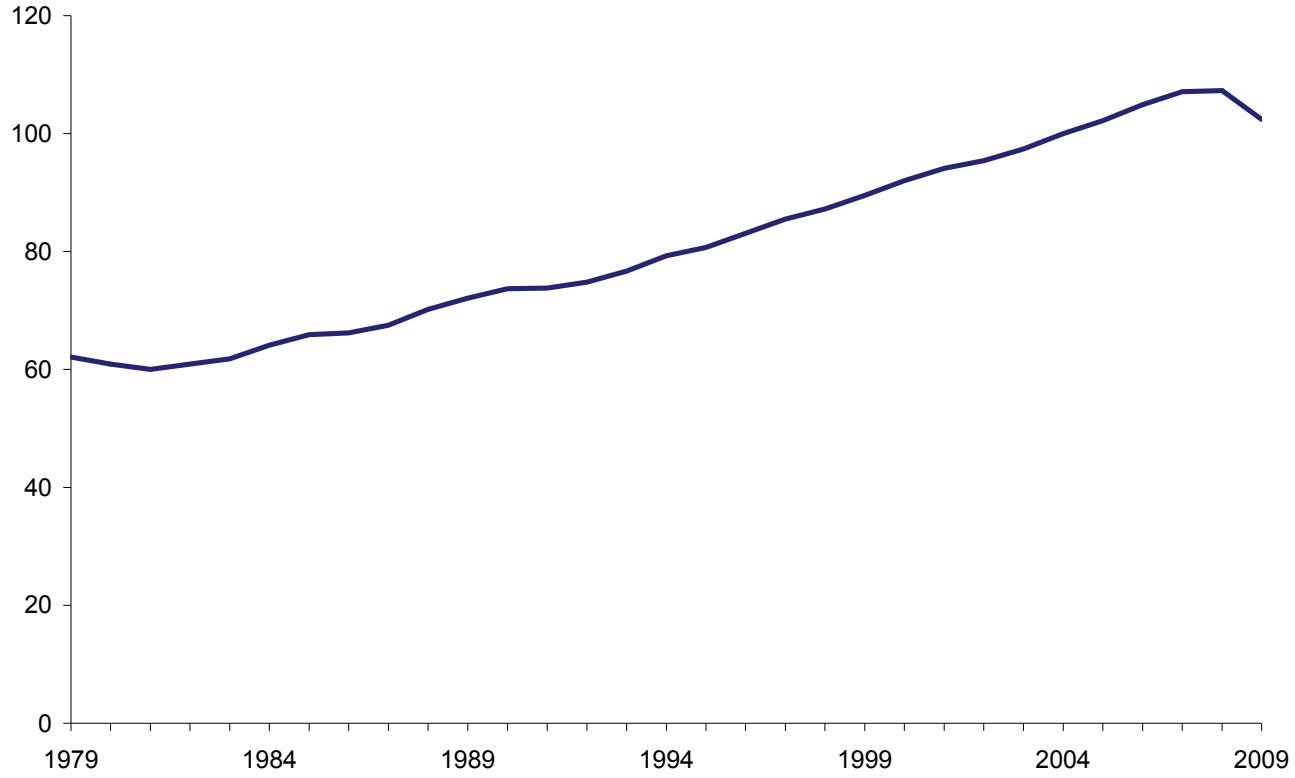
The number of households rose by around 300,000 (15%) between 1991 and 2009, reflecting the fact that household structures are changing, with fewer people per household. Projections based on 2008 figures suggest that by 2033, the number of households in Scotland will increase by 21% to 2.8 million. This will contribute significantly to the demand for housing, not all of which can be accommodated on previously developed land.

In 2007, the Scottish Government set a target in their Economic Strategy[2], to match average European (EU15) population growth over the period from 2007 to 2017. In 2008-09, Scotland's population growth was 0.02 percentage points lower than the EU15's, compared to 0.14 percentage points lower in 2007-08.[3]

Source: General Register Office for Scotland

Gross Domestic Product (GDP)[R,4]: 1979-2009

Scottish GDP at basic prices (2004=100)



	1979	1985	1990	1995	2000	2005	2008	2009
Scottish GDP (2004=100)	61.2	65.9	73.7	80.7	92.0	102.2	107.3	102.4

Gross Domestic Product (GDP) is an important measure of the activity and strength of the economy. However, a high GDP does not necessarily imply an efficient use of resources.

Between 1979 and 2009 the Scottish GDP index increased from 62.1 to 102.4, representing an average annual growth of 1.7%.

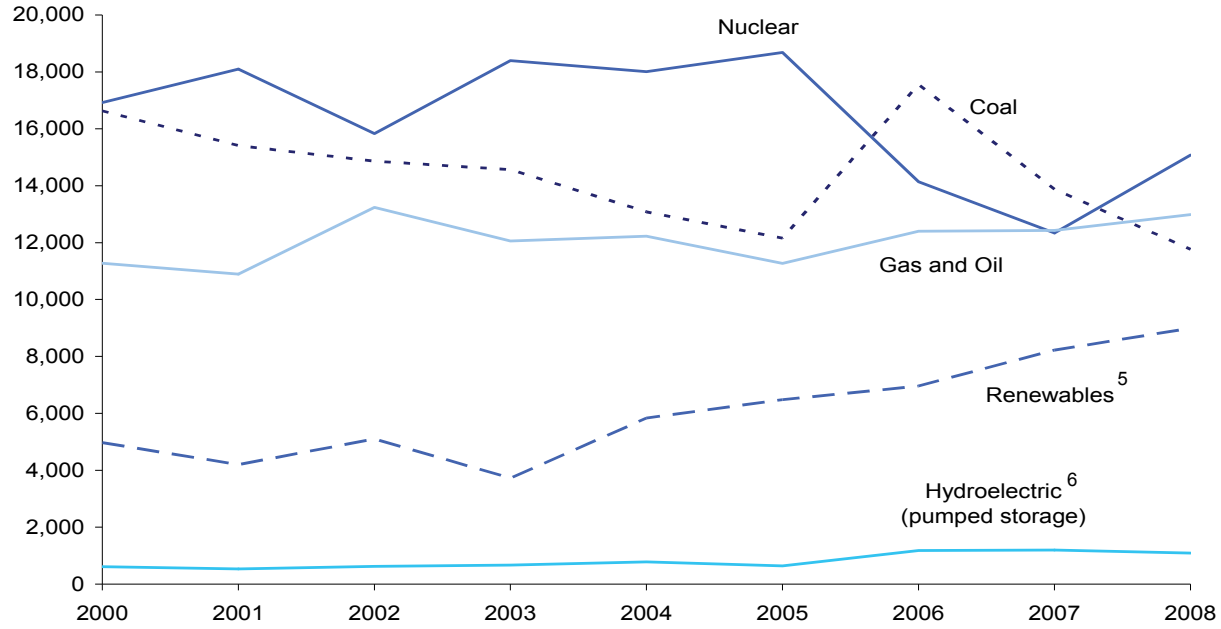
In 2007, the Scottish Government set a target to raise Scotland's GDP growth rate to the UK level by 2011, and a longer-term target to match the GDP growth rate of the small independent EU countries by 2017. The small independent EU countries are defined as Austria, Denmark, Finland, Ireland, Luxembourg, Portugal and Sweden.

Over the 2009 calendar year, GDP in Scotland fell by 4.6%, compared to a fall of 4.7% in the UK and a decline of 5.0% in the small independent EU countries.

Source: Scottish Government

Electricity Generation by Source[R]: 2000-2008

Electricity generated (GigaWatt hours)



GigaWatt hours

	2000	2004	2005	2006	2007	2008
Nuclear	16,918	18,013	18,681	14,141	12,344	15,079
Coal	16,624	13,080	12,158	17,560	13,877	11,767
Gas and Oil	11,274	12,226	11,270	12,402	12,429	12,983
Renewables[5]	4,972	5,832	6,486	6,963	8,220	8,990
Hydroelectric (pumped storage)[6]	613	786	643	1,184	1,198	1,091
Total Generated	50,401	49,937	49,237	52,250	48,067	49,911
Gross Consumption[7]	40,801	41,364	41,924	41,308	40,707	40,922

The combustion of fossil fuel, especially coal, is a major contributor to carbon dioxide emissions. Carbon dioxide is one of a basket of six greenhouse gases that Scotland is committed to reduce under the Climate Change (Scotland) Act 2009[8].

In 2008, Scotland generated 49,911 GWh of electricity, 4% more than in 2007. Nuclear production of electricity increased by 22% in this period, accounting for 30% of the total amount generated, the largest contribution by any one source. In 2008, the amount generated by coal fell by 15%, contributing 24% of the total amount generated. Gas and oil contributed 26%, and renewables 18%, of total electricity generation in Scotland.

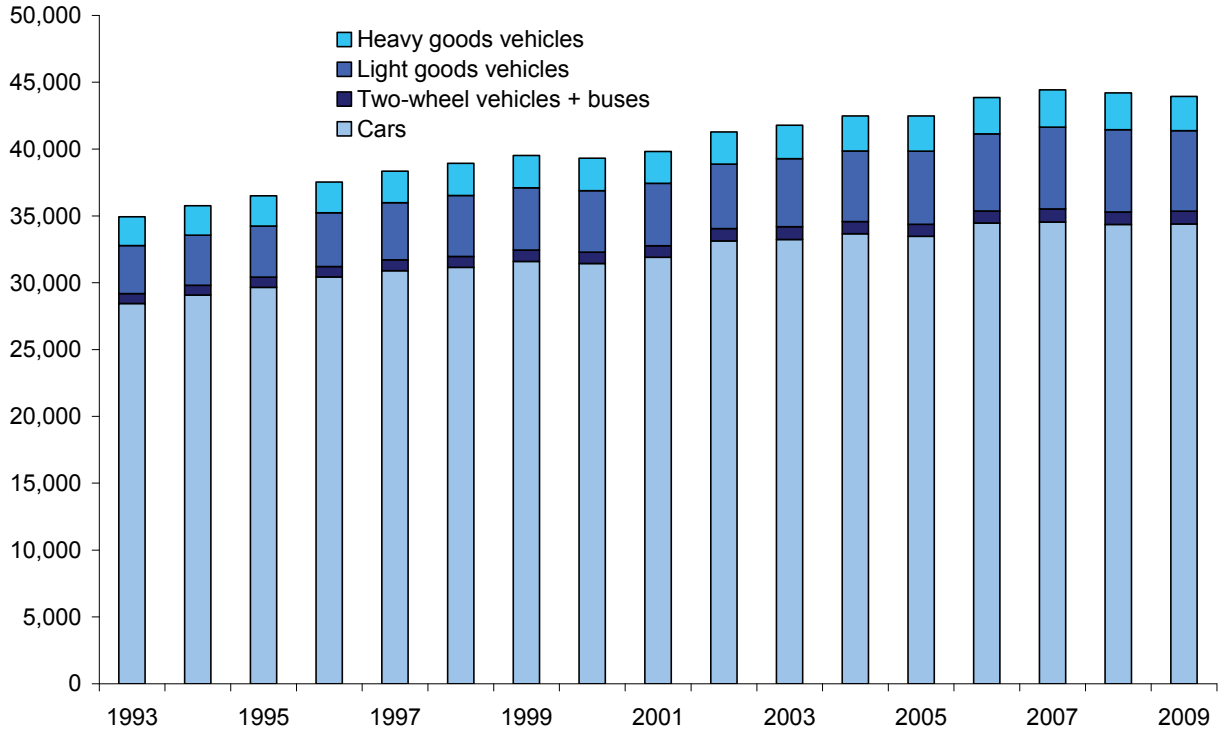
Nuclear power does not emit greenhouse gases although its use raises other environmental issues, including the long-term disposal of spent fuel. Unplanned outages at nuclear stations in 2006 and 2007 saw reductions in outputs for these years. The electricity generated by nuclear fell by 34% between 2005 and 2007 but has since recovered to around 80% of the 2005 level.

Scotland generated 8,990 GWh of electricity from renewable sources in 2008. This equated to 22% of the gross consumption[7] of electricity in Scotland, compared with 12% in 2000. A target of 50% of Scottish gross electricity consumption should come from renewable sources by 2020 has been set, with an interim target of 31% by 2011.

Source: Department for Energy and Climate Change

Motor Traffic on All Roads: 1993-2009

Million vehicle kilometres



Million vehicle kilometres

Vehicle type	1993	1995	2000	2005	2008	2009
Cars	28,449	29,646	31,443[R]	33,478[R]	34,357	34,391
Two-wheeled motor vehicles	203	203	250	313	315	322
Buses	538	565	599	586	630	635
Light goods vehicles	3,591	3,832	4,591	5,460[R]	6,145	6,027
Heavy goods vehicles	2,156	2,250	2,436	2,637[R]	2,751	2,557
Total	34,938	36,496	39,319	42,475[R]	44,197	43,932

The pollutants emitted by road transport contribute greatly to poor air quality that damages human and ecosystem health. Fine particulate matter and nitrogen dioxide (NO_2) are the pollutants of most concern, due primarily to their effects on human health. Oxides of nitrogen (NOx), of which NO_2 is a component, contribute to the formation of ozone that can impact on both human health and plant growth. Transport emissions also contain carbon dioxide and other greenhouse gases (GHGs), which contribute to climate change. A reduction in the volume of road traffic would help to achieve reductions in GHG emissions and concentrations of atmospheric pollutants.

The volume of motor traffic on roads in Scotland has increased by 26% between 1993 and 2009. However, between 2008 and 2009 there was a 0.6% decrease in the volume of motor traffic on Scottish roads. In 2009, major roads (motorways and 'A' roads) accounted for 66% of the volume of motor traffic in Scotland. In addition, minor roads ('B', 'C' and unclassified) accounted for 15 billion vehicle kilometres of traffic per year. Cars accounted for nearly 78% of all road traffic.

Source: Department for Transport

Background - Footnotes

1) General Register Office for Scotland (2009). Projected Population of Scotland (2008-based).

2) Scottish Government (2007). The Government Economic Strategy.

3) Scottish Government (2010). Scotland Performs Population Target.

4) GDP estimates are based on output and are at constant 2004 prices. Seasonally adjusted. GDP estimates are in basic prices, also referred to as Gross Value Added (GVA).

5) Includes wind, wave, solar power, thermal renewables and hydroelectric (natural flow).

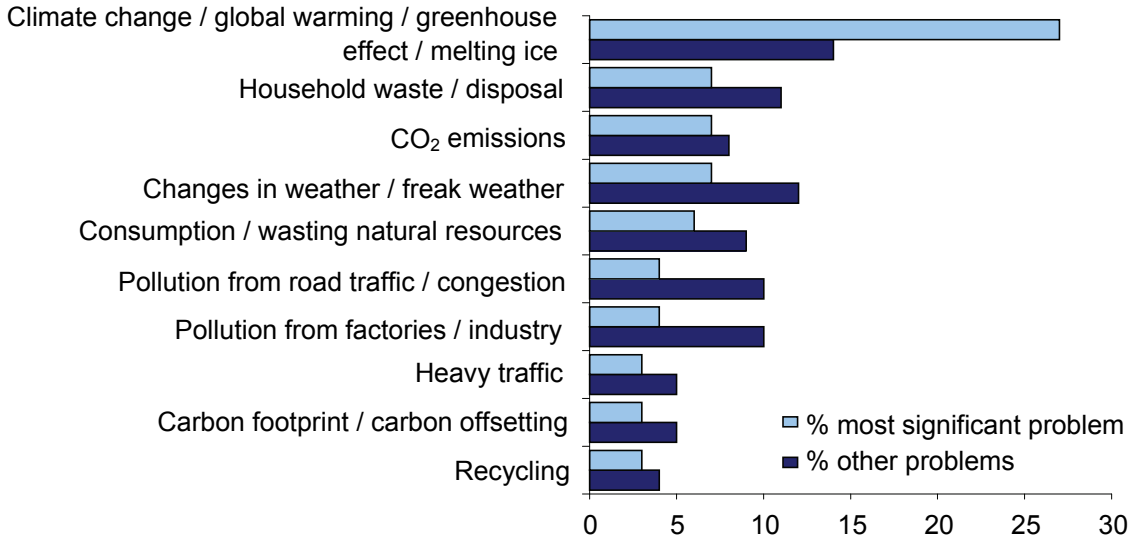
6) Pumped storage is not a renewable source of energy because it uses electricity produced by other means to create a store of hydrological power.

7) The amount of electricity generated minus net exports (but including losses).

8) Scottish Parliament (2009). Climate Change (Scotland) Act 2009.

Perceived Significant Environmental Problems: 2008

What is the most significant environmental problem? Other environmental problems? (percentage of respondents)



Perceived significance of environmental problems (percentage of respondents)

Environmental issue	most significant problem	other problems
Climate change / global warming / greenhouse effect / melting ice	*27*	*14*
Household waste / disposal	*7*	*11*
CO_2 emissions	*7*	*8*
Changes in weather / freak weather	*7*	*12*
Consumption / wasting natural resources	*6*	*9*
Pollution from road traffic / congestion	*4*	*10*
Pollution from factories / industry	*4*	*10*
Heavy traffic	*3*	*5*
Carbon footprint / carbon offsetting	*3*	*5*
Recycling	*3*	*4*

The Scottish Environmental Attitudes and Behaviours Survey 2008[1] included a question to gauge which specific environmental issues are most prominent in the public mind. Respondents were asked (unprompted): a) what they considered to be the 'most significant' environmental problem these days; and b) what they saw as 'other' environmental problems.[2]

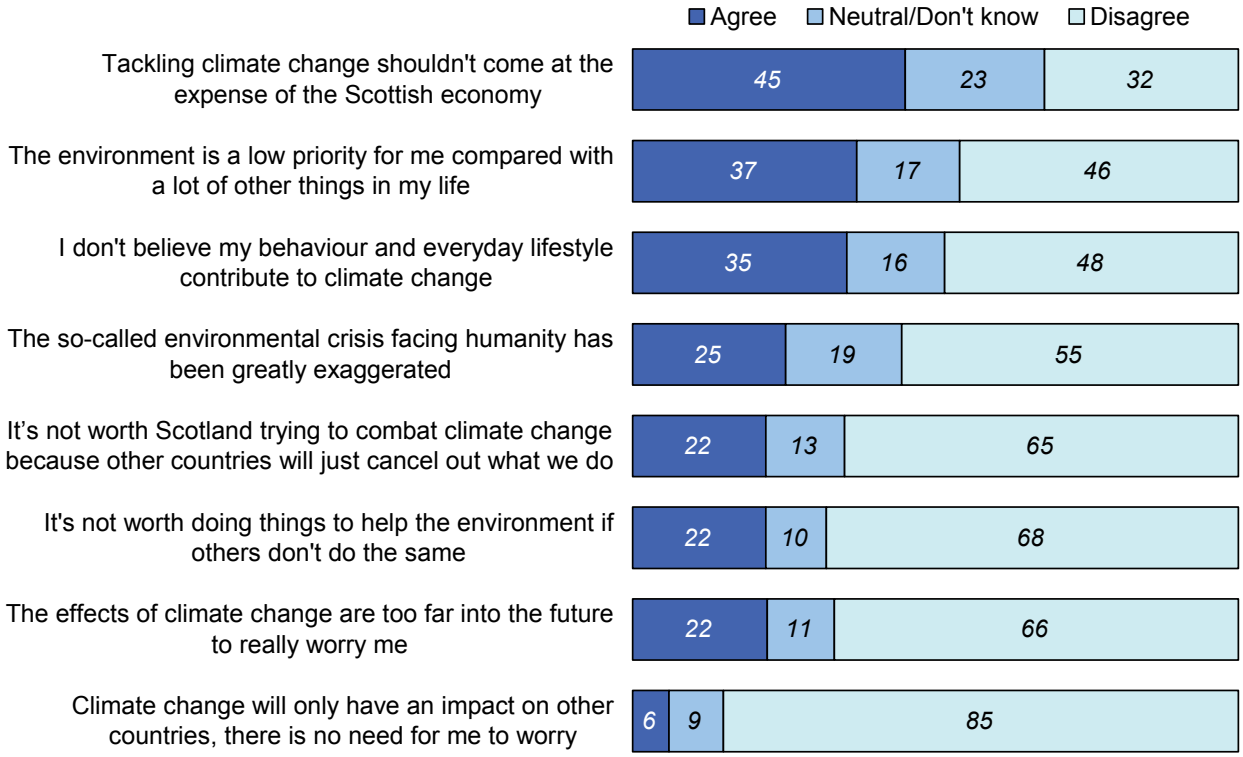
Climate change was by far the most common response - 41% of respondents in total mentioned the issue, and 27% identified it as the single most significant environmental issue. The next highest ranking issues were: changing weather patterns (mentioned by 19% overall), household waste (18%), CO_2 emissions (15%), and over-consumption (15%). It could be argued that all of these issues are in some way related to climate change. Overall, 53% of respondents mentioned climate change, CO_2 emissions or carbon footprint.

The Scottish Parliament passed the Climate Change (Scotland) Act 2009[3] with the aim of reducing Scotland's emissions by 80% by 2050. This includes all greenhouse gases.

Source: Scottish Government

Agreement or Disagreement with Statements About Climate Change and the Environment: 2008

To what extent do you agree/disagree with each statement? (percentage of respondents)



Respondents to the Scottish Environmental Attitudes and Behaviours Survey 2008[1] were asked to indicate the extent to which they agreed or disagreed with a series of statements about climate change and the environment.[4] These are presented above.

Respondents were asked if they agreed with the statement, “It is not worth Scotland trying to combat climate change, because other countries will just cancel out what we do”. Overall, 22% agreed with this statement and 65% disagreed. When asked if they agreed that “it’s not worth me doing things to help the environment if others don’t do the same”, 22% agreed and 68% disagreed.

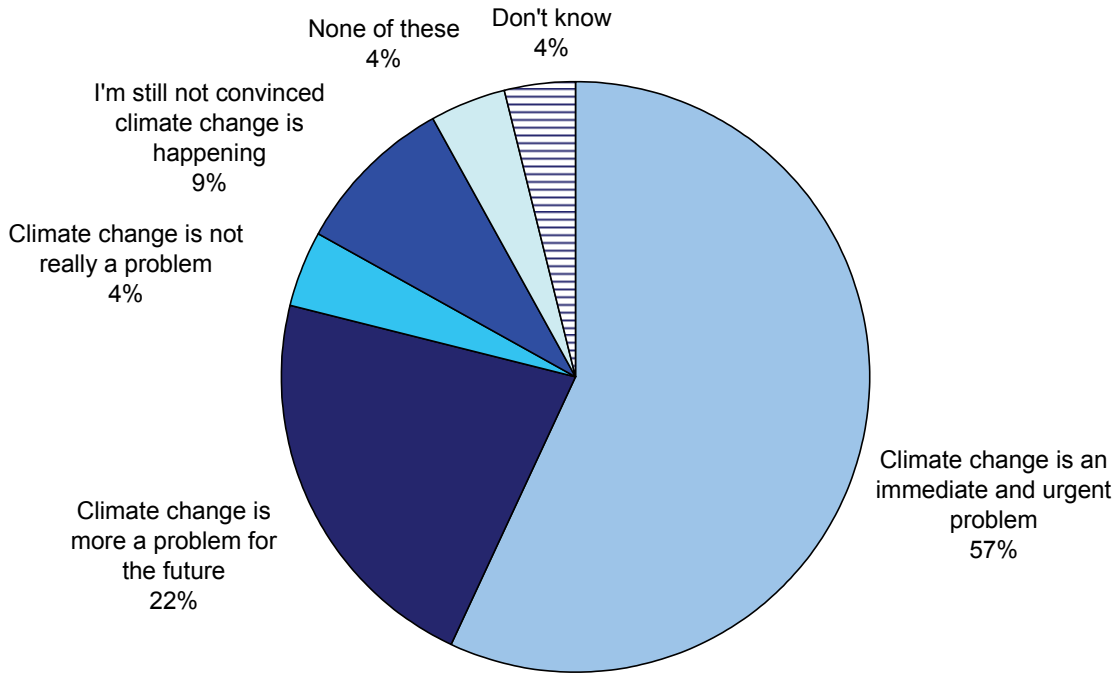
A sizeable proportion of people struggle to make the link between climate change and their own individual behaviour, with over a third (35%) agreeing, ‘I don't believe my behaviour and everyday lifestyle contribute to climate change’ (48% disagreed and 16% gave a neutral response).

The results further indicate that, when set against other day to day concerns, climate change is not top of the Scottish public’s priorities. Over a third of respondents (37%) agreed that the ‘environment is a low priority for me compared with a lot of other things in my life’, while less than half (46%) disagreed with this. Also, more people agreed (45%) than disagreed (32%) that, ‘tackling climate change shouldn’t come at the expense of the Scottish economy’, while 23% expressed no opinion or did not know.

Source: Scottish Government

Perceived Immediacy of Climate Change: 2008

Which of these views, if any, comes closest to your own view about climate change?



	Percentage of respondents
Climate change is an immediate and urgent problem	*57*
Climate change is more a problem for the future	*22*
I'm still not convinced climate change is happening	*9*
Climate change is not really a problem	*4*
None of these	*4*
Don't know	*4*

The Intergovernmental Panel on Climate Change (IPCC) has provided evidence that humans are contributing to climate change.[5] As a result of every day behaviour, emissions of greenhouse gases, such as carbon dioxide, are released into the atmosphere. Although technological innovation should, over the long term, enable the public to lower their emissions, behavioural change will also be required. Therefore, monitoring the extent to which the public sees climate change as a concern is important. This is particularly relevant as more recent UK evidence[6] suggests a decline in the proportions viewing climate change as a problem.

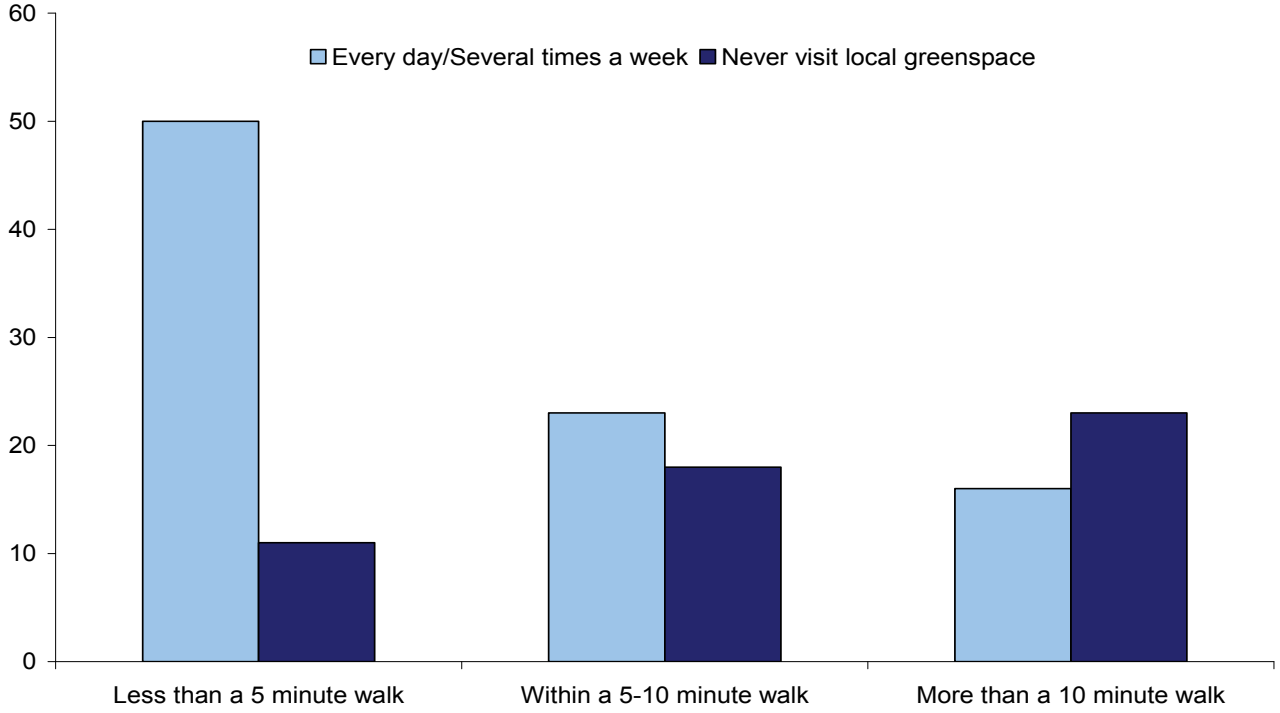
The Scottish Environmental Attitudes and Behaviours Survey 2008[1] included a question to gauge public concern about the perceived immediacy of climate change. Respondents were asked to choose one statement that came closest to their own view.[7]

The majority of respondents (57%) said that 'climate change is an immediate and urgent problem'. However, more than one in three expressed some degree of doubt, with approximately one fifth (22%) saying that 'climate change is more of a problem for the future' and around one in eight either saying 'I'm still not convinced that climate change is happening' (9%) or that 'climate change is not really a problem' (4%). Around 4% said that that none of these statements closely matched their own view on climate change.

Source: Scottish Government

Frequency of Use of Local Greenspace

Frequency of use by time to walk to local greenspace (percentage of respondents)



	Percentage of respondents		
Frequency of Use	**Less than a 5 minute walk**	**Within a 5-10 minute walk**	**More than a 10 minute walk**
Every day / Several times a week	*50*	*23*	*16*
Not at all	*11*	*18*	*23*
Base (sample)	1,004	303	173

Greenspaces are a vital part of the landscape. Having easy access to quality greenspace can improve people's quality of life, increasing neighbourhood satisfaction, promoting mental and physical health (including through its association with increased physical activity[8]) and reducing health inequalities.[9] It is important to understand the public's views on greenspace, in order to inform the development of policies designed to promote quality of life through enhancing the physical environments Scotland's communities are exposed to and our use and enjoyment of them.

The Scottish Social Attitudes Survey 2009: Sustainable Places and Greenspace[9] collected data on how accessible people's local green or open space was from their home (measured in terms of the time taken to walk there), and how often they use it. It identified that around two thirds of people in Scotland live less than 5 minutes walk away from an area of local green or open space.

Those who live less than a 5 minute walk from their local greenspace are more likely to use it frequently, with 50% of respondents in this category using it every day or several times a week. In comparison, only 23% of respondents who live within a 5-10 minute walk of local greenspace, and 16% who live more than a 10 minute walk from local greenspace, use it every day or several times a week.

Source: Scottish Social Attitudes Survey 2009: Sustainable Places and Greenspace

Public Attitudes - Footnotes

1) Scottish Government Social Research (2009). Scottish Environmental Attitudes and Behaviours Survey 2008 (SEABS '08).

2) Actual question asked was: 'There is a lot of talk these days about environmental problems. When people talk about environmental problems, what do you see as the most significant problem? And what do you see as other environmental problems?'
Sample size: all respondents (3,054).

3) Scottish Parliament (2009). Climate Change (Scotland) Act 2009.

4) Respondents were asked indicate the extent to which they agreed or disagreed with a total of 29 attitudinal statements.
Sample size: all respondents who completed the Computer Assisted Self-Interview section (2,673).

5) Intergovernmental Panel on Climate Change (2007) Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

6) Spence, A. et al (2010) Public Perceptions of Climate Change and Energy Futures in Britain: Summary Findings of a Survey Conducted in January-March 2010. Cardiff University School of Psychology, Cardiff. http://www.understanding-risk.org/. Note that questions in this survey are framed differently from their SEABS'08 equivalents. However this and other surveys suggest a pattern of decline in responses about climate change attitudes generally.

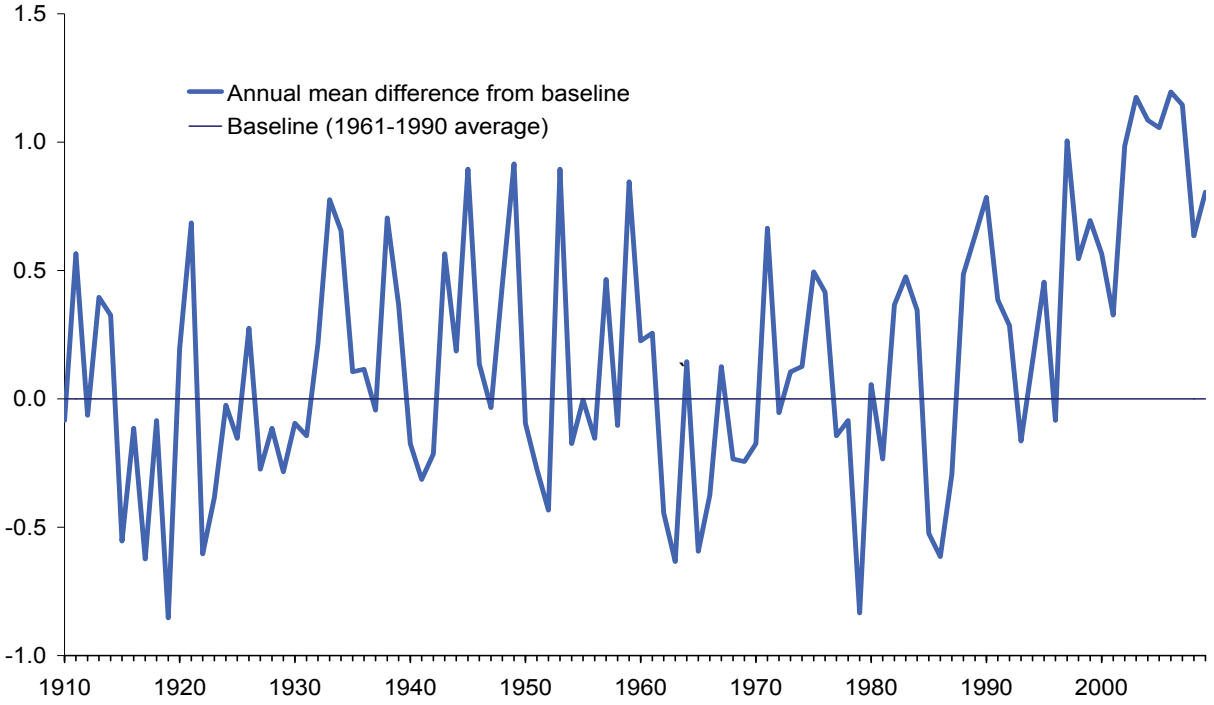
7) Actual question asked was: 'On this card are some statements people have made about climate change. Which of these statements, if any, comes closest to your own view?'
Sample size: all respondents (3,054).

8) Bell, S., Hamilton, V. et al (2008) Greenspace and Quality of Life: a critical literature review. Greenspace Scotland, Stirling.

9) Reid, S. & Curtice, J. (2010) Scottish Social Attitudes Survey 2009: Sustainable Places and Greenspace Scottish Government, Edinburgh.

Annual Mean Temperature[R,1]: 1910-2009

Annual mean temperature – difference from 1961-1990 average[1] (degrees Celsius)



	1910s[R]	1920s	1930s	1940s	1950s
Difference from 1961-1990 baseline[1] (°C)	-0.11	-0.07	0.27	0.24	0.10
	1960s	**1970s**	**1980s**	**1990s**	**2000s[R]**
Difference from 1961-1990 baseline[1] (°C)	-0.18	0.05	0.07	0.41	0.90

The balance between incoming solar energy and outgoing infrared radiation determines the earth's temperature. Changes in the amount of energy retained within the atmosphere affects global climate, which naturally exhibits long-term fluctuations. However, current climate trends are unlikely to be entirely natural in origin, and there is compelling evidence that human activities are having a discernible impact on the global climate.[2]

While the global impacts of climate change are considerable, there are also wide-ranging implications for Scotland. For example, flood risk, water resources, agriculture, tourism and human health may be affected, all of which are of economic, social and environmental importance.

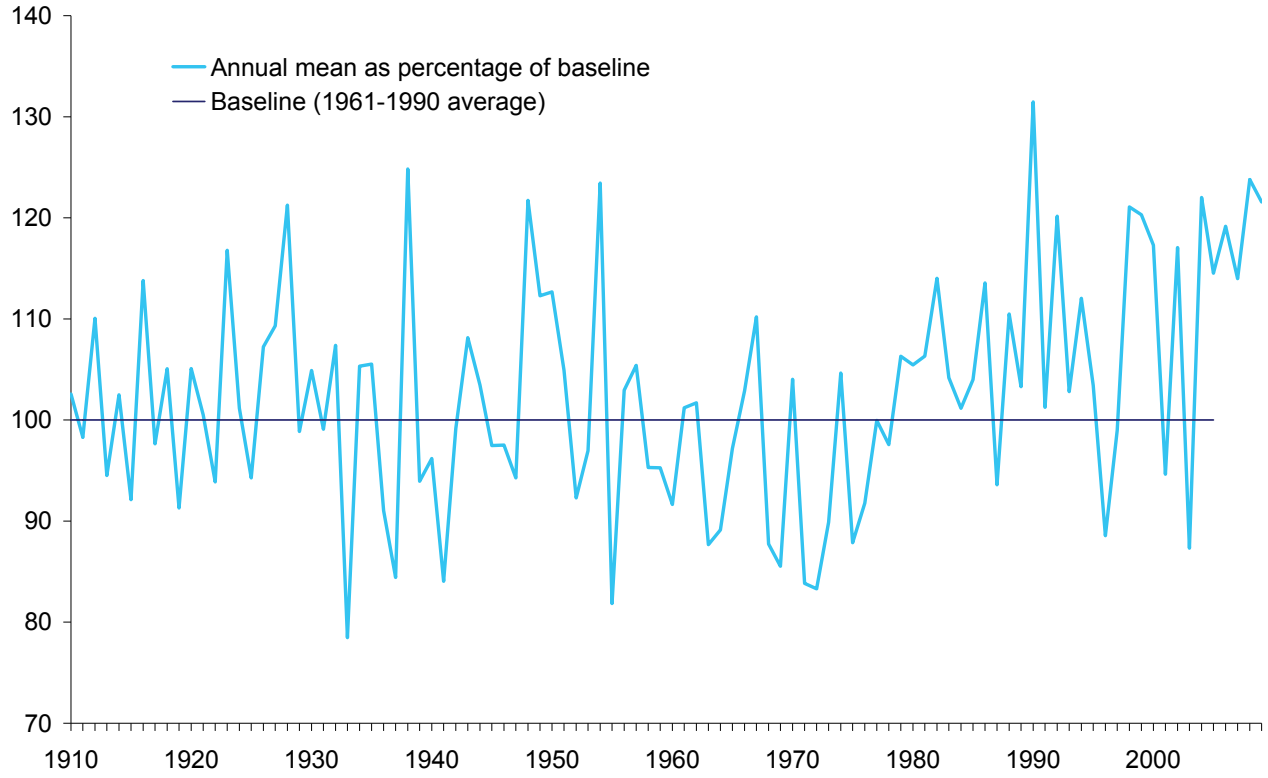
Over the period 1901-2000, the change in mean global surface temperature explained by a linear trend is 0.57 degrees Celsius (°C).[3] Similarly, a linear trend through the Scottish temperature series for the period 1910-2009 indicates an average increase of 0.06°C per decade, or 0.6°C each 100 years. The temperatures between 2003 and 2007 in Scotland were the highest since the record began in 1910. The temperatures in 2008 and 2009 were over 0.3°C lower than in 2007, but remained in the upper quintile of temperatures recorded since 1910.

Temperatures in Scotland are projected to continue increasing over the next century, with hotter summers and milder winters. The UK Climate Projections[4] are probabilistic and by the 2080s projected increases in mean annual temperature for Scottish 'regions' that range from 1.6°C to 4.5°C[5], with central estimates from these distributions between 2.6°C to 3.0°C.[5]

Source: Met Office

Annual Precipitation[R,1]: 1910-2009

Annual precipitation as a percentage of 1961-1990 average[1]



	1910s[R]	1920s	1930s	1940s	1950s
Average annual precipitation (mm)	1,402	1,458	1,384	1,410	1,406
Percentage of 1961–1990 baseline[1]	*100.8*	*104.8*	*99.5*	*101.4*	*101.1*
	1960s	**1970s**	**1980s**	**1990s**	**2000s[R]**
Average annual precipitation (mm)	1,328	1,320	1,469	1,530	1,573
Percentage of 1961–1990 baseline[1]	*95.5*	*94.9*	*105.6*	*110.0*	*113.1*

Climate change will have an effect on weather patterns in Scotland. The UK Climate Projections[4] indicate that while the amount of annual precipitation will remain about the same, it is likely that precipitation will increase in winter and decrease in summer. By the 2080s, the central estimates[6] in distributions of winter rainfall for Scottish 'regions' range from +12% to +21%[5]. Similarly, the central estimates of summer rainfall range from -12% to -17%[5]. These changes in precipitation have several implications for Scotland, including affecting water resources, flood and drought risk and habitat loss.

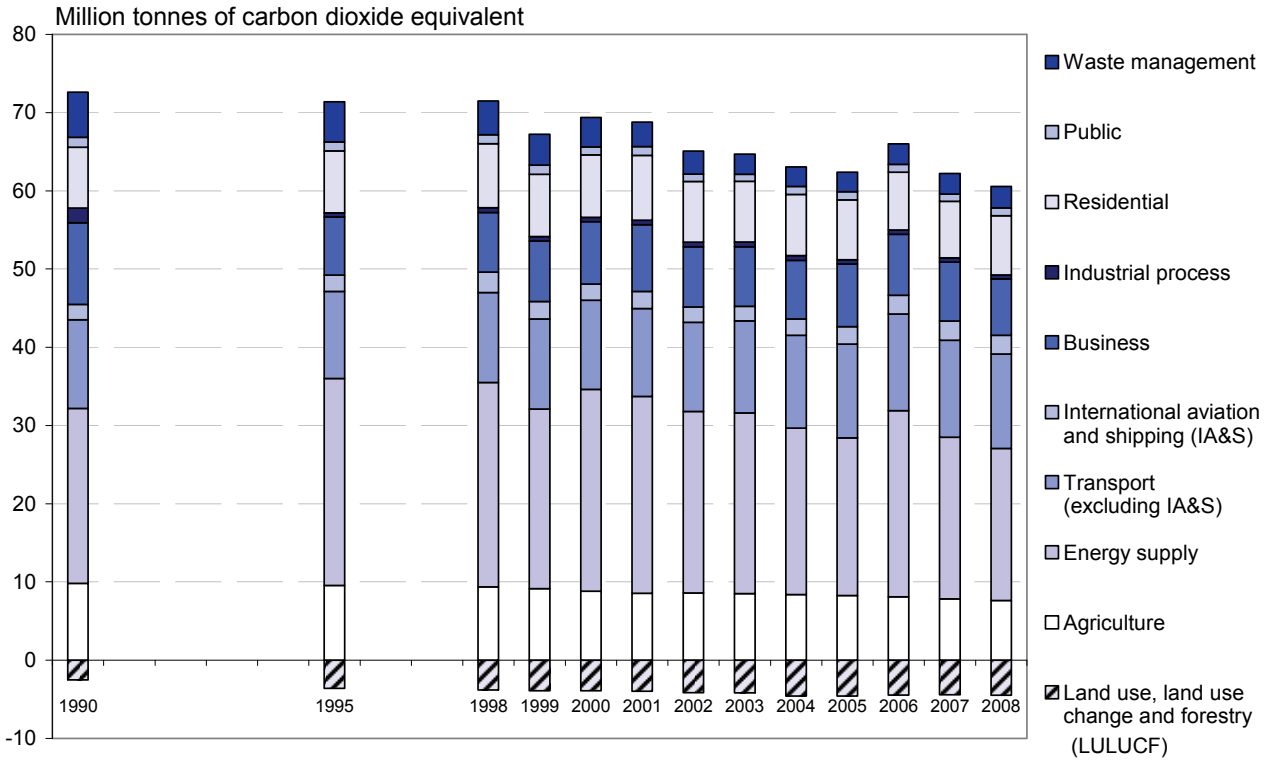
The average annual precipitation in the 1980s, 1990s and the 2000s was higher than in previous decades, particularly the 1970s, which contained several years with below average rainfall.

The average winter[7] precipitation in the 1990s and 2000s was about 24% higher than the 1961-1990 baseline, compared to the 1960s which was about 10% lower. Summer[8] precipitation has not differed as much, with the average 1990s figure about 4% less than the baseline and the 2000s figure 15% more than the baseline.[9]

Source: Met Office

Greenhouse Gas Emissions by Source[R,10,11]: 1990-2008

Greenhouse gas emissions taking account of emissions and removals (Mt CO_2e)[12]



	Million tonnes of carbon dioxide equivalent					
Sector[11]	**1990**	**1995**	**2000**	**2005**	**2007**	**2008**
Energy supply	22.3	26.5	25.8	20.1	20.7	19.4
Transport[10]	13.3	13.2	13.5	14.2	14.8	14.4
Business and Industrial processes	12.3	8.0	8.5	8.5	8.1	7.7
Agriculture	9.8	9.6	8.8	8.3	7.8	7.6
Residential and Public	9.0	9.0	9.0	8.7	8.2	8.6
Waste management	5.8	5.1	3.7	2.5	2.6	2.8
LULUCF[13]	-2.5	-3.6	-3.9	-4.6	-4.4	-4.5
Net Scottish emissions [14,15,16]	70.1	67.8	65.5	57.8	57.8	56.1

It should be noted that improved data sources and estimation techniques have routinely led to revision of historic greenhouse gas emission estimates. All data has been revised to reflect these changes.

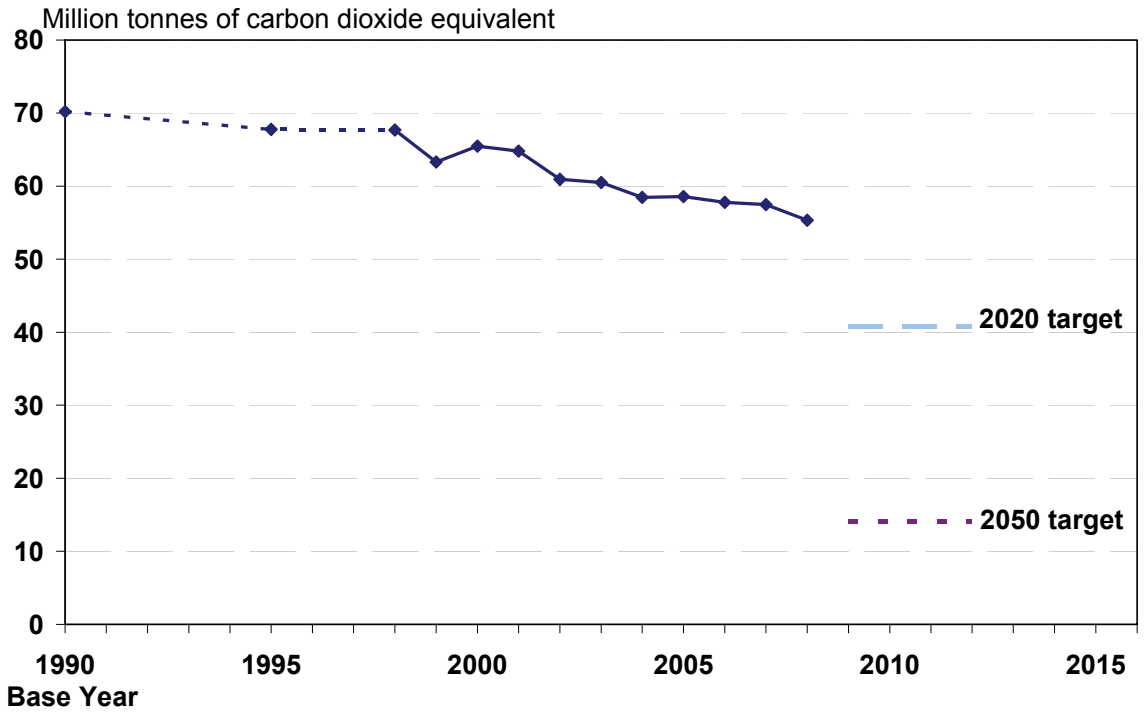
Greenhouse gases (GHGs) in the atmosphere help to retain radiation, resulting in warming of the lower atmosphere and earth surface. Atmospheric concentrations of GHGs have increased as a result of human activities since the industrial revolution (c.1750). This has enhanced the greenhouse effect and is influencing global climate change.[17]

Scotland's net emissions of greenhouse gases in 2008 were 56.1 Mt CO_2e, 3.0% (1.7 Mt CO_2e) below 2007 levels and 20.0% (14.0 Mt CO_2e) below 1990 levels. The energy supply sector was the largest emitter of GHG emissions in 2008, contributing 35% of the emissions in Scotland. Emissions from this sector were 13.0% lower than in 1990. Transport emissions, including those from international aviation and shipping, contributed 26% to the 2008 total and have increased by 8.6% since 1990. In 2008, residential and public sector emissions contributed 15% of the total and the 2008 emissions have fallen by 5.3% since 1990.

Source: National Atmospheric Emissions Inventory [18]

Greenhouse Gas Emissions adjusted to take account of trading in the EU Emissions Trading System[R,10,19]: 1990-2008

Greenhouse gas emissions taking account of emissions trading (Mt CO_2e)[12]



Million tonnes of carbon dioxide equivalent

	1990 Base Year[20]	1995	2000	2005	2006	2007	2008
Net emissions without trading	70.2	67.8	65.5	57.8	61.5	57.8	56.1
Net purchases (-)/sales(+)	-	-	-	+0.76	-3.78	-0.32	-0.75
Net emissions with trading[19]	70.2	67.8	65.5	58.6	57.8	57.5	55.3

It should be noted that improved data sources and estimation techniques have routinely led to revision of historic greenhouse gas emission estimates. All data has been revised to reflect these changes.

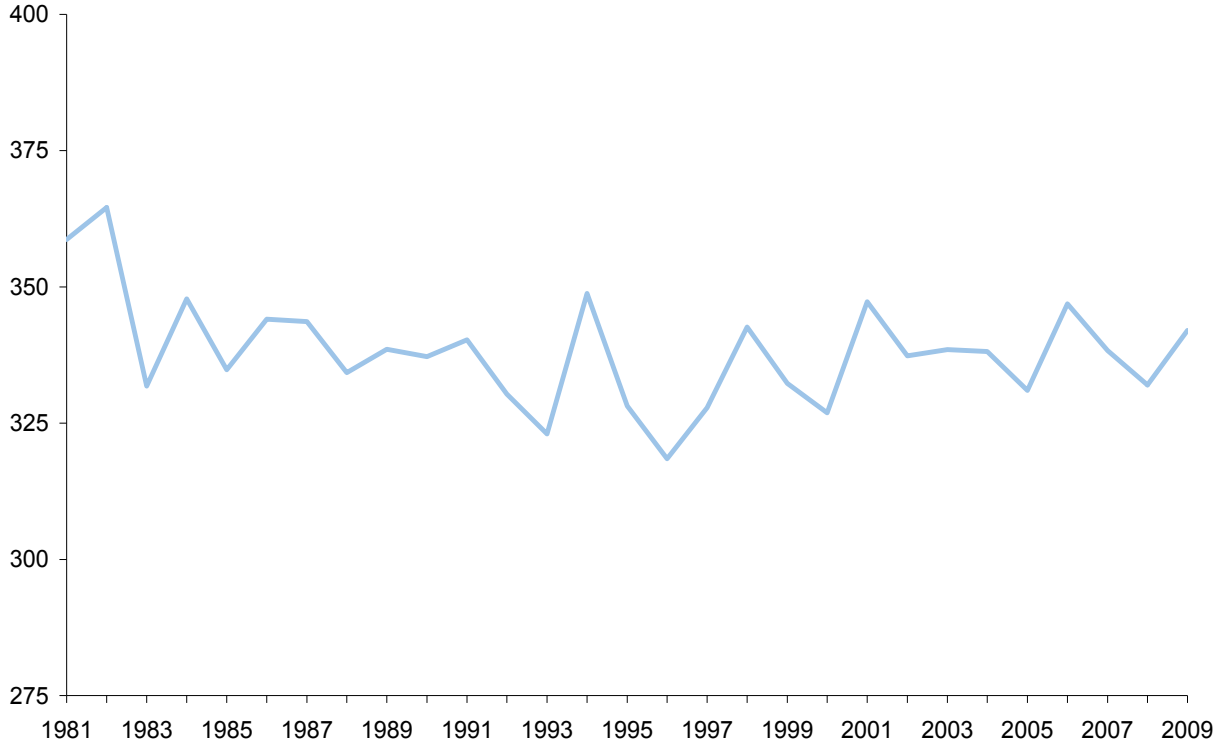
The European Union Emission Trading System (EU ETS) is the largest multi-country, multi-sector, company-level, greenhouse gas (GHG) emission trading system world-wide. When trading in the EU ETS is taken into account[19], Scottish GHG emissions, including international aviation and shipping, reduced by 3.7% between 2007 and 2008 (from 57.5 Mt CO_2e to 55.3 Mt CO_2e). Compared with the 1990 base year[20], such emissions in 2008 were 21.2% lower.

The Climate Change (Scotland) Act 2009 sets a statutory framework for greenhouse gas emissions reductions in Scotland with a reduction target of at least 80 per cent by 2050 and an interim reduction target of at least 42 per cent by 2020, both reductions against the 1990 base year[20]. In 2007, the Scottish Government also set a short term target to reduce emissions by 2011, compared with a 2006 baseline. All the targets include international aviation and shipping and take into account trading in the EU ETS.

Source: National Atmospheric Emissions Inventory [21], Scottish Government [22]

Column Ozone Measurements: 1981-2009

Column ozone concentrations over Lerwick (Dobson units)



	Column ozone concentrations (Dobson units)								
Station	**1981**	**1985**	**1990**	**1995**	**2000**	**2005**	**2007**	**2008**	**2009**
Lerwick	358.7	334.8	337.2	328.2	326.9	331.0	338.3	332.0	342.0

The stratospheric ozone layer, located around 10-30 km above the Earth's surface, forms a protective shield against harmful solar (UVB) radiation.[23] Thinning of the ozone layer has occurred since the beginning of the 1980s in all regions except equatorial ones. Depletion is most marked in the Antarctic where, in 2006, the Antarctic ozone hole reached 29.5 million square kilometres in area (over 300 times the land area of Scotland).[24]

The 1987 Montreal Protocol set guidelines to eliminate the global production and use of ozone depleting substances. European production of CFCs for non-essential use fell to zero in 1995.[23] However, leaks from old equipment and the long life of these substances in the lower atmosphere mean that full recovery of the ozone layer is not predicted until about 2050.

The total ozone levels at Lerwick vary seasonally, with maximum levels generally occurring in early spring and minimum levels in autumn. Over the last 28 years, the annual average total ozone cover over Lerwick has shown the natural interannual variability which would be expected due to varying meteorological conditions. Generally levels have decreased over this period. More recently, it appears that the trend may be levelling out.

Source: Met Office, AEA Energy and Environment

Global Atmosphere - Footnotes

1) The 1910s data have been revised to include the years 1910-1913 and the 2000s data have been revised to include 2009 data. The 1961-1990 averages used in this publication are calculated from 5km grid squares, as are the annual figures, and differ from the averages published by the Met Office which are based upon 1km grid squares. The averages used are temperature: 7.03°C and precipitation: 1390.57mm.

2) Intergovernmental Panel on Climate Change (IPCC) (2007) Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K. and Reisinger, A.(eds.)]. IPCC, Geneva, Switzerland.

3) IPCC (2007) Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

4) UK Climate Projections 2009. Change values are under medium emissions scenario for 2080s (average of 2070-2099) and compared to baseline of 1961-1990. The Scottish regions are North, West and East Scotland based on Met Office climate regions. The central estimate is 50% probability level; the wider range is for smallest 10% probability level (north Scotland) and largest 90% probability level (Western Scotland).

5) Change is relative to the baseline climate variables for the 30-year time period 1961-1990 derived by the Met Office for UKCP09.

6) The central estimate is the 50% probability level in a probabilistic distribution.

7) December – February

8) June – August

9) Winter and summer precipitation figures are available on Scottish Environment Statistics Online.

10) Includes emissions from international aviation and shipping. In 2008, AEA have estimated that Scotland's share of UK GHG emissions from international aviation and shipping equalled 2.4 Mt CO_2e, compared to 2.5 Mt CO_2e in 2007 and 2.0 Mt CO_2e in 1990. For more details see (18).

11) The sectors presented use the National Communication (NC) categories. The NC categories are agreed groupings of more detailed sectors reported to the United Nations Framework Convention on Climate Change. Further details together with a detailed mapping are available at: http://www.decc.gov.uk/en/content/cms/statistics/climate_change/gg_emissions/intro/intro.aspx.

12) Emissions of each GHG are weighted by the global warming potential (GWP) of the gas. GWP accounts for the potency of the gas as a contributor to atmospheric

warming. Therefore, while sulphur hexafluoride (SF_6) is released in small quantities, those emissions are adjusted to better reflect the strong warming effect it has. GWPs of all gases are expressed as tonnes of carbon dioxide equivalent to permit ready comparison. To convert emission values to carbon, they should be multiplied by $^{12}/_{44}$.

13) Estimates of emissions and removals from land use, land use change and forestry (LULUCF) are particularly uncertain since they depend critically on assumptions made on the rates of loss or gain of carbon associated with soils and forestry. In Scotland, the effect of activities recorded in LULUCF, taken as a whole is to act as a sink, absorbing quantities of carbon dioxide in excess of the quantity of GHGs this group of activities generates.

14) The approximate 95% confidence interval for Scottish GHG emissions in 2008, excluding international aviation and shipping, is estimated to be ±26% of the mean. (The estimates for international aviation have low uncertainty, while those for international shipping have high uncertainty.) The approximate 95% confidence interval for the trend in GHG emissions between 1990 and 2008 is between -31% and -10% around a central estimate of -21%. For more details see (18).

15) Emissions from offshore oil and gas installations are not included in the Scottish inventory, and are reported as “unallocated” within the disaggregated UK inventory. For more details see (18).

16) This total has not been adjusted to take account of the effect of trading in carbon units.

17) IPCC Fourth Assessment Report: Climate Change 2007. For full reference see (3).

18) Sneddon, S., Brophy, N., Li, Y., MacCarthy, J., Martinez, C., Murrells, T., Passant, N., Thomas, J., Thistlethwaite, G.,Tsagatakis, I., Walker, H., Thomson, A. & Laura Cardenas (2010) "Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2008". AEA Group.

19) In accounting for trading in the EU ETS under both the Climate Change (Scotland) Act 2009 and the short term Sustainability Purpose target, the approach taken is to set contributions from Scottish installations in the EU ETS equal to Scotland’s share of the UK’s EU ETS cap (Scotland’s cap). (Further details of this cap are given in Scottish Greenhouse Gas Emissions 2008) During each year, if emissions from Scottish EU ETS sites collectively exceed this cap total emissions are reduced by this amount as excess units must have been bought from overseas, carried over or brought forward. If on the other hand emissions from Scottish EU ETS sites collectively are below this cap total emissions are increased by this amount as excess units must have been sold overseas or retained. In Phase I of the EU Emissions Trading Scheme (2005-2007), Scotland’s emissions were also increased to take account of Scotland’s share of EU ETS units sold by the UK Government.

20) 1990 base year is 1990 for carbon dioxide, methane and nitrous oxide and 1995 for the F-gases, i.e. HFCs, PFCs and SF_6.

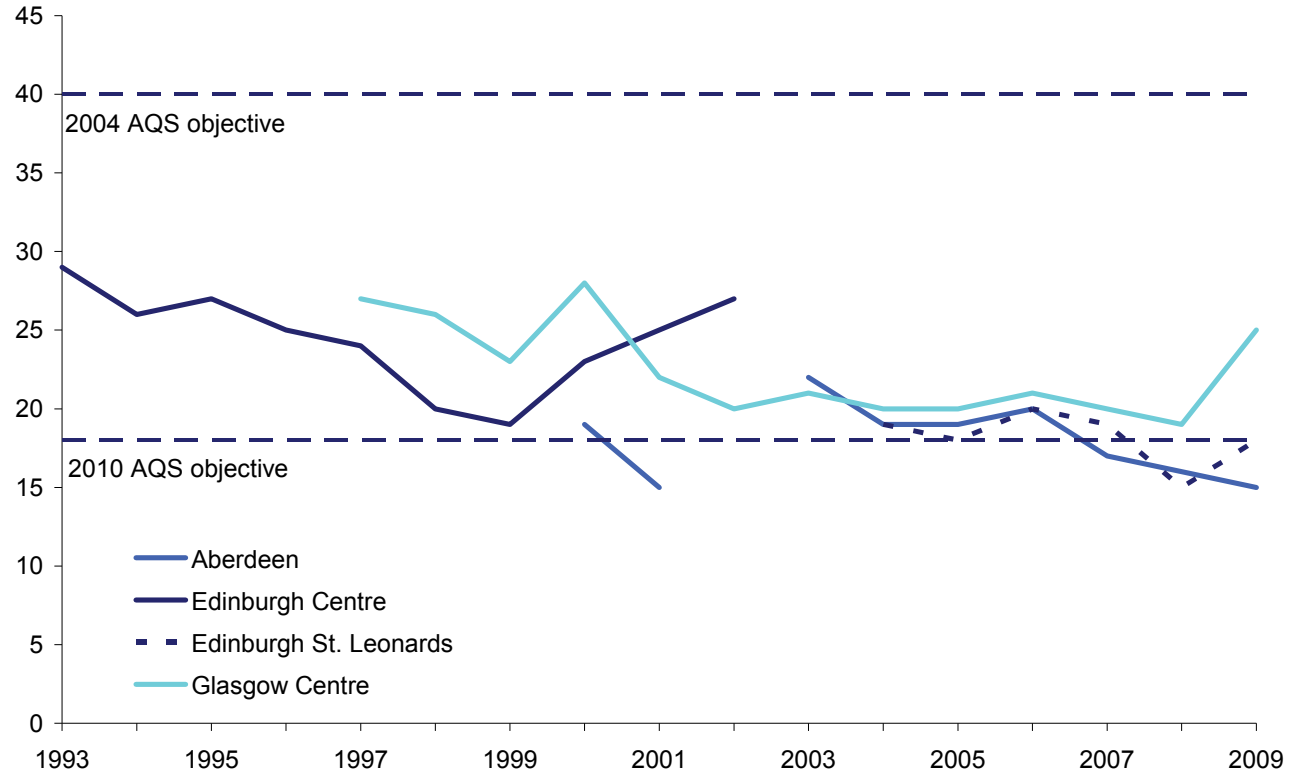
21) For more information on emissions trading see EU ETS section of the Department for Energy and Climate Change website.

22) Scottish Greenhouse Gas Emissions 2008 (2010) Scottish Government, Edinburgh.

23) Stratospheric ozone should not be confused with tropospheric (ground level) ozone.

24) Department for Environment, Food and Rural Affairs: e-Digest of Environmental Statistics.

Particulate (PM_{10}) concentrations[1]: 1993-2009



Annual mean concentration (µg/m³)

Site	1993	1995	2000	2005	2007	2008	2009[2]
Glasgow Centre	-	-	28	20	20	19	25
Edinburgh[3]	29	27	23	18	19	15	18
Aberdeen	-	-	19	19	17	16	15

Particulate pollution can harm the human respiratory and cardiovascular systems, and is linked to asthma and mortality. Smaller particles are the most damaging and current targets focus on particles less than 10µm in diameter (PM_{10}).

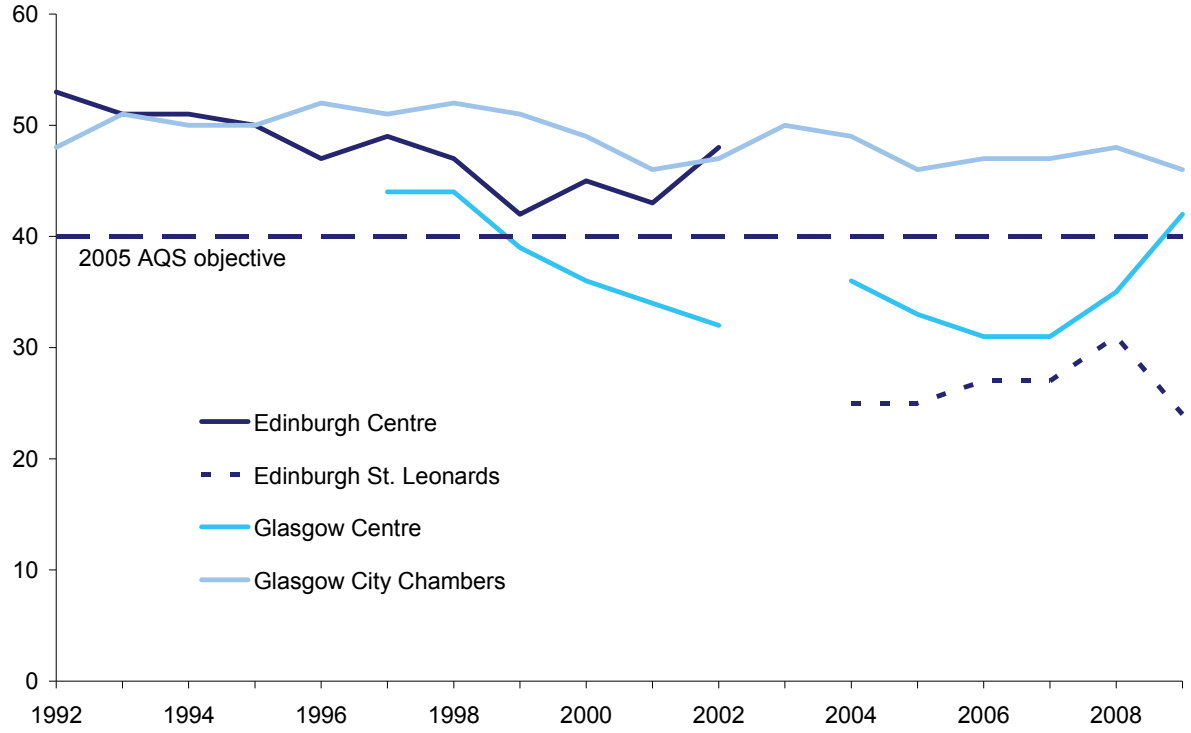
The greatest source of PM_{10} is combustion. In particular, road transport accounted for around 26% of Scottish emissions of PM_{10} in 2007.[4] Between 1990 and 2007, Scottish emissions of PM_{10} fell by 52%.[4]

The Air Quality Strategy[5] objectives for PM_{10} come in two stages. Stage 1 (to be met by the end of 2004): a 24-hour mean of 50µg/m³ not to be exceeded more than 35 times a year, and an annual mean of 40µg/m³. Stage 2 (to be met by the end of 2010): a 24-hour mean of 50µg/m³ not to be exceeded more than seven times a year, and an annual mean of 18µg/m³. Stage 1 objectives were met at all of the automatic monitoring sites in 2009. The Stage 2 annual mean objective was met at 38 of the 49 automatic monitoring sites in Scotland with more than 75% data capture, including Aberdeen[6]. Four of the 49 sites failed to meet the objective of a daily mean of 50µg/m³ not to be exceeded more than seven times a year.

Source: Scottish Air Quality Database

Nitrogen dioxide concentrations[1]: 1992-2009

Annual mean concentrations (µg/m^3)



	Annual mean concentrations (µg/m^3)						
Site	**1992**	**1995**	**2000**	**2005**	**2007**	**2008**	**2009[7]**
Glasgow Centre[8]	-	-	36	33	31	35	42
Glasgow City Chambers	48	50	49	46	47	48	46
Edinburgh[3]	53	50	45	25	27	31	24

High concentrations of nitrogen dioxide (NO_2) can affect human health, particularly by causing inflammation of the airways. Ecosystem health is also damaged by NO_2 by contributing to acid deposition, eutrophication and promoting the formation of ground level ozone.

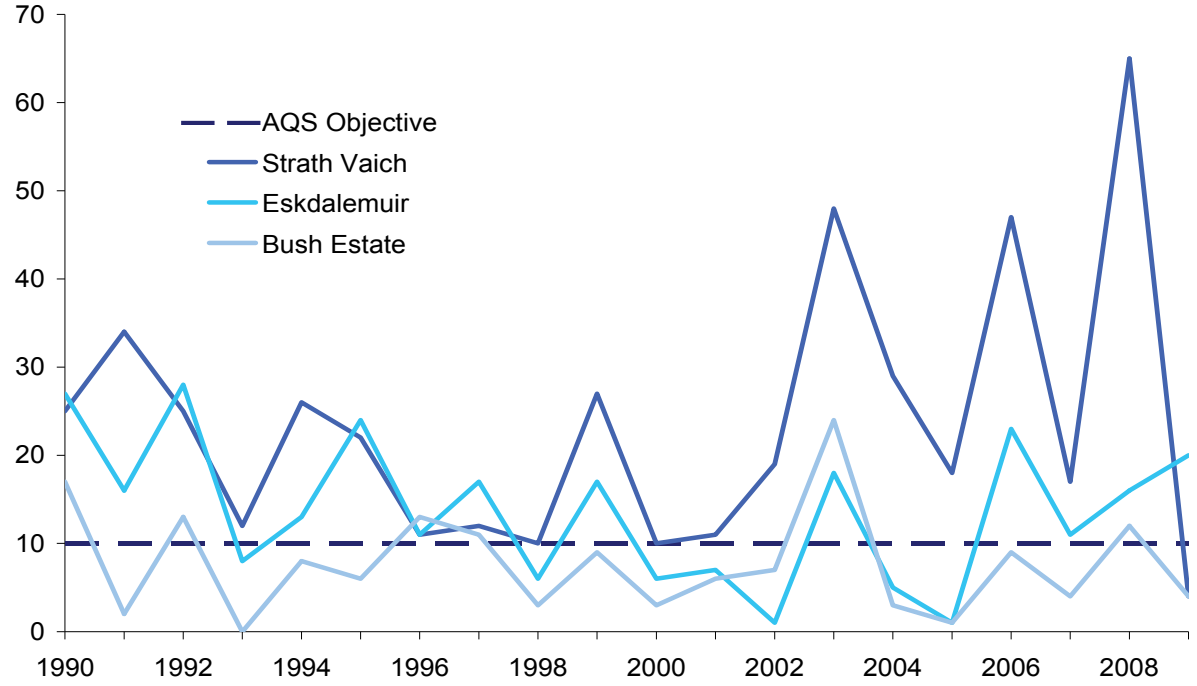
All combustion processes in air produce oxides of nitrogen (NOx). In 2007, power generation accounted for 28% of all Scottish NOx emissions and road transport accounted for 26%[4]; the contribution from road transport is greatly increased in urban areas. Between 1990 and 2007, Scottish emissions of NOx are estimated to have decreased by 45%[4], due in part to the installation of catalytic converters in vehicles.

The Air Quality Strategy[5] objectives for NO_2 (to be met by the end of 2005) are (a) an annual mean of 40µg/m3 and (b) an hourly mean of 200µg/m3 not to be exceeded more than 18 times a year. In 2009, the first objective was not met at 11 of the 54 automatic monitoring sites in Scotland with more than 75% data capture[9]. Those failing included Edinburgh St. John's Road, Glasgow City Chambers, and Glasgow Centre. The second objective was met at all but 6 automatic monitoring sites.

Source: Scottish Air Quality Database

Ground level ozone concentrations[1]: 1990-2009

Number of days exceeding 100µg/m^3 (maximum 8hr running mean)



Site	1990	1995	2000	2005	2007	2008	2009[10]
	Number of days exceeding 100µg/m^3 (maximum 8hr running mean)						
Strath Vaich	25	22	10	18	17	65	4
Eskdalemuir	27	24	6	1	11	16	20
Bush Estate	17	6	3	1	4	12	4
				Annual mean concentration (µg/m^3)			
Strath Vaich	66	67	66	67	68	73	67
Eskdalemuir	55	55	47	51	54	57	56
Bush Estate	55	53	55	55	56	58	56

Ozone in the stratosphere forms a layer that protects the earth against harmful ultra-violet radiation, but tropospheric (ground level) ozone is a damaging oxidant. Exposure to high ozone concentrations can cause respiratory damage, and affects vegetation by damaging leaves and reducing yields.

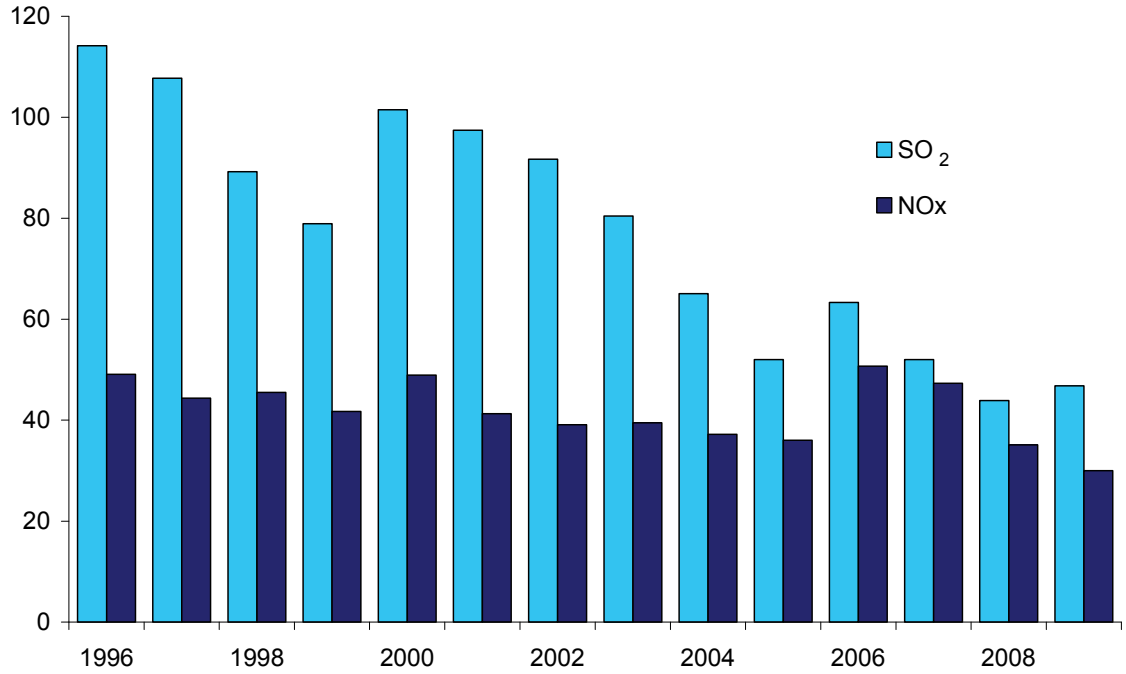
Ozone is formed by a slow, complicated series of reactions from other pollutants that may be blown over from Europe. The most important man-made precursors are nitrogen oxides and volatile organic compounds produced by road transport, industrial processes and solvent use. Ozone concentrations tend to be lower in urban areas where it is converted to nitrogen dioxide by reacting with nitrogen oxides.

The Air Quality Strategy[5] objective for ground level ozone (to be met by the end of 2005) is for the maximum daily concentration (measured as an 8-hour running mean) of 100µg/m^3 not to be exceeded more than 10 times a year. In 2009, this objective was met at 8 of the 10 sites with data capture greater than 75%, including Strath Vaich and Bush Estate. Since 1990 there has been relatively little variation in annual average concentrations.

Source: Scottish Air Quality Database

Emissions of Sulphur Dioxide and Nitrogen Oxides from Large Combustion Plants[11]: 1996-2009

Annual LCP emissions (thousand tonnes)



Annual emissions (thousand tonnes)

	SO_2				NOx			
Source	**1996**	**2000**	**2008**	**2009**	**1996**	**2000**	**2008**	**2009**
Electricity supply	99.1	93.2	39.5	43.0	44.7	42.6	29.1	24.6
Refinery	11.3	6.0	2.2	2.1	2.9	2.9	2.1	1.9
Other industry	3.8	2.3	2.2	1.7	1.5	3.4	3.9	3.4

Sulphur dioxide (SO_2) and oxides of nitrogen (NOx) affect human health through respiratory damage, and ecosystem health through acidification. SO_2 and NOx are released into the atmosphere through the combustion of fossil fuels. In 2007, large combustion plants (LCPs) accounted for 68% of the SO_2 emissions and 31% of NOx emissions in Scotland.[4]

The Large Combustion Plants Directive (since revised by 2001/80/ EC) called for a 60% reduction in SO_2 emissions by 2003 and a 30% reduction in NOx emissions by 1998, from a 1980 baseline. By 2002, UK emissions for SO_2 and NOx were 79% and 66% respectively below 1980 levels.[12]

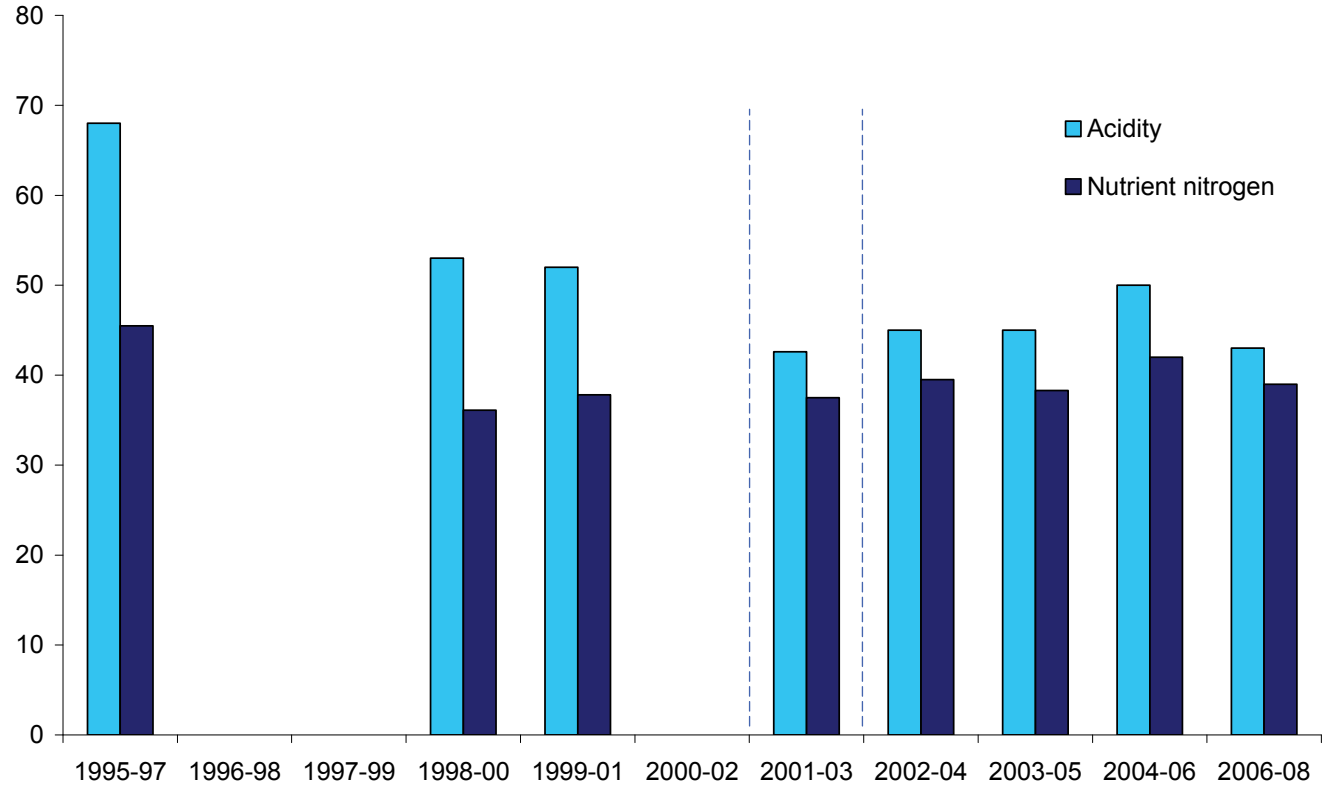
In Scotland, SO_2 emissions from the electricity supply industry fell between 1996 and 1999, but there were rises in 2000 and 2006. These rises were due to the increased use of coal-fired power stations, necessary to offset the reduced capacity of the nuclear sector because of refurbishment work at certain plants.

Emissions of SO_2 increased by 7% between 2008 and 2009, due in part to Longannet Power Station increasing it's electricity output and sourcing more Scottish coal.[13] Despite this increased production of electricity, emissions of NOx decreased by 15% between 2008 and 2009, as new abatement technology helped to reduce the emissions of NOx. This third consecutive year of reductions in NOx means that NOx emissions are now at the lowest they have been since records began in 1996.

Source: Scottish Environment Protection Agency

Sensitive habitats affected by air pollution[14]: 1995-1997 to 2006-2008

Percentage of sensitive habitat area affected by acid and nutrient nitrogen (N) deposition



Percentage of sensitive habitat area affected by acid and nutrient nitrogen (N) deposition

	1995-97	1998-00	2001-03	2002-04	2003-05	2004-06	2006-08
Acidity	*68*	*53*	*43*	*45*	*45*	*50*	*43*
Nutrient N	*46*	*36*	*38*	*40*	*38*	*42*	*39*

Critical loads are thresholds above which the deposition of pollutants causing acidification (sulphur dioxide, nitrogen oxides and ammonia) and eutrophication (nitrogen oxides and ammonia) causes significant harm to the environment[15]. The pollutants come mainly from industry, transport and agriculture.

Around 60% of Scotland's land area contains habitats sensitive to acid deposition and 55% to eutrophication. Scotland experienced a reduction in acidity exceedance from 68 per cent in 1995-1997 to 43 per cent in 2006-2008, primarily due to reductions in sulphur emissions. This included a 7 per cent reduction in acidity exceedance between 2004-06 and 2006-08. In addition, the percentage area of sensitive habitats affected by nutrient nitrogen in Scotland fell from 46% to 39% in the period 1995-97 to 2006-08.

The EU National Emissions Ceiling Directive sets limits for emissions of ammonia, nitrogen oxides, sulphur dioxide and volatile organic compounds (VOCs) to be achieved by 2010. The Gothenburg Protocol (United Nations Economic Commission for Europe, 1999) also sets ceilings for these emissions. The UK ratified the Protocol in 2005.

Source: Centre for Ecology and Hydrology

Air Quality - Footnotes

1) All values displayed in the chart and table are at the 50% data capture rate. If the data capture rate for any site is below 50% then the figure will not be included in the chart or table. Where this occurs, information will be provided as appropriate in further footnotes. When assessing whether sites met the Air Quality Strategy objectives, only those sites with 75% data capture rate are included.

2) In 2009, PM10 concentrations were measured at 62 automatic monitoring sites in Scotland. Of these sites, 49 had capture rates of 75% or more – data for these sites is available in the Scottish Air Quality Database Annual Report for 2009.

3) In 2003, the data capture rate for Edinburgh Centre was low (under 50%). The 2003 data for Edinburgh is therefore unreliable and will not be included in any charts or tables. The 2003 results for Edinburgh are: PM10: mean = 25, NO_2: mean = 50. The site stopped recording on the 13th of October and the monitor was then relocated to an urban background site at Edinburgh St Leonards, which started recording on 24 November 2003.

4) Y. Li, J. Jackson, T.P. Murrells, S. Okamura, N. Passant, S. Sneddon, J. Thomas, G. Thistlethwaite & T Misselbrook (2009). Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990-2007.

5) Department for Environment, Food and Rural Affairs, Scottish Executive, Welsh Assembly Government & DOE Northern Ireland (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland Volume 1.

6) This includes 5 sites that equalled the annual mean objective. In addition, Edinburgh St.Leonard's also equalled the Stage 2 annual mean objective in 2009, though the data capture for the site was only 53%.

7) In 2009, concentrations of nitrogen dioxide were measured at 67 automatic monitoring sites in Scotland. Of these sites, 54 had a capture rate of at least 75% - data for these sites can be found in the Scottish Air Quality Database Annual Report for 2009.

8) In 2003, the data capture rate for nitrogen dioxide concentrations in Glasgow Centre was low (under 50%), it will therefore be excluded from the table and chart. The 2003 result for Glasgow is: annual mean = 39.

9) In addition two sites equalled the annual average objective. Of the 13 sites with less than 75% data capture, 2 of these exceeded (both had capture rates above 70%) and one equalled the annual average objective (with a data capture rate of 36%).

10) In 2009, ozone concentrations were measured at 11 sites in Scotland. Data for these sites is available in the Scottish Air Quality Database Annual Report for 2009. At one new site (Peebles) the data capture was not greater than 75%.

11) Large combustion plants have a rated thermal output of over 50 megawatts.

12) Department for Environment, Food and Rural Affairs – e-digest of Environment Statistics.

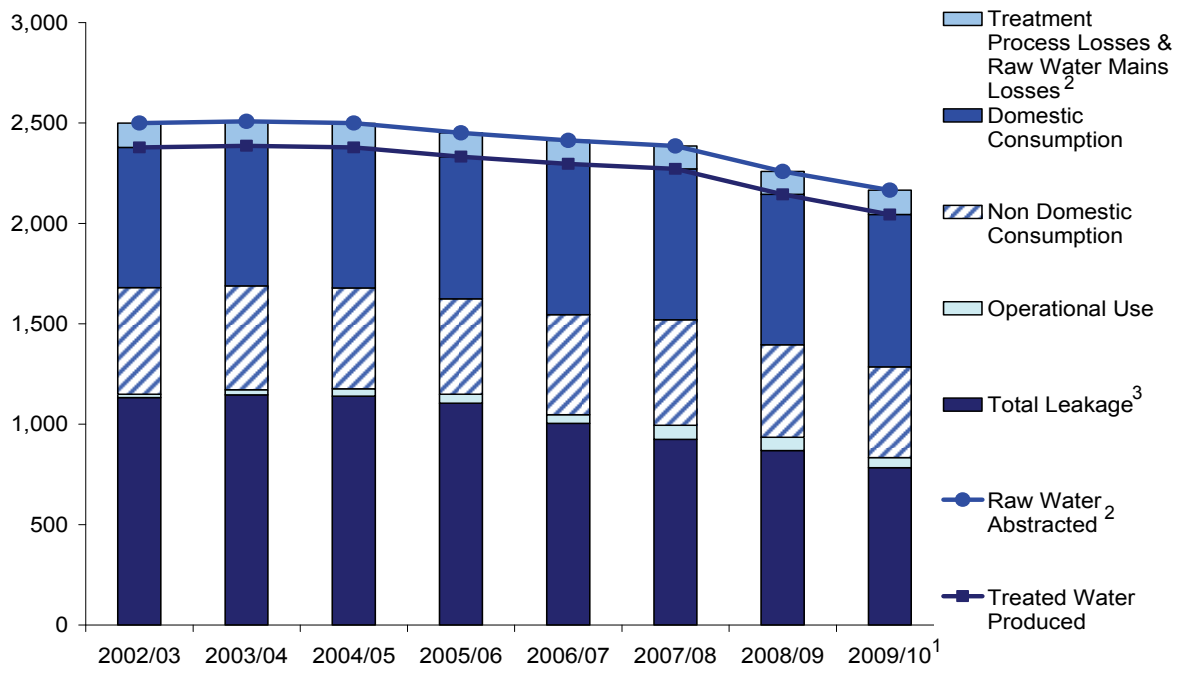
13) Scottish coal contains a greater proportion of sulphur and nitrogen than many other sources, which results in the higher volumes of SO_2 and NO_x being produced during electricity production. Scottish Power Longannet Power Station EMAS Statement 2009.

14) 3-year average deposition is used to reduce substantial year to year variability. Deposition data for 1995-97 to 1999-01 are based on the same methodology. Changes have been made to the methods for estimating deposition subsequently: (i) nitric acid deposition has been included in data from 2001-03 onwards; (ii) aerosol deposition of NH4, NO3, SO4 has been included in data from 2002-04 onwards. Therefore deposition for earlier years may be underestimated and hence the actual reductions may be larger than shown here.

15) UK National Focal Centre, Centre for Ecology and Hydrology (2004). The Status of UK Critical Loads - Critical Loads Methods, Data and Maps.

Public Water Supplies – Water Abstracted and Supplied: 2002/03-2009/10[1]

Million litres per day (Ml/d)



Million litres per day (Ml/d)

	2002/03	2006/07	2007/08	2008/09	2009/10[1]
Raw Water Abstracted[2]	**2,499**	**2,413**	**2,385[R]**	**2,258[R]**	**2,165[P]**
Treatment Process Losses and Raw Water Mains Losses[2]	121	117	114[R]	114[R]	121[P]
Treated Water Produced	**2,378**	**2,296**	**2,271**	**2,144**	**2,044[P]**
Non Domestic Consumption	530	498	524	460	452[P]
Domestic Consumption	698	751	752	749	758[P]
Operational Use	18	44	71	66	51[P]
Total Leakage[3]	1,132	1,004	924	869	783[P]

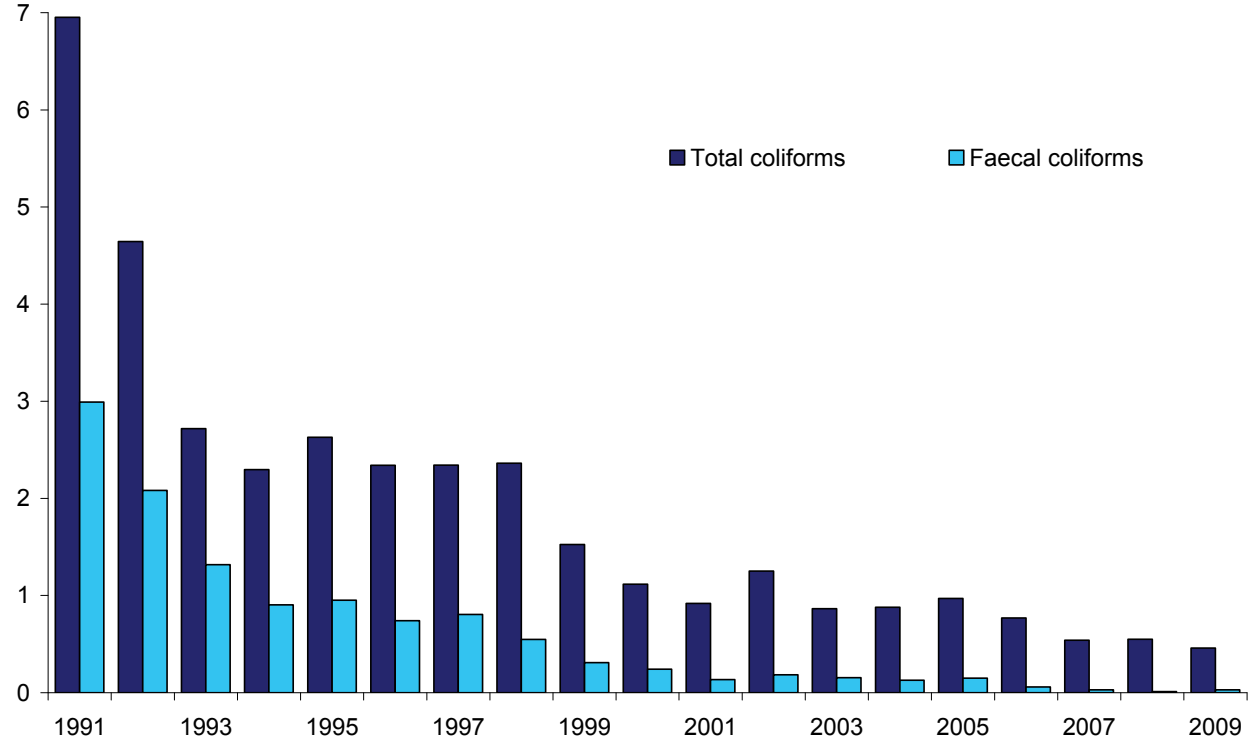
For sustainable management of water resources, it is essential to meet consumers' demands and standards, whilst maintaining aquatic ecosystem health. Abstraction of water has impacts on geology, habitats, wildlife, biodiversity and recreational use of water resources. This is being managed by Scottish Water and Scottish Environment Protection Agency under the Water Resource Planning and River Basin Management Planning Processes.

Between 2002/03 and 2009/10, estimated raw water abstractions by Scottish Water decreased by 13% to 2,165 Ml/d. Over the same period, domestic consumption increased by 9%, whilst non domestic consumption reduced by 15%. In addition to a decrease in overall consumption, there has been a 14% reduction in treated water produced between 2002/03 and 2009/10, which was largely achieved by a reduction in leakage.

However, in 2009/10 leakage remained a major element of total demand (approximately 38%). Scottish Water plan to reduce this by 2014 to the target[4] as agreed with the Water Industry Commission. Reductions would provide benefits both to customers by reducing the risk of drought impact and to the environment from reduced raw water abstraction.
Source: Scottish Water

Drinking Water Quality: 1991-2009

Percentage of samples at consumer's taps failing test



	1991	1995	2000	2005	2007	2008	2009
Percentage failure for total coliforms	*6.95*	*2.63*	*1.12*	*0.97*	*0.54*	*0.55*	*0.46*
Percentage failure for *E.coli* (faecal coliforms)	*2.99*	*0.95*	*0.24*	*0.15*	*0.03*	*0.01*	*0.03*

The coliform group of organisms is present in large numbers in the gut of all warm-blooded animals and is also widely distributed in the environment. Their presence in tap water indicates a breach in the integrity of the water supply system.

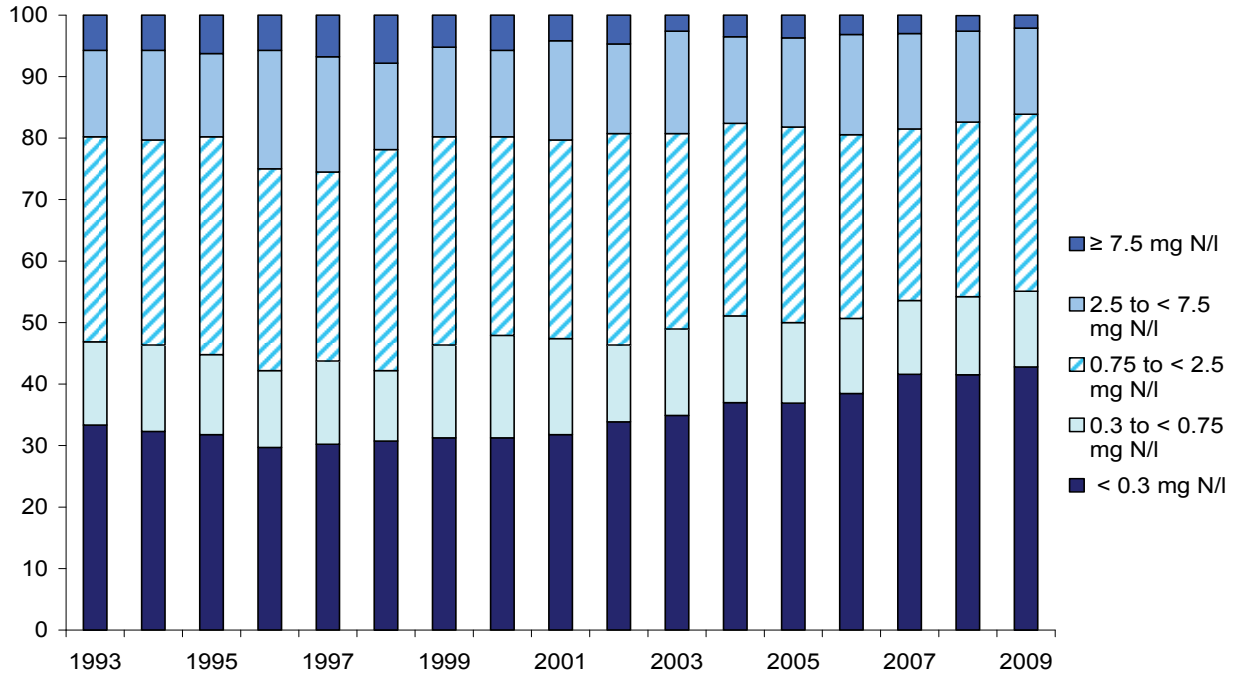
Scottish Water is required to analyse samples taken from water treatment works, service reservoirs and consumers' taps. The Water Supply (Water Quality) (Scotland) Regulations 2001 set strict standards for compliance for a wide range of parameters. The major centres of population in Scotland are served by modern water treatment works, which are generally well equipped to achieve the standards set. In recent years improvements have been made to some of the small, rural treatment works, many of which were previously unable to consistently treat water to the standard required by the Regulations.

Between 1991 and 2009 the percentage of samples from consumer taps containing coliforms fell from 6.95% to 0.46% and the percentage failure for *E.coli* fell from 2.99% to 0.03%. Between 2008 and 2009 the failure rate for *E.coli* increased by 0.02 percentage points whilst the failure rate for total coliforms decreased by 0.09 percentage points.

Source: Drinking Water Quality Regulator For Scotland

Nitrate Concentrations in Rivers[5]: 1993-2009

Distribution of mean nitrate concentrations, percentage of sites[6] within each band



Percentage of sites[6] within each band

Band	1993	1995	2000	2005	2007	2008	2009
≥ 7.5 mg N/l	*6*	*6*	*6*	*4*	*3*	*3*	*2*
2.5 to <7.5 mg N/l	*14*	*14*	*14*	*15*	*16*	*15*	*14*
0.75 to <2.5 mg N/l	*33*	*35*	*32*	*32*	*28*	*28*	*29*
0.3 to <0.75 mg N/l	*14*	*13*	*17*	*13*	*12*	*13*	*12*
<0.3 mg N/l	*33*	*32*	*31*	*37*	*42*	*42*	*43*

The enrichment of waters by nutrients, such as nitrates and phosphates, may lead to damage to the aquatic environment through the accelerated growth of algae and other plant life. The rapid growth and subsequent decay of plant organisms depletes oxygen levels, and this can have harmful effects upon fish and other aquatic life. This process is termed eutrophication.

High nitrate levels tend to have a greater impact on marine and coastal waters than on freshwater; a substantial part of the nitrates in freshwater will eventually reach the sea. The main source of nitrates in freshwater is agriculture.

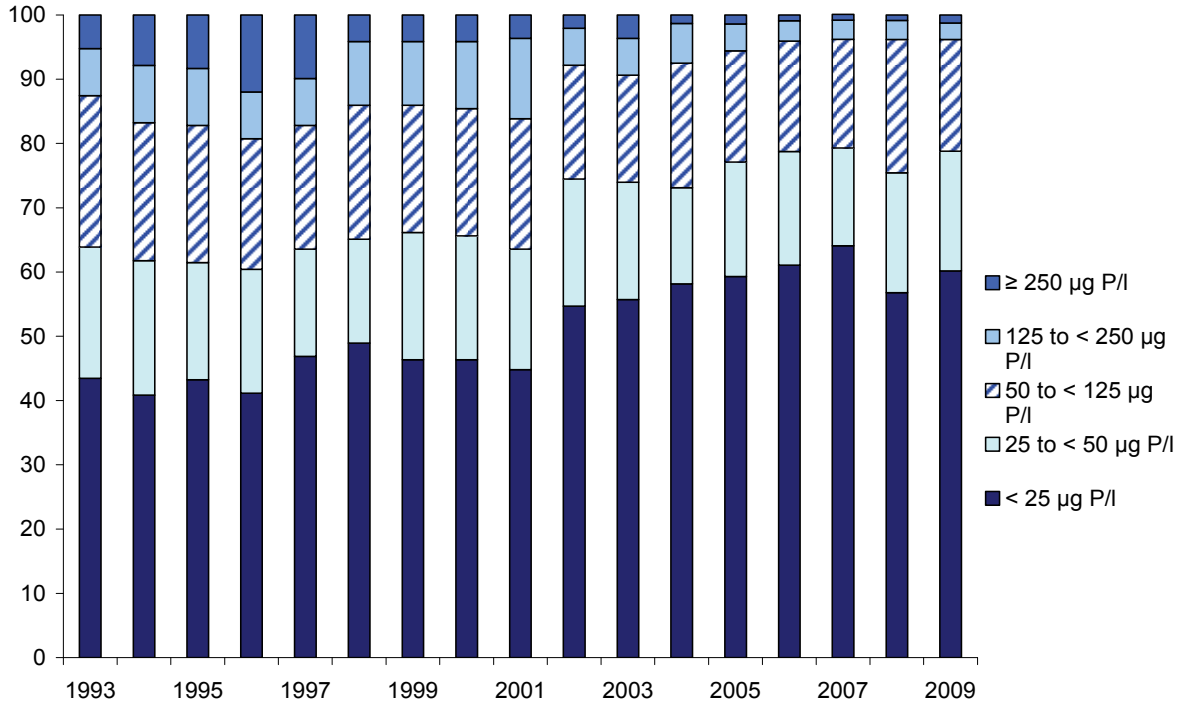
Concentrations of nitrate below 0.3 mg N/l are considered to be natural or background levels[7]; over 40% of the sites met this classification in 2009, with 43% of sites being found to have concentrations < 0.3 mg N/l. The percentage of sites with annual mean nitrate concentrations ≥ 2.5 mg N/l rose to a peak of 25.5% in 1997 but has gradually fallen since. In 2009, this percentage was 16.1%.

Regulations have been made designating 14% of the area of Scotland[8] as Nitrate Vulnerable Zones (NVZs)[9]. In NVZs, mandatory rules on farming practices aim to reduce nitrate water pollution from agricultural sources.

Source: Scottish Environment Protection Agency

Orthophosphate Concentrations in Rivers[10]: 1993-2009

Distribution of mean orthophosphate concentrations, percentage of sites[6] within each band



Percentage of sites[6] within band

Band	1993	1995	2000	2005	2007	2008	2009
≥ 250 µg P/l	*5*	*8*	*4*	*1*	*1*	*1*	*1*
125 to <250 µg P/l	*7*	*9*	*10*	*4*	*3*	*3*	*3*
50 to <125 µg P/l	*24*	*21*	*20*	*17*	*17*	*21*	*17*
25 to <50 µg P/l	*20*	*18*	*19*	*18*	*15*	*19*	*19*
<25 µg P/l	*43*	*43*	*46*	*59*	*64*	*57*	*60*

Raised levels of orthophosphate in freshwaters may lead to eutrophication. The main source of phosphorus is diffuse pollution from agriculture, but it also comes from sources such as detergents and dishwater detergents that are discharged from sewage treatment works.

Over the period 1993-2001, the percentage of sites with annual mean orthophosphate concentrations <25 µg P/l averaged 45% and the percentage of those ≥ 125 µg P/l averaged 16%. By 2007, the percentage of sites with mean concentrations <25 µg P/l had increased to over 60% and the percentage of sites ≥ 125 µg P/l had fallen to 4%. However, in 2008 the percentage of sites with mean concentrations <25 µg P/l fell to 57%, before recovering in 2009 to 60%. The percentage of sites ≥ 125 µg P/l remained stable between 2007 and 2009 at 4%. The long term reduction in orthophosphate concentrations is in part due to the installation of nutrient removal facilities in sewage treatment works.

Under the Urban Waste Water Treatment Directive (UWWTD) (91/271/EEC), catchments where nutrient levels are considered to be high are designated as sensitive areas. Discharges into waters that have been designated as sensitive require additional treatment to remove nutrients.
Source: Scottish Environment Protection Agency

Water - Footnotes

1) 2009/10 data subject to Water Industry Commission confirmation.

2) Figures for raw water abstracted and treatment process losses and raw water mains losses are estimates. Slight corrections have been made to years 2007/08 and 2008/09. The 2009/2010 raw water abstracted figure is an estimate based on a calculation methodology as for previous years. In future years, metered data will be used. For 2009/2010, a raw water abstracted figure based on a mix of metered and estimated data is also available and has been supplied to Water U.K. for their Sustainability Report. These figures show raw water abstracted as 2,290 Ml/d and treatment process losses and raw water mains losses as 246 Ml/d.

3) Total leakage only relates to potable water and is the combination of customer supply side leakage and Scottish Water distribution network losses.

4) The target for Scottish Water is to keep working towards the Economic Level of Leakage. This is the point where it is more costly to repair a leak than the cost saving due to the value of the water leaking from the system.

5) Data is expressed as mg N/l. To convert to mg NO_3/l (nitrate), multiply by $^{62}/_{14}$.

6) A set of around 200 sites, based on nitrate directive locations, was used.

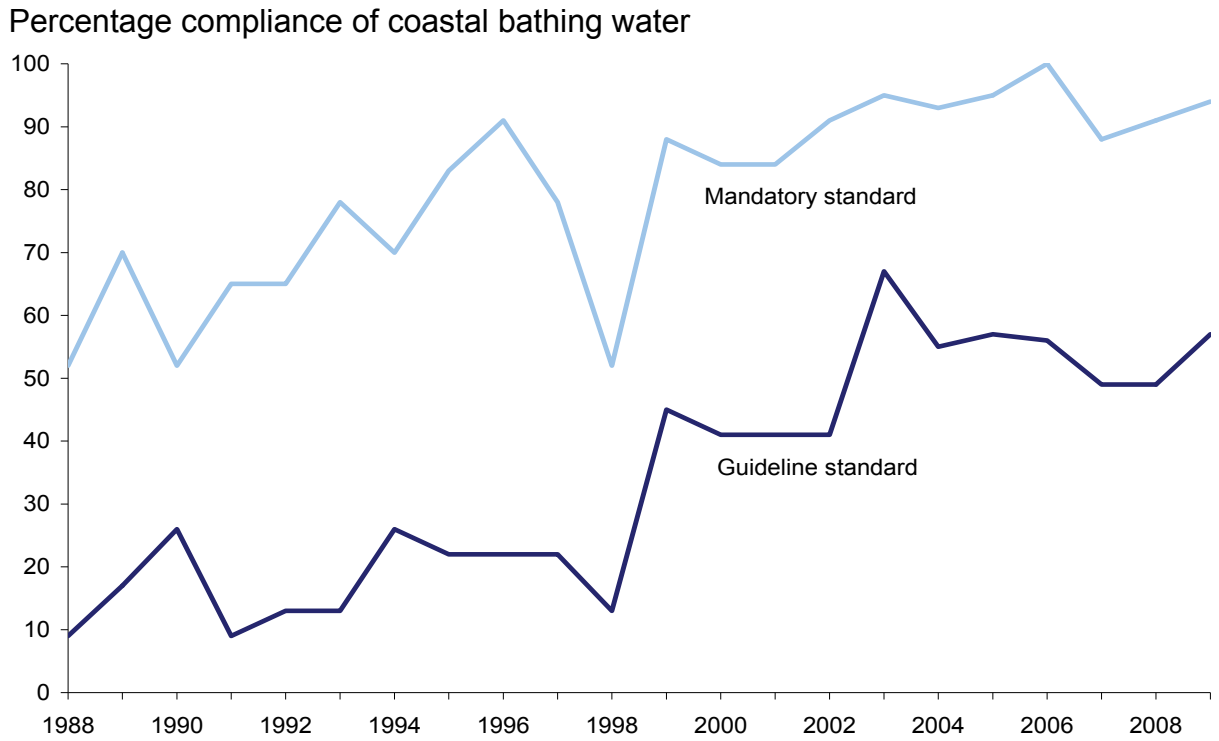
7) This applies to most European rivers though for some rivers up to 1 mg N/l is reported. European Environment Agency, 'Indicator Fact Sheet'. '(WEU02) Nutrients in Rivers'.

8) In Aberdeen, Moray, Banff and Buchan; Strathmore and Fife; Lothians and Borders; and Lower Nithsdale.

9) Under The Designation of Nitrate Vulnerable Zones (Scotland) Regulations 2002 and The Designation of Nitrate Vulnerable Zones (Scotland) (No. 2) Regulations 2002 and EC Nitrates Directive (91/676/EEC) Annex 1A(3).

10) Soluble reactive phosphorus was measured as µg P/l. To convert to µg PO_4/l (orthophosphate), multiply by $^{95}/_{31}$.

Compliance with the EC Bathing Water Directive (76/160/EEC): 1988-2009



	1988	1990	1995	2000	2005	2008	2009
Mandatory standard compliance (%)	*52*	*52*	*83*	*84*	*95*	*91*	*94*
Guideline standard (%)	*9*	*26*	*22*	*41*	*57*	*49*	*57*
Failure to comply (%)	*48*	*48*	*17*	*16*	*5*	*9*	*6*
Number of identified coastal bathing waters[1,2]	23	23	23	58	58	77	77

High quality bathing waters are important for a wide variety of interests and they support Scotland's tourism industry. Monitoring the quality of these waters provides an indication of the health risks of bathing from both direct and diffuse discharges of effluents containing faecal contaminants.

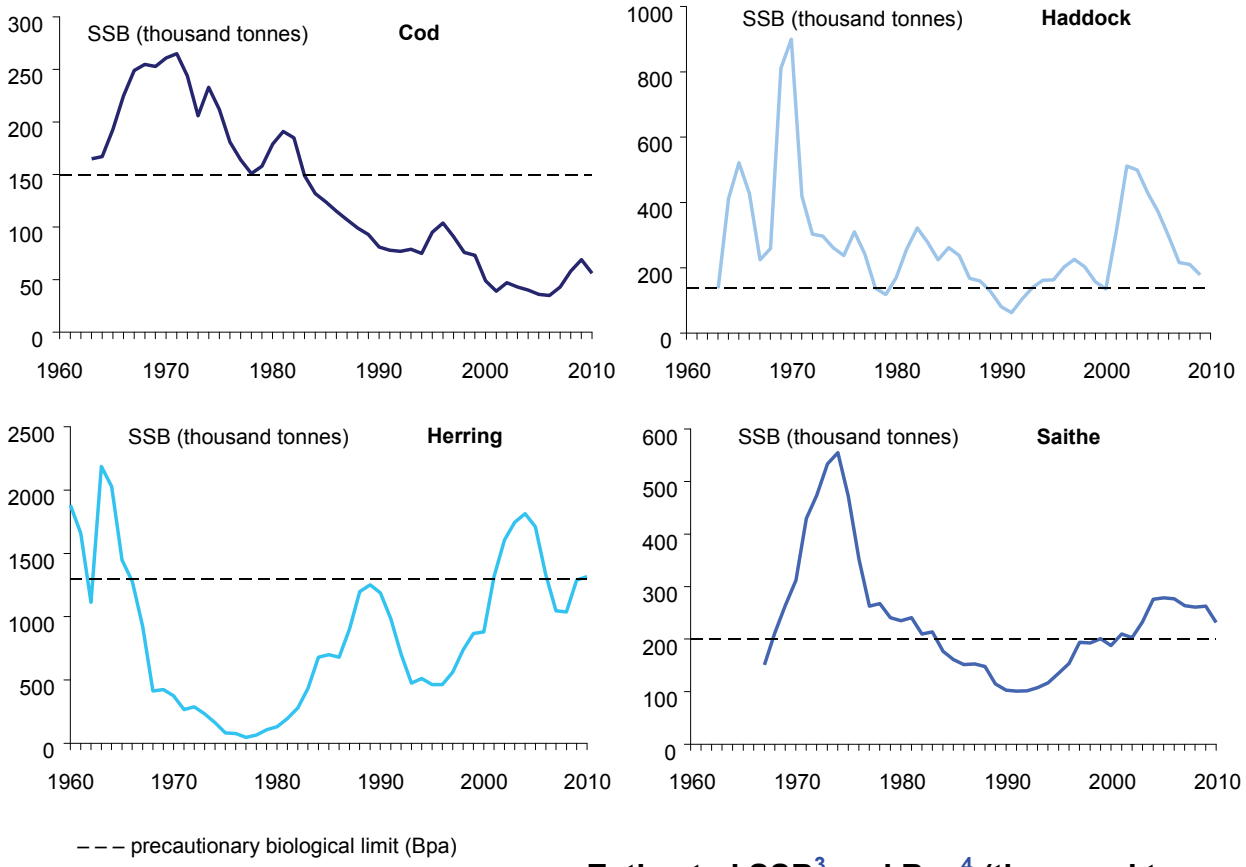
EC Bathing Water Directive (76/160/EEC) sets out two quality standards - the 'mandatory' standard, and the stricter 'guideline' standard. Member states should comply with the mandatory standard and aim to comply with the guideline standard. In 2009, 94% of the 77 identified coastal bathing waters achieved the mandatory standard, and 57% also complied with the guideline standard.

It is important to note that the weather has a bearing on compliance, with wet weather often contributing to poorer results and, conversely, drier, sunnier weather associated with better results. When samples are taken in abnormal weather conditions, these may be excluded and a replacement sample taken immediately after the abnormal effects have ceased.

The 2006 Bathing Waters Directive (a revision of the current directive) means that the bathing waters will have to comply with stricter microbiological parameters by 2015.

Source: Scottish Environment Protection Agency

Selected Commercial Fish Stocks: 1960s – 2010



Estimated SSB[3] and Bpa[4] (thousand tonnes)

Stock[5,6]	1967	1970	1980	1990	2000	2009	2010[7]	Bpa
NS Cod	249	261	179	81	49	69	56	150
NS Haddock[8]	225	900	170	81	135	178	-	140
NS Herring	923	375	132	1,188	879	1,289	1,317	1,300
NS/WoS Saithe[9]	151	312	235	103	188	263	232	200

The ecosystem of the seas around Scotland supports fisheries for commercially important species. If stocks are in a poor state or overfished it can have a knock-on effect on other parts of the marine ecosystem. The state of commercial fish stocks may be considered, alongside other indicators, as a proxy for the general sustainability of the marine environment. One measure of the state of a fish stock is the size of its spawning stock biomass (SSB).[3] The health of the fish stock can then be indicated by comparing the SSB with a precautionary value, or reference point (Bpa).[4]

The SSB of North Sea cod stock has been below Bpa since 1983. The stock SSB increased in each year since 2006 to 2009, but fell to 56 kt in 2010, still well below the Bpa of 150 kt. The SSB of haddock has been above the Bpa of 140 kt since 2001 and in 2009 was 178 kt. In 2010 the SSB value of herring stocks was above the Bpa at 1,317 kt. The SSB of the North Sea/West of Scotland saithe was estimated to be just over 232 kt in 2010: it has been above the Bpa of 200 kt since 2001.

The size of these stocks are affected by commercial fishing and other factors such as climate change. A range of management measures are applied to fishing activity in Scotland, with the aim of achieving or maintaining healthy stock levels.[10]

Source: Marine Scotland Science, ICES

Marine - Footnotes

1) In 1999, a further 37 bathing waters were added to the 23 already identified. Two of these were inland bathing waters and are not included with the data presented here. Both have complied with the standards in every year since 1999. In 2006, 3 additional bathing waters were included. In 2007, three sites were de-designated and one site was split into two. In 2008, one site was de-designated, 19 new coastal waters were added and one inland water was added (not included in the data). This inland water has complied with the standards in both 2008 and 2009.

2) For the 2010 bathing season (June 1 - September 15) there are 82 designated sites in Scotland. This includes an additional two sites newly identified in 2010. The latest data for 2010 can be found online at the Scottish Environment Protection Agency website.

3) The spawning stock biomass (SSB) is the total weight of fish capable of spawning in any one year.

4) The Bpa indicates the SSB below which the stock is considered to be at risk of suffering reduced reproductive capacity, indicating that spawning levels may be insufficient to guarantee stock replenishment and stock abundance will probably decrease. The Bpa for each stock is defined by the International Council for the Exploration of the Sea (ICES).

5) Estimates for cod, haddock and herring are for the North Sea (NS) stock. Those for saithe are for the North Sea and West of Scotland (WoS) stock.

6) The data for the fish stocks are the current best estimates of each stock and not the historic estimates. The full time series is revised for each stock every time an assessment is re-run and although values at the most recent end of the time series may change markedly in some cases, most other values remain stable.

7) It is the nature of fish stock assessments that the most recent year's estimates are also the least certain, and subject to revision when subsequent years' data become available.

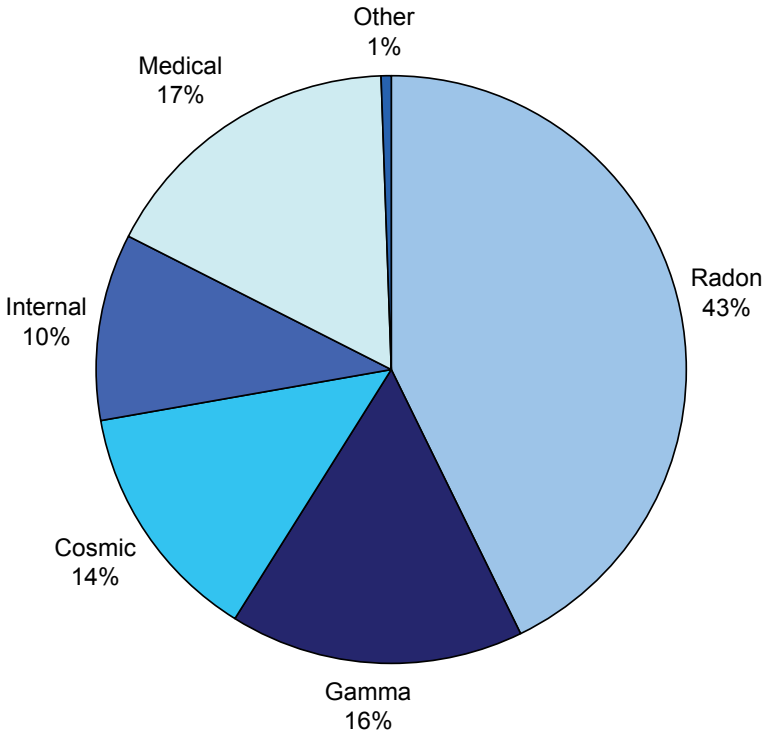
8) A 2010 haddock SSB value of 194 kt was included in the ICES Working Group report but was not included in the latest ICES advice sheets. No reason was provided for this omission.

9) Some survey and catch data relevant to Saithe were not available to the ICES North Sea and Skagerrak working group in 2010, therefore a full assessment could not be carried out. The assessment of the 2009 working group meeting was accepted by ICES and this has been used as a basis to forecast a stock size in 2010. Consequently, there are no revisions to historical values for Saithe.

10) More information on management measures applied to fishing activity in Scotland can be found by visiting http://www.scotland.gov.uk/Topics/marine/Sea-Fisheries.

Exposure of the Population to All Sources of Radiation: 2003[1]

Average annual dose in Scotland, 2,400 microsieverts



	Average annual dose (microsieverts)		
Natural sources	**µSv**	**Artificial sources**	**µSv**
Radon	1,040	**Medical**	410
Gamma rays	390	**Other**[2]	
Cosmic	330	**Occupational**	6
Internal (from diet)	250	**Fallout**	6
		Disposals	0.9
		Consumer products	0.1

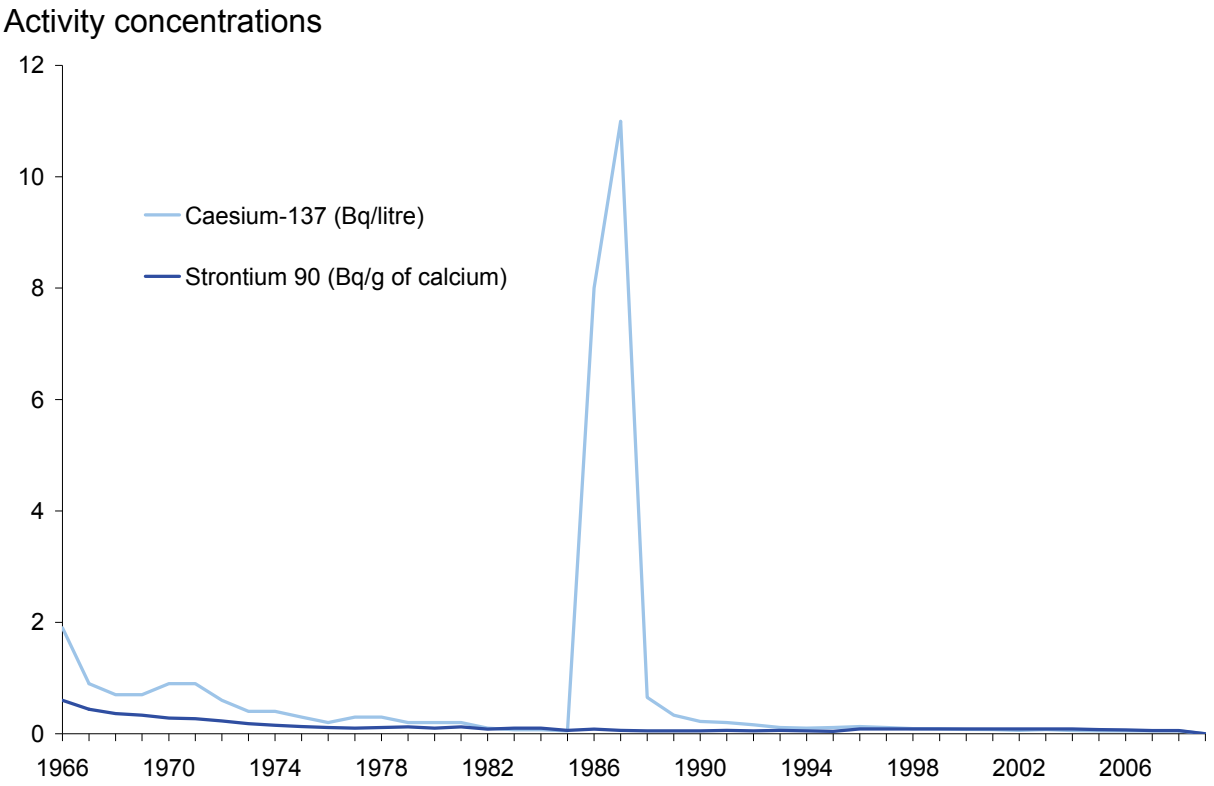
The average annual dose of radiation to someone living in Scotland is 2,400 microsieverts, 83% of which comes from natural sources. The main source of natural radiation exposure is radon, a radioactive gas that is emitted from tiny amounts of uranium naturally present in materials such as rocks, soils, bricks and concrete.

Radon decays and emits short-lived products that can increase the risk of lung cancer. The action level for radon in the home is 200 Bq/m^3, above which, measures should be taken to reduce concentrations. Other important natural sources of radiation are cosmic rays, terrestrial gamma rays and long-lived radionuclides that enter the body through food and drink.

The greatest artificial source of exposure to radiation comes from medical x-rays. Nuclear waste disposals and fall-out account for less than 0.3% of exposure. The Chernobyl reactor incident in 1986 caused average annual doses from fall-out to increase by about five times that year.

Source: Health Protection Agency – Radiation Protection Division

Activity Concentrations in Milk: 1966-2009[3]



Activity concentrations in milk

	1966	1975	1987	2000	2008	2009
Caesium 137 (Bq/litre)	1.90	0.30	11.00	<0.078	<0.051	<0.044
Strontium 90 (Bq/gram of calcium)	0.60	0.13	0.06	<0.083	<0.054	<0.058

Exposures to ionising radiation from radioactive substances can have an impact on human health. For this reason, a number of foodstuffs are monitored each year to assess that the public has been adequately protected from ionising radiation.

Cows' milk is a widely consumed foodstuff that can provide a valuable indicator of changes over time. Samples are bulked from a number of farms to provide an extensive surveillance area. From 1966 until 1980, there were gradual falls in the concentrations of caesium-137 (^{137}Cs) and strontium-90 (^{90}Sr) until the concentration was so low it was difficult to detect. This reflects a decline in atmospheric radioactive fall-out, following the ban on above-ground nuclear weapons testing under the 1963 Partial Test Ban Treaty between the UK, USA and former USSR.

Following the Chernobyl reactor incident in 1986, concentrations of ^{137}Cs in milk peaked in 1987. These concentrations have fallen since and are now below pre-Chernobyl levels.[4] In 2009, the concentration of ^{137}Cs was <0.044 Bq/litre and ^{90}Sr was <0.058 Bq/gram of calcium. However, even at its peak the ^{137}Cs concentration in milk was still below the Community Food Intervention Levels, defined by Euratom Regulations EC/3954/87 and EC/2218/89, which were derived to ensure the protection of the public. Even at its peak concentration following the Chernobyl accident the levels of ^{137}Cs in milk were around 100 times lower than the intervention level.

Source: Scottish Environment Protection Agency

Radioactivity - Footnotes

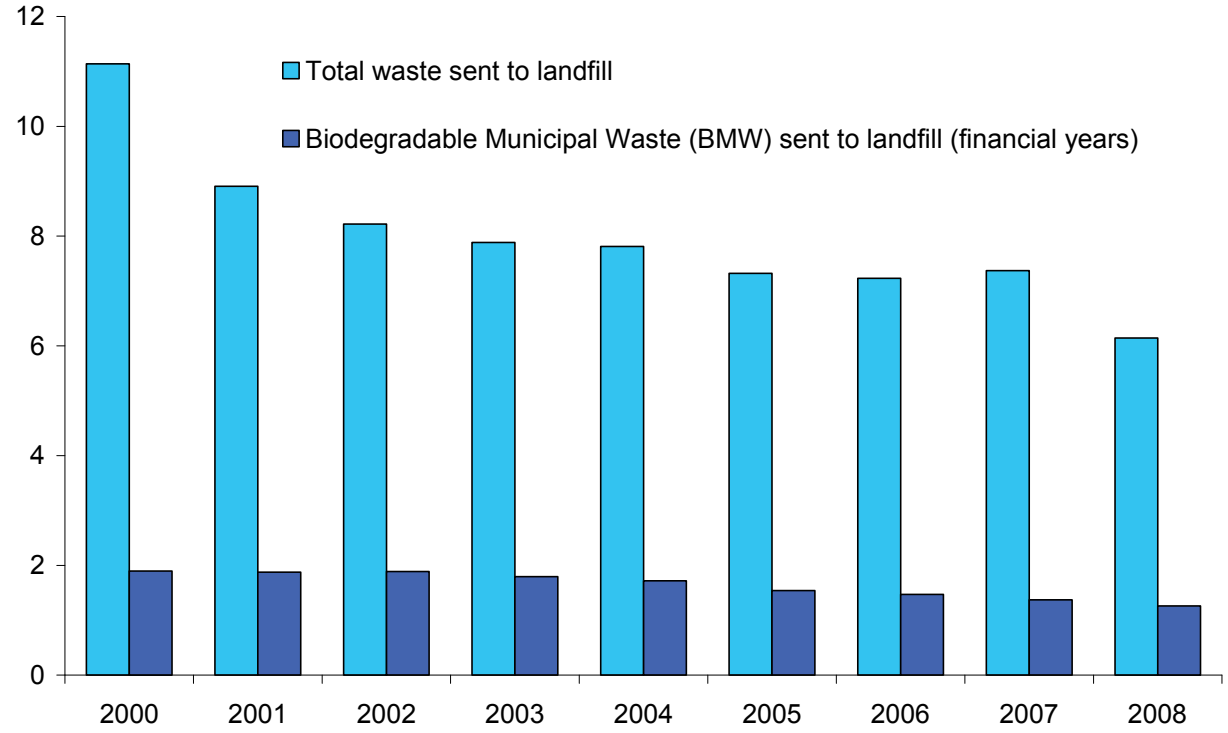
1) Radon and gamma values are specific to Scotland. Other values are assumed to be the same as the UK average as published in the Health Protection Agency – Radiation Protection Division's publication: HPA-RPD-001 - Ionising Radiation Exposure of the UK Population: 2005 Review.

2) 'Other' includes fallout, disposals, occupational and consumer products (smoke alarms, luminous watches, etc.).

3) From 1996 onwards, the concentrations reported were lower than the limit level for detection. Note that figures pre-1996 were produced by the HPA who took milk samples from a number of milk depots throughout the country, in proportion to the quantity of milk handled by each depot in order to generate the data. Post-1996 the figures were produced by SEPA who collected samples and analysed them for sites remote from nuclear sites. As a result the pre-1996 and post-1996 figures are not strictly comparable.

4) Unlike Cs-137 which was widely dispersed in the environment, Sr-90 was mostly deposited near Chernobyl.

Waste Sent to Landfill: 2000-2008



Million tonnes

	2000	2003	2004	2005	2006	2007	2008
Biodegradable Municipal Waste[1,2,3]	1.90	1.79	1.72	1.54	1.47	1.37	1.26
Total waste sent to landfill[4]	11.14	7.88	7.81	7.32	7.23	7.37	6.14

The disposal of waste to landfill can result in the loss of many tonnes of valuable materials, release pollutants into the soil and watercourses, and emit methane, a greenhouse gas.

Landfill is at the bottom of the waste hierarchy[5]. In Scotland, 6.14 million tonnes were landfilled in 2008. The amount of Biodegradable Municipal Waste (BMW) sent to landfill in 2008/09 was 1.26 million tonnes. Between 2000 and 2008 the total waste sent to landfill decreased by 45% (5 million tonnes), while the amount of BMW sent to landfill between 2000/01 and 2008/09 decreased by 34%. BMW includes items such as paper and card, textiles, food and garden waste, which decompose and release greenhouse gases.

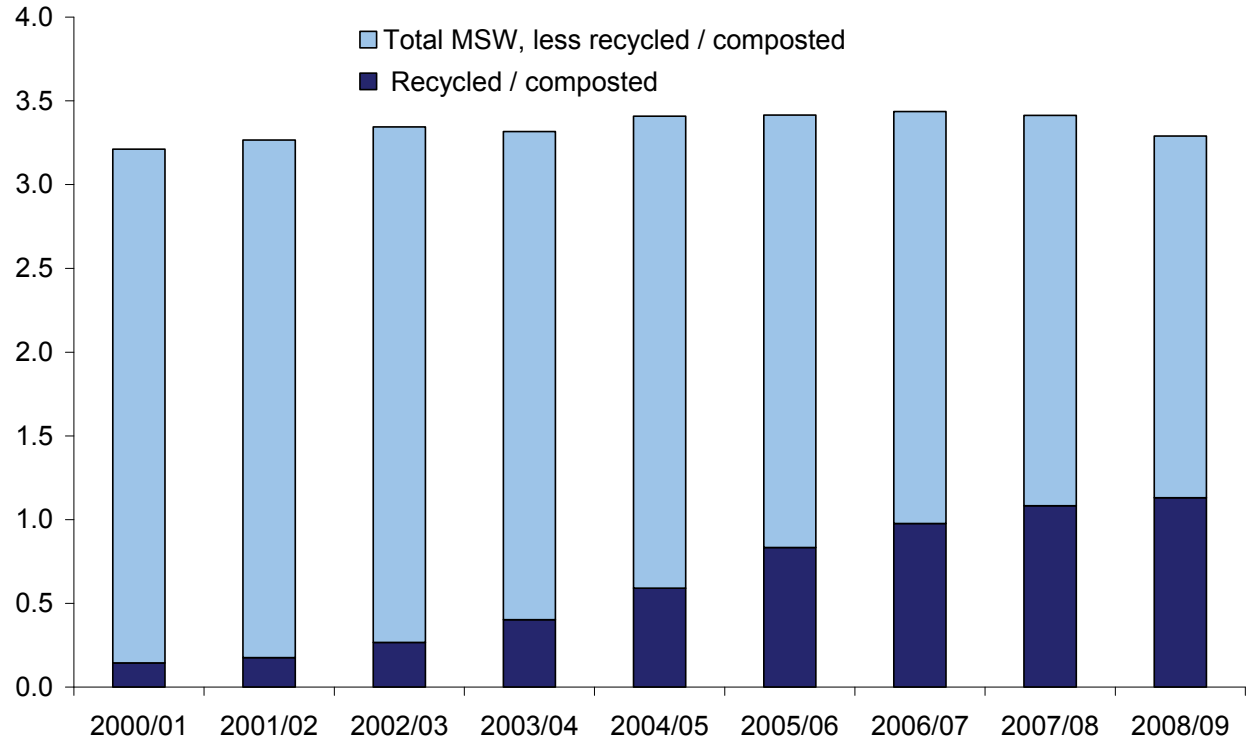
In 2007, the Scottish Government set a target for the maximum amount of BMW sent to landfill of 1.32 million tonnes by 2010. This target was in line with regulations introduced in 2004[6], which set targets for each of the administrations in the United Kingdom (UK) to meet UK targets set in the EU Landfill Directive[7].

The Landfill Tax was introduced in 1996 in order to discourage the disposal of waste to landfill. The tax rate was increased to £40 per tonne for biodegradable waste for 2009/10, and will continue to rise by £8 on 1 April each year until at least 2014. From April 2008, the lower rate applying to inactive waste is £2.50 per tonne.

Source: Scottish Environment Protection Agency

Municipal Solid Waste (MSW)[1,2]: 2000/01-2008/09

Million tonnes



Million Tonnes

	2000/01	2004/05	2005/06	2006/07	2007/08	2008/09
MSW arisings	3.21	3.41	3.42[R]	3.44	3.41	3.29
MSW recycled / composted	0.14[R]	0.59[R]	0.83[R]	0.98	1.08	1.13
Percentage recycled/ composted	*4.5[R]*	*17.3[R]*	*24.4[R]*	*28.4*	*31.7*	*34.3*

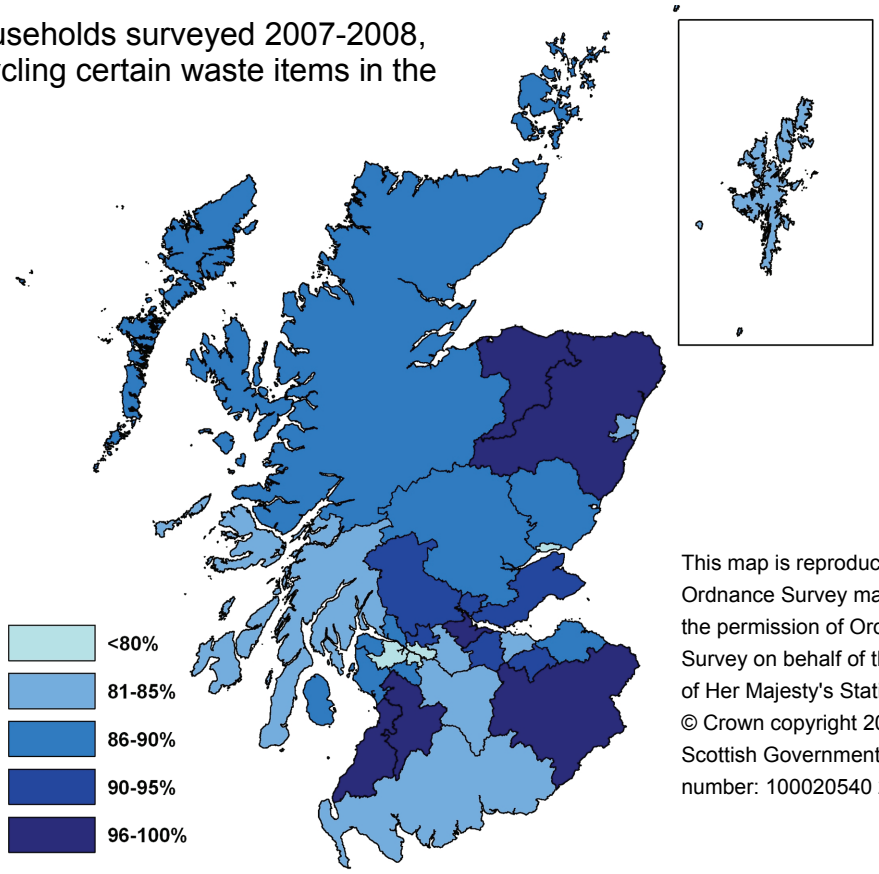
The strong dependence on landfill for waste management in Scotland is not sustainable since it involves the depletion of both renewable and finite natural resources. In addition, extracting and processing raw materials may consume large quantities of energy, release pollutants and destroy landscapes and ecosystems. Reducing, re-using and recovering waste are key sustainable development and Zero Waste objectives.

Municipal waste arisings rose from 3.21 million tonnes in 2000/1 to 3.44 million tonnes in 2006/07 before falling to 3.29 million tonnes in 2008/09. Over the same period the percentage of municipal waste recycled or composted rose from 4.5% to 34.3%. This reflects more than a six-fold increase in the amount of material recycled.

The National Waste Plan[8] set a target of stopping growth in municipal waste by 2010. In 2008, the Scottish Government also set targets[9] to increase the amount of municipal waste being recycled or composted to 40% by 2010, 50% by 2013, 60% by 2020 and 70% by 2025. These targets have been included in the 2010 Zero Waste Plan[10] but have been revised to apply to waste collected from households. In addition, prior to the development of targets for other sectors, the plan included a Scottish Government aspiration to achieve a 70% recycling level for all waste by 2025.
Source: Scottish Environment Protection Agency

Waste Recycling Behaviour: 2000-2009

Percentage of households surveyed 2007-2008, who reported recycling certain waste items in the past month



Scottish Government GI Science & Analysis Team 2009

Percentage surveyed who reported recycling waste items in the past month

	Adult Respondents		Households			
Item	**2000**	**2002**	**2003**[11]	**2007**[12]	**2008**	**2009**
Newspaper/Magazines/paper/card	*30*	*33*	*45*	*81*	*83*	*84*
Glass Bottles and Jars[13]	*29*	*31*	*35*	*67*	*70*^{R}	*73*
Plastic Bottles[13]	*6*	*8*	*12*^{R}	*58*	*65*	*71*
Metal Cans	*9*	*10*	*14*	*59*	*65*	*69*
One or more of above items	*43*	*45*	*55*	*84*	*87*	*88*

Waste prevention, minimisation and re-use are at the top of the waste hierarchy[5] and recognition for this is given in Scotland's Zero Waste Plan[10]. The Scottish Household Survey[14] provides information on recycling behaviour. Before 2003, adults were asked which, if any, of a selection of certain waste items, they had recycled from home in the past month. From 2003, the same question was asked of households.

In 2009, 88% of households surveyed said they had recycled one or more of the tabulated items in the past month, increasing from 55% in 2003. In 2009, 84% had recycled paper and card, 71% had recycled plastic bottles and 69% had recycled metal cans. Since 2003, the percentage of households recycling waste has increased for each item in the survey.

The chart shows the percentage of households surveyed who said they recycled any of the four items in the past month, by local authority area, averaged over 2007 and 2008[15].

Source: Scottish Government

Waste - Footnotes

1) The definition of municipal waste has changed slightly over the time period in which this data has been collected.

2) The definition of municipal waste for recent years is all waste collected by or on behalf of local authorities, excluding road maintenance wastes and end-of-life vehicles, separately collected construction and demolition wastes and industrial waste.

3) The biodegradable municipal waste (BMW) data for 2001-2008 are for financial years. To calculate the BMW in the years before 2003/2004, it has been assumed that 63% of the waste landfilled was biodegradable. A mass balance calculation, assuming 63% of waste arisings are biodegradable, has been used to provide the data from 2003/2004 onwards. Landfill Allowance Scheme (Scotland) Regulations 2005.

4) The total to landfill from all sources. Total waste sent to landfill is for calendar years.

5) Waste Hierarchy (SEPA)

6) The Landfill (Scheme Year and Maximum Landfill Amount) Regulations 2004
During 2010, revised targets for the reduction of landfilling of BMW were agreed between the UK and the Commission, based upon a change in scope of the definition of municipal waste. This revised definition now extends beyond waste managed by local authorities and now includes waste from businesses that is similar in nature and composition to waste from households. As a result, Scotland's share of the UK's Landfill Directive 2010, 2013 and 2020 targets has been revised to 2.7, 1.8 and 1.26 million tonnes of biodegradable municipal waste respectively. In the meantime, the targets set for Scotland in the 2004 regulations, for waste collected by or on behalf of local authorities, remain.

7) Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste.

8) National Waste Plan (2003)

9) Scottish Government News Release 2008 "New vision for waste"

10) Zero Waste Plan (2010)

11) The survey method changed from a survey of adults to a survey of households from the second quarter of 2003. The 2003 data used is from quarters 2, 3 and 4 only.

12) From 2007, this question was asked of three quarters of the sample. Previously, it was asked of all households. In previous years the question asked whether or not the household recycled each of four items (yes or no). In 2007, this was changed to how much (all/most/some/none) was recycled. The table shows those reporting recycling, 'all' 'most' or 'some' of each item.

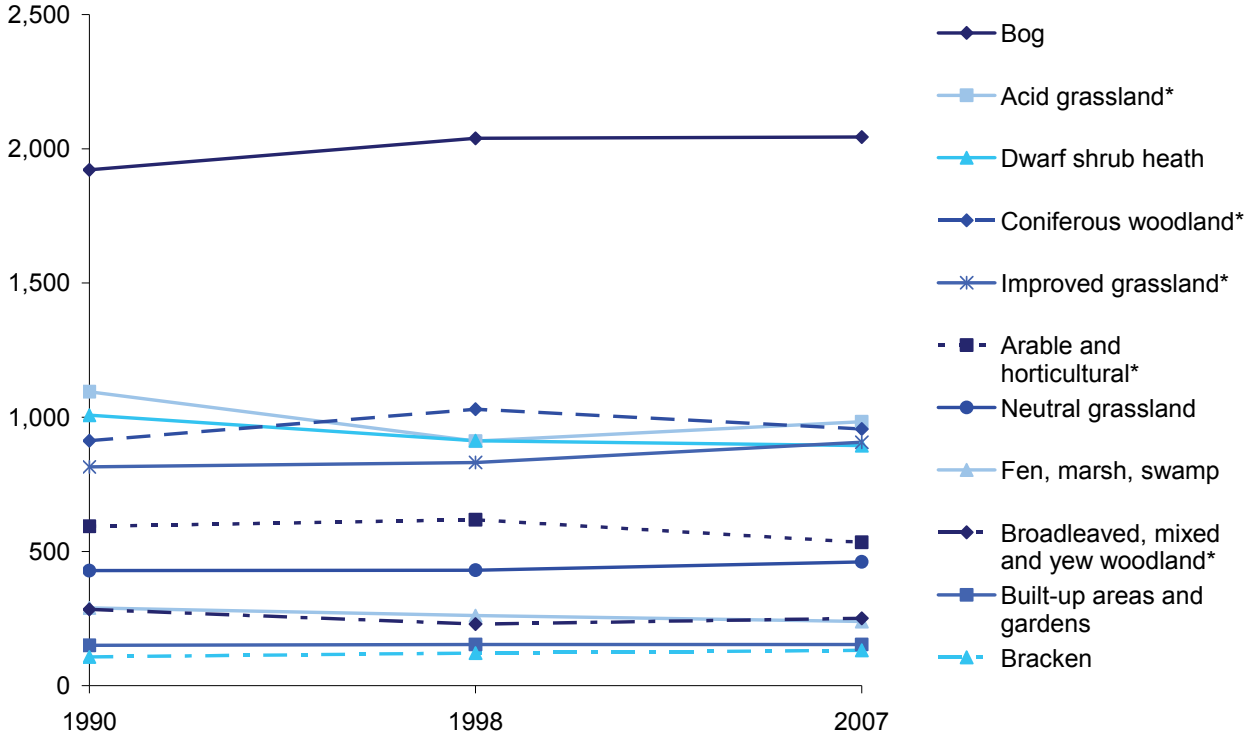
13) In 2007, there was also a change to the items: 'glass bottles' became 'glass bottles and jars', and 'plastic' became 'plastic bottles'.

14) The Scottish Household Survey is a continuous cross-sectional survey based on a sample of the population in private residences in Scotland.

15) Two years data needs to be combined to provide local authority data. New data will be available at local authority level in 2011, when 2009 and 2010 data can be combined.

Broad Habitat Change: 1990-2007

Changes in the extents of the most widespread Broad Habitats (thousand hectares)



Area (thousand hectares)

Habitat	1990[1]	1998	2007	% Change (1998-2007)
Acid grassland	1,095	911	983	*7.9**
Coniferous woodland	913	1,030	956	*-7.1**
Improved grassland	815	831	907	*9.1**
Arable and horticultural land	593	618	534	*-13.6**
Broadleaf, mixed and yew woodland	284	229	251	*9.5**

(* statistically significant, p<0.05)

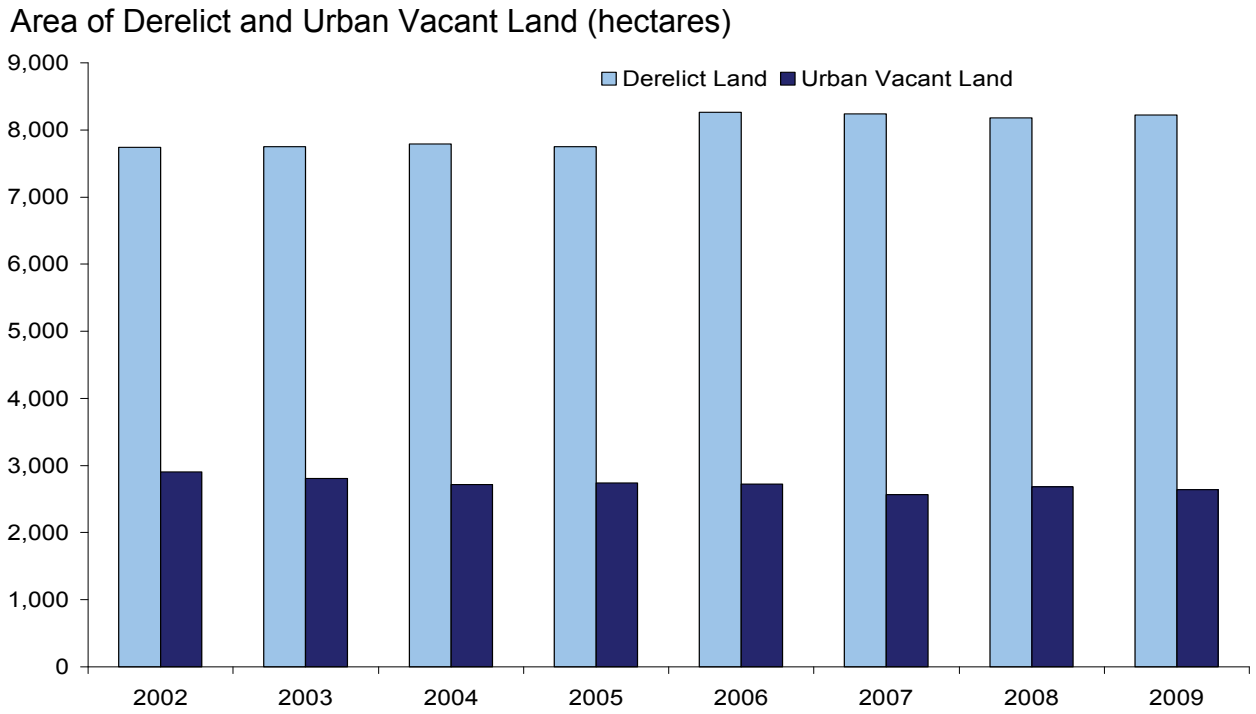
A classification of 'broad habitat' was defined for consistent reporting and monitoring of priority habitats that were identified under the UK Biodiversity Action Plan.[2] The habitats range from developed land, such as built-up areas and gardens, to semi-natural land, such as grasslands, bog and bracken. The Countryside Survey 2007[3] reported the status of 19 of the 27 broad habitats occurring in Scotland. Changes in the extents of the 11 most widespread broad habitats are presented above.

Between 1998 and 2007 the area of broadleaved woodland, improved grassland and acid grassland increased. Coniferous woodland and arable and horticultural land decreased in the same time period. The area of all other broad habitats showed no significant change.

The largest change over the period 1998 to 2007 was in arable and horticultural land, which decreased by nearly 84,000 hectares (13.6%). The largest increase in area of broad habitat was for acid grassland, which increased by 72,000 hectares (7.9%) between 1998 and 2007, with most of this change being concentrated in the Scottish Uplands.

Source: Countryside Survey 2007

Derelict and Urban Vacant Land[R,4,5] : 2002-2009



Area (ha)

	2002	2005	2006	2007	2008	2009
Derelict Land	7,741	7,747	8,261	8,238	8,177	8,224
Urban Vacant Land	2,903	2,742	2,725	2,563	2,681	2,640
Total	10,644	10,489	10,986	10,801	10,858	10,863

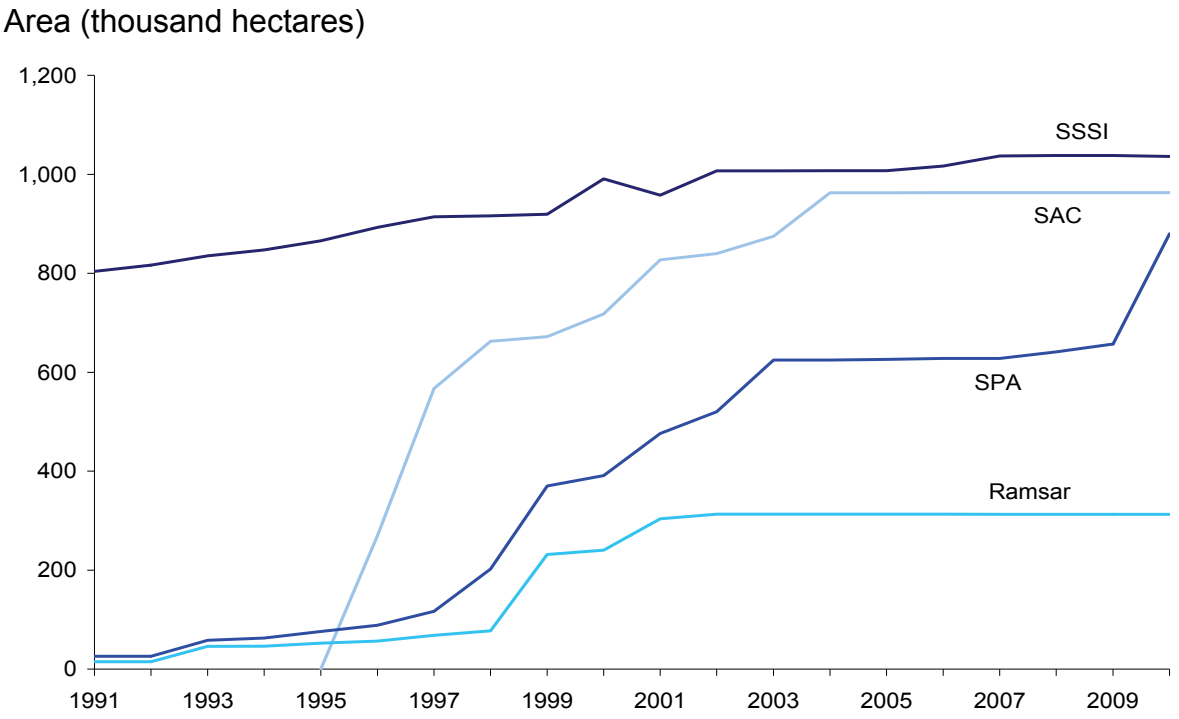
Derelict land together with vacant land in urban areas is an unused resource. Every year the Scottish Government conducts a survey of derelict and urban vacant land in each local authority. The main purpose of the survey is to provide a national data source to inform the programming of the rehabilitation, planning and reuse of derelict and urban vacant sites.

Vacant land is land that is unused for the purposes for which it is held and is viewed as an appropriate site for development. This land must either have had prior development on it, or had preparatory work taken place on it in anticipation of future development. Derelict land[6] (and buildings) is land that has been so damaged by development, that it is incapable of development for beneficial use without rehabilitation. In addition, the land must currently not be used for the purpose for which it is held or a use acceptable in the local plan.

The annual Scottish Vacant and Derelict Land Survey[7] shows that the total amount of derelict and urban vacant land in Scotland has increased from 10,644 hectares in 2002 to 10,863 hectares in 2009. Of this 10,863 hectares, 76% was classified as derelict. The area of derelict land has increased from 7,741 hectares in 2002 to 8,224 hectares in 2009. This is attributable to the land that has been brought back into productive use or removed due to naturalisation being balanced by a small number of large sites falling out of use. The area of vacant land has decreased from 2,903 hectares in 2002 to 2,640 ha in 2009.

Source: Scottish Government

Designated Areas: 1991-2010[8]



	Area[9] (thousand hectares)						
	1991	**1995**	**2000**	**2005**	**2008**	**2009**	**2010**
SSSI[10,11]	804	866	991	1,008	1,038	1,038	1,036
SAC[12]	-	0	718	963	963	963	963
SPA[13]	26	76	391	626	641	657	880
Ramsar	15	53	240	313	313	313	313

Sites of Special Scientific Interest (SSSIs) protect flora, fauna, geological or physiographical features of outstanding quality. In Scotland, SSSIs are notified by Scottish Natural Heritage under the Nature Conservation (Scotland) Act 2004 (which amended the 1981 Wildlife and Countryside Act). In 1991, SSSIs covered a total of 804,000 hectares but this has steadily increased and at 31 March 2010, there were 1,453 SSSIs in Scotland, covering a total of approximately 1,036,000 hectares (around 13% of land in Scotland).

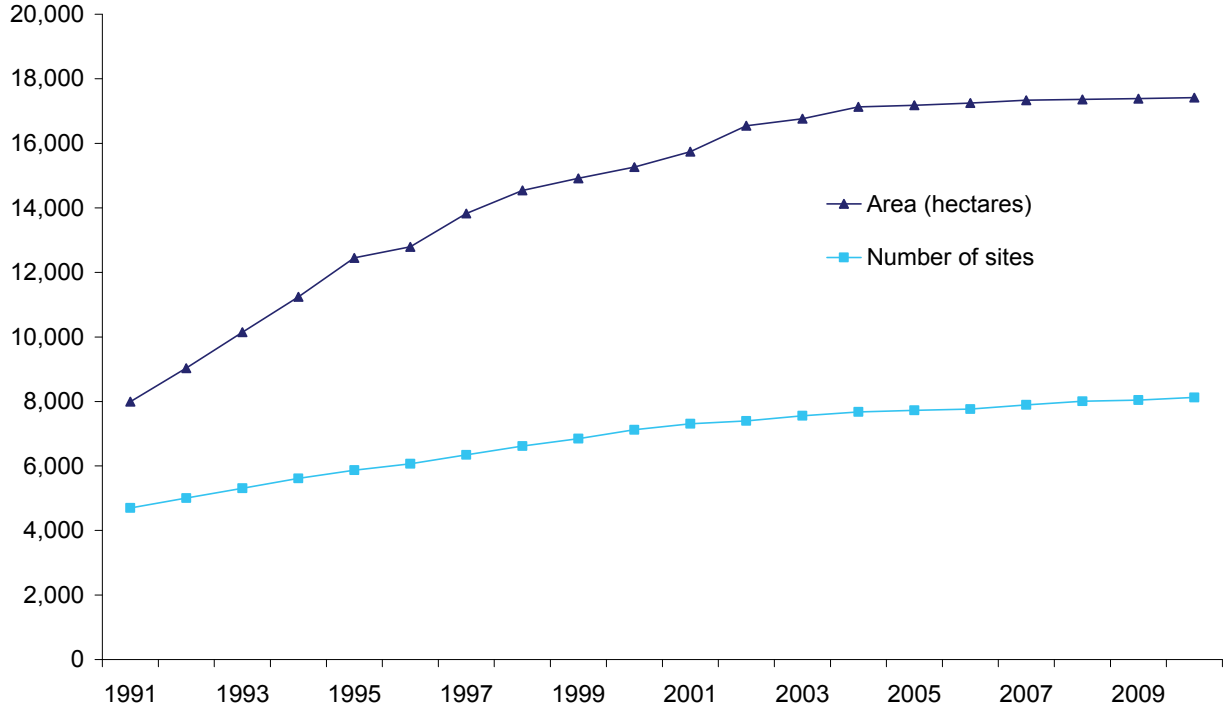
Special Areas of Conservation (SACs) are designated under the 1992 EC Habitats Directive to protect certain species and habitat types throughout the EU. Special Protection Areas (SPAs) are classified under the 1979 EC Wild Birds Directive to safeguard the habitat of certain wild bird species. Ramsar sites are designated under the 1971 Convention on Wetlands of International Importance especially as Waterfowl Habitat (commonly known as the Ramsar Convention). At 31 March 2010, there were 239 SACs 147 SPAs and 51 Ramsar sites in Scotland. The area of SACs rose from 0 hectares in 1995 to 963,000 hectares in 2004 and has since remained stable. The area of SPAs has risen from 26,000 hectares in 1991 to 880,000 hectares in 2010, with the introduction of 31 marine extensions resulting in a 34% increase in SPA area between 2009 and 2010.

A site may be protected by more than one designation. For example, at 31 March 2010 around 66% of the area of SACs and 86% of the area of SPAs and Ramsar sites was also designated as SSSI.

Source: Scottish Natural Heritage

Scheduled Monuments in Scotland: 1991-2010[8]

Number and area of sites designated as Scheduled Monuments



	1991	1995	2000	2005	2008	2009	2010
Number of sites	4,698	5,867	7,120	7,725	8,002	8,041	8,124
Area (hectares)	7,992	12,450	15,261	17,180	17,361	17,386	17,418

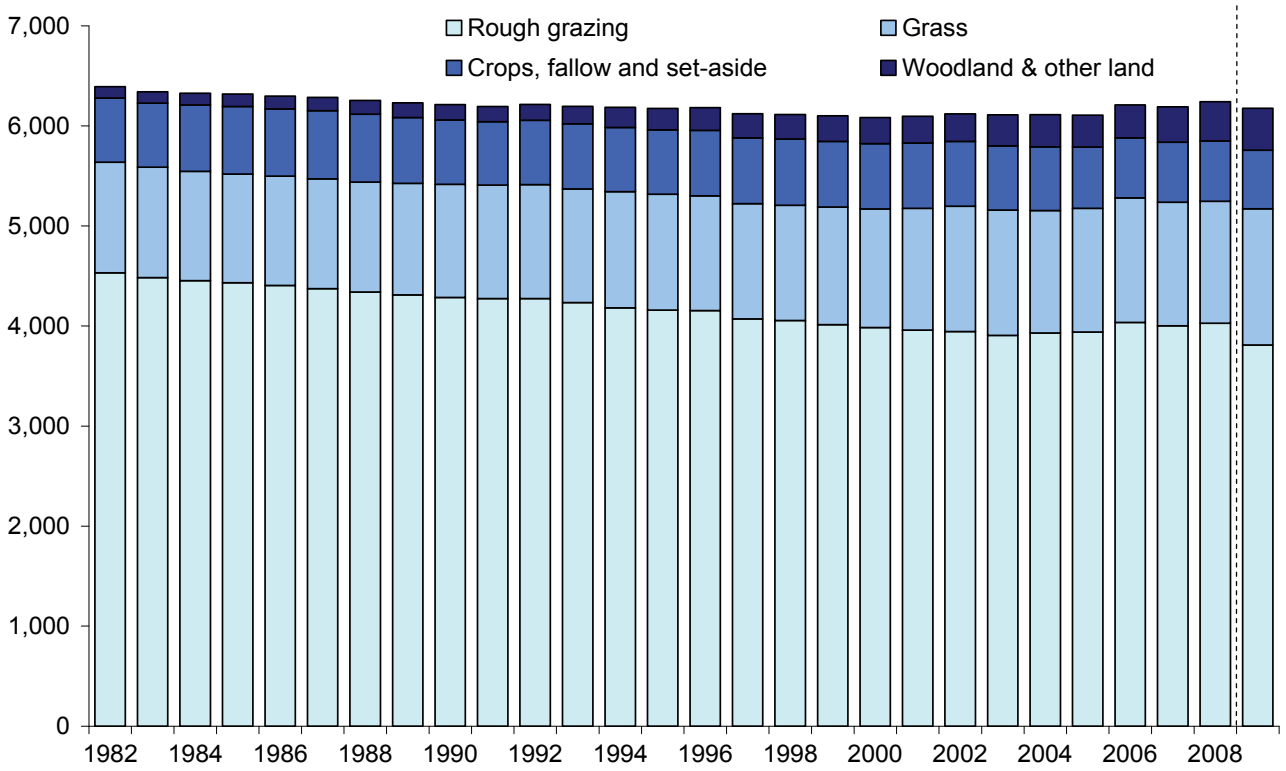
Historic Scotland is responsible for safeguarding the nation's historic environment and promoting its understanding and enjoyment. This is achieved partly by giving legal protection to nationally important sites and monuments – these are called 'scheduled monuments'.

Scheduled monuments (SMs) are protected under the Ancient Monuments and Archaeological Areas Act 1979[14]. The oldest date from around 8,000 years ago, when people first settled in Scotland; the most recent include Second World War defences. Once a monument is scheduled, the prior written consent of the Scottish Ministers is required for most works or activities in the scheduled area to help ensure the monument is not damaged or destroyed.

The number of SMs and the area they account for has steadily risen every year since 1991. There was a 52% increase in the number of SMs between 1991 and 2000, with a 91% increase in the total area of SMs in this period. Between 2000 and 2010, there was a 14% increase in the number of SMs in Scotland and a 14% increase in their area. In 2010, there were 8,124 designated SMs in Scotland, accounting for an area of 17,418 hectares. There are SMs spread across Scotland, with more added to the Schedule every year, but numbers very across local authorities. In 2010, the largest number of SMs was in the Highlands, with 1,236 SMs covering an area of 2,226 hectares.

Source: Historic Scotland [15]

Agricultural Land Use: 1982-2009



Area (thousand hectares)

	1982	1990	1993	2000	2005	2008	2009[16]
Rough grazing	4,533	4,286	4,233	3,983	3,941	4,028	3,810
Grass	1,104	1,130	1,137	1,187	1,235	1,219	1,361
Crop, fallow and set-aside	641	644	650	652	614	602	587
Woodland and other	114	153	175	262	319	392	420
Total land	6,392	6,213	6,195	6,083	6,108	6,240	6,177
Set-aside land[17]	-	-	90	78	69	18	-

Agricultural land use has a strong influence on the landscape and environment of Scotland. In particular, changes in agricultural land use have an impact on wildlife habitats, water pollution, and emissions of the greenhouse gas carbon dioxide.

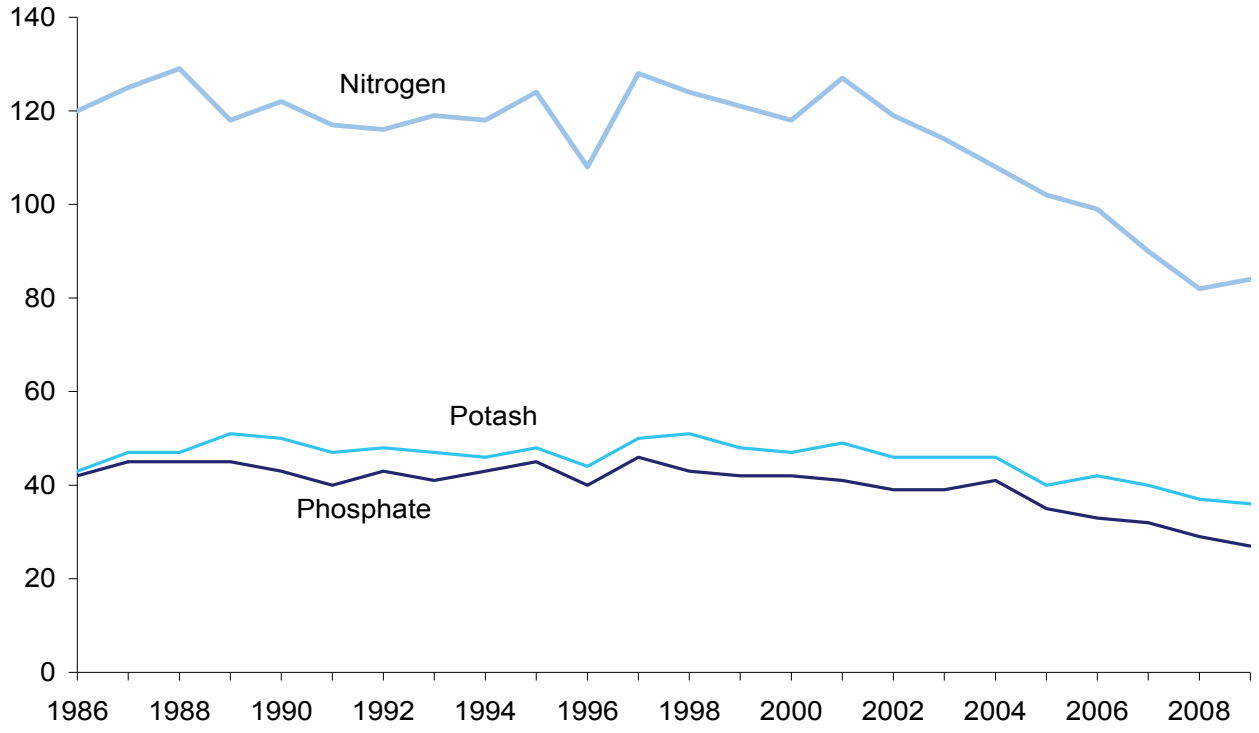
Between 1982 and 2009 the total land used for agriculture in Scotland decreased by over 3%[16]. In 2009, the area of woodland and other land was more than three times the 1982 figure[18]. The area of rough grazing decreased by 0.5m ha (11%) between 1982 and 2008. There is a step change in the land use data series in 2009, due to a switch in data source. This has lead to some substitution between rough grazing and grass, so these data for 2009 should not be compared directly with previous years.

The amount of land set-aside was recorded separately between 1993 and 2008. Trends have reflected changes in the European Union compulsory set-aside rate. There was a decrease in set-aside land from 90,000 ha in 2003 to 69,000 ha in 2005, before dropping to 18,000 ha in 2008, reflecting a 0 per cent compulsory set-aside rate. Set aside payments entitlements under the Single Farm Payments ceased in 2009.

Source: Scottish Government

Nutrients[19] Applied on Crops and Grass[20]: 1986-2009

Total nutrients applied (kg/ha) on crops and grass



Total nutrients applied on crops and grass (kg/ha)[21]

	1986	1990	1995	2000	2005	2007	2008	2009
Nitrogen (N)	120	122	124	118	102	90	82	84
Phosphate (P_2O_5)	42	43	45	42	35	32	29	27
Potash (K_2O)	43	50	48	47	40	40	37	36

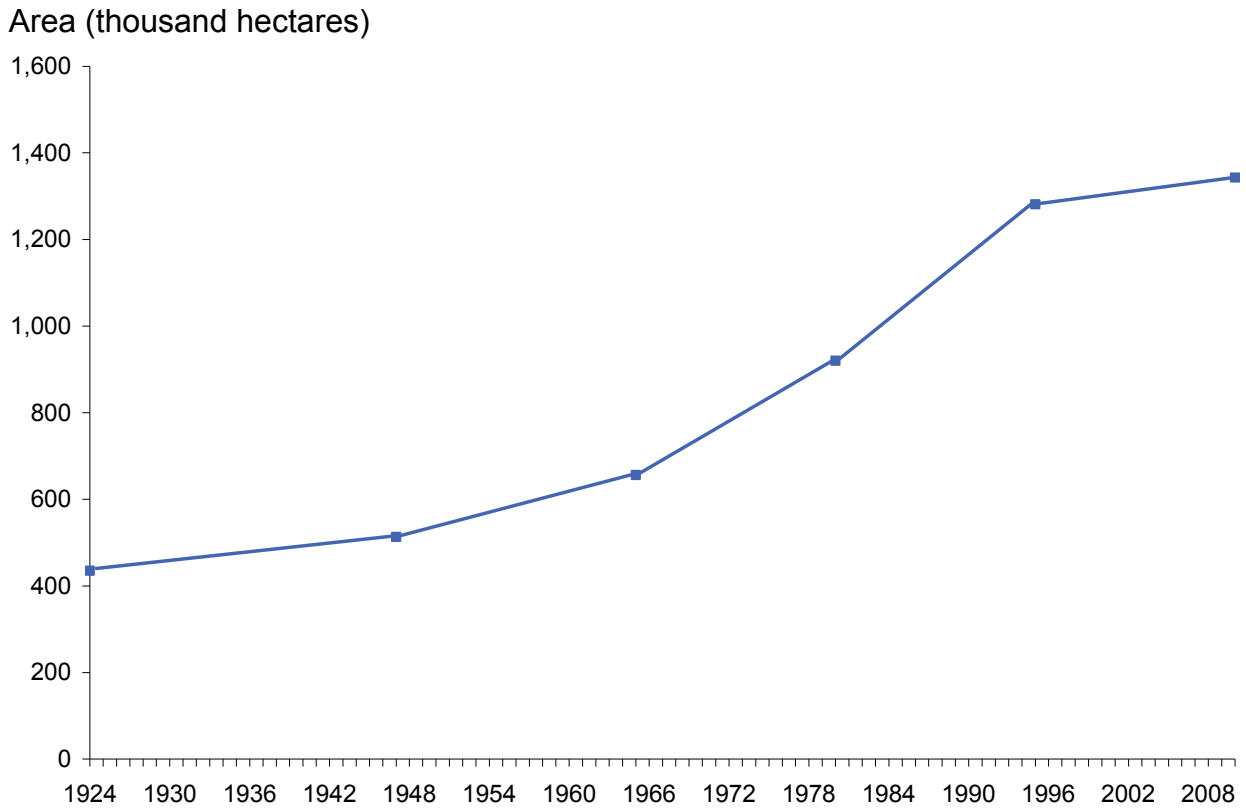
Fertilisers contain nutrients, such as nitrogen, phosphorus and potassium, which improve plant growth and crop yields. The inappropriate or mistimed use of fertilisers may cause nutrient enrichment and eutrophication of waters. Excess nitrates in drinking water are also a danger to human health. The EC Nitrates Directive (91/676/EEC) provides a framework to protect water bodies from agricultural nitrate pollution. This includes the designation of Nitrate Vulnerable Zones, where an action programme controlling fertiliser use is implemented.

Changes in overall application rate of inorganic fertilisers are due to changes in either the proportion of crop area treated or average rate of application, or both. Weather and economic factors may contribute to changes in fertiliser use.

Between 1986 and 2000, overall phosphate and potash application rates remained relatively stable, although both have seen a decline in recent years. Overall nitrogen application rates have declined since 2001, reflecting a longer term reduction in application rates to grassland and a recent reduction for tillage crops. In 2009, the nitrogen application rate was 84 kg/ha, a reduction of 32% compared to 1995.

Source: Defra, Scottish Government[22]

Area of Woodland: 1924-2010



	1924	1947	1965	1980	1995	2010[23]
Area (000 hectares)	435	513	656	920	1,281[R]	1,343[P]
% of total land	*5.6*[R]	*6.6*[R]	*8.4*[R]	*11.8*[R]	*16.4*[R]	*17.2*[P]

The extent of woodland[24] is of significant environmental importance. Woodland provides wildlife habitats and affects the physical environment, and is valued as a location for recreation and for its contribution to the landscape. It can also contribute to the sustainable production of wood products and paper, and provides a source of renewable energy.

Woodland is managed by the Forestry Commission, other public bodies (including other government departments and local authorities), and private owners. The Forestry Commission manages a third of woodland in Scotland. Planting and management of non-Forestry Commission woodland is normally carried out with the assistance of government grants. In 2010, 56% of Scotland's woodland area (757,000 hectares) was certified as sustainably managed. Forest management practices are assessed against the Woodland Assurance Standard, an agreed standard of practice, in order to be certified.

New planting of woodland peaked in 1988 and 1989 when over 25,000 hectares of new woodland a year were created. Since then new planting has declined to around 2,700 hectares in 2009-10. In 2010, the area of woodland in Scotland was 17.2% of the total land area, compared with 5.6% in 1924 and 11.8% in 1980.

Source: Forestry Commission [25]

Land - Footnotes

1) Due to changes in definitions that have been applied retrospectively, the estimates from 1990 are not in all cases directly comparable to the later surveys.

2) UK Biodiversity Steering Group (1995). Biodiversity: The UK Steering Group Report. HMSO.

3) Norton, L. R., Murphy, J., Reynolds, B., Marks, S., Mackey, E.D. (2009). Countryside Survey: Scotland Results from 2007. Centre for Ecology and Hydrology, Scottish Government, Scottish Natural Heritage. Countryside Survey data owned by NERC – Centre for Ecology & Hydrology Countryside Survey.

4) During 2009, historical data for the years 2002 - 2008 was revised to remove sites that had been taken out of the survey for definitional reasons and to correct any other previous errors highlighted in the 2009 survey returns.

5) A small number of councils did not participate in every survey. In these cases, the most recent available data is used to provide an estimate for the appropriate year. Sites must be at least 0.1 hectares in size to be included.

6) Land also qualifies as derelict if it has an unremedied previous use which could constrain future development.

7) Scottish Government (2010). Scottish Vacant and Derelict Land Survey 2009.

8) Figures as at 31 March each year.

9) Area figures are rounded to the nearest thousand hectares and percentages to the nearest whole number. Area figures exclude the area in England of cross-border sites. Area figures for SACs include both land and marine areas.

10) Some SSSIs overlap and where this occurs the area of overlapping land will be counted more than once. In 2010, this accounted for around 2,500 hectares, so the net area of SSSI sites at 31 March 2010 was approx 1,033,300 hectares.

11) The area of an SSSI is based on the documented area stated on each citation at the time the site was notified or reviewed. Where an SSSI has been reviewed under the Nature Conservation (Scotland) Act 2004 and the citation area figure has been changed to a more accurate GIS measurement, SSSI area totals will reflect the revised area from the date of SSSI review, but retrospective SSSI area totals have not been adjusted. As a result of this it is possible for the overall SSSI area figure to change from one year to the next without there being any actual change in SSSI site boundaries on the ground.

12) Some SACs overlap, and where this occurs the area of overlapping land will be counted more than once. In 2010, this accounted for around 5,500 hectares, so the net area of SAC sites at 31 March 2010 was approx 957,000 hectares. Figures include both designated SACs and candidate SACs submitted to the EC.

13) In September 2009, Scottish Ministers classified 31 marine extensions to existing seabird breeding colony SPAs around Scotland's coasts, which has contributed to the large increase in SPA area from 657,456 hectares in 2009 to 880,096 hectares in 2010.

14) UK Parliament (1979). Ancient Monuments and Archaeological Areas Act 1979.

15) Maps and information about SMs is available on Historic Scotland's data website: http://data.historic-scotland.gov.uk.

16) In 2009, data on land use was obtained from the Single Application Form (SAF) for 24,700 holdings claiming Single Farm Payments. This data has been combined with the land use data from all other holdings, collected through the June Agricultural Census Forms, to generate overall 2009 June Agricultural Census results. The use of SAF data has resulted in a step change in some of the land use results for 2009, especially for rough grazing and grass. This means that the trends between 2008 and 2009 for these land use categories do not represent genuine changes to land use, but do represent differences in the way this data has been reported between the 2008 June Agricultural Census and 2009 SAF.

17) Figures from the annual Scottish Government June Agricultural Census. Set aside entitlements under the Single Farm Payment Scheme ceased in 2009.

18) Only includes woodland on agricultural holdings. For total woodland area, see page 53.

19) Inorganic fertilisers only - excludes organic fertilisers such as sewage sludge and farmyard manure.

20) Excludes Orkney, Shetland and the Western Isles.

21) Total quantity of nutrient used (kg) divided by the total extent of crop area (ha) (including any areas without application of the nutrient). These overall application rates provide a means of estimating the tonnage of nutrients from manufactured fertiliser used during the year.

22) Department for Environment, Food and Rural Affairs, Scottish Government (2010). The British Survey of Fertiliser Practice 2009.

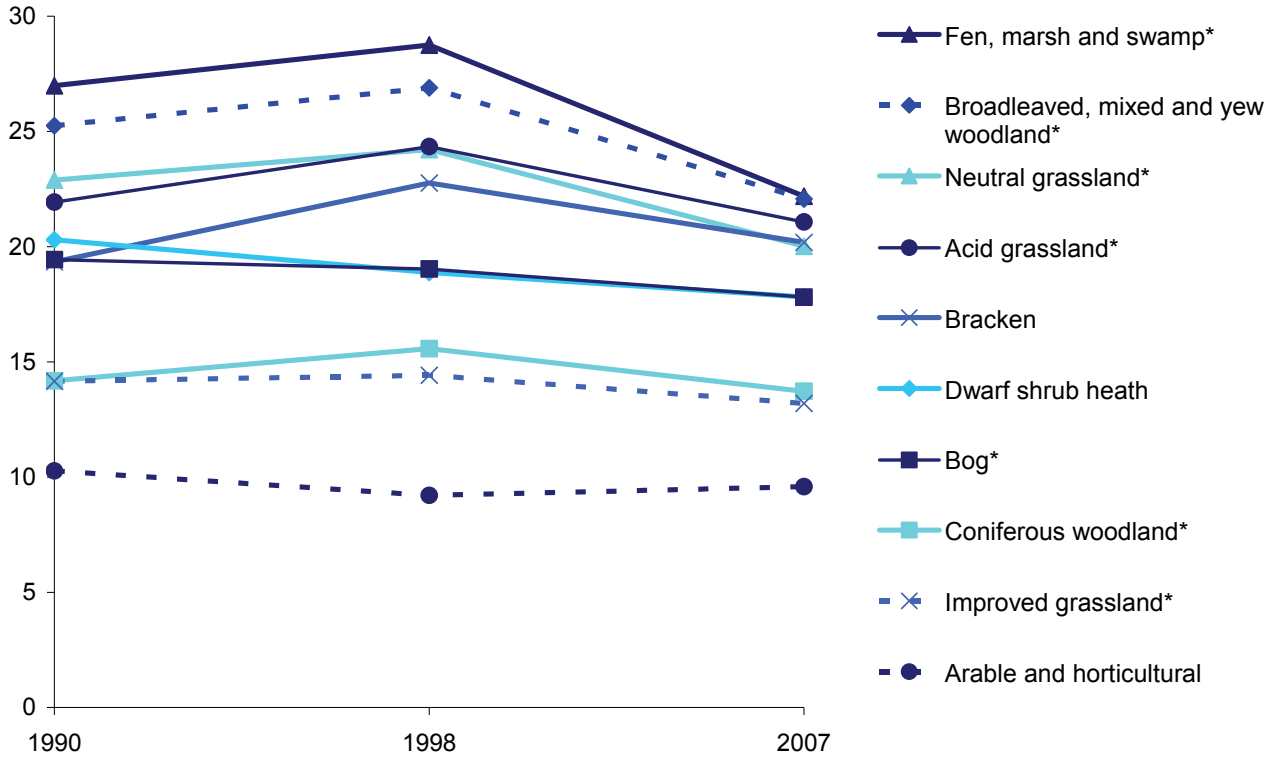
23) The non-Forestry Commission component of the 2010 figure is based on data obtained from the 1995-1999 National Inventory Woodlands and Trees. 2010 data is provisional.

24) Woodland is defined as land under stands of trees with a canopy cover of at least 20%, or having the potential to achieve this, including integral open space, wooded agricultural land, and felled areas that are awaiting restocking.

25) Forestry Commission (2010). First Release: Woodland Area, Planting and Restocking 2010 edition. Forestry Statistics 2009 and website www.forestry.gov.uk/statistics.

Changes in Plant Species Richness: 1990-2007

Mean number of vascular[1] plant species per 1km square[2]



Mean number of vascular[1] plant species per 1km square

Broad habitat of plots	1990	1998	2007	% change 1998-2007
Acid grassland	21.9	24.3	21.1	*-13**
Broadleaved, mixed and yew woodland	25.2	26.9	22.1	*-18**
Coniferous woodland	14.2	15.6	13.7	*-12**
Bog	19.4	19.0	17.8	*-6**
Improved grassland	14.2	14.4	13.2	*-8**
Fen, marsh and swamp	27.0	28.7	22.2	*-23**
Neutral grassland	22.9	24.2	20.0	-17*

(*statistically significant, p<0.05)

Plant species diversity is one measure of botanical composition that can provide an indication of changes in habitat quality. Changes are often associated with land management and atmospheric pollution. Effects of climate change may become evident in the future.

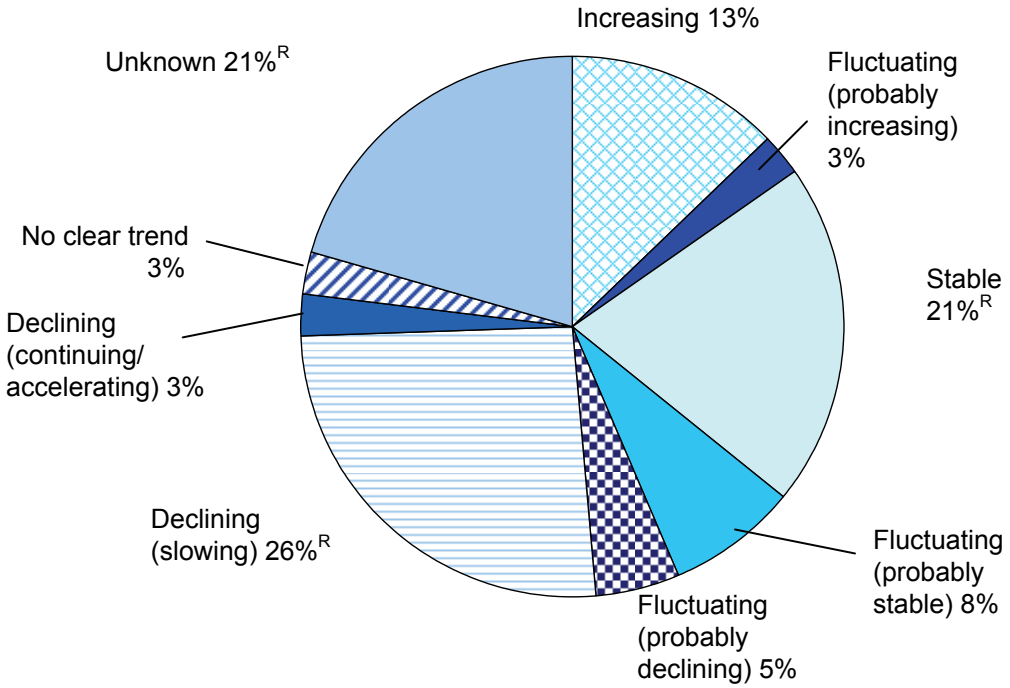
The Countryside Survey 2007[3] reported changes between surveys in 1998 and 2007 of 195 1km sample squares. Plant diversity, in terms of the number of vascular plant species recorded, was estimated from plots placed within each square.

Vascular plant diversity declined between 1998 and 2007 across the majority of habitats, with significant changes to plant species richness in seven broad habitats. There was a 23% decrease in plant species richness in fen, marsh and swamp, and a 18% decrease in species richness in broadleaved, mixed and yew woodland. The only habitats that did not show significant changes in species richness were bracken, dwarf shrub heath and arable and horticultural.

Source: Countryside Survey 2007

Status of UK BAP Habitats in Scotland: 2008

Status of UK BAP Habitats



Based on 39 UK BAP priority habitats in Scotland

	Number of Habitats	Percentage of Habitats
Increasing	5	*13*
Fluctuating (probably increasing)	1	*3*
Stable	8	*21R*
Fluctuating (probably stable)	3	*8*
Fluctuating (probably declining)	2	*5*
Declining (slowing)	10	*26R*
Declining (continuing/accelerating)	1	*3*
No clear trend	1	*3*
Unknown	8	*21R*

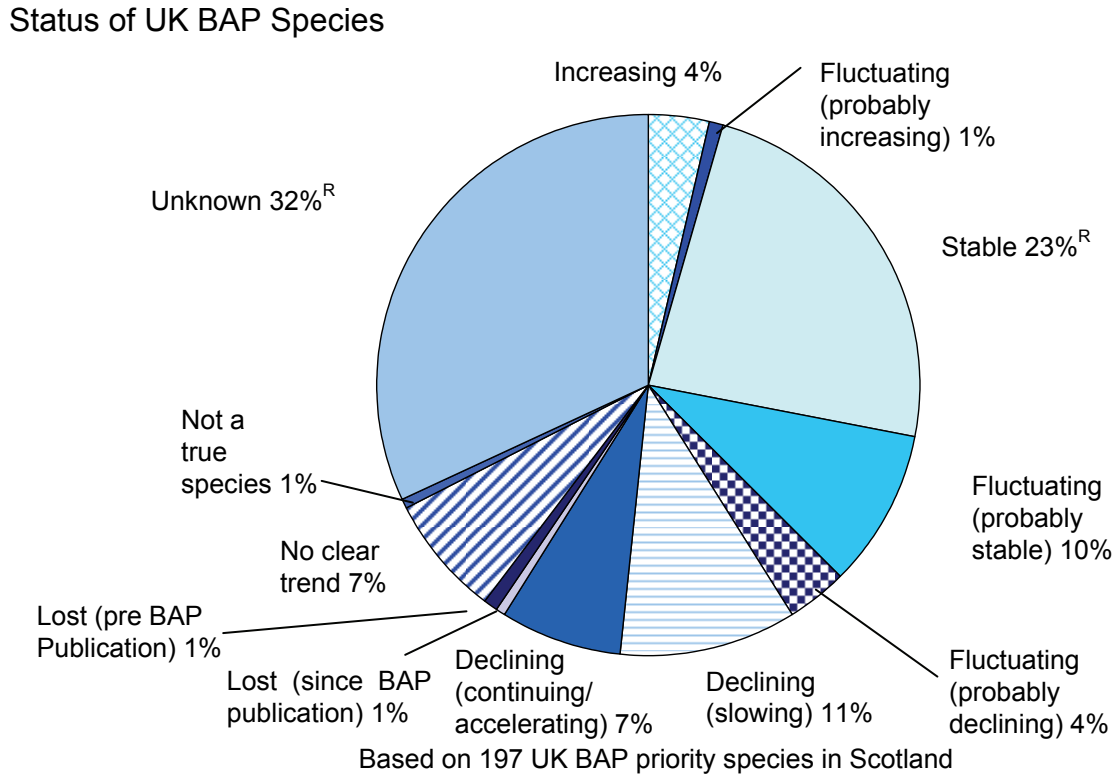
Biodiversity refers to the variety of life. The conservation and enhancement of our rich and varied natural heritage of plants and animals, habitats and ecosystems, is essential to the quality of our lives and for a sustainable future.

In 1992, the UN Convention on Biological Diversity recognised the need to protect biodiversity. The UK was one of the 150 countries to sign up to the convention, and in 1994 the UK Biodiversity Action Plan (UK BAP)[4] was launched. The plan aims to conserve and enhance the populations of species and habitats which are considered threatened within the UK. The Scottish Biodiversity Forum is responsible for implementing the objectives of the UK BAP in Scotland.[5]

Between 1995 and 1999, action plans were developed for 45 habitats in the UK[6] ,39 of these occurred in Scotland. As at 2008, of these 39, 15% of the habitats were increasing[7], 28% were considered stable[7] and 33% were in decline[7]. For the remainder, 21% had an unknown trend and for 1 habitat the trend was unclear.

Source: Biodiversity Action Reporting System (BARS)

Status of UK BAP Species in Scotland: 2008



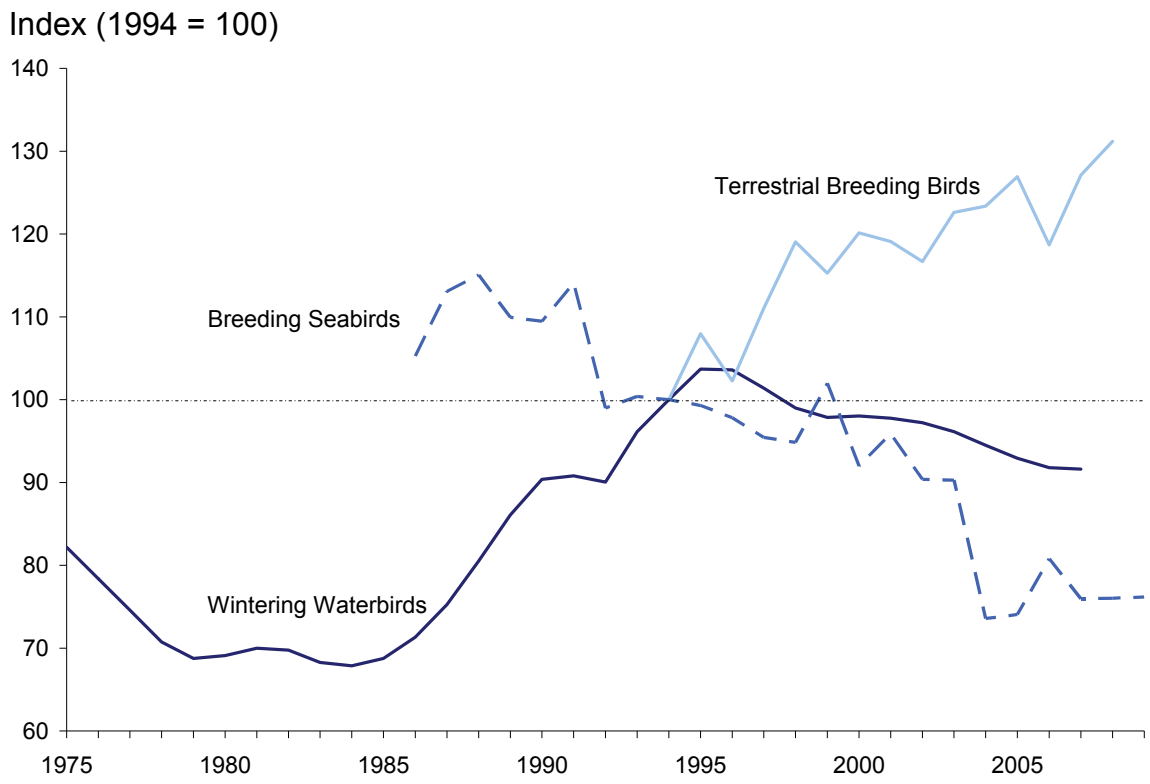
	Number of Species	Percentage of Species
Increasing	7	*4*
Fluctuating (probably increasing)	2	*1*
Stable	46	*23*[R]
Fluctuating (probably stable)	19	*10*
Fluctuating (probably declining)	7	*4*
Declining (slowing)	21	*11*
Declining (continuing/accelerating)	14	*7*
Lost (pre UK BAP publication)	2	*1*
Lost (since BAP publication)	1	*1*
No clear trend	14	*7*
Not a true species	1	*1*
Unknown	63	*32*[R]

In 1994 the UK Biodiversity Action Plan (BAP)[4] was launched. The action plan aims to conserve and enhance the populations of species and habitats that are considered threatened in the UK. In Scotland 197 species are considered threatened and have been assigned individual Biodiversity Action Plans. The Scottish Biodiversity Forum is responsible for implementing the objectives of the UK BAP in Scotland.[5]

Between 1995 and 1999, action plans were developed for 391 species in the UK[6] that had been identified as priorities. 197 of these occur in Scotland. In the 2008 assessment for Scotland, 37% of the species were increasing[7] or stable[7] and 22% were in decline[7]. For the remainder of the species considered 7% showed no clear trend, 32% had an unknown trend, 1 species[8] (Wryneck) had been lost since the commencement of BAP in 1994, 2 had been lost pre BAP and 1 was no longer considered a true species.

Source: Biodiversity Action Reporting System (BARS)

Status of Wild Bird Populations[R]: 1975-2009



Index (1994=100)

	1975	1986	1994	2000	2005	2007	2008	2009
Wintering Waterbirds[9]	82	71	100	98	93	92	-	-
Terrestrial Breeding Birds			100	120	127	127	131	-
Breeding Seabirds[10]		105	100	92	74	76	76	76

Bird populations are relatively well studied and can provide an indication of the state of biodiversity in Scotland's habitats.

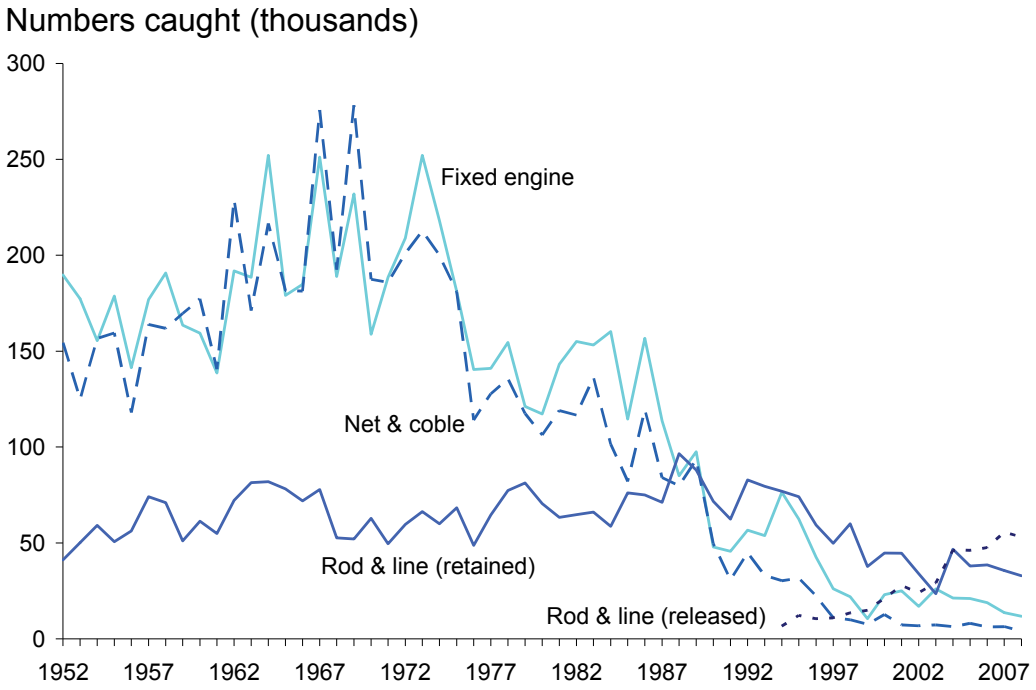
The number of wintering waterbirds rose between the mid-1980s and mid-1990s, reaching a peak in 1995, since then there has been a steady decline to 2007. Seabird numbers declined by 41 index points between 1991 and 2004, since when the trend has levelled off. The number of terrestrial breeding birds has risen since 1994, with a 12 index point increase occurring between 2006 and 2008, following an 8 index point fall between 2005 and 2006.

Naturally occurring birds and their habitats are protected under the Wildlife and Countryside Act 1981, the Nature Conservation (Scotland) Act 2004 and the EC Birds Directive (79/409/EEC and amendments). Actions to protect and enhance bird populations and habitats are coordinated under the Scottish Biodiversity Strategy.

The Scottish Government has established a National Indicator to increase the index of abundance of terrestrial breeding birds in Scotland against a 2006 base year. This is used as a proxy measure of biodiversity, as biodiversity cannot be measured by a single indicator.

Source: British Trust for Ornithology, Joint Nature Conservation Committee, Wildfowl and Wetlands Trust, Shetland Oil Terminal Environmental Advisory Group

Catches of Wild Salmon[11]: 1952-2008



Number caught (thousands)

Method[12]	1952	1970	1980	1990	2000	2007	2008
Fixed engine	190	159	117	48	23	14	12
Net & coble	154	187	106	50	13	6	4
Rod & line[13] (retained)	41	63	71	72	45	36[R]	33
Rod & line[13] (released)	-	-	-	-	21	56	53

The salmon fishing industry is a significant economic and leisure resource in rural Scotland. To protect this resource sustainable management practices are essential. Climate change, water pollution, predation and disease may affect populations. Yearly variations in weather, timing of runs and fishing effort can affect catch sizes. Consequently, a difference in catch does not necessarily indicate a difference in the abundance of the stock that provides the catch.

Catch sizes for the fixed engine and net & coble fisheries have fallen by over 90% since 1952. Catches rose during the 1950s and 1960s but have declined rapidly since the early 1970s. The fishing effort has declined at a similar rate. The effort in 2008 for net and coble fishing was less than 7% of that in 1952, whereas the effort for fixed engine fishing in 2008 was less than 4% of its 1952 counterpart[14].

Since 1994, salmon that have been caught and released by anglers have been reported separately. In 2008, 33,000 salmon were retained. The number of salmon released has increased from 7,000 in 1994 to 53,000 in 2008. No figures for fishing effort for rod & line catches are available.

The Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003 contains provisions for the conservation and sustainable management of salmon fisheries in Scotland, for example, through regulating the introduction of salmon and salmon eggs into salmon fishery districts for which there is a district salmon fishery board, and regulating the permissible methods and times during which fishing is permitted.
Source: Marine Scotland Science

Biodiversity - Footnotes

1) Vascular plants (sometimes referred to as higher plants) comprise ferns, flowering plants, shrubs and trees.

2) The changes in plant species richness in 10 of the most widespread broad habitats are displayed.

3) Norton, L. R., Murphy, J., Reynolds, B., Marks, S., Mackey, E.D. (2009). Countryside Survey: Scotland Results from 2007. Centre for Ecology and Hydrology, Scottish Government, Scottish Natural Heritage. Countryside Survey data owned by NERC – Centre for Ecology & Hydrology Countryside Survey. © Database Right/Copyright NERC– Centre for Ecology & Hydrology. All rights reserved.

4) Department of the Environment (1994). Biodiversity: the UK Action Plan. HMSO.

5) Scottish Executive (2004). Scotland's Biodiversity: It's in Your Hands. A strategy for the conservation and enhancement of biodiversity in Scotland. Scottish Biodiversity Forum.

6) In 2007/08 an updated UKBAP priority list was published containing 1150 species and 65 habitats across the UK, of which 606 species and 60 habitats are in Scotland. The next assessment of this indicator (in 2011) will be based upon this updated list.

7) Including categories which are said to be fluctuating. The probable behaviour has been assumed true. These figures are calculated using the unrounded percentages.

8) This species has declined to such an extent it is now considered to be only an occasional breeder. None of the other trend categories adequately reflect this status.

9) The population of wintering water birds is measured in the winter beginning in the year indicated, i.e. 2003 indicates populations measured from approximately November 2003 – March 2004

10) Re-assessment of the accuracy of abundance trends has led to a reduction in the species composition of the breeding seabirds indicator (previously 19 species for the 2008 index). It now comprises 12 species.

11) Includes grilse (salmon which have matured, or are about to mature, after one winter at sea).

12) Fixed engine fisheries operate in coastal areas. Net & coble fisheries are generally restricted to estuaries and the lower reaches of rivers. Rod & line fisheries cover recreational angling within river systems.

13) Since 1994, numbers of fish reported as caught and released by anglers have been reported separately. Prior to this, only numbers caught and retained are available.

14) Marine Scotland Science (2009): "Statistical Bulletin: Scottish Salmon and Sea Trout Catches 2008"

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