A National Statistics Publication for Scotland

Key Scottish Environment Statistics 2014

August 2014

natural scotland
SCOTTISH GOVERNMENT

Introduction

Welcome to the fourteenth edition of the annual publication **'Key Scottish Environment Statistics'**. This is 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 datasets 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. An Excel spreadsheet containing the data sets and charts presented in 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 August 2014 and will not be revised throughout the year. An **internet database, Scottish Environment Statistics Online (SESO),** accompanies this publication as a data dissemination tool and contains additional statistics to those presented here, where available. Any data revisions or updates to the information presented in KSES will be made in SESO and identified in the Recent changes page. SESO also provides detailed metadata including information on data accuracy and suitability, quality assurance, comparability and data revisions. You will find a link to the corresponding SESO dataset at the bottom of each page of this publication, titled 'Metadata'. This will take you to the main SESO dataset for the data. You can then access the further information about the data by choosing the 'source metadata' tab of the SESO dataset page. The SESO 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. In addition to any quality assurance conducted by these organisations, the Scottish Government also conducts a quality assurance process for these datasets. We have deemed any dataset contained in this publication to be fit for purpose and of a high enough quality to be published in this document. Such datasets have previously been available on request from these organisations. Further information on the source of a dataset, and further metadata, can be obtained via the source and metadata links at the bottom of each page in the publication (see Revisions and Further Information above).

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 the Scottish Neighbourhood Statistics website.
http://www.sns.gov.uk/

Scotland's Environment Web is another source of environmental data. The trends and indicators section of the website is being developed in collaboration with colleagues in SEPA and Scottish Natural Heritage (SNH).
http://www.environment.scotland.gov.uk/

Publication Key

Throughout this publication, an '**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**' in the page title indicates that the latest figures are provisional. It should also be noted that throughout this publication, figures and percentages may not sum exactly due to rounding.

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.

Website: http://www.scotland.gov.uk/envstats
Email: envstats@scotland.gsi.gov.uk
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Overview

The environment is a key aspect to the success and well-being of Scotland, affecting human health, wildlife and economic success. As a compendia publication considering many aspects of the environment, Key Scottish Environment Statistics may be used to provide an overview of how the environment in Scotland is changing. Scotland's environment in general is in a good condition but there remain areas where environmental quality is poor. Some recent trends are highlighted below.

This year, Key Scottish Environment Statistics includes a page on the perceived immediacy of climate change; which is one of the low carbon attitude and behaviour-related indicators set out in 'Low Carbon Scotland: A Behaviours Framework'. In 2008, 57% of respondents thought that climate change was an immediate and urgent problem, compared with 46% in 2013 (pp 14).

During 2013, 46% of adults are estimated to have visited the outdoors one or more times per week compared with 42% in 2012 (pp 15).

Seven of the ten warmest years recorded in Scotland have all occurred in the 21st century. Annual mean temperatures from 2000 - 2009 were 0.9°C higher than the 1961-1990 average, the highest for any decade since records began in 1910. The annual mean temperature in 2013 was 0.49°C above the 1961-1990 average (pp 18). The average winter precipitation in the 1990s and 2000s was around 23% higher than the 1961-1990 baseline for winter precipitation, compared to the 1960s which was around 9% lower. In 2013, winter precipitation was 13% greater than the 1961-1990 baseline while summer precipitation was 17% below the baseline (pp 19).

Net greenhouse gas emissions (taking account of emissions and removals) in 2012 were estimated to be 52.9 million tonnes of carbon dioxide equivalent (MtCO2e), 0.8% (0.4 MtCO2e) higher than 2011 and 29.9% below 1990 levels (pp 20). When adjusted for trading in the EU Emissions Trading System, the 2012 figure is 0.3 MtCO2e higher than 2011, a 0.5% increase, and 26.4% lower than the 1990 baseline (pp 21). Between 2009 and 2010, Scotland's carbon footprint increased by 4% following a 19% fall in 2009. It remains below the peak in 2007 (pp 22).

Figures for air quality indicate that UK Air Quality Strategy (AQS) Objectives were not met at some Scottish sites. In relation to nitrogen dioxide, 14 of 70 automatic monitoring sites failed to meet an annual mean AQS objective in 2013, and 4 failed the hourly mean AQS objective (pp 28). Ground level ozone objectives were met at 5 of 8 sites in 2013 and the second stage AQS objective for annual mean PM_{10} concentrations to be met by 2010 was not met at 15 of 59 Scottish sites (pp 27, 29). Between 1990 and 2011, there were reductions in Scottish emissions of PM_{10} and nitrogen oxides by 58% and 65%, respectively. (pp 27, 28). Sulphur dioxide emissions from Large Combustion Plants decreased by 32% between 2012 and 2013, mainly as a result of the closure of Cockenzie Power Station (pp 30).

Around 60% of Scotland's land area contains habitats sensitive to acid deposition and 55% to eutrophication. The area of sensitive habitats in Scotland exceeding critical loads for acidification fell from 68% in 1995-1997 to 33% in 2010-2012 while over the same period nutrient nitrogen exceedance fell from 59% to 45% (pp 31).

Between 2004/05 and 2013/14, the amount of treated water produced fell by 554 Ml/d (22%) to a new low of 1,824 Ml/d. This decrease in treated water is almost entirely due to a reduction in leakage of 531 Ml/d (47%) to 608 Ml/d over the same period. There were similar reductions over this period in the amount of raw water abstracted by Scottish Water (pp 34). Drinking water quality and river water quality have both improved over time though there were small deteriorations in 2013 (pp 35, 36). The percentage of monitoring sites on rivers with a mean nitrate concentration at natural background levels (< 0.3 mg N/l) increased from 25% in 2000 to 33% in 2013 while over the same period the percentage of those with a mean nitrate concentration greater than 7.5 mg N/l decreased from 7% to less than 3% (pp 37). Between 2000 and 2013, the percentage of river monitoring sites with orthophosphate concentrations less than 30 µg P/l increased from 43% to 73% (pp 38).

In recent years, more identified bathing waters have met the mandatory standard required by the 1976 EC Bathing Water Directive. In 2013, all identified waters met the mandatory standard, and 59% met the more rigorous guideline standard (pp 40).

In 2010, the average annual dose of radiation to someone living in Scotland was 2,300 microsieverts, this has fallen from 2,400 microsieverts in 2003. At 81%, the majority of the annual dose comes from natural sources (pp 43)

In 2012, total waste sent to landfill decreased to 4.47 million tonnes, and has shown a long term decrease of 39% from 2005 (pp 46). In 2012, 41.2% of household waste was recycled or composted, up from 40.1% in 2011 (pp 47). Households reporting using local authority provided caddies to dispose of their food waste increased to 34% in 2013, up from 26% in 2012 (pp 48). The proportion of households reporting that they recycled a range of other waste items increased each year between 2003 and 2011 (pp 49).

Derelict and urban vacant land decreased slightly between 2007 and 2013 (pp 51). In 2013, nutrient application rates (nitrogen, phosphate and potash applied to crops and grass) were some 10% higher than in 2012, however rates remain below those applied before 2008. (pp 53). In 2014, 18.2% of the land was woodland, compared with 16.4% in 1995 (pp 54). The area of designated protected areas has shown an upward trend over the long term (pp 57).

Terrestrial breeding bird numbers increased by 15.5% between 1994 and 2012, but have seen a 10.1% reduction since 2008. Seabird abundance has continued to decline and was 54% lower in 2012 than at the 1991 peak. Wintering waterbird numbers have shown a 26% reduction from a peak in 1997 to 2011 (pp 64). The provisional reported rod catch (retained and released) for 2013 is 66,387 salmon. It is the lowest reported catch since 2003, and is 74% of the previous 5-year average (pp 65).

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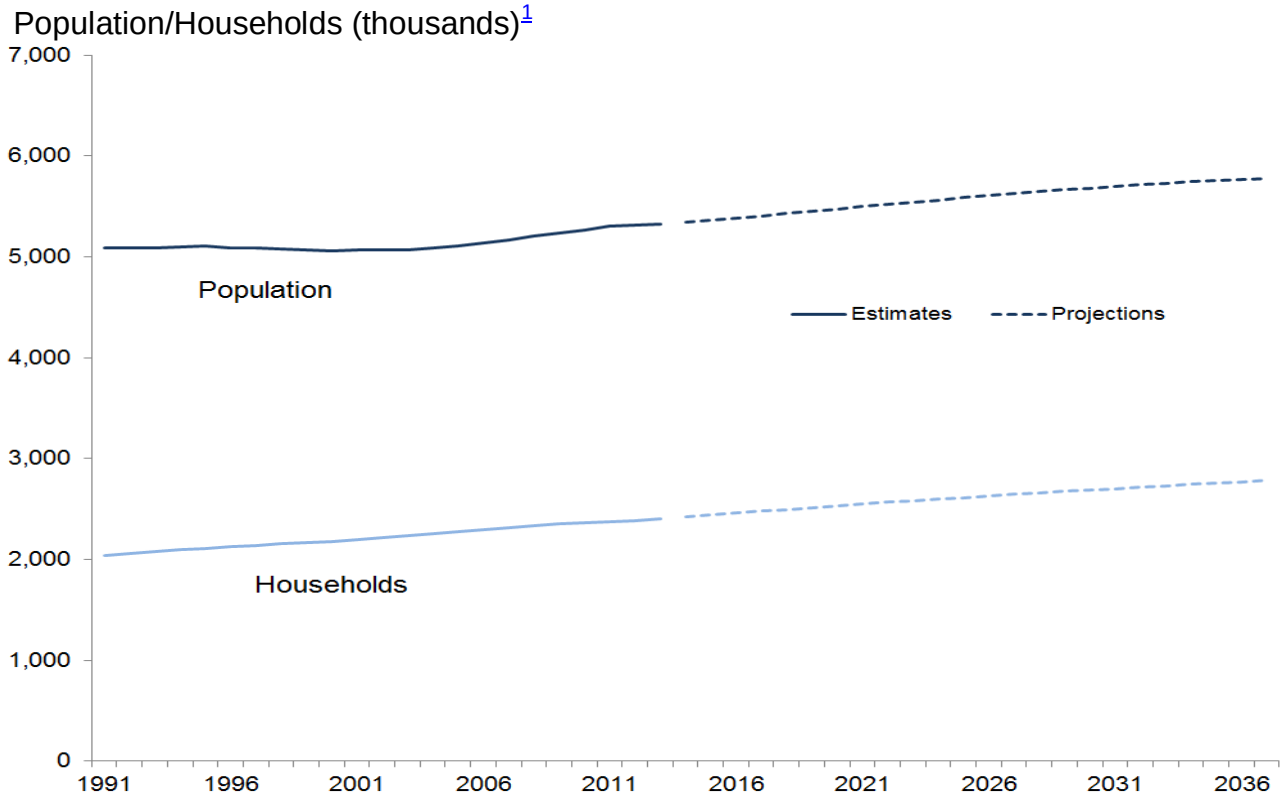
Population and Households: 1991-2037



People and households are important consumers of energy and water, therefore the population and number of households will have an effect on 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 5.07 million in 2002, but it has since increased to 5.33 million in 2013. Population estimates are rebased with each census to ensure a consistent time series. The estimates for 2002 to 2010 were revised following the results of the 2011 Census.

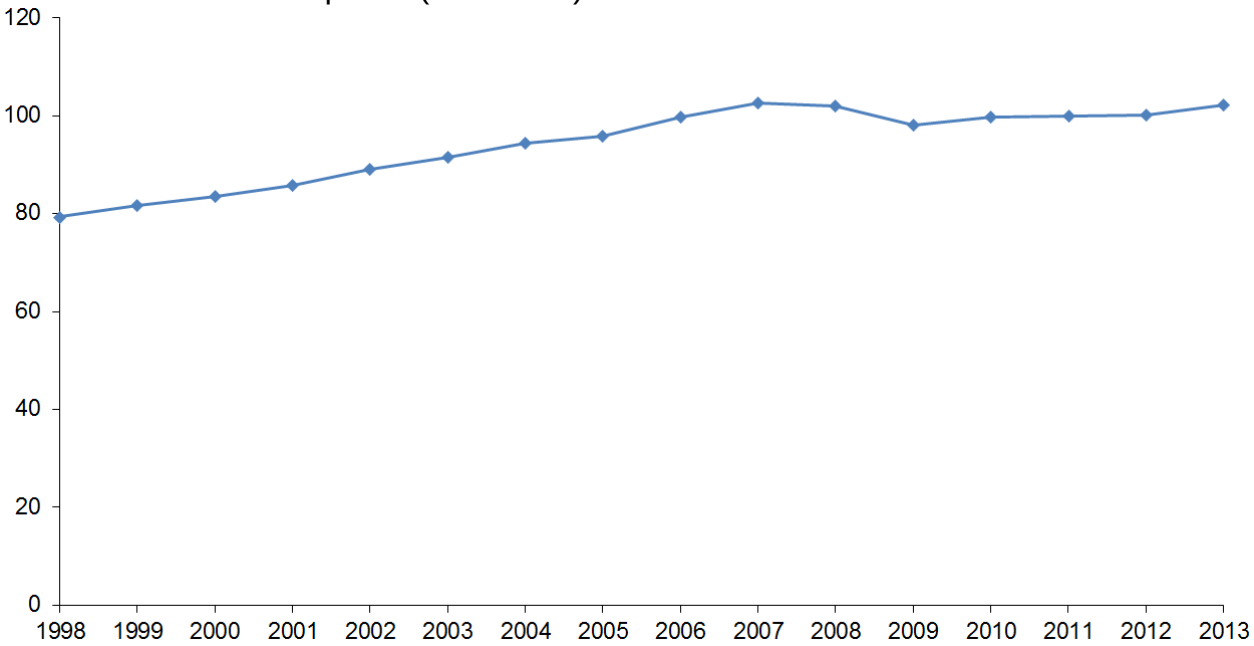
The latest projections indicate that the population will rise by 8.5% to 5.78 million in 2037. This trend is consistent with the overall UK population, which is also projected to increase but at a greater rate.[2]

The number of households rose by 359,000 (18%) between 1991 and 2013, whereas the population grew by 5%. The higher growth in household numbers reflects the fact that household structures are changing, with fewer people per household. Projections based on 2012 figures suggest that the number of households in Scotland will increase by 16% between 2013 and 2037, to 2.78 million[3]. This will contribute significantly to the demand for housing, not all of which can be accommodated on previously developed land. It is also likely to result in greater demand for goods and services which tend to be consumed on a household basis rather than an individual basis.

Source: National Records of Scotland / Metadata – Population/Households

Gross Domestic Product (GDP)[R,4]: 1998-2013

Scottish GDP at basic prices (2011=100)



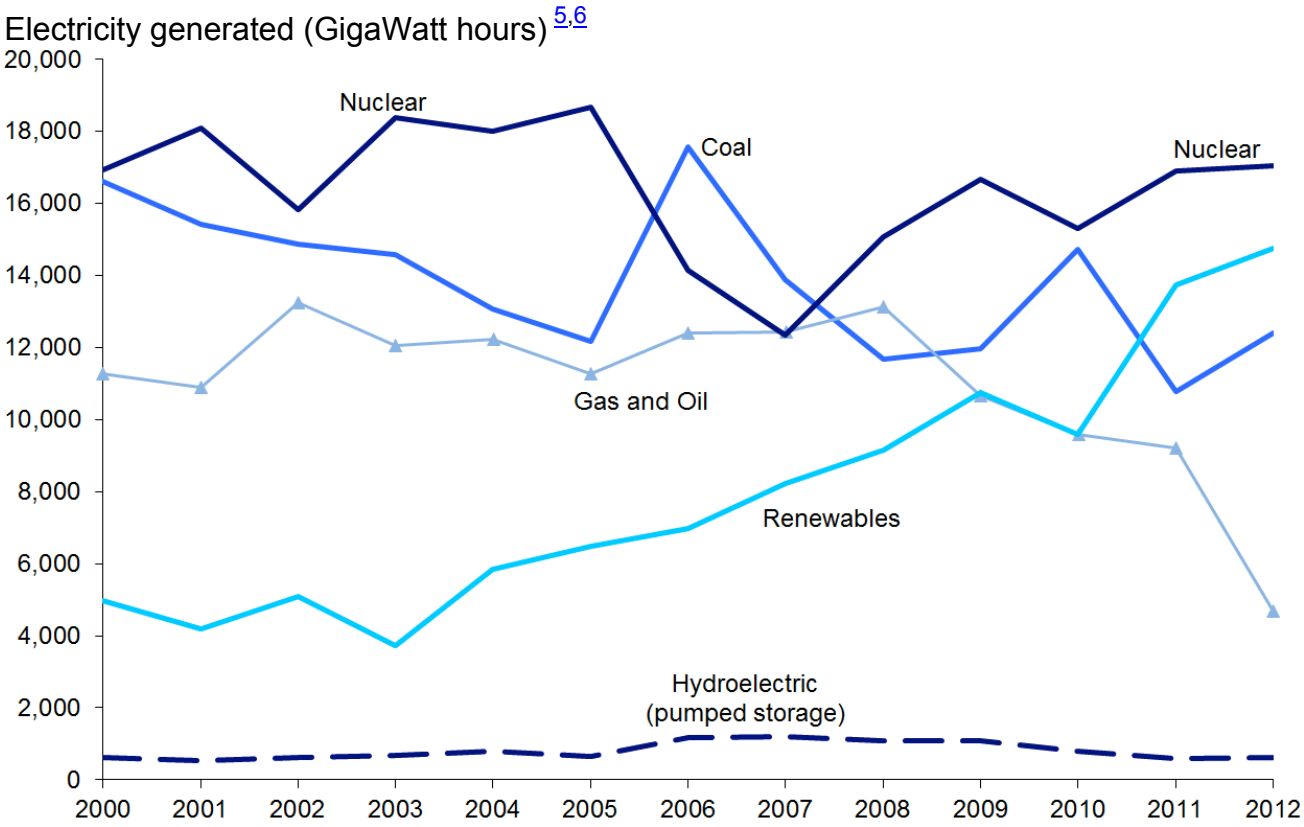
Scotland's Gross Domestic Product (GDP) is the main indicator of Scotland's economic performance. The GDP index is a short-term measure of output growth expressed in real terms. The estimates are adjusted for regular seasonal effects, and appropriately deflated to represent changes in the volume of economic activity rather than the value.

Over the 2013 calendar year, GDP in Scotland grew by 1.9%. This followed similar growth during 2012.

Over the 15 year time series between 1998 and 2013, the Scottish GDP index increased from 79.3 to 102.1, representing an average annual growth rate of 1.7%. However, this has not been a smooth increase and has been punctuated by some disruption. Most notably, following the deterioration in global economic conditions, Scottish GDP fell by 5.6% between the second quarter of 2008 and the third quarter of 2009. Scottish GDP returned to its pre-recession level during the first quarter of 2014.

Source: Scottish Government / Metadata

Electricity Generation by Source[R]: 2000-2012



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.[7]

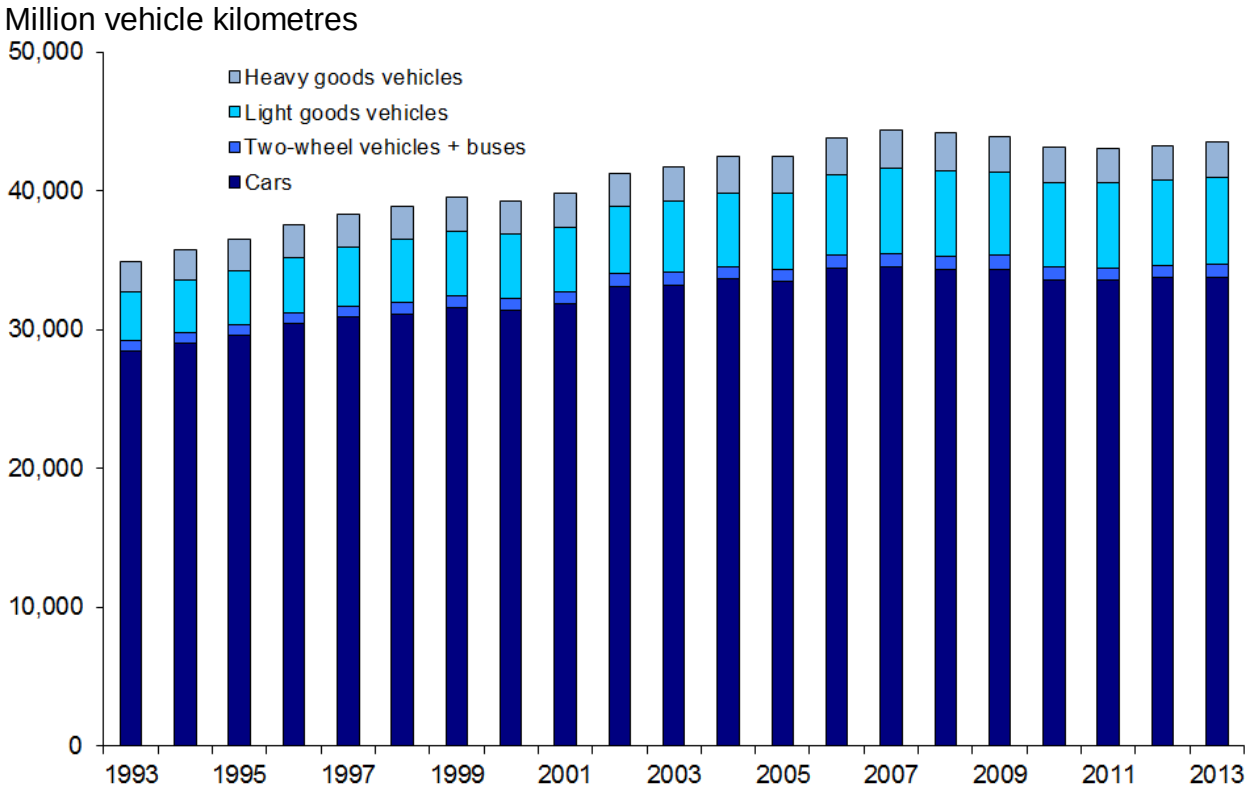
In 2012, Scotland generated 49,498 GWh of electricity, 3.4% less than in 2011. Renewable electricity generation increased by approximately 7% over this period, accounting for 30% of the total generated. The increase since 2000 is mainly the result of a rise in the amount of electricity generated by wind power. Hydro generation accounted for 33% of Scotland's renewable electricity generation in 2012, and was 9% less than 2011 levels due to drier weather. Scotland generated 14,756 GWh of electricity from renewable sources in 2012. This equated to 40% of the gross consumption[8] of electricity in Scotland, compared with 12% in 2000 and 36% in 2011.[9]

Fossil fuels accounted for 35% of Scotland's electricity generation in 2012. Coal and gas are the two main fossil fuels used for electricity generation, with oil used to a lesser extent. The mix of fossil fuels used in any year is affected by relative fuel prices. There was a slight upward trend in generation from gas and oil between 2005 and 2008, but this dropped in 2009, and in 2012 reached its lowest level since 2000 with a 49% drop from 2011. Electricity generated by coal increased by 15% in 2012 compared to 2011.

Nuclear power does not emit greenhouse gases although its use raises other environmental issues, including the long-term disposal of spent fuel. In 2012, 34% of electricity generated in Scotland was from nuclear power stations, compared with 33% in 2011. Scotland's two nuclear stations both currently have a decommissioning date of 2023. No new nuclear power stations are currently planned.

Source: Department of Energy and Climate Change / Scottish Government / Metadata

Motor Traffic on All Roads: 1993-2013



The pollutants emitted by road transport are a major contributor to poor air quality, which damages human and ecosystem health.[10] 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 (NO_x), of which NO_2 is a component, contribute to the formation of ground level 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. Improvements in fuel efficiency and switching to newer cleaner fuel sources are helping to achieve reductions in GHG emissions and concentrations of atmospheric pollutants.

Since 1993, the volume of motor traffic on roads in Scotland has increased by 25% to some 43.5 billion vehicle kilometres in 2013. However, since 2007 there has been a reduction in motorised road traffic with 2011 levels 3% less than the peak in 2007. The volume of motor traffic increased in both 2012 and 2013 but remains 2% below the 2007 peak. In 2013, major roads (motorways and 'A' roads) accounted for approximately two thirds of the volume of motor traffic in Scotland. In addition, minor roads ('B', 'C' and unclassified) accounted for 14.5 billion vehicle kilometres of traffic. Much of the growth in road traffic has been by light goods vehicles, which showed a 76% increase in vehicle kilometres since 1993.

Source: Department for Transport / Metadata

Background – Footnotes

1) Population estimates are rebased with each census to ensure a consistent time series. Estimates for 2002 to 2010 were revised using information from the 2011 Census. The population estimates from 2011 onwards are all based on the 2011 Census.

2) National Records of Scotland (2014). Population Projections of Scotland (2012-based).

3) National Records Scotland (2014). Household Projections for Scotland (2012 based).

4) The estimates from the Scottish Government's Quarterly GDP Publication measure GDP at basic prices, also referred to as Gross Value Added (GVA), which does not account for taxes or subsidies on products. The GDP index is produced in constant (2011) prices, meaning that the effect of price changes is removed from the estimates, and is seasonally adjusted.

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) Scottish Government (2009). Climate Change (Scotland) Act 2009.

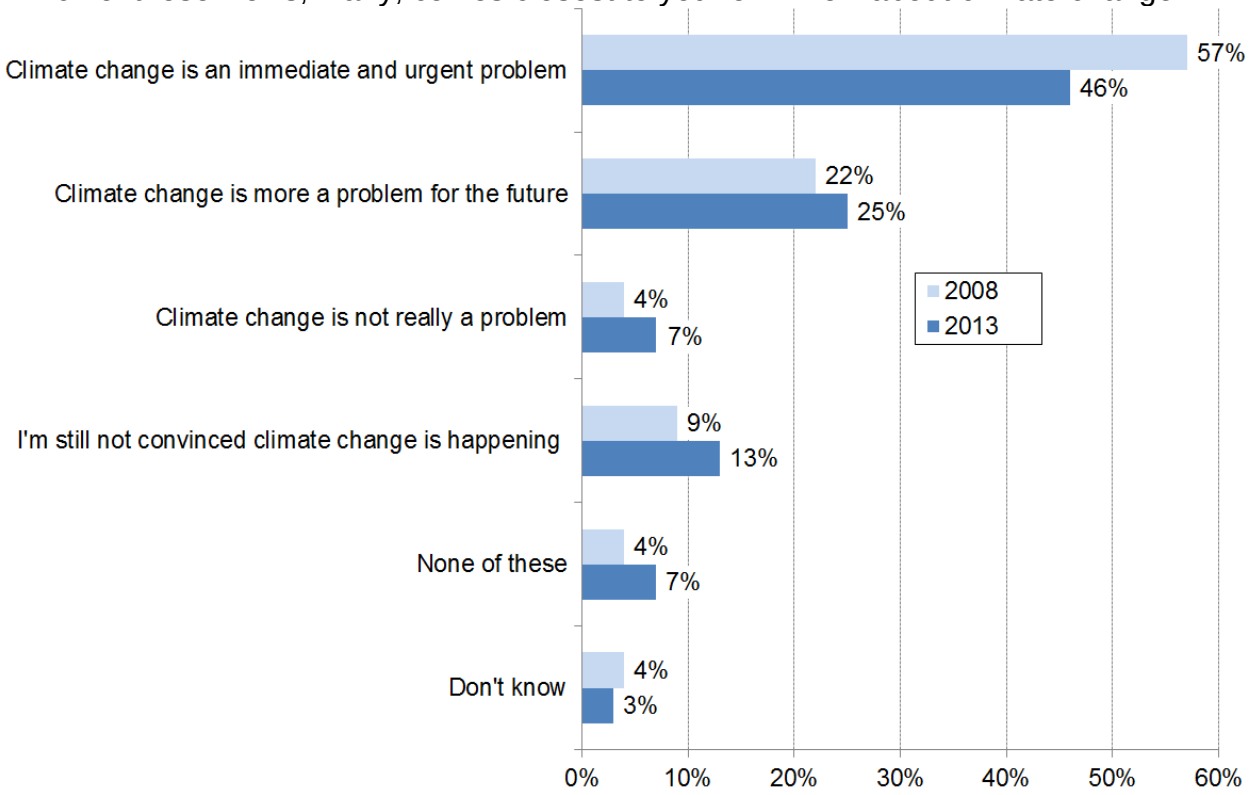
8) The amount of electricity generated minus net exports (but including losses).

9) The Scottish Government has set a target for renewable sources to generate the equivalent of 100% of Scotland's gross annual electricity consumption by 2020, with a new interim target of 50% set for 2015.

10) National Atmospheric Emissions Inventory (2013). Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990 - 2011

Perceived Immediacy of Climate Change: 2008 and 2013

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



Action to address climate change is a high priority for the Scottish Government, and the Climate Change (Scotland) Act (2009)[1] set targets to reduce Scotland's greenhouse gas emissions. Public attitudes about the immediacy of climate change as a problem for Scotland are likely to influence their willingness to support initiatives to address climate change, including changing their own behaviours. This measure is part of a small set of low carbon attitude and behaviour-related indicators set out in 'Low Carbon Scotland: A Behaviours Framework'[2].

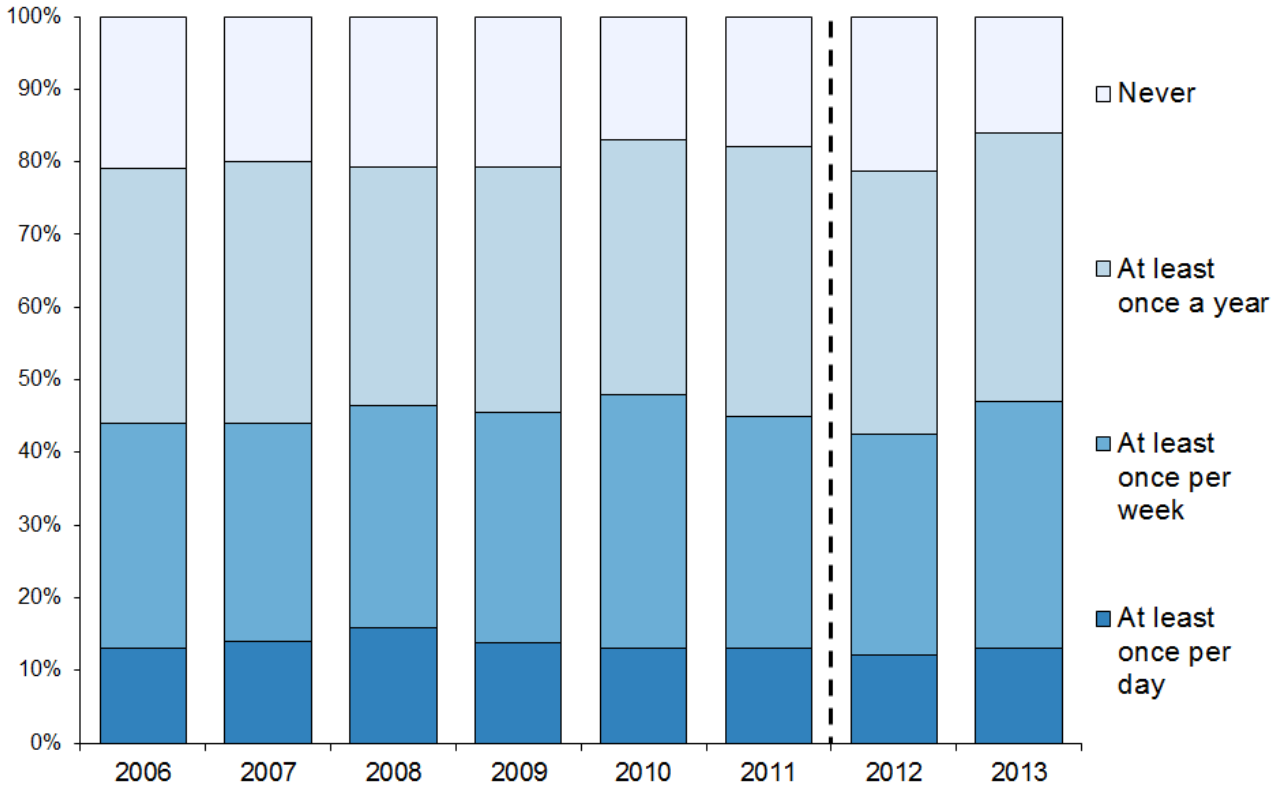
The Scottish Household Survey, 2013, included a question about attitudes towards climate change. The same question had been asked in the Scottish Environmental Attitudes and Behaviours Survey 2008[3], so the results can be compared, although the surveys were slightly different. Respondents were presented with four statements about climate change and asked which, if any, was closest to their own view.

In 2008, 57% of respondents thought that climate change was an immediate and urgent problem, compared with 46% in 2013, a fall of 11 percentage points. The percentage of people who think climate change is a problem for the future increased from 22% to 25%. In contrast in 2008, 13% of respondents considered either that climate change was not a problem or were not convinced it was happening, compared with 20% of respondents in 2013, an increase of seven percentage points.

Source: Scottish Government / Scottish Government / Metadata

Outdoor Visits: 2006 - 2013

Percentage of adults making visits to the outdoors



Outdoor recreation is beneficial for health and well-being. It also provides opportunities for people to come into contact with, and increase their understanding of, the natural environment. Although outdoor recreation has multiple motivations, this indicator provides a useful measure of the numbers of people who gain benefit and enjoyment from nature and biodiversity and improve their understanding and functioning of the natural environment.

The Scottish Government has established a National Indicator[4] to increase the proportion of adults making one or more visit to the outdoors per week. During 2013, 46% of adults are estimated to have made visits to the outdoors one or more times per week, compared to 42% in 2012. For 2012 and 2013, data are taken from the Scottish Household Survey, where respondents were asked how often, on average, they had made a visit to the outdoors for leisure and recreation in Scotland in the last 12 months.

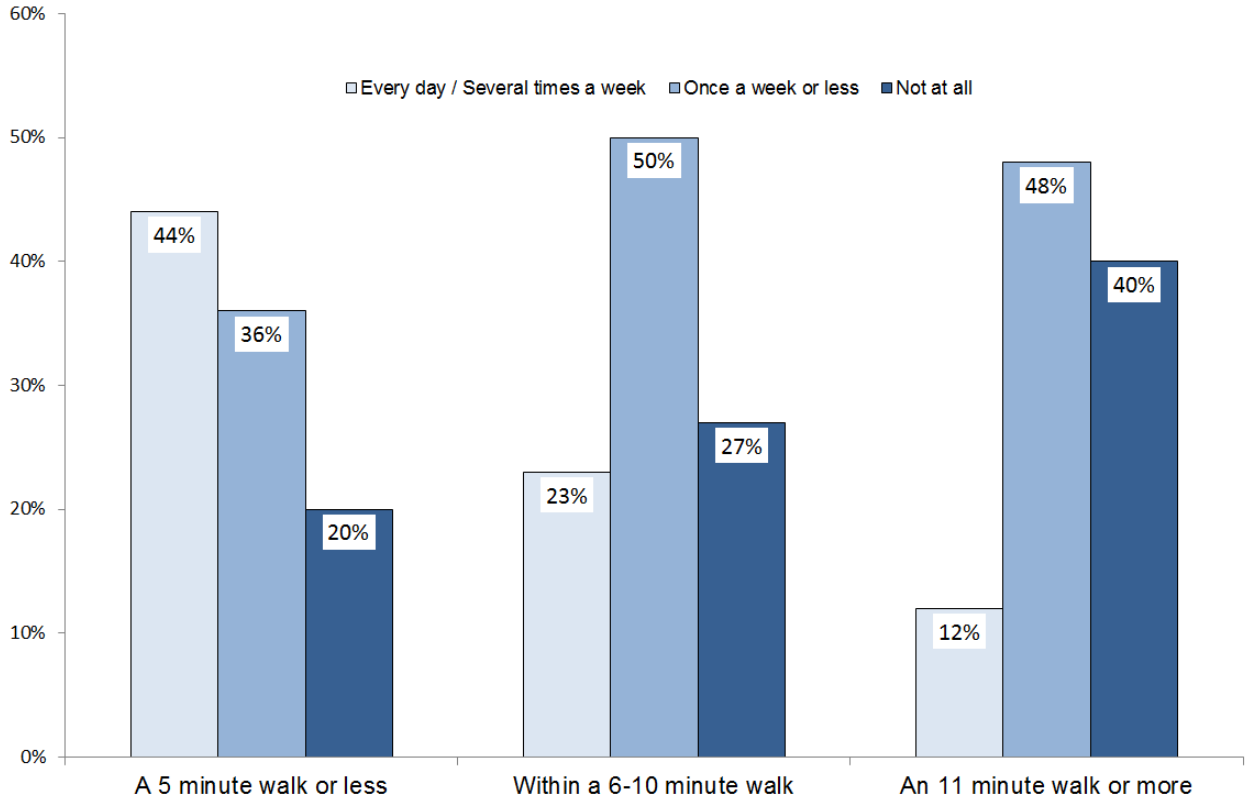
There are a great variety of factors and influences for the level of outdoor recreation which may have affected the number of visits made to the outdoors last year, such as the weather. 2013 was also the Year of Natural Scotland, which aimed to celebrate and promote all of Scotland's outstanding natural beauty, landscapes and biodiversity.

Prior to 2012 the data was sourced from the Scottish Recreation Survey produced by Scottish Natural Heritage, which contained the same question[5].

Source: Scottish Government / Scottish Natural Heritage / Metadata

Frequency of Use of Local Greenspace: 2013

Frequency of use by time to walk to nearest useable greenspace (percentage of adults)[6]



Greenspaces are parks, greens and areas of grass available for people to visit. Within urban areas they are a particularly important part of the Scottish landscape, where they allow people to participate in sports and exercise who would otherwise not have access to suitable spaces. Having easy access to good greenspaces can improve people's quality of life by increasing satisfaction with their neighborhood, promoting mental and physical health (including through its association with increased physical activity), and reducing health inequalities[7].

The Scottish Household Survey collects data on how accessible people's nearest usable greenspace is from their home (measured in terms of the time taken to walk there), and how often they use it. In 2013, 68% of people in Scotland reported that they lived within a 5 minute walk or less of their nearest greenspace, with 19% living within 6-10 minutes of their nearest greenspace. Overall 36% of people said that they visit their nearest greenspace once a week or more, with 40% visiting once a week or less and 24% not visiting at all.

There is a strong link between how far people have to walk to reach their local greenspace and how often they use it. For those living within a 5 minute walk, 44% of people visited their nearest greenspace several times a week. Increasing this to just a 6-10 minute walk this is reduced down to 23%.

Source: Scottish Government / Metadata

Public Attitudes & Behaviours – Footnotes

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

2) Scottish Government (2010). Low Carbon Scotland: A Behaviours Framework.

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

4) Scotland Performs – National Indicator.

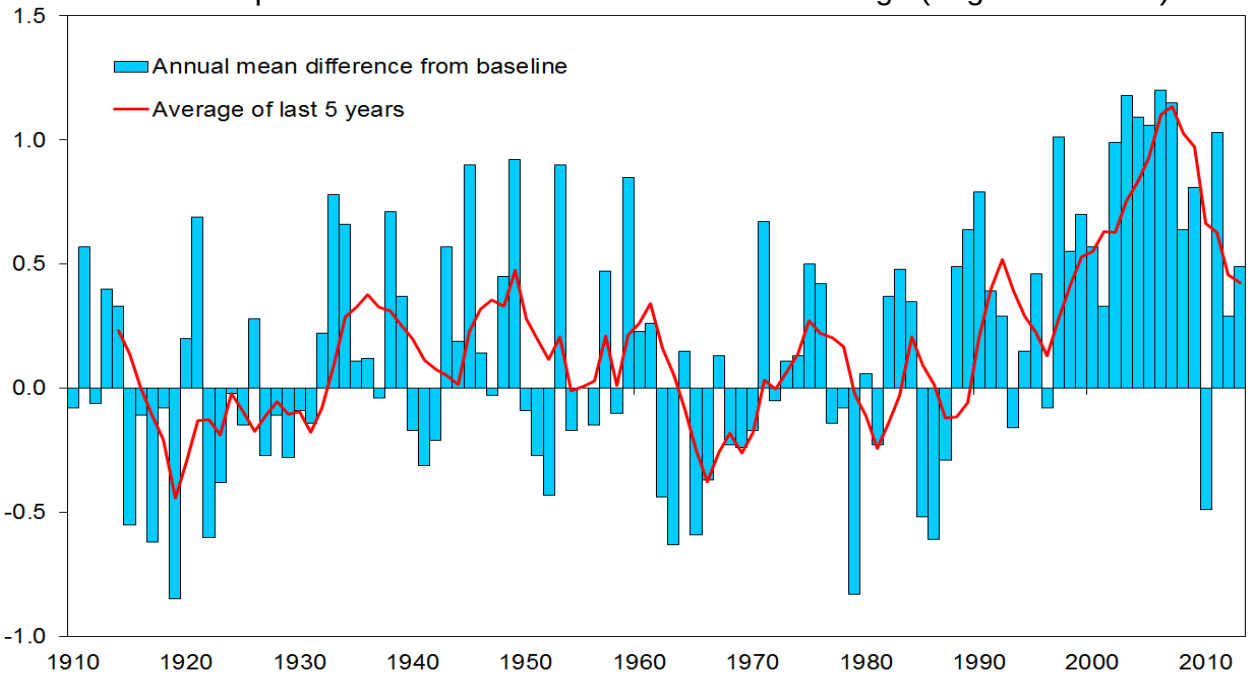
5) Between 2006 and 2012, the annual Scottish Recreation Survey (ScRS), managed by Scottish Natural Heritage (SNH), provided the official statistic for the annual updating of the National Indicator. However a new consolidated survey, Scotland's People and Nature Survey (SPANS) was commissioned by SNH to provide a single, comprehensive source of information on people's use of the natural environment and thereby reduce costs. SPANS commenced in 2013 and will run at intervals of 3 years (and so cannot provide the official statistic which is required on an annual basis).

6) Sample size: all respondents - 9,759.

7) Bell, S. et al. (2008) and Mitchell, R. and Popham, F. (2008) in Reid, S. & Curtice, J. (2010) Scottish Social Attitudes Survey 2009: Sustainable Places and Greenspace Scottish Government, Edinburgh.

Annual Mean Temperature: 1910-2013

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



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 strong evidence that human activities are having a discernible impact on the global climate.[2]

For Scotland, the effects of climate change have implications in areas such as buildings and property, health, agriculture, forestry, transport, water resources and energy demand. These are areas of economic, social and environmental importance.

The globally averaged combined land and ocean surface temperature data as calculated by a linear trend, show a warming of 0.85 [0.65 to 1.06] °C, over the period 1880 to 2012.[2] Similarly, a linear trend through the Scottish land temperature series for the period 1910-2013 indicates an average annual increase of 0.006°C, or 0.6°C every 100 years.[3]

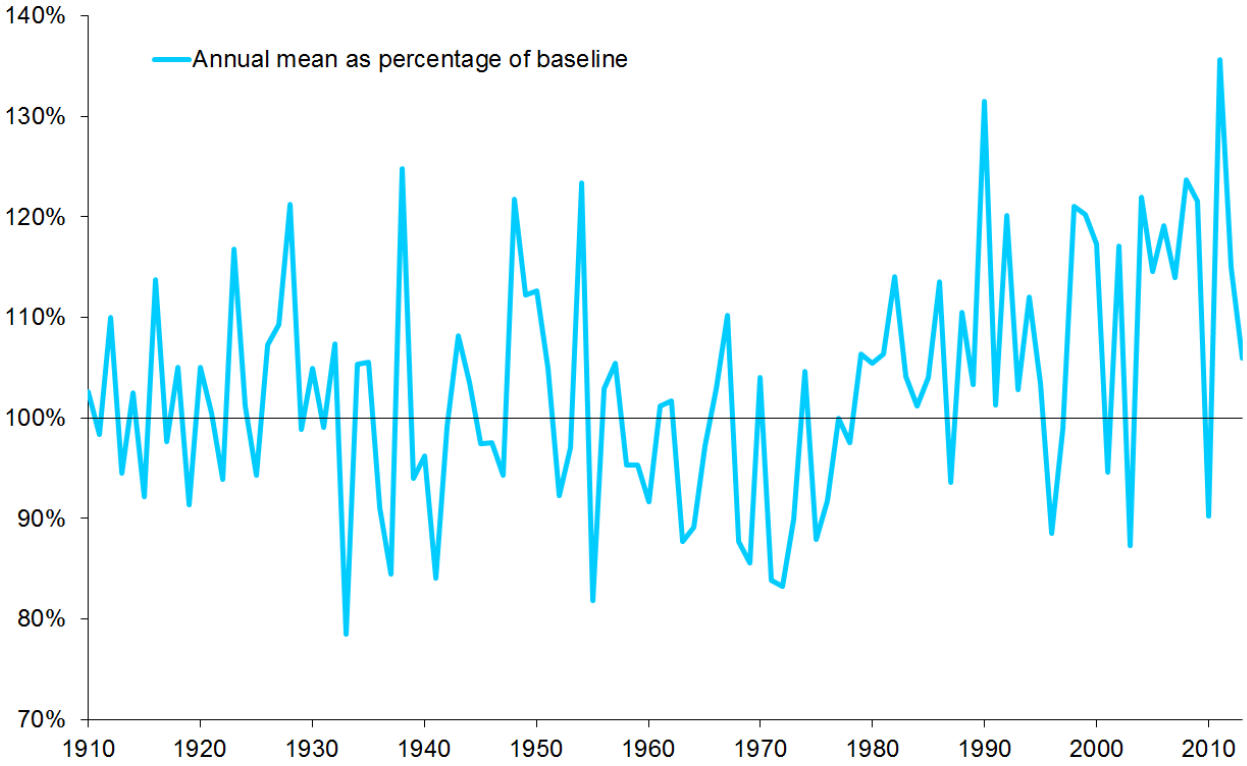
Seven of the ten warmest years recorded in Scotland have all occurred in the 21st century. The warmest years on record are 2003 and 2006, with temperatures of 1.18°C and 1.20 °C above the 1961-1990 average, respectively. The average temperature from 2000 - 2009 was 0.90°C higher than the 1961-1990 average and warmer than any other decade. 2013 shows an increase in mean temperature of 0.2°C from 2012. The 2013 temperature of 7.52°C is 0.49°C higher than the 1961-1990 average.

Temperatures in Scotland are projected to continue increasing over the next century, with a general trend towards hotter summers and milder winters[4]. For example, by 2070 - 2100, projected increase in mean temperature for the East of Scotland in the winter months[5] is 2.2°C (1.0°C to 3.7°C) and in the summer months[6], is 3.5°C (1.8°C to 5.7°C).

Source: Met Office / Metadata

Annual Precipitation: 1910-2013

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



The average annual precipitation in the 1980s, 1990s and 2000s was higher than in previous decades, particularly the 1970s, which contained several years with below average rainfall. Annual precipitation in 2013 was 6% above the 1961-1990 baseline. Although there has been an overall increase in rainfall, it varies among seasons and regions.[3]

The average winter precipitation in the 1990s and 2000s was around 23% higher than the 1961-1990 baseline for winter precipitation, compared to the 1960s which was around 9% lower. In 2013, the winter precipitation was 13% greater than the baseline. Summer precipitation has not differed as much; average summer precipitation in the 1990s was 4% below the 1961-1990 baseline for summer precipitation and in the 2000s was 15% above the baseline. In 2013, summer precipitation was 17% lower than the baseline.[7]

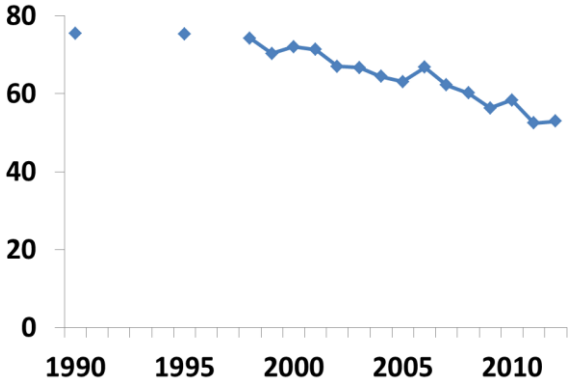
Climate change will have an impact on Scotland. The UK Climate projections for the next century indicate that the climate trends observed over the last century will continue and intensify over the coming decades. Rainfall is likely to become even more seasonal, with an average summer becoming drier, while autumn and winter become wetter[4]. For example, projected changes in the East of Scotland are reduced precipitation of 17% (-33% to 0%) in the summer months[6] and an increase of 12% (1% to 25%) precipitation in winter months[5] . Precipitation changes have several implications for Scotland, affecting water resources, flood and drought risk and habitat loss.

Source: Met Office / Metadata

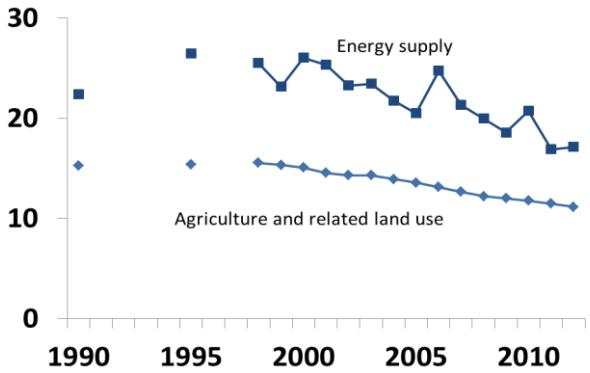
Greenhouse Gas Emissions by Source: 1990-2012[R]

Values in million tonnes carbon dioxide equivalent ($MtCO_2e$)[8]

NET EMISSIONS (ALL SECTORS)[9, 10]



LARGEST SECTORS:



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 radiative energy, 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.[9]

Scotland's emissions of greenhouse gases in 2012 were estimated to be 52.9 million tonnes of carbon dioxide equivalent ($MtCO_2e$), 0.8% (0.4 $MtCO_2e$) higher than 2011 and 29.9% below 1990 levels[8]. The main contributors to this long term reduction have been a fall in energy supply emissions (such as in the production of electricity) and from business and industrial emissions[10, 11, 12].

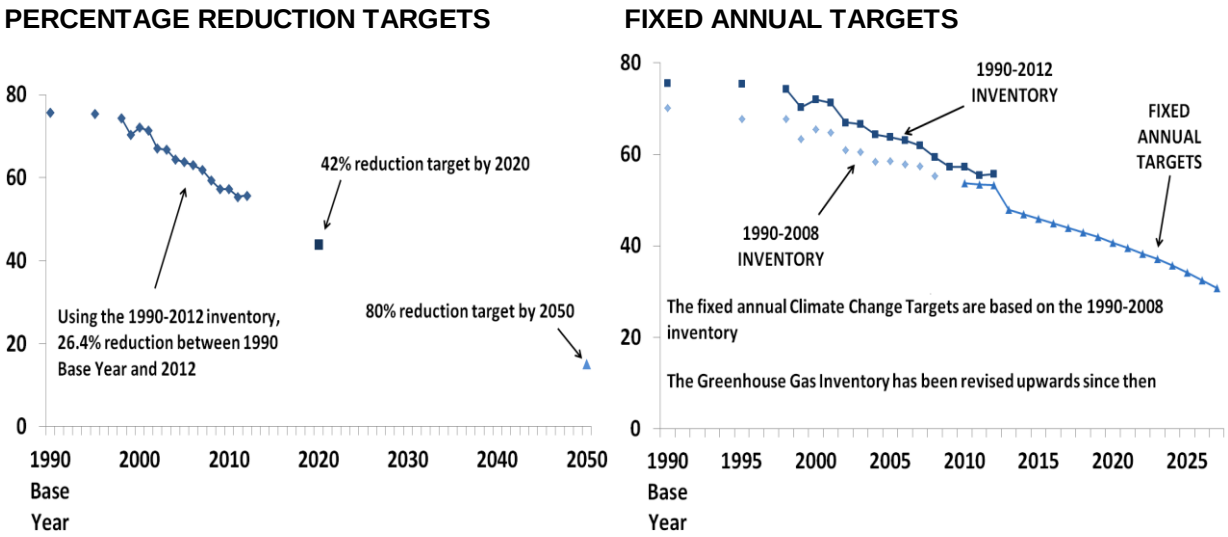
In 2012, Energy supply was the largest source of net emissions (17.1 $MtCO_2e$), followed by agriculture and related land use (11.2 $MtCO_2e$), and Transport (excluding International Aviation and Shipping) (10.5 $MtCO_2e$). Emissions from the energy supply sector were greater than emissions from public sector, development, international aviation and shipping, waste management and residential emissions combined. Forestry was the only aggregate sector in which there has been a net emissions sink (removal of 9.9 $MtCO_2e$).

Most sectors exhibit a general downward trend between 1990 and 2012, most clearly evident since 1998. In all years, energy supply is the main source of greenhouse gas emissions. Energy supply is a very volatile sector, which is linked to the ambient temperature, particularly during the winter months; and fuel used for electricity production, which in turn is largely driven by the price of coal relative to "cleaner" fuels[13, 14].

Source: National Atmospheric Emissions Inventory / Scottish Government / Metadata

Reporting against Scotland's Climate Change Targets. Greenhouse Gas Emissions Adjusted to Take Account of Trading in the EU Emissions Trading System: 1990 base year – 2012[R]

Greenhouse gas emissions taking account of emissions trading ($MtCO_2e$) [8,15]



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[16]. When trading in the EU ETS is taken into account, Scottish GHG emissions, including international aviation and shipping, increased by 0.5% between 2011 and 2012 (from 55.4 $MtCO_2e$ to 55.7 $MtCO_2e$). Compared with the 1990 baseline, such emissions in 2012 were 26.4% lower.

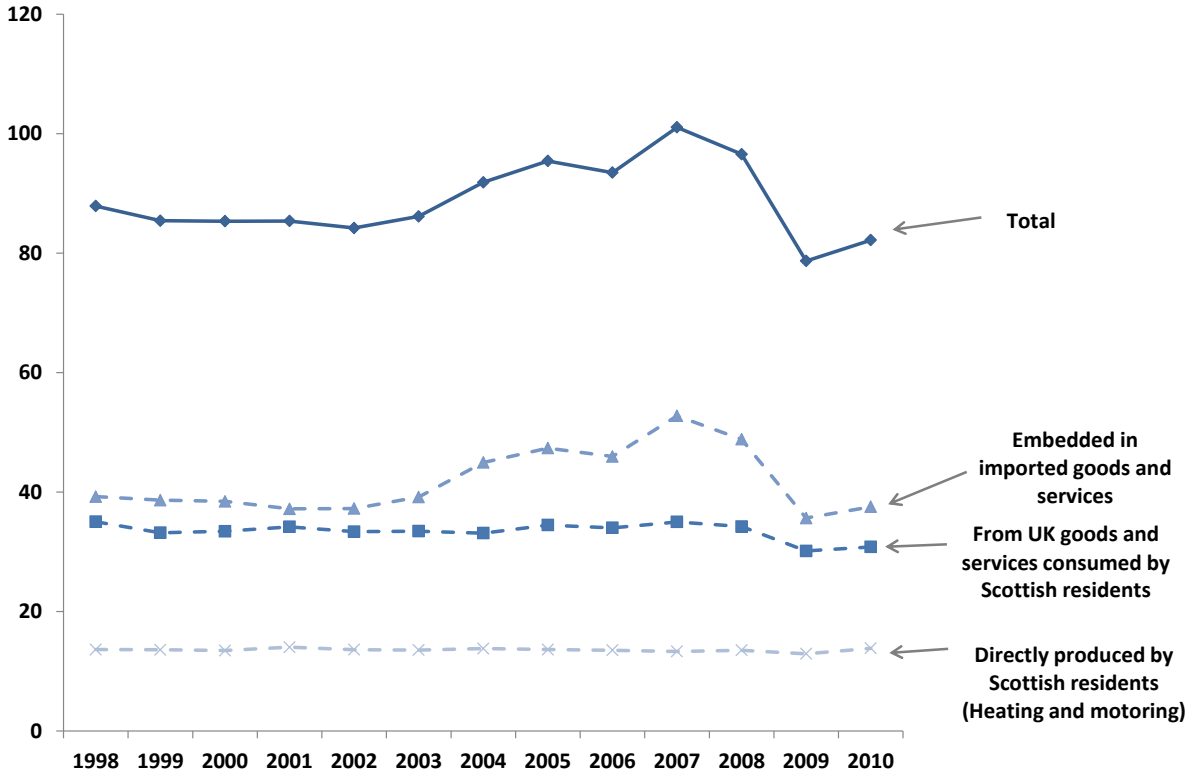
The Climate Change (Scotland) Act 2009[17] sets a statutory framework for greenhouse gas emissions reductions in Scotland with a reduction target of at least 80 per cent by 2050 and an interim reduction target of at least 42 per cent by 2020, both reductions against the 1990 baseline[15]. The Act also requires Scottish Ministers to set annual targets for emissions and the Scottish Parliament has passed legislation setting annual targets to the year 2027 [18, 19]. The 2012 target is 53.226 million tonnes of carbon dioxide equivalent ($MtCO_2e$). The fixed annual targets were based on data from the 1990-2008 Greenhouse Gas Inventory. The Greenhouse Gas Inventory has been revised upwards since then, increasing the percentage reductions required to meet the fixed annual targets. In accounting for trading in the EU ETS under the Climate Change (Scotland) Act 2009, 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 [20](Scotland's cap).

These figures are also used for reporting progress against the Scottish Government's Sustainability Purpose Target[21] and is one of the indicators set out in 'Low Carbon Scotland: A Behaviours Framework'[22].

Source: National Atmospheric Emissions Inventory / Scottish Government / Metadata

Scotland's Carbon Footprint (Greenhouse Gas Emissions on a Consumption Basis): 1998-2010

Values in million tonnes carbon dioxide equivalent ($MtCO_2e$)[8]



The carbon footprint refers to greenhouse gas emissions that are associated with the spending of Scottish residents on goods and services, wherever in the world these emissions arise along the supply chain, and those which are directly generated by Scottish households; for example, through heating and private motoring. The Carbon Footprint is part of a small set of low carbon attitude and behaviour-related indicators set out in 'Low Carbon Scotland: A Behaviours Framework'[22].

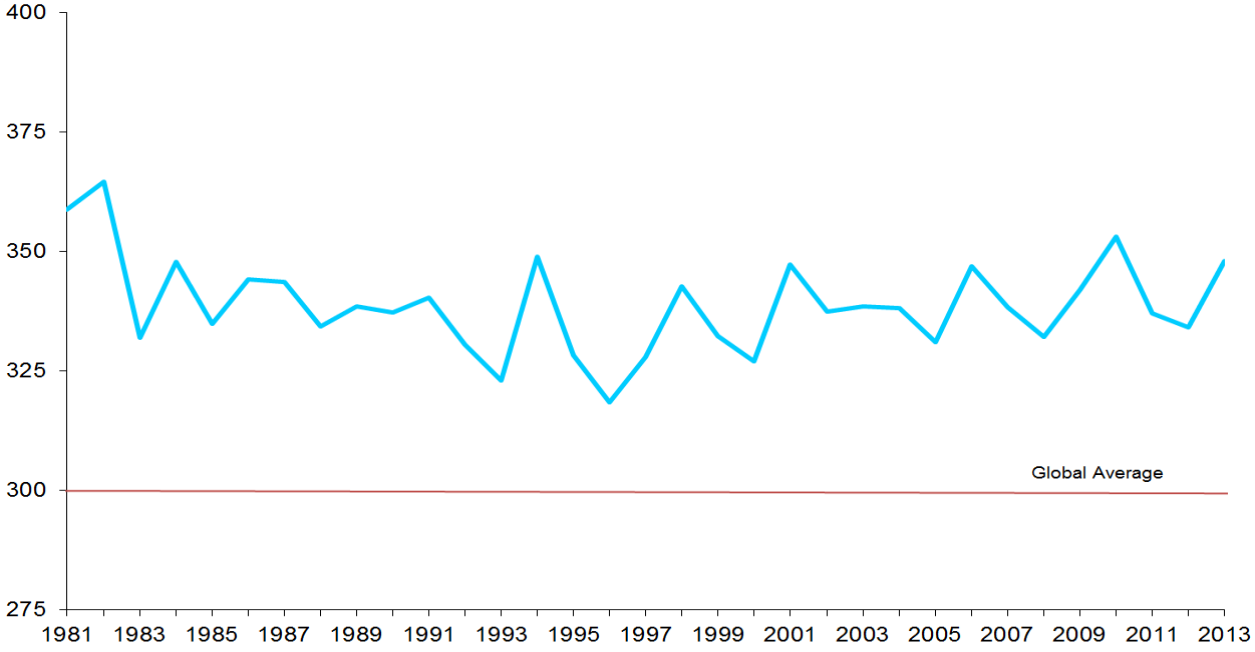
Scotland's carbon footprint can be separated into a number of components: those generated directly by Scottish households through heating and private motoring, those emissions relating to goods and services produced by UK business, and those emissions relating to imported goods and services. These are often referred to as emissions that are "embedded" in imports.

Between 2009 and 2010, Scotland's carbon footprint increased by 4% following a 19% fall in 2009. From 1998, the footprint rose by 15% to a peak of 101.1 million tonnes carbon dioxide equivalent[8] ($MtCO_2e$) in 2007 before falling to 78.7 $MtCO_2e$ in 2009. In 2010, Scotland's carbon footprint was 82.2 $MtCO_2e$, 6% less than in 1998 (87.9 $MtCO_2e$).

Source: Scottish Government / Metadata

Column Ozone Measurements: 1981-2013

Column ozone concentrations over Lerwick (Dobson units)



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 those around the equator.

Depletion is most marked in Antarctica where, in 2013, the area of the ozone hole reached a maximum of 24.0 million km^2 (over 300 times the land area of Scotland) on 16 September. This is more than in 2012 and 2010, but less than in 2011. If one considers the last 20 ozone holes (1994-2013), fifteen ozone holes have seen more ozone loss and four have seen less ozone loss than the 2013 ozone hole.[24]

The 1987 Montreal Protocol[25] 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. However, leaks form old equipment and the long life of these substances 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 30 years, the annual average total ozone cover over Lerwick has shown the natural variability which would be expected due to varying meteorological conditions. Generally, levels decreased until the late 1990s. More recently, it appears that this trend may be levelling out, but it is too soon to be sure.

Source: DEFRA / Metadata

Global Atmosphere – Footnotes

1) The 1961-1990 averages used in this publication are calculated from 5 km grid squares and differ from the averages published by the Met Office which are based upon 1 km grid squares. The averages used are temperature: 7.03°C and precipitation: 1,390.57 mm. Although 1971-2000 and 1981-2010 averages are available, 1961-1990 averages are used for comparability with UK Climate Projections 2009 (see 5).

2) Climate Change 2013: The Physical Science Basis, Intergovernmental Panel on Climate Change (IPCC), Working Group 1 (WG1) Report, September 2013.

3) For more information of Scottish climate trends over the last century, see: An online handbook of climate trends across Scotland - available on Scotland's Environment Web at www.environment.scotland.gov.uk/

4) UK Climate Projections 2009. The projected changes, based on the 1961-1990 averages, use the medium emissions scenario climate model, and are for the 2080s, i.e. a 2071-2100 average. The Scottish regions are North, West and East Scotland, based on Met Office climate regions. For each estimate, the smallest 10% probability level and the largest 90% probability level as well as the most likely estimate are given, to show the spread of possible outcomes.

5) December – February.

6) June – August.

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

8) 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 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 from carbon dioxide equivalent to carbon, they should be multiplied by $^{12}/_{44}$.

9) IPCC Fifth Assessment Report 2013.

10) The sectors presented are primarily based on National Communication (NC) categories. The NC categories are agreed groupings of more detailed sectors reported to the United Nations Framework Convention on Climate Change.

11) Here the NC categories Land Use, Land Use Change and Forestry (LULUCF) and Agriculture have been combined and split out into three groups. 'Agriculture and related land use' includes all emissions in the NC category Agriculture together with those LULUCF emissions associated with agricultural practices. The remaining LULUCF emissions are grouped into 'Forestry' (changes in emissions resulting from afforestation, deforestation and harvested wood products) and 'Development' (changes in emissions resulting from land use change to settlements). Estimates of emissions and removals from 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 Forestry taken as a whole is to act as a sink, absorbing quantities of carbon in excess of the quantity of GHGs the activities generate.

12) Emissions from offshore oil and gas installations are not included in the Scottish inventory, and are reported as “unallocated” within the disaggregated UK inventory.

13) DECC Energy Trends (2013). Electricity generation and supply figures for Scotland, Wales, Northern Ireland and England, 2009 to 2012.

14) Scottish Government (2013). Energy in Scotland Compendium 2013.

15) The Base Year for reporting against Climate Change Targets is: 1990 for carbon dioxide carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O); and 1995 for Fluorinated gases (F gases): hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).

16) Launched in 2005, the EU Emissions Trading Scheme (EU ETS) is an EU policy aimed at mitigating climate change by limiting greenhouse gas emissions from industry sectors and aviation. Participants include more than 11,000 heavy energy-using installations in power generation, the manufacturing industry and airlines across 31 countries in the European Economic Area (EEA).

The EU ETS is a 'cap and trade' system. A limit (cap) is placed on the overall volume of emissions from participants in the system. Within the cap, organisations receive or buy emissions allowances which they can trade (1 emissions allowance equals 1 tCO2e). Each year, an organisation must surrender enough allowances to cover its emissions. The cap is reduced each year so that by 2020, the volume of emissions permitted within the system will be 21% lower than in 2005. The reducing cap alongside the financial considerations of trading emissions allowances, incentivises organisations within the system to find the most cost effective way of reducing their emissions.

The EU ETS contributes to delivering Scotland's Climate Change Targets through incentivising the reduction in emissions from Scottish organisations participating in the system. In 2012, there were 86 Scottish installations that surrendered emissions allowances in the EU ETS.

17) Climate Change (Scotland) Act 2009

18) Climate Change (Annual Targets) (Scotland) Order 2010 (2010-2022)

19) Climate Change (Annual Targets) (Scotland) Order 2011 (2023-2027)

20) Further details of this cap are given in Scottish Greenhouse Gas Emissions 2012. 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.

21) Scottish Government (2014). Sustainability Purpose Target.

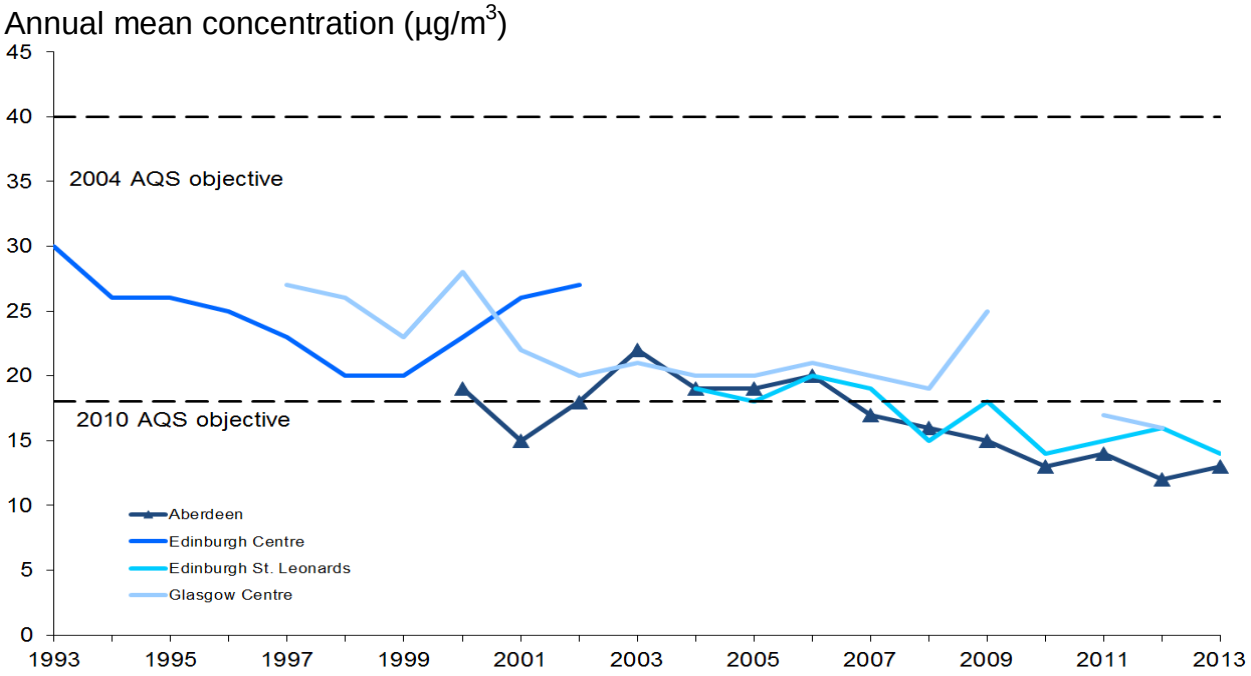
22) Scottish Government (2010). Low Carbon Scotland: A Behaviours Framework.

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

24) World Meteorological Organisation (2013). Antarctic Ozone Bulletin No. 6/2013.

25) United Nations Environment Programme. Montreal Protocol.

Particulate (PM_{10}) Concentrations[1,2,3]: 1993-2013



Particulate pollution can harm the human respiratory and cardiovascular systems, and is linked to asthma and mortality. Smaller particles are the most damaging as they can enter through the lungs and into the bloodstream. Current targets focus on particles less than 10µm in diameter (PM_{10}), the greatest source of which is combustion. Between 1990 and 2011, Scottish emissions of PM_{10} fell by 58%.[4]

The Air Quality Strategy (AQS)[5] objectives for PM_{10} come in two stages. Stage 1 sets objectives of: a 24 hour mean of 50µg/m^3 not to be exceeded more than 35 times a year, and an annual mean of 40µg/m^3 (both were to be achieved by the end of 2004). Stage 2 sets longer term objectives of: a 24 hour mean of 50µg/m^3 not to be exceeded more than 7 times a year, and an annual mean of 18µg/m^3 (both to be achieved by the end of 2010).

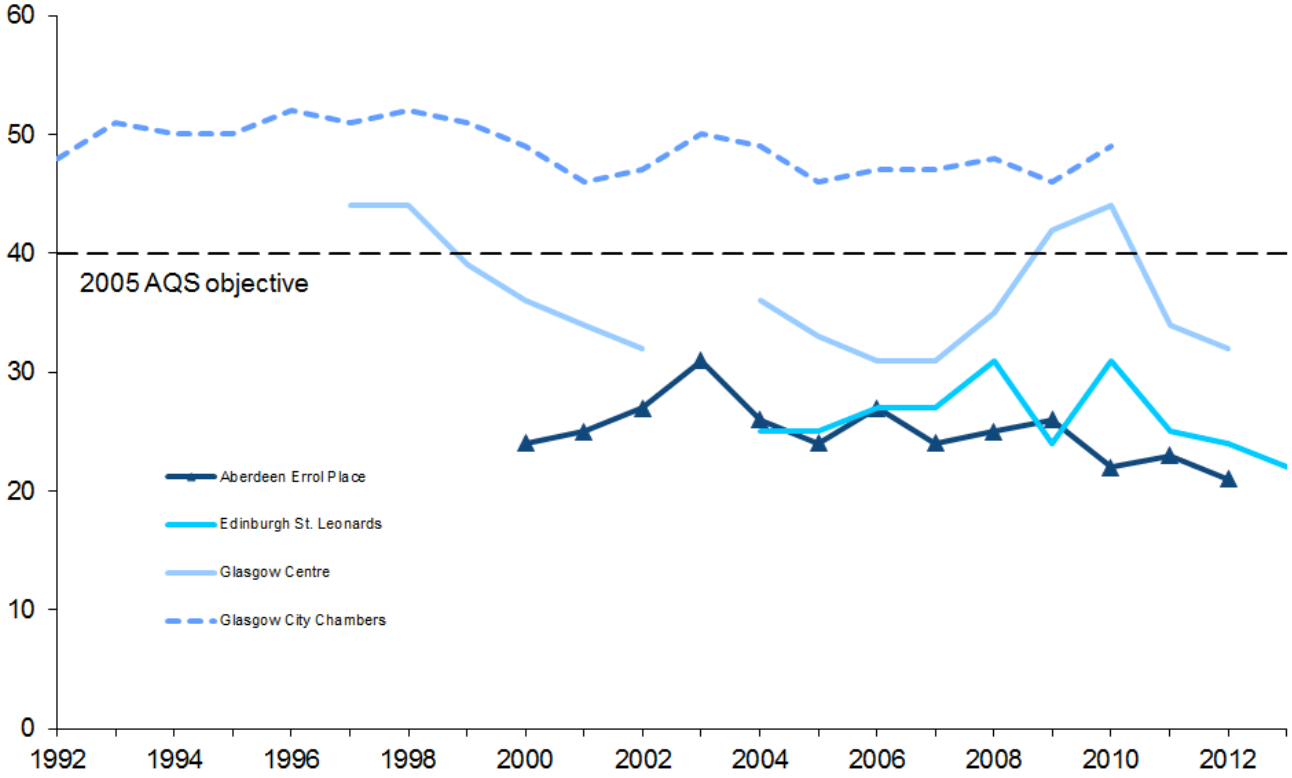
In 2013, the Stage 1 objectives were met at all of the automatic monitoring sites.[6] The Stage 2 annual mean objective was not met at 15 of 59 automatic monitoring sites in Scotland in 2013. Two sites also failed to meet the Scottish daily mean objective. Edinburgh Salamander Street has not met the stage two Scottish annual mean objective since 2010.

Through analysis of modelled background $PM_{2.5}$ concentrations (particles less than 2.5 µm in diameter) it is estimated that the effects on annual mortality in 2010 in Scotland were over 2000 deaths and over 22,000 associated life-years lost.[7]

Currently there are 31 Air Quality Management Areas (AQMAs)[8] in Scotland. Nine of these have been declared solely for PM_{10} and a further 11 for both PM_{10} and nitrogen dioxide (NO_2). Ten of the remaining AQMAs are for NO_2 only, one is for sulphur dioxide (SO_2). All except the SO_2 AQMA have been declared on the basis of emissions from transport sources.

Source: Scottish Air Quality Database / Metadata

Nitrogen Dioxide Concentrations[1,9,10]: 1992-2013



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 (accelerated plant growth in water bodies caused by excess nutrients) and promoting the formation of ground level ozone.

Between 1990 and 2011, Scottish emissions of nitrogen oxides fell by 65%.[4] Road transport was responsible for 29% of the emissions of nitrogen oxides in 2011.

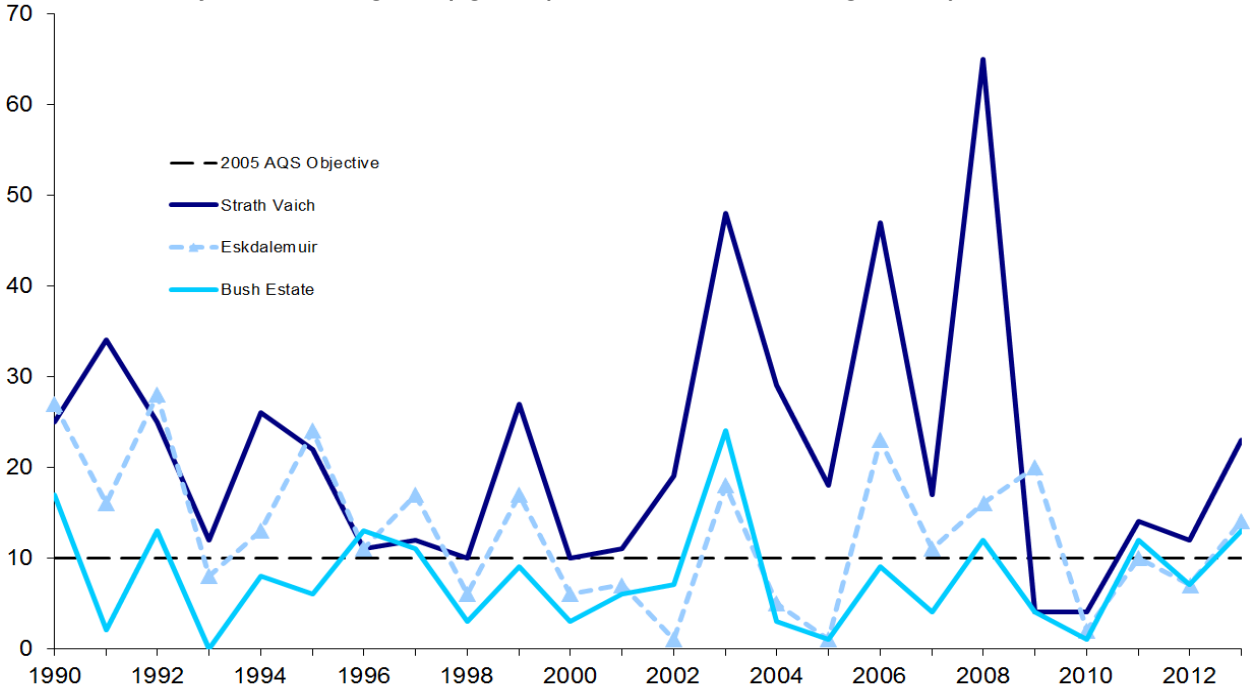
The UK Air Quality Strategy[5] objectives for NO_2 (to be met by the end of 2005) are an annual mean of 40µg/m^3 and an hourly mean of 200µg/m^3 not to be exceeded more than 18 times a year. In 2013, the first objective was not met at 14 of the 70 automatic monitoring sites[11] in Scotland. Those sites recording the highest annual mean concentrations were found next to busy roads, such as Edinburgh Queensferry Road and Glasgow Kerbside. The second objective was met at all but 4 automatic monitoring sites; Dundee Lochee Road and Edinburgh St John's Road were among those that failed.

Of the 31 Air Quality Management Areas[8] in Scotland, 10 have been declared solely for NO_2 and a further 11 for both NO_2 and PM_{10}.

Source: Scottish Air Quality Database / Metadata

Ground Level Ozone Concentrations[1]: 1990-2013

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



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.

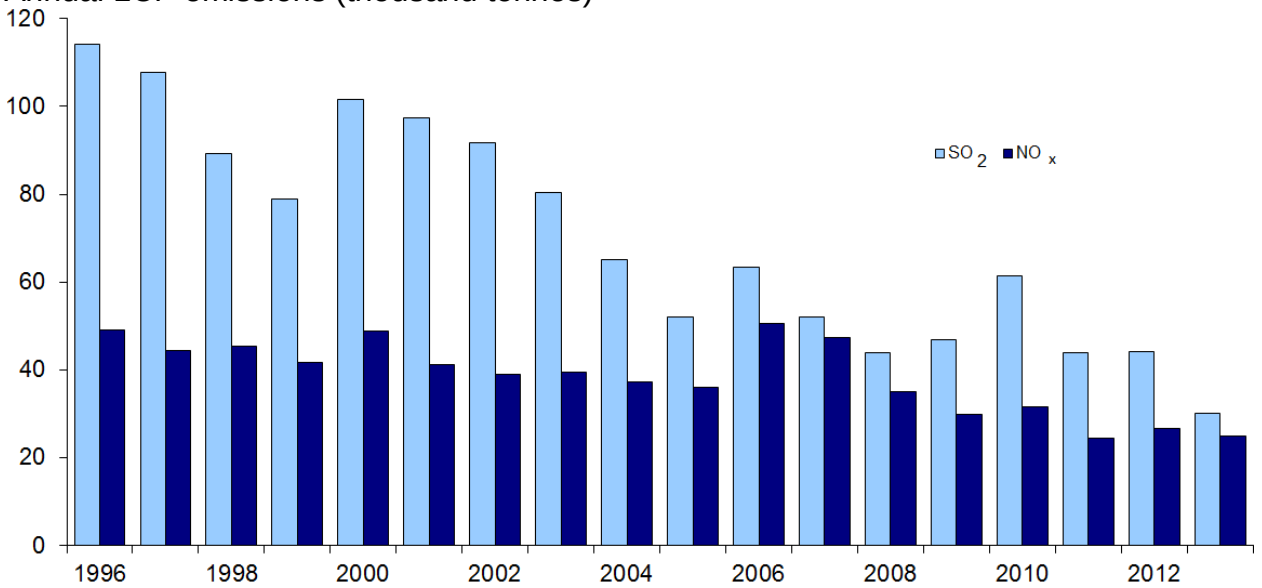
Ozone is formed by a slow, complicated series of reactions from other pollutants that may be blown over from Europe. The most important man-made precursors are nitrogen oxides and volatile organic compounds produced by road transport, industrial processes and solvent use. Ozone concentrations tend to 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 concentration (to be met by 2005) states that the maximum daily concentration (measured as an 8-hour running mean) of 100µg/m^3 should not be exceeded more than 10 days per year. In 2013, this objective was met at 5 of the 8 sites with a data capture greater than 75%.[12] Strath Vaich, Eskdalemuir and Bush Estate all failed to meet the AQS objective in 2013. All 3 sites, which are either rural or remote, regularly exceed the AQS objective.

Source: Scottish Air Quality Database / Metadata

Emissions of Sulphur Dioxide and Nitrogen Oxides from Large Combustion Plants[13]: 1996-2013

Annual LCP emissions (thousand tonnes)



Sulphur dioxide (SO_2) and oxides of nitrogen (NO_x) affect human health through respiratory damage, and ecosystem health through acidification. SO_2 and NO_x are released into the atmosphere through the combustion of fossil fuels. In 2011, large combustion plants (LCPs) accounted for 71% of the SO_2 emissions and 25% of NO_x emissions in Scotland.[4] In 2013 there were 54 LCPs in Scotland, down from 57 in 2011.

The Large Combustion Plants Directive (LCPD, which has now been incorporated into the Industrial Emissions Directive (2010/75/EC)[14]) called for a 60% reduction in LCP SO_2 emissions by 2003 and a 30% reduction in LCP NO_x emissions by 1998, from a 1980 baseline. By 2002, total UK emissions of SO_2 were 79% below 1980 levels, and 91% below 1980 levels in 2012. In 1998, total UK emissions of NO_x were 25% below 1980 levels, and 60% below 1980 levels in 2012.[15] The Large Combustion Plants Directive has now been superseded by the Industrial Emissions Directive 2010/75/EU, which was transposed into Scottish law by the Pollution Prevention and Control (Scotland) Regulations 2012.

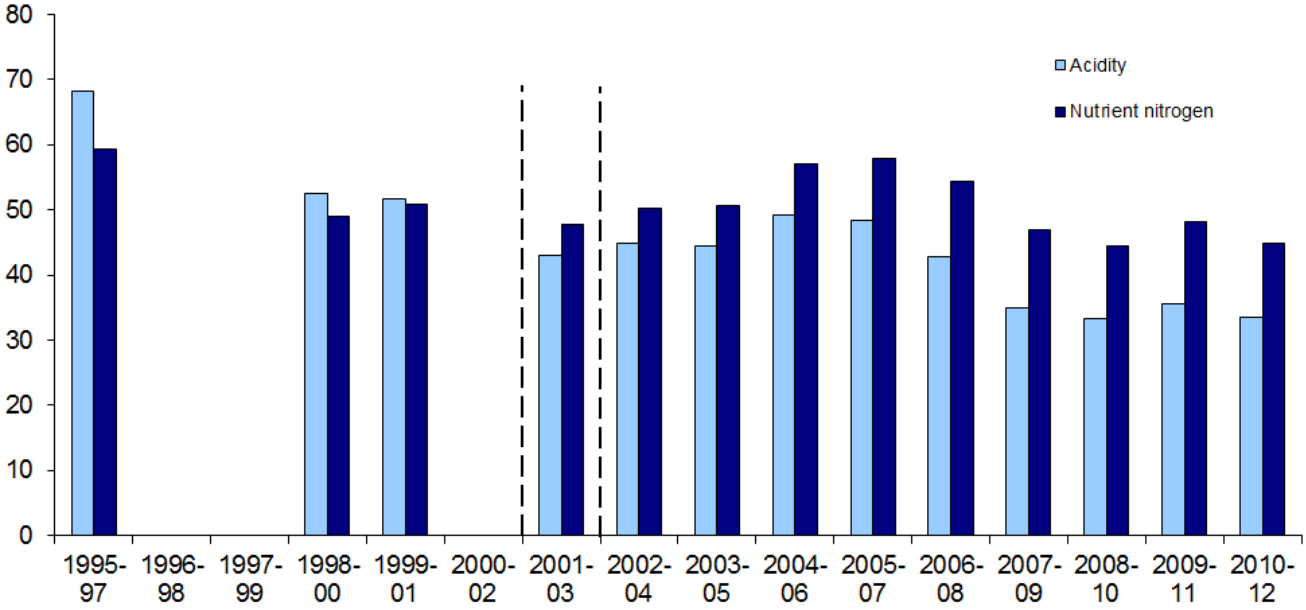
In Scotland, SO_2 emissions from the electricity supply industry fell between 1996 and 1999, but there were rises, particularly in 2000, 2006 and 2010. These rises were due to the cold weather and increased use of coal-fired power stations, at times necessary to offset the reduced capacity of the nuclear sector because of refurbishment work but also affected by the price of coal versus gas. In 2013, SO_2 emissions from large combustion plants decreased by 32% compared with 2012, mainly due to the closure of Cockenzie power station in January 2013.[16]

NO_x emissions from large combustion plants decreased by 36% between 1996 and 2010. This was followed by a 22% reduction between 2010 and 2011, in part due to a reduction in Cockenzie's emissions. Emissions of NO_x were the lowest on record in 2011 before increasing by 9% in 2012 and subsequently decreasing by 6% in 2013.

Source: Scottish Environment Protection Agency / Metadata

Sensitive Habitats Exceeding Critical Loads for Acidification and Eutrophication[17]: 1995-1997 to 2010-2012

Percentage exceedance



Critical loads are thresholds above which the deposition of pollutants causing acidification (sulphur dioxide, nitrogen oxides and ammonia) and eutrophication (nitrogen oxides and ammonia) cause significant harm to the environment.[18] The pollutants mainly come from industry, transport and agriculture.

Around 60% of Scotland's land area contains habitats sensitive to acid deposition and 55% to eutrophication. The area of sensitive habitats in Scotland exceeding critical loads for acidification fell from 68% in 1995-1997 to 33% in 2010-2012, primarily due to reductions in sulphur emissions. This included a 16% reduction in acidity exceedance between 2004-06 and 2010-12. Following a period of increase between 2001-2003 and 2005-2007, nutrient nitrogen exceedance decreased by 13% between 2005-2007 and 2010-2012. Overall, nutrient nitrogen exceedance fell from 59% to 45% in the period 1995-1997 to 2010-2012.[19]

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. According to data released from the European Environment Agency (EEA), the UK is meeting these targets. 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 / Metadata

Air Quality – Footnotes

1) All values displayed in the chart are at or above the 50% data capture rate. If the data capture rate for any site is below 50% then the data will not be included in the chart. 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 2003, the data capture rate for Edinburgh Centre was low (under 50%). The 2003 data for Edinburgh are therefore unreliable and will not be included in any charts or tables. The 2003 figure for Edinburgh is: PM10 = 25. 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.

3) In 2010, the data capture rate for Glasgow Centre was low (under 50%). The 2010 data for Glasgow are therefore unreliable and will not be included in any charts or tables. The 2010 figure for Glasgow is: PM_{10} = 23.

4) Thistlethwaite, G., Salisbury, E., Pang, Y., MacCarthy, J., & Misselbrook, T. (2013). National Atmospheric Emissions Inventory (2013). Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990 - 2011.

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) In 2013, PM_{10} concentration was measured at 78 automatic monitoring sites in Scotland. Of these sites, none exceeded the 40 $\mu g/m^3$ UK AQS – data for these sites are available on the Scottish Air Quality Database.

7) Public Health England (2014). Estimating local mortality burdens associated with particulate air pollution.

8) Under the Local Air Quality Management (LAQM) system, which has been in operation since 1997, all local authorities are required to regularly review air quality in their areas against several objectives for pollutants of particular concern for human health. If this work shows that any objective is not being achieved, the authority concerned must declare an Air Quality Management Area (AQMA) and produce an action plan outlining how it intends to tackle the issues identified.

9) In 2003, the data capture rate for Edinburgh Centre was low (under 75%). The 2003 data for Edinburgh Centre are therefore unreliable and will not be included in any charts or tables. The 2003 figure for Edinburgh is: NO_2 = 50. The site stopped recording on the 13th of October and the monitor was then relocated to an urban background site at Edinburgh St Leonard, which started recording on 24 November 2003.

10) In 2003, the data capture rate for Glasgow Centre was low (under 50%). The 2003 data for Glasgow Centre are therefore unreliable and will not be included in any charts or tables. The 2003 figure for Glasgow is: NO_2 = 39. In 2011, the data capture rate for Glasgow City Chambers was low. It will therefore not be included in any charts or tables. The 2011 figure for Glasgow City Chambers is: NO_2 = 50.

11) In 2013, concentrations of nitrogen oxides are measured at 80 automatic monitoring sites in Scotland. Of these sites, 70 had a capture rate of at least 75% - data for these sites can be found on the Scottish Air Quality Database.

12) In 2013, ozone concentrations were measured at 11 sites, but 3 of these had a data capture rate of less than 75%. Data for these sites are available on the Scottish Air Quality Database.

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

14) Scottish Environment Protection Agency. Industrial Emissions Directive.

15) Department for Environment, Food and Rural Affairs – Environment Statistics website.

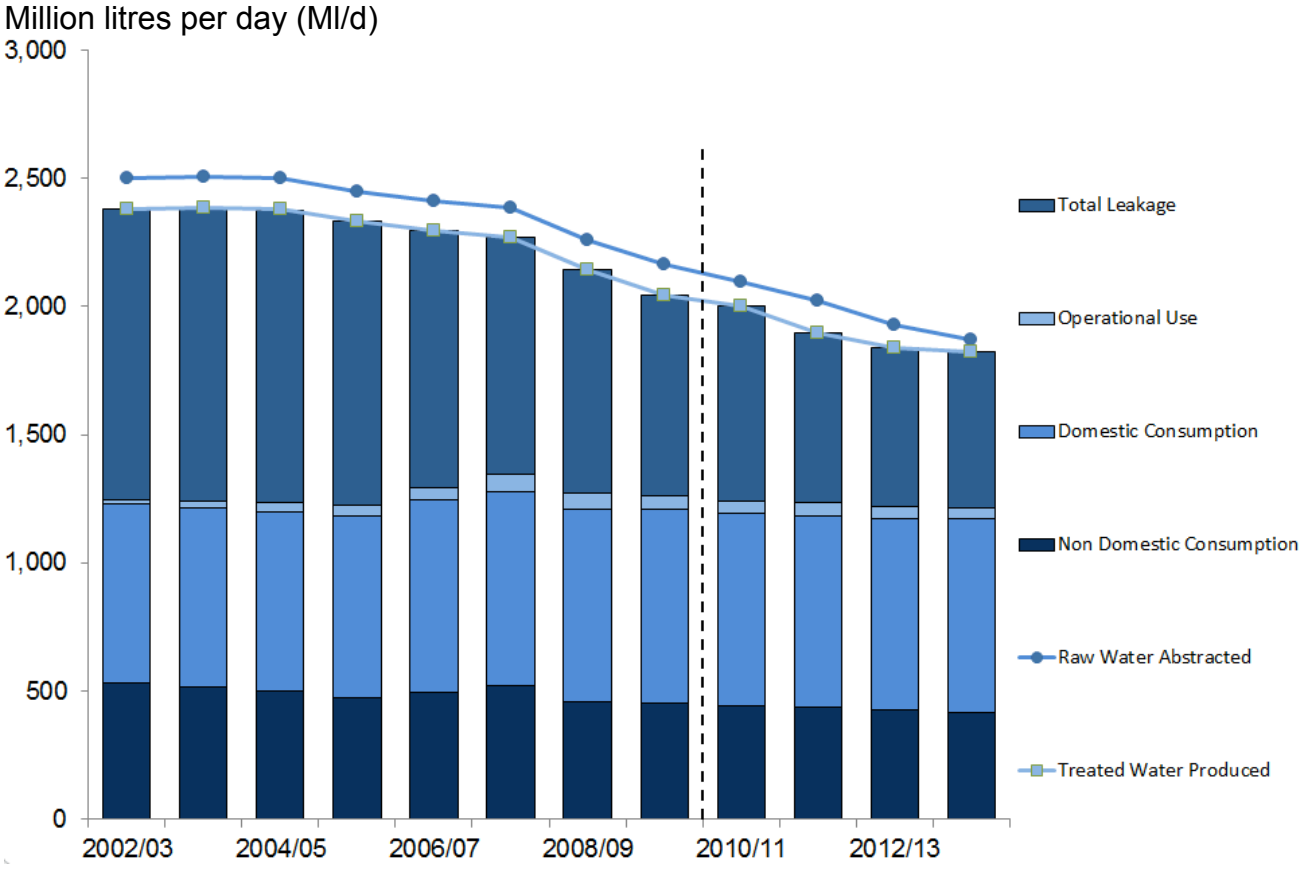
16) Scottish Power, Cockenzie Power Station.

17) 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.

18) Hall, J. et al. (2008). Status of UK Critical Loads and Exceedances. UK National Focal Centre for Critical Loads Mapping & Modelling, Centre for Ecology and Hydrology.

19) All nutrient nitrogen critical load exceedance values were reviewed and updated in 2011. Hall, J. et al. (2011). UK Status Report July 2011: Update to Empirical Critical Loads of Nitrogen. UK National Focal Centre for Critical Loads Mapping & Modelling, Centre for Ecology and Hydrology.

Public Water Supplies – Water Abstracted and Supplied[1,2,3,4]: 2002/03-2013/14



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 and 2009, estimated raw water abstractions by Scottish Water decreased by 13% to 2,165 Ml/d. Between 2010 and 2013, using improved data and methodology, the volume of raw water abstracted also decreased by 11% to 1,870 Ml/d. [1,2]

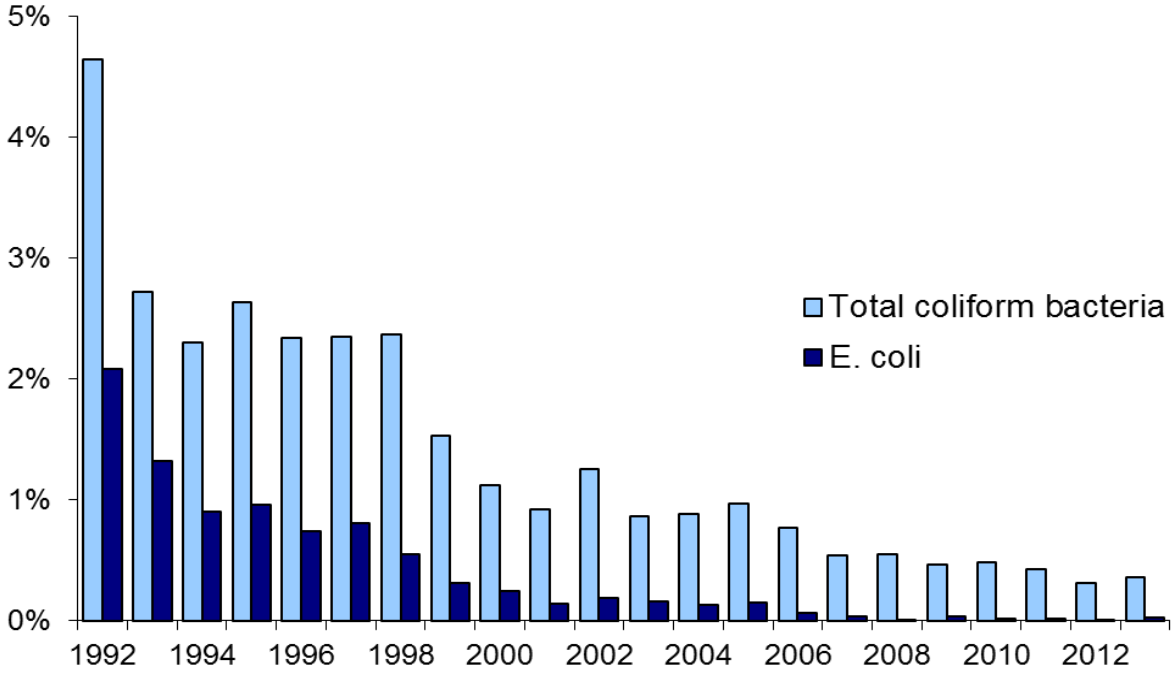
Between 2004/05 and 2013/14, treated water produced[3,5] fell by 554 Ml/d (23%) to a new low of 1,824 Ml/d. This decrease in treated water is almost entirely due to a reduction in leakage[6] of 531 Ml/d (47%) to 608 Ml/d over the same period. The Economic Level of Leakage (ELL) (where the cost of repair is greater than the value of water leaking from the system) was attained in 2012/13, and Scottish Water continues to manage leakage at the ELL.

Operational use[7] increased by 53 Ml/d between 2002/03 and 2007/08 to a peak of 71 Ml/d. It has since decreased by 28 Ml/d to 43 Ml/d in 2013/14. Domestic water consumption has increased by 8% between 2002/03 and 2013/14 whereas non-domestic water consumption has decreased by 21% over the same period. However, when looking at all water consumption combined (operational use, domestic and non-domestic consumption), there has been relatively little change over the whole period.

Source: Scottish Water / Metadata

Drinking Water Quality: 1992-2013

Percentage of samples at consumers' taps containing coliform bacteria



The coliform group of bacteria 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.

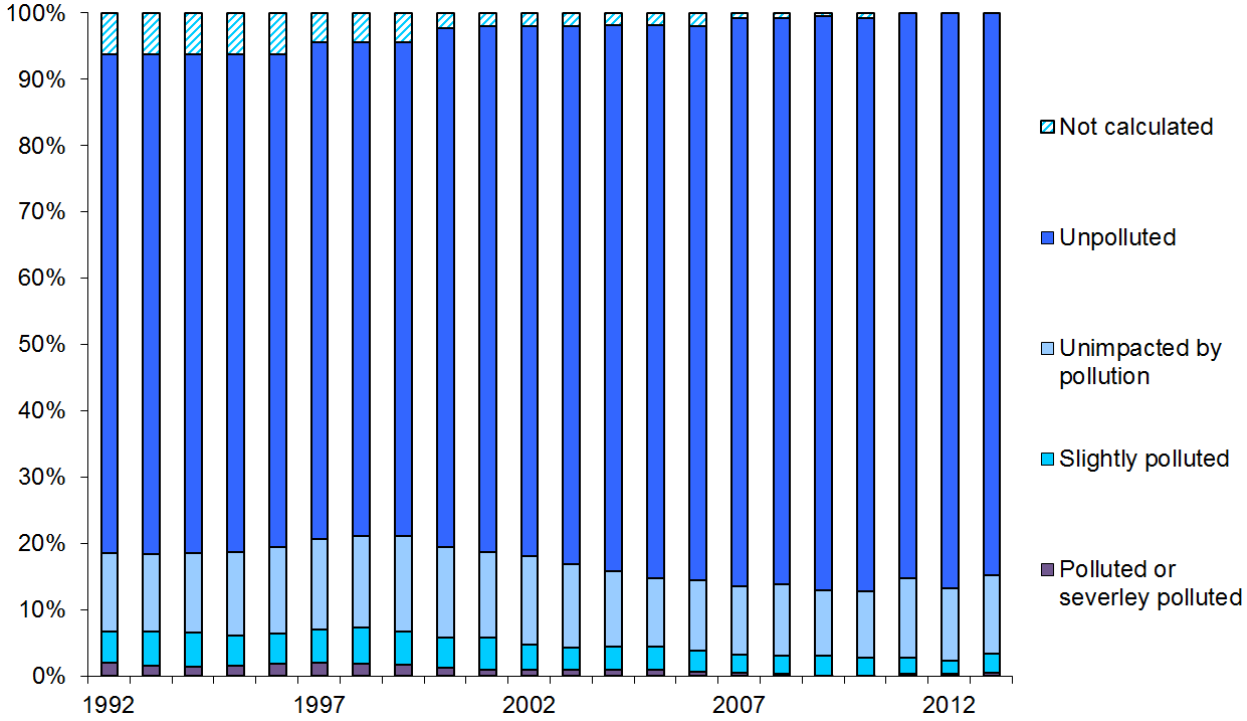
Scottish Water is required to analyse samples taken from water treatment works, service reservoirs and consumers' taps. The Water Supply (Water Quality) (Scotland) Regulations 2001[8] set strict standards for compliance for a wide range of parameters. The major centres of population in Scotland are served by modern water treatment works, which are all well equipped to achieve the required standard. In recent years, many improvements have been made to most of the small, rural treatment works, that have historically been unable to consistently and satisfactorily treat water to the standard required by the Regulations.

Samples containing coliform bacteria fail to meet the water quality standards. Between 1992 and 2013, the percentage of samples from consumer taps containing coliform bacteria fell from 4.64% to 0.35% and the percentage containing Escherichia coli (E.coli) fell from 2.08% to 0.02%. Most of this improvement is the result of investments made at water treatment works across the country over the past ten years. Between 2012 and 2013 the failure rate for total coliforms increased by 0.04 percentage points while the failure rate for E. coli increased by 0.02 percentage points.

Source: Drinking Water Quality Regulator For Scotland / Metadata

River Water Quality[R]: 1992-2013

Distribution of river water quality, percentage of river length within each band



Low standards of river water quality may threaten the aquatic environment, drinking water quality and recreational water use. Sewage, industry, urban development and agriculture are some of the factors that can affect river water quality.

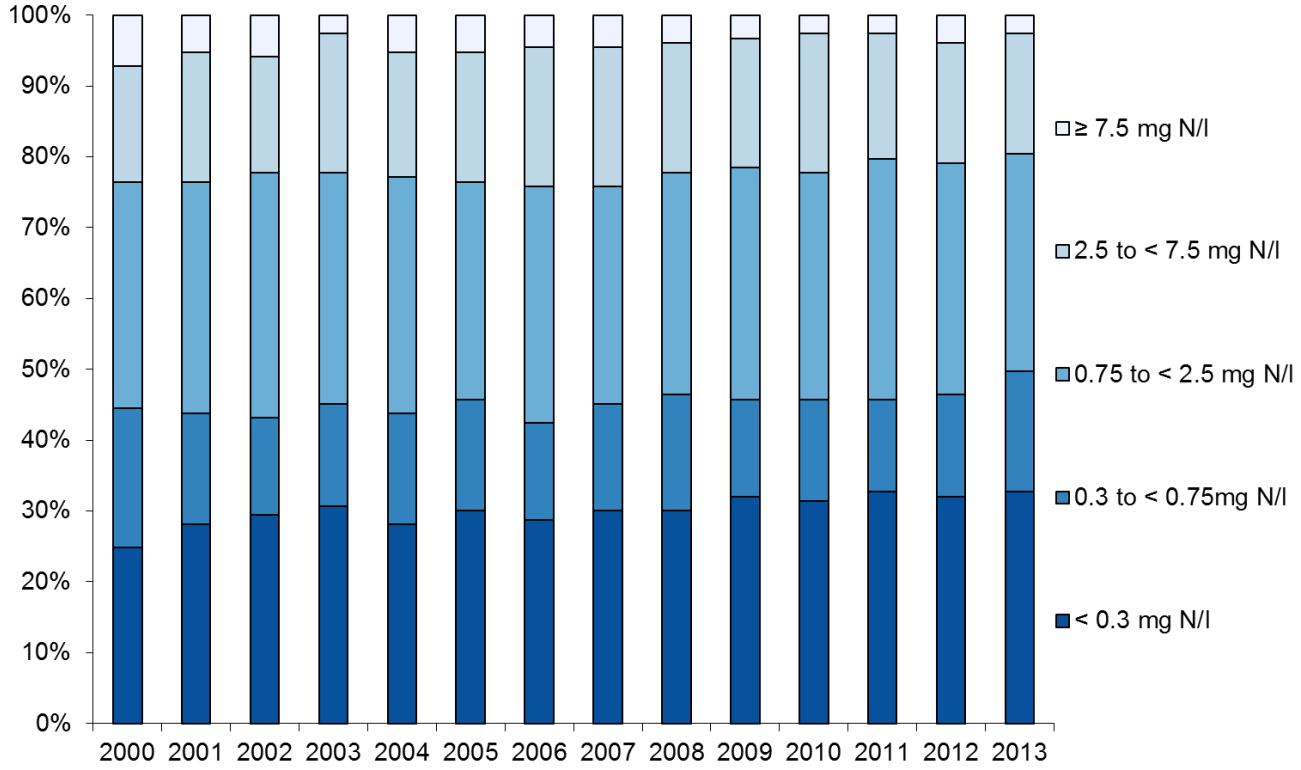
The Scottish Environment Protection Agency (SEPA) has established an indicator of river water quality based on a network of sites covering 253 water bodies (rivers or sections of rivers), which account for approximately 10% of all water bodies. The indicator is based on a consistent set of five water quality parameters which are sensitive to organic pollution, nutrients and toxic substances and provide a measure of species diversity. Each of the parameters is assessed over a rolling 3 year period and the results weighted by river length. The assessment is against the standards provided for each parameter in the Water Framework Directive classification.[9]

In this indicator, river water quality is classified as 'unpolluted', 'unimpacted by pollution', 'slightly polluted', 'polluted', or 'severely polluted'. Between 1992 and 2013, the proportion of river length for which river quality could not be calculated fell from 6.2% to zero. Most of these water bodies were subsequently classed as 'unpolluted' or 'unimpacted by pollution'. The proportion of river length that was classed as slightly polluted, polluted or severely polluted in Scotland rose from 6.8% in 1992, to 7.4% in 1998, before falling to 2.3% in 2012 but rising to 3.4% in 2013. The main drivers of slightly polluted, polluted and severely polluted rivers are inputs of nutrients, leading to degraded biological and nutrient quality. The proportion of river length classed as unpolluted rose from 85.7% in 2007 to 86.5% in 2010. This has since fallen to 84.8% in 2013. The length of river classed as unimpacted by pollution fell from 12% in 2011 to 11.8% in 2013.

Source: Scottish Environment Protection Agency / Metadata

Nitrate Concentrations in Rivers: 2000-2013

Distribution of mean nitrate concentrations, percentage of sites[10] within each band



The enrichment of waters by nutrients, such as nitrates and phosphates, may lead to the damage of the aquatic environment through a process called eutrophication. The increase in nutrients causes accelerated growth of algae and other plant life. This rapid growth and subsequent decay of plant organisms depletes oxygen levels, which can have harmful effects upon fish and other aquatic life which require oxygen to survive.

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

To provide a consistent time series, allowing trends to be measured, the chart is based on concentrations at the 153 sites where four or more samples per year have been taken each year since 2000.

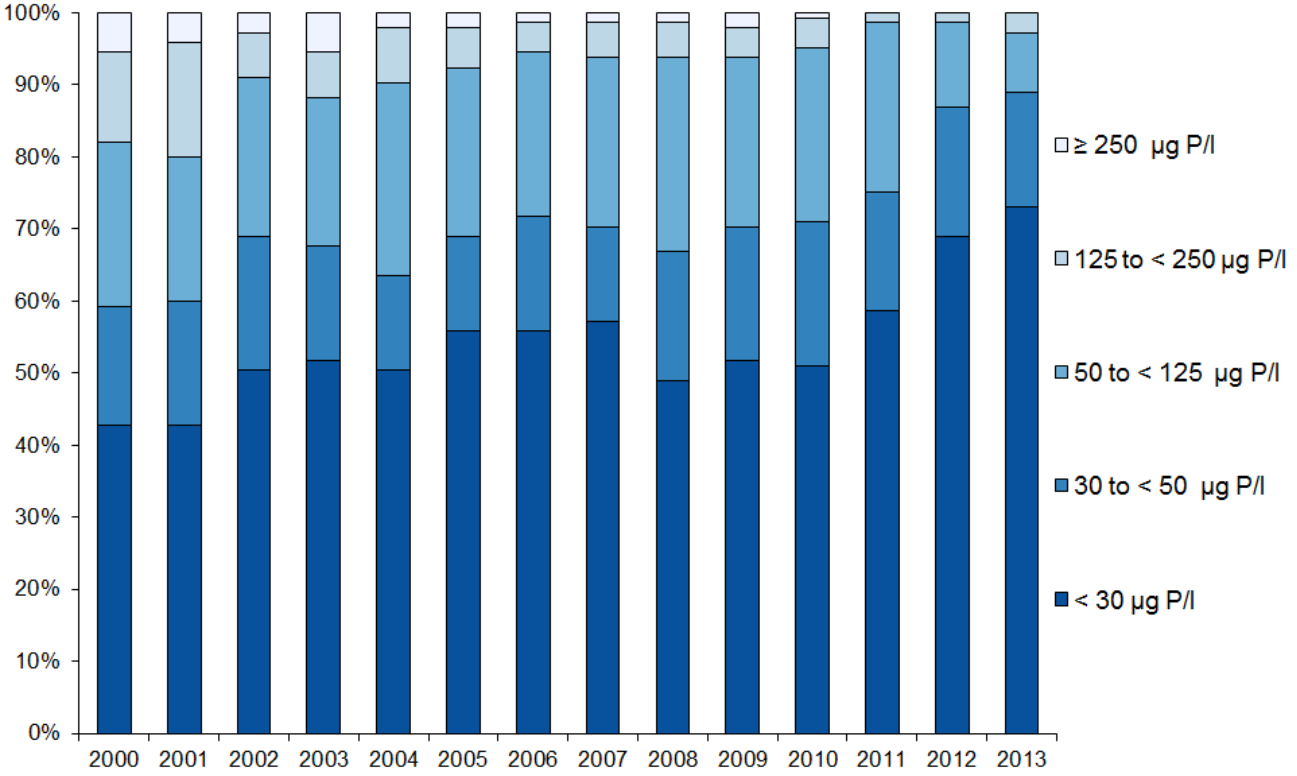
Concentrations of nitrate below 0.3 mg N/l are considered to be natural or background levels[11]; over 30% of the sites have met this classification between 2007 and 2013. The percentage of sites with mean nitrate concentrations of < 0.3 mg N/l has increased from 25% in 2000 to 33% in 2013. In 2013, less than 3% of sites had nitrate concentrations over 7.5 mg/l compared with over 7% in 2000.

Regulations have been made designating 14% of the area of Scotland[12] as Nitrate Vulnerable Zones (NVZs).[13] In NVZs, mandatory rules on farming practices aim to reduce nitrate water pollution from agricultural sources.

Source: Scottish Environment Protection Agency / Metadata

Orthophosphate Concentrations in Rivers: 2000-2013

Distribution of mean orthophosphate concentrations[14], percentage of sites within each band



Raised levels of orthophosphate in freshwaters may lead to eutrophication. The main source of phosphorus is diffuse pollution from agriculture, but there is also a risk that discharges from waste water treatment works contain phosphates.

To provide a consistent time series, allowing trends to be measured, the chart is based on concentrations at the 145 sites where four or more samples per year have been taken each year since 2000.

Between 2000 and 2013, the percentage of sites with orthophosphate concentrations less than 30 µg P/l increased from 43% to 73%, while the percentage of sites with concentrations in excess of 125 µg P/l fell from 18% to 3% over the same time period. These changes over the time series in part reflect the improvements in water quality following the investments made to the sewage infrastructure in Scotland.

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 / Metadata

Water – Footnotes

1) Figures for the raw water abstracted are collected over the calendar year, as it is part of the corporate data submitted to SEPA. Therefore, for the years shown in the graph, the raw water abstracted figure only reflects the first part of the business reporting year. For example, this means that the figure for 2013/14 reflects the raw water abstracted in 2013.

2) Since 2010, raw water abstracted has been based on metered data. Prior to 2010, it was estimated based on a calculated methodology. Slight corrections were made to the 2007 and 2008 figures in 2010.

3) Treated water produced data is collected over the business reporting year, which is April to March the following year.

4) 2013/14 data subject to Water Industry Commission confirmation.

5) Treated water produced is measured and is the figure reported in the SW Annual Return to WICS.

6) Total Top Down Leakage is the summation of Scottish Water distribution network losses and customer supply side leakage, as calculated using ISO9001 Water Balance methodologies.

7) Operational use includes standpipe volumes, fire service use, hydrant misuse, void property use, as well as use by Scottish Water in Offices, waste water treatment works, the distribution network and sewer jetting.

8) Drinking Water Quality Regulator for Scotland (2001). The Water Supply (Water Quality) (Scotland) Regulations 2001.

9) Only parameters available over the whole period are included in the indicator; thus it is not possible to equate these results with those using the latest classification based on all the parameters in the Water Framework Directive.

10) Data are expressed as mg N/l. To convert to mg NO_3/l (nitrate), multiply by 62/14.

11) 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'.

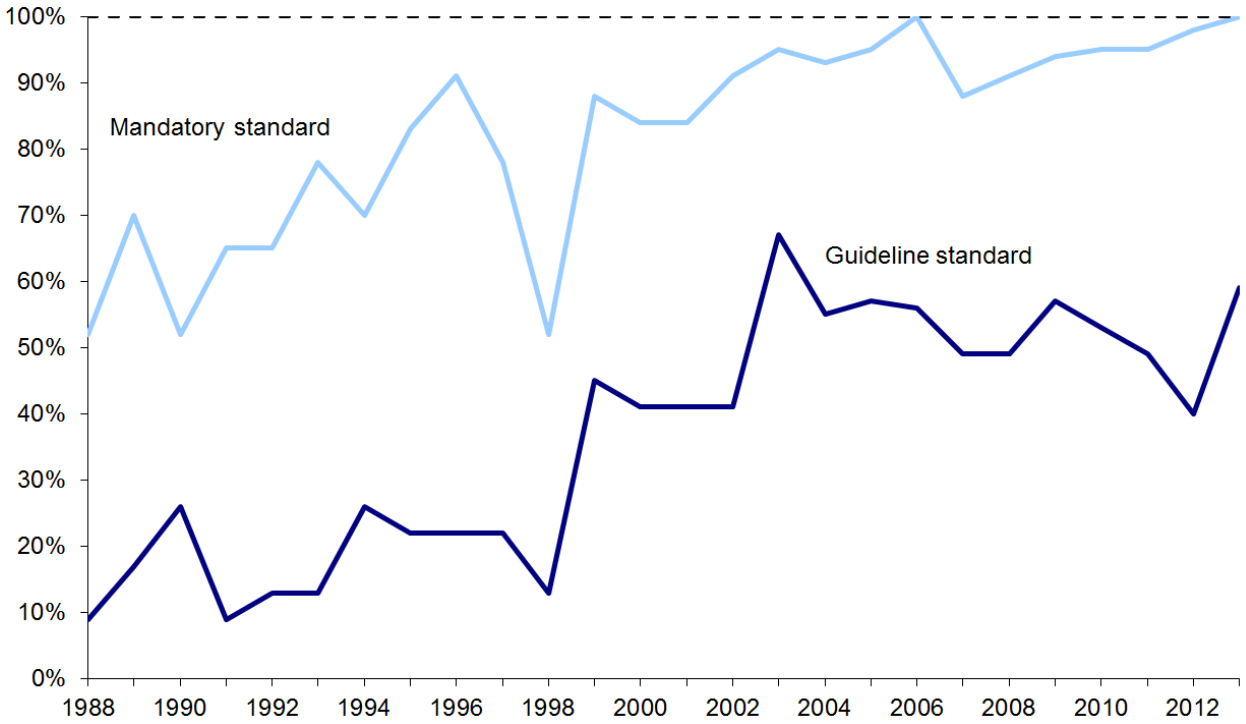
12) In Aberdeen, Moray, Banff and Buchan; Strathmore and Fife; Lothians and Borders; and Lower Nithsdale.

13) 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).

14) 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): 1988-2013

Percentage compliance of coastal bathing waters[1]



High quality coastal bathing waters are important for encouraging the use of the outdoors by people in Scotland and promoting Scotland as a tourist destination. The quality of these bathing waters in Scotland is consistently high, but health risks can exist if high concentrations of faecal bacteria are present in the water. This can happen if heavy rain run-off in urban areas and fields causes contaminants to enter the water. Monitoring the quality of these waters is a high priority to protect public health.

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 2013 all of Scotland's bathing waters met the mandatory standard, with 59% exceeding this and achieving the guideline standard.

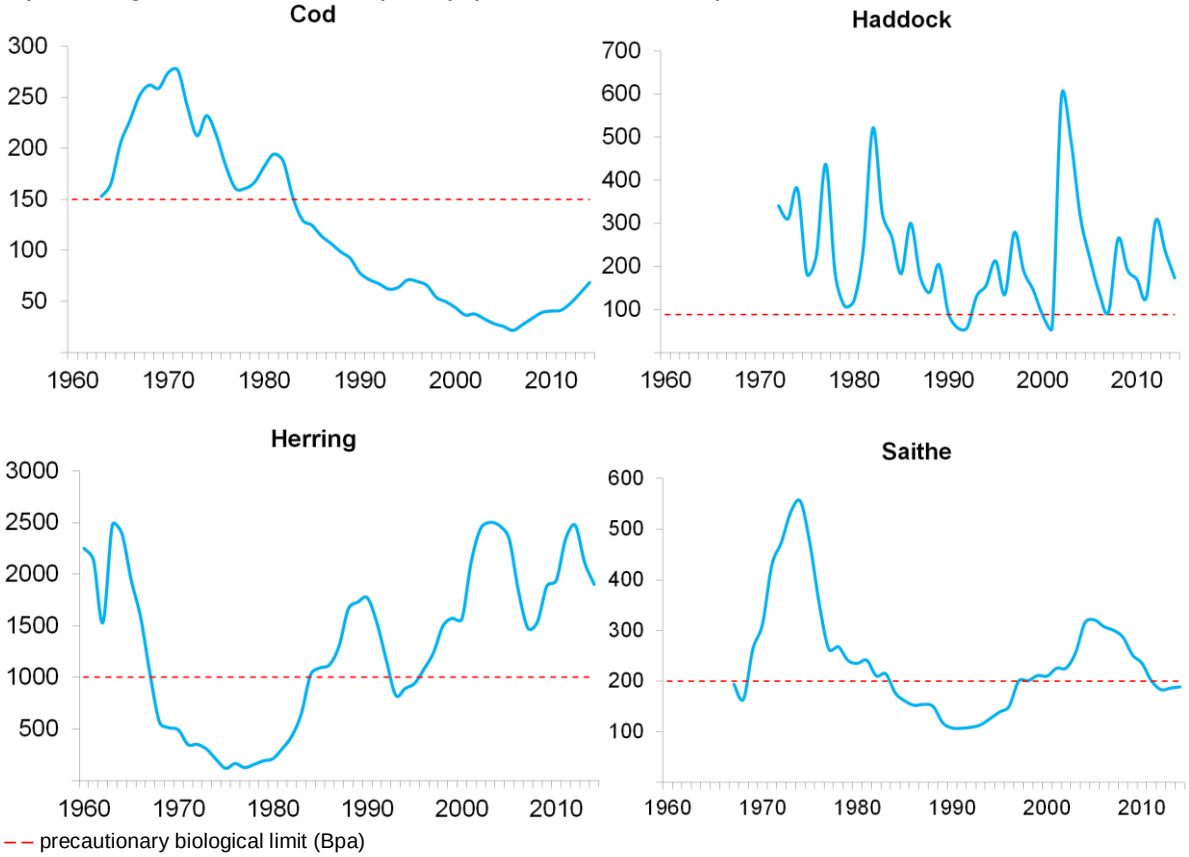
Weather can have a large effect on the results of this dataset. Particularly wet years leads to more run-off which results in more sites failing to meet the standards, while drier weather often results in better compliance. However, there is a general trend of more sites reaching the mandatory standard in recent years.

From 2015, bathing water will be assessed by a new standard on bathing water quality, based on an assessment over four years.

Source: Scottish Environment Protection Agency / Metadata

Selected Commercial Fish Stocks[R,2,3]: 1960–2014

Spawning Stock Biomass (SSB) (thousand tonnes)



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. Likewise, changes in the wider marine environment can have an impact on the state of the stock[4]. 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).[5] The health of the fish stock can then be indicated by comparing the SSB with a precautionary value, or reference point (Bpa).[6]

The SSB of North Sea cod stock has been below Bpa since 1984. The SSB has increased each year since historical lows in 2006, in spite of continued low recruitment, but the value of 69 kt in 2014 is still well below the Bpa of 150 kt. The SSB of haddock was above the previously-determined value for Bpa of 140 kt from 2002 - 2005. The value has since decreased to 173 kt in 2014 but still remains above trigger levels[7]. The SSB of herring stocks has been above the Bpa of 1,300 kt since 1996. Since falling to 1,476 kt in 2007, it rose to 2,476 kt in 2012 before declining again to 1,903 kt by 2014. The SSB of the North Sea/West of Scotland saithe saw a 20 year decline in SSB levels between 1970s – 1990s. SSB then increased up to 2005 but has been declining since then to levels slightly below the Bpa of 200 kt for the last three years, with an estimated SSB of 189 kt in 2014.

A range of management measures are applied to fishing activity in Scotland, with the aim of achieving or maintaining healthy stock levels.[8]

Source: Marine Scotland Science / ICES / Metadata

Marine – Footnotes

1) The number of bathing waters identified in Scotland has not remained constant in the period 1988 to 2013. There were 23 identified bathing waters in the period 1988-98, but this number has since increased to 83 in 2013. Three of the 83 designated waters are inland waters, which have all complied with the bathing water standards since designation.

2) 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.

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

4) The size of these fish stocks are affected by several factors, including commercial fishing and other factors such as climate change and success of recruitment.

5) The spawning stock biomass (SSB) is the total weight of mature fish (capable of spawning) in a particular stock.

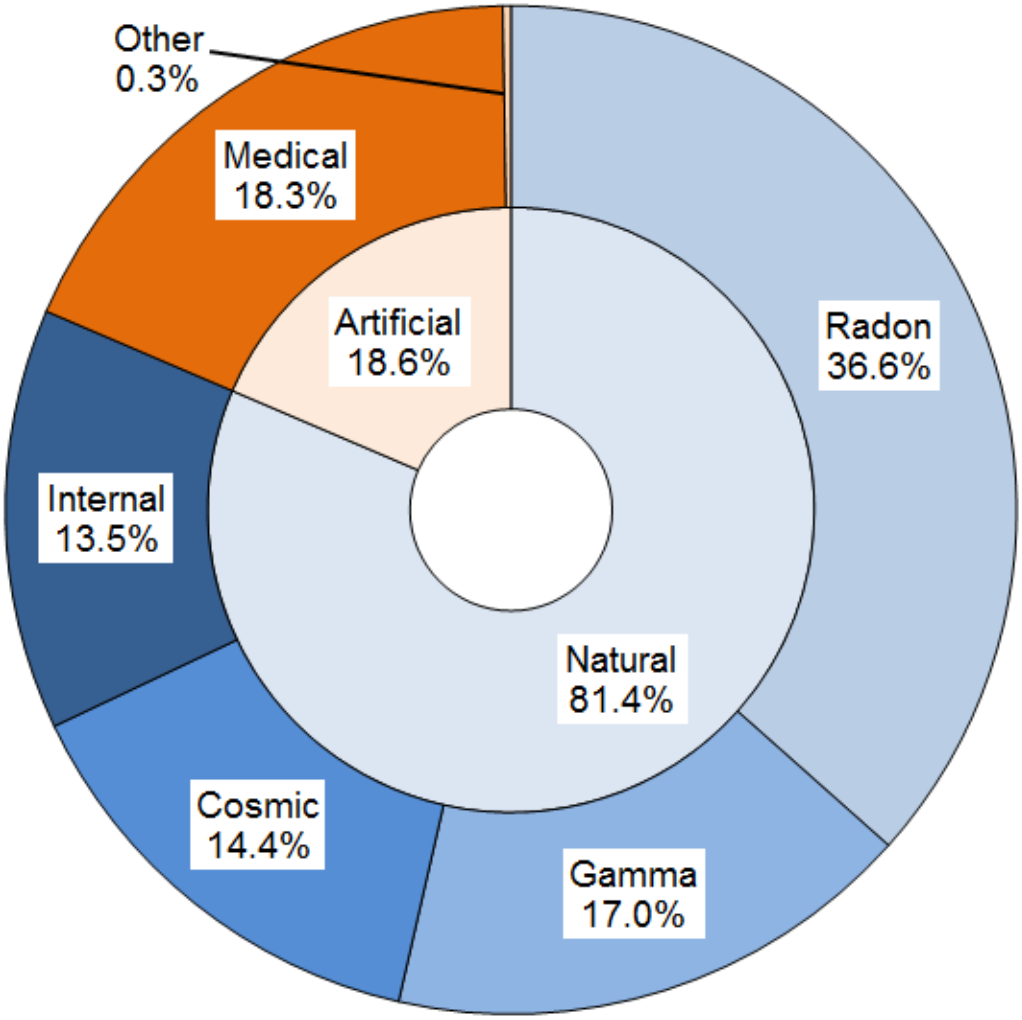
6) The precautionary biological limit (Bpa) indicates the SSB below which the stock is considered to be at risk of suffering reduced reproductive capacity, indicating that spawning levels may be insufficient to guarantee stock replenishment and that stock abundance will probably decrease. The Bpa for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

7) The precautionary biological limit for haddock is currently being revised.

8) 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: 2010[1]

Average annual dose in Scotland, 2,300 microsieverts[2]



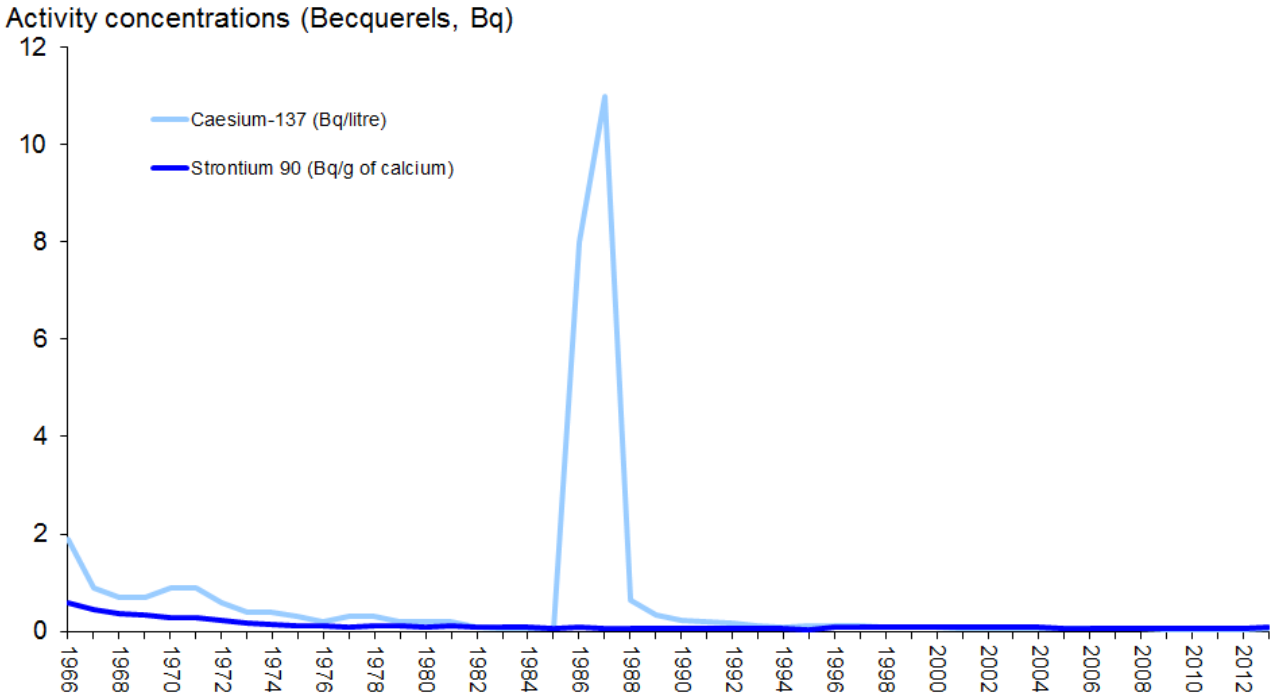
In 2010, the average annual dose of radiation to someone living in Scotland was 2,300 microsieverts, this has fallen from 2,400 microsieverts in 2003. At 81%, the majority of the annual dose comes from natural sources.

The greatest 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 terrestrial gamma rays, cosmic rays, and long-lived radionuclides that enter the body through food and drink (classed as internal in the above chart).

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 / Metadata

Activity Concentrations in Milk: 1966-2013[3]



Exposure 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 measured because air-borne radioactive particles falling on pasture are taken up by grazing animals and passed onto their milk. This concentrates radioactive materials from the grazing range of the animals, effectively giving a very large surveillance area. Samples of milk are bulked from a number of farms to give the final activity concentration for Scotland.

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 and then began to fall again and are now below pre-Chernobyl levels.[4] In 2013, the concentration of ^{137}Cs was <0.052 Bq/litre and ^{90}Sr was <0.083 Bq/gram of calcium. However, even at its peak, the ^{137}Cs concentration in milk following the Chernobyl accident was around 100 times lower than 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.

Source: Scottish Environment Protection Agency / Metadata

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.

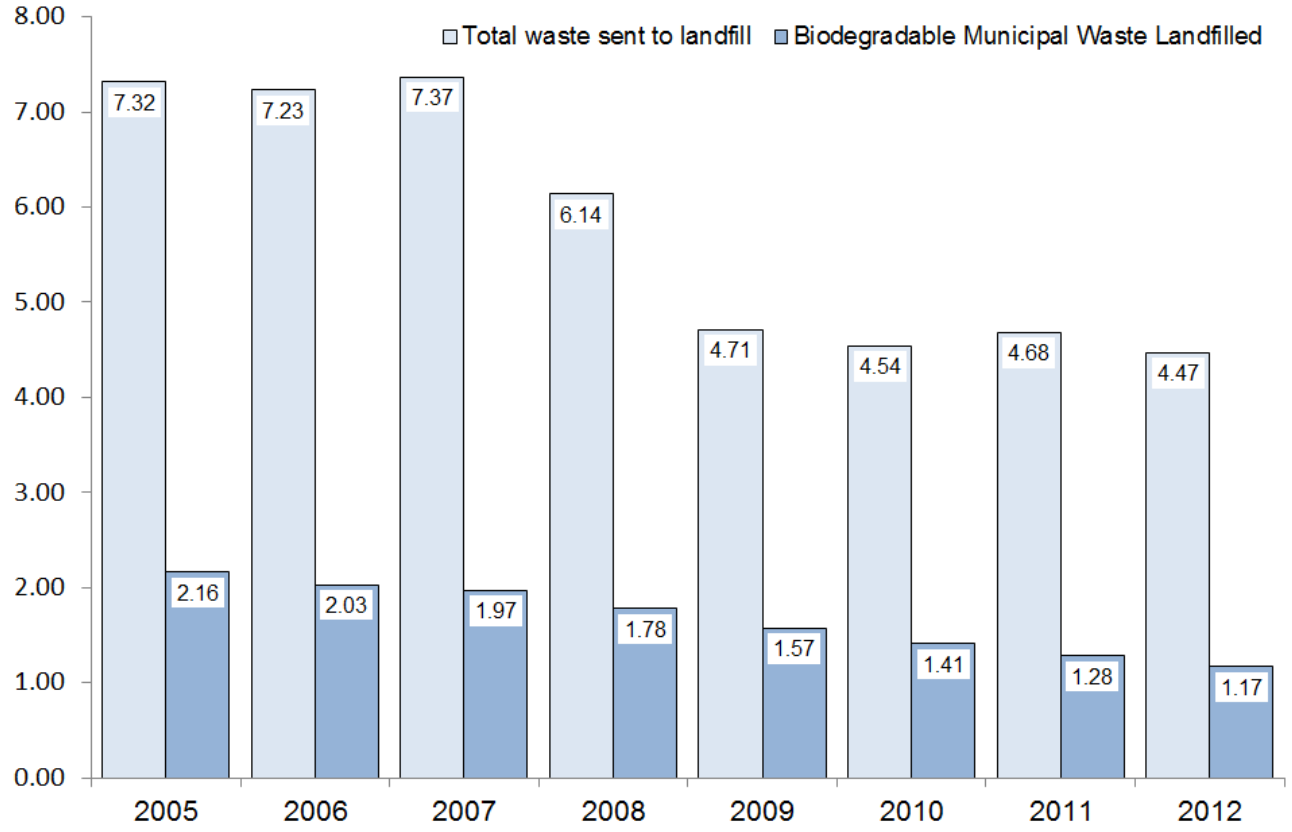
2) Because of rounding, percentages do not add up to 100.

3) From 1996 onwards, the concentrations reported were lower than the limit 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 1996-2012 figures are not strictly comparable with previous years, although they still represent average concentrations in milk in Scotland.

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

Waste Sent to Landfill: 2000-2012

Million tonnes



Scotland's Zero Waste Plan[1] 2010 sets a maximum 5% target for all waste sent to landfill by 2025. The disposal of waste to landfill is at the bottom of the waste hierarchy[2] . It results in the loss of valuable materials and generates pollutants. In particular, biodegradable waste such as paper, food and garden waste emit methane, a potent greenhouse gas, alongside carbon dioxide.

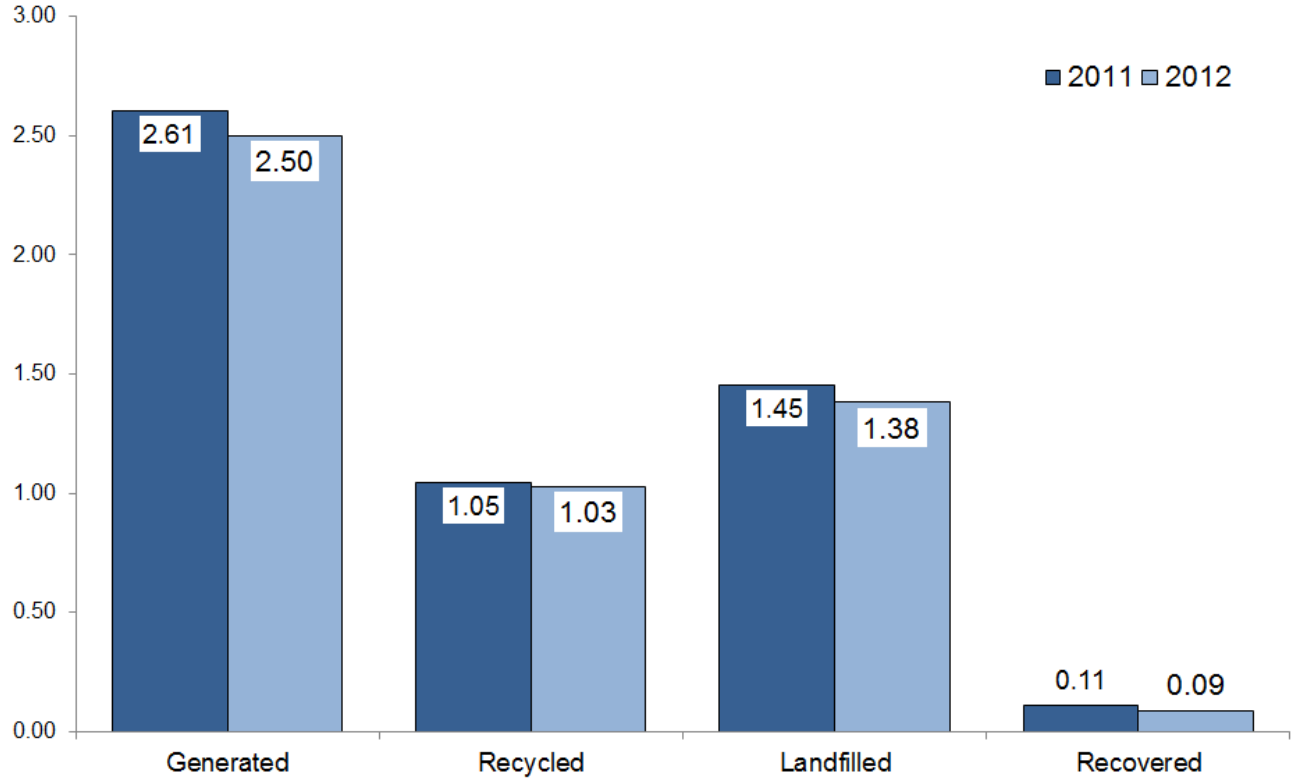
In 2012, 4.47 million tonnes were landfilled[3]. Biodegradable Municipal Waste (BMW)[4] landfilled accounted for 1.17 million tonnes in 2012. Between 2005 and 2012, total waste landfilled decreased by 39%, and BMW landfilled decreased by 46%.

The Scottish Government set a target for the maximum amount of BMW sent to landfill of 2.7 million tonnes by 2010 as Scotland's contribution to UK targets set in the EU Landfill Directive.[5,6] Landfill Tax, introduced in 1996 in order to discourage the disposal of waste to landfill, increased incrementally to £64 per tonne for biodegradable waste for 2012/13, and is £80 per tonne for 2014/15. The lower rate for inactive waste has remained at £2.50 per tonne since 2008.

Source: Scottish Environment Protection Agency / Metadata

Household Waste : 2011-2012

Million Tonnes



Waste prevention, minimisation and re-use are at the top of the waste hierarchy[2] while landfill is at the bottom. Recognition for this is given in Scotland's Zero Waste Plan[1] . The strong historic dependence on landfill for waste management in Scotland is unsustainable 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 destroys landscapes and ecosystems.

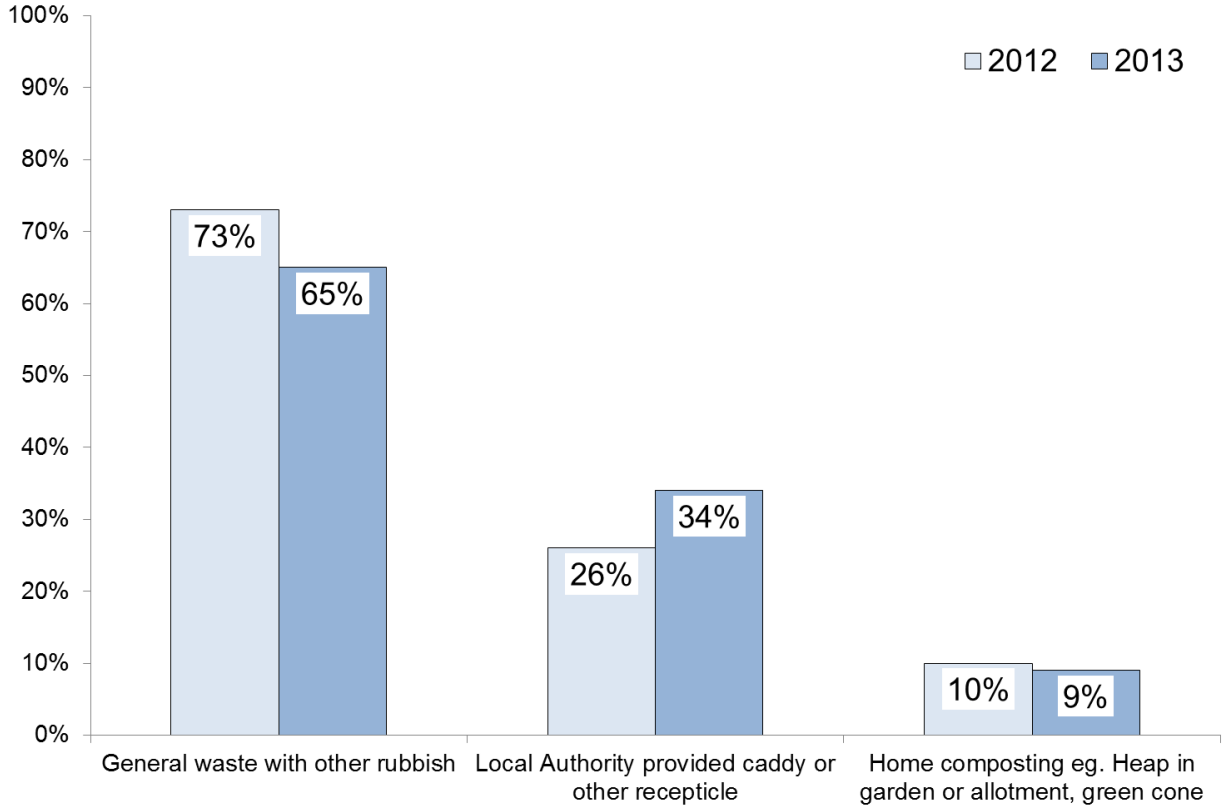
The national household waste recycling rate in 2012 was 41.2%, increasing from 40.1% in 2011. The total amount of household waste generated decreased, from 2.61 tonnes in 2011 to 2.50 tonnes in 2012. As a result of this decrease in the amount of household waste generated, the overall tonnage of recycled material also decreased, despite the increased recycling rate.

As part of the Zero Waste Plan[1], the Scottish Government has set targets for 50% of household waste to be recycled, composted or prepared for reuse by 2013; 60% by 2020 and 70% of all waste (not just household) by 2025.

Source: Scottish Environment Protection Agency / Metadata

Food Waste Disposal: 2012 – 2013

% surveyed who reported methods used to dispose of food waste in past week



Zero Waste Scotland estimated that 566,000 tonnes of food are thrown away by households in Scotland every year[7]. Food is an essential resource, and wasted food costs households money and reduces the self sufficiency of the economy. Some food waste cannot be avoided however, but can instead be processed to produce nutrient rich fertilisers and bio-gas – a low carbon energy source. Home composting of food wastes also produces fertiliser. Most local authorities in Scotland now operate a food waste caddy system which allows households to separate their food waste for separate collection. Diverting food waste from landfill is important in avoiding generation of greenhouse gases.

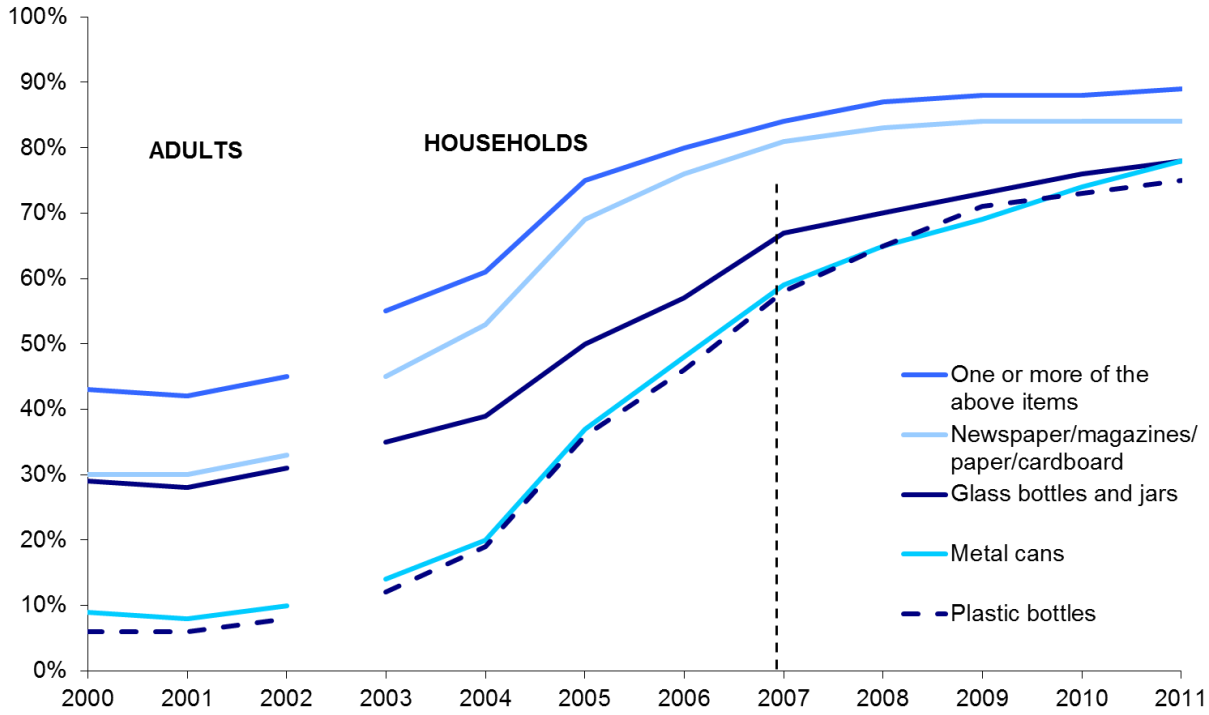
From 2012, respondents in the Scottish Household Survey[8] have been asked how they disposed of food waste in the previous week and were given three options, of which they could select more than one[9]. In 2013, 34% of households used local authority provided food waste caddies to dispose of their household waste compared with 26% in 2012. There has been an associated decline in people throwing food out with general waste, from 65% in 2012 compared to 73% in 2012. There has been a 1% decline in the percentage of people using home composting methods, but this change is not statistically significant.

The diversion of food waste helps work towards the EU target of no more than 1.8 million tonnes of biodegradable municipal waste sent to landfill by 2013 and less than 1.26 million tonnes by 2020[6].

Source: Scottish Government / Metadata

Waste Recycling Behaviour: 2000-2011

% surveyed who reported recycling waste items in the past month[10,11,12]



Re-using and recycling waste are key to sustainable development and Zero Waste objectives. The Scottish Household Survey[8] provides information on recycling behaviour amongst households in Scotland. Households were asked which, if any, of a selection of certain waste items they had recycled from home in the past month. Before 2003, the same question was asked of a random adult in the household.

In 2011, 89% of households surveyed said they had recycled one or more of the tabulated items in the past month, increasing from 55% in 2003. In 2011, 84% had recycled paper and card, 75% had recycled plastic bottles, and 78% had recycled both metals cans and glass bottles and jars. Since 2003, the percentage of households recycling waste has increased for each item in the survey.

There is a clear relationship between the type of property in which households live and the amount of recycling. In 2011, 94% of households living in a house or bungalow recycled at least one of the items in the past month compared with 80% living in flats. This question was suspended from the survey for 2012 and 2013. The next round of responses to the recycling question will be reported on in 2015.

Source: Scottish Government / Metadata

Waste & Recycling – Footnotes

1) Zero Waste Plan (2010).

2) Waste hierarchy (SEPA).

3) The total to landfill from all sources.

4) The definition of municipal waste has changed over the time data has been collected. The current definition of municipal waste is household and similar waste. For calculating the tonnage of municipal biodegradable waste a mass balance calculation, assuming a certain proportion of each waste type generated is biodegradable has been used to provide the data. For example for mixed household waste 63% is estimated to be biodegradable.

5) 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 European Commission. 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.

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

7) Zero Waste Scotland Love Food, Hate Waste

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

9) This question was asked of a third of the sample - 3,461 in 2012 and 3,508 in 2013.

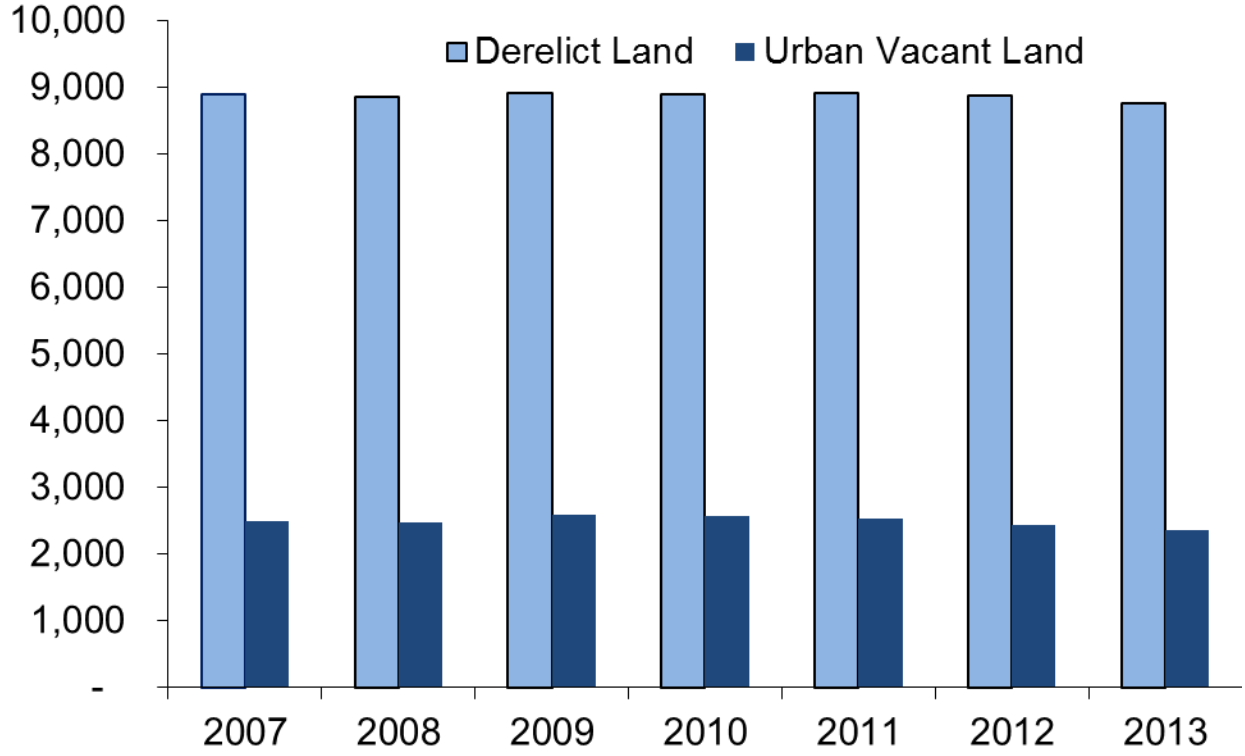
10) Number surveyed in 2011: 10,777.

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 are from quarters 2,3 and 4 only.

12) From 2007 to 2011, 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. In 2007, there was also a change to some of the item names: 'glass bottles' became 'glass bottles and jars', and 'plastic' became 'plastic bottles'.

Derelict and Urban Vacant Land[R,1,2]: 2007-2013

Area of derelict and urban vacant land (hectares)



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.

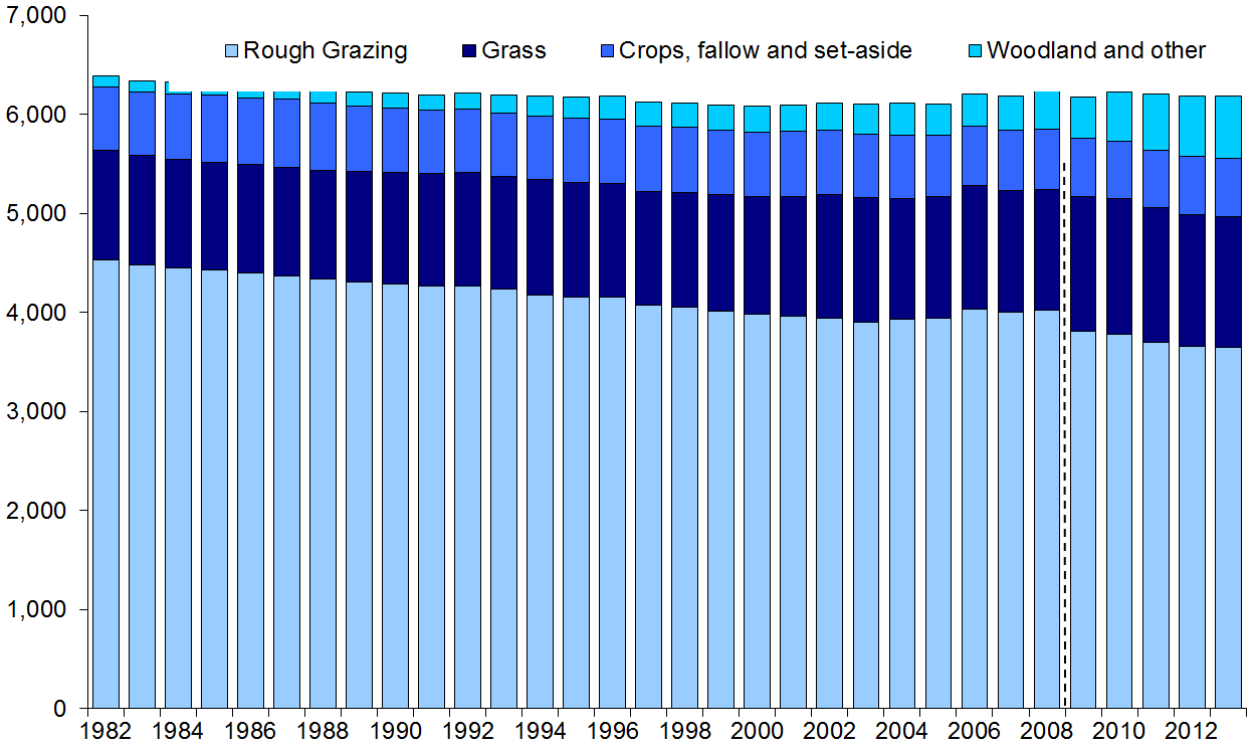
Vacant land is land which is unused for the purposes for which it is held and is viewed as an appropriate site for development. This land must either have had prior development on it, or had preparatory work taken place on it in anticipation of future development to be classed as 'vacant land'. Derelict land (and buildings) is land which 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[3].

The annual Scottish Vacant and Derelict Land Survey[4] shows that the total area of derelict and urban vacant land has decreased slightly since 2007. In 2013, there were 11,114 hectares compared to 11,379 hectares in 2007. This change in total area is the result of a fall of 128 hectares in the area of urban vacant land and a fall of 137 hectares in the area of derelict land over the same period. The most recent survey (2013) showed a net decrease of 187 hectares since 2012.

Source: Scottish Government / Metadata

Agricultural Land Use[5]: 1982-2013

Area (thousand hectares)



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.

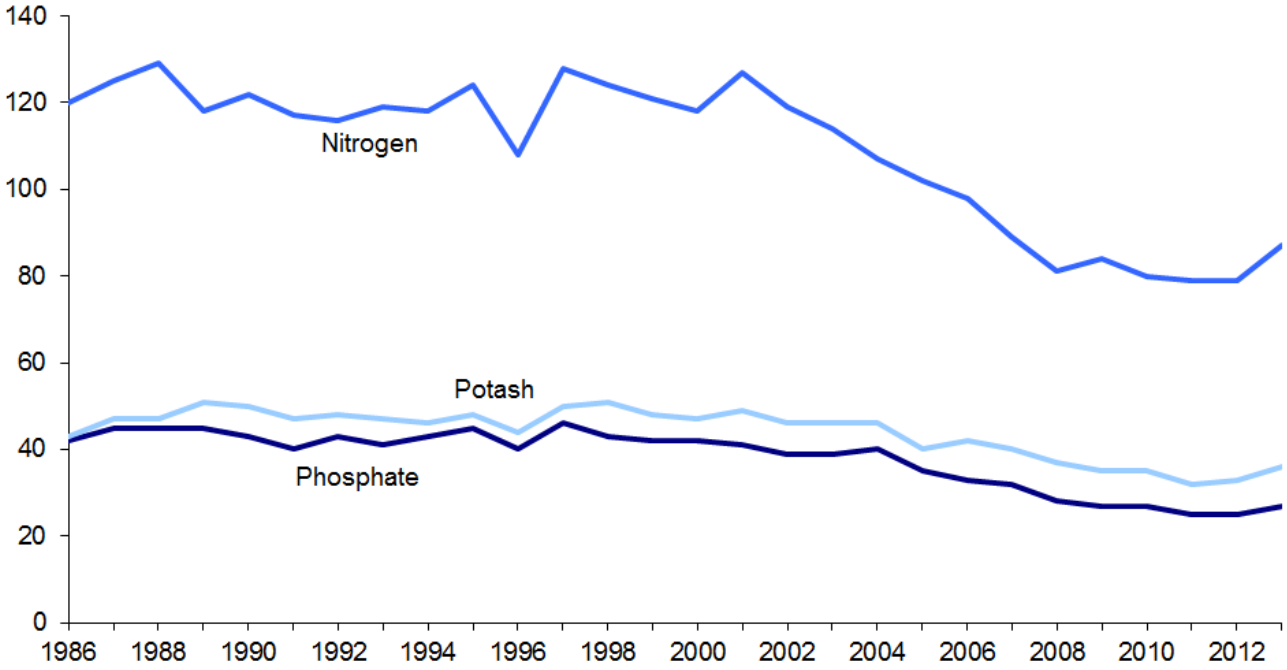
Between 1982 and 2013, the total land used for agriculture in Scotland decreased by around 3%. There was a small increase in the total land used for agriculture between 2007 and 2008, to 6,240,400 hectares, resulting in the highest figure for the total land used for agriculture since 1988. After the introduction of the Single Application Form data in 2009, the area of land used for agriculture was recorded as 6,176,800 hectares. This increased to 6,187,700 hectares in 2013. Since 2009, the area of woodland and other land has continued to increase to 631,800 hectares in 2013.[6] There is a step change in the land use data series in 2009, following the switch in data source.[5] This has led to some substitution between rough grazing and grass, therefore post 2009 data is not comparable to previous years and trends should be treated with caution.

The amount of land set-aside[7] 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 payment entitlements under the Single Farm Payments ceased in 2009.

Source: Scottish Government / Metadata

Nutrients Applied to Crops and Grass: 1986-2013

Total nutrients applied to crops and grass (kg/ha)[8,9,10]



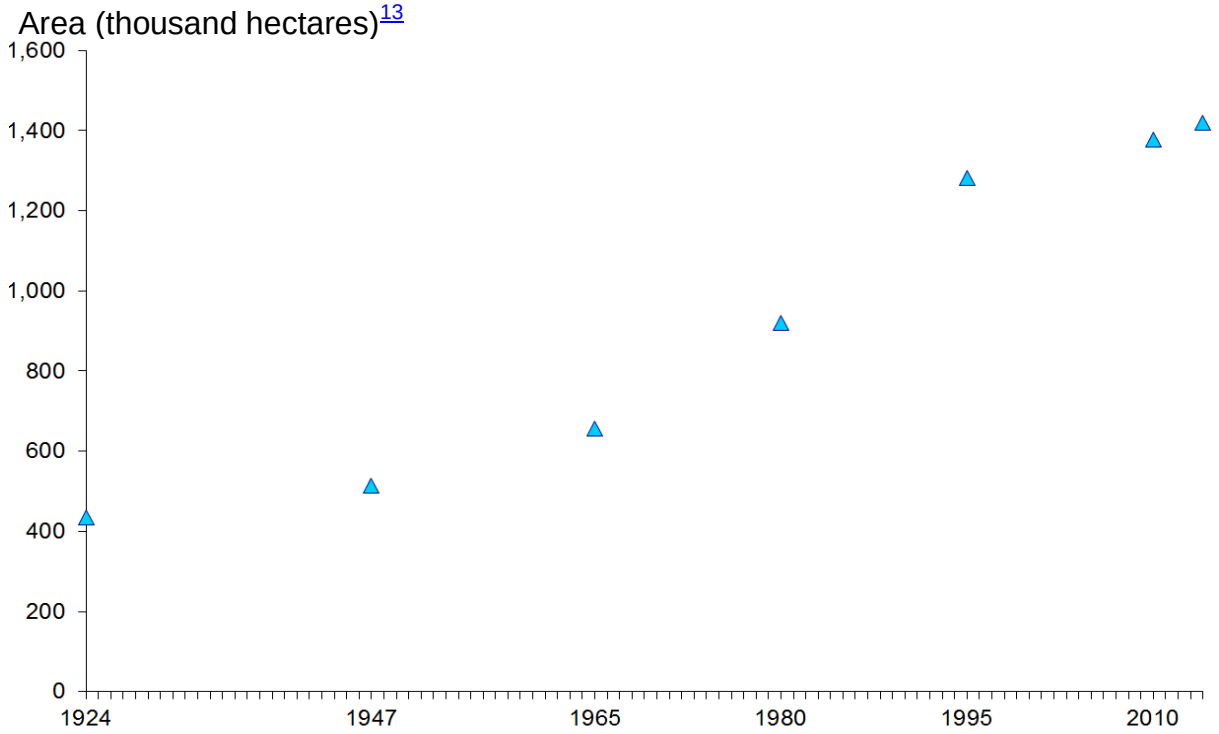
Fertilisers contain nutrients, such as nitrogen, phosphorus and potassium, which improve plant growth and crop yields. The inappropriate or mistimed use of fertilisers may cause nutrient enrichment and eutrophication of waters. Excess nitrates in drinking water are also a danger to human health. The EC Nitrates Directive (91/676/EEC)[11] 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 rates are due to changes in either the proportion of crop area treated or average rate of application, or both. Weather and economic factors may also contribute to changes in fertiliser use.

Between 1986 and 2000, overall phosphate and potash application rates remained relatively stable, although both have declined 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, although overall application rates have increased by 10% between 2012 and 2013. In 2013, the application rates of phosphate and potash showed similar percentage increases. However, the application rates for all three nutrients remain below the rates applied before 2008. For nitrogen, the application rate in 2013 is 31% lower than in 2001, at 87 kg/ha.

Source: Defra / Scottish Government / Metadata

Area of Woodland: 1924-2014[P,12]



The extent of woodland[14] 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.

Provisional figures show that, in 2014, the area of woodland in Scotland was 1,419,000 hectares (18.2% of the total land area). This compares with 16.4% in 1995, 11.8% in 1980 and 5.6% in 1924. 74% of this area is made up of conifers, both native and introduced such as Scots pine, Sitka spruce and larch, with the remaining 26% made up of broadleaved species, again both native and introduced.

Forestry Commission Scotland manages the National Forest Estate on behalf of Scottish Ministers, which accounts for around one third of all woodland in Scotland. The remaining two thirds is owned by private owners including environmental Non-Government Organisations and community bodies, as well as by other public bodies.

Planting and management of non-Forestry Commission Scotland woodland is normally carried out with the assistance of government grants. The UK Forestry Standard sets out the standards for the sustainable management of all forests in the UK. Independent certification schemes for sustainable forest management are based on this Standard. The provisional figure for 2014, shows that 58% of Scotland's woodland area is certified as suitably managed. (822,000 hectares)

New planting of woodland peaked in the late 1980s with around 25,000 hectares of new woodland being created annually. New planting has declined steadily over the last two decades to a low of 2,700 hectares in 2009/10 but has since increased and 8,300 hectares were planted in 2013/14.

Source: Forestry Commission/ Metadata

Land – Footnotes

1) During 2012, historical data for the years 2006-2011 were 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 2012 survey returns.

2) 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.

3) Land also qualifies as derelict if it has an un-remedied previous use which could constrain future development.

4) Scottish Government (2014). Scottish Vacant and Derelict Land Survey 2013.

5) From 2009, data on land use was obtained from the Single Application Form (SAF). This data has been combined with the land use data from all other holdings, collected through the June Agricultural Census Forms, to generate overall June Agricultural Census results. This development has led to a substantial reduction in statistical data collection and an overall improvement in the quality of land use statistics. The use of SAF data has resulted in a step change in some of the land use results from 2009, especially for rough grazing and grass. This means that the trends across 2008 and 2009 for these land use categories do not represent genuine changes in land use, but do represent differences in the way this data has been reported between the 2008 June Agricultural Census and 2009 SAF. These trends should be treated with caution.

6) Only includes woodland on agricultural holdings. For total woodland area see pp 54.

7) Figures from the annual Scottish Government June Agricultural Census.

8) Manufactured fertilisers only - excludes organic fertilisers such as manure and slurry or sewage sludge.

9) Excludes Orkney, Shetland and the Western Isles.

10) 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.

11) EC Nitrates Directive.

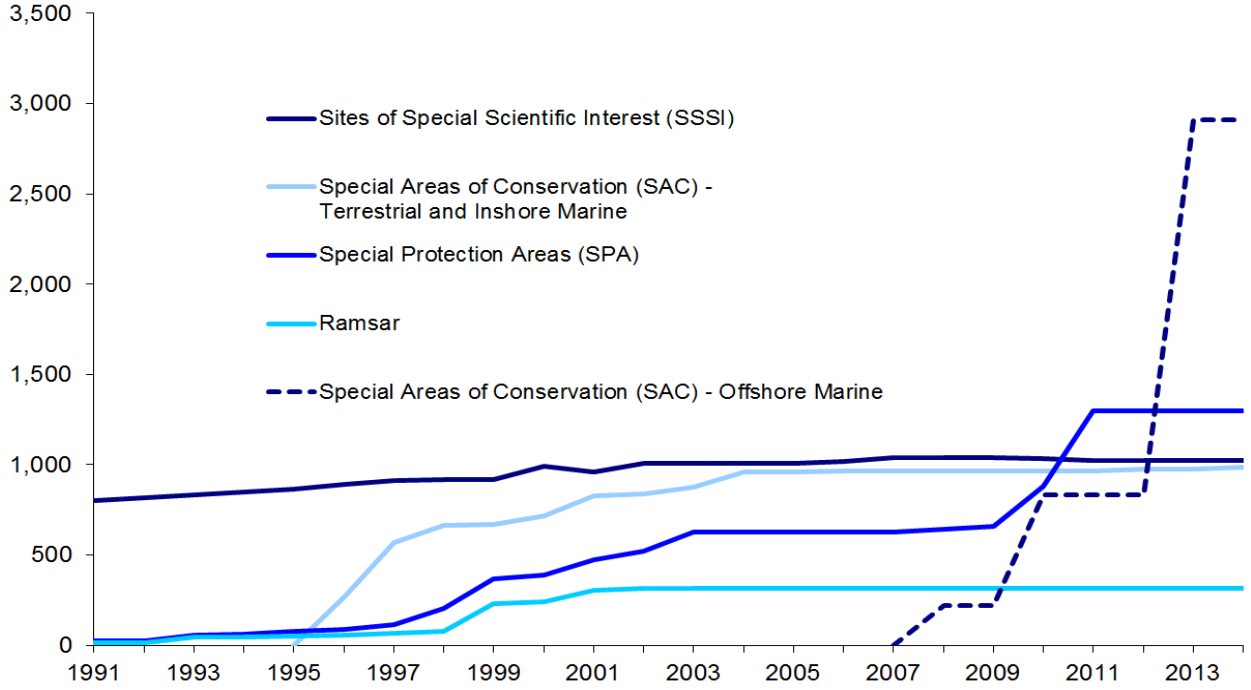
12) Annual planting figures based on financial year April – March. Areas are as at 31st March

13) Data are obtained from forest inventories. Data for 2014 are early provisional results. Data from 2010 are derived from the National Forest Inventory. Most inventories have slightly different definitions of woodland, so some apparent changes in area over time are due to changing definitions. More detailed information on differences is available from Forestry Statistics 2013 and Woodland Area, Planting and Restocking Version 1 2014.

14) 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.

Designated Areas[1]: 1991-2014

Area (thousand hectares)[2]



Sites of Special Scientific Interest (SSSIs)[3,4] protect flora, fauna, geological or physiographical features of outstanding quality in terrestrial and coastal environments. In Scotland, SSSIs are designated by Scottish Natural Heritage under the Nature Conservation (Scotland) Act 2004 (which amended the 1981 Wildlife and Countryside Act). On 31st March 1991, SSSIs covered a total of 804,000 hectares (ha) but this has steadily increased and on 31st March 2014, there were 1,425 SSSIs in Scotland, covering a total of 1,022,260 ha (about 13% of land in Scotland).

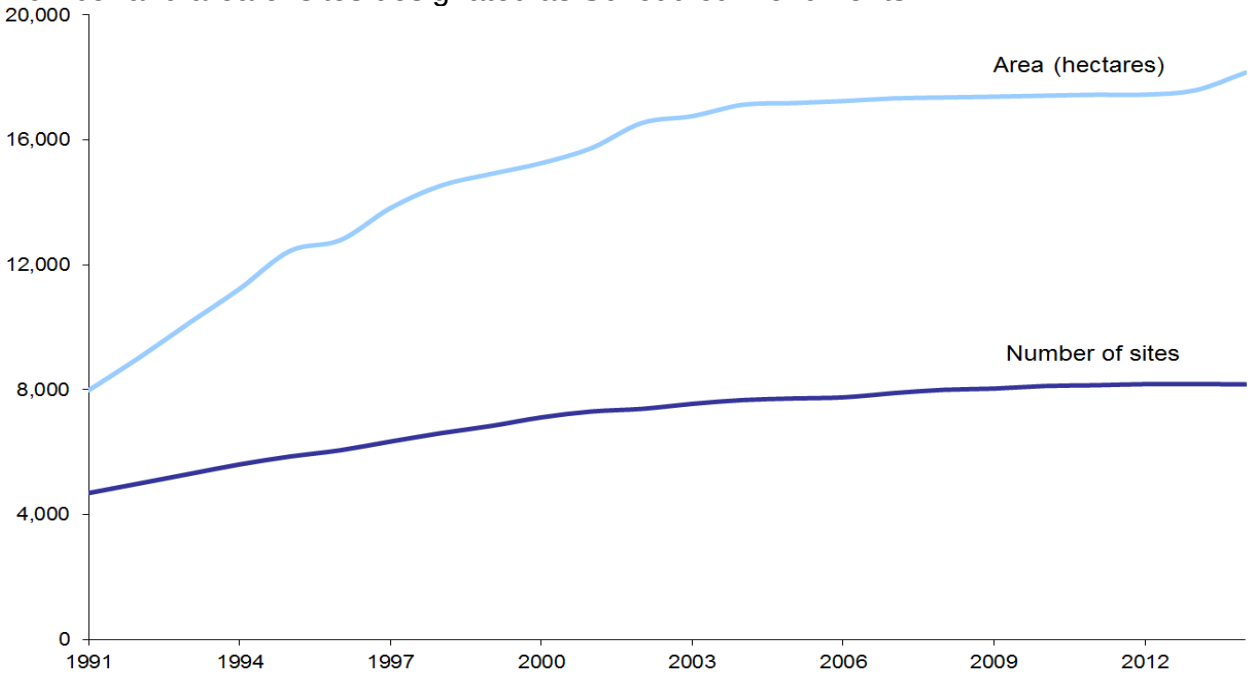
Special Areas of Conservation (SACs)[5] are designated under the 1992 EC Habitats Directive to protect certain species and habitat types throughout the EU. Special Protection Areas (SPAs)[6,7] are classified under the 1979 EC Wild Birds Directive (which was codified in 2009) to safeguard the habitat 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). In 2014, there were 241 SACs, 153 SPAs and 51 Ramsar sites in Scotland.

The area of SACs in the terrestrial and inshore environment rose from 0 ha in 1995 to 963,000 ha in 2004 and has since remained broadly stable, rising to 986,705 ha in 2014. In 2010, the UK Government's nature conservation functions under the EC Birds and Habitats directives in Scottish offshore waters were devolved to Scottish Ministers. In 2014, there were 9 offshore SACs in Scottish offshore waters covering a total area of 2,912,610 ha. This is an increase of 2,082,000 ha from 2012, mainly due to the introduction of the UK's largest offshore marine SAC at Hatton Bank, which measures 1,569,000 ha in area. The area of SPAs rose from 26,000 ha in 1991 to 657,000 hectares in 2009 and then almost doubled in size to 1,297,000 ha in 2011 where the level has remained since. A site may be protected by more than one designation. For example, in 2014 around 65% of SACs, 52% of SPAs and 86% of Ramsar sites by area are also designated as SSSIs.

Source: Scottish Natural Heritage / Metadata

Scheduled Monuments[1]: 1991-2014

Number and area of sites designated as Scheduled Monuments



Historic Scotland is responsible for safeguarding and celebrating the nation's historic environment and promoting its understanding and enjoyment. One way to achieve this is by legally protecting nationally important sites and monuments through designation as 'scheduled monuments'.

Scheduled monuments (SMs) are protected under the Ancient Monuments and Archaeological Areas Act 1979[8] and range from the earliest traces of settlement and human activity over 10,000 years ago to medieval castles and abbeys, and Second World War coastal batteries. Once a monument is scheduled, the prior written consent of Scottish Ministers is required for most works or activities in the scheduled area to help ensure the monument is not damaged or destroyed – this process is known as 'scheduled monument consent'.

The number of SMs and the area they account for has steadily risen every year since 1991. There was a 74% increase in the number of SMs between 1991 and 2014, and a 127% increase in the total area of SMs in this period. In 2014, there were 8,176 designated SMs in Scotland, 11 less than in 2013. However, the 2014 sites accounted for a total area of 18,157 hectares, which is an increase of 565 hectares from 2013. These changes are due to an ongoing review of Scheduled Monuments[9, 10] which may involve the rescheduling or rationalisation of some sites. There are SMs spread across Scotland, with more added to the Schedule every year, but numbers vary across local authorities. In 2014, the largest number of SMs was in Highland Council, with 1,240 SMs covering a total area of 2,688 hectares.

Source: Historic Scotland / Metadata

Conservation – Footnotes

1) Figures as at 31st March each year.

2) 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. Figures for SACs and SPAs include both terrestrial and marine areas. Figures for SSSIs include intertidal habitats.

3) Some SSSIs overlap, and where this occurs the area of overlapping land will be counted more than once. In 2014 this accounted for 2,716 hectares, so the net area of SSSI sites at 31st March 2014 is approximately 1,019,544 hectares.

4) 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.

5) Some SACs overlap, and where this occurs the area of overlapping land will be counted more than once. In 2014 this accounted for around 5,500 hectares, so the net area of terrestrial/inshore SAC and candidate SAC sites at 31st March 2014 is approximately 981,200 hectares.

6) In 2009, Scottish Ministers classified 31 marine extensions to existing seabird breeding colony SPAs around Scotland's coasts. In 2010, six new SPAs were classified for golden eagle. These designations contributed to the large increase in SPA area from 657,456 hectares in 2009 to 1,296,843 hectares in 2011.

7) Some SPAs overlap, and where this occurs the area of overlapping land will be counted more than once. In 2014 this accounted for around 58,500 hectares, so the net area of SPA sites at 31st March 2014 is approximately 1,238,400 hectares.

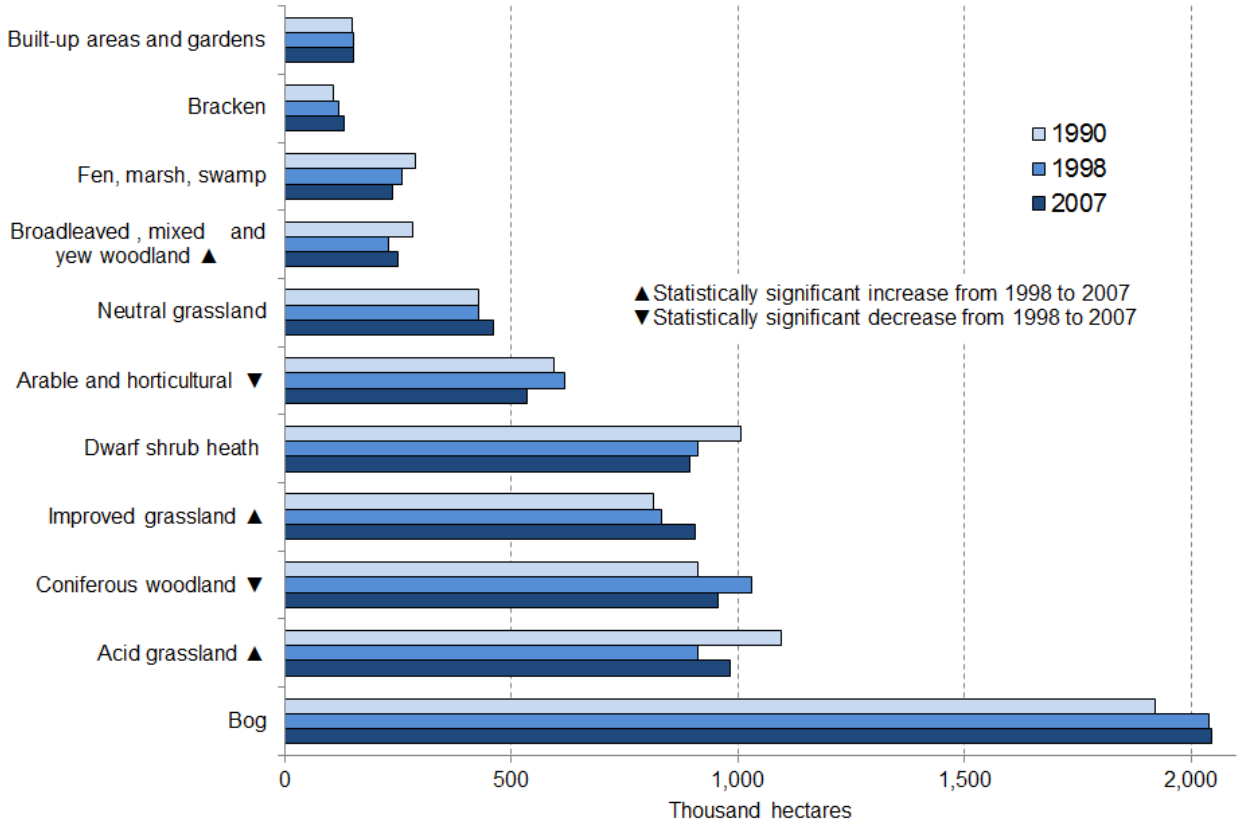
8) UK Parliament (1979). Ancient Monuments and Archaeological Areas Act 1979.

9) The Scheduling, Marine and Battlefields Team within Historic Scotland compiles and maintains the ‘Schedule’ of monuments of national importance on behalf of Scottish Ministers. Work is currently focused on improving the quality of the Schedule across Scotland. This includes a rolling programme of area-based fieldwork reviewing the boundaries of scheduled areas. Where necessary, sites may be rescheduled to update the maps and documentation to provide clarity for owners, occupiers and the Local Authority; in a few cases, it can lead to a monument being de-scheduled.

10) Further information about SMs, including maps, is available on Historic Scotland’s data website: http://data.historic-scotland.gov.uk.

Broad Habitat Change: 1990-2007[1]

Extent of broad habitat (thousand hectares)



In order to allow for accurate reporting for the UK Biodiversity Action Plan, the UK's natural habitats are classified into a range of 'broad habitat' types. Maintaining and restoring the biodiversity of the UK is ultimately dependant on the area and quality of these areas[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.

Within Scotland the most important habitat by area is bog land, which accounts for nearly a quarter of Scotland's total land area. Although frequently disregarded as wasteland in the past, Scotland's bogs are now seen as a vital area of biodiversity as well a large carbon sink.

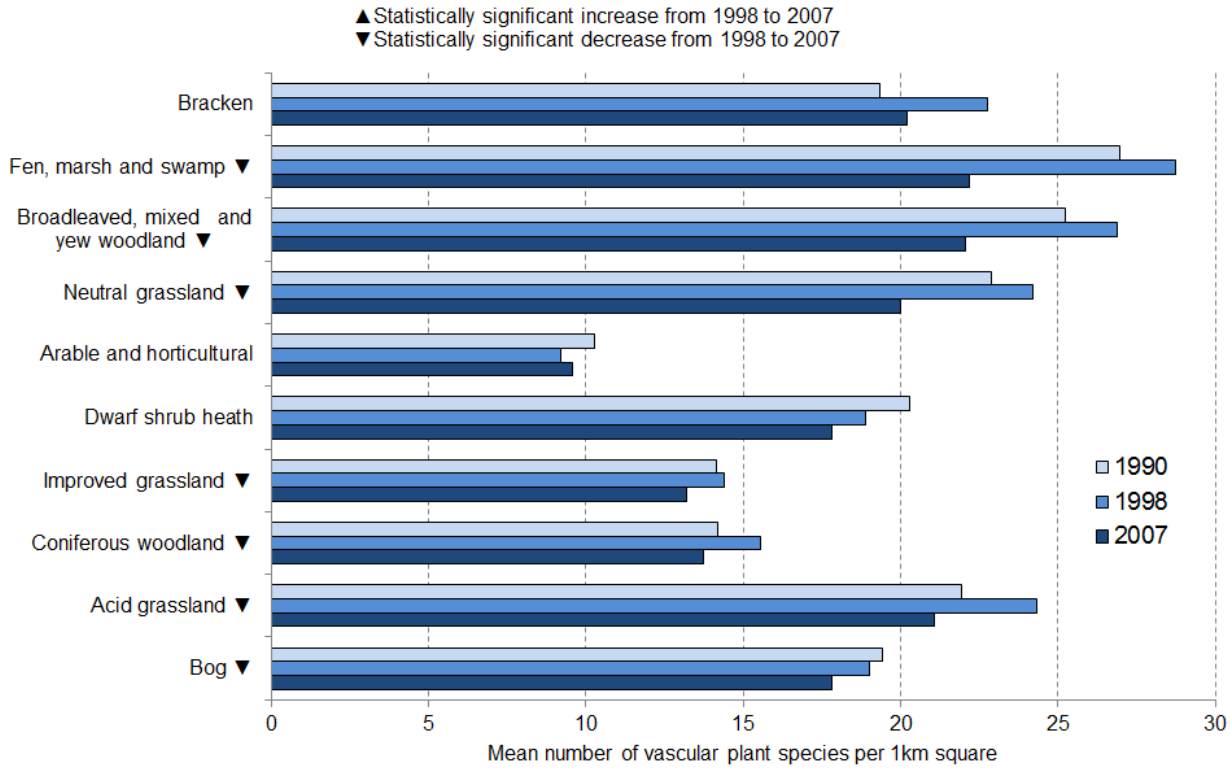
Between 1998 and 2007 the area of broadleaved woodland, improved grassland and acid grassland increased significantly.[4] Coniferous woodland and arable and horticultural land decreased significantly over the same time period. The area of all other broad habitats showed no significant change.

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 / Metadata

Changes in Plant Species Richness: 1990-2007

Mean number of vascular[5] plant species per 1km square[6]



Vascular plant species diversity is one measure that can provide an indication of changes in habitat quality. Vascular plants (also referred to as the 'higher plants') often form the base of the ecosystem and a decline in the average number of species can signal a decline in habitat quality. Changes are often associated with land management and atmospheric pollution, although the effects of climate change may become evident in the future.

In the case of bog land much of the habitat contains non-vascular plant (such as mosses) and so this measure may underestimate the habitat quality.

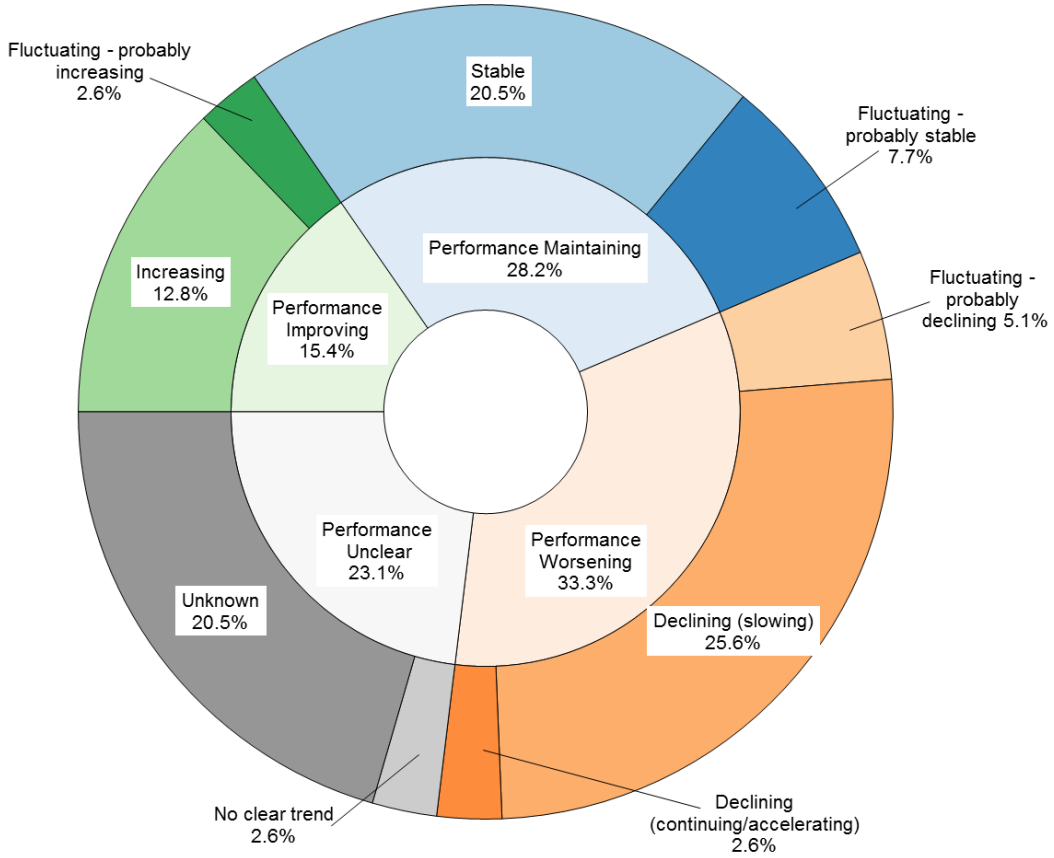
The Countryside Survey 2007[3] reported changes between surveys in 1998 and 2007 of 195 1km sample squares. Plant diversity, in terms of the number of vascular plant species recorded, was estimated from plots placed within each square.[7]

Vascular plant diversity declined between 1998 and 2007 across the majority of habitats, with significant changes[4] to plant species richness in seven broad habitats. There was a 23% decrease in plant species richness in fen, marsh and swamp, and an 18% decrease in species richness in broadleaved, mixed and yew woodland. The habitats that did not show significant changes in species richness were bracken, dwarf shrub heath and arable and horticultural.

Source: Countryside Survey 2007 / Metadata

Status of UK Biodiversity Action Plan (BAP) Habitats in Scotland: 2008

Status of UK BAP Habitats[8]
(based on 39 UK BAP priority habitats in Scotland)



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.

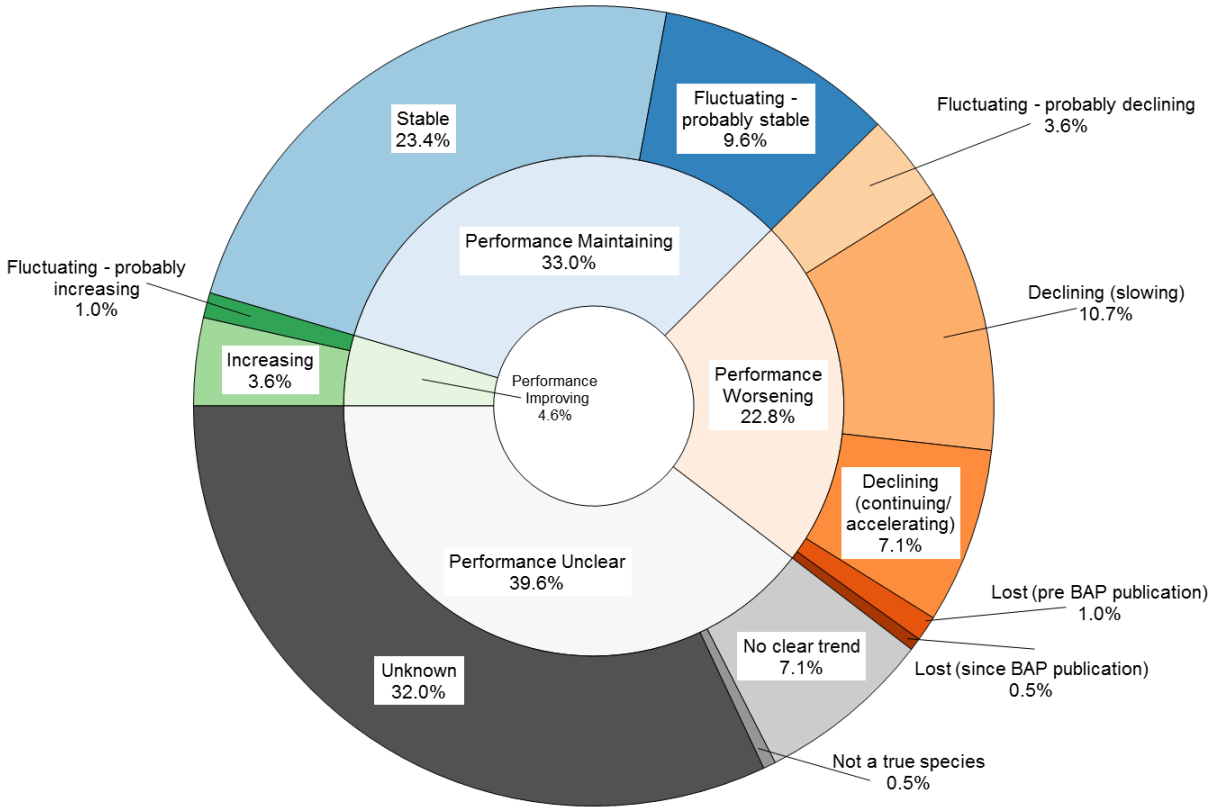
In 1992, the UN Convention on Biological Diversity recognised the need to protect biodiversity. The UK was one of the 150 countries to sign up to the convention, and in 1994 the UK Biodiversity Action Plan (UK BAP)[9] was launched. The plan aims to conserve and enhance the populations of species and habitats which are considered threatened within the UK.

Between 1995 and 1999, action plans were developed for 45 habitats in the UK[10], of which 39 occur in Scotland. As at 2008, of these 39, 15% of the habitats were increasing, 28% were considered stable and 33% were in decline.[11] For the remainder, 23% had an unknown trend and for 1 habitat the trend was unclear.

Source: Biodiversity Action Reporting System (BARS) / Metadata

Status of UK Biodiversity Action Plan (BAP) Species in Scotland: 2008

Status of UK BAP Species[8]
(based on 197 UK BAP priority species)



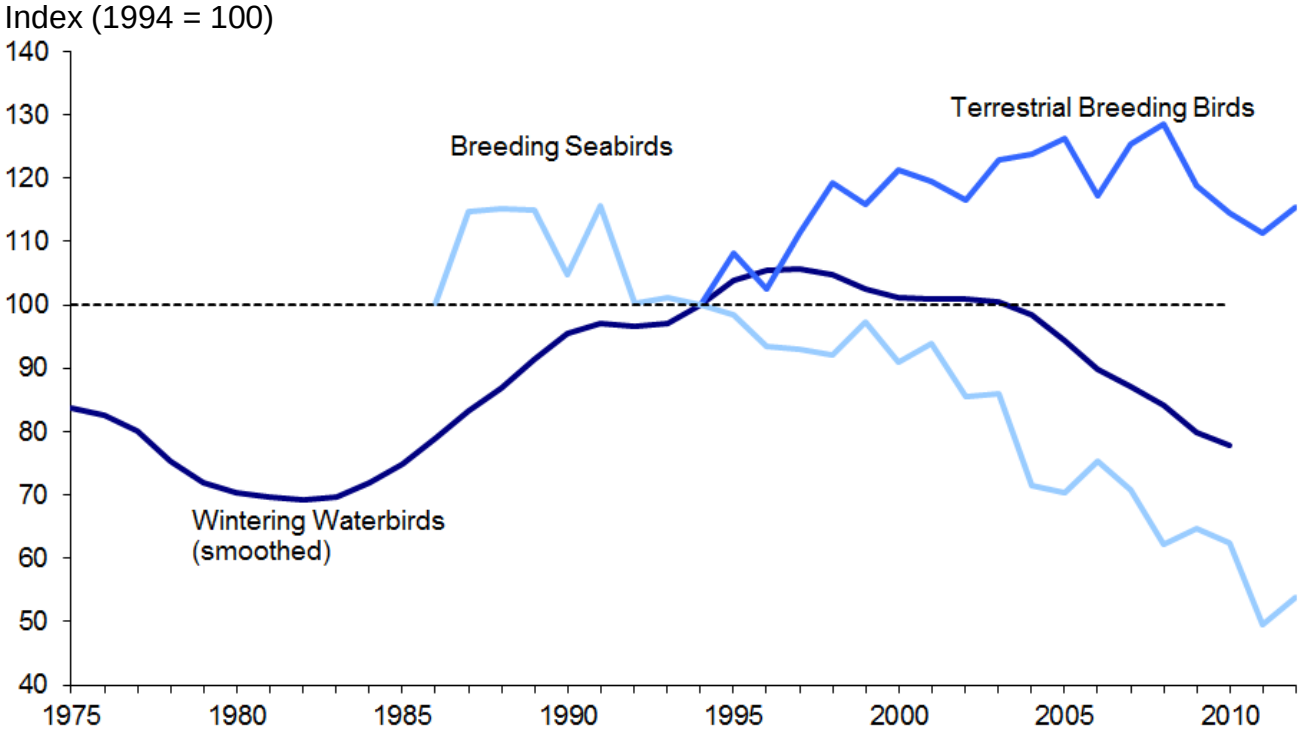
In 1994 the UK Biodiversity Action Plan (BAP)[9] was launched. The action plan aims to conserve and enhance the populations of species and habitats that are considered threatened in the UK.

Between 1995 and 1999, action plans were developed for 391 species in the UK[10] that had been identified as priorities. 197 of these occur in Scotland. In the 2008 assessment for Scotland, 38% of the species were increasing or stable and 21% were in decline.[11] For the remainder of the species considered, 7% showed no clear trend, 32% had an unknown trend, 1 species[12] (Wryneck) had been lost since the commencement of BAP in 1994, 2 had been lost pre BAP and 1 (scurvy grass) was no longer considered a true species.

The Scottish Biodiversity Strategy, first published in 2004, sets out how Scotland plans to protect biodiversity in Scotland. Following the agreement of new targets under the UN's Convention on Biological Diversity in 2010[13] and the publication of a European Biodiversity Strategy [14], the Scottish Biodiversity Strategy was refreshed in 2013[15] Following the publication of the refreshed strategy a revised Scottish Biodiversity List was produced [16]. A formal assessment of the status of these species has not yet been undertaken.

Source: Biodiversity Action Reporting System (BARS) / Metadata

Status of Wild Bird Populations[R,17]: 1975-2012



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

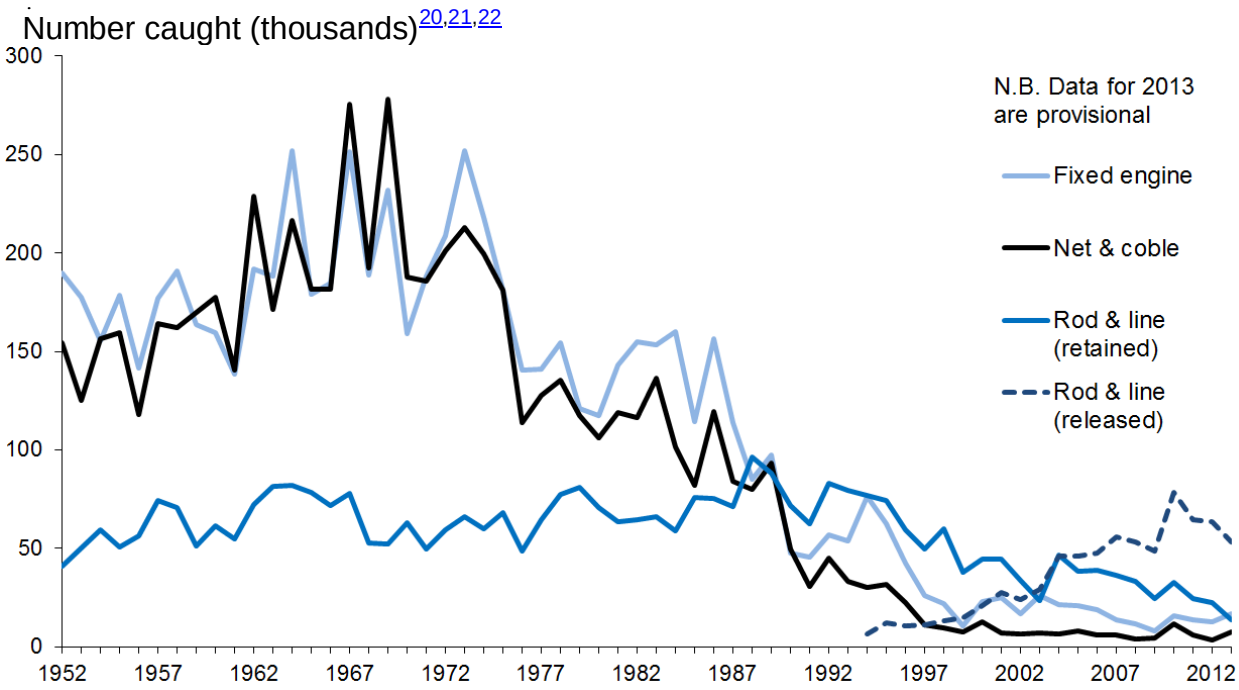
The number of wintering waterbirds rose between the mid-1980s and mid-1990s, reaching a peak in 1997. Since then there has been a steady decline, with the abundance falling 26% between 1997 and 2011. Seabird abundance has declined by 54% between 1991 and 2012. The abundance of terrestrial breeding birds has shown a long term increase of 15.5% between 1994 and 2012; however, between 2008 and 2012 the abundance of terrestrial breeding birds decreased by 10%.

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[18] to increase the index of abundance of terrestrial breeding birds in Scotland against a 1994 base year. This is used as a proxy measure of biodiversity, as biodiversity cannot be measured by a single indicator and birds are diverse, easy to monitor and can be quite sensitive to environmental changes.

Source: British Trust for Ornithology / Joint Nature Conservation Committee / Wildfowl and Wetlands Trust / Metadata

Catches of Wild Salmon[19]: 1952-2013[P]



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 also 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 provisional data published for 2013 indicate that 16,732 wild salmon were reported caught and retained in the fixed engine fishery; an increase from the 12,584 caught in 2012. The net and coble fishery saw an increase in the number of salmon caught and retained in 2013 to a provisional figure of 7,579, from 3,646 caught in 2012.[23]

Since 1994, salmon that have been caught and released by anglers have been reported separately from those caught and retained. There has been a long-term reduction in the number of salmon caught and retained by the rod & line fishery, from a peak of 96,488 in 1988 to 13,629 in 2013. The number of salmon caught and released increased from 6,595 in 1994 to 53,118 in 2013. The proportion of the rod catch accounted for by catch and release has generally increased since 1994. In 2013, 80% of the annual rod catch was released compared to less than 8% in 1994. Total reported rod catch (retained and released) for 2013 is 66,387 salmon. It is the lowest reported catch since 2003, and is 74% of the previous 5-year average.[24, 25]

Source: Marine Scotland Science / Metadata

Biodiversity – 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. © Database Right/Copyright NERC– Centre for Ecology & Hydrology. All rights reserved.

4) Statistically significant change between 1998 and 2007, $p < 0.05$.

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

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

7) Vegetation plots are known locations, so changes in the time series are a reliable indication of change in habitat quality.

8) Because of rounding, percentages in the pie chart do not add up to 100.

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

10) In 2007/08 an updated UK BAP priority list was published containing 1150 species and 65 habitats across the UK, of which 606 species and 60 habitats are in Scotland.

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

12) 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.

13) UN Convention on Biological Diversity (2010). Aichi Biodiversity Targets.

14) European Commission (2011). EU Biodiversity Strategy to 2020.

15) 2020 Challenge for Scotland's Biodiversity - A Strategy for the conservation and enhancement of biodiversity in Scotland

16) Scottish Biodiversity List – Published in April 2013

17) 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. Data displayed for wintering water birds is smoothed.

18) Scotland Performs – National Indicator.

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

20) 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.

21) 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. No figures for fishing effort for rod & line catches are available.

22) The provisional data published for 2013 indicate that fishing effort in fixed engine fisheries and net & coble fisheries were the seventh lowest and fourth lowest, respectively, since records began in 1952. Also, catch in the fixed engine and net & coble fisheries were 7% and 3% of the maximum recorded in their respective time series.

23) Data for 2013 are provisional. Marine Scotland (2013). Provisional Salmon and Sea Trout Fishery Statistics 2013.

24) 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.

25) The Aquaculture and Fisheries (Scotland) Act 2013 introduced 'good governance' obligations on Salmon Fishery Boards to improve openness, transparency and accountability, with powers for Ministers to intervene if that is not the case. These include requirements to hold an annual public meeting and a register of interest, the presumption of meetings open to the public minutes and a documented complaints procedure.

The Act also includes powers to enhance the management of salmon fisheries through powers to create a carcass tagging scheme, and to enable Ministers to make close time orders and require information from proprietors.

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