A National Statistics Publication for Scotland

Key Scottish Environment Statistics 2013

August 2013

natural scotland
SCOTTISH GOVERNMENT

Introduction

Welcome to the thirteenth 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 2013 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 Scottish Neighbourhood Statistics.
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 with collaboration from Scottish Government and SEPA colleagues.
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. 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

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. The environment is a key aspect to the success and well-being of Scotland. There are aspects of the environment which affect human health, wildlife and economic success. Scotland's environment is generally in a good condition but there remain areas where environmental quality is poor. Some of the main trends are highlighted below.

Annual mean temperatures in the 2000's were 0.9°C higher than the 1961-1990 average, the highest for any decade since records began in 1910. 2010 was the tenth coldest year. The annual mean temperature in 2012 was 0.29°C above the 1961-1990 average (pp 19).

Net greenhouse gas emissions (taking account of emissions and removals) in 2011 were estimated to be 51.3 million tonnes of carbon dioxide equivalent ($MtCO_2e$), 9.9% (5.6 $MtCO_2e$) lower than 2010 and 29.6% below 1990 levels (pp 21). Adjusting for trading in the EU Emissions Trading System the 2011 figure is 1.6 Mt CO_2e lower than 2010, a 2.9% decrease, and 25.7% lower than the 1990 base year (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, 16 of 66 monitoring sites failed to meet an annual mean AQS objective in 2012, and 4 failed an hourly mean AQS objective. Ground level ozone objectives were met at 8 of 9 sites in 2012 and the second stage of the AQS for PM_{10} to be met by 2010 was not met at 8 of 58 Scottish sites (pp 27, 28). Between 1990 and 2010, there were reductions in Scottish emissions of PM_{10} and nitrogen oxides by 57% and 61%, respectively. There was no significant change in sulphur dioxide and nitrogen dioxide emissions from large combustion plants in 2012 compared with 2011. (pp 26, 27, 29).

Drinking water quality and river water quality have both generally improved over time and between 2011 and 2012 (pp 34, 35). The percentage of river sites with a mean nitrate concentration of ≥ 2.5 mg N/l was 19.9%, (pp 36). Sites with a mean orthophosphate concentration < 25µg P/l peaked at 68%, up from 67% in 2011 (pp 37). Bathing water quality has varied over time with 98% of bathing waters meeting the mandatory standard required by the 1976 EC Bathing Water Directive in 2012 (pp 40).

In 2011, total waste sent to landfill increased by 3% from 2010, but has shown a long term decrease of 58% from 2000 (pp 46). In 2011/12 41.2% of local authority municipal waste was recycled or composted, up from 38.2% in 2010/11 and 4.5% in 2000/01 (pp 47). The proportion of households recycling waste items has increased each year since 2003 (pp 48).

Derelict and urban vacant land decreased slightly by between 2006 and 2012 (pp 52). In 2013, 18.1% of Scotland's land was woodland, compared with 18% in 2012 and 16.4% in 1995 (pp 55). In 2012, Nutrient application rates (nitrogen, phosphate and potash) applied to crops and grass decreased continuing a downward trend since around 2000 (pp 54). The area of designated protected areas has shown an upward trend over the long term (pp 58).

Terrestrial breeding bird numbers increased by 11% between 1994 and 2011, but have seen a 14% reduction since 2008. Seabird abundance declined between 1991 and 2005 and, though it has stabilized between 2006 and 2010, was 57% lower in 2011 than in the 1991 peak. Wintering waterbird numbers have shown a 25% reduction from a peak in 1996 to 2010 (pp 64).

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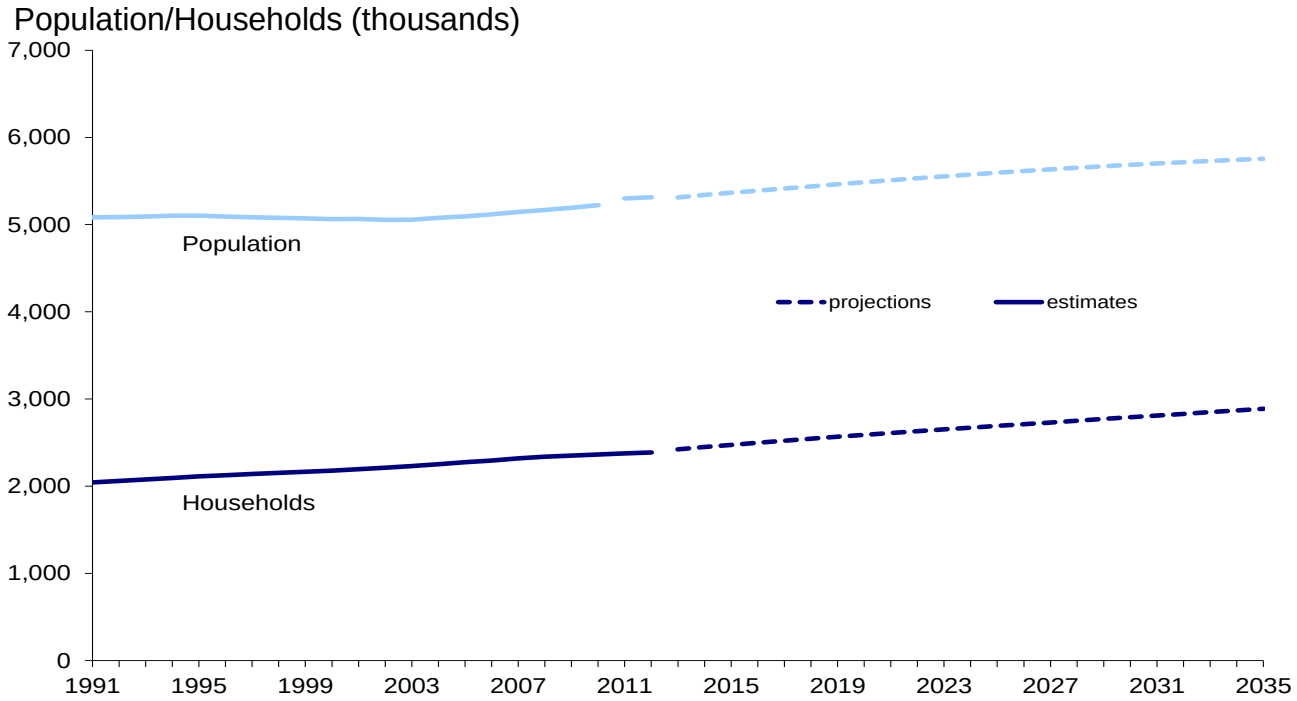
Conservation

Biodiversity

Population and Households: 1991-2035



People and households are important consumers of energy and water, and therefore have implications for the environment. The population of Scotland declined steadily through most of the 1980s, followed by small increases in the seven years up to 1995. The population then decreased to 5.05 million in 2002, but it has since increased to 5.31 million in 2012. Population estimates are rebased with each census to ensure a consistent time series. Estimates for 1982-2000 were revised to be in line with the results of the 2001 Census. The results of the 2001 Census were then rolled forward each year to give the 2002 to 2010 series. The 2011 and 2012 estimates are based on the 2011 Census. This means there is a break in comparability in the time series between 2010 and 2011.

The latest projections indicate that the population will rise by 10% to 5.76 million in 2035. This trend is consistent with the overall UK population, which is also projected to increase but at a greater rate.[1]

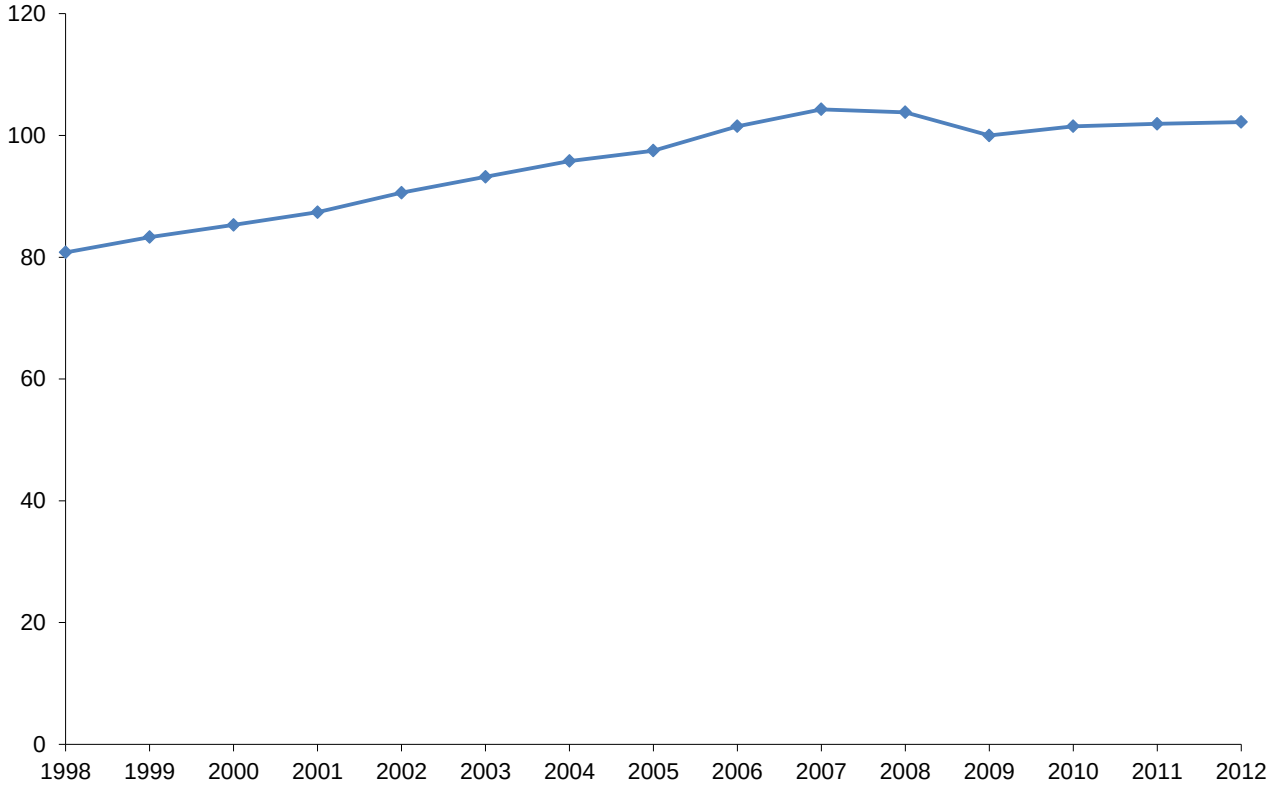
The number of households rose by 343,000 (17%) between 1991 and 2012, reflecting the fact that household structures are changing, with fewer people per household. Projections based on 2010 figures suggest that by 2035, the number of households in Scotland will increase by 22% to 2.89 million. This will contribute significantly to the demand for housing, not all of which can be accommodated on previously developed land.

In 2007, the Scottish Government set a target in their Economic Strategy[2], to match average European (EU15) population growth over the period from 2007 to 2017. The annual population growth rates for Scotland and EU15 in 2010/11 were 0.63 and 0.38 per cent respectively. So, in 2010 and 2011, the population of Scotland grew more than that of the EU15.[3]

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

Gross Domestic Product (GDP)[R,4]: 1998-2012

Scottish GDP at basic prices (2009=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.

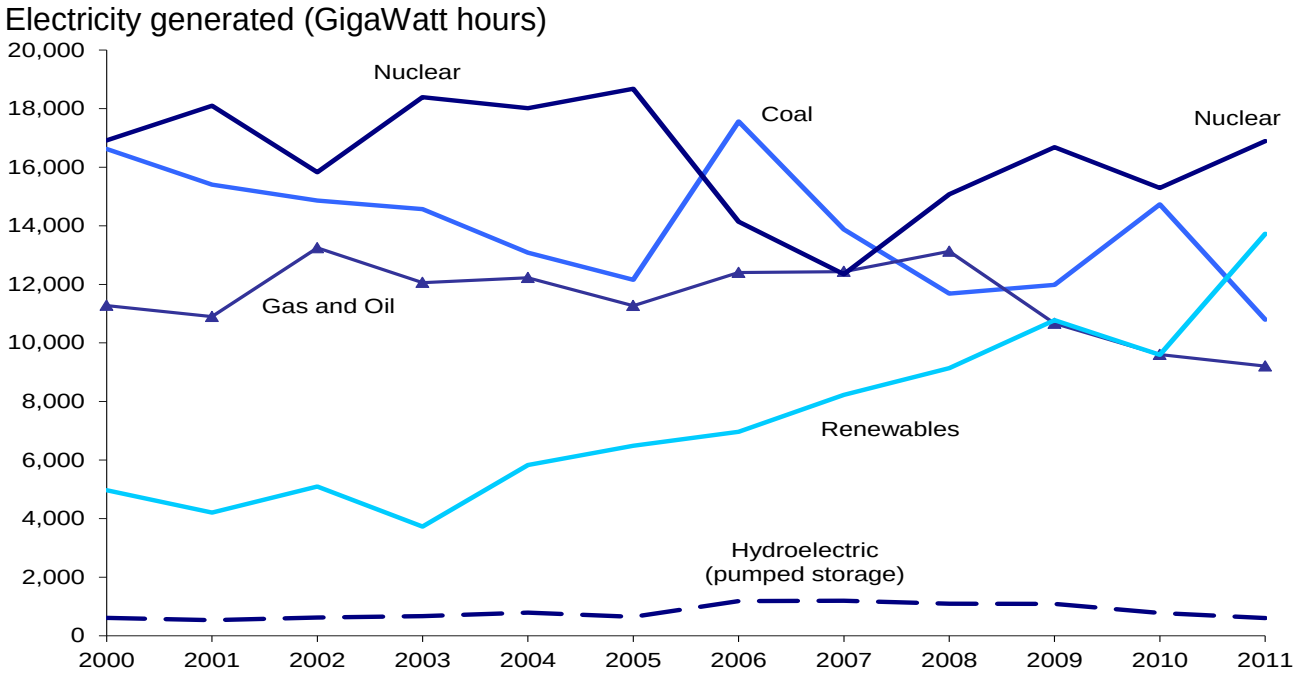
Between 1998 and 2012 the Scottish GDP index increased from 80.8 to 102.2, representing an average annual growth of 1.69%.

Over the 2012 calendar year, GDP in Scotland grew by 0.3%. This followed growth of 0.4% during 2011.

Following the deterioration in global economic conditions, Scottish GDP started to contract in the third quarter of 2008 before returning to growth in the last quarter of 2009.

Source: Scottish Government / Metadata

Electricity Generation by Source[R,5,6]: 2000-2011



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 the UK is committed to reduce under the Climate Change (Scotland) Act 2009.[7]

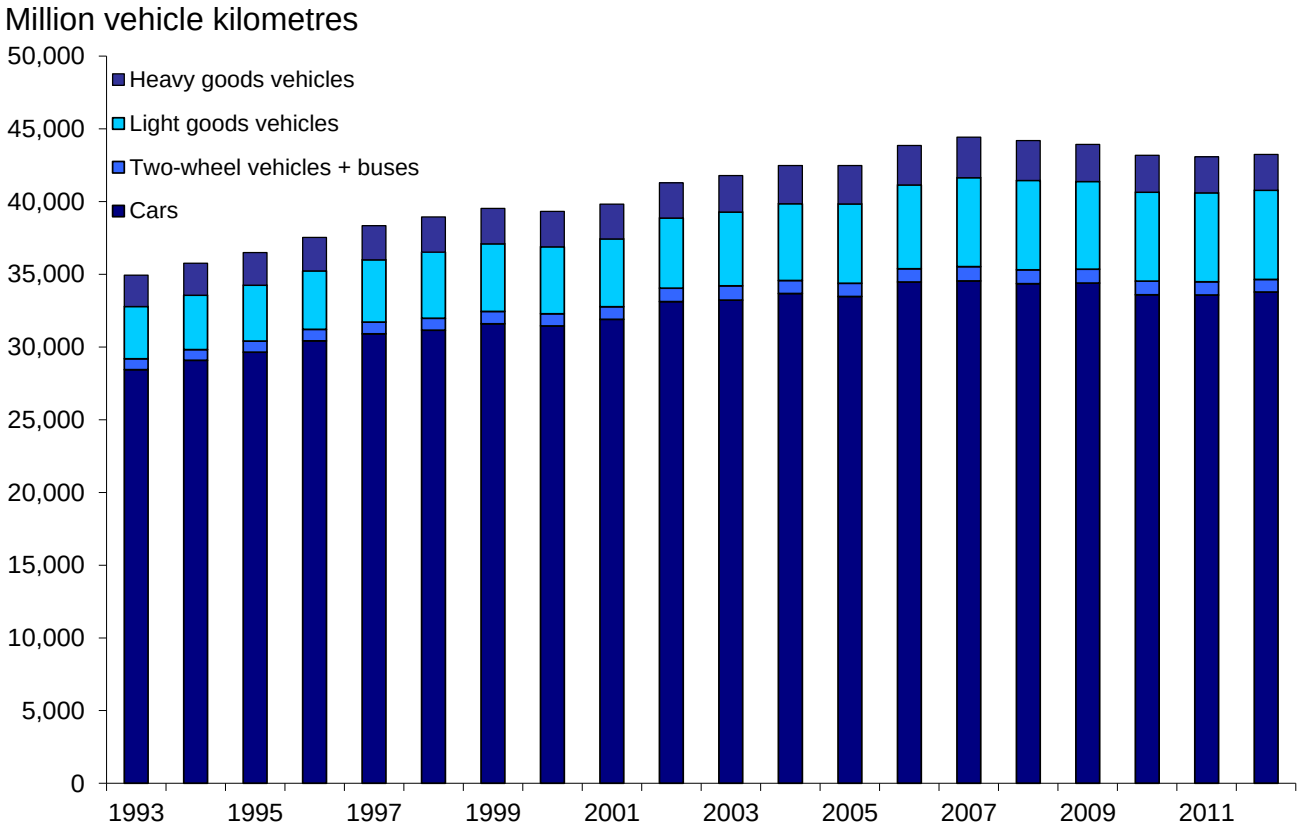
In 2011, Scotland generated 51,223 GWh of electricity, 2.5% greater than in 2010. Renewable electricity generation increased by approximately 43% over this period, accounting for 27% of the total generated. The increase since 2000 is mainly the result of a rise in the amount of electricity generated by wind power. Hydro generation accounted for 39% of Scotland's renewable electricity generation in 2011 and was up 61% on 2010 levels due to wetter weather. Scotland generated 13,728 GWh of electricity from renewable sources in 2011. This equated to 36% of the gross consumption[8] of electricity in Scotland, compared with 12% in 2000 and 24% in 2010. 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. An initial interim target of 31% set for 2011 has been replaced with a new interim target of 50% set for 2015.

Fossil fuels accounted for 39% of Scotland's electricity in 2011. Coal and gas are the two main fossil fuels used for electricity generation, with oil used to a lesser extent. There was a slight upward trend in generation from gas and oil between 2005 and 2008, but this dropped in 2009, and in 2011 reached its lowest level in the 2000s. The mix of fossil fuels used in any year is affected by relative fuel prices. Electricity generated by coal decreased by 27% in 2011 compared to 2010.

Nuclear power does not emit greenhouse gases although its use raises other environmental issues, including the long-term disposal of spent fuel. In 2011, 33% of electricity generated in Scotland was from nuclear power stations, compared with 31% in 2010. 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: 1993-2012



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

Since 1993, the volume of motor traffic on roads in Scotland has increased by 24% to some 43.2 billion vehicle kilometres in 2012. However, since 2007 there has been a reduction in motorised road traffic with 2011 levels 3% less than the peak in 2007. 2012 saw a slight increase in comparison to previous years. In 2012, 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 14.4 billion vehicle kilometres of traffic. Much of the growth in road traffic has been by light goods vehicles, which showed a 70% increase in vehicle kilometres since 1993.

Source: Department for Transport / Metadata

Background – Footnotes

1) National Records of Scotland (2011). Population Projections of Scotland (2010-based).

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

3) Scottish Government (2012). Scotland Performs Population Target.

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 (2009) 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).

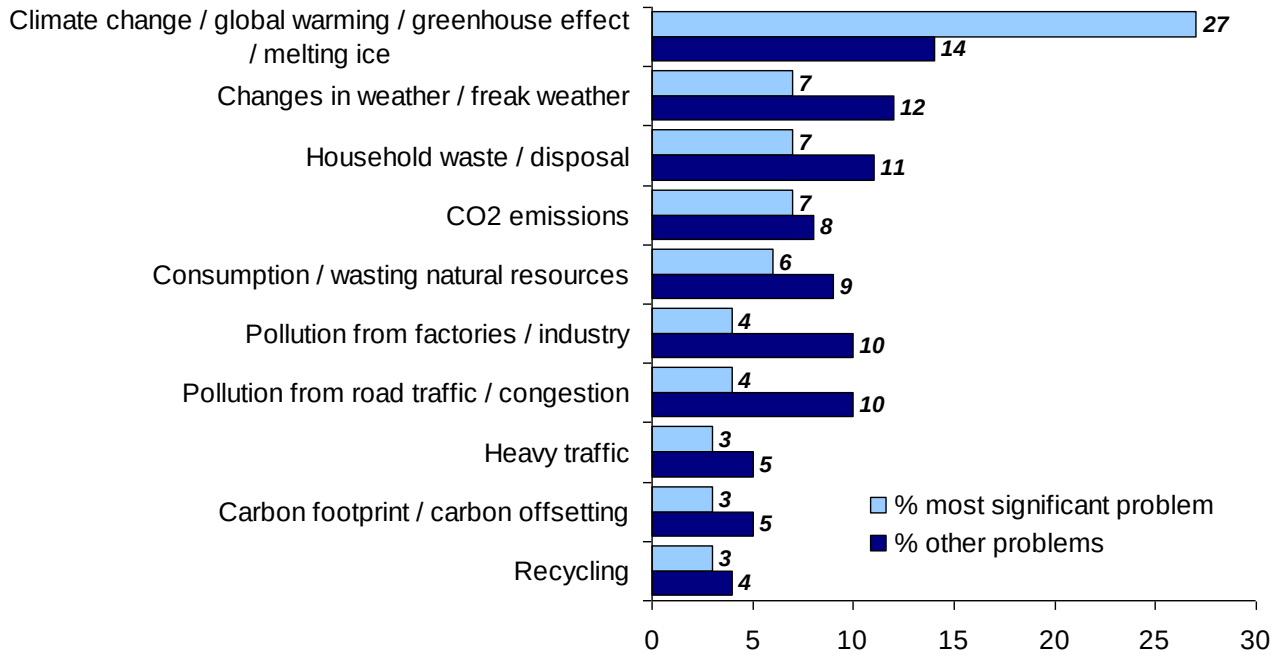
6) Pumped storage is not a renewable source of energy because it uses electricity produced by other means to create a store of hydrological power.

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

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

Perceived Significant Environmental Problems: 2008

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



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

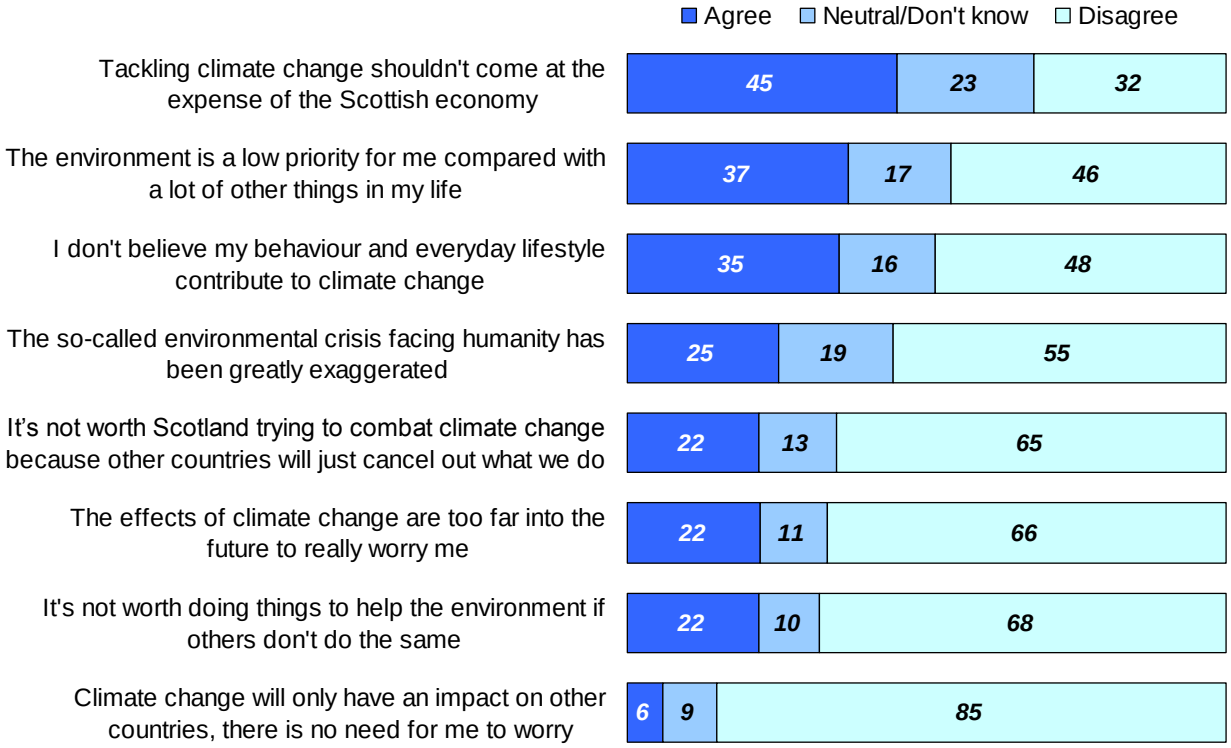
Climate change was by far the most common response - 41% of respondents in total mentioned the issue, and 27% identified it as the single most significant environmental issue. The next highest ranking issues were: changing weather patterns (mentioned by 19% overall), household waste (18%), CO_2 emissions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

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

Source: Scottish Government / Metadata

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

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



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

Respondents were asked if they agreed with the statement, “It is not worth Scotland trying to combat climate change, because other countries will just cancel out what we do”. Overall, 22% agreed with this statement and 65% disagreed. Also, two thirds (66%) disagreed with the statement “The effects of climate change are too far into the future to really worry me” (22% agreed).

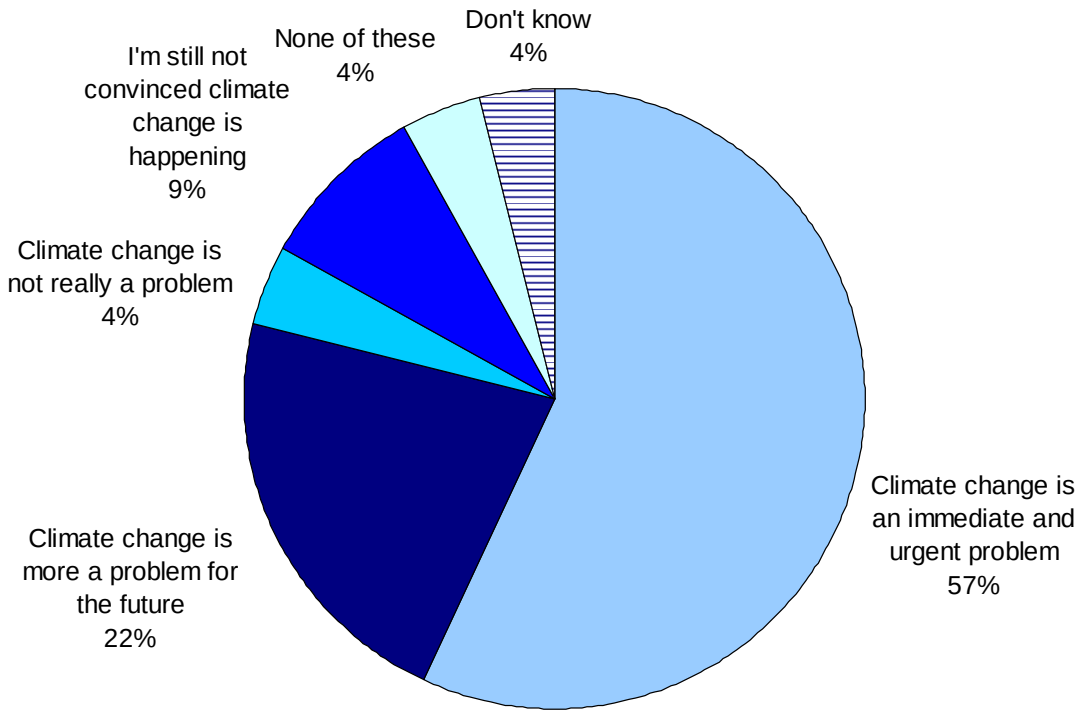
However, a sizeable proportion of people struggle to make the link between climate change and their own individual behaviour, with over a third (35%) agreeing with the statement, “I don’t believe my behaviour and everyday lifestyle contribute to climate change” (48% disagreed and 16% gave a neutral response). In addition, more people agreed (45%) than disagreed (32%) that, “tackling climate change shouldn’t come at the expense of the Scottish economy”, while 23% expressed no opinion or did not know.

Thinking about the environment more generally, when asked if they agreed that “it’s not worth me doing things to help the environment if others don’t do the same”, 22% agreed and 68% disagreed. Attitudes were more evenly split when the environment was set against other day to day concerns. Over a third of respondents (37%) agreed that the “environment is a low priority for me compared with a lot of other things in my life”, while almost half (46%) disagreed with this.

Source: Scottish Government / Metadata

Perceived Immediacy of Climate Change: 2008

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



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

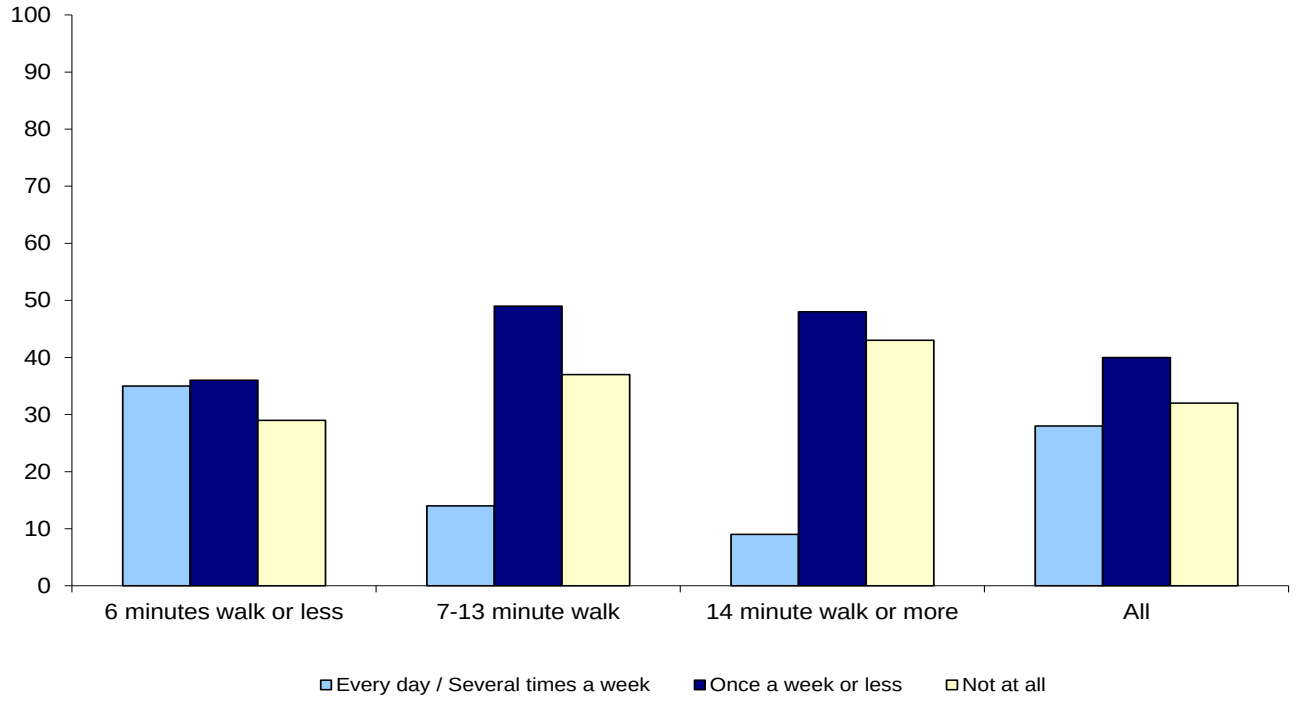
The Scottish Environmental Attitudes and Behaviours Survey 2008[1] included a question to gauge public concern about the perceived immediacy of climate change. Respondents were asked to choose one statement that came closest to their own view.[7]

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

Source: Scottish Government / Metadata

Frequency of Use of Local Greenspace: 2012

Frequency of use by time to walk to nearest useable greenspace (percentage of adults)[8]



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

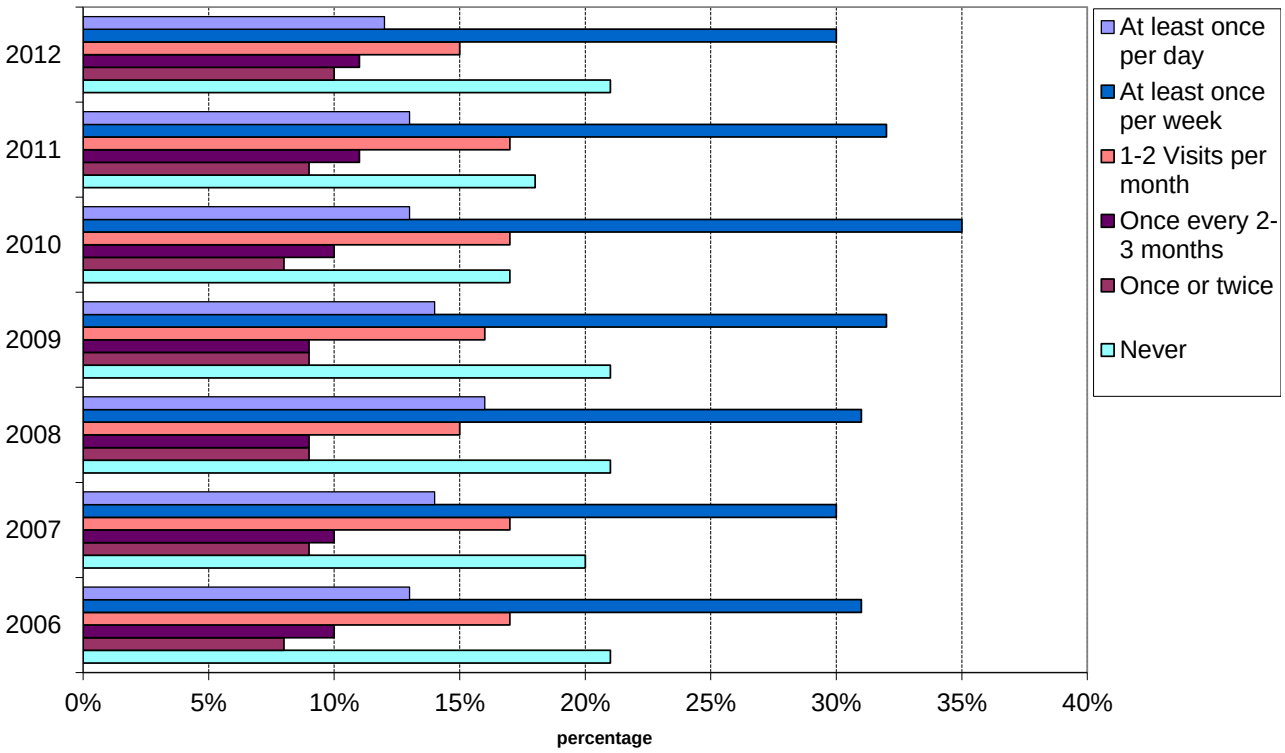
The Scottish Household Survey collects data on how accessible people's nearest useable greenspace is from their home (measured in terms of the time taken to walk there), and how often they use it. In 2012 it identified that 71% of adults in Scotland live a six minute walk or less away from a useable greenspace, 16% live a 7-13 minute walk away and 12% live a 14 minute or more walk away. It also identified that 28% of adults in Scotland use their local greenspace every day or several times a week, 40% use it once a week or less, and 32% do not use it all.

There is a strong link between how far people have to walk to reach their local greenspace and how often they use it. Adults who live 6 minutes or less away from useable greenspace are more than twice as likely to use it every day or several times a week than those who live a 7-13 minute walk away (35% versus 14%), and are almost four times as likely to use it every day or several times a week than those who live 14 minutes or more away (35% versus 9%). Similarly, those who live a 14 minute walk or more from useable greenspace are more likely to say they never use it than those who live a 6 minute or less walk (43% versus 29%).

Source: Scottish Household Survey / Metadata

Outdoor Visits: 2006 - 2012

Percentage of adults making visits to the outdoors[10]



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 of the importance and functioning of the natural environment.

The Scottish Government has established a National Indicator[11] to increase the proportion of adults making one or more visits to the outdoors per week. During 2012, 42% of adults are estimated to have visited the outdoors one or more times per week, compared to 46% in 2011, 48% in 2010 and 44% in 2006. This data is taken from the Scottish Recreation 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 and reasons such as the wet Spring and Summer months and the Olympics in 2012 may have resulted in less people visiting the outdoors.

In 2012, 15% of adults made 1 or 2 visits to the outdoors per month, with 42% visiting less often than that, and 12% visiting the outdoors at least once a day. The number of people visiting the outdoors once every two or three months or less in 2012 was the highest percentage seen in this survey (42%).

Source: Scottish Natural Heritage - Scottish Recreation Survey / Metadata

Public Attitudes & Behaviours – Footnotes

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

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

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

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

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

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

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

8) Sample size: all respondents 9,394.

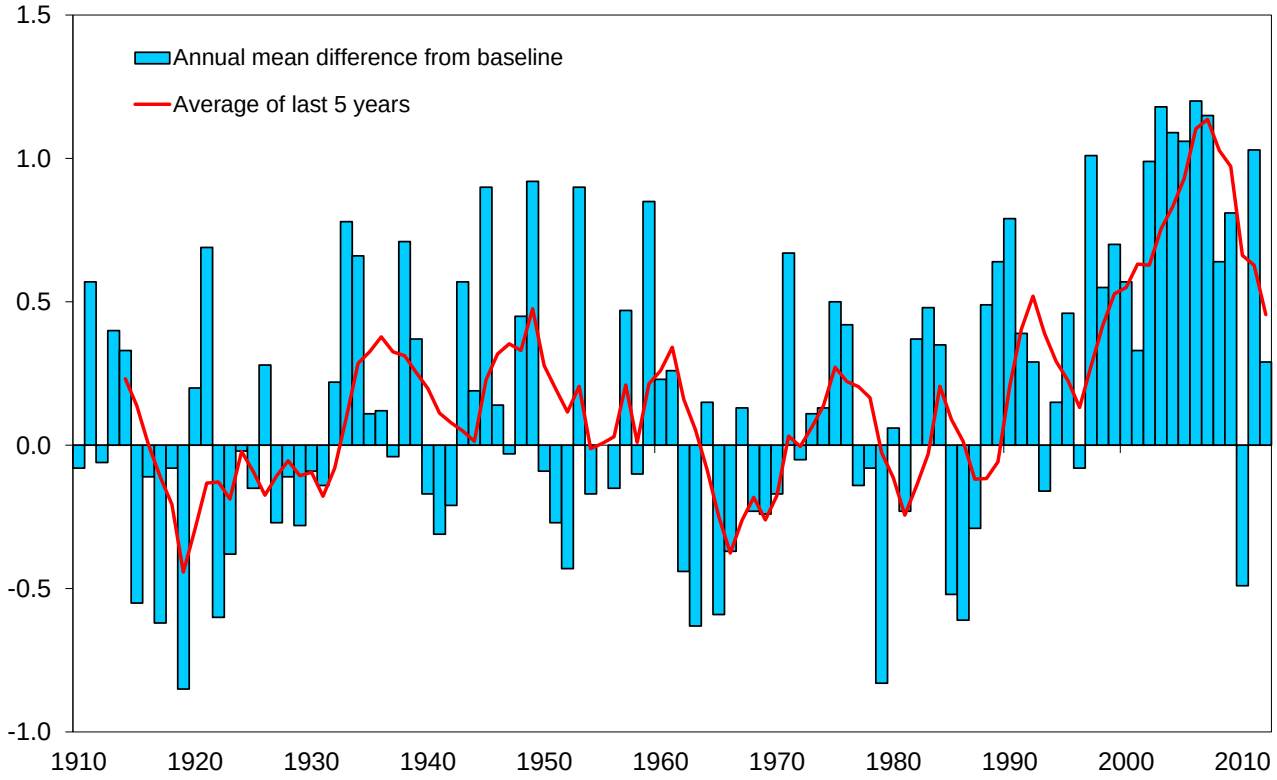
9) Bell, S. et al. (2008) and Mitchell, R. and Popham, F. (2008) in Reid, S. & Curtice, J. (2010) Scottish Social Attitudes Survey 2009: Sustainable Places and Greenspace Scottish Government, Edinburgh.

10) SNH Commissioned Report 465

11) Scotland Performs – National Indicator

Annual Mean Temperature: 1910-2012

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. Current climate trends are unlikely to be entirely natural in origin, however, and there is now evidence that human activities are having a discernible impact on the global climate.[2]

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

Over the period 1901-2000, the increase in mean global surface temperature, explained by a linear trend, is 0.57 degrees Celsius (°C).[3] Similarly, a linear trend through the Scottish temperature series for the period 1910-2010 indicates an average annual increase of 0.006°C, or 0.6°C each 100 years.[4]

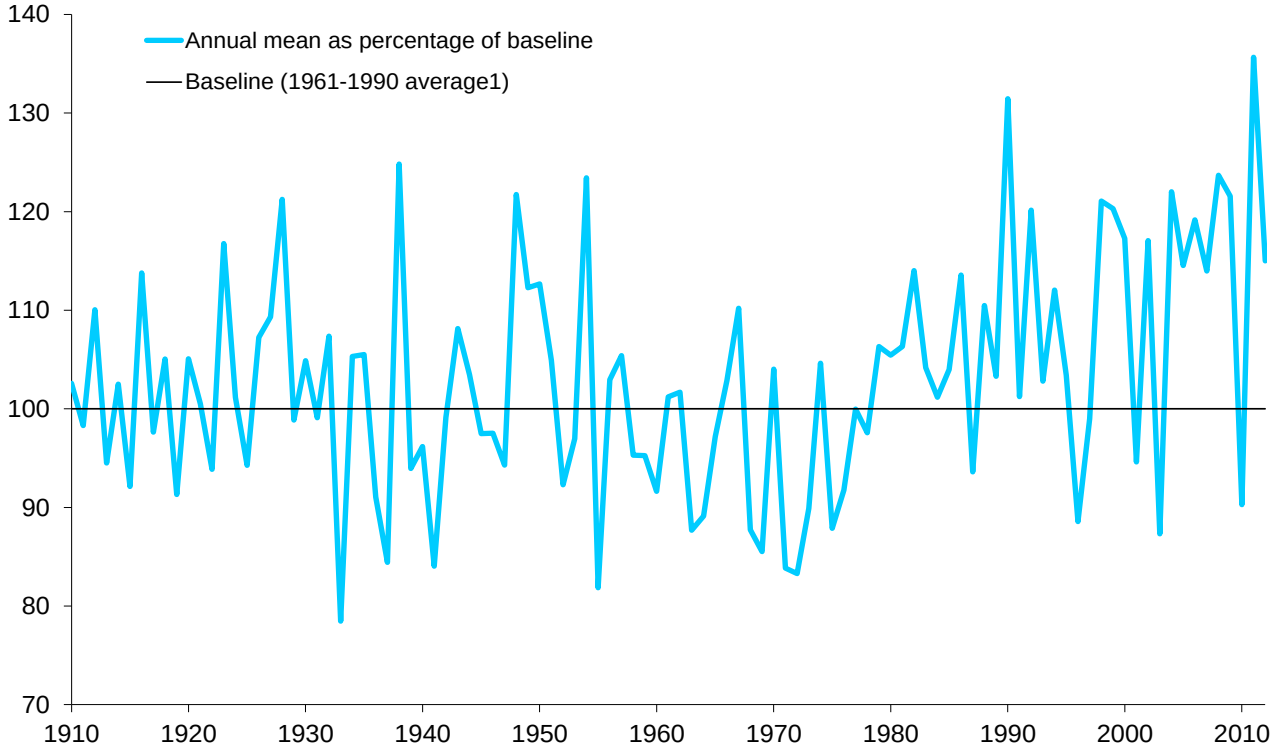
The temperatures between 2003 and 2007 in Scotland were the highest since the record began in 1910. The average temperature in the 2000s was 0.90°C higher than the 1961-1990 average and warmer than any other decade. 2012 shows a decrease in mean temperature of 0.74°C compared with 2011. The 2012 temperature of 7.32°C is 0.29°C higher than the 1961-1990 average.

Temperatures in Scotland are projected to continue increasing over the next century, with hotter summers and milder winters. For example, by the 2080s, projected increases[5] in mean temperature for Scotland East in winter months[6] is 2.2°C (1.0°C to 3.7°C) and in the summer months[7] is 3.5°C (1.8°C to 5.7°C).

Source: Met Office / Metadata

Annual Precipitation: 1910-2012

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 2012 was 15% above the 1961-1990 baseline.

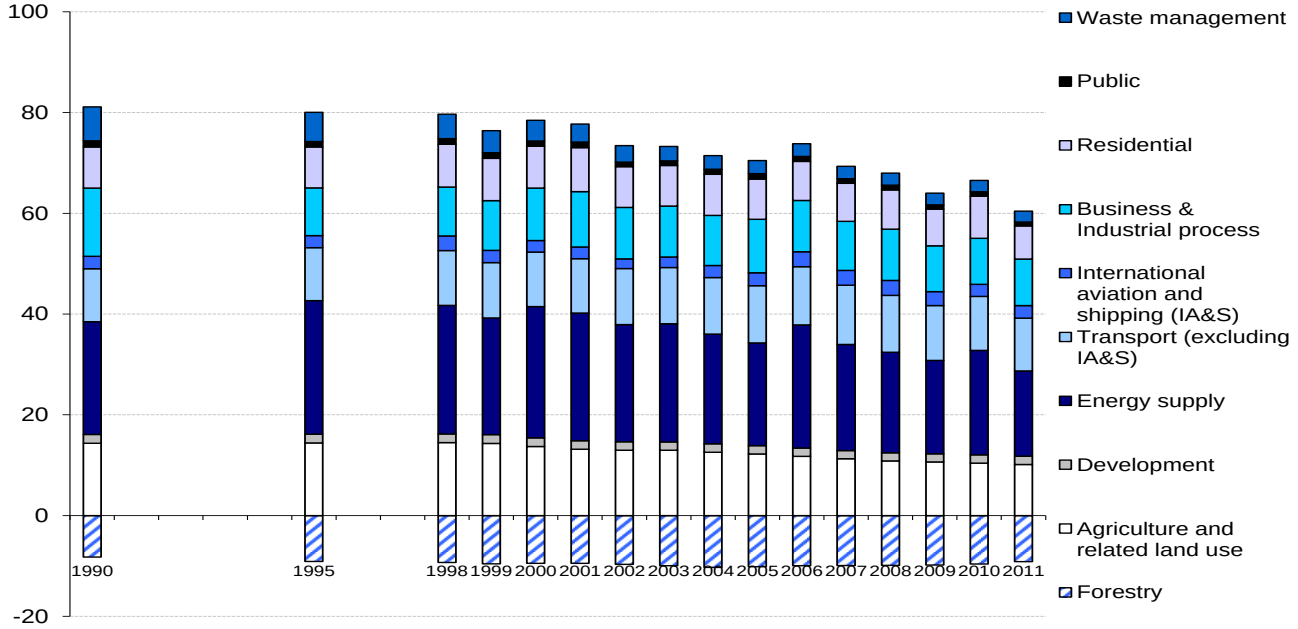
The average winter precipitation in the 1990s and 2000s was around 23% higher than the 1961-1990 baseline, compared to the 1960s which was around 9% lower. In 2012, the winter precipitation was 41% greater than the baseline, the 10th highest winter precipitation recorded in the period 1911-2012. Summer precipitation has not differed as much; average summer precipitation in the 1990s was 4% below the 1961-1990 baseline and in the 2000s 15% above the baseline. In 2012, summer precipitation was 39% higher than the baseline.[8]

Climate change will have an effect on all weather patterns in Scotland. The UK Climate Projections scenarios indicate that while the amount of annual precipitation will remain about the same, it is likely that winters will be wetter and summers will be drier. For example, projected changes[5] in the region Scotland East are a decrease in summer months[7] precipitation of 17% (-33% to 0%) and an increase in winter months[6] precipitation of 12% (1% to 25%). 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[R,9,10,12]: 1990-2011

Greenhouse gas emissions taking account of emissions and removals ($MtCO_2e$)[11]



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.[13]

Scotland's emissions of greenhouse gases in 2011 were estimated to be 51.3 million tonnes of carbon dioxide equivalent ($MtCO_2e$), 9.9% (5.6 $MtCO_2e$) lower than 2010 and 29.6% below 1990 levels.[14,15,16] Between 2010 and 2011, there were large decreases in greenhouse gas emissions in the energy supply and residential sectors primarily due to reduced consumption of coal in power stations in the energy supply sector and the decrease in the residential sector was as a result of a large reduction in natural gas consumption. Emissions from the residential sector are affected by changes in weather, with 2011 being on average 1.5°C warmer than 2010.

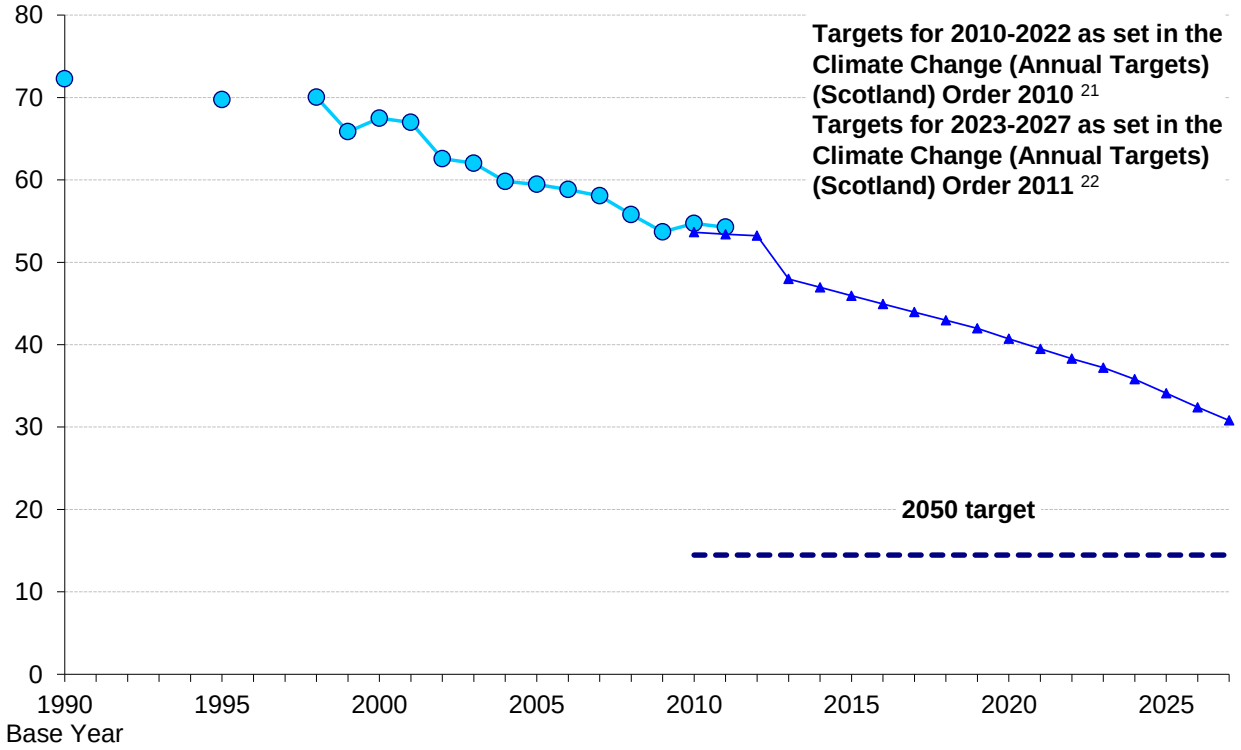
In 2011, Energy Supply was the largest emitter of GHGs, contributing 33% of the net emissions in Scotland. Emissions from the Energy Supply sector in 2011 were 24% lower than in 1990 and 18% lower than in 2010. Transport emissions contributed 20% to the 2011 total, and have remained approximately the same since 1990. Emissions from the Residential sector decreased by 21% between 2010 and 2011, and accounted for 13% of Scottish net emissions in 2011. They also decreased by 19% since 1990. Forestry has represented a net removal of GHGs since 1990 and this net removal increased by 11% between 1990 and 2011, but reduced in size by 5% from 2010 to 2011.

The Agriculture and Related Land Use and Business and Industrial process sectors contributed 20% and 18%, respectively towards net Scottish emissions in 2011, and reduced their emissions by 29% and 32% respectively since 1990. Between 2010 and 2011 Agricultural and Related Land Use emissions decreased by 3% while Business and Industrial Process increased by 1%.

Source: National Atmospheric Emissions Inventory[17] / Scottish Government[18] / Metadata

Greenhouse Gas Emissions Adjusted to Take Account of Trading in the EU Emissions Trading System[R,9, 19]: 1990-2011

Greenhouse gas emissions taking account of emissions trading ($MtCO_2e$)[11]



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

The European Union Emission Trading System (EU ETS) is the largest multi-country, multi-sector, company-level, greenhouse gas (GHG) emission trading system world-wide. When trading in the EU ETS is taken into account, Scottish GHG emissions, including international aviation and shipping, fell by 2.9% between 2010 and 2011 (from 55.893 $MtCO_2e$ to 54.252 Mt CO_2e). Compared with the 1990 base year[20], such emissions in 2011 were 25.7% lower.

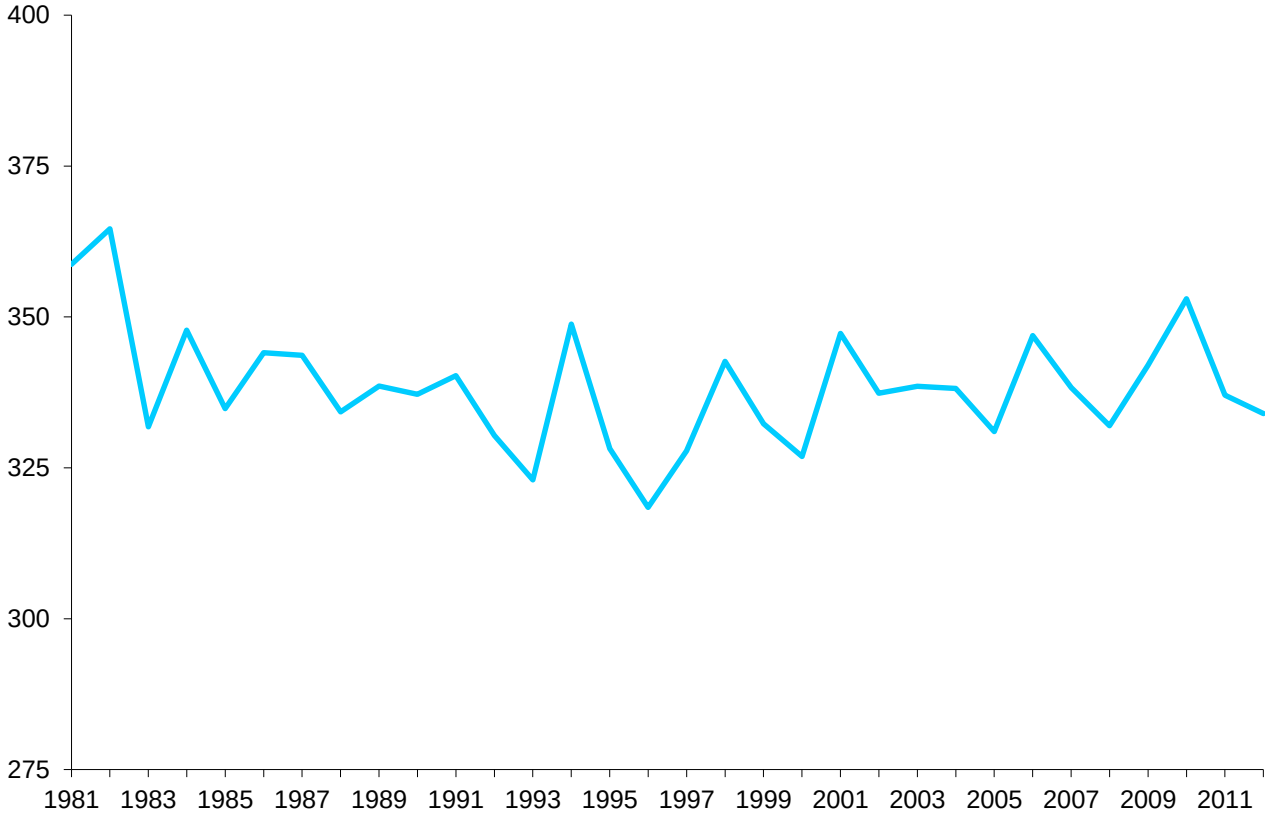
The Climate Change (Scotland) Act 2009 sets a statutory framework for greenhouse gas emissions reductions in Scotland with a reduction target of at least 80 per cent by 2050 and an interim reduction target of at least 42 per cent by 2020, both reductions against the 1990 base year[20]. The Act also requires Scottish Ministers to set annual targets for emissions and the Scottish Parliament has passed legislation setting annual targets to the year 2027[21,22]. The 2011 target is 53.404 million tonnes of carbon dioxide equivalent ($MtCO_2e$). The Scottish Government also set a short term Sustainability Purpose target within the National Performance Framework to reduce emissions by 2011, compared with a 2006 baseline. Compared with 2006, Scottish emissions of the basket of six greenhouse gases showed a 5.861 $MtCO_2e$ reduction, a 9.8 per cent decrease.

In accounting for trading in the EU ETS under both the Climate Change (Scotland) Act 2009 and the short term Sustainability Purpose target, the approach taken is to set contributions from Scottish installations in the EU ETS equal to Scotland's share of the UK's EU ETS cap[23] (Scotland's cap).

Source: National Atmospheric Emissions Inventory[17] / Scottish Government[18] / Metadata

Column Ozone Measurements: 1981-2012

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.[24] Thinning of the ozone layer has occurred since the beginning of the 1980s in all regions except equatorial ones. Depletion is most marked in the Antarctic where, in 2006, the Antarctic ozone hole reached 29.5 million square kilometres in area (over 300 times the land area of Scotland).

The 1987 Montreal Protocol set guidelines to eliminate the global production and use of ozone depleting substances. European production of CFCs for non-essential use fell to zero in 1995. 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 interannual variability which would be expected due to varying meteorological conditions. Generally, levels have decreased over this period. More recently, it appears that this trend may be levelling out, but it is too soon to be sure.

Source: AEA Energy and Environment / 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) IPCC Fourth Assessment Report: Climate Change 2007. A Report of the Intergovernmental Panel on Climate Change.

3) Inter-Governmental Panel on Climate Change (IPCC), Working Group 1 (WG1) Report , February 2007. The Physical Science Basis of Climate Change.

4) For a detailed analysis of Scottish climate trends over the last century, see: Barnett, C., Hossell, J., Perry, M., Procter, C. & Hughes, G. (2006). Patterns of climate change across Scotland: Technical Report. SNIFFER Project CC03, Scotland & Northern Ireland Forum for Environmental Research.

5) 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.

6) December – February.

7) June – August.

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

9) Includes emissions from international aviation and shipping. For 2011, it is estimated that Scotland's share of UK GHG emissions from international aviation and shipping equalled 2.5 $MtCO_2e$, compared to 2.4 $MtCO_2e$ in 2010 and 2.4 $MtCO_2e$ in 1990. For more details see 17.

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. For further details together with a detailed mapping see 18.

11) 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 $^{12}/_{44}$.

12) 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.

13) IPCC Fourth Assessment Report: Climate Change 2007. For full reference see 2.

14) The approximate 95% confidence interval for Scottish GHG emissions in 2011, excluding international aviation and shipping, is estimated to be ±29% of the mean. (The estimates for international aviation have low uncertainty, while those for international shipping have high uncertainty.) The approximate 95% confidence interval for the trend in GHG emissions between 1990 and 2011 is between -41% and -18% around a central estimate of -30%. For more details see 17.

15) Emissions from offshore oil and gas installations are not included in the Scottish inventory, and are reported as "unallocated" within the disaggregated UK inventory. For more details see 17.

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

17) Salisbury, E., Claxton, R., Goodwin, J., Thistlethwaite, G., MacCarthy, J., Pang, Y., Thomson, A., & Cardenas, L. (2013) "Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2011". Ricardo-AEA..

18) Scottish Greenhouse Gas Emissions 2011 (2013) Scottish Government, Edinburgh.

19) Further details of this cap are given in Scottish Greenhouse Gas Emissions 2011. In Phase I of the EU Emissions Trading Scheme (2005-2007), Scotland's emissions were also increased to take account of Scotland's share of EU ETS units sold by the UK Government.

20) 1990 base year is 1990 for carbon dioxide, methane and nitrous oxide and 1995 for the F-gases, i.e. hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride.

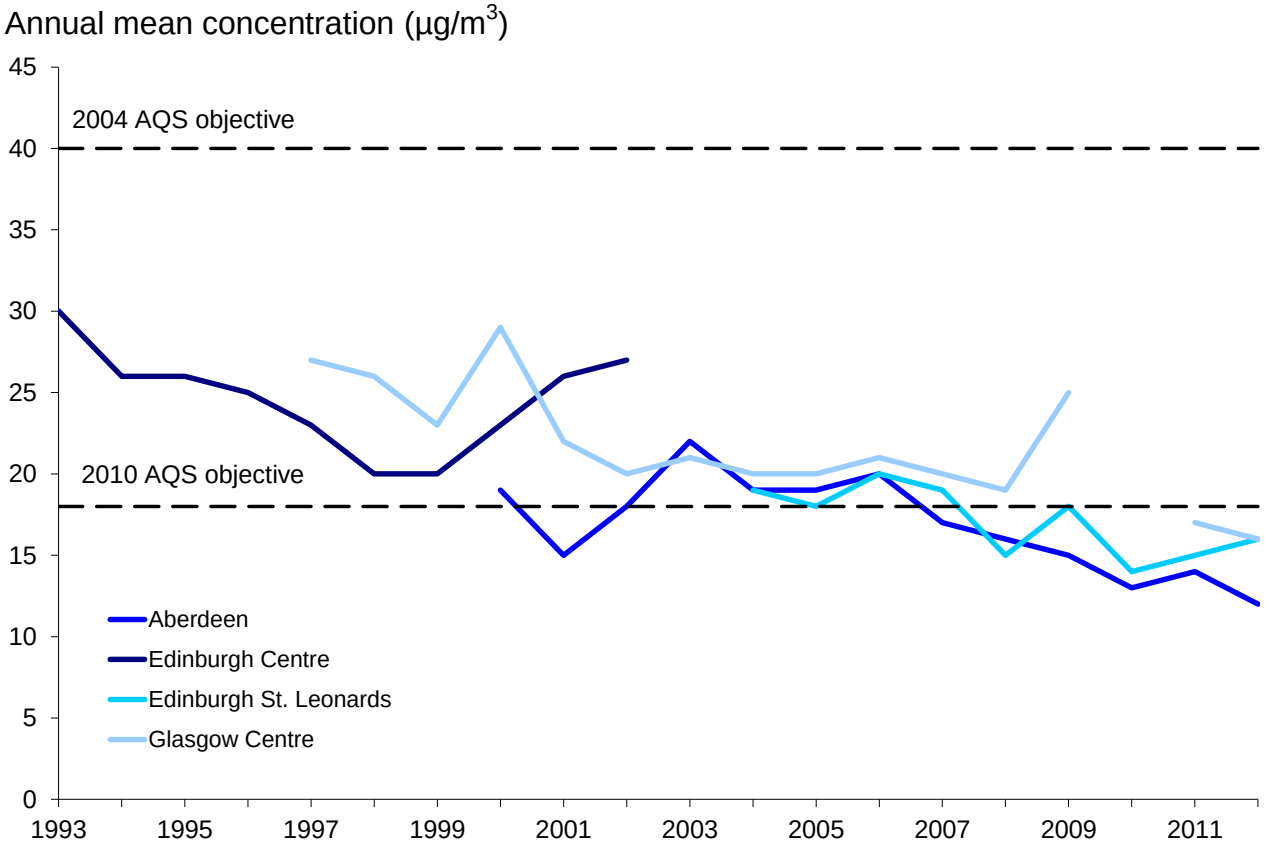
21) Climate Change (Annual Targets) (Scotland) Order 2010

22) Climate Change (Annual Targets) (Scotland) Order 2011

23) During each year, if emissions from Scottish EU ETS sites collectively exceed this cap total emissions are reduced by this amount as excess units must have been bought from overseas, carried over or brought forward. If, on the other hand, emissions from Scottish EU ETS sites collectively are below this cap total, emissions are increased by this amount as excess units must have been sold overseas or retained.

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

Particulate (PM_{10}) Concentrations[1,2,3]: 1993-2012



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

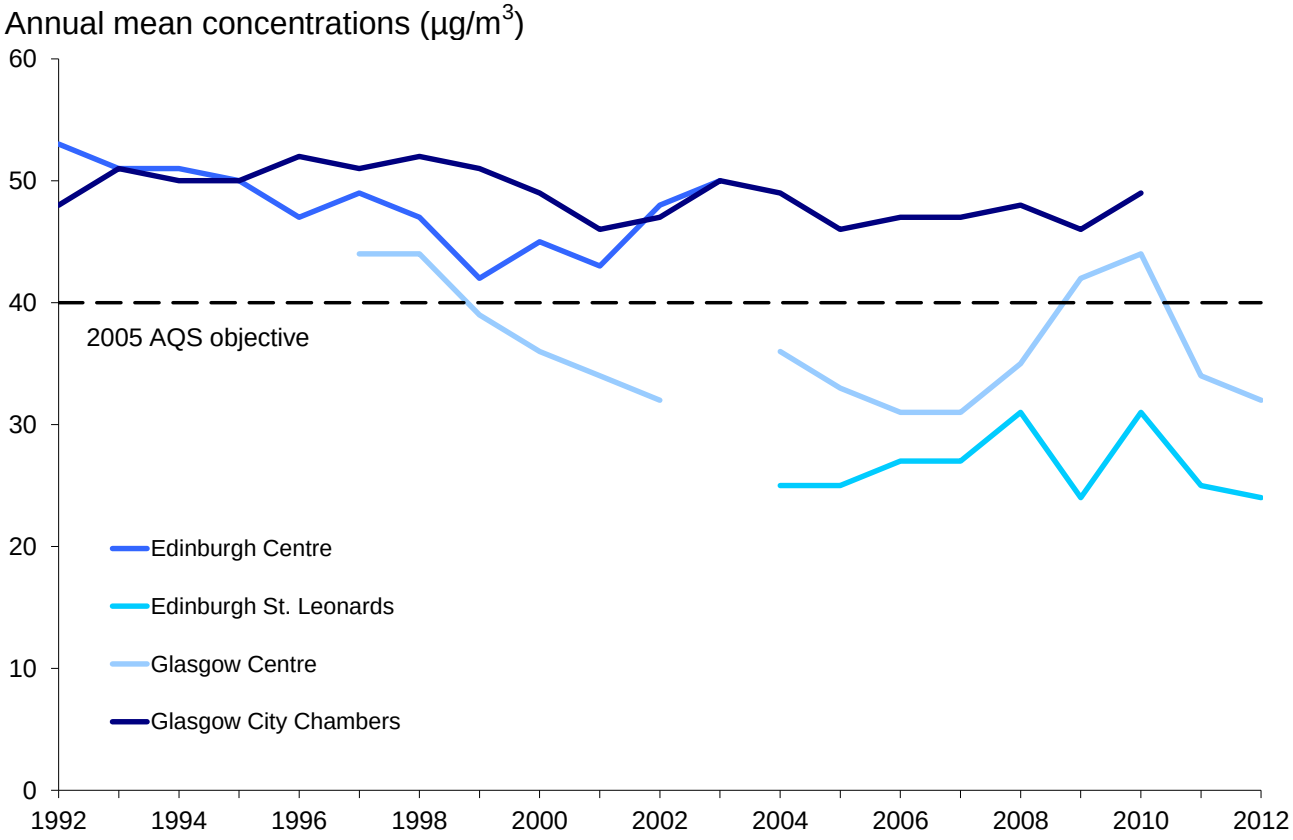
The greatest source of PM_{10} is combustion. Between 1990 and 2010, Scottish emissions of PM_{10} fell by 57%.[4]

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 2012, the Stage 1 objectives were met at all of the automatic monitoring sites.[6] The Stage 2 annual mean objective was not met at 8 of 58 automatic monitoring sites in Scotland in 2012. Five sites also failed to meet the Scottish daily mean objective. Since 2010, Edinburgh Salamander Street has not met the stage two Scottish objectives.

Source: Scottish Air Quality Database / Metadata

Nitrogen Dioxide Concentrations[1,7,8]: 1992-2012



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

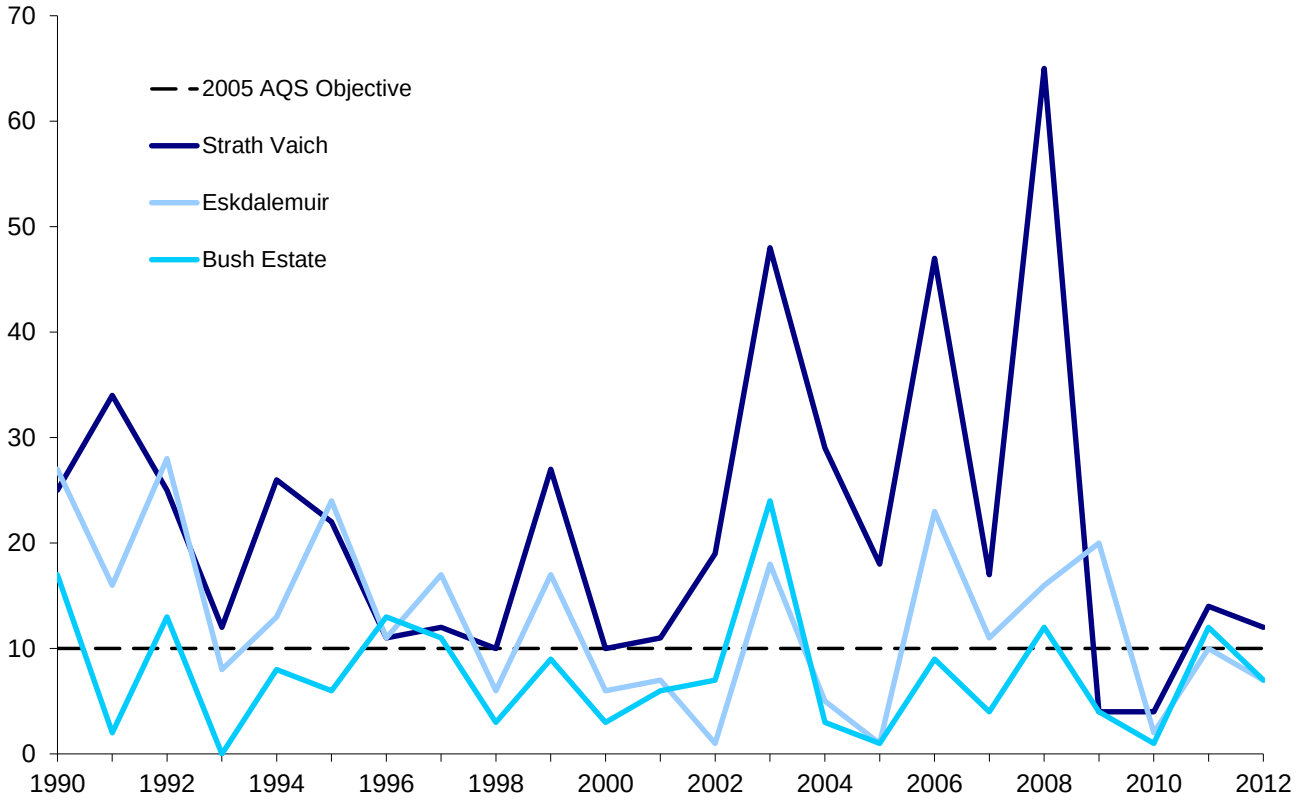
Between 1990 and 2010, Scottish emissions of nitrogen oxides have fallen by 61%.[4]

The UK Air Quality Strategy[5] objectives for NO_2 (to be met by the end of 2005) are (1) an annual mean of 40µg/m^3 and (2) an hourly mean of 200µg/m^3 not to be exceeded more than 18 times a year. In 2012, the first objective was not met at 16 of the 66 automatic monitoring sites[9] 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.

Source: Scottish Air Quality Database / Metadata

Ground Level Ozone Concentrations[1]: 1990-2012

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.

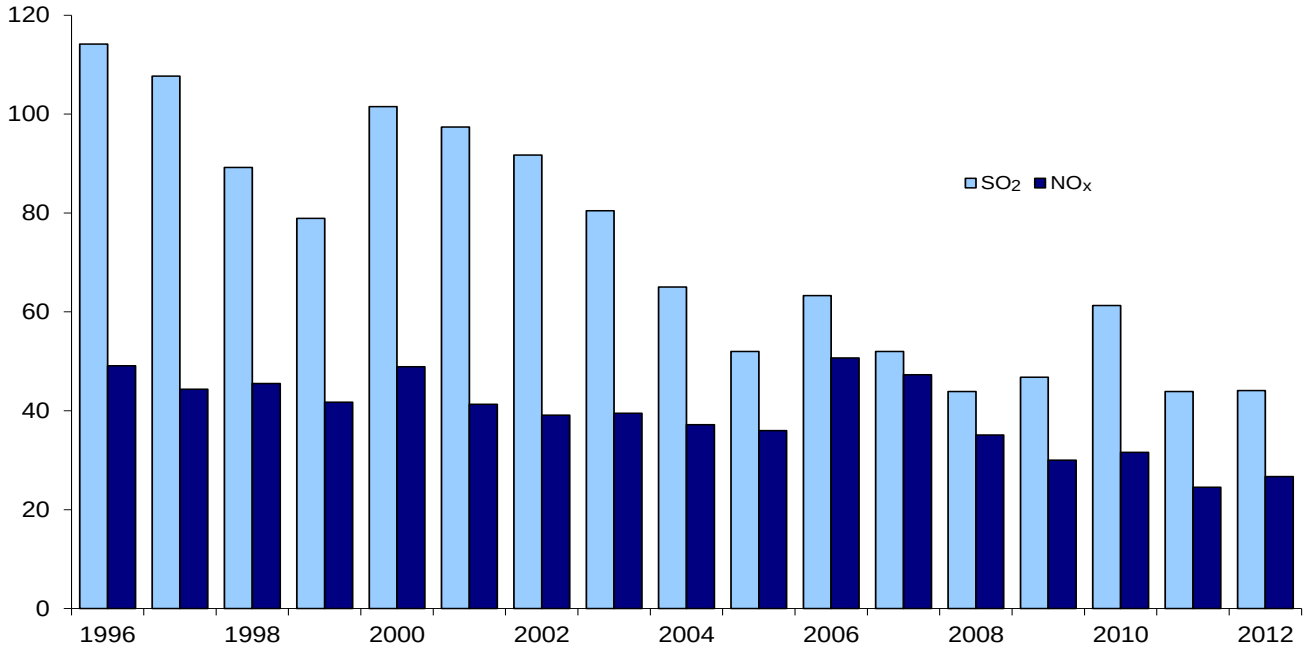
Ozone is formed by a slow, complicated series of reactions from other pollutants that may be blown over from Europe. The most important man-made precursors are nitrogen oxides and volatile organic compounds produced by road transport, industrial processes and solvent use. Ozone concentrations tend to 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 2012, this objective was met at 8 of the 9 sites.[10] The site that failed was Strath Vaich. Strath Vaich regularly fails to meet the AQS objective, most recently failing in the periods 2005-08 and 2011-12.

Source: Scottish Air Quality Database / Metadata

Emissions of Sulphur Dioxide and Nitrogen Oxides from Large Combustion Plants[11]: 1996-2012

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 2010, large combustion plants (LCPs) accounted for 81% of the SO_2 emissions and 36% of NO_x emissions in Scotland.[4] In 2012 there were 54 LCPs in Scotland, down from 57 in 2011.

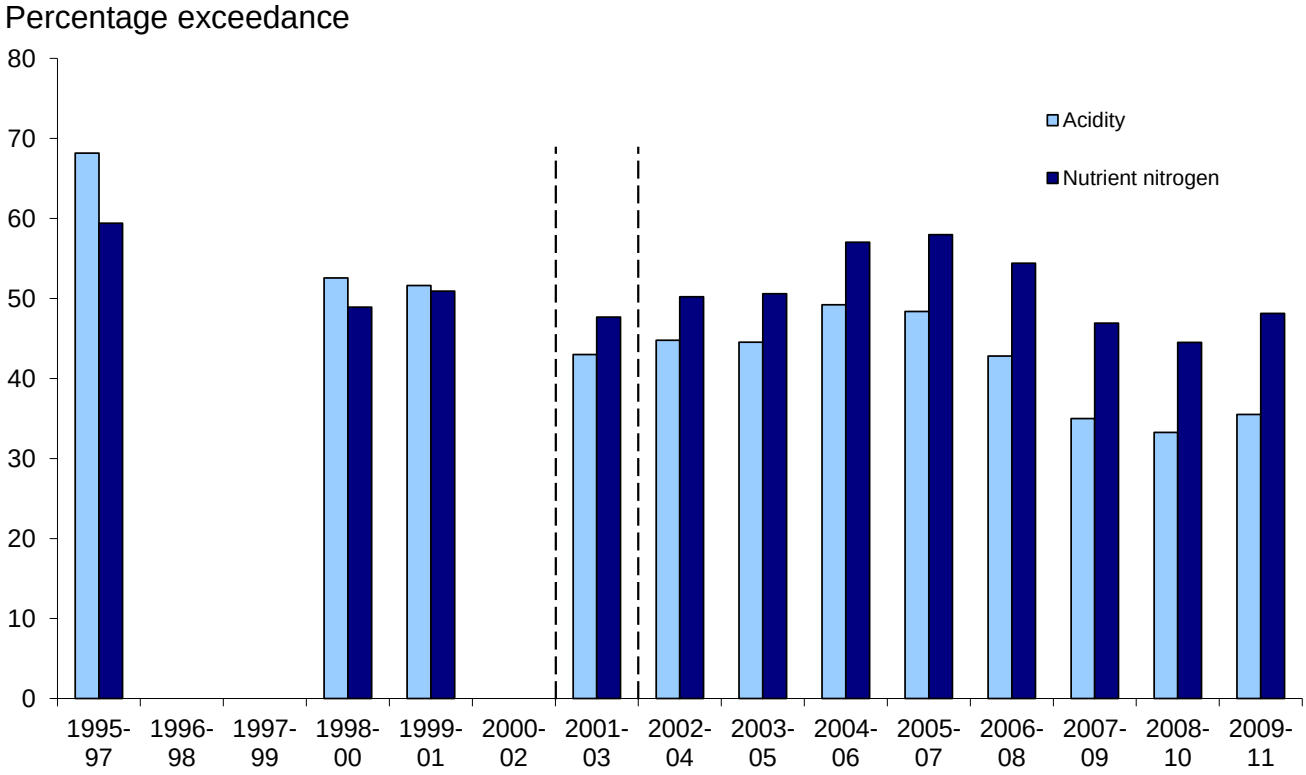
The Large Combustion Plants Directive (LCPD, since revised by 2001/80/EC) called for a 60% reduction in LCP SO_2 emissions by 2003 and a 30% reduction in LCP NO_x emissions by 1998, from a 1980 baseline. By 2002, total UK emissions of SO_2 were 79% below 1980 levels, and 95% below 1980 levels in 2011. In 1998, total UK emissions of NO_x were 60% below 1980 levels, and 74% below 1980 levels in 2011.[12] 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 in 2000, 2006, 2009 and 2010. These rises were due to the cold weather and increased use of coal-fired power stations, necessary to offset the reduced capacity of the nuclear sector because of refurbishment work at certain plants. This was followed by decreases in 2007, 2008 and in 2011. In 2012, SO_2 emissions increased by less than 1%, following a 28% decrease in 2011.

Despite increased production of electricity, emissions of NO_x emissions decreased by 41% between 2006 and 2009, as new abatement technology helped to reduce the emissions of NO_x. This was followed by a small increase of 5% in 2010, before a 22% reduction between 2010 and 2011, in part due to a reduction in Cockenzie's emissions. 2011 emissions of NO_x were the lowest on record, with 2012 seeing an increase of 9%.

Source: Scottish Environment Protection Agency / Metadata

Sensitive Habitats Exceeding Critical Loads for Acidification and Eutrophication[14]: 1995-1997 to 2009-2011



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

Around 60% of Scotland's land area contains habitats sensitive to acid deposition and 55% to eutrophication. Scotland experienced a reduction in acidity exceedance from 68% in 1995-1997 to 36% in 2009-2011, primarily due to reductions in sulphur emissions. This included a 13% reduction in acidity exceedance between 2004-06 and 2009-11. Following a period of increase between 2001-2003 and 2005-2007, nutrient nitrogen exceedance decreased by 10% between 2005-2007 and 2009-2011. However, there was an increase in nutrient nitrogen exceedance from 45% in 2008-2010 to 48% in 2009-2011. Overall, nutrient nitrogen exceedance fell from 59% to 48% in the period 1995-1997 to 2009-2011.[16]

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) MacCarthy, J., Thistlethwaite, G., Pang, Y., Salisbury, E. & Misselbrook, T. (2012). Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010.

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 2012, PM_{10} concentration was measured at 76 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) 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.

8) 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.

9) In 2012, concentrations of nitrogen oxides are measured at 76 automatic monitoring sites in Scotland. Of these sites, 66 had a capture rate of at least 75% - data for these sites can be found on the Scottish Air Quality Database.

10) In 2012, ozone concentrations were measured at 11 sites, but two of these had a data capture rate of less than 75%. Data for these sites are available on the Scottish Air Quality Database.

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

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

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

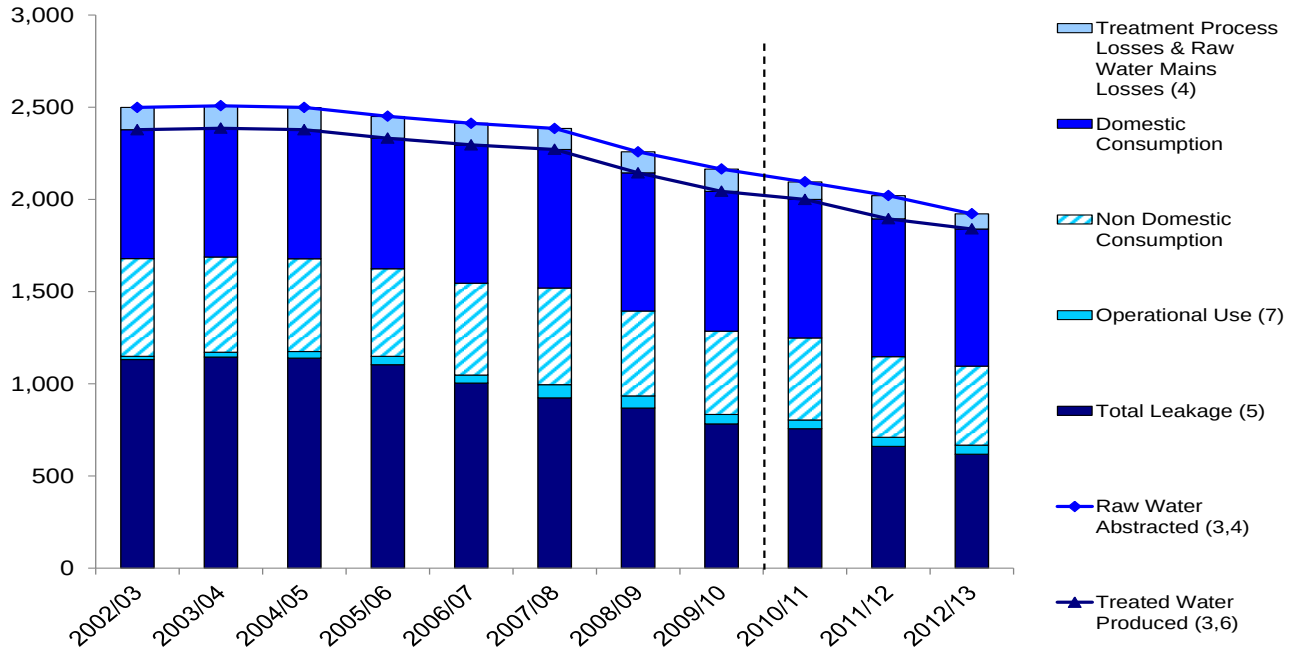
14) 3-year average deposition is used to reduce substantial year to year variability. Deposition data for 1995-97 to 1999-01 are based on the same methodology. Changes have been made to the methods for estimating deposition subsequently: (i) nitric acid deposition has been included in data from 2001-03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

15) 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.

16) 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]: 2002/03-2012/13

Million litres per day (Ml/d)



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

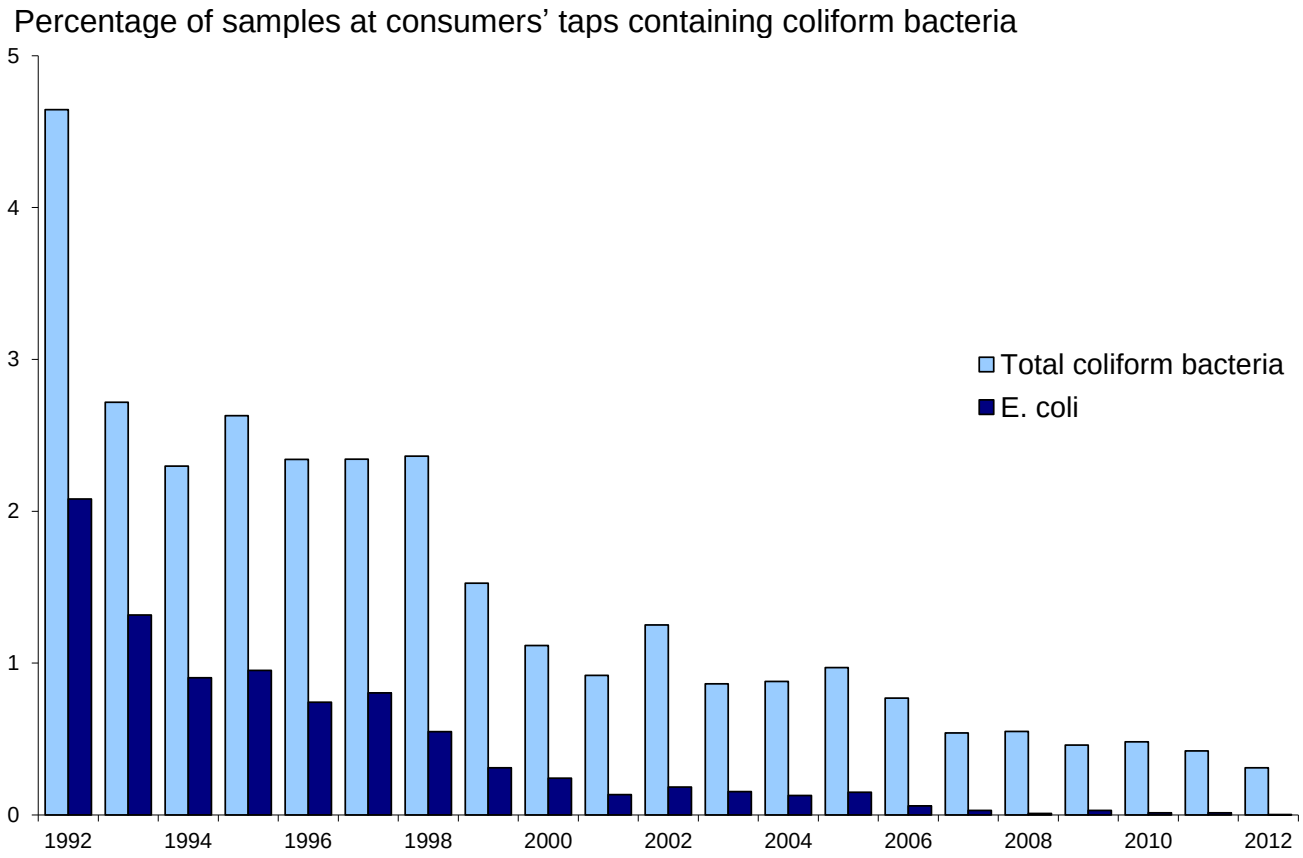
Between 2002/03 and 2009/10, estimated raw water abstractions by Scottish Water decreased by 13% to 2,165 Ml/d. Between 2010/11 and 2012/13, using improved data and methodology, the volume of raw water abstracted also decreased and was 1,922 Ml/d in 2012/13. Between 2002/03 and 2012/13, domestic water consumption increased by 7%, whilst non domestic consumption decreased by 19%.

Treated water produced has fallen by 55 Ml/d to a new low of 1,840 Ml/d. 78% of this reduction is due to a further reduction in leakage of 43 Ml/d to 618 Ml/d. Operational use has increased by 1 Ml/d over the past year to 50 Ml/d. Both household and non-household demand have decreased, accounting for the remaining 12 Ml/d decrease in DI.

The total volume of abstracted water has decreased by 99 Ml/d, and the resultant raw water losses have restored to a more consistent volume than reported in 2011/12. Having reduced leakage in recent years, and attaining the Economic Level of Leakage (ELL) in 2012/13, one year ahead of regulatory expectation, Scottish Water continues to manage leakage at the ELL. Reducing leakage has led to a similar reduction in the water abstracted and the treated water produced, resulting in a new low annualised average for water into supply of 1,840 Ml/d for 2012/13. This low has been driven mainly from the significant 45% reduction in leakage since 2006.

Source: Scottish Water / Metadata

Drinking Water Quality: 1992-2012



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.

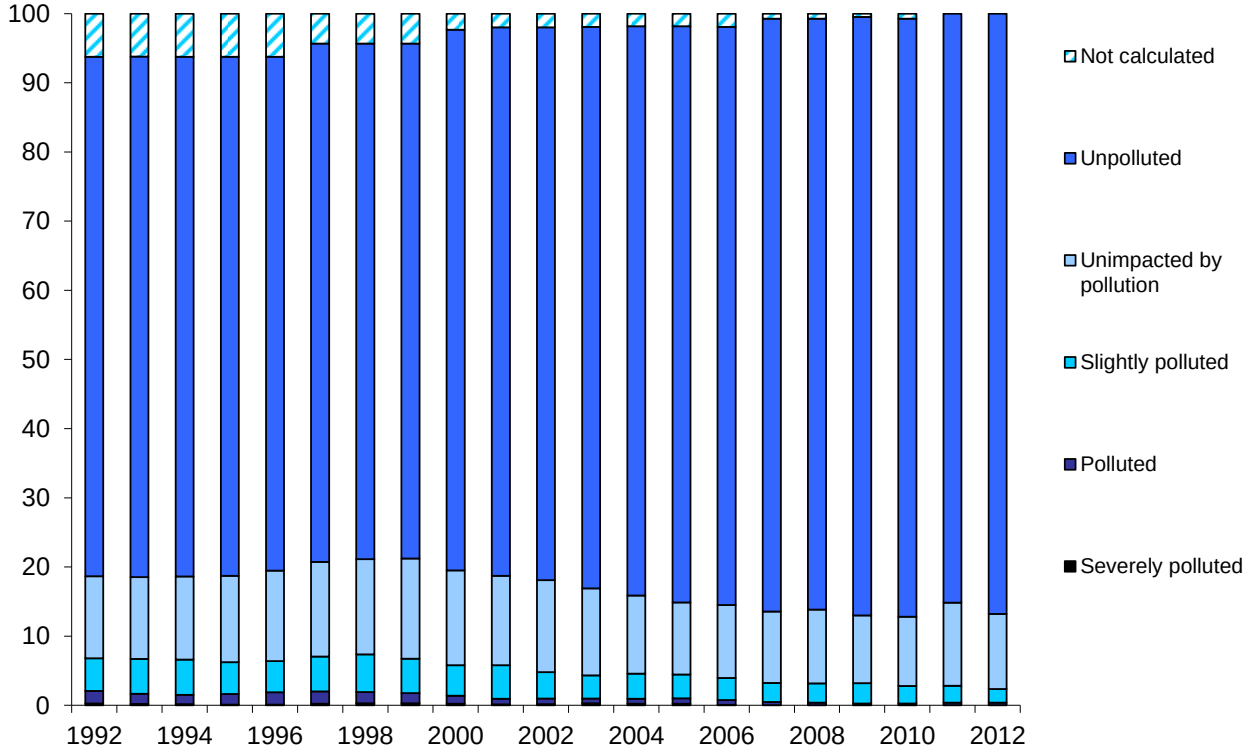
Scottish Water is required to analyse samples taken from water treatment works, service reservoirs and consumers' taps. The Water Supply (Water Quality) (Scotland) Regulations 2001 set strict standards for compliance for a wide range of parameters. The major centres of population in Scotland are served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

Between 1992 and 2012, the percentage of samples from consumer taps containing coliform bacteria fell from 4.64% to 0.31% and the percentage containing Escherichia coli (E.coli) fell from 2.08% to 0.0033%. Samples containing coliform bacteria fail to meet the water quality standards. Between 2011 and 2012 the failure rate for E. coli decreased by 0.01 percentage points while the failure rate for total coliforms decreased by 0.11 percentage points.

Source: Drinking Water Quality Regulator For Scotland / Metadata

River Water Quality[R]: 1992-2012

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 may 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.[8]

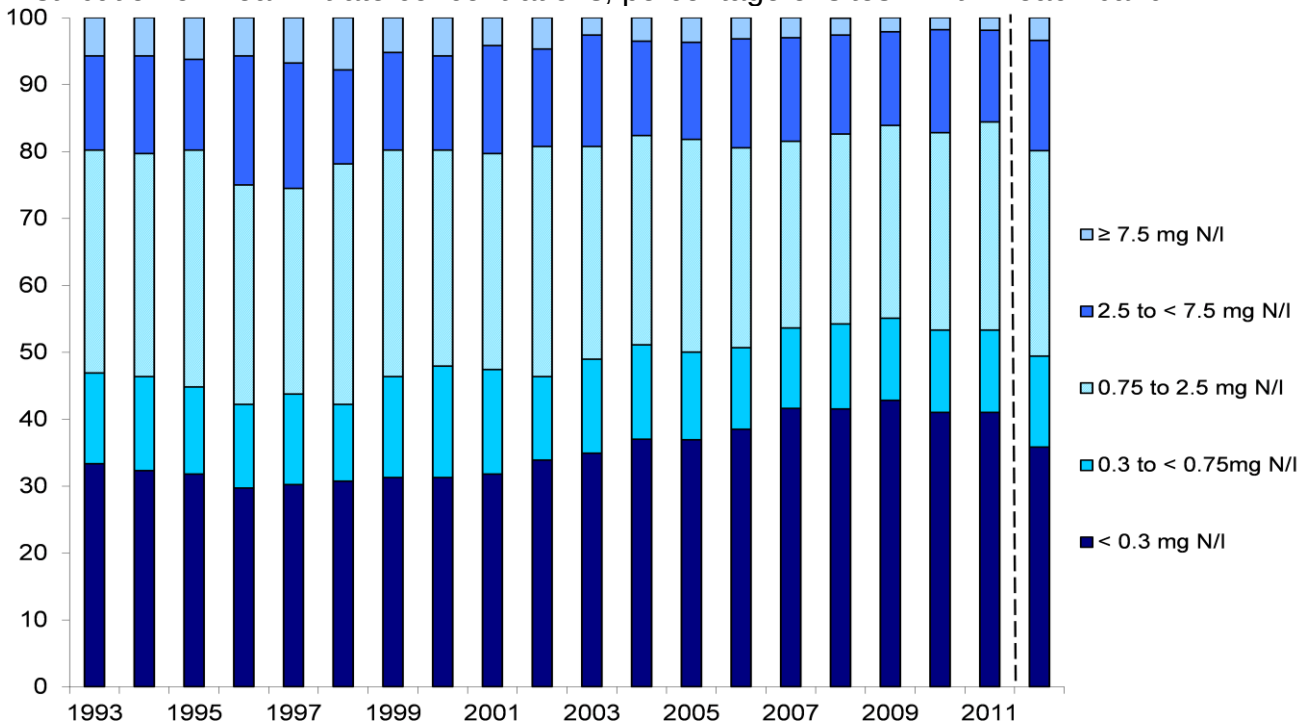
In this indicator, river water quality is classified as *unpolluted*, *unimpacted by pollution*, *slightly polluted*, *polluted,* or *severely polluted.* Between 1992 and 2012, the proportion of river length for which river quality could not be calculated fell from 6.2% to zero. Most of these water bodies were subsequently classed as *unpolluted* or *unimpacted by pollution*.

Between 1992 and 2012, 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. 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. After falling to 85.2% in 2011 the proportion then rose again to 86.8% in 2012. The length of river classed as unimpacted by pollution fell from 12% in 2011 to 10.9% in 2012.

Source: Scottish Environment Protection Agency / Metadata

Nitrate Concentrations in Rivers[9]: 1993-2012

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 damage to the aquatic environment through the accelerated growth of algae and other plant life. The rapid growth and subsequent decay of plant organisms depletes oxygen levels, and this can have harmful effects upon fish and other aquatic life. This process is termed eutrophication.

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

Concentrations of nitrate below 0.3 mg N/l are considered to be natural or background levels[11]; since 2007, over 40% of the sites have met this classification. In 2011, 41.0% of sites had a mean nitrate concentration < 0.3 mg N/l. The percentage of sites with average nitrate concentrations ≥2.5 mg N/l peaked at 25.5% in 1997, but has since fallen to its lowest level of 15.6% in 2011.

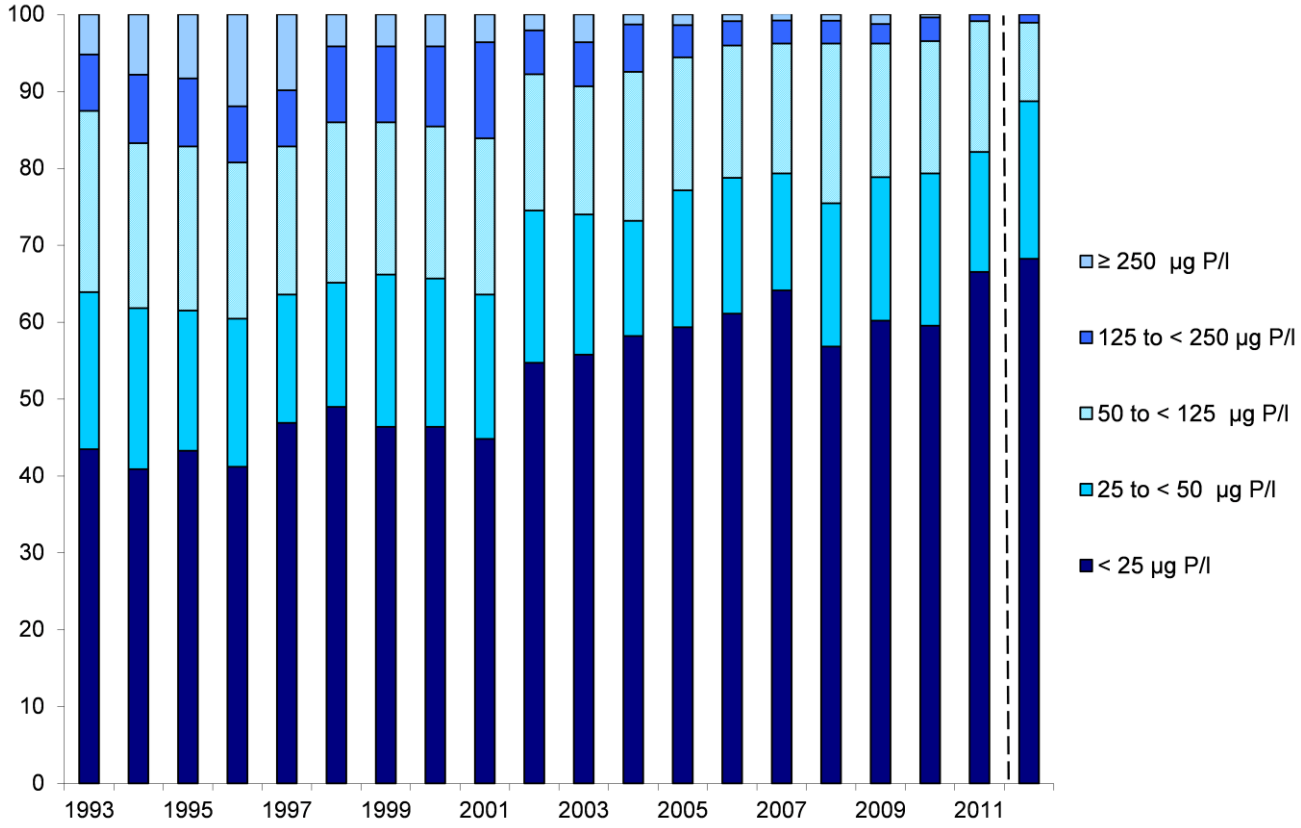
The 2012 figures are not directly comparable to previous figures as a smaller sample of sites (176, down from 200) has been used to calculate the percentages. This resulted in a change of the distribution of the nitrate concentrations in the sites. In 2012, 35.8% of sites had a mean nitrate concentration of < 0.3 mg N/l.

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[14]: 1993-2012

Distribution of mean orthophosphate concentrations, percentage of sites[10] 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.

The percentage of sites with a mean orthophosphate concentration <25 µg P/l rose to 64% in 2007, decreased to 57% in 2008, then settled around 60% in 2009 and 2010. In 2011 the percentage increased to approximately 67%. The percentage of sites with a mean orthophosphate concentration ≥ 125 µg P/l has fallen gradually since 2001. In 2011, less than 1% of sites had mean orthophosphate concentrations ≥ 125 µg P/l.

The 2012 figures are not directly comparable to previous figures as a smaller sample of sites (176, down from 200) has been used to calculate the percentages. In 2012, the percentage of sites with a mean orthophosphate concentration <25 µg P/l was 68%.

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 financial year.

2) 2012/13 data subject to Water Industry Commission confirmation.

3) The figure for raw water abstracted for 2012/13, is the corporate data submitted to SEPA. However, this is required to be collected over the calendar year, 2012 whilst treated water produced data is based on the business reporting year, April 2012 to March 2013. Since 2010/11 raw water abstracted has been based on metered data. Prior to 2010/11 it was estimated based on a calculation methodology.

4) Figures for raw water abstracted and treatment process losses and raw water mains losses are estimates up to 2009/10. In 2010, slight corrections have been made to years 07/08 and 08/09.

5) 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.

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

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) 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.

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

10) A set of around 176 sites was used in 2012, based on nitrate directive locations. Previously around 200 sites had been used. The reduction in sites is a consequence of SEPA moving to a risk based monitoring network. The risk based approach means that sites with background levels and little risk of anthropogenic influence are no longer monitored reducing the percentage in the lower categories and increasing the percentage in the higher categories.

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'.

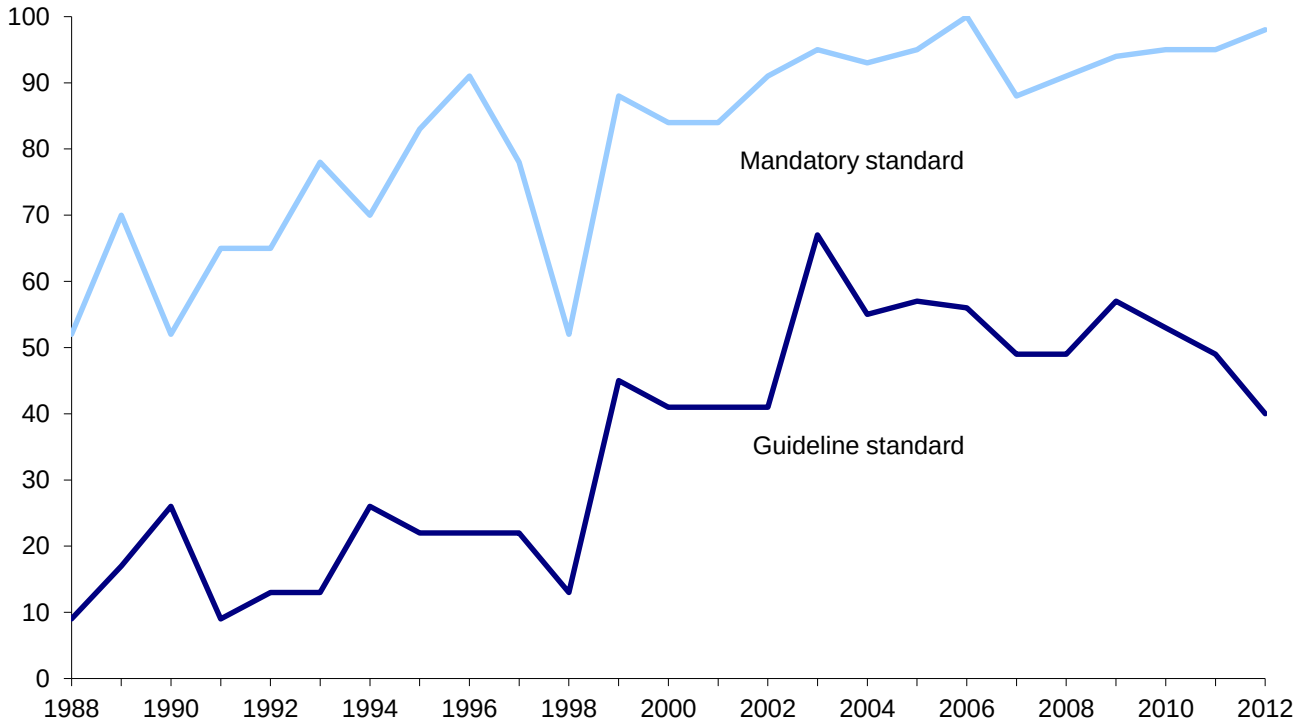
12) In Aberdeen, Moray, Banff and Buchan; Strathmore and Fife; Lothians and Borders; and Lower Nithsdale.

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): 1988-2012

Percentage compliance of coastal bathing waters[1]



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

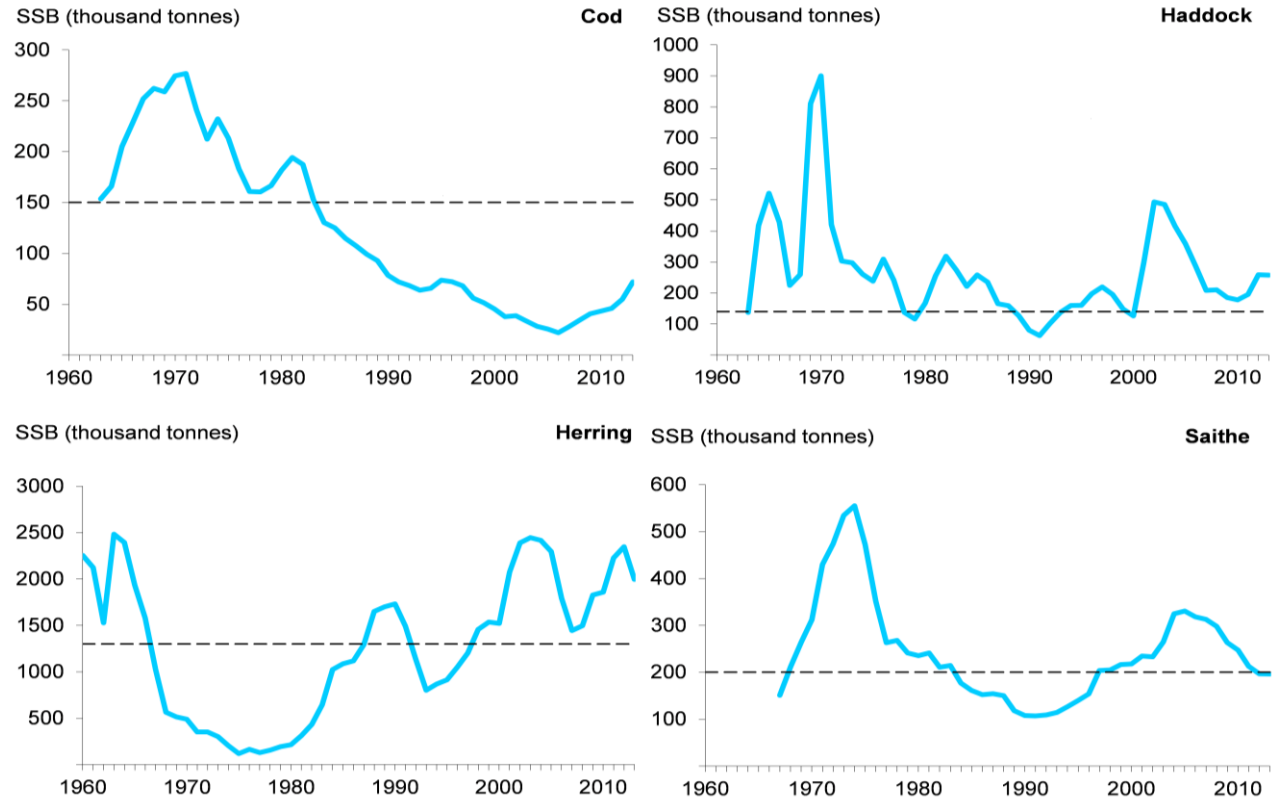
EC Bathing Water Directive (76/160/EEC) sets out two quality standards - the 'mandatory' standard, and the stricter 'guideline' standard. Member states should comply with the mandatory standard and aim to comply with the guideline standard. In 2012, 98% of the 80 identified coastal bathing waters achieved the mandatory standard, and 40% achieved the guideline standard.

It is important to note that the weather has a bearing on compliance, with wet weather often contributing to poorer results and, conversely, drier, sunnier weather associated with better results. Under Article 5.2 of the current directive (76/160/EEC), results can be excluded from consideration if they are the consequence of abnormal situations. If a result is excluded, then a replacement sample is taken immediately after the abnormal effects have ceased.

Under the new directive, bathing waters are assessed over a 4 year period. With the first report due in 2015, this means sampling under the new directive will begin in 2012.

Source: Scottish Environment Protection Agency / Metadata

Selected Commercial Fish Stocks[R,2,3,4]: 1960–2013



– – precautionary biological limit (Bpa)

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. 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 increased every year from 2006 to 2013, but the value of 72 kt is still well below the Bpa of 150 kt. The SSB of haddock has been above the Bpa of 140 kt since 2001. The value declined steadily from 2002 to 2011, but has since increased to 258 kt in 2013. The SSB of herring stocks has been above the Bpa of 1,300 kt since 1998. Since falling to 1,444 kt in 2007, it rose to 2,348 kt in 2012 before declining again to 1,996 kt in 2013. The SSB of the North Sea/West of Scotland saithe was estimated to be just over 196 kt in both 2012 and 2013; the value has been gradually declining since 2005 and has fallen just below the Bpa in the previous two years.

The size of these stocks are affected by several factors, including commercial fishing and other factors such as climate change and success of recruitment. A range of management measures are applied to fishing activity in Scotland, with the aim of achieving or maintaining healthy stock levels.[7]

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 2012. There were 23 identified bathing waters in the period 1988-98, but this number has since increased to 83 in 2012. 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) It is the nature of fish stock assessments that the most recent year's estimates are also the least certain, and subject to revision when subsequent years' data become available.

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

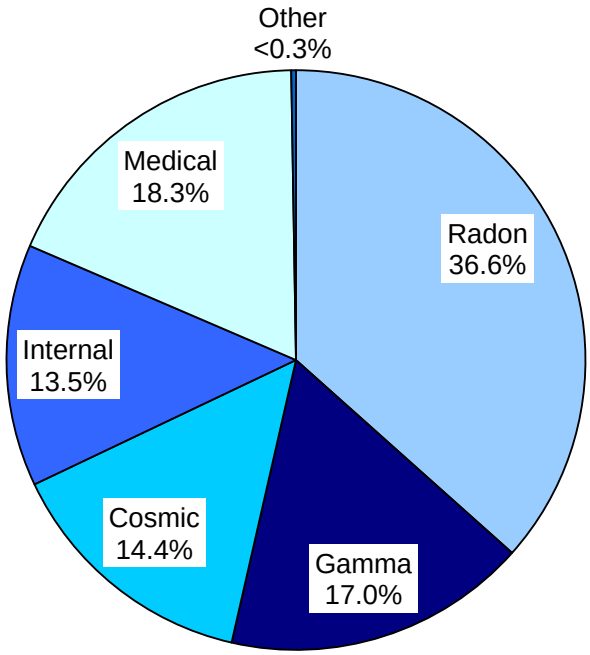
5) The spawning stock biomass (SSB) is the total weight of mature fish (capable of spawning) in a particular stock.

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) 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]



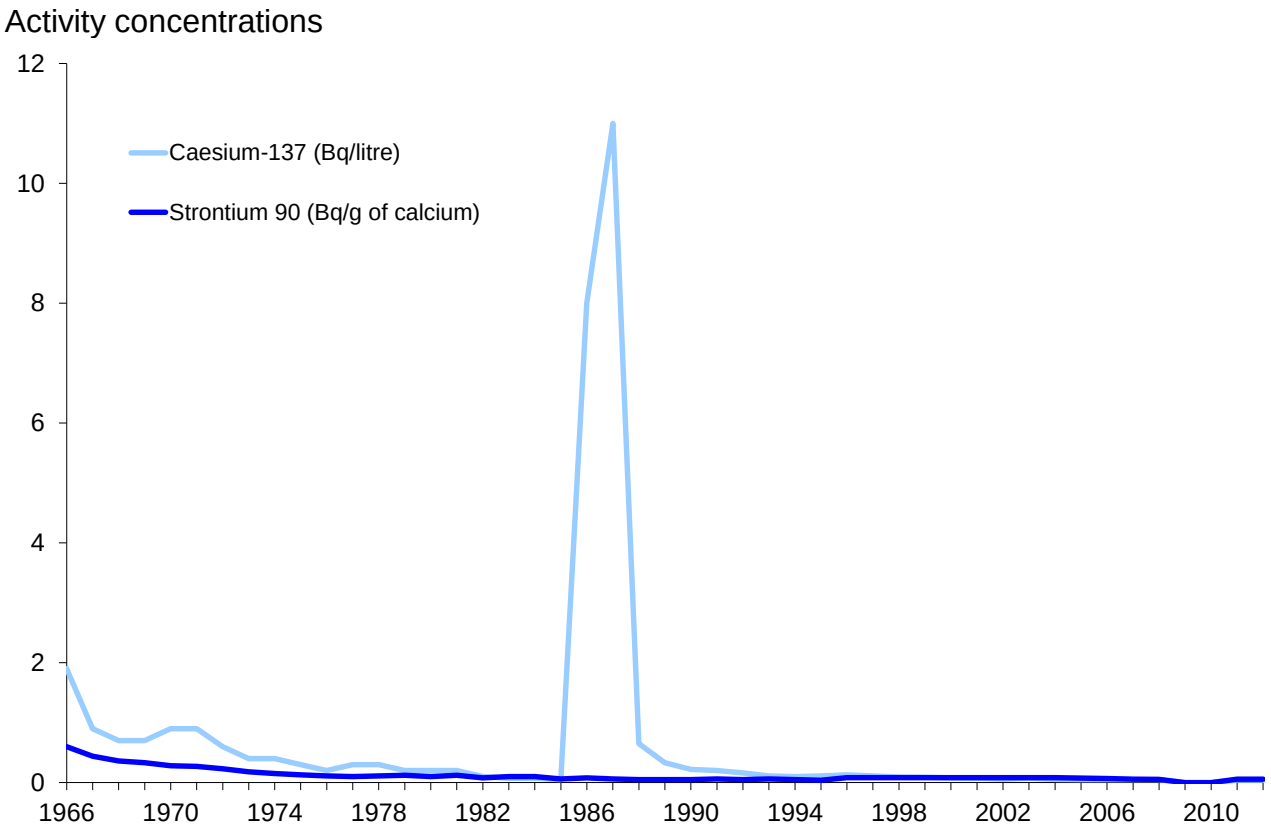
The average annual dose of radiation to someone living in Scotland is 2,300 microsieverts, 81% of which comes from natural sources. This has fallen from 2,400 microsieverts in 2003. The greatest source of natural radiation exposure is radon, a radioactive gas that is emitted from tiny amounts of uranium 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 cosmic rays, terrestrial gamma rays and long-lived radionuclides that enter the body through food and drink.

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

Source: Health Protection Agency – Radiation Protection Division / Metadata

Activity Concentrations in Milk: 1966-2012[3]



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

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

Following the Chernobyl reactor incident in 1986, concentrations of ^{137}Cs in milk peaked in 1987 and then began to fall again and are now below pre-Chernobyl levels.[4] In 2012, the concentration of ^{137}Cs was <0.041 Bq/litre and ^{90}Sr was <0.055 Bq/gram of calcium. However, even at its peak the ^{137}Cs concentration in milk was still below the Community Food Intervention Levels, defined by Euratom Regulations EC/3954/87 and EC/2218/89, which were derived to ensure the protection of the public. At its peak concentration following the Chernobyl accident the levels of ^{137}Cs in milk were around 100 times lower than the intervention level.

Source: Scottish Environment Protection Agency / Metadata

Radioactivity – Footnotes

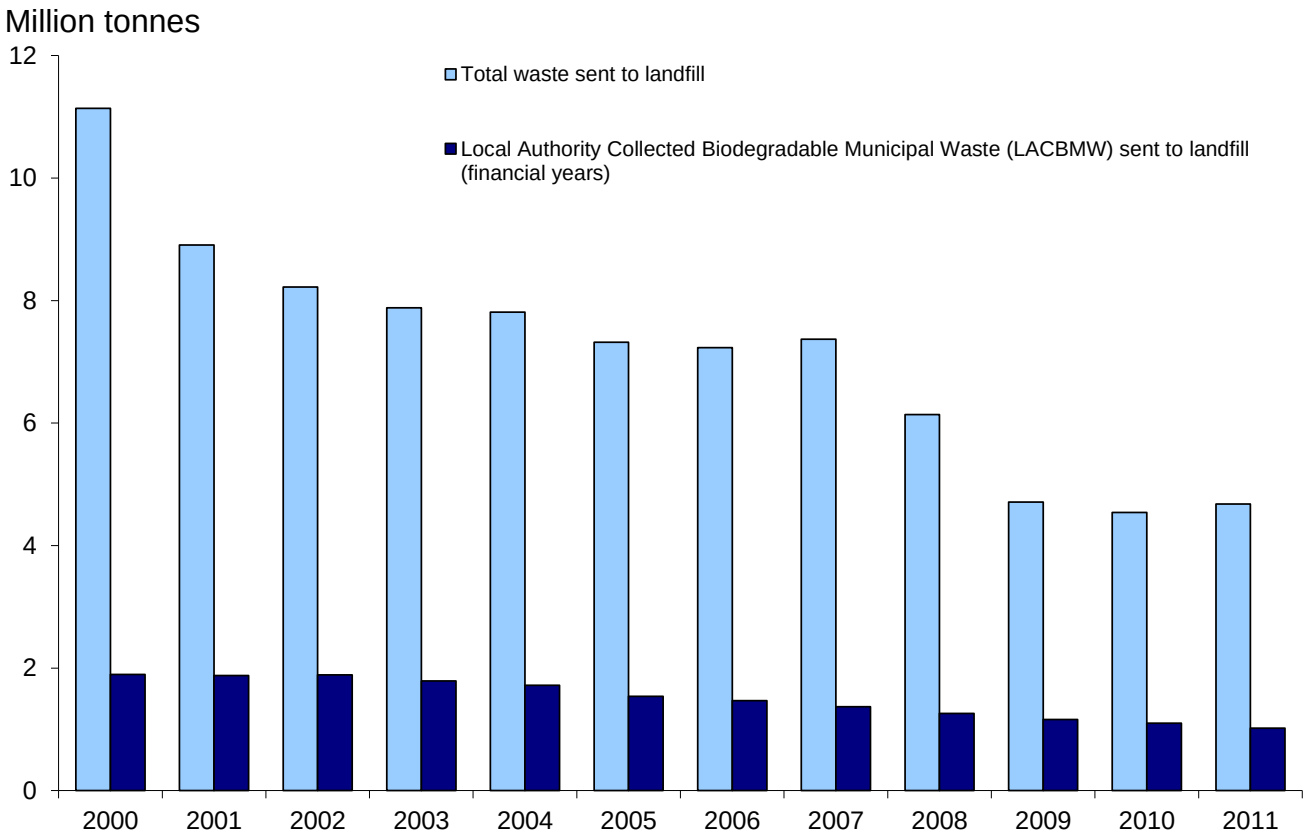
1) Radon and gamma values are specific to Scotland. Other values are assumed to be the same as the UK average as published in the Health Protection Agency – Radiation Protection Division's publication: HPA-RPD-001 - Ionising Radiation Exposure of the UK Population: 2005 Review.

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: 2000-2011



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

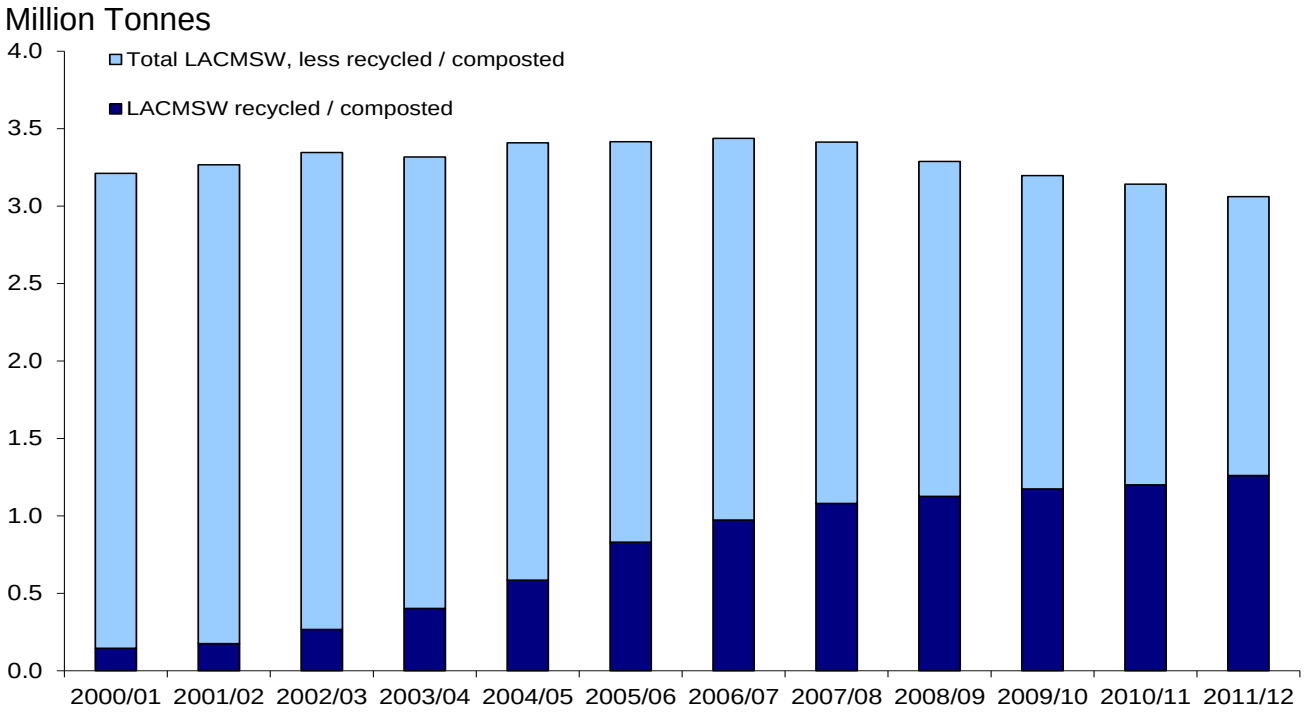
Landfill is at the bottom of the waste hierarchy. In Scotland, 4.68 million tonnes were landfilled[2] in 2011, an increase of 3% from 2010. Local Authority Collected Biodegradable Municipal Waste (LACBMW)[3,4,5] accounted for 1.02 million tonnes in 2011. Between 2000 and 2011 the total waste sent to landfill decreased by 58%, while the amount of LACBMW sent to landfill decreased by 46%. LACBMW items such as paper and card, textiles, food and garden waste decompose and release the greenhouse gases methane and carbon dioxide.

In 2007, the Scottish Government set a target for the maximum amount of LACBMW sent to landfill of 1.32 million tonnes by 2010. This target (which was achieved in 2009 - 2011) was in line with regulations introduced in 2004[6], which set targets for each of the administrations in the United Kingdom to meet UK targets set in the EU Landfill Directive.[7]

The Landfill Tax was introduced in 1996 in order to discourage the disposal of waste to landfill. The tax rate was increased to £40 per tonne for biodegradable waste for 2009/10, and will continue to rise by £8 each year until at least 2014. The lower rate applying to inactive waste increased from £2 to £2.50 per tonne on 1 April 2008.

Source: Scottish Environment Protection Agency / Metadata

Local Authority Collected Municipal Solid Waste (LACMSW)[3,4]: 2000/01-2011/12



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 destroy landscapes and ecosystems. Reducing, re-using and recovering waste are key to sustainable development and Zero Waste objectives.

Local authority collected (LAC) municipal waste arisings rose from 3.21 million tonnes in 2000/1 to 3.44 million tonnes in 2006/07, before falling to 3.06 million tonnes in 2011/12. Over the same period the percentage of LAC municipal waste recycled or composted rose from 4.5% to 41.2%. This reflects an increase in the amount of material recycled or composted of over 900%. The amount of MSW being sent to landfill as a percentage of total LACMSW arisings has decreased steadily between 2000/01 and 2011/12 from 94% to 56% respectively

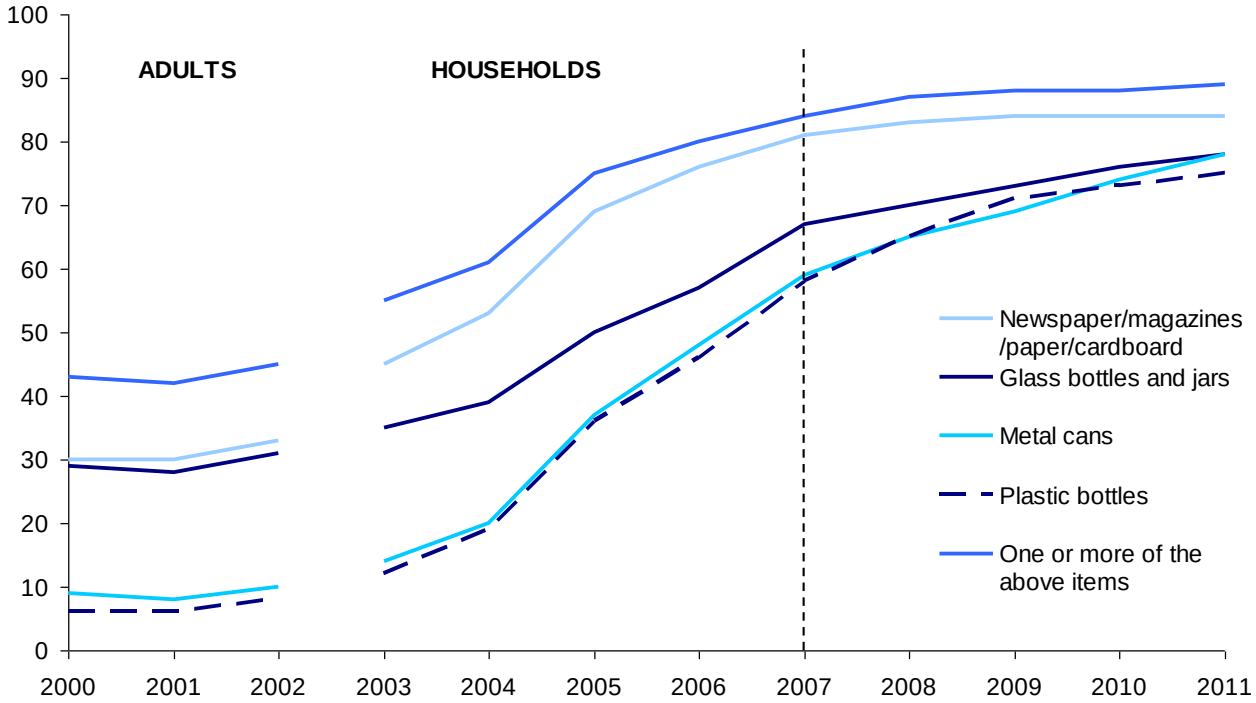
The National Waste Plan[8] set a target of stopping growth in municipal waste by 2010. In 2008, the Scottish Government also set targets[9] to increase the amount of municipal waste being recycled or composted to 40% by 2010, 50% by 2013, 60% by 2020 and 70% by 2025.

These targets have been included in the Zero Waste Plan[10] issued in 2010, but have been revised to apply to waste collected from households. This was accompanied by a new approach to assessing recycling rates based upon carbon. Future assessments of recycling rates will include a carbon measure, thereby helping to target recycling efforts at those materials with the highest environmental impacts. The Zero Waste plan also established a target to achieve a 70% recycling rate and 5% landfill rate by 2025 for all wastes, not just municipal waste

Source: Scottish Environment Protection Agency / Metadata

Waste Recycling Behaviour: 2000-2011 and Food Waste Disposal: 2012

% surveyed who reported recycling waste items in the past month[11,12,13]



Waste prevention, minimisation and re-use are at the top of the waste hierarchy[1] and recognition for this is given in Scotland's Zero Waste Plan.[10] The Scottish Household Survey[14] provides information on recycling behaviour. Before 2003, adults were asked which, if any, of a selection of certain waste items, they had recycled from home in the past month. From 2003, the same question was asked of households.

In 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.

In 2012, the question on recycling was changed to focus on food waste disposal[15]. Respondents were asked how they disposed of food waste in the previous week and were given three options, of which they could select more than one. In 2012, almost three quarters (73%) of households surveyed said that they had disposed of food waste as general waste along with other rubbish. Just over a quarter of households (26%) used a local-authority provided caddy, receptacle or bin. One-in-ten households disposed of food waste by home composting (for instance, a heap in a garden or allotment, green cone or wormery).

Source: Scottish Government / Metadata

Waste & Recycling – Footnotes

1) Waste hierarchy (SEPA).

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

3) The definition of municipal waste has changed slightly over the time period in which these data have been collected. The current definition of municipal waste is household and similar waste.

4) Local authority collected municipal waste is all waste for which the councils make arrangements, with the exclusion of: abandoned vehicles; road maintenance waste; commercial waste that is delivered to local authority owned or run landfill sites where the local authority has no part in the collection or disposal arrangements that have led to this delivery; industrial waste collected from industrial premises and taken for disposal or treatment separately from any other waste; and construction and demolition waste that is collected and taken for disposal or treatment separately from any other waste. Bricks and rubble taken to civic amenity sites are included in municipal waste.

5) The LACBMW data for 2001-2011 are for financial years. To calculate the LACBMW in the years before 2003/2004, it has been assumed that 63% of the waste landfilled was biodegradable. A mass balance calculation, assuming 63% of waste arisings are biodegradable, has been used to provide the data from 2003/2004 onwards. Landfill Allowance Scheme (Scotland) Regulations 2005.

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

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

8) National Waste Plan (2003).

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

10) Zero Waste Plan (2010).

11) Number surveyed in 2011: 10,777.

12) 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.

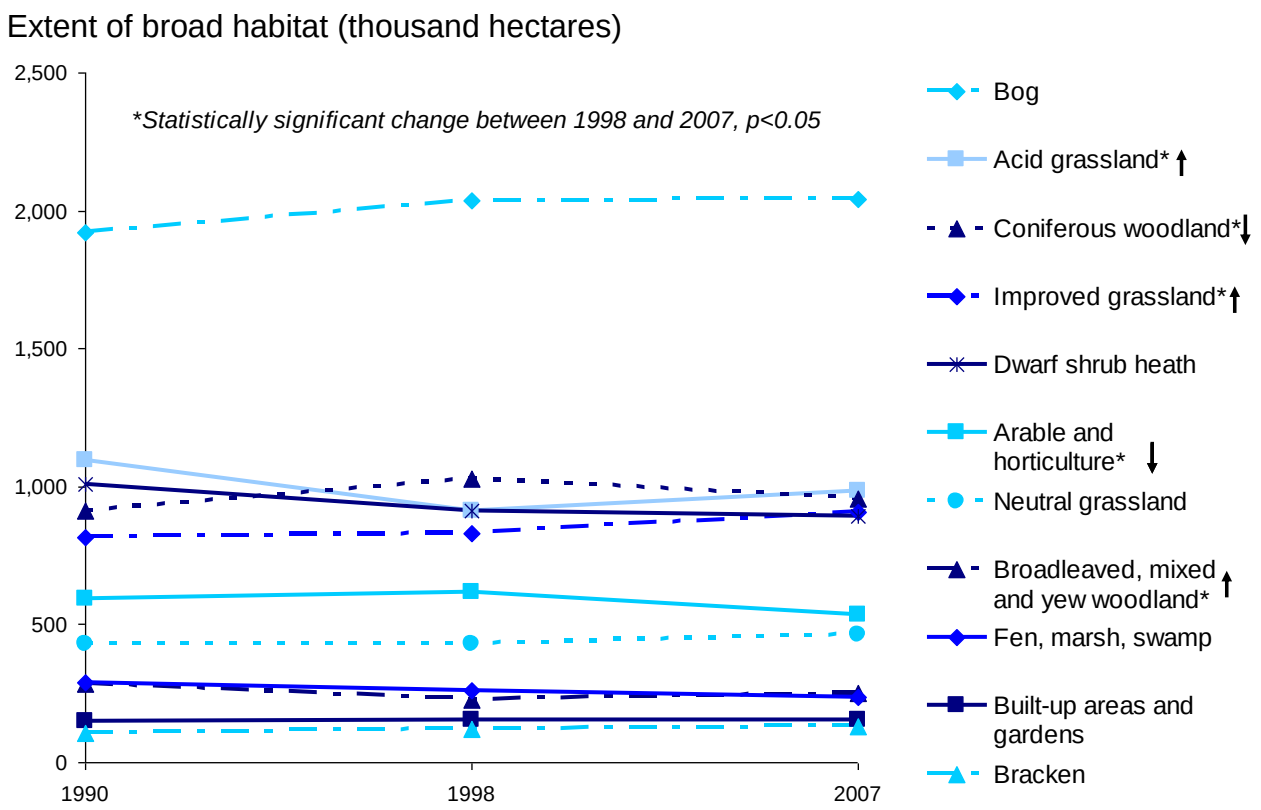
13 From 2007 to 2011, this question was asked of three quarters of the sample. Previously, it was asked of all households. In previous years the question asked whether or not the

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’.

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

15) In 2012, the Scottish Household Survey question on recycling was replaced with a question on how households dispose of food waste. This question was asked of a third of the sample - 3,461 in 2012.

Broad Habitat Change: 1990-2007[1]



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

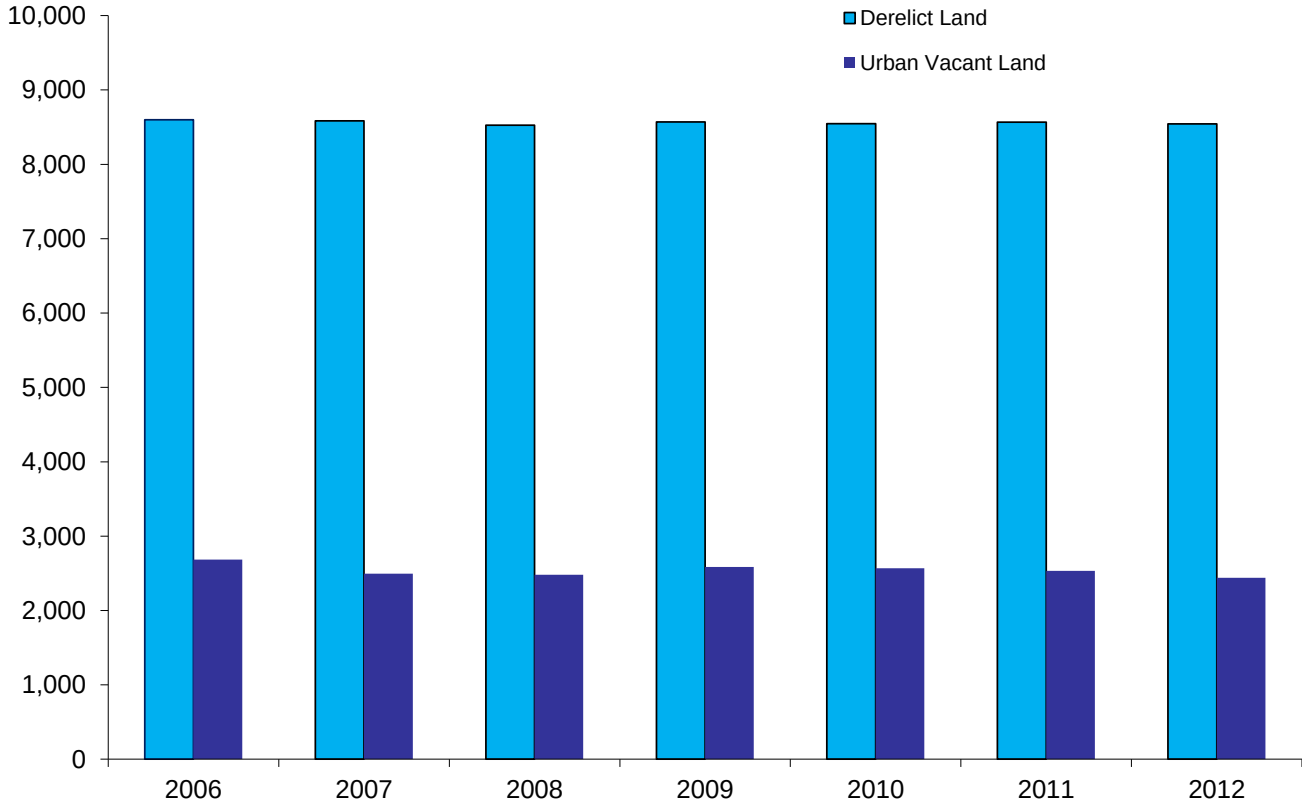
Between 1998 and 2007 the area of broadleaved woodland, improved grassland and acid grassland increased significantly.[4] Coniferous woodland and arable and horticultural land decreased significantly over the same time period. The area of all other broad habitats showed no significant change.

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

Derelict and Urban Vacant Land[R,5,6]: 2006-2012

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.

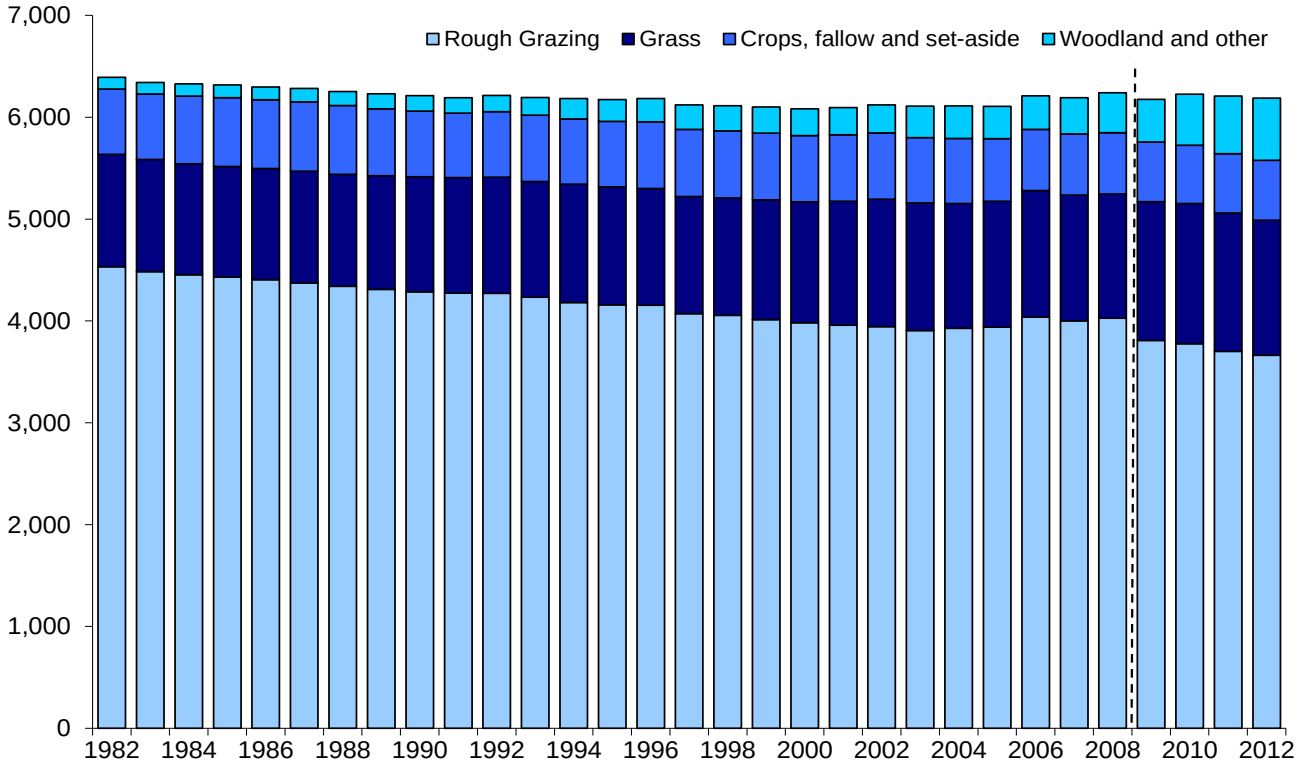
Vacant land is land which is unused for the purposes for which it is held and is viewed as an appropriate site for development. This land must either have had prior development on it, or had preparatory work taken place on it in anticipation of future development. Derelict land[7] (and buildings) is 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.

The annual Scottish Vacant and Derelict Land Survey[8] shows that the total area of derelict and urban vacant land has decreased slightly since 2006. In 2012, there were 10,984 hectares compared to 11,282 hectares in 2006. This change in total area is the result of a fall of 243 hectares in the area of urban vacant land and a fall of 55 hectares in the area of derelict land over the same period. The most recent survey (2012) showed a net decrease of 114 hectares since 2011.

Source: Scottish Government / Metadata

Agricultural Land Use[9]: 1982-2012

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.

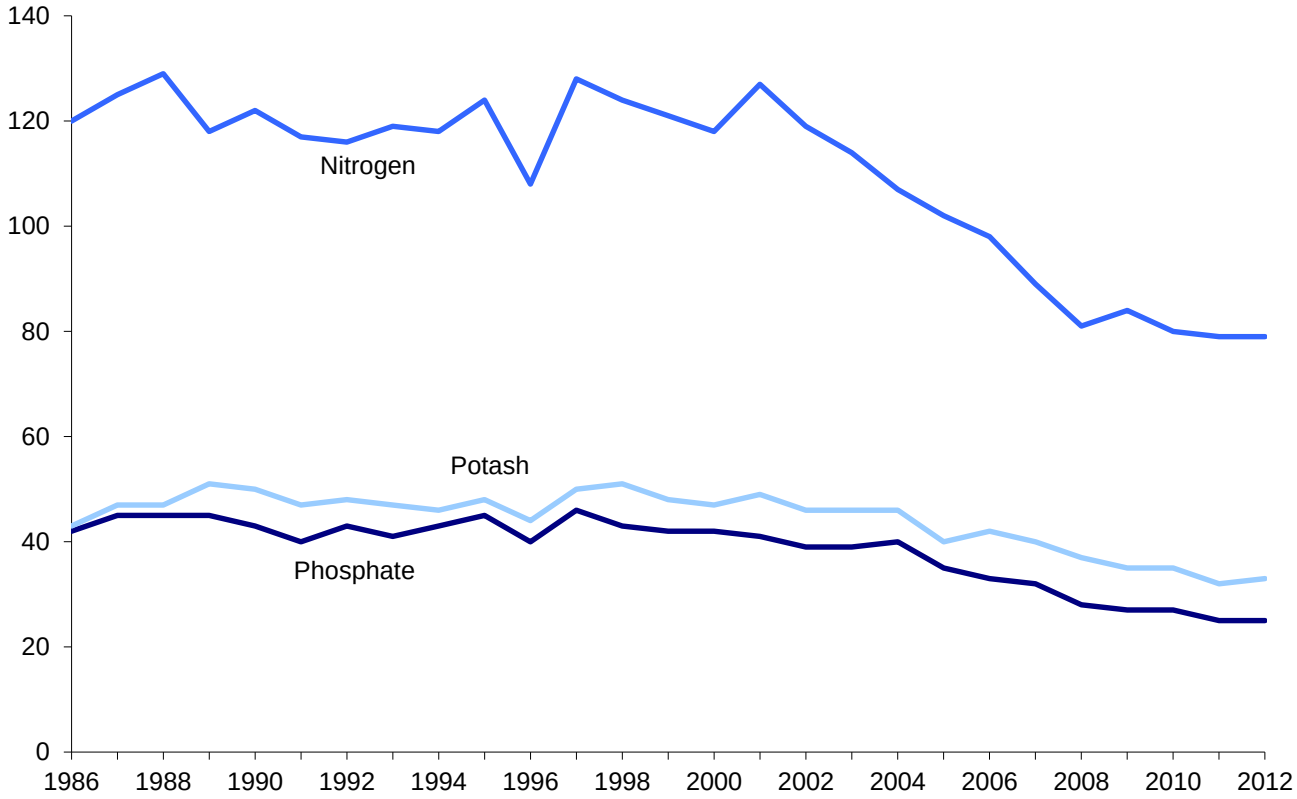
Between 1982 and 2012, the total land used for agriculture in Scotland decreased by around 3%.[9] There was a small increase in the total land used for agriculture between 2007 and 2008, to 6,240,400 hectares, resulting in the highest total land used for agriculture since 1988. After the introduction of the Single Application Form data in 2009, this decreased to 6,176,800 hectares. In 2012, 6,187,800 hectares of land were used for agriculture in Scotland. In 2008, the area of woodland and other land was over three times what it was in 1982, increasing from 114,000 hectares in 1982 to 392,000 hectares in 2008.[10] There is a step change in the land use data series in 2009, due to a switch in data source. 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[11] was recorded separately between 1993 and 2008. Trends have reflected changes in the European Union compulsory set-aside rate. There was a decrease in set-aside land from 90,000 ha in 2003 to 69,000 ha in 2005, before dropping to 18,000 ha in 2008, reflecting a 0 per cent compulsory set-aside rate. Set aside payments entitlements under the Single Farm Payments ceased in 2009.

Source: Scottish Government / Metadata

Nutrients Applied to Crops and Grass: 1986-2012

Total nutrients applied to crops and grass (kg/ha)[12,13,14]



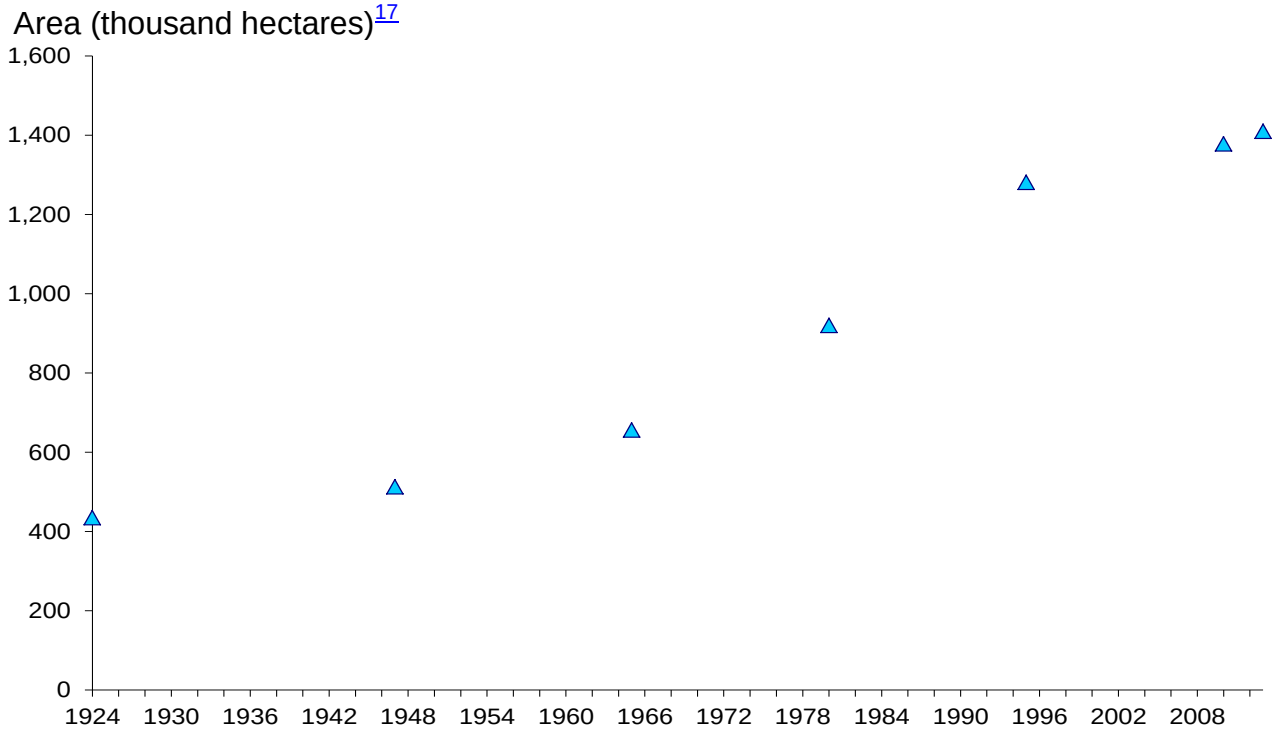
Fertilisers contain nutrients, such as nitrogen, phosphorus and potassium, which improve plant growth and crop yields. The inappropriate or mistimed use of fertilisers may cause nutrient enrichment and eutrophication of waters. Excess nitrates in drinking water are also a danger to human health. The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

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

Between 1986 and 2000, overall phosphate and potash application rates remained relatively stable, although both have declined in recent years. The decline is probably largely due to increased fertiliser prices. Overall nitrogen application rates have declined since 2001, reflecting a longer term reduction in application rates to grassland and a recent reduction for tillage crops. In 2012, the nitrogen application rate was 79 kg/ha, a reduction of 38% compared with 2001.

Source: Defra / Scottish Government[15] / Metadata

Area of Woodland: 1924-2013 [P,16]



The extent of woodland[18] 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 2013, the area of woodland in Scotland was 18.1% of the total land area (1,410,000 hectares). This compares with 17.7% in 2010, 11.8% in 1980 and 5.6% in 1924. 76% of this area is made up of conifers, both native and introduced such as Scots pine, Sitka spruce and larch, with the remaining 24% 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. In 2013, 57% of Scotland's woodland area (803,000 hectares) was certified as sustainably managed.

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 7,000 hectares were planted in 2012-13.

Source: Forestry Commission[19] / Metadata

Land – Footnotes

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

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

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

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

5) 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.

6) 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.

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

8) Scottish Government (2013). Scottish Vacant and Derelict Land Survey 2012.

9) 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 between 2008 and 2012 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 to 2012 SAF. These trends should be treated with caution.

10) Only includes woodland on agricultural holdings. For total woodland area see pp 56.

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

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

13) Excludes Orkney, Shetland and the Western Isles.

14) 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.

15) Department for Environment, Food and Rural Affairs, Scottish Government (2013). The British Survey of Fertiliser Practice 2012.

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

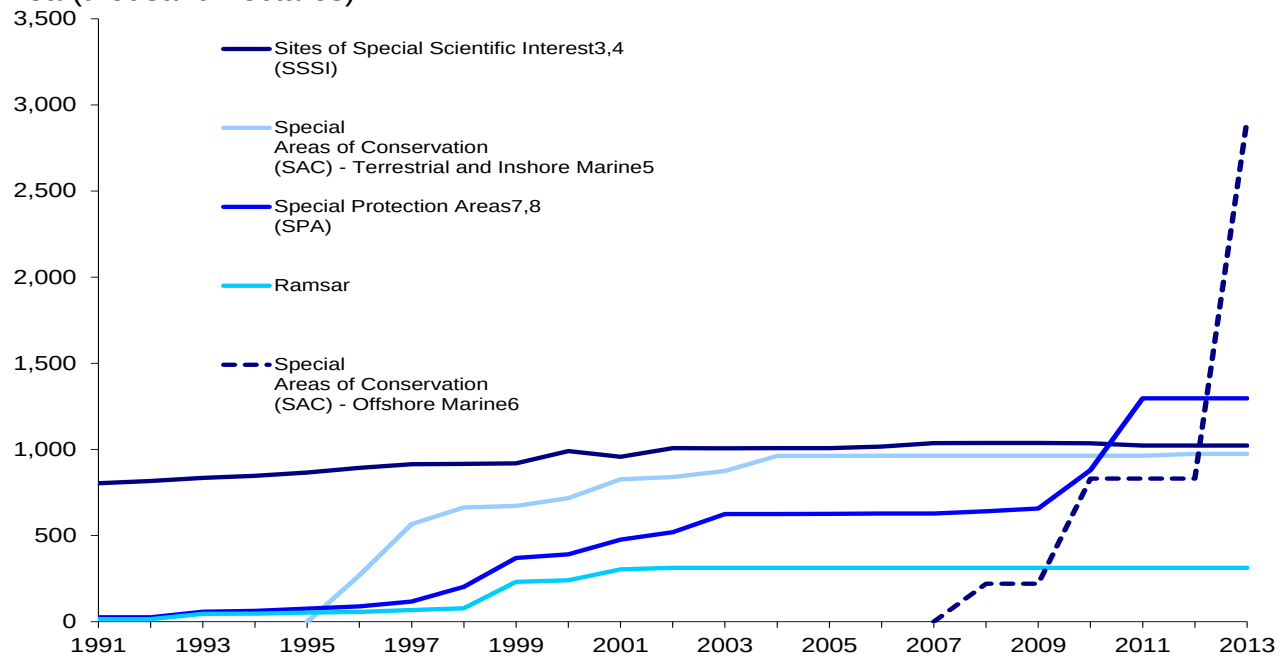
17) Data are obtained from forest inventories. Data for 2013 are early provisional results. Data from 2010 are derived from the National Forest Inventory. Most inventories have slightly different definitions of woodland, so some apparent changes in area over time are due to changing definitions. More detailed information on differences is available from Forestry Statistics 2012.

18) 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.

19) Forestry Commission (2013). First Release: Woodland Area, Planting and Restocking 2013 Edition. Forestry Commission (2012). Forestry Statistics 2012. See website www.forestry.gov.uk/statistics for further information.

Designated Areas[1]: 1991-2013

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 notified 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 2013, there were 1,429 SSSIs in Scotland, covering a total of 1,022,604 ha (about 13% of land in Scotland).[8]

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 2013, there were 240 SACs, 153 SPAs and 51 Ramsar sites in Scotland.

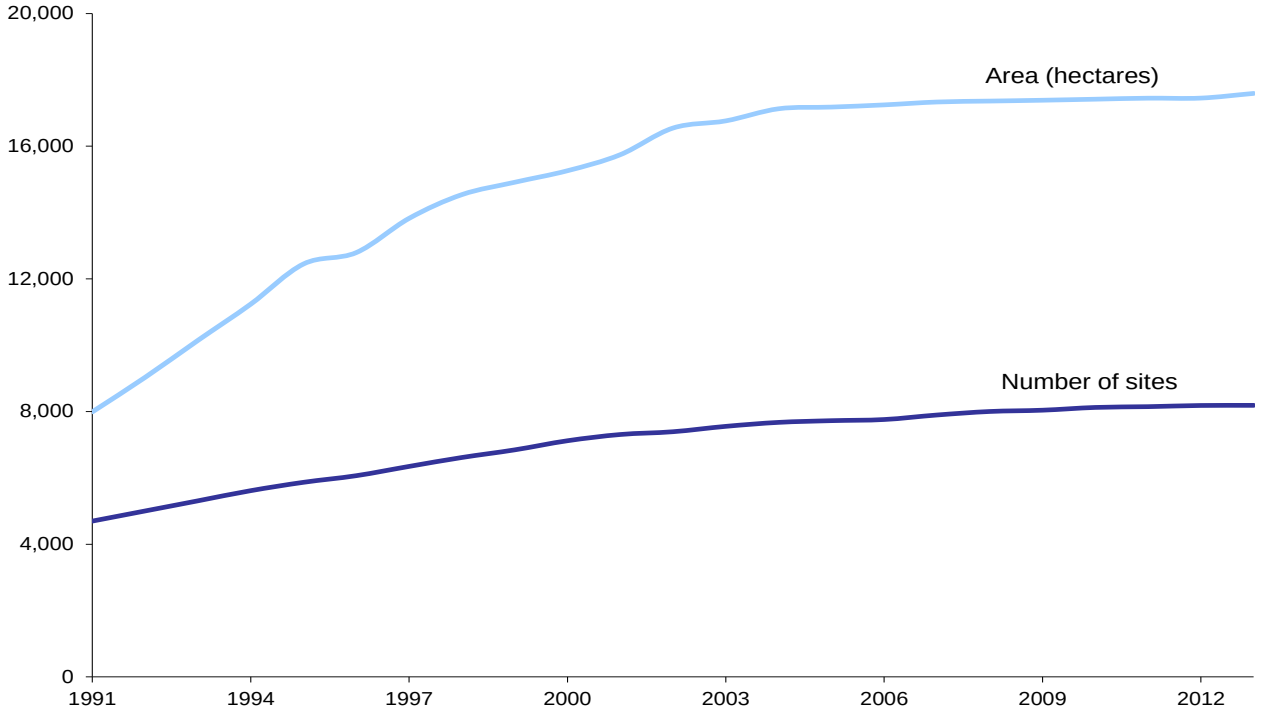
The area of SACs in the terrestrial and inshore environment rose from 0 ha in 1995 to 963,000 ha in 2004 and has since remained broadly stable, rising to 974,197 ha in 2013. In 2010, the UK Government's nature conservation functions under the EC Birds and Habitats directives in Scottish offshore waters were devolved to Scottish Ministers. In 2013, 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 UKs 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, a level it has remained at in 2012 and 2013.

A site may be protected by more than one designation. For example, in 2013 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]: 1991-2013

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. This is achieved partly by giving legal protection to nationally important sites and monuments – these are called 'scheduled monuments'.

Scheduled monuments (SMs) are protected under the Ancient Monuments and Archaeological Areas Act 1979.[9] The oldest date from around 10,000 years ago, when people first settled in Scotland; the most recent include Second World War defences. Once a monument is scheduled, the prior written consent of 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 2013, and a 120% increase in the total area of SMs in this period. In 2013, there were 8,187 designated SMs in Scotland, 4 more than in 2012. These sites accounted for a total area of 17,592 hectares, giving an increase of 141 hectares from 2012. There are SMs spread across Scotland, with more added to the Schedule every year, but numbers vary across local authorities. In 2013, the largest number of SMs was in Highland Council, with 1,238 SMs covering a total area of 2,198 hectares.

Source: Historic Scotland[10] / 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 2013 this accounted for around 2,700 hectares, so the net area of SSSI sites at 31st March 2013 is approximately 1,019,900 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 2013, this accounted for around 5,500 hectares, so the net area of SAC sites at 31 March 2013 is approximately 968,700 hectares. Figures include both designated SACs and candidate SACs submitted to the EC.

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 have contributed to the large increase in SPA area from 657,456 hectares in 2009 to 1,296,843 hectares in 2012.

7) Some SPAs overlap, and where this occurs the area of overlapping land will be counted more than once. In 2013 this accounted for around 58,500 hectares, so the net area of SPA sites at 31 March 2013 is approximately 1,238,000 hectares.

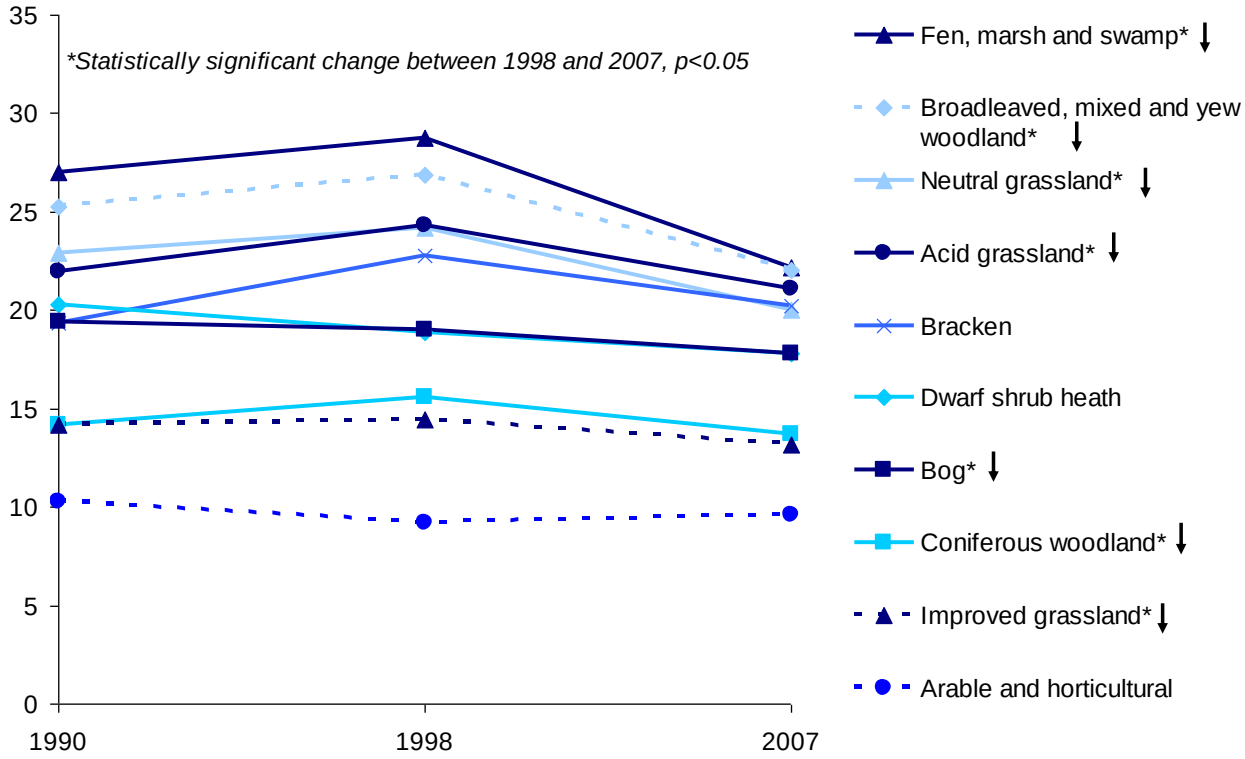
8) Since 2004, SNH has carried out a review of SSSIs and their associated documentation and a small number of sites (or parts of sites) are no longer considered to be of special interest. SNH is taking action to denotify these areas.

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

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

Changes in Plant Species Richness: 1990-2007

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



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

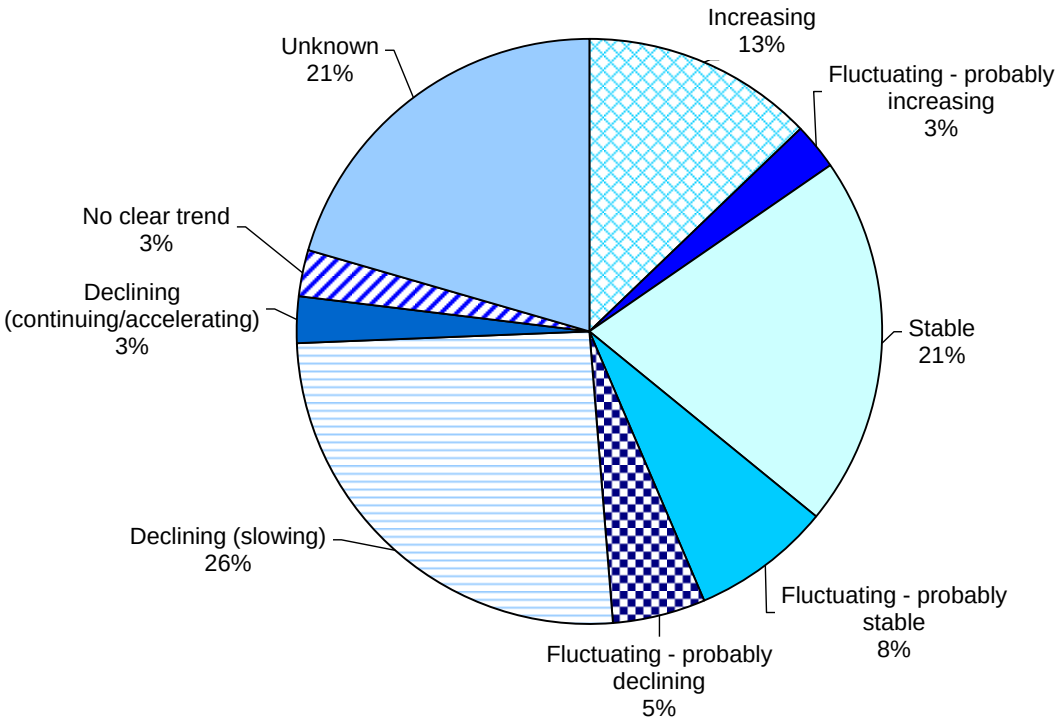
The Countryside Survey 2007[3] reported changes between surveys in 1998 and 2007 of 195 1km sample squares. Plant diversity, in terms of the number of vascular plant species recorded, was estimated from plots placed within each square.

Vascular plant diversity declined between 1998 and 2007 across the majority of habitats, with significant changes[4] to plant species richness in seven broad habitats. There was a 23% decrease in plant species richness in fen, marsh and swamp, and a 18% decrease in species richness in broadleaved, mixed and yew woodland. The 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[5]
(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)[6] was launched. The plan aims to conserve and enhance the populations of species and habitats which are considered threatened within the UK.

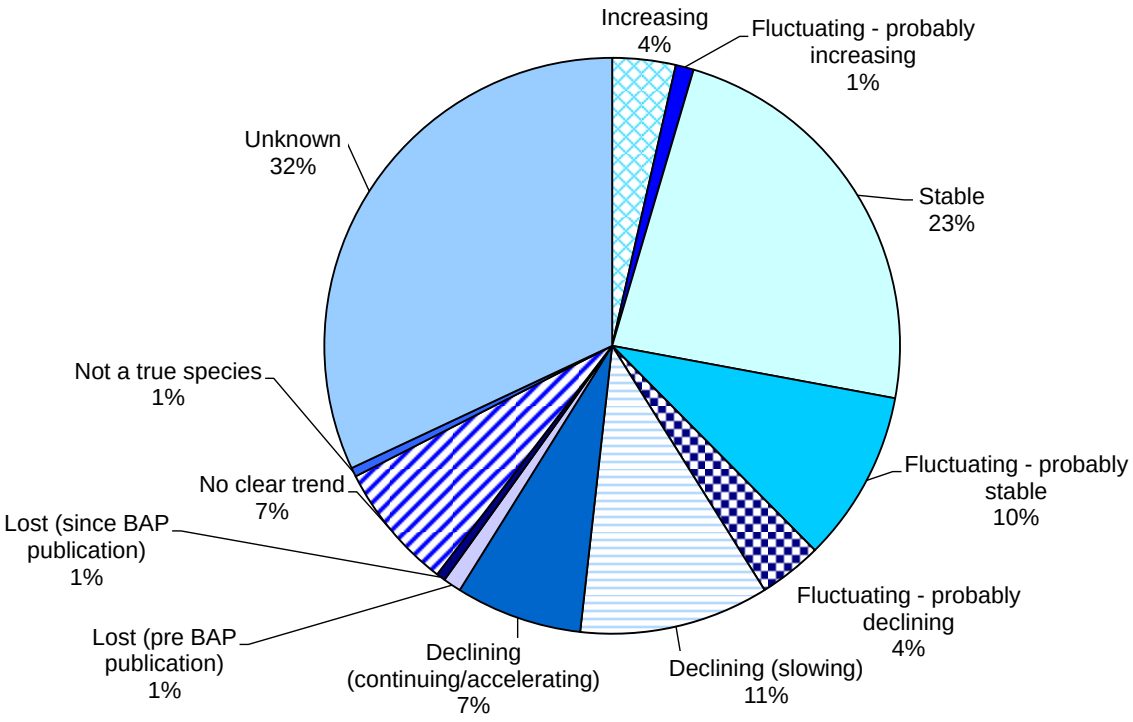
Between 1995 and 1999, action plans were developed for 45 habitats in the UK[7], of which 39 occur in Scotland. As at 2008, of these 39, 15% of the habitats were increasing, 29% were considered stable and 33% were in decline.[8] For the remainder, 21% had an unknown trend and for 1 habitat the trend was unclear.

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[9] and the recent publication of a new European Biodiversity Strategy[10] the Scottish Biodiversity Strategy is currently under review.[11] The consultation is open until 26 September 2012 and a revised strategy is expected in 2013.

Source: Biodiversity Action Reporting System (BARS) / Metadata

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

Status of UK BAP Species[5]
(based on 197 UK BAP priority species)



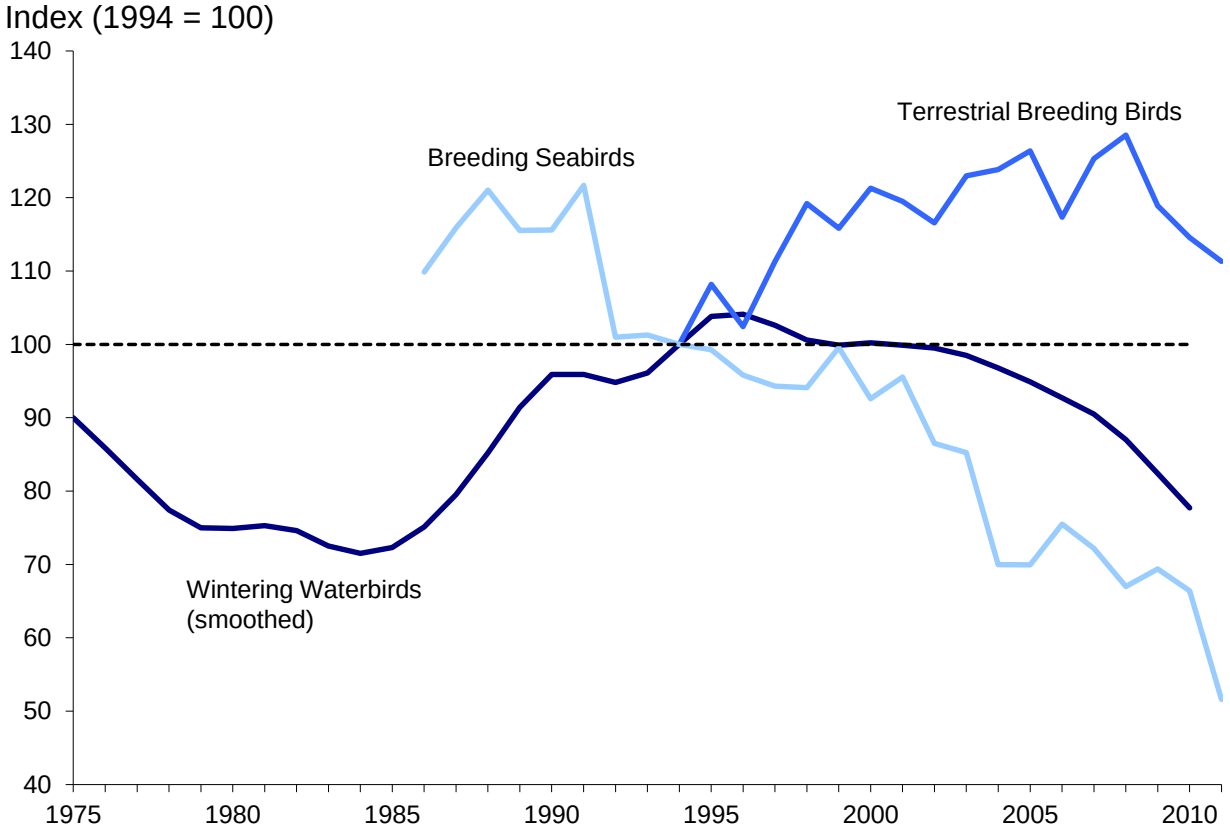
In 1994 the UK Biodiversity Action Plan (BAP)[6] was launched. The action plan aims to conserve and enhance the populations of species and habitats that are considered threatened in the UK.

Between 1995 and 1999, action plans were developed for 391 species in the UK[7] 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.[8] For the remainder of the species considered, 7% showed no clear trend, 32% had an unknown trend, 1 species[13] (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[9] and the recent publication of a new European Biodiversity Strategy[10] the Scottish Biodiversity Strategy has been refreshed[11]. Following the publication of the refreshed strategy in 2013 a Scottish Biodiversity List has been produced and will be reported on in future bulletins[12].

Source: Biodiversity Action Reporting System (BARS) / Metadata

Status of Wild Bird Populations[R,14]: 1975-2011



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

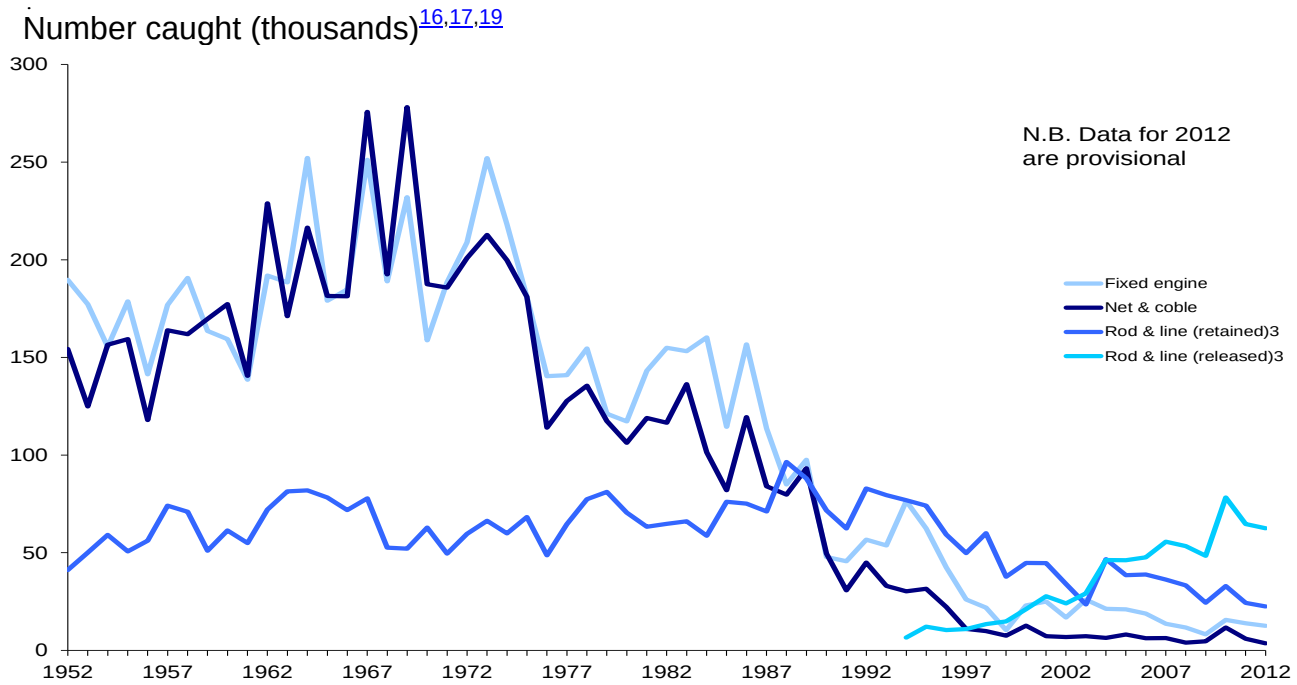
The number of wintering waterbirds rose between the mid 1980s and mid 1990s, reaching a peak in 1996. Since then there has been a steady decline, with the abundance falling 25% between 1996 and 2010. Seabird abundance was in decline between 1991 and 2005, but stabilised until 2010. However, a sharp fall in 2011, resulted in the abundance of seabirds being 57% lower than the 1991 peak. The abundance of terrestrial breeding birds has shown a long term increase of 11% between 1994 and 2011; however, between 2008 and 2011 the abundance of terrestrial breeding birds decreased by 14%.

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

The Scottish Government has established a National Indicator to increase the index of abundance of terrestrial breeding birds in Scotland against a 1994 base year. This is used as a proxy measure of biodiversity, as biodiversity cannot be measured by a single indicator.

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

Catches of Wild Salmon[15]: 1952-2012[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 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 2012 indicate that 12,580 wild salmon were reported caught and retained in the fixed engine fishery; a decline from the 13,845 caught in 2011. The net and coble fishery saw another decrease in the number of salmon caught and retained in 2012 to a provisional figure of 3,646, after decreasing from 11,738 to 5,973 between 2010 and 2011.[18]

Since 1994, salmon that have been caught and released by anglers have been reported separately. There has been a long-term reduction in the number of salmon caught and retained by the rod & line fishery, since a peak of 96,488 in 1988. However, 2010 saw an increase of 36% from the 2009 level to 32,890. In 2011 this fell to a similar level found in 2009 of around 24,000, with provisional data for 2012 indicating another decrease to 22,450. The number of salmon caught and released increased from 6,595 in 1994 to a peak of 78,304 in 2010, but has since fallen to 62,500 in 2012.

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

Source: Marine Scotland Science / Metadata

Biodiversity – Footnotes

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

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

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

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

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

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

7) 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. The next assessment of this indicator (in 2011) will be based upon this updated list.

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

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

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

11) 2020 Challenge for Scotland's Biodiversity - A Strategy for the conservation and enhancement of biodiversity in Scotland

12) Scottish Biodiversity List – Published in April 2013

13) 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.

14) 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.

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

16) 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.

17) 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.

18) The provisional data published for 2012 indicate that fishing effort in fixed engine fisheries and net & coble fisheries were the fourth lowest and lowest, respectively, since records began in 1952. Also, catch in the fixed engine and net & coble fisheries were 5% and 1% of the maximum recorded in the respective time series.

19) Data for 2012 are provisional. Marine Scotland (2012). Provisional salmon fishery statistics - 2012.

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