A National Statistics Publication for Scotland

Key Scottish Environment Statistics 2016

October 2016

natural scotland
SCOTTISH GOVERNMENT

Introduction

Welcome to the sixteenth edition of the annual publication **'Key Scottish Environment Statistics' (KSES)**. This is available as a web publication only.

This publication aims to provide an easily accessible reference document that 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 and data source, a summary of the trend and brief information on the potential factors affecting the trend. An Excel spreadsheet containing the data sets and charts presented in this publication is also available on our website.
http://www.gov.scot/Topics/Statistics/Browse/Environment/Publications

Revisions and Further Information
This publication provides a snapshot of the data as available at October 2016 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.gov.scot/seso/

The Scottish Government Environment Statistics Revisions Policy can be found here: http://www.gov.scot/Topics/Statistics/Browse/Environment/Revisions/revisionspolicy.

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.gov.scot/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.gov.scot/About/Performance/scotPerforms

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

Publication Key

Throughout this publication, an '**R**' indicates that figures have been revised since the previous edition of Key Scottish Environment Statistics. A '**P**' in the page title indicates that the latest figures are provisional. It should also be noted that throughout this publication, figures and percentages may not sum exactly due to rounding.

User Feedback

Our aim is to produce a useful, user-friendly publication. Therefore, 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, or if there are any other environmental statistics that you think we should include in future editions, please feel free to contact us using the details below. Any comments or feedback would be most welcome.

Website: http://www.gov.scot/Topics/Statistics/Browse/Environment
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Overview

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

Public attitudes and behaviours
In 2008, 57% of respondents thought that climate change was an immediate and urgent problem, compared with 45% in 2014 and 50% in 2015 (p 15). Walking distance to people's nearest greenspace and the frequency of use has remained fairly stable year to year, with those living closest to their local greenspace generally using it more frequently (p 16). During 2015, 49% of adults are estimated to have visited the outdoors one or more times per week compared with 48% in 2014 and 44% in 2006 (p 17).

Global atmosphere
Eight of the ten warmest years recorded in Scotland have all occurred in the 21st century. In 2015, the average temperature was 7.58 °C (0.55 °C higher than the 1961-1990 average), a decrease of 0.87 °C from 2014, which was the warmest year on record (p 19). The average annual precipitation in the 1980s, 1990s and 2000s was higher than in previous decades. 2015 was the second wettest year since records began in 1910 with annual precipitation 33.3% above the 1961-1990 baseline (p 20).

Scotland's net emissions of greenhouse gases in 2014, including emissions from international aviation and shipping, were estimated to be 46.7 million tonnes of carbon dioxide equivalent ($MtCO_2e$), 8.6% lower than 2013 and 39.5% below 1990 levels (p 21). Between 1998 and 2012, Scotland's carbon footprint fell by 6.3 per cent, from 82.0 $MtCO_2e$ in 1998 to 76.8 $MtCO_2e$ in 2012. Scotland's carbon footprint rose fairly steadily from 1998 to a peak of 94.3 $MtCO_2e$ in 2007 before falling sharply in the following years to 72.9 $MtCO_2e$ in 2011 (p 22).

Air quality
Between 1990 and 2014, there have been decreases in emissions of many pollutants, including 13% for ammonia, 46% per cent for particulate matter smaller than 10 microns diameter (PM_{10}), 65% for non-methane volatile organic compounds, 69% for nitrogen oxides (NOx), 75% for carbon monoxide, 90% for sulphur dioxide and 98% for lead (p 25). In 2015, sulphur dioxide (SO_2) emissions from large combustion plants decreased by 27% compared with 2014 and NOx emissions fell by 13% over the same period, mainly due to lower emissions from Longannet power station. The 2015 SO_2 and NOx emissions from large combustion plants are the lowest on record, starting from 1996 (p 26).

Measurements of air pollutant concentrations with a data capture rate greater than 75% indicate that UK Air Quality Strategy (AQS) Objectives were not met at some Scottish sites. The second stage AQS objective for annual mean PM_{10} concentrations to be met by 2010 was not met at 4 of 64 automatic monitoring sites in 2015 compared with 10 of 58 Scottish sites in 2014 (p 27). In 2015, the annual mean objective for nitrogen dioxide was not met at 8 of the 70 automatic monitoring sites, compared to 10 of 68 sites in 2014 (p 28). Ground level ozone objectives were met at all 11 sites, compared to 8 of 9 sites in 2014 (p 29).

Around 60% of Scotland's land area contains habitats sensitive to acid deposition and 55% to eutrophication, with much of the area sensitive to both. The area of sensitive habitats in Scotland exceeding critical loads for acidification fell from 68% in 1995-97 to 31% in 2011-13. Over the same time period, nutrient nitrogen exceedances fell from 59% to 41% (p 30).

Water

Between 2004/05 and 2015/16, treated water produced fell by 598 Ml/d (25%) to a new low of 1,780 Ml/d. There were similar reductions over this period in the amount of raw water abstracted by Scottish Water. The decrease in treated water is almost entirely due to a reduction in leakage of 608 Ml/d (53%) between 2004/05 and 2015/16 (p 32). Between 1992 and 2015, the percentage of samples from consumer taps containing coliform bacteria fell from 4.64% to 0.25%, the lowest level recorded, and the percentage containing Escherichia coli (E.coli) fell from 2.08% to 0.01% (p 33).

Using the old standards, the proportion of river length that was classed in SEPA's long term river water quality indicator as slightly polluted, polluted or severely polluted in Scotland rose from 6.8% in 1992, to 7.4% in 1998, before falling to 3.4% in 2013. Using the new standards, this proportion fell from 3.7% in 2013 to 3.5% in 2015 (p 34). Nitrate concentrations below 0.3 mg N/l are considered to be natural or background levels; the percentage of sites with mean nitrate concentrations of less than 0.3 mg N/l has increased from 27% in 2000 to 34% in 2015. In 2015, less than 3% of sites had nitrate concentrations greater than or equal to 7.5 mg/l compared with over 7% of sites in 2000 (p 35). The percentage of sites with orthophosphate concentrations less than 30 µg P/l has generally increased over time from 44% in 2000 to 73% in 2013 before falling to 63% in 2015. The percentage of sites with concentrations greater than or equal to 125 µg P/l has generally fallen over this period (p 36).

On the basis of initial assessments for 2016, 85% of the 81 coastal bathing waters met the new minimum European standard with 73% classified as excellent or good quality. There has been an increase in the number of coastal bathing waters assessed as excellent quality from 16 over the four years to 2015 to 25 over the four years to 2016 (p 37).

Radioactivity

In 2010, the average annual dose of radiation to someone living in Scotland was 2,300 microsieverts; this has fallen from 2,400 microsieverts in 2003. At 81%, the majority of the annual dose comes from natural sources (p 39). Following the Chernobyl reactor incident in 1986, concentrations of ^{137}Cs in milk peaked in 1987 before beginning to fall again and are now below pre-Chernobyl levels (p 40).

Waste

Between 2005 and 2014, the amount of Scottish waste sent to landfill decreased by 42%. Over the same period, the amount of biodegradable municipal waste landfilled in Scotland decreased by 51% (p 42). The household waste recycling rate in 2015 was 44.2%, increasing from 42.8% in 2014 (p 43). In 2015, 46% of households reported using local authority provided food waste caddies to dispose of their household waste compared with 40% in 2014. There has also been a decline in households throwing food out with general waste, from 73% in 2012 to 55% in 2015 (p 44). The proportion of households reporting that they recycled a range of other waste items increased each year between 2003 and 2011. Between 2011 and 2015, there was little change in the percentage of households recycling each item, except for plastic bottles which increased by 7 percentage points to

82%. In 2015, the recycling rate was highest for paper and card at 87% and lowest for glass at 77% (p 45).

Land

The total area of derelict and urban vacant land increased by 10%, from 11,530 hectares in 2009 to 12,674 hectares in 2015; mainly due to the addition of 2,217 hectares of former surface coal mines that became derelict in East Ayrshire in 2014. The most recent survey (2015) showed a net decrease of 458 hectares from 2014 (p 47). Since 2009, the area of woodland and other land on agricultural holdings increased by 237,600 hectares (57%) to 657,100 hectares in 2016; whereas the area of land used for rough grazing and the area of grass have decreased by 141,100 hectares (4%) and 32,900 hectares (2%) respectively over the same period (p 48). Potash, phosphate and nitrogen application rates have declined overall since 1986. The application rates of nitrogen and potash varied between 1986 and 2001, but have both since declined. The application rate of nitrogen was 89 kg/ha in 2015 and the application rate of potash was 34 kg/ha. The phosphate application rate remained relatively stable until 1997 before declining steadily to 27 kg/ha in 2015 (p 49). As at 31 March 2016, the area of woodland in Scotland accounted for 18.4% of the total land area, compared with 16.4% in 1995. There were 4,600 ha of new woodland planted in 2015-16 (p 50).

Conservation

The area of designated protected areas and number and area of scheduled monuments has shown an upward trend over the long term (p 52-53). As at 31 March 2016, 80.4% of natural features on protected nature sites were assessed as being in favourable condition. This figure represents an increase of 1.1 percentage points from 2015 and 4.4 percentage points from 76.0% in 2007 (p 54).

Biodiversity

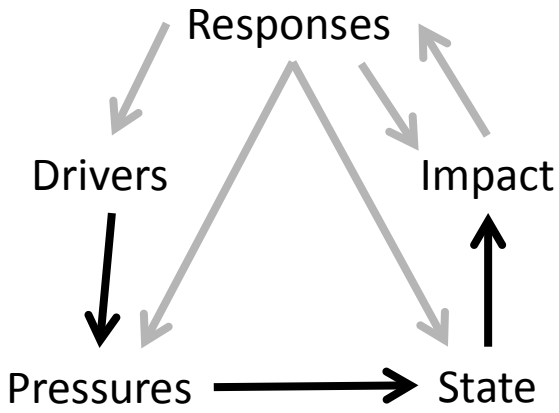
Between 1995 and 1999, biodiversity action plans were developed for 45 priority habitats in the UK, of which 39 occur in Scotland. As at 2008, of these 39, 15% of the habitats were increasing, 28% were considered stable and 33% were in decline. For the remainder, 23% had an unknown trend and for one habitat, the trend was unclear (p 56). In the 2008 assessment for Scotland, 38% of the priority species were increasing or stable and 21% were in decline. For the remainder of the species considered, 7% showed no clear trend, 32% had an unknown trend, one species (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 (p 57).

The number of wintering waterbirds rose between the mid-1980s and mid-1990s, reaching a peak in 1997. Since then there has been a steady decline, with the abundance falling 26% between 1997 and 2013. The abundance of breeding seabirds has declined by 44% between 1991 and 2014. The abundance of terrestrial breeding birds has shown a long-term increase of 20.1% between 1994 and 2014. In the last year, the abundance of terrestrial breeding birds increased by 14.6%, following a general decline from the peak of 2008 (p 58). The total reported salmon rod catch (both retained and caught and released) for 2015 is 69% of the previous 5 year average. The number of salmon caught and released increased from 6,595 in 1994 to 45,973 in 2015. In 2015, 84% of the annual rod catch was released compared to less than 8% in 1994 (p 60).

Contents

Background

Many of the environmental measures that are reported in Key Scottish Environment Statistics are affected by similar background drivers. These generally correlate with the usage of resources and the release of pollutants in the natural world. In many cases as these drivers increase, they lead to the worsening of a wide range of negative effects on the environment. In order to put the rest of the environmental statistics into context, these drivers have to be accurately measured.



The process for responding to environmental issues can be informed by the DPSIR (Drivers, Pressures, State, Impact, Responses) model[1]. Under this model, the pressures that directly affect the state of the environment are envisioned as being directly affected by drivers. These can be affected by responses from the government to try and improve the state of the environment, or mitigate the impact of the pressures. This chapter gives information on datasets that are often thought to be important drivers of environmental pressures.

For instance, the Gross Domestic Product (GDP) of a nation is fundamentally a measure of economic activity. Economic activity will generally drive the use of energy and other resources, leading to pressure on the environment from carbon dioxide emissions, waste and pollution, and ultimately impacting in terms of climate change. In order to ensure the long-term sustainability of both the economy and the environment, Scotland needs to achieve economic growth without environmental degradation.

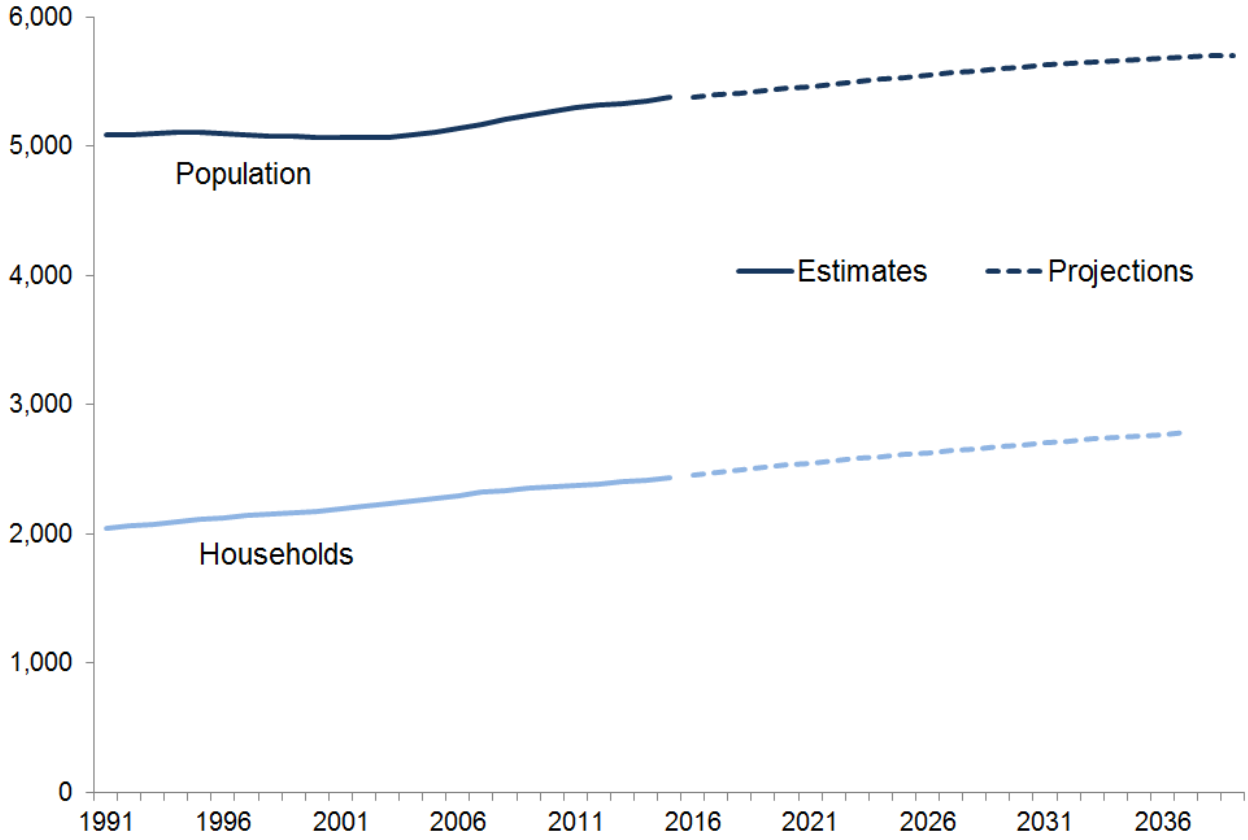
In order to maintain economic growth without causing additional environmental damage it is necessary to “decouple” the correlation between GDP and carbon dioxide emissions and other negative environmental effects. Many environmental policies are geared towards this goal, such as zero waste, circular economy, and renewable energies.

Targets and Aims

- **2017**: Match the GDP growth rates of small independent EU countries
- **2017**: Match average European (EU15) population growth rate in the period from 2007
- **2020**: Renewable electricity generation to be the equivalent of 100% of gross electricity consumption

Population and Households: 1991-2039[R]

Population/Households (thousands) [2]



Why this measure is important

People and households are important consumers of energy and water, therefore the population and number of households will have an effect on the wider environment.

Background

Population estimates[3] are rebased with each census to ensure a consistent time series. Household estimates[4] for 2002 onwards are based on the number of occupied dwellings from council tax billing information.

Trend

The population of Scotland declined steadily through most of the 1980s, followed by small increases in the seven years up to 1995. The population subsequently decreased to a low of 5.06 million in 2000 before increasing to 5.37 million in 2015. The latest projections[5] indicate that the population will rise by 6.1% to 5.70 million in 2039. This trend is consistent with the overall UK population, which is also projected to increase but at a greater rate.

The number of households rose by 391,150 (19%) between 1991 and 2015. Projections[6] based on 2012 figures suggest that the number of households in Scotland will increase by 14% between 2015 and 2037, to 2.78 million.

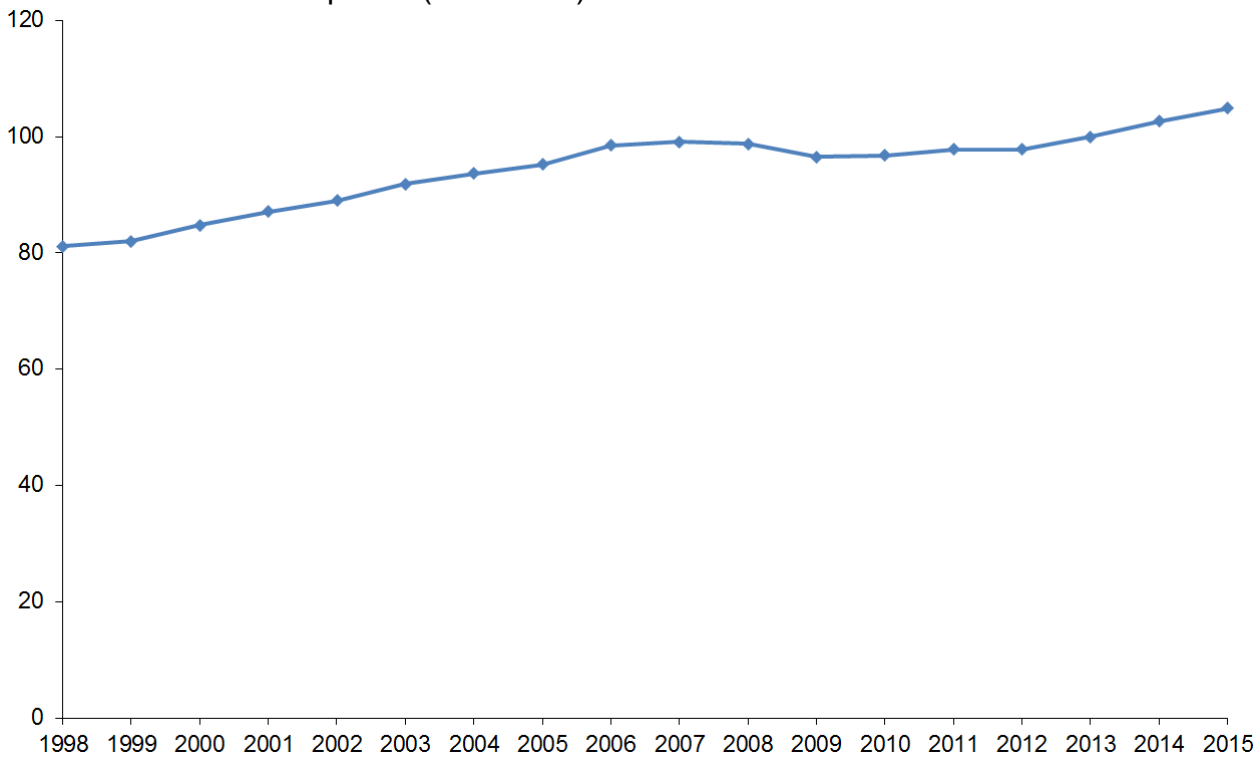
Factors affecting trend

Changes in population can be due to changes in the numbers of births and deaths and migration. Since mid-2000, the population increase has mostly been due to net migration, as more people came to Scotland than left[7]. Growth in households has been faster than the population because more people are living alone and in smaller households.

Source: National Records of Scotland Metadata – Population/Households

Gross Domestic Product (GDP)[8]: 1998-2015[R]

Scottish GDP at basic prices (2013=100)



Why this measure is important

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, adjusted for inflation. Traditionally, growth in GDP has been linked with environmental problems such as increased carbon dioxide emissions, waste and pollution.

Background

The GDP index is produced in constant (2013) prices, meaning that the effect of price changes is removed from the estimates, and is seasonally adjusted. These estimates measure GDP at basic prices, also referred to as Gross Value Added (GVA), which does not account for taxes or subsidies on products.

Trend

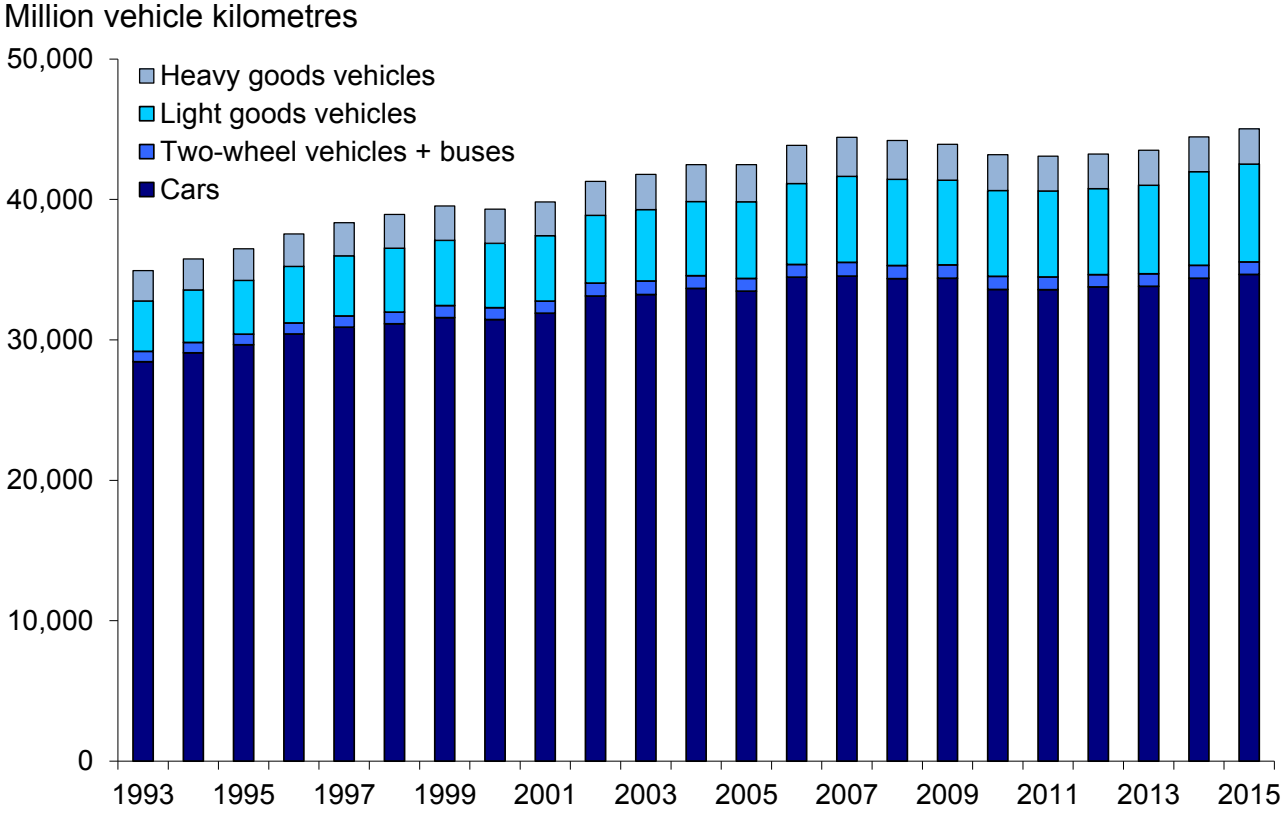
Over the 2015 calendar year, GDP in Scotland grew by 2.1%. This followed growth of 2.6% during 2014. Over the period 1998 to 2015, the Scottish GDP index increased by 29%, from 81.2 in 1998 to 104.7 in 2015.

Factors affecting trend

Scottish GDP can be affected by a number of factors, including overall economic conditions. This can be seen in the decrease in Scottish GDP of 2% between 2008 and 2009, following the deterioration in global economic conditions.

Source: Scottish Government Metadata

Motor Traffic on All Roads: 1993-2015[R]



Why this measure is important

The pollutants emitted by road transport are a major contributor to poor air quality, which damages human and ecosystem health[9]. Fine particulate matter and nitrogen dioxide are the pollutants of most concern, due primarily to their effects on human health. Transport emissions also contain carbon dioxide and other greenhouse gases, which contribute to climate change.

Background

Data are provided by the Department for Transport as part of a UK wide survey.

Trend

During the period 2007-2011 there was a reduction in motorised road traffic; however, from 2012, levels have shown an upward turn reaching the highest level ever in 2015.

Compared with 1993, motor traffic on all roads was 29% higher in 2015, with increases of 44% for two-wheeled motor vehicles and 94% for light goods vehicles. Cars now account for 77% of motorised road traffic.

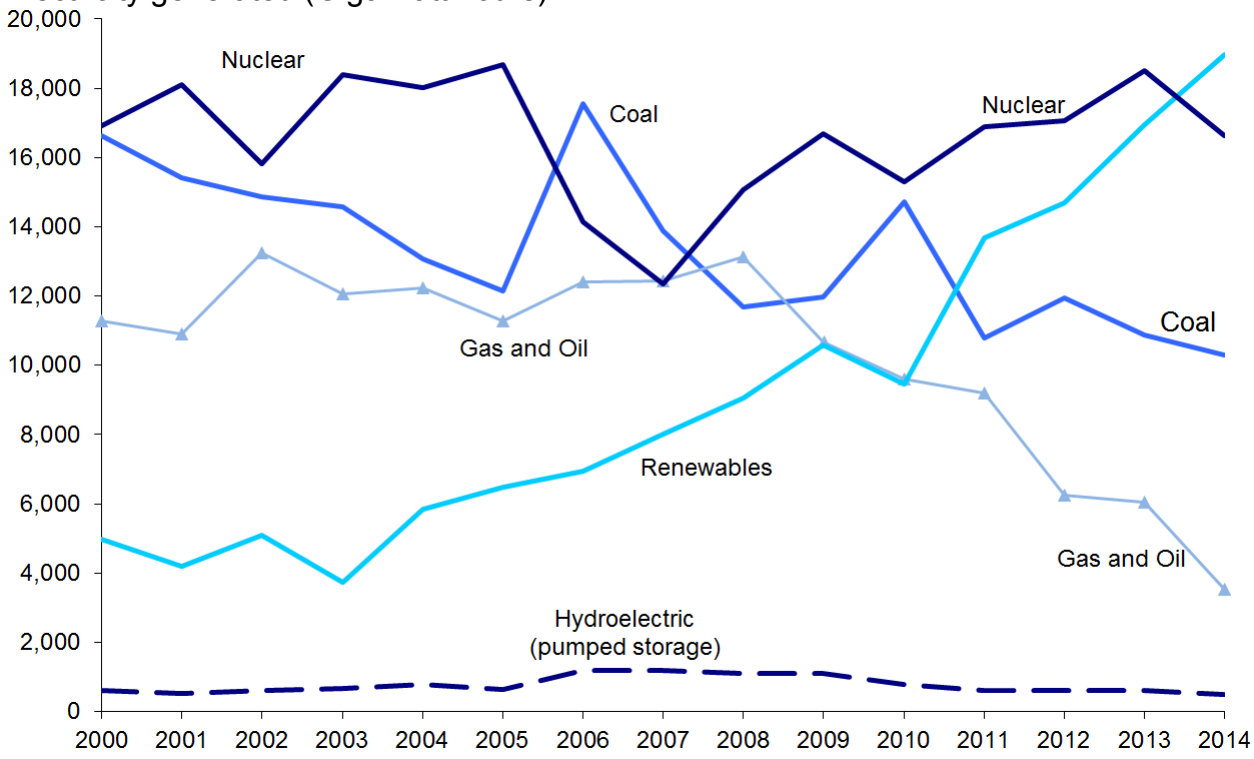
Factors affecting trend

There are a number of factors that may contribute to increases in motor vehicle traffic[10]. There were increases in the number of householders with access to at least one car for private use until around 2007, and this number has since remained fairly steady at about 70% of households in Scotland[11]. 2015 saw the most registrations of new vehicles in Scotland in a single year since 2007[12] and the total number of light goods vehicles registered is now at the highest level in at least the last 10 years.

Source: Department for Transport Metadata

Electricity Generation by Source: 2000-2014[R]

Electricity generated (GigaWatt hours)[13,14]



Why this measure is important

The combustion of fossil fuels, especially coal, is a major contributor to carbon dioxide emissions, which is one of the six greenhouse gases that Scotland is committed to reducing under the Climate Change (Scotland) Act 2009.[15]

Background

Data are obtained from the Department for Business, Energy and Industrial Strategy.

Trend

In 2014, Scotland generated 49,929 GWh of electricity, 5.7% less than in 2013. Of this total, 18,962 GWh (38%) was generated from renewable sources[16], which is an increase of 11.9% from 2013. Electricity generated from renewable sources equated to almost 50% of the gross consumption[17] of electricity in Scotland in 2014, compared with 44% in 2013. Fossil fuels accounted for 28% of Scotland's electricity generation in 2014, compared with 32% in 2013, while 33% of the electricity generated in 2014 was from nuclear power stations, compared with 35% in 2013.

Factors affecting trend

Fossil fuel generation in Scotland tends to vary over time and is influenced by a wide range of factors including fossil fuel prices (absolute and relative) and the prevalence of renewable and nuclear generation. The closure of Cockenzie Power Station in March 2013 has also contributed to the reduction in electricity generated by fossil fuels. Generation of renewable electricity from non-hydro sources has grown year on year since 2000. Building upon a long established base of hydro generation, the recent growth in renewable capacity has been predominantly through onshore wind.

Source: Department of Business, Energy and Industrial Strategy/Scottish Government Metadata

Public Attitudes & Behaviours

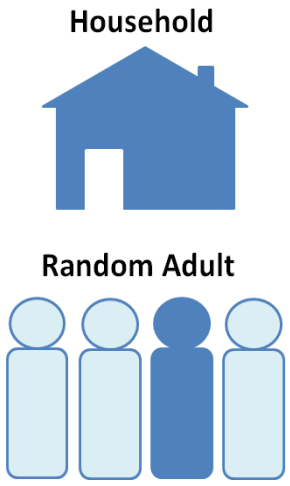
Background

The attitudes that people hold towards environmental issues can influence their behaviour with regards to the environment. In turn, the way in which a person interacts with their environment can have a positive effect on that individual and the environment itself, for example, increasing outdoor activity may improve the health of the individual and lead them to support environmental measures. Changes in attitudes can be encouraged through public initiatives and the conversion of positive attitudes to positive behaviour can be aided by ensuring that provision of appropriate resources are available to the public.

Scottish Household Survey

The Scottish Household Survey (SHS) is a large annual survey that collects a wide range of information on the status and views of people and homes in Scotland. It is a vital tool to evaluate the effectiveness of policy and the composition, characteristics, attitudes and behaviour of households and individuals at a national and sub-national level.

Households are selected at random to take part in the survey, the major part of which is split into two separate modules. These are the Household survey, where questions are asked of the householder with the highest income, and the Random Adult survey, where a person aged over 16 in the household is selected to answer another set of questions. It is designed to be representative of Scottish society as a whole.



The survey began in 1999, and many of the questions in the SHS are asked for many years in a row, giving us a view of how the measures are changing over time. Nearly 10,000 people are surveyed each year in order to give coverage down to Local Authority level and to give an indication of important social demographics in Scotland.

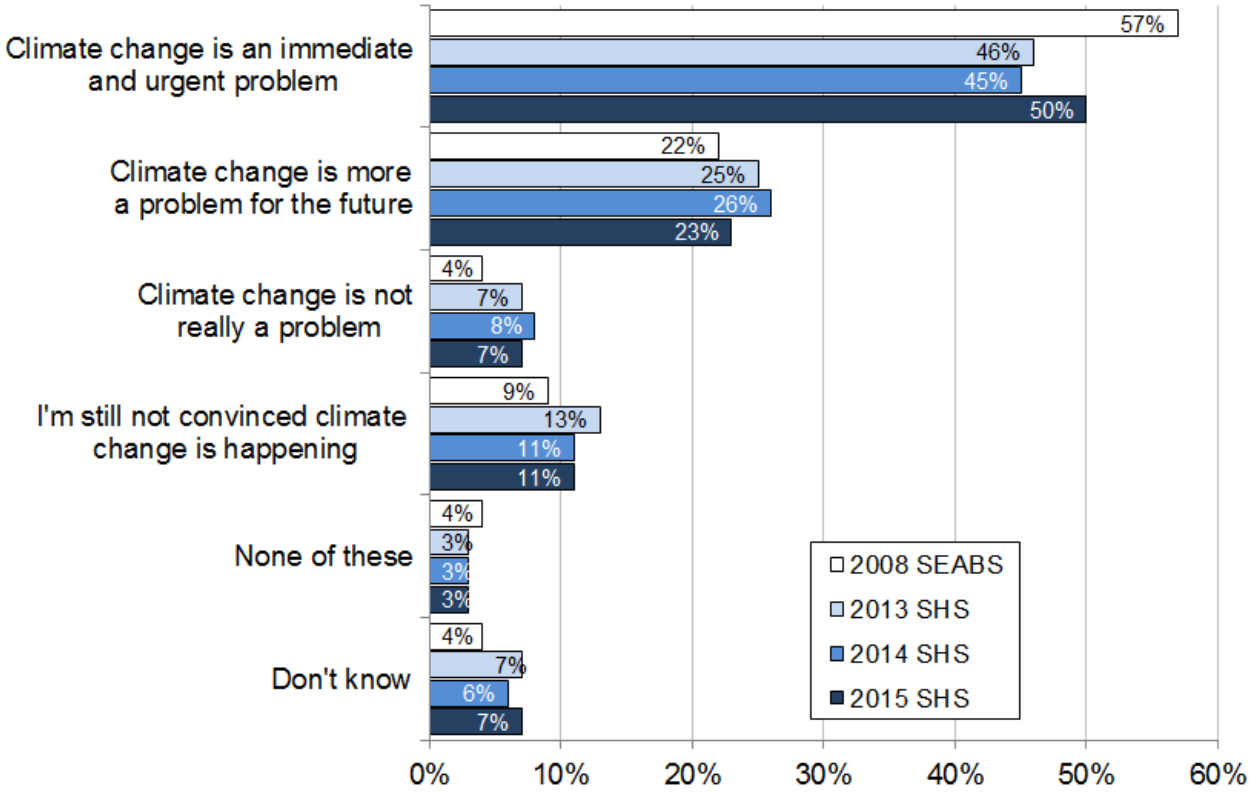
Each year the SHS reports its findings in an annual report, detailing the key results across a wide range of features.

Targets and Indicators

- Increase people's use of Scotland's outdoors is a National Indicator for Scotland
- Improve access to local greenspace is also a National Indicator
- Perceived immediacy of Climate Change is one of the low carbon attitude and behaviour related indicators set out in 'Low Carbon Scotland': A Behaviours Framework'

Perceived Immediacy of Climate Change: 2008, 2013-2015

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



Why this measure is important

Public attitudes towards climate change are likely to influence their willingness to support initiatives to address climate change, as well as to take action themselves.

Background

From 2013 onwards, the Scottish Household Survey has included a question about attitudes towards climate change (although the sample dropped from around 10,000 in 2014 to around 3,000 in 2015). The same question had previously been asked in the Scottish Environmental Attitudes and Behaviours Survey 2008, so the results can be compared despite the slight differences between the surveys. Respondents were presented with four statements about climate change and asked which, if any, was closest to their own view.

Trend

Since 2008, there has been a decrease in the number of people who view climate change as an immediate and urgent problem for Scotland. However, there has been an increase in the number of people who view climate change as an immediate and urgent problem over the last year, from 45% in 2014 to 50% in 2015.

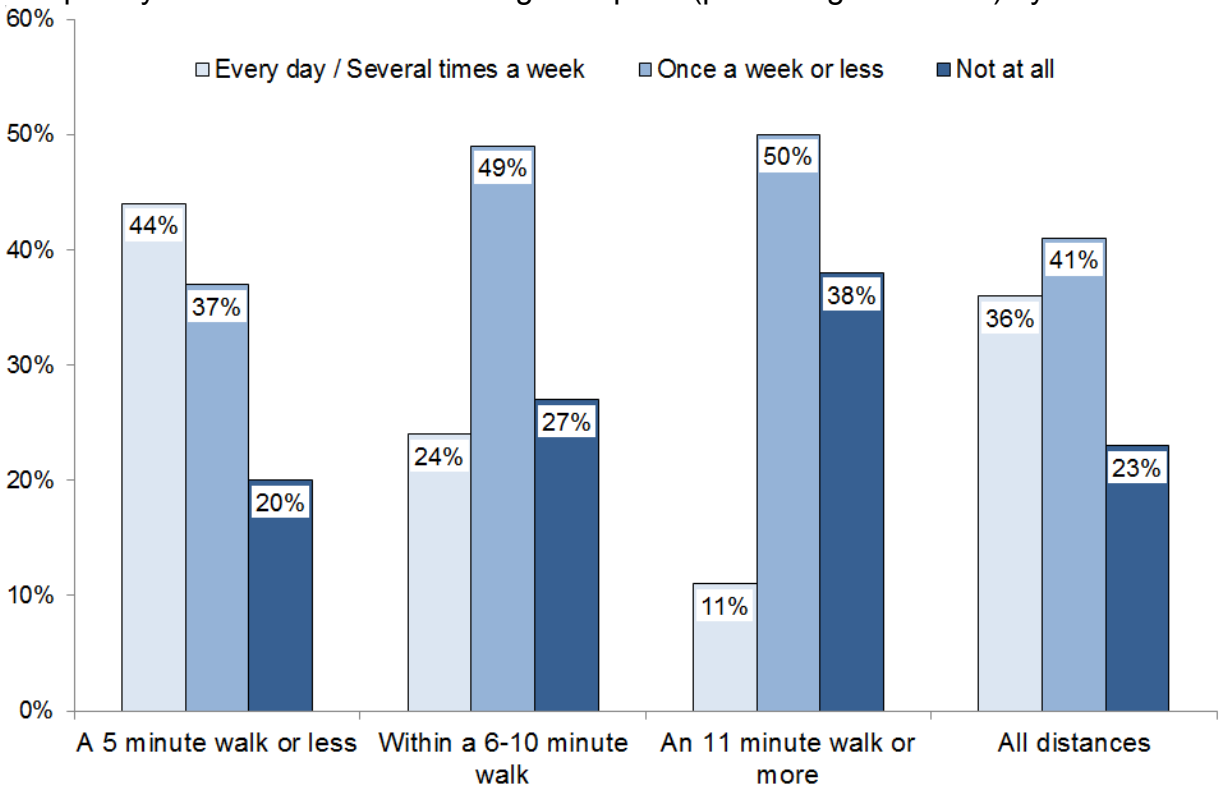
Factors affecting trend

Weather patterns, including specific events such as flooding, as well as media coverage of these issues and of climate change more generally, may influence people's views on climate change.

Source: Scottish Government / Scottish Government Metadata

Frequency of Use of Local Greenspace: 2015

Frequency of use of nearest usable greenspace (percentage of adults) by distance



Why this measure is important

Regularly making use of good quality greenspace can improve people's quality of life by increasing their satisfaction with their neighbourhood, promoting physical health and mental wellbeing and reducing health inequalities. How often local greenspace is used can depend on how long it takes people to get there and how satisfied they are with the space.

Background

The Scottish Household Survey (SHS) collects data on how accessible people's nearest usable greenspace is from their home (measured in terms of the time they think it would take the interviewer to walk there), their satisfaction with that space and how often they use it. Greenspace is defined in the SHS as public green or open spaces in the local area such as parks, play areas, canal paths and beaches (private gardens are not included). The Scottish Government has now introduced 'Improve access to local greenspace' as a National Indicator.[18]

Trend

Walking distance to people's nearest greenspace and the frequency of use has remained fairly stable year to year, with those living closest to their local greenspace generally using it more frequently. In 2015, around 36% of adults reported that they visited their nearest greenspace at least several times a week, compared to 37% in 2014.

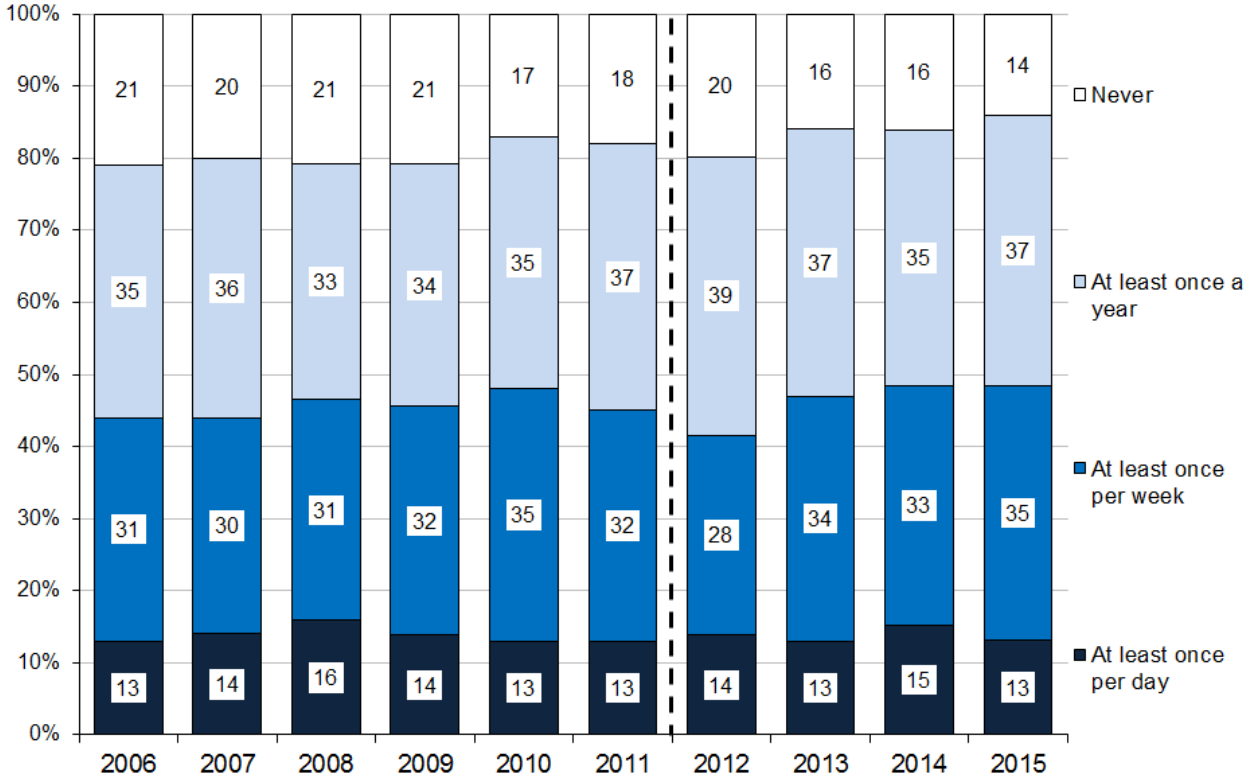
Factors affecting trend

People who report their health to be bad or very bad visit greenspace less often than others. Also, people aged over 75 are more likely not to use their local greenspace at all compared to other age groups, so an aging population may affect the trend in the longer term.

Source: Scottish Government Metadata

Outdoor Visits: 2006-2015

Percentage of adults making visits to the outdoors



Why this measure is important

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.

Background

The data are taken from a sample of randomly selected adults in the Scottish Household Survey who were asked how often they visit the outdoors in Scotland. Prior to 2012, the data was sourced from the Scottish Recreation Survey produced by Scottish Natural Heritage, which included the same question[19]. The Scottish Government has established a National Indicator[20] to increase the proportion of adults making one or more visit to the outdoors per week.

Trend

Visits to the outdoors have remained roughly stable over time. During 2015, 49% of adults reported visiting the outdoors at least once per week, compared to 48% in 2014 and 44% in 2006. The percentage of adults who reported not visiting the outdoors at all decreased slightly between 2014 and 2015, from 16% to 14%.

Factors affecting trend

People aged 75 and over and people who report their health to be bad or very bad are less likely to visit the outdoors once a week than others (29% and 25% respectively), so changes to the demographics in Scotland may have an influence on the number of people visiting the outdoors.

Source: Scottish Government / Scottish Natural Heritage Metadata

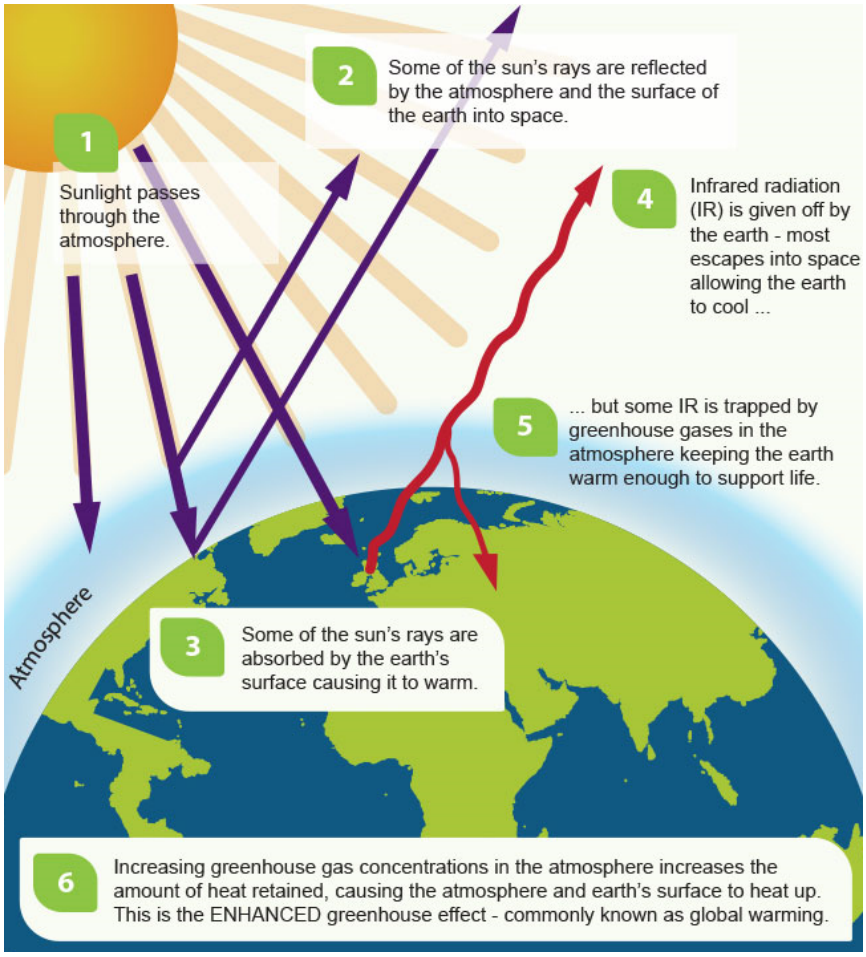
Global Atmosphere

Background

Changes in the amount of energy retained within the atmosphere affect the global climate, which naturally exhibits long-term fluctuations. However, “human influence on the climate system is clear” and it is extremely likely that over half of the observed increase in global average surface temperature from 1951 to 2010 was due to human activities.[21] This human influence has mainly been in the form of the emission of greenhouse gases, such as carbon dioxide (CO_2), that help to trap heat within the atmosphere and so contribute to global warming. Atmospheric concentrations of CO_2, methane and nitrous oxide are now at the highest levels for at least the last 800,000 years.

Our Changing Climate

Global climate projections indicate that the global mean surface temperature will likely increase by between 0.3 °C and 1.7 °C based on a low emissions scenario, or by between 2.6 °C and 4.8 °C based on a high emissions scenario, by 2081-2100 relative to 1986-2005[21]. Global mean precipitation is also projected to increase with global warming, although this will vary spatially and seasonally. These changes have implications for a wide range of areas including health, agriculture and transport.



The greenhouse effect - from Scotland's Environment website, Get Informed section

Targets and Indicators

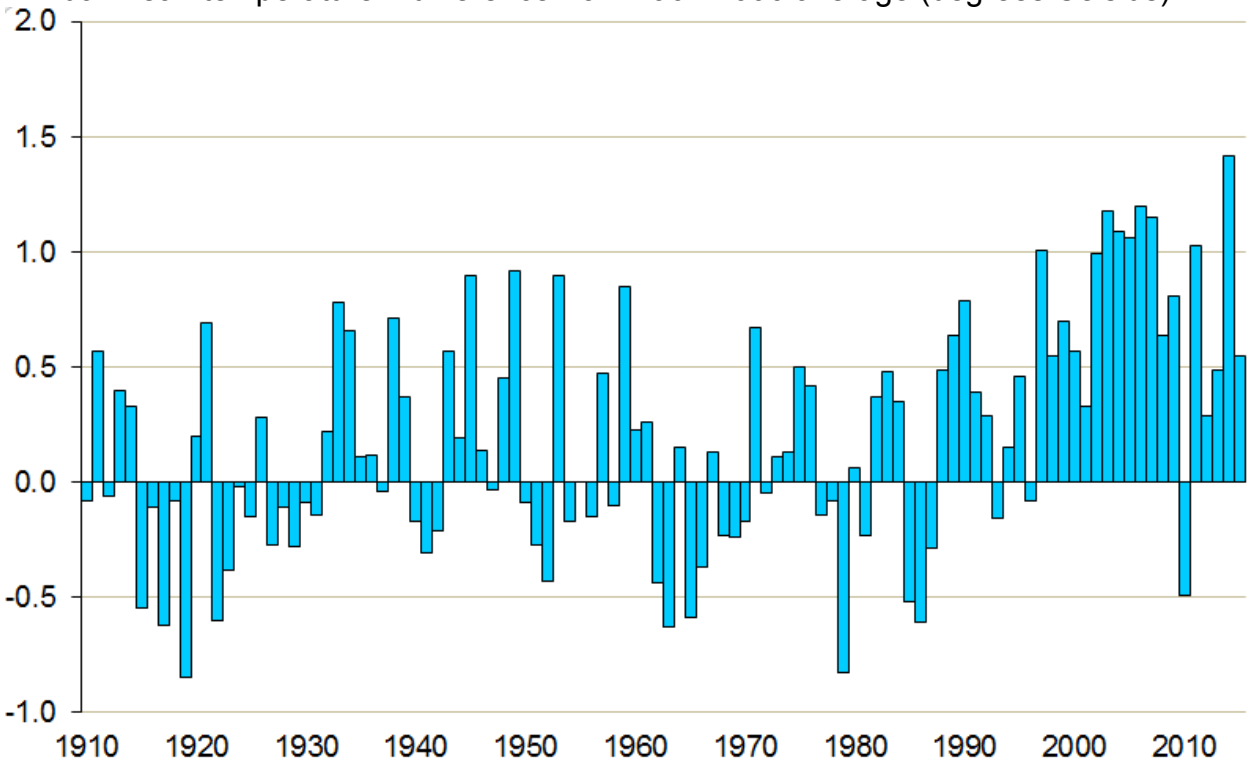
The Climate Change (Scotland) Act 2009[22] has set long term percentage reduction targets for the reduction of greenhouse gas emissions and also requires Scottish Ministers to set annual targets for emissions[23, 24].

Estimates of greenhouse gas emissions and carbon footprint are both reported to meet the requirements of the Climate Change (Scotland) Act 2009, and to inform a range of Scottish Government targets and indicators, including:

- **2020**: Reduce greenhouse gas emissions by 42% compared with 1990[25]
- **2050**: Reduce greenhouse gas emissions by 80% compared with 1990
- Reduce Scotland's Carbon Footprint is a National Indicator for Scotland[26]

Annual Mean Temperature: 1910-2015

Annual mean temperature – difference from 1961-1990 average (degrees Celsius)[27]



Why this measure is important

Temperatures in Scotland are projected to continue increasing over the next century, with a general trend towards hotter summers and milder winters[28]. The effects of rising temperatures have implications for areas such as health, agriculture, water resources and energy demand.

Background

The Met Office gather air temperature measurements from a network of weather stations across Scotland, which are then used to create 5km x 5km gridded datasets covering the whole country.

Trend

Eight of the ten warmest years recorded in Scotland have all occurred in the 21st century. In 2015, the average temperature was 7.58 °C (0.55 °C higher than the 1961-1990 average), a decrease of 0.87 °C from 2014, which was the warmest year on record. The average temperature in the 2000s was 0.90 ºC warmer than the 1961-1990 average and warmer than any other decade.

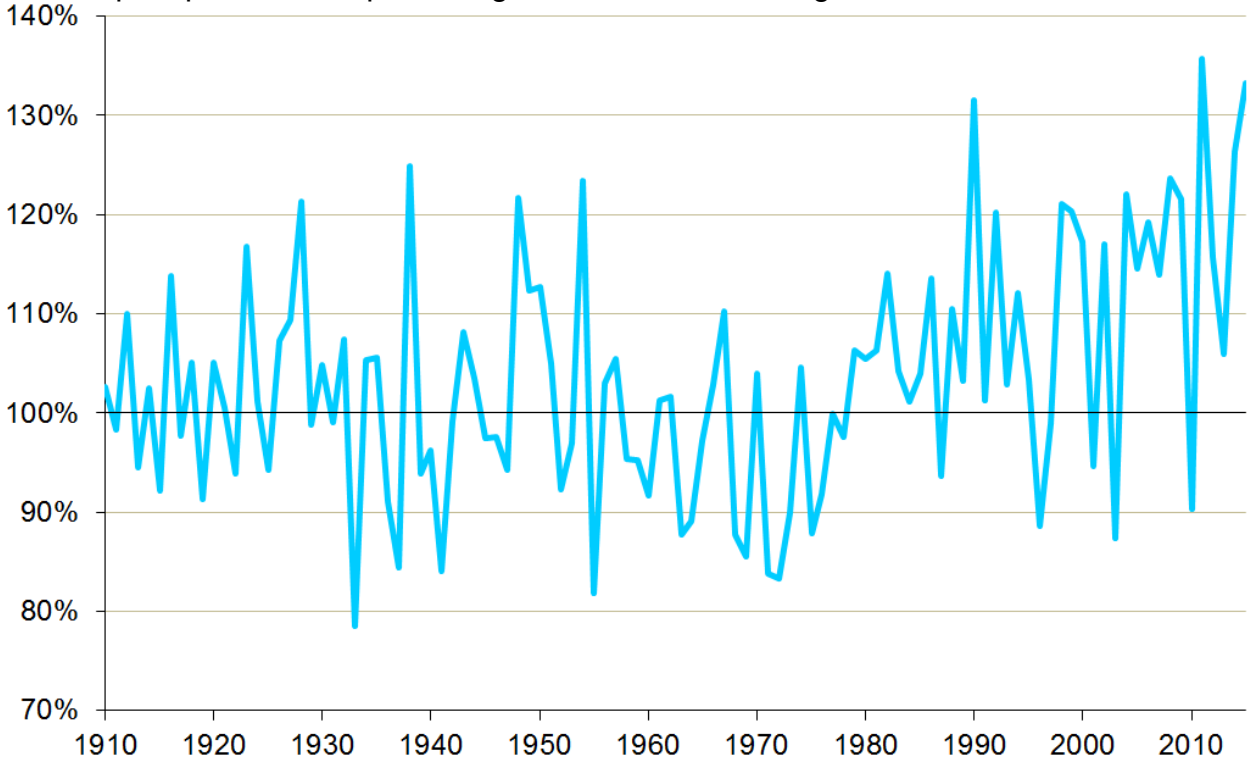
Factors affecting trend

While the global climate naturally exhibits long-term fluctuations, there is evidence that humans are also influencing the climate system[29]. This is mainly through the emission of greenhouse gases, a large proportion of which are generated through the combustion of fossil fuels.

Source: Met Office Metadata

Annual Precipitation: 1910-2015

Annual precipitation as a percentage of 1961-1990 average[30]



Why this measure is important

The UK Climate projections[31] indicate that the climate trends observed over the last century will continue and intensify over the coming decades. Rainfall is likely to become even more seasonal, with an average summer becoming drier, while autumn and winter become wetter[32]. Precipitation changes have several implications for Scotland, affecting water resources, flood and drought risk and habitat loss.

Background

Data are obtained from the Met Office. Measurements from rain gauges in the Met Office network of rainfall stations are used to create 5km x 5km gridded datasets covering Scotland.

Trend

The average annual precipitation in the 1980s, 1990s and 2000s was higher than in previous decades. 2015 was the second wettest year since records began in 1910 with annual precipitation 33.3% above the 1961-1990 baseline[33]. However, it is important to note that although there has been an overall increase in rainfall, this varies among seasons and regions.

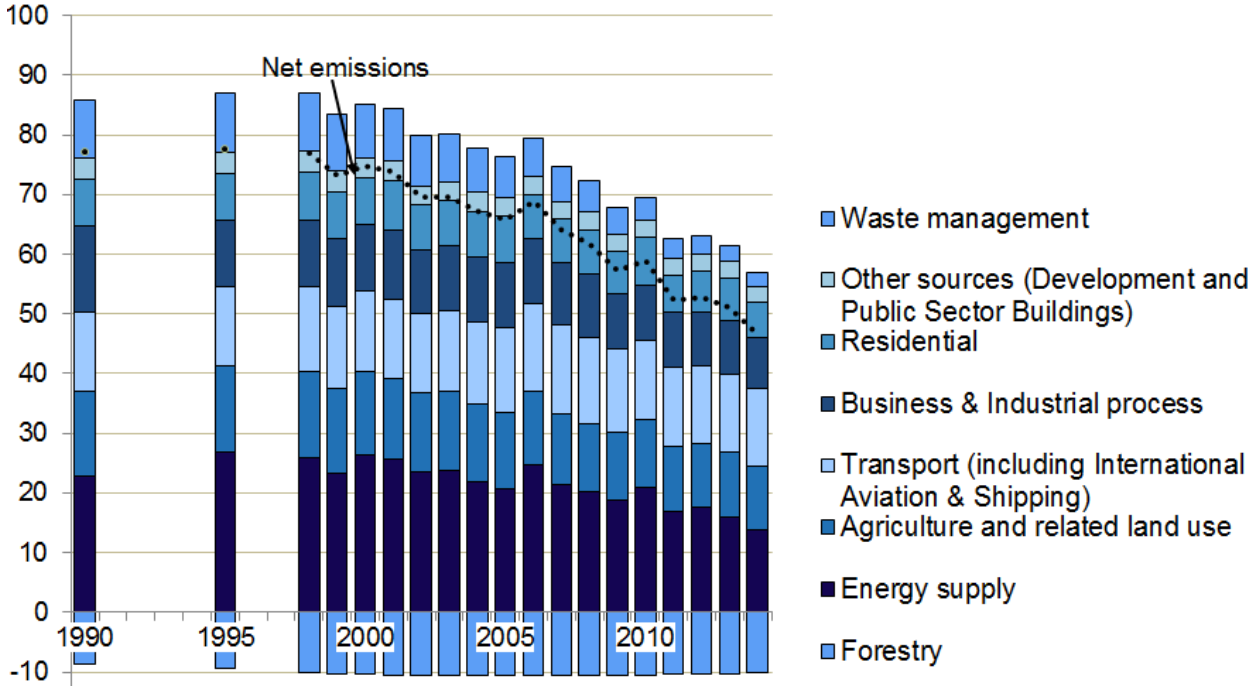
Factors affecting trend

While the global climate naturally exhibits long-term fluctuations, there is evidence that humans are also influencing the climate system[34]. This is mainly through the emission of greenhouse gases, a large proportion of which are generated through the combustion of fossil fuels.

Source: Met Office Metadata

Greenhouse Gas Emissions by Source: 1990-2014[R]

Million tonnes carbon dioxide equivalent ($MtCO_2e$)[35]



Why this measure is important

Greenhouse gases (GHGs) in the atmosphere help to retain radiative energy, resulting in warming of the lower atmosphere and earth surface.

Background

The Greenhouse Gas Inventory[36,37] is compiled in line with international guidance from the Intergovernmental Panel on Climate Change (IPCC)[38]. Only anthropogenic emissions (i.e. those caused by human activity) are included.

Trend

Scotland's net emissions of greenhouse gases in 2014, including emissions from international aviation and shipping, were estimated to be 46.7 million tonnes of carbon dioxide equivalent ($MtCO_2e$), 8.6% (4.4 $MtCO_2e$) lower than 2013 and 39.5% below 1990 levels. Energy supply emissions rose 18% between 1990 and 1995 and have since fallen by 48%, but still remained the largest source of emissions in 2014 (13.8 $MtCO_2e$). Other sectors with large falls in emissions between 1990 and 2014 include waste (-77%), business and industrial process (-40%) and the residential sector (-26%). The size of the annual forestry sink rose by 16% between 1990 and 2014 to -10.2 $MtCO_2e$ in 2014.

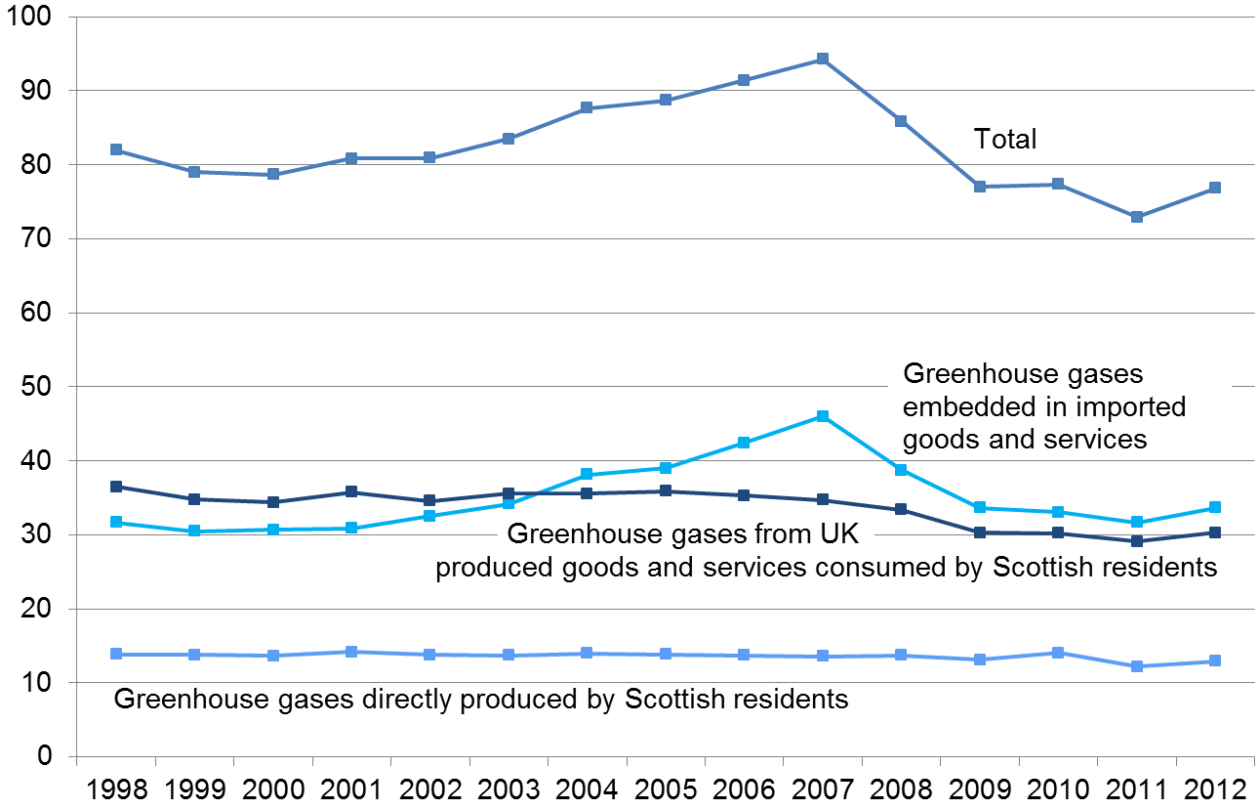
Factors affecting trend

Waste emissions fell due to the reduction in biodegradable waste landfilled and increased capture of landfill gas. The closure of Ravenscraig steel works in 1992 resulted in a sharp fall in industrial process emissions. Energy supply emissions fell following reduced use of coal at power stations. Agriculture and related land use emissions primarily fell due to historic land use changes and changes in farming practices. The forestry sink rose as a result of afforestation in the 1960s and 1970s which increased the net carbon store.

Source: National Atmospheric Emissions Inventory/Scottish Government Metadata

Scotland's Carbon Footprint (Greenhouse Gas Emissions on a Consumption Basis): 1998-2012[R]

Values in million tonnes carbon dioxide equivalent ($MtCO_2e$)[39]



Why this measure is important

Scotland's carbon footprint[40] measures all greenhouse gas (GHG) emissions generated at home and abroad in the production and transport of the goods and services consumed by Scottish residents.

Background

Data are provided under contract from the University of Leeds using a Multi-Regional Input-Output (MRIO) model, which takes the GHG emissions from where goods are bought and their associated supply chains into account.

Trend

Between 1998 and 2012, Scotland's carbon footprint fell by 6.3 per cent, from 82.0 million tonnes carbon dioxide equivalent ($MtCO_2e$) in 1998 to 76.8 $MtCO_2e$ in 2012. Scotland's carbon footprint rose fairly steadily from 1998 to a peak of 94.3 $MtCO_2e$ in 2007 before falling sharply in the following years to 77.1 $MtCO_2e$ in 2009 and 72.9 $MtCO_2e$ in 2011. Between 2011 and 2012, the total carbon footprint increased by 5.3 per cent. GHG emissions associated with imported goods and services increased from 31.7 $MtCO_2e$ in 1998 to 46.0 $MtCO_2e$ in 2007, before falling to 33.6 $MtCO_2e$ in 2012.

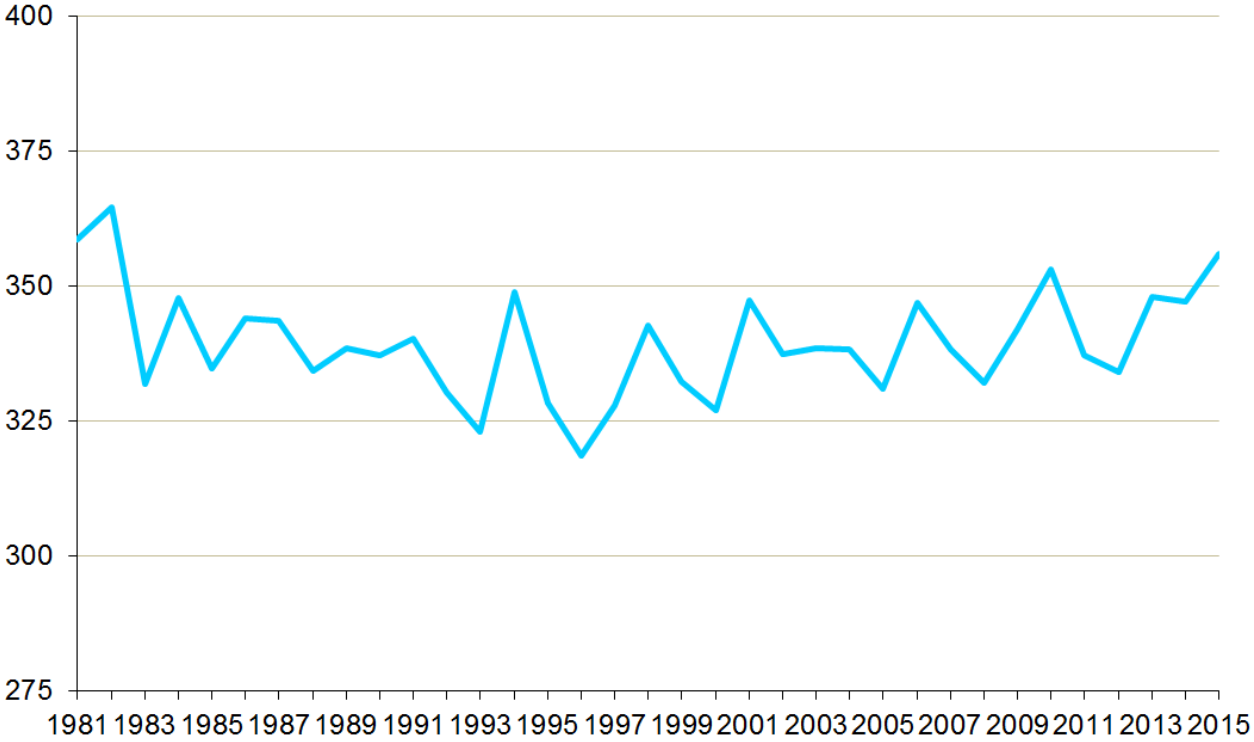
Factors affecting trend

Scotland's carbon footprint is partly affected by the economy (which can affect how much of the goods and services Scotland uses are imported from outside the UK) as is evidenced by the sharp decrease in carbon footprint after 2007, coinciding with the global recession.

Source: Scottish Government Metadata

Column Ozone Measurements: 1981-2015

Column ozone concentrations over Lerwick (Dobson units)



Why this measure is important
The stratospheric ozone layer, located around 10-30 km above the Earth's surface, forms a protective shield against harmful solar (UVB) radiation[41]. Thinning of the ozone layer has occurred since the beginning of the 1980s in all regions except those around the equator.

Background
Column ozone measurements are made using the Dobson Spectrophotometer at Lerwick in 4-year observational cycles.

Trend
The total ozone levels at Lerwick vary seasonally, with maximum levels generally occurring in early spring and minimum levels in autumn. Generally, levels decreased until the late 1990s. More recently, it appears that this trend may be leveling out, but it is too soon to be sure.

Factors affecting trend
Over the last 30 years, the annual average total ozone cover over Lerwick has shown the natural variability which would be expected due to varying meteorological conditions. Globally, the 1987 Montreal Protocol[42] 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 from old equipment and the long life of these substances mean that full recovery of the ozone layer is not predicted until around 2050.

Source: Defra Metadata

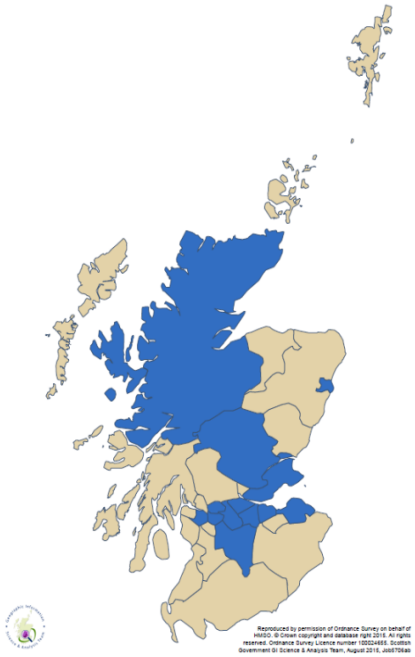
Air Quality

Background

Air quality can be affected by the emission of pollutants into the atmosphere from a wide range of sources, and has implications for both human health[43] and the natural environment. The Air Quality Strategy[44] (AQS) has introduced objectives that aim to improve air quality by reducing concentrations of several different pollutants.

Air Quality Management Areas

Local authorities with Air Quality Management Areas as at 10 October 2016[45]



While the Air Quality Strategy focusses on improving air quality at a national level, localised areas of poor air quality may remain. To address this, the Local Air Quality Management (LAQM) system was established.

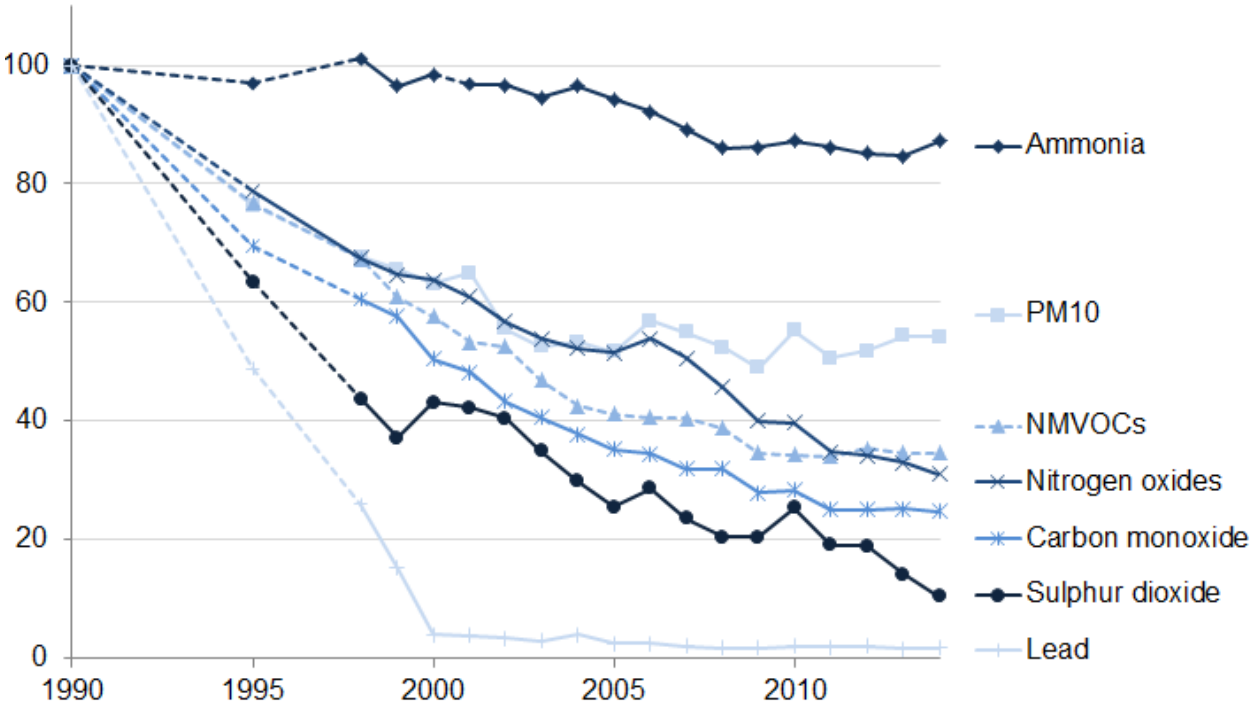
Under the LAQM system, all local authorities are required to regularly review air quality in their areas against several objectives for pollutants of particular concern for human health. If this work shows that any objective is not being achieved, the authority concerned must declare an Air Quality Management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

As at 10 October 2016, there are 36 AQMAs in Scotland. Eight of these have been declared solely for particulate matter (PM_{10}) and a further 11 for both PM_{10} and nitrogen dioxide (NO_2). Sixteen of the remaining AQMAs are for NO_2 only and one is for sulphur dioxide (SO_2). All except the SO_2 AQMA have been declared on the basis of emissions from transport sources.

Targets and Indicators

Pollutant		AQS Objective	Year to be met
Nitrogen Dioxide (NO_2)		1 hour mean of 200 µg/m^3, not to be exceeded more than 18 times a year	2005
		Annual mean of 40 µg/m^3	
Ground level ozone		8-hour running mean of 100 µg/m^3, not to be exceeded more than 10 days a year	2005
Particulate matter (PM_{10})	Stage 2	24 hour mean of 50 µg/m^3, not to be exceeded more than 7 times a year	2010
		Annual mean of 18 µg/m^3	
Sulphur dioxide (SO_2)		1 hour mean of 350 µg/m^3, not to be exceeded more than 24 times a year	2004
		24 hour mean of 125 µg/m^3, not to be exceeded more than 3 times a year	
		15 minute mean of 266 µg/m^3, not to be exceeded more than 35 times a year	2005

Emissions of Air Pollutants: 1990-2014[R]



Index of air pollutant emissions (1990=100)

Why this measure is important

Air pollutants can negatively affect human and ecosystem health, with some pollutants such as PM_{10}[46] being of particular concern to human health.

Background

Ricardo-AEA and Aether are contracted to provide estimates of air pollution emissions. These are published on the National Atmospheric Emissions Inventory.

Trend

Over the long term there have been reductions in emissions for all the pollutants in the inventory. Between 1990 and 2014, there have been decreases of 13% for ammonia, 46% per cent for PM_{10}, 65% for NMVOCs, 69% for nitrogen oxides (NOx), 75% for carbon monoxide, 90% for sulphur dioxide and 98% for lead.

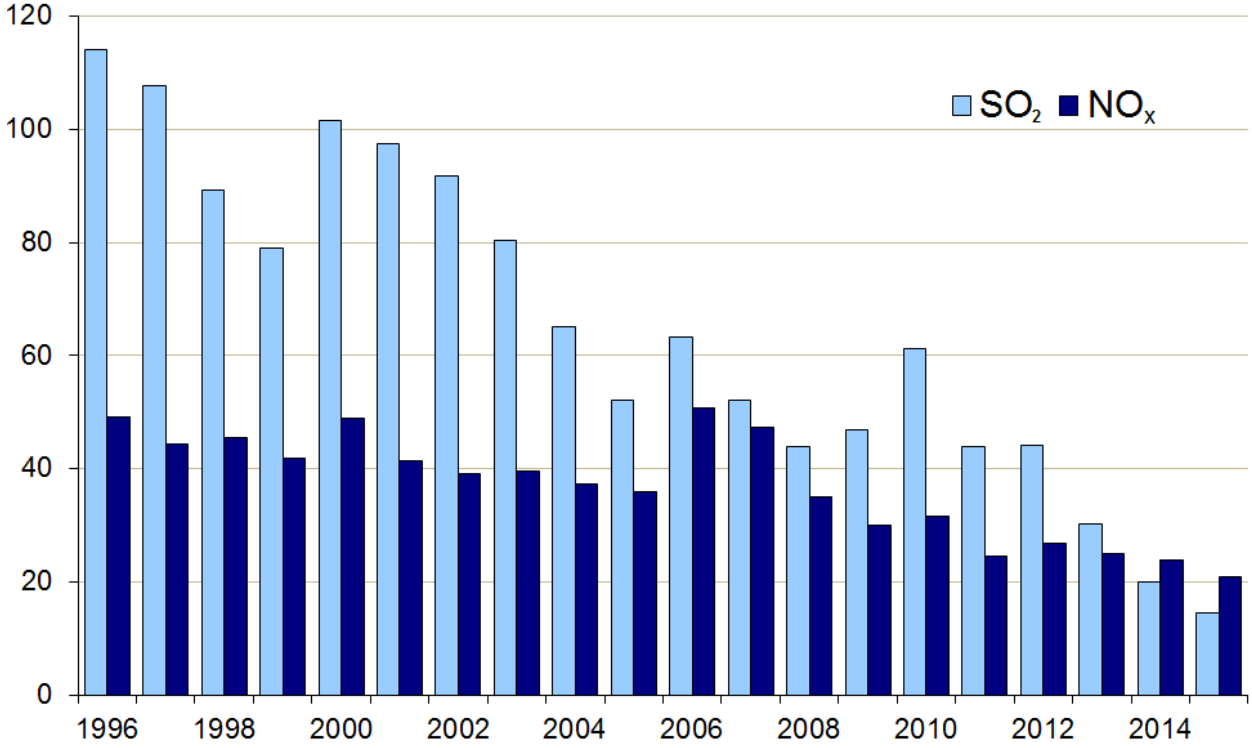
Factors affecting trend

Ammonia emissions have reduced through a combination of decreasing animal numbers and a decline in fertiliser use. Sulphur dioxide emissions fell following the move to gas fired power stations, the introduction of flue gas desulphurisation to coal-fired power stations and the closure of Cockenzie power station in 2013. Reductions in emissions of NOx and carbon monoxide are related to the need for new petrol cars to have 3 way catalysts installed and more recently the introduction of “Euro standards” for new cars. The decline in NOx emissions since 2007 is also linked to the power sector, as Boosted Over-Fire Air abatement systems were fitted which reduces NOx emissions formed during coal combustion. Reductions in NMVOCs are mainly the result of minimising fugitive emissions from sources such as oil loading and unloading operations. Historic reductions in lead emissions are due to the removal of lead in petrol.

Source: National Atmospheric Emissions Inventory Metadata

Emissions of Sulphur Dioxide and Nitrogen Oxides from Large Combustion Plants: 1996-2015[47]

Annual Large Combustion Plant emissions (thousand tonnes)



Why this measure is important

Sulphur dioxide (SO_2) and oxides of nitrogen (NOx) affect human health through respiratory damage, and ecosystem health through acidification. Oxides of sulphur, including SO_2, and NOx are released into the atmosphere through the combustion of fossil fuels.

Background

Data are obtained from the Large Combustion Plants Directive[48] (LCPD) report, which is compiled for the United Kingdom LCPD submission to the European Commission.

Trend

In 2015, SO_2 emissions from large combustion plants decreased by 27% compared with 2014 and NOx emissions fell by 13% over the same period, mainly due to lower emissions from Longannet power station. Overall, SO_2 emissions from large combustion plants decreased by 87% between 1996 and 2015 and NOx emissions decreased by 58%. The 2015 SO_2 and NOx emissions are the lowest on record.

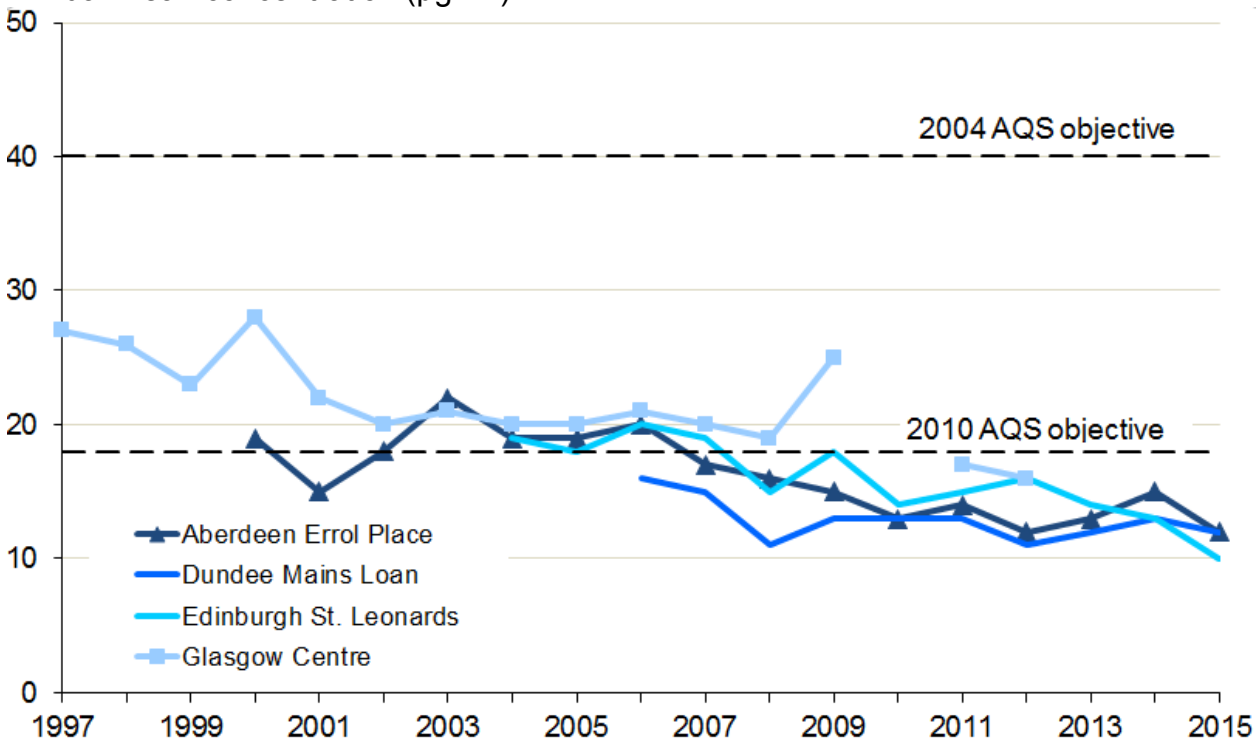
Factors affecting trend

Previous rises in emissions (for example, in 2006 and 2010) coincided with periods of cold weather that led to increased emissions from the electricity supply sector. This was in part due to increased electricity production at Longannet and the increased use of domestic coal that has a higher sulphur content. Trends in emissions from Large Combustion Plants can also be affected by the relative prices of coal and gas. The large decrease in SO_2 emissions can be partly attributed to the closure of Cockenzie power station in March 2013.

Source: Scottish Environment Protection Agency Metadata

Particulate (PM_{10}) Concentrations: 1997-2015[49, 50, 51]

Annual mean concentration ($\mu g/m^3$)



Why this measure is important

Particulate pollution can harm the human respiratory and cardiovascular systems, and is linked to asthma and mortality. Smaller particles are the most damaging as they can enter the bloodstream through the lungs. Current targets focus on particles less than 10µm in diameter (PM_{10}), the greatest source of which is combustion. Between 1990 and 2014, Scottish emissions of PM_{10} fell by 46%[52].

Background

Data are obtained from automatic air quality monitoring sites, which measure the concentrations of a range of pollutants at various sites across Scotland.

Trend

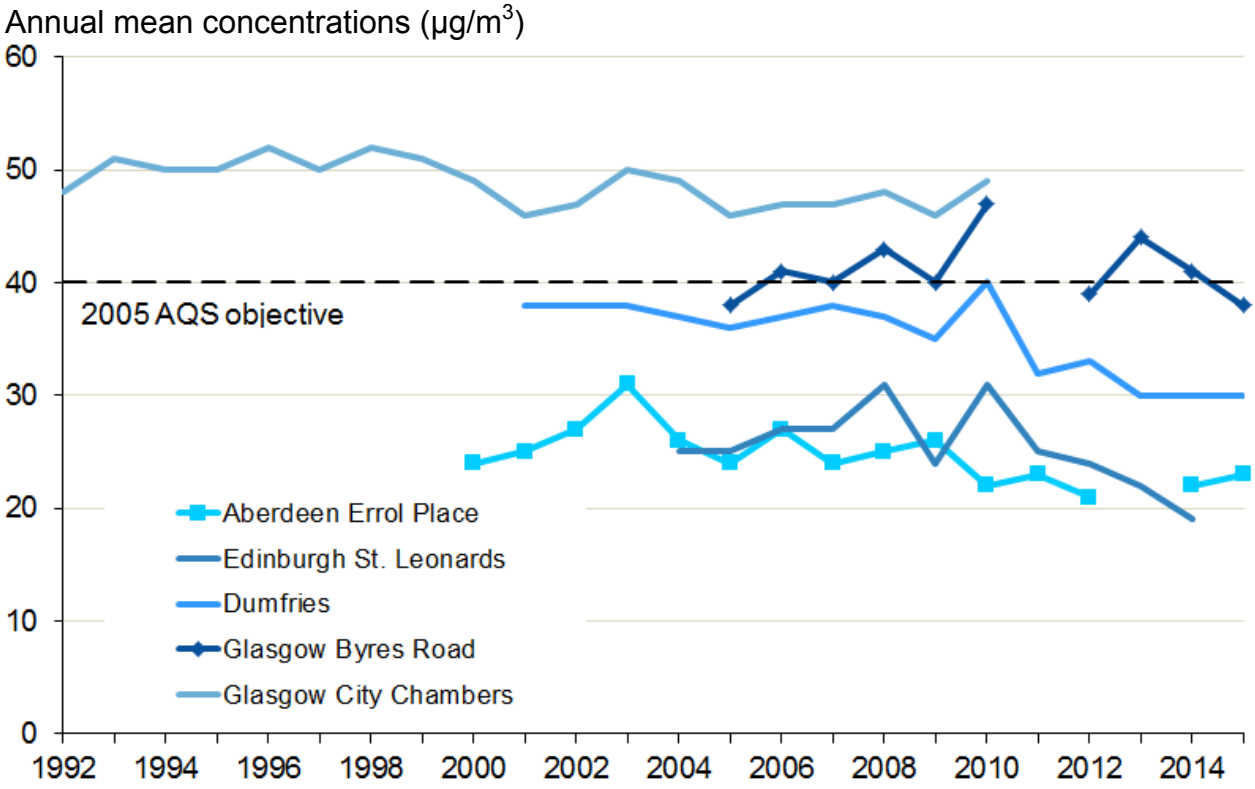
The Stage 2 annual mean objective was not met at 4 of 64 automatic monitoring sites with a data capture rate of greater than 75% in Scotland in 2015[53], compared to 10 of 58 sites in 2014. Three of these sites also failed to meet the Scottish daily mean objective in addition to one other Aberdeen site. Edinburgh Salamander Street has not met the stage two Scottish annual mean objective since 2010.[54]

Factors affecting trend

Changes in PM_{10} concentrations depend on the levels of emissions from several different sources including domestic combustion and power generation. Recent reductions in PM_{10} concentrations can be attributed to a reduction in the emissions from power generation, largely due to a switch from coal-fired energy generation to gas, which produces negligible PM_{10} emissions.

Source: Scottish Air Quality Database Metadata

Nitrogen Dioxide Concentrations: 1992-2015[55, 56, 57]



Why this measure is important
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 through its contribution to acid deposition, eutrophication (accelerated plant growth in water bodies caused by excess nutrients) and promotion of the formation of ground level ozone.

Background
Data are obtained from automatic air quality monitoring sites, which measure the concentrations of a range of pollutants at various sites across Scotland.

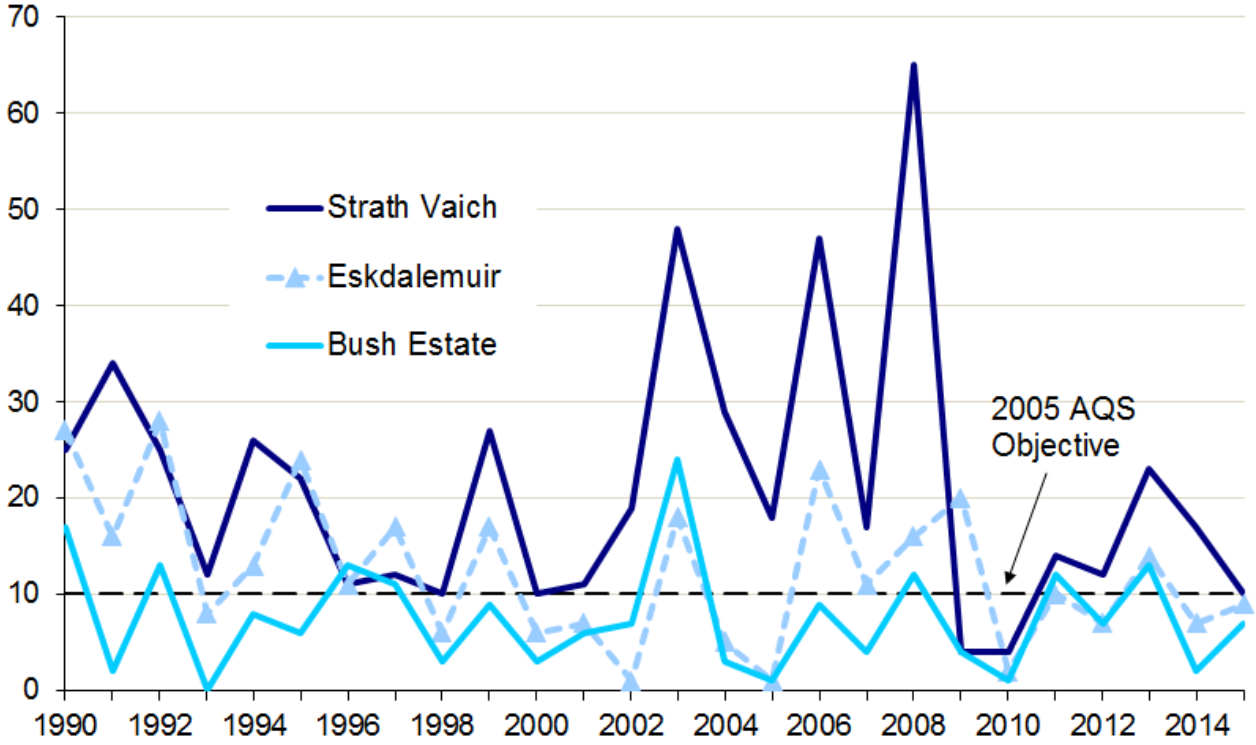
Trend
In 2015, the annual mean objective was not met at 8 of the 70 automatic monitoring sites with a data capture rate of greater than 75%[58] in Scotland, compared to 10 of 68 sites in 2014. Those sites recording the highest annual mean concentrations were found next to busy roads, such as Glasgow Kerbside and Edinburgh St John's Road[59]. The hourly mean objective was met at all automatic monitoring sites in Scotland, apart from Edinburgh St John's Road.

Factors affecting trend
The main sources of nitrogen oxides (that are not produced naturally) are road transport, especially in urban areas, power generation and industry. Between 1990 and 2014, Scottish emissions of NOx are estimated to have decreased by 69%, due in part to the installation of catalytic converters in vehicles[60].

Source: Scottish Air Quality Database Metadata

Ground Level Ozone Concentrations: 1990-2015[61, 62]

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



Why this measure is important

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 can affect vegetation by damaging leaves and reducing yields.

Background

Data are obtained from automatic air quality monitoring sites, which measure the concentrations of a range of pollutants at various sites across Scotland.

Trend

In 2015, the AQS objective was met at all 11 sites with a data capture greater than 75%[63], compared to 8 of 9 sites in 2014. Annual average ozone concentrations fluctuate from year-to-year and, as such, it is difficult to say if there is any overall trend.

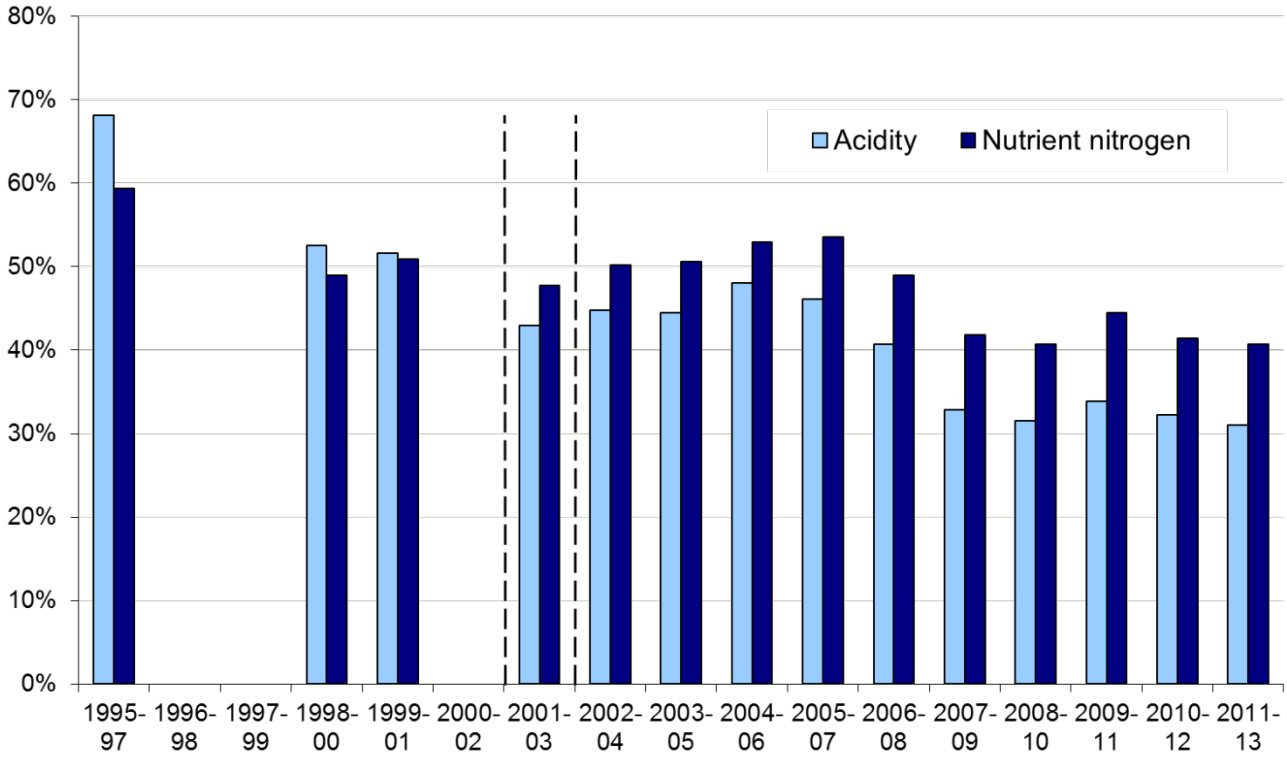
Factors affecting trend

Ozone is formed 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 also tend to be lower in urban areas where it is converted to nitrogen dioxide by reacting with nitrogen oxides.

Source: Scottish Air Quality Database Metadata

Sensitive Habitats Exceeding Critical Loads for Acidification and Eutrophication: 1995-1997 to 2011-2013[64, 65]

Percentage exceedance



Why this measure is important

Critical loads are thresholds above which the deposition of pollutants causing acidification (sulphur dioxide, nitrogen oxides and ammonia) and eutrophication (nitrogen oxides and ammonia) cause significant harm to the environment[66]. Around 60% of Scotland's land area contains habitats sensitive to acid deposition and 55% to eutrophication, with much of the area sensitive to both.

Background

Critical loads for acidity and nutrient nitrogen are calculated using internationally agreed methods. These are then compared with deposition values to calculate critical load exceedances and identify habitat areas at risk from the adverse impacts from acidification and eutrophication.

Trend

The area of sensitive habitats in Scotland exceeding critical loads for acidification fell from 68% in 1995-97 to 31% in 2011-13. Over the same time period, nutrient nitrogen exceedances fell from 59% to 41%[67].

Factors affecting trend

Changes in the area of sensitive habitats exceeding critical loads largely depend on changing emissions of pollutants; for instance, the reduction in acidity exceedance has been largely driven by a reduction in sulphur emissions. Changes were also made to the methodology for calculating depositions in 2001-03 and 2002-04, which means that depositions for earlier years may be underestimated.

Source: Centre for Ecology and Hydrology Metadata

Water

Background

Water is vitally important for a number of areas as it supports a variety of wildlife, is an important resource for tourism and recreation and provides domestic and commercial water supplies. Water quality can be negatively affected by the enrichment of nutrients such as nitrates and orthophosphates, which can affect aquatic ecosystem health, and by the presence of certain bacteria that can pose a potential risk to public health.

Water body type	Approximate area/length (to the nearest thousand)	Additional information
Rivers	125,000 km	There are also 220 km of canals in Scotland
Lochs	2,000 km^2	There are 25,500 lochs in Scotland – over 17,600 of these cover less than 0.01 km^2.
Estuaries	1,000 km^2	There are 49 estuaries in Scotland assessed through the Water Framework Directive, including 9 salt-water lagoons.
Coastal Waters	48,000 km^2	Scotland has approximately 19,000 km of coastline
Offshore Waters	462,000 km^2	Scottish offshore waters extend from 3 nautical miles from the coast to the Exclusive Economic Zone (EEL).

Maintaining water health

Maintaining the health of Scotland's water bodies is important for protecting drinking water supplies and wildlife, and for industries such as tourism, aquaculture and whisky production.

There are a number of pressures on the health of Scotland's water bodies including rural diffuse pollution, waste water and hydropower generation. Rural diffuse pollution can occur when rainwater run-off from land picks up soil, fertilisers and pesticides used in agriculture, forestry and other rural land uses, which can in turn result in eutrophication[68]. Scottish Environment Protection Agency (SEPA) has an extensive monitoring network, which focusses on high priority areas, to monitor the general health of Scotland's water bodies and to help target action when required.

Scottish Water is the body responsible for public water supplies and for monitoring the quality of drinking water that it supplies.

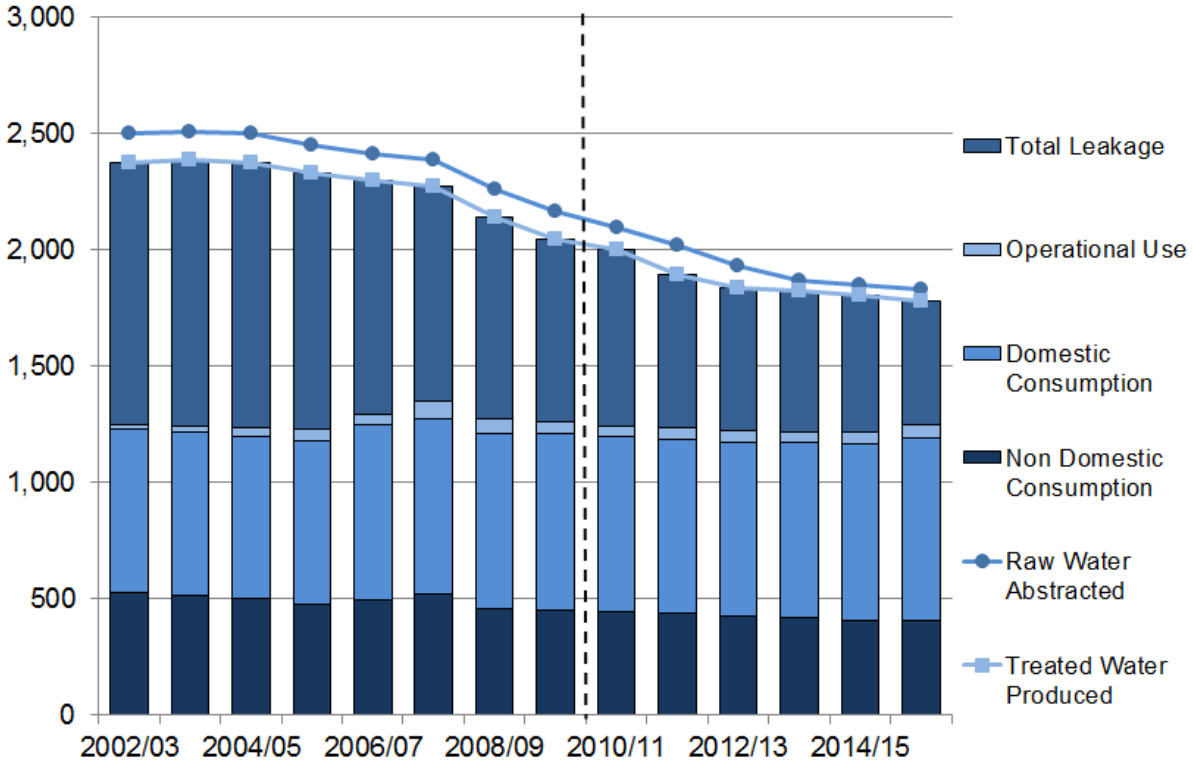
Targets and Indicators

SEPA compile a long-term river water quality indicator based on five parameters (see page 34). There are also various standards to be met for:

- The quality of Scottish bathing waters – set out in the EC Bathing Water Directive (76/160/EEC). These have now been superseded by the EU Bathing Water Directive (2006/7/EC).
- The quality of drinking water – set out in the Water Supply (Water Quality) (Scotland) Regulations 2001[69]. These have now been superseded by the Public Water Supplies (Scotland) Regulations 2014.

Public Water Supplies – Water Abstracted and Supplied: 2002/03-2015/16[70, 71]

Million litres per day (Ml/d)



Why this measure is important

For sustainable management of water resources, it is essential to meet consumer demand whilst maintaining aquatic ecosystem health. The abstraction of water can have impacts on geology, habitats, wildlife and biodiversity.

Background

Water abstraction is managed by Scottish Water and Scottish Environment Protection Agency under the Water Resource Planning and River Basin Management Planning Processes.

Trend

Between 2002 and 2009, estimated raw water abstractions by Scottish Water decreased by 13% to 2,165 Ml/d. Between 2010 and 2015, using improved data and methodology, the volume of raw water abstracted also decreased by 12.6% to 1,831 Ml/d. Between 2004/05 and 2015/16, treated water produced fell by 598 Ml/d (25%) to a new low of 1,780 Ml/d. There has been a slight increase of 89 Ml/d (13%) in domestic water consumption between 2004/05 and 2015/16, while non-domestic water consumption has decreased by 98 Ml/d (19%) over the same period. However, there has been relatively little change in all water consumption overall (domestic, non-domestic and operational use[72]) between 2004/05 and 2015/16.

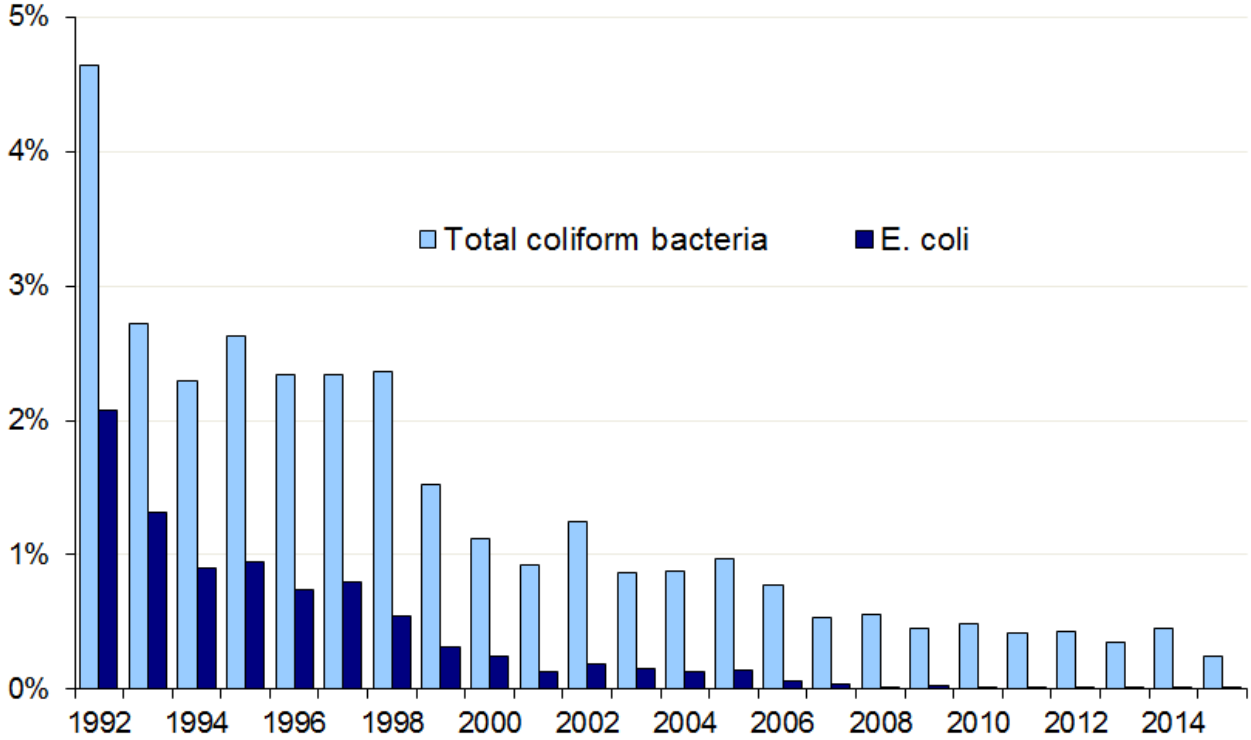
Factors affecting trend

The decrease in treated water is almost entirely due to a reduction in leakage[73,74] of 608 Ml/d (53%) between 2004/05 and 2015/16. The increase in domestic water consumption partly reflects an increase in the number of households and the decrease in non-domestic water consumption partly reflects the introduction of the retail market, where retailers offer customers advice on how to reduce their water and sewerage bills.

Source: Scottish Water Metadata

Drinking Water Quality: 1992-2015

Percentage of samples at consumers' taps containing coliform bacteria



Why this measure is important

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

Background

Scottish Water is required to analyse samples taken from water treatment works, service reservoirs and consumers' taps to test for the presence of coliform bacteria. Samples containing coliform bacteria fail to meet the standards set out in the Water Supply (Water Quality) (Scotland) Regulations 2001[75]. These regulations have now been superseded by the Public Water Supplies (Scotland) Regulations 2014, which sets out the standards to be met by the 2015 tests. The Drinking Water Quality Regulator for Scotland publishes an annual report summarising this data[76].

Trend

Between 1992 and 2015, the percentage of samples from consumer taps containing coliform bacteria fell from 4.64% to 0.25% and the percentage containing Escherichia coli (*E. coli*) fell from 2.08% to 0.01%. Between 2014 and 2015, the failure rate for total coliforms decreased by 0.20 percentage points to the lowest level recorded, while the failure rate for *E. coli* remained fairly constant.

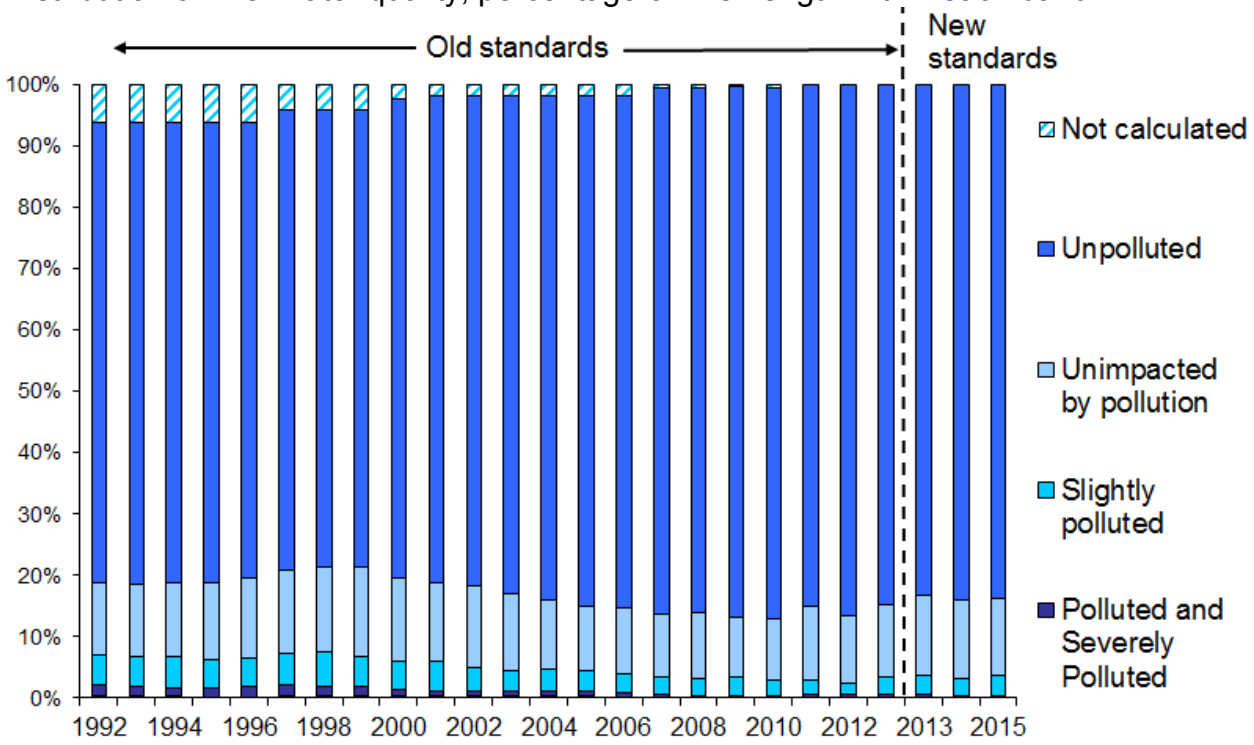
Factors affecting trend

Most of this overall improvement is the result of investments made at water treatment works across the country over the past ten years. In recent years, many improvements have been made to most of the small, rural treatment works that have historically been unable to consistently and satisfactorily treat water to the standard required by the Regulations.

Source: Drinking Water Quality Regulator For Scotland Metadata

River Water Quality: 1992-2015

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



Why this measure is important

Low standards of river water quality may threaten the aquatic environment, drinking water quality and impact on recreational water use. River water quality can be affected by a number of factors including sewage, industry, urban development and agriculture.

Background

The Scottish Environment Protection Agency (SEPA) long term indicator of river water quality is based on a network of sites covering 253 water bodies (rivers or sections of rivers), which account for approximately 10% of all water bodies in Scotland. Two of the standards used to calculate the indicator were changed in 2013[77]. In this indicator, river water quality is classified as 'unimpacted by pollution,' 'unpolluted', 'slightly polluted', 'polluted', or 'severely polluted'. The 'polluted' and 'severely polluted' categories have been combined on the chart above so that they can be seen more clearly.

Trend

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 3.4% in 2013, using the old standards. Using the new standards, this proportion fell from 3.7% in 2013 to 3.5% in 2015. The proportion of river length classed as unpolluted fell from 86.5% in 2010 to 84.8% in 2013. Using the new standards, the proportion of river length classed as unpolluted rose slightly from 83.3% in 2013 to 84.0% in 2015. In 2015, the proportion of river length classed as unimpacted by pollution was 12.5%.

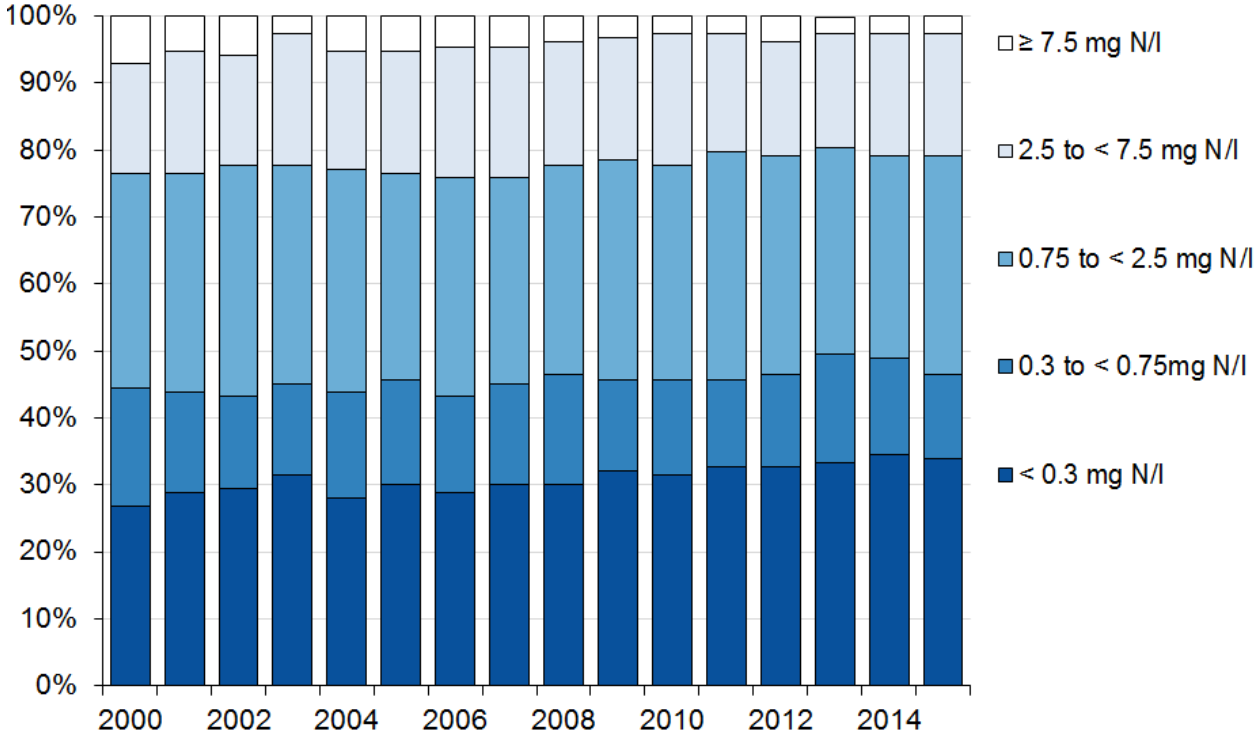
Factors affecting this trend

The main drivers of slightly polluted, polluted and severely polluted rivers are inputs of nutrients, such as those from agriculture and waste water treatment works, leading to degraded biological and nutrient quality. In general, Scottish water quality has improved following the investments made to the sewage infrastructure in Scotland.

Source: Scottish Environment Protection Agency Metadata

Nitrate Concentrations in Rivers: 2000-2015

Distribution of mean nitrate concentrations, percentage of sites[78] within each band



Why this measure is important

The enrichment of waters by nutrients, such as nitrates, may lead to the damage of the aquatic environment through eutrophication. Therefore, monitoring of the water environment for nutrient enrichment is important to protect water quality. Although some freshwater lochs can be at risk, high nitrate levels tend to have a greater impact on marine and coastal waters than on freshwater.

Background

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

Trend

Nitrate concentrations below 0.3 mg N/l are considered to be natural or background levels[79]; the percentage of sites with mean nitrate concentrations of less than 0.3 mg N/l has increased from 27% in 2000 to 34% in 2015. In 2015, less than 3% of sites had nitrate concentrations greater than or equal to 7.5 mg/l compared with over 7% of sites in 2000.

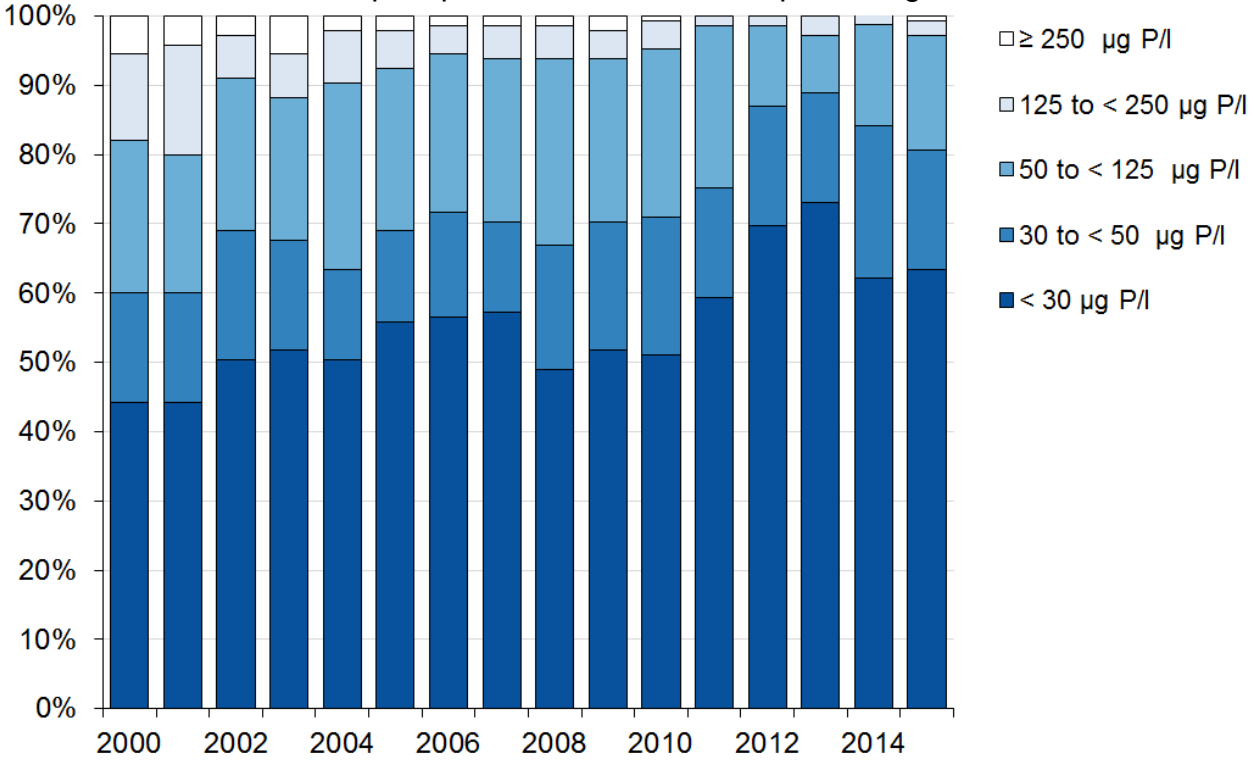
Factors affecting trend

The main source of nitrates in freshwater is from agriculture; nutrients are important for crop growth and good nutrient management is crucial to ensure there is no excessive loss to the water environment. Currently, 10% of the area of Scotland[80] is designated, through legislation, as Nitrate Vulnerable Zones (NVZs)[81], in which mandatory rules on farming practices aim to reduce nitrate water pollution from agricultural sources.

Source: Scottish Environment Protection Agency Metadata

Orthophosphate Concentrations in Rivers: 2000-2015

Distribution of mean orthophosphate concentrations[82], percentage of sites in each band



Why this measure is important

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

Background

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

Trend

The percentage of sites with orthophosphate concentrations less than 30 µg P/l has generally increased over time from 44% in 2000 to 73% in 2013 before falling to 63% in 2015. The percentage of sites with concentrations greater than or equal to 125 µg P/l has generally fallen over this period.

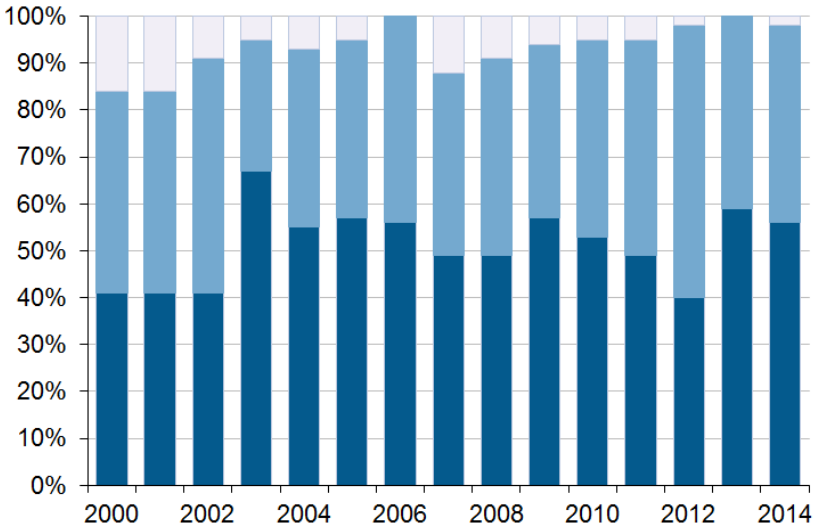
Factors affecting trend

These changes mainly reflect the improvements in water quality following the investments made to the sewage infrastructure in Scotland. Under the Urban Waste Water Treatment Directive (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

Coastal Bathing Water[83] Quality 2000-2016

Percentage compliance with EC Bathing Water Directive (76/160/EEC)



Assessment against standards in EU Bathing Water Directive (2006/7/EC)

Why this measure is important

There is a potential risk to public health if high concentrations of faecal bacteria are present in bathing waters. This can occur if heavy rain leads to increased surface water run-off in urban areas and fields, which causes contaminants to enter the water.

Background

EC Bathing Water Directive (76/160/EEC) set out requirements for Member States to monitor and assess the water quality at designated bathing waters, and provide public information on the results. The Directive set out two quality standards - the 'mandatory' standard and the stricter 'guideline' standard. Designated bathing waters should comply, as a minimum, with the mandatory standard and aim to comply with the guideline standard. Since 2015, bathing water has been assessed by new tighter standards on bathing water quality based on four years performance, as set out in EU Bathing Water Directive (2006/7/EC).

Trend

In 2014, all but two of Scotland's coastal bathing waters met the mandatory standard, with 56% of the bathing waters also achieving the guideline standard. There was a steady improvement in compliance with the mandatory standard between 2007 and 2013 when all coastal bathing waters met the mandatory standard. On the basis of initial assessments for 2016, 85% of the 81 coastal bathing waters met the new minimum European standard with 73% classified as excellent or good quality. There has been an increase in the number of coastal bathing waters assessed as excellent quality from 16 over the four years to 2015 to 25 over the four years to 2016. The number assessed as poor quality fell from 17 over the four years to 2015 to 12 over the four years to 2016.

Factors affecting trend

Weather can have a large effect on the compliance of bathing waters, as heavy rain can lead to overflows from drains and surface water run-off from fields containing animal manure, which raises the risk of sites failing to meet the required standard.

Source: Scottish Environment Protection Agency Metadata

Radioactivity

Background

Radiation refers to the transmission of energy through the environment. Ionising radiation are those forms of radiation which are capable of creating positive or negative charges in the matter that they interact with. Because of the damaging effects of this ionisation on living cells, high levels of ionising radiation have a range of harmful effects on human health including burns, increased incidence of cancers and hereditary disease, as well as radiation sickness in cases of extremely high levels of exposure.

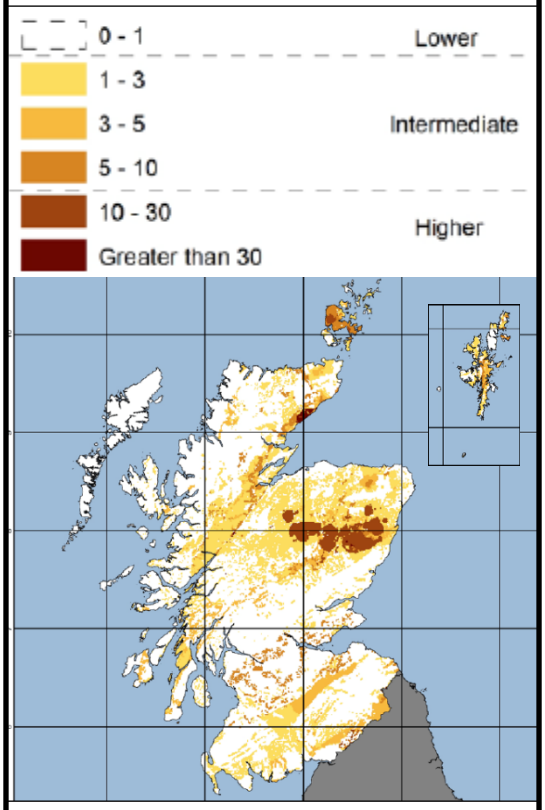
Radiation comes from a wide range of sources, most of which are found naturally in the environment, and is always present in the environment at a low level, known as the background radiation level. Radiation levels become a concern when they rise substantially above background levels. Heightened levels of artificial radiation have occurred during the 20th century from atmospheric nuclear weapons testing in the 1940s to 1960s, and from the Chernobyl nuclear incident.

Sources of Radiation

The single biggest source of exposure to ionising radiation in Scotland is radon, a naturally produced gas, which is released by the radioactive decay of uranium ore in rocks. Radon itself decays into a radioactive dust that can be inhaled, leading to an increased risk of lung cancer, particularly amongst smokers. Levels of radon vary across the country[84], depending on the amount of uranium ore in the underlying geology. In buildings where the radon level exceeds the Action Level, this can be mitigated by the installation of ventilation systems to remove radon gas out of buildings. Other important natural sources of radiation are terrestrial gamma rays, cosmic 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.

Scottish Environment Protection Agency (SEPA) produce an annual report on the monitoring of radioactivity in food and the environment[85].

Percentage of homes at or above the Action Level for Radon

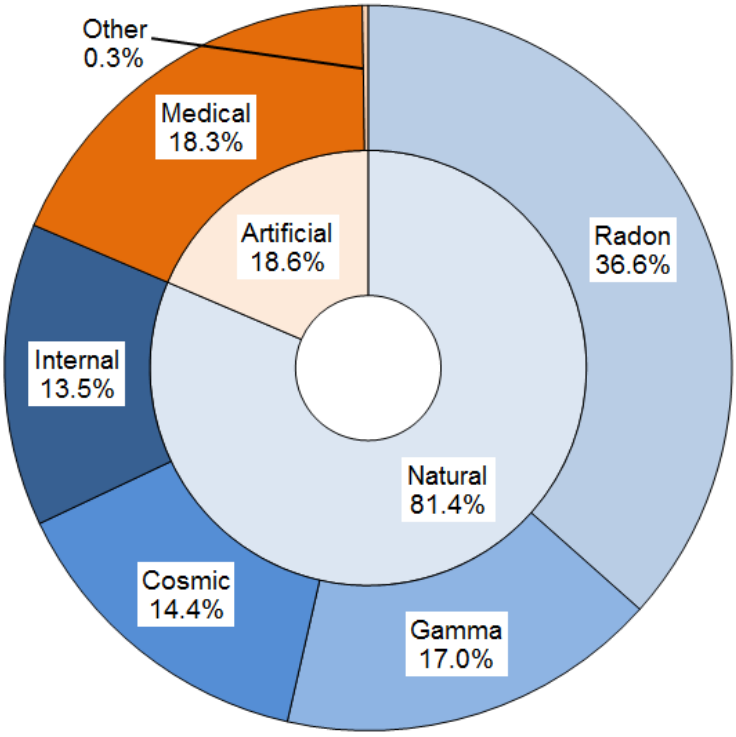


Targets and Objectives

- Sources of artificial radiation are kept to a minimum wherever possible.

Exposure of the Population to All Sources of Radiation: 2010[P] [86, 87]

Percentage of annual radiation exposure from all sources



Average annual dose in Scotland
2,300 microsieverts

Why this measure is important

Exposure to ionising radiation at very high levels can lead to radiation sickness, but even low-level exposure may be associated with genetic damage that can induce cancer.

Background

The average annual doses of radiation from all sources to an individual living in Scotland is reported by the Centre for Radiation, Chemical and Environmental Hazards (CRCE), part of Public Health England (PHE). The values for Radon and gamma rays are specific to Scotland; other figures are assumed to be the same as the UK average values. Values for 2010 are provisional and based on on-going work.

Trend

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

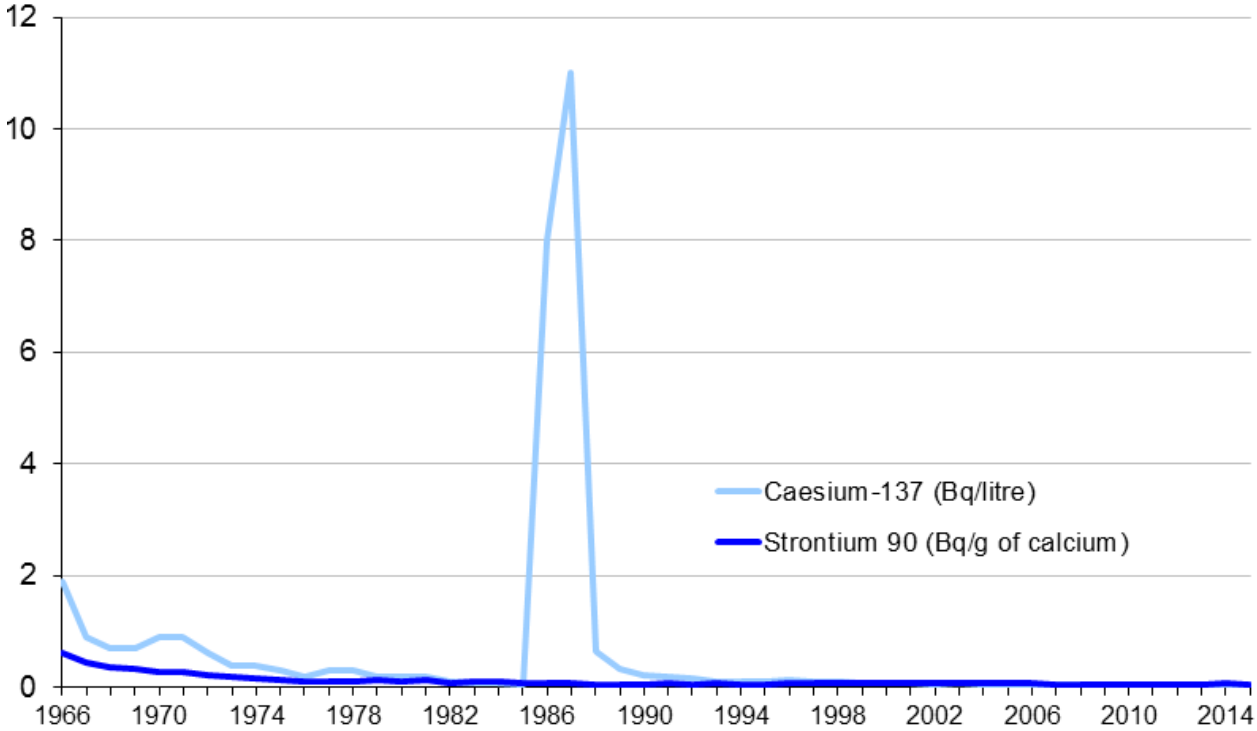
Factors affecting trend

The Chernobyl reactor incident in 1986 caused average annual doses from fall-out (included in the category “Other”) to increase by about five times that year. This rapidly declined to baseline levels in later years where it has remained.

Source: Public Health England Metadata

Activity Concentrations in Milk: 1966-2015[88]

Activity concentrations (Becquerels, Bq)



Why this measure is important

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

Background

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

Trend

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. In 2015, the concentration of ^{137}Cs was below 0.038 Bq/litre and ^{90}Sr was below 0.056 Bq/gram of calcium. However, even at its peak, the ^{137}Cs concentration in milk following the Chernobyl accident was around 100 times lower than the Community Food Intervention Levels, defined by Euratom Regulations EC/3954/87 and EC/2218/89, which were derived to ensure the protection of the public.

Factors affecting trend

Caesium-137 is one of the main radioactive isotopes produced in nuclear reactions, with a half-life of 30 years. Activity levels of caesium-137 in milk peaked sharply following the Chernobyl reactor incident in 1986, with 1987 concentrations 220 times greater than 1985 concentrations. Concentrations then fell rapidly in 1988, and are now below pre-Chernobyl levels.[89]

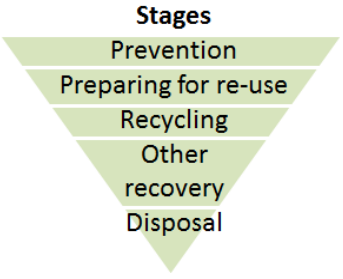
Source: Scottish Environment Protection Agency Metadata

Waste and Recycling

Background

Waste is produced from a variety of sources including households, industry, construction and agriculture. Waste can have a serious impact on the environment through the loss of finite resources and the generation of pollutants. Recycling is one means to reduce Scotland's waste impact by transforming waste into new and useful products.

Waste Hierarchy



- Using less materials, products lasting longer
- Checking, cleaning, repairing, refurbishing etc.
- Turning waste into new materials and compost
- Anaerobic digestion, incineration with energy recovery

- Landfill and incineration without energy recovery

The waste hierarchy[90] governs the design of waste prevention and management legislation and policy. It places an emphasis on seeing waste as a potential resource, with landfilling at the bottom of this hierarchy with waste prevention, preparation for reuse and recycling at the top of the hierarchy. Sending waste to landfill not only results in the loss of resources but also leads to further extraction and processing of raw materials which may consume large quantities of energy, release pollutants and destroy landscapes and ecosystems.

Waste management accounted for around 5% of Scotland's net greenhouse gas emissions in 2014, so reducing the impact of waste types that have the largest contribution to this helps with meeting Scotland's climate change targets.

Targets and Indicators

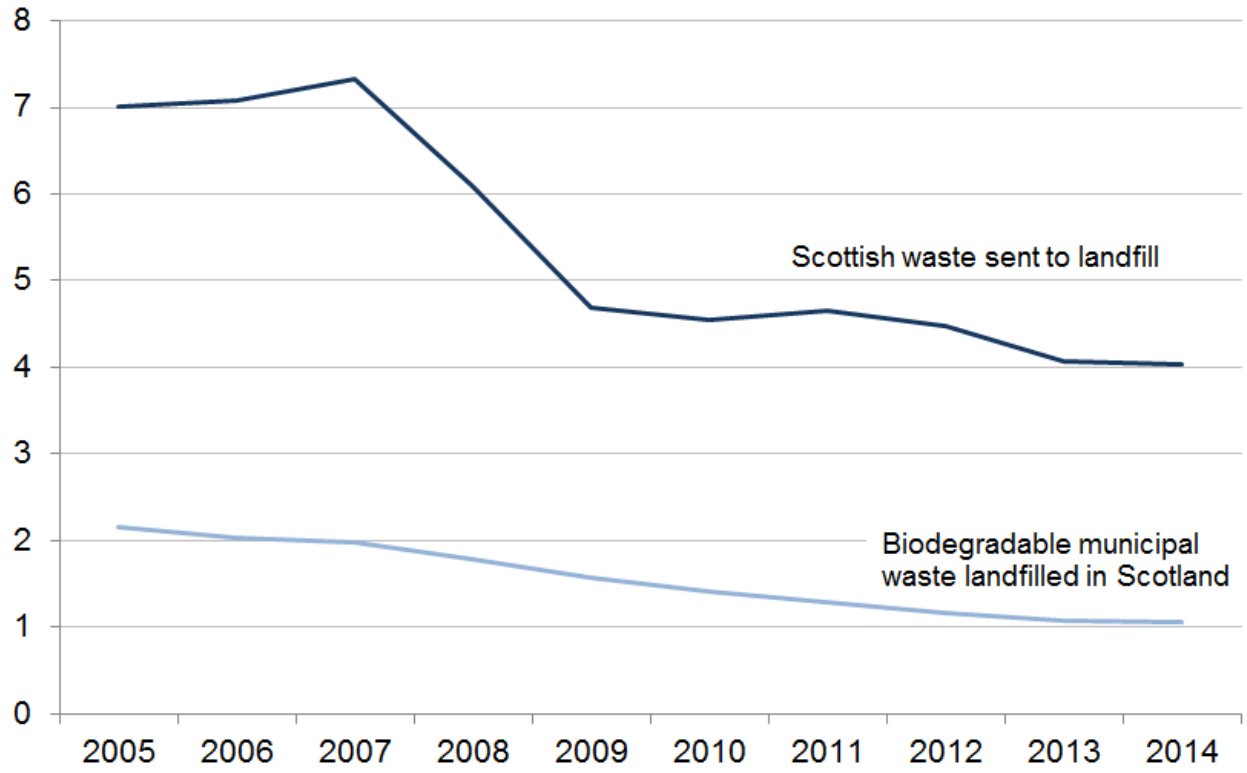
Many targets have been set with the aim of reducing waste, most of which are set out in Scotland's Circular Economy Strategy[91]:

- 2017: Reduce waste arising by 7% against the 2011 baseline
- 2020: Recycling and preparing for re-use of 50% by weight of household and similar waste
- 2020: 60% of household waste recycled/composted or prepared for re-use
- 2020: Less than 1.26 million tonnes of biodegradable municipal waste landfilled
- 2020: 70% recycling and reuse of construction & demolition waste.
- 2025: Reduce waste arising by 15% against the 2011 baseline
- 2025: Maximum of 5% of all waste sent to landfill
- 2025: 70% of all waste recycled/composted or prepared for re-use
- 2025: Reduce all food waste arising in Scotland by 33% (2013 baseline) and work with industry to reduce on-farm losses of edible produce

'Reduce waste generated' is also a National Indicator[92].

Waste Sent to Landfill: 2000-2014

Million tonnes



Why this measure is important

Sending waste to landfill results in the loss of valuable materials and generates pollutants. In particular, biodegradable waste such as paper, food and garden waste emit methane, a greenhouse gas. Reducing this is critical for meeting Scotland's climate change targets.

Background

The tonnage of Scottish waste sent to landfill (which includes waste landfilled outside Scotland) is measured by compiling a variety of sources, such as reports by the Local Authority on the destination of waste they have collected, and reported returns at accredited waste sites[93]. Scotland has a target of reducing biodegradable waste landfilled in Scotland in line with the EU Landfill Directive (99/31/EC).

Trend

In 2014, 4.03 million tonnes of waste generated in Scotland were sent to landfill, a reduction of 42% compared with the 7.01 million tonnes sent to landfill in 2005. The amount of Biodegradable Municipal Waste (BMW) landfilled in Scotland was 1.06 million tonnes in 2014, a reduction of 51% compared with 2005.

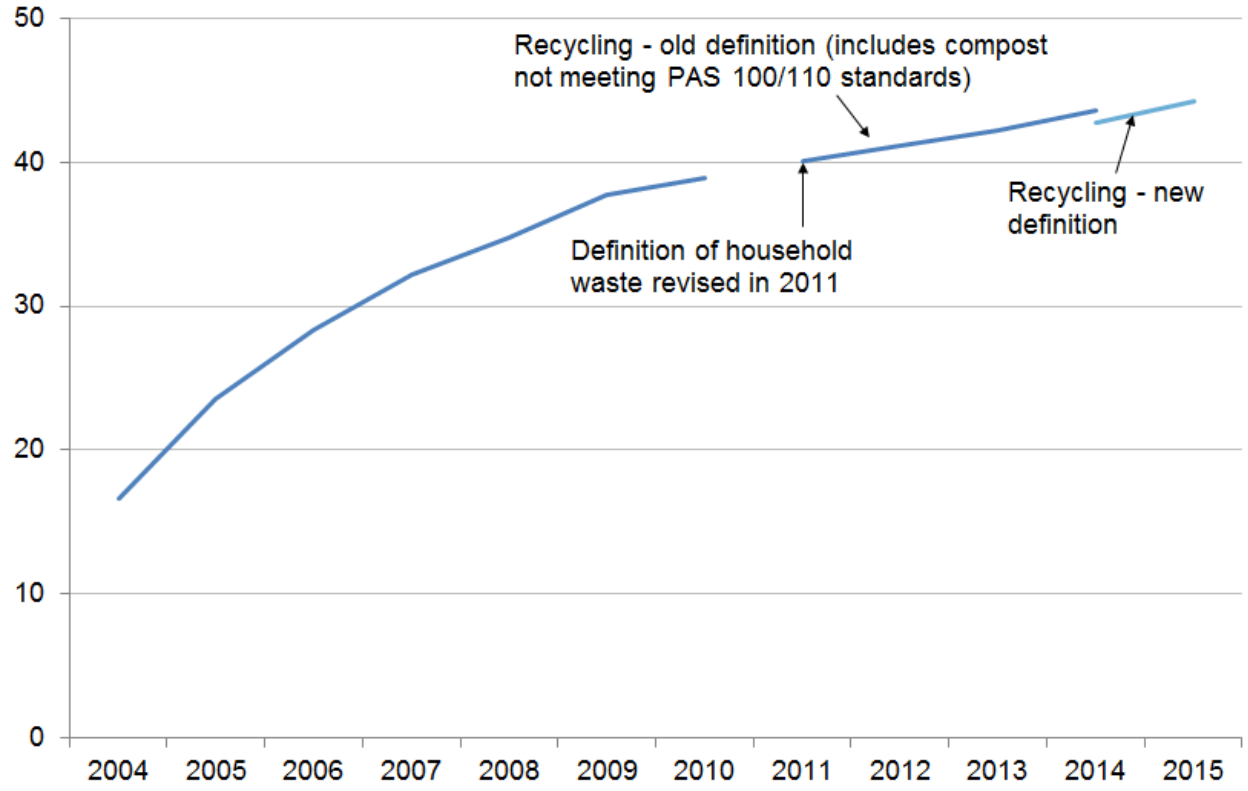
Factors affecting trend

Increased recycling rates and reduced generation of waste has had the effect of reducing landfill rates. These changes are likely to have partly been the result of the increases to landfill taxes. Landfill tax is intended to encourage waste producers to produce less waste, and promote recycling and waste recovery. The 2008 recession occurred alongside a sharp reduction in tonnage sent to landfill, which may be due to the reduction in the construction industry. Methods of food waste disposal can also have an impact on the tonnage of biodegradable waste sent to landfill, see Food Waste Disposal: 2012 – 2015.

Source: Scottish Environment Protection Agency Metadata

Household Waste Recycling: 2004-2015

Percentage of household waste recycled, composted or prepared for re-use



Why this measure is important

The dependence on landfill for waste management in Scotland is unsustainable since it involves the depletion of natural resources. Recycling is one of the most important ways of preventing waste going to landfill.

Background

Local authorities provide data to SEPA on the management of waste collected from households through kerbside collections together with waste that households take to "Bring" sites (such as recycling collection bins at supermarkets) and to civic amenity sites. The definition of household waste and recycling was revised in 2011[94]. In 2014, a new definition of recycling was introduced which excludes composted waste that is produced by facilities not accredited to produce compost to the BSI PAS 100/110 standard.

Trend

Household waste recycling rates have increased at a slowing pace over time. The household waste recycling rate in 2015 was 44.2%, increasing from 42.8% in 2014. Using the previous definition of recycling, which included composting to a lower standard, the rate increased from 40.1% in 2011 to 44.9% in 2015.[95]

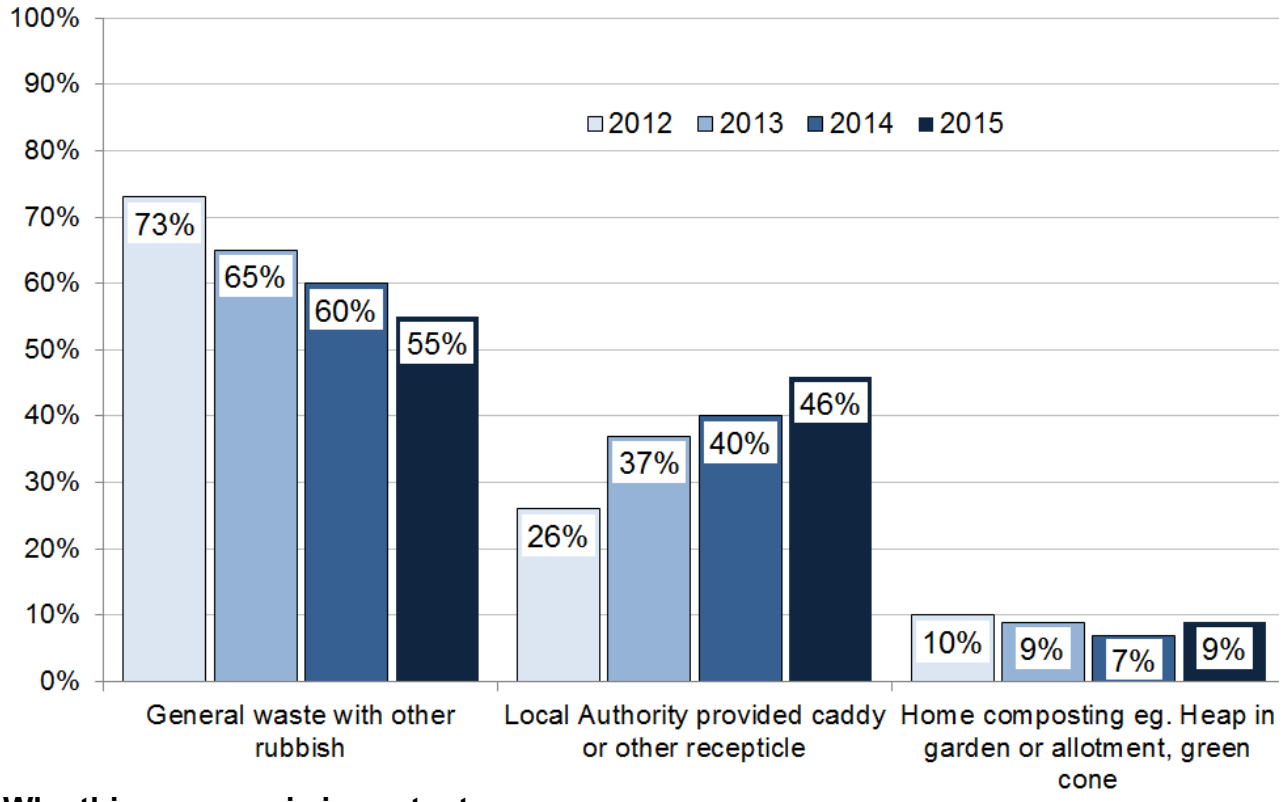
Factors Affecting Trend

The recycling rate of households is a combination of individual's behaviour and the provision of recycling facilities within local authorities. In recent years, local authorities have been increasing the provision of recycling facilities for households.

Source: Scottish Environment Protection Agency Metadata

Food Waste Disposal Behaviour: 2012 – 2015

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



Why this measure is important

In 2013, Zero Waste Scotland estimated that 566,000 tonnes of food were thrown away by households in Scotland. Food is an essential resource, and wasted food costs households money and reduces the self-sufficiency of the economy. Home composting, or provision of food waste caddies, can help divert this waste from landfill into the production of compost or biogas.

Background

Household food waste recycling behaviour is measured as part of the annual Scottish Household Survey. Households were asked what methods, if any, they used to dispose of food waste in the past week. More than one method could be chosen.

Trend

In 2015, 46% of households reported using local authority provided food waste caddies to dispose of their household waste compared with 40% in 2014 and 26% in 2012. There has also been a decline in households throwing food out with general waste, from 73% in 2012 to 55% in 2015.

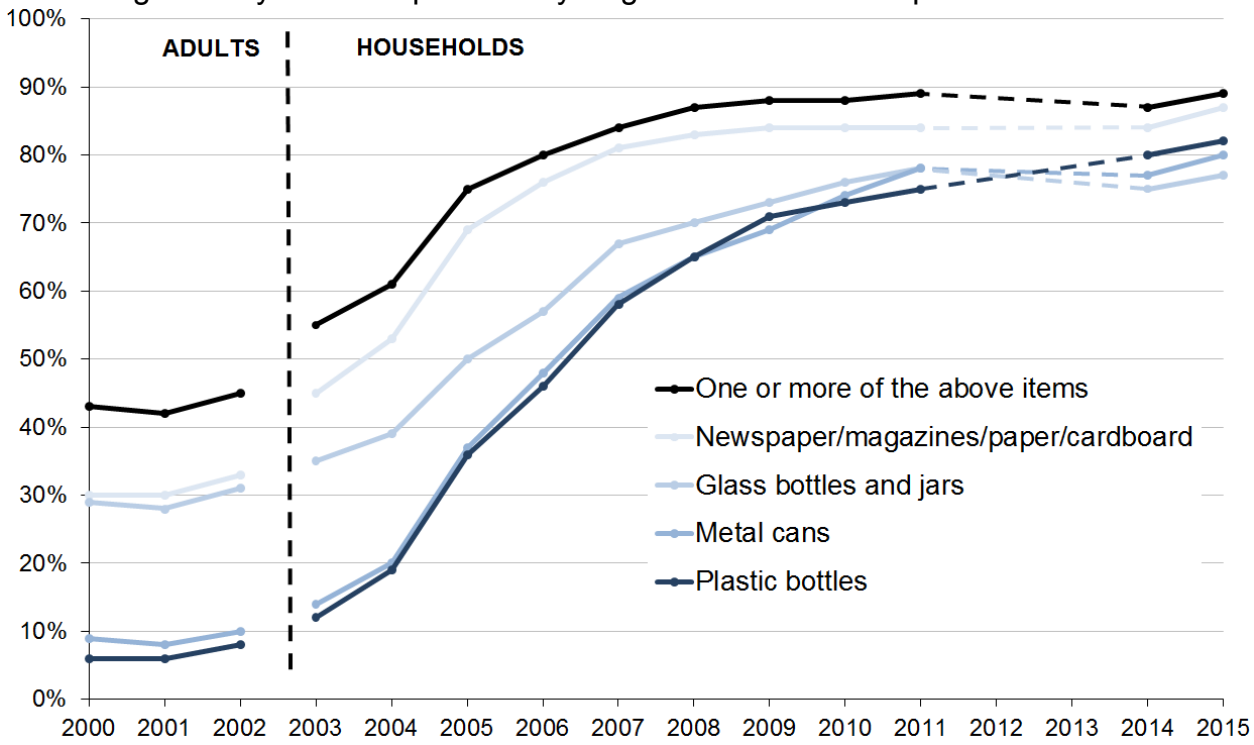
Factors affecting trend

Provision of food waste collection services has increased over the last few years. In May 2016, Zero Waste Scotland estimated that 75 per cent of Scottish households (1.8 million) had access to a food waste collection service. However, provision of these services varies across local authorities. In some rural areas, home composting is being encouraged as an alternative to a street collection service.

Source: Scottish Government Metadata

Waste Recycling Behaviour: 2000-2015

Percentage surveyed who reported recycling waste items in the past month



Why this measure is important

Re-using and recycling waste are vital to achieving sustainable development and Zero Waste objectives. One of the key drivers for this is individual recycling behaviour.

Background

The Scottish Household Survey provides information on recycling behaviour amongst households in Scotland. In the period 2003-2011, households were asked which of a selection of certain waste items, if any; they had recycled from home in the past month. Before 2003, the same question was asked of a random adult in the household. From 2014, households were asked a modified question asking if, in general, they recycled a selection of materials.

Trend

Since 2003, the percentage of households recycling waste has increased for each item in the survey up until 2011, when the question was suspended until 2014. Between 2011 and 2015, there was little change in the percentage of households recycling each item, except for plastic bottles which increased by 7 percentage points to 82%. In 2015, the recycling rate was highest for paper and card at 87% and lowest for glass at 77%.

Factors affecting trend

Provision of recycling facilities and acceptance of the necessity of recycling has increased steadily over the years, leading to an increase in recycling amongst the general public. This upwards trend has tended to slow recently as easy gains have already been made and there remain harder system problems that prevent total recycling, such as the difficulty in providing facilities to tenement flats and remote properties.

Source: Scottish Government Metadata

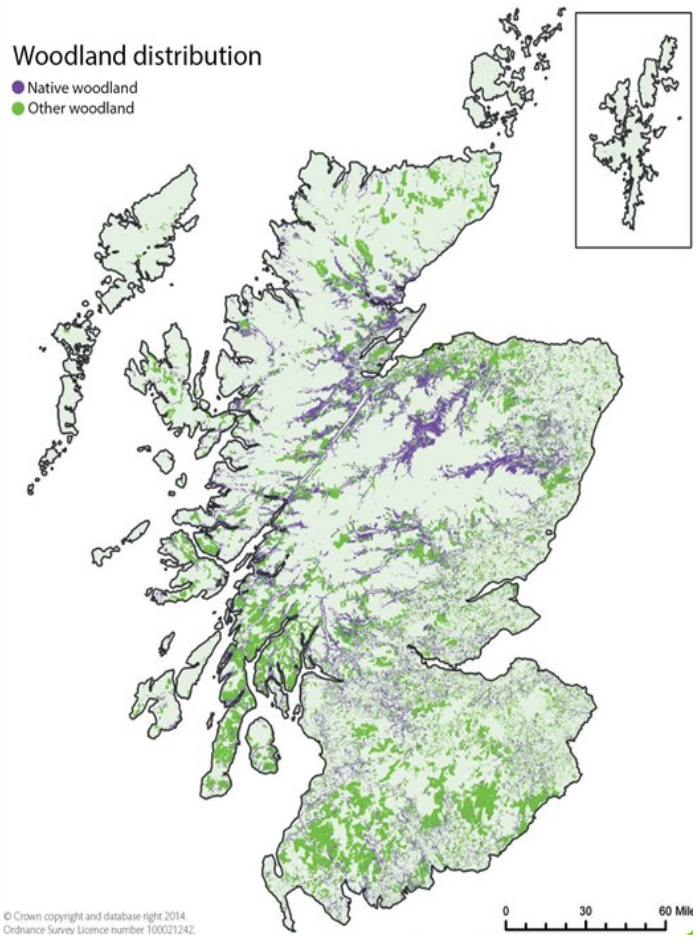
Land

Background
Land is an important part of the Scottish environment, supporting a range of habitats and species and providing a wealth of benefits such as food, timber, clean water, energy and employment. The way in which land is used and managed has implications for many areas such as water pollution, greenhouse gas emissions, human health and the economy; and is vital to the sustainability of the environment as a whole[96].

Land Use Strategy

From Scotland's Environment website – Get Informed section[97,98]

One of the outcomes of the Scottish Government Greener Objective[99] is to protect and enhance the natural environment. The Land Use Strategy 2016-2021[100], which is one of the commitments of the Climate Change (Scotland) Act 2009, builds upon the previous land use strategy and provides a set of Principles for Sustainable Land Use to guide policy and decision making in relation to land use.



Forestry
There are also specific guidelines in place to encourage the sustainable management of different sectors. For instance, the UK Forestry Standard sets out the standards for the sustainable management of all forests in the UK, on which the independent certification schemes for sustainable forest management are based.

As at 31 March 2016, 56% of Scotland's woodland area was certified as sustainably managed (807,000 hectares)[101], although woodland that is not certified may also be managed sustainably.

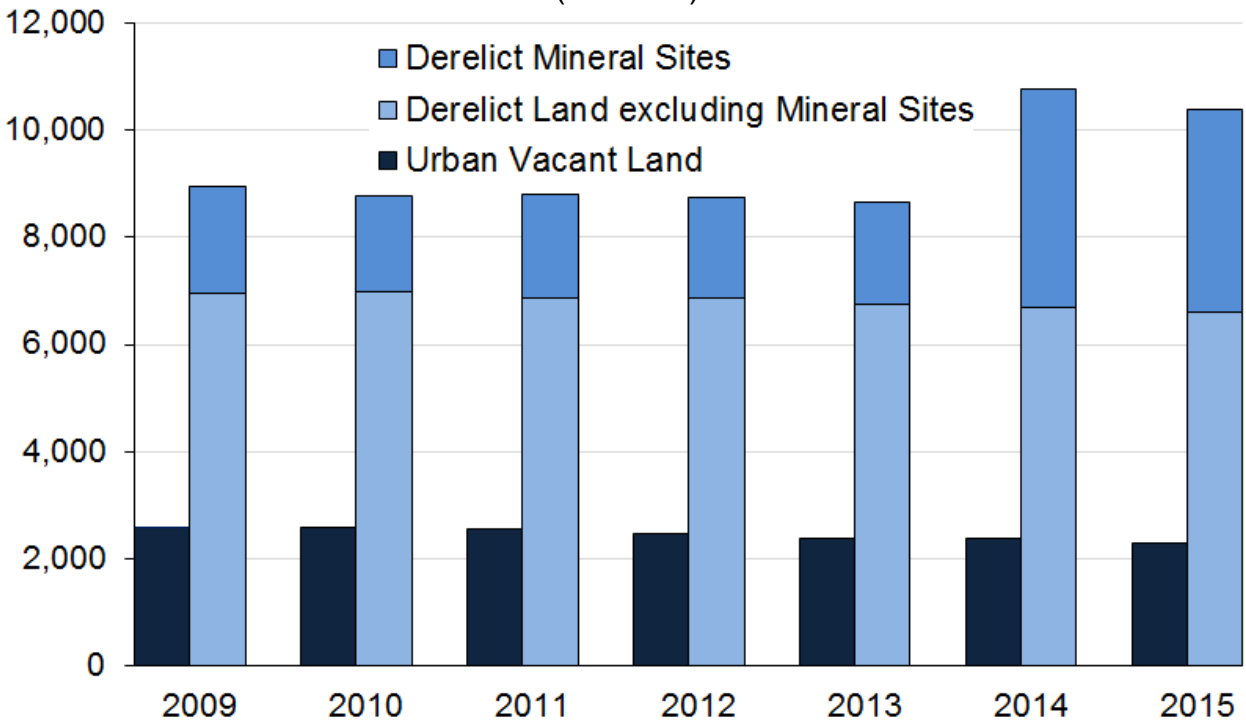
Targets and Indicators
There are two National Indicators that relate to Scotland's land:

- Improve people's use of Scotland's outdoors[102]
- Improve the condition of protected nature sites[103]

The Land Use Strategy also has ten indicators that measure progress towards the delivery of the three Objectives of the Strategy[104].

Derelict and Urban Vacant Land: 2009-2015[R]

Area of derelict and urban vacant land (hectares)[105]



Why this measure is important

Derelict land together with vacant land in urban areas is an unused resource. Vacant land is land that is unused for the purposes for which it is held and is viewed as an appropriate site for development. Derelict land (and buildings) is land that has been so damaged by development that it is incapable of being developed for beneficial use without rehabilitation[106].

Background

The Scottish Vacant and Derelict Land Survey is an annual data collection managed by the Scottish Government using data sourced from local authorities and the Loch Lomond and Trossachs National Park 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.

Trend

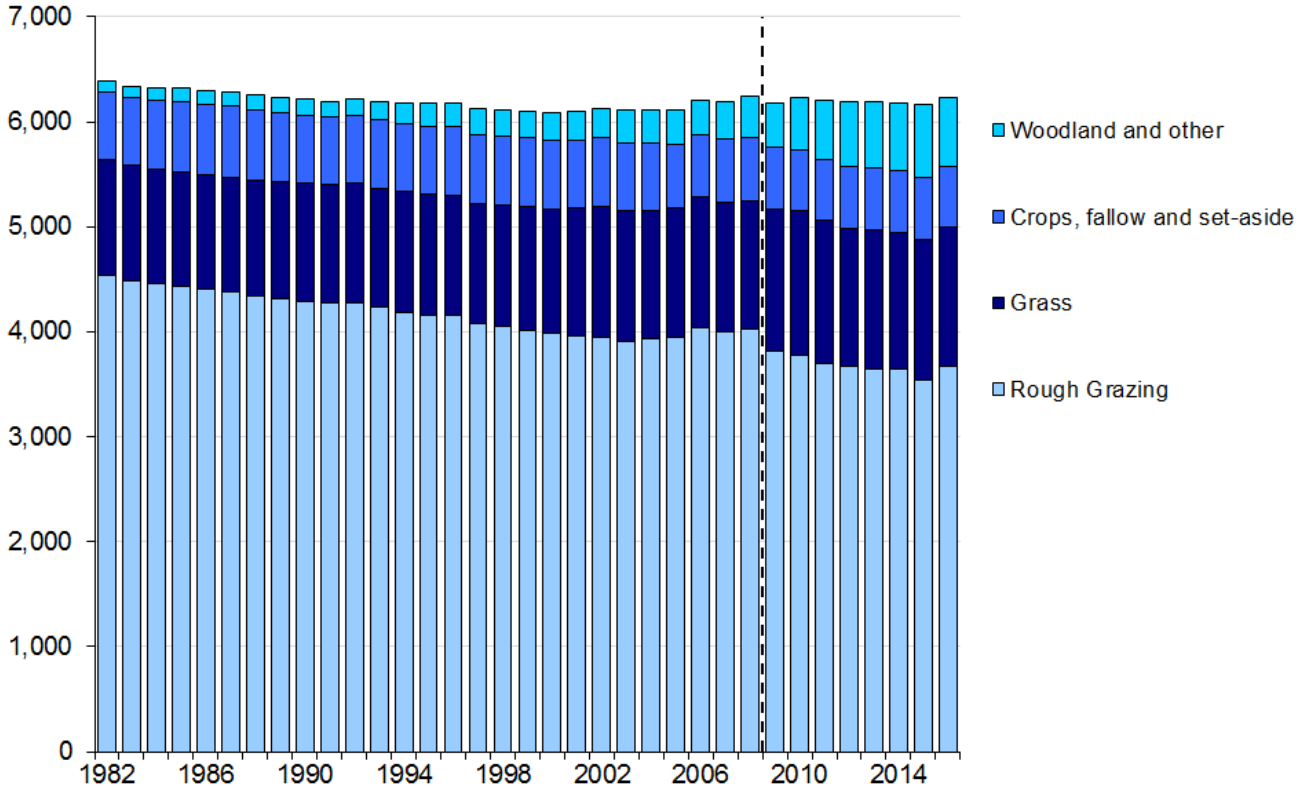
Since 2009, there has been an increase of 1,145 hectares (10%) in the total amount of derelict and urban vacant land recorded in the survey (including derelict mineral sites), from 11,530 hectares in 2009 to 12,674 hectares in 2015. The most recent survey (2015) showed a net decrease of 458 hectares from 2014.

Factors affecting trend

The increase in derelict land (including mineral sites) is mainly due to the addition of 2,217 hectares of former surface coalmines that became derelict in East Ayrshire in 2014. Urban vacant and derelict land can also be brought back into use; the area that is brought back into use each year can depend on the land's development potential, it's previous use and the potential funding available. In 2015, the most common new uses of the derelict and urban vacant land brought back into use were residential development (44%) and mineral activity (18%).

Source: Scottish Government Metadata

Agricultural Land Use: 1982-2016[107]



Why this measure is important

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 greenhouse gas emissions. Approximately four fifths of Scotland's land is used for agriculture, although this may also be used for other purposes[108].

Background

There is a step change in the agricultural land use data series in 2009 following a switch in data source to the Single Application Form (SAF).[109] This means that post 2009 data is not directly comparable to previous years and so trends should be treated with caution[110].

Trend

Between 2009 and 2016, the total land used for agriculture in Scotland increased by around 1% from 6,176,800 hectares to 6,236,400 hectares. Since 2009, the area of woodland and other land[111] has increased by 237,600 hectares (57%) to 657,100 hectares in 2016 whereas the area of land used for rough grazing and the area of grass have decreased by 141,100 hectares (4%) and 32,900 hectares (2%) respectively over the same period.

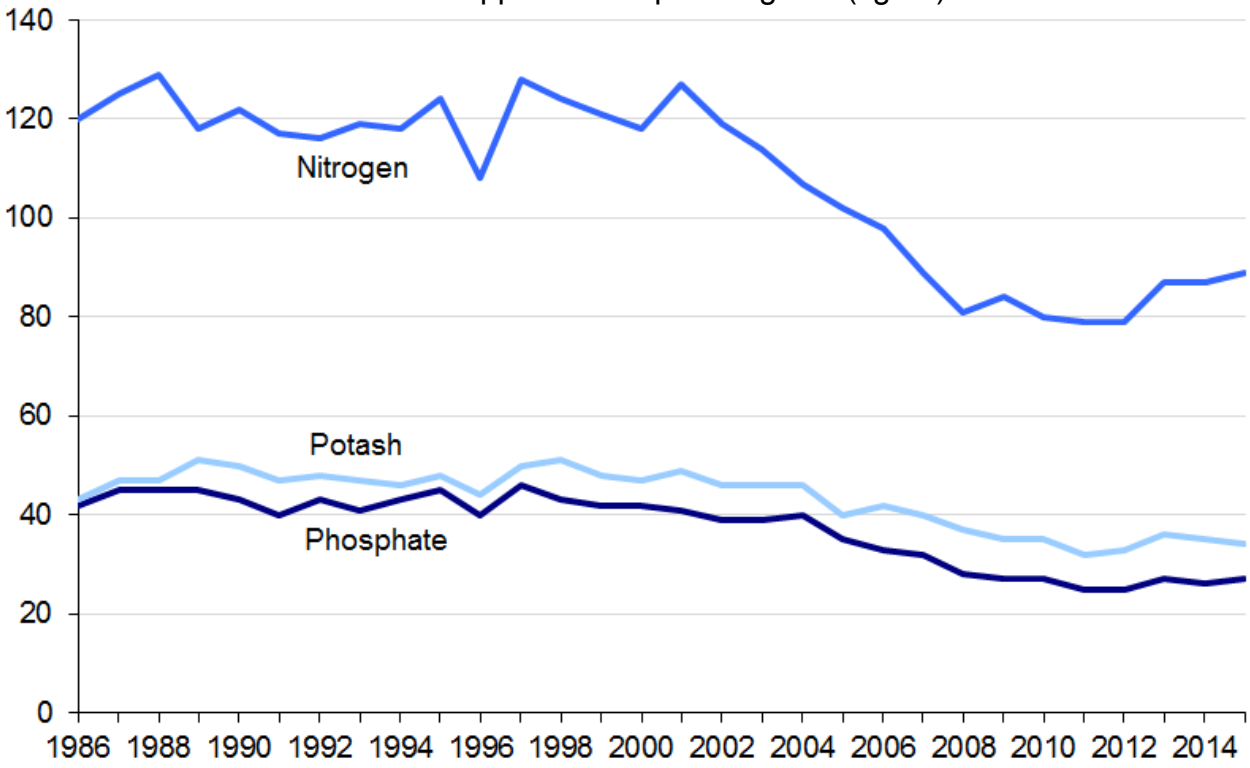
Factors affecting trend

Though the area of woodland fell in the year to 2016, changes to the ways in which woodland was collected on the SAF in 2015 and 2016 may be a large factor in this fall and therefore the data for these years should be treated with caution. There has been a general upward trend in woodland over the last decade, however. While this may be partly due to increased coverage of this type of land by the June Census register, particularly in the years immediately following the use of SAF data from 2009, consistent increases over the last couple of decades suggests genuine increases have been driving this trend.

Source: Scottish Government Metadata

Nutrients Applied to Crops and Grass: 1986-2015

Manufactured fertiliser nutrients applied to crops and grass (kg/ha)[112]



Why this measure is important

Fertilisers contain nutrients, such as nitrogen, phosphorus and potassium, which improve plant growth and crop yields. However, the inappropriate or mistimed use of fertilisers may cause nutrient enrichment and eutrophication of waters.

Background

Data on manufactured fertiliser[113] use is obtained from the British Survey of Fertiliser Practice, which is an annual survey based on a representative sample of farms which vary from year to year. The survey includes estimated average rates of manufactured fertiliser nitrogen, phosphate and potash applied to agricultural crops and grassland, excluding Orkney, Shetland and the Western Isles.

Trend

Potash, phosphate and nitrogen application rates have declined overall since 1986. The application rates of nitrogen and potash varied between 1986 and 2001, but have since declined. The application rate of nitrogen fell from 127 kg/ha in 2001 to 89 kg/ha in 2015 and the application rate of potash fell from 49 kg/ha to 34 kg/ha over the same period. The phosphate application rate remained relatively stable until 1997, before declining steadily to 27 kg/ha in 2015.

Factors affecting trend

The application rates for nitrogen are generally higher than those for phosphate and potash. Most agricultural soils do not contain enough naturally occurring plant available nitrogen and so need to be supplemented at certain times of year. Phosphate and potash can be held in large quantities by most British soils and so managing the supply of these is based more on maintaining appropriate levels in the soil. Weather, economic factors, subsidy regimes and cropping patterns all may contribute to changes in fertiliser use.

Source: Defra / Scottish Government Metadata

Area of Woodland: 1924-2016 [114]

Why this measure is important

Woodland is important as it provides wildlife habitats and can contribute to the sustainable production of wood products and paper. Woodland also contributes to the removal of carbon dioxide from the atmosphere, with the Forestry sector acting as a carbon sink.

Background

Data are obtained from forest inventories; however, most inventories have slightly different definitions of woodland and so some apparent changes in area over time are due to changing definitions. Data for 2016, as at 31 March, are the final results obtained from 'Forestry Statistics 2016'.

Trend

As at 31 March 2016, the area of woodland in Scotland was 1,436,000 hectares (18.4% of the total Scottish land area). This compares with 16.4% of the total land area in 1995 and 11.8% in 1980. 74% of the area of woodland is made up of conifers and 26% is made up of broadleaved species, both native and introduced. There were 4,600 hectares of new woodland planted in 2015-16.

Factors affecting trend

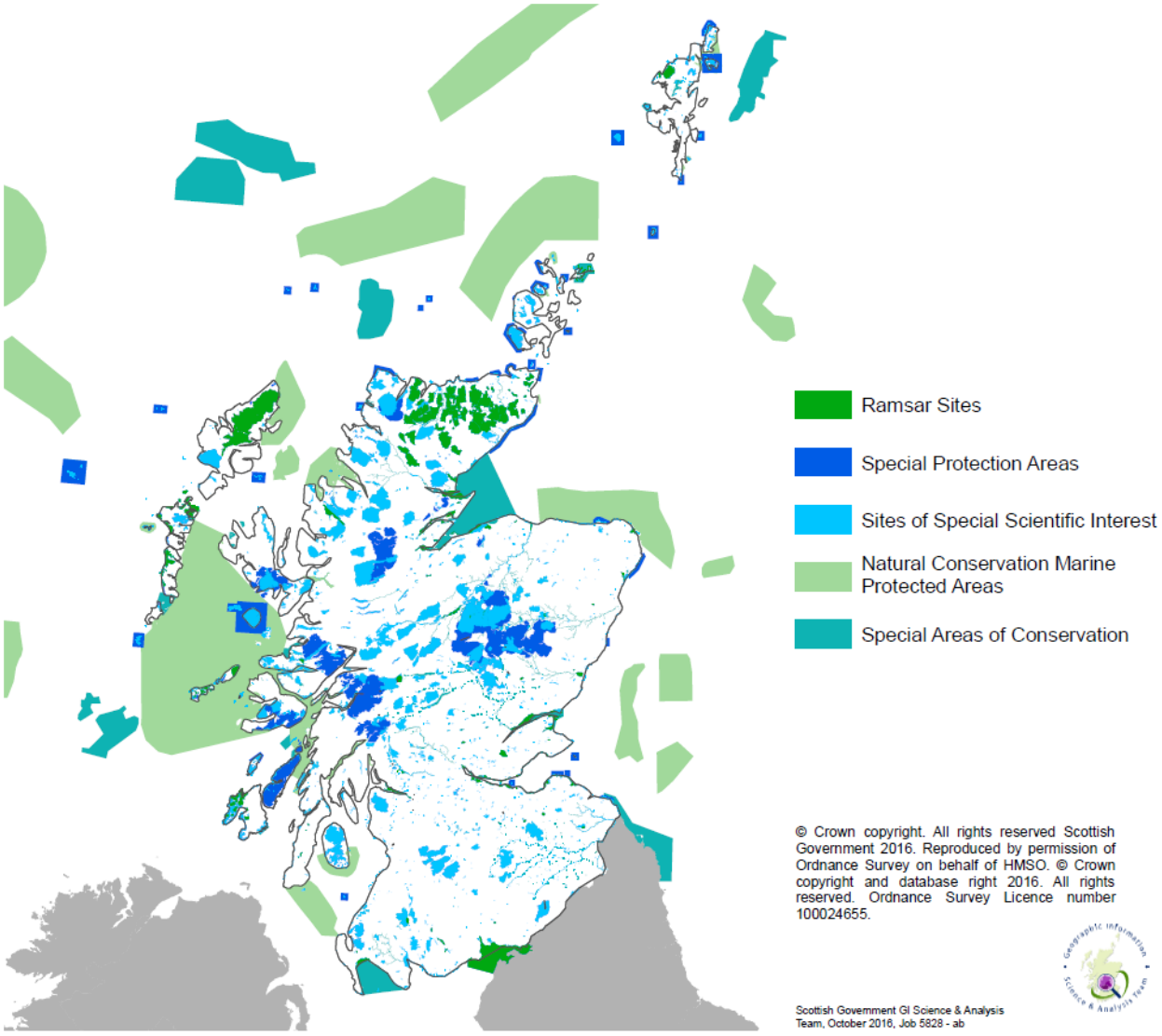
Increases in woodland area are mainly the result of new planting, which has increased in recent years due to the introduction of Scottish Rural Development Contracts, or by natural colonisation of trees on land near existing woodland. Decreases in woodland area can result from the conversion of woodland to other land uses. Regulatory approval, which normally requires the area to be restocked[115], is usually required before trees can be felled. However, trees may be permanently removed in some cases, generally for environmental reasons. The permanent removal of trees may also be authorised under planning regulations, to enable development.

Source: Forestry Commission Metadata

Conservation

Background
The legal protection of habitats, species, buildings and archaeological sites plays a part in securing their future through preventing damage, destruction or inappropriate exploitation.

Map of Nature Conservation Areas in Scotland

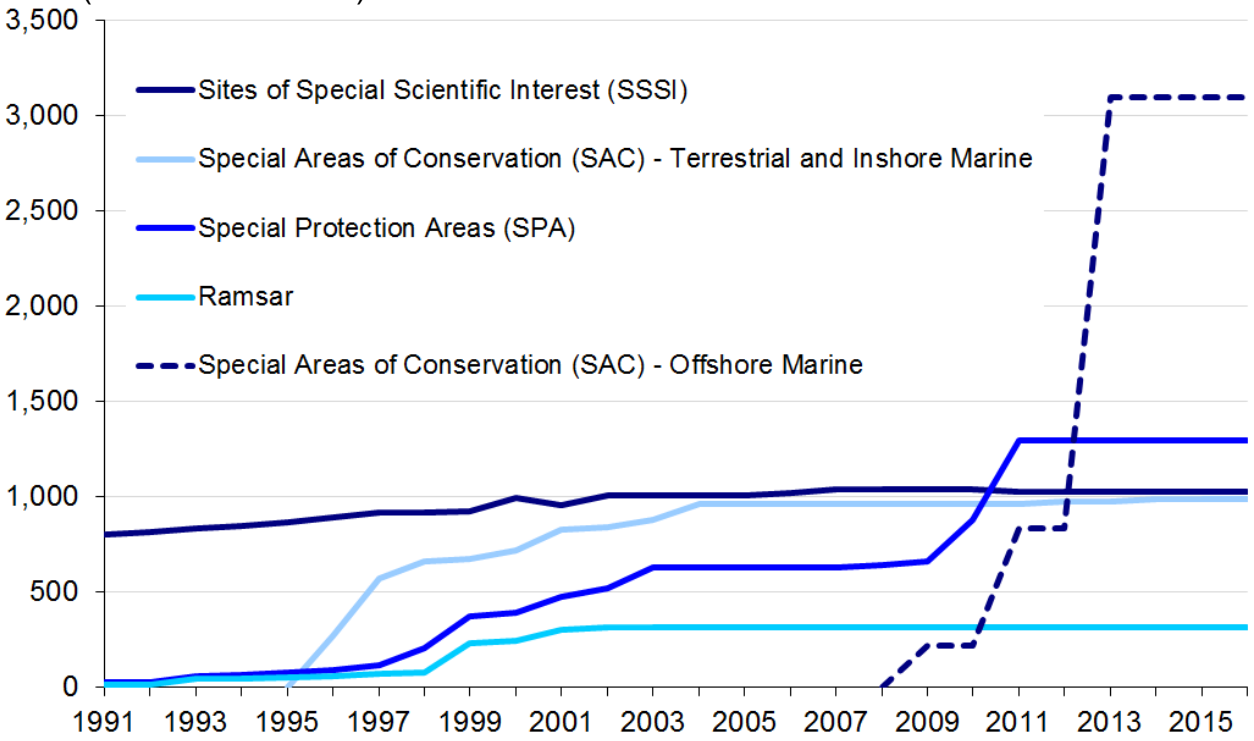


The map above shows the area of many designated nature conservation areas in Scotland. There are also additional areas outwith the area shown on the map (65% of Special Areas of Conservation and 71% of Nature Conservation Marine Protected Areas are located outside the area pictured). Further information on marine conservation areas can be found on Marine Scotland's National Marine Plan Interactive site[116].

Targets and National Indicators
National Indicators: Improve the condition of protected nature sites

Designated Areas: 1991-2016[117]

Area (thousand hectares)[118,119]



Why this measure is important
Designated areas provide protection for areas of cultural or biological importance.

Background
Designated sites, including Sites of Special Scientific Interest (SSSIs)[120], Special Areas of Conservation (SACs)[121] , Special Protection Areas (SPAs)[122] and Ramsar[123] sites, protect flora, fauna, geological or physiographical features of outstanding quality in terrestrial and coastal environments. In 2016, there were 1,423 SSSIs, 252 SACs, 153 SPAs and 51 Ramsar sites in Scotland.

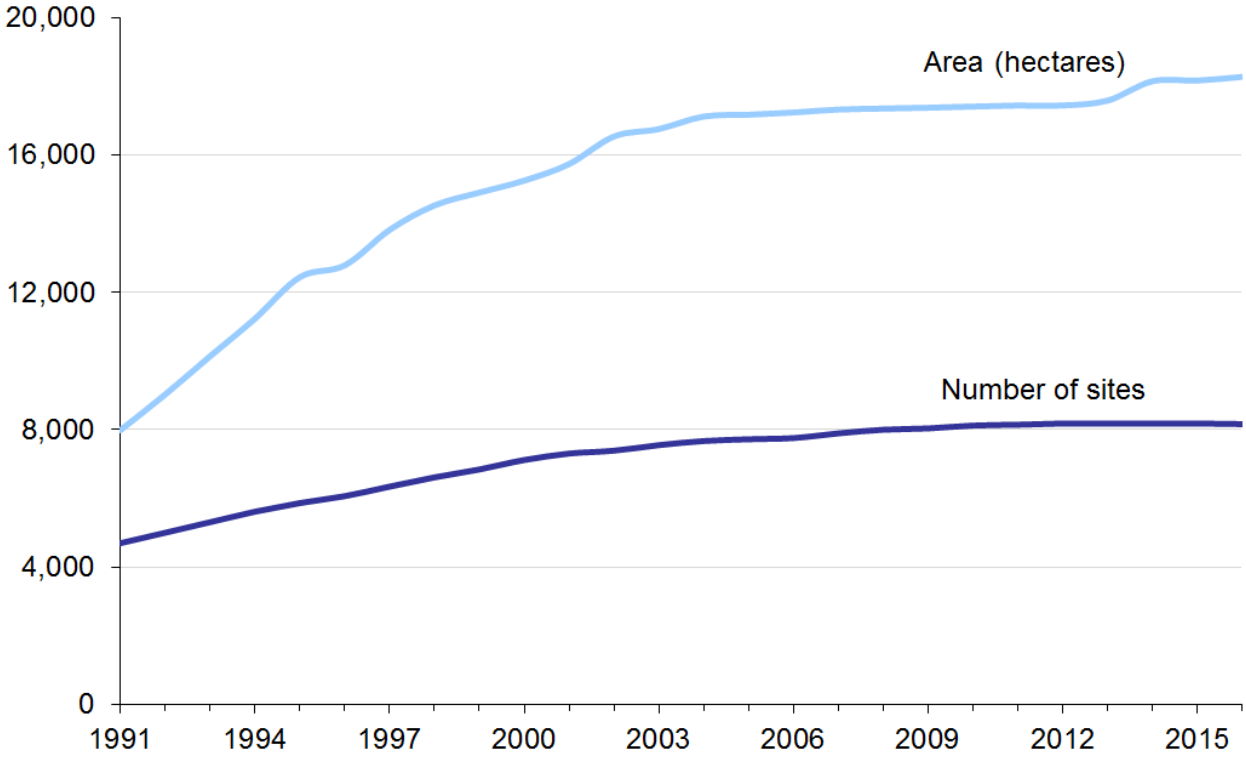
Trend
The total area of SSSIs in Scotland has steadily increased from 804,000 hectares (ha) in 1991 to 1,022,000 ha in 2016 (about 13% of land in Scotland). The area of terrestrial and inshore marine SACs rose from 0 ha in 1995 to 963,000 ha in 2004 and has since remained broadly stable, rising slightly to 987,000 ha in 2016. In 2016, there were 11 offshore SACs covering a total area of 3,095,000 ha. The area of SPAs rose from 26,000 ha in 1991 to 1,297,000 ha in 2011 and has remained broadly similar since. There are also 30 nature conservation Marine Protected Areas that have been designated to protect marine wildlife and habitats, covering an area of 6,140,000 ha – around 50% greater than that covered by SACs.

Factors affecting trend
In 2009, Scottish Ministers classified 31 marine extensions to existing seabird breeding colony SPAs around Scotland's coasts and classified six new SPAs for golden eagle in 2010, which contributed to the large increase in SPA area of 639,387 ha between 2009 and 2011. The increase of 2,082,000 ha in the area of offshore SACs from 2012 was mainly due to the submission of the SAC at Hatton Bank, which covers 1,569,000 ha.

Source: Scottish Natural Heritage Metadata

Scheduled Monuments: 1991-2016[124]

Number and area of sites designated as Scheduled Monuments



Why this measure is important

Historic Environment Scotland is the lead public body set up to investigate, care for and promote Scotland's historic environment. One way it does this is by legally protecting nationally important sites and monuments through designation as 'scheduled monuments'.

Background

Scheduled monuments (SMs) are protected under the Ancient Monuments and Archaeological Areas Act 1979[125]. 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'. Further information on scheduled monuments is available from Historic Environment Scotland.[126]

Trend

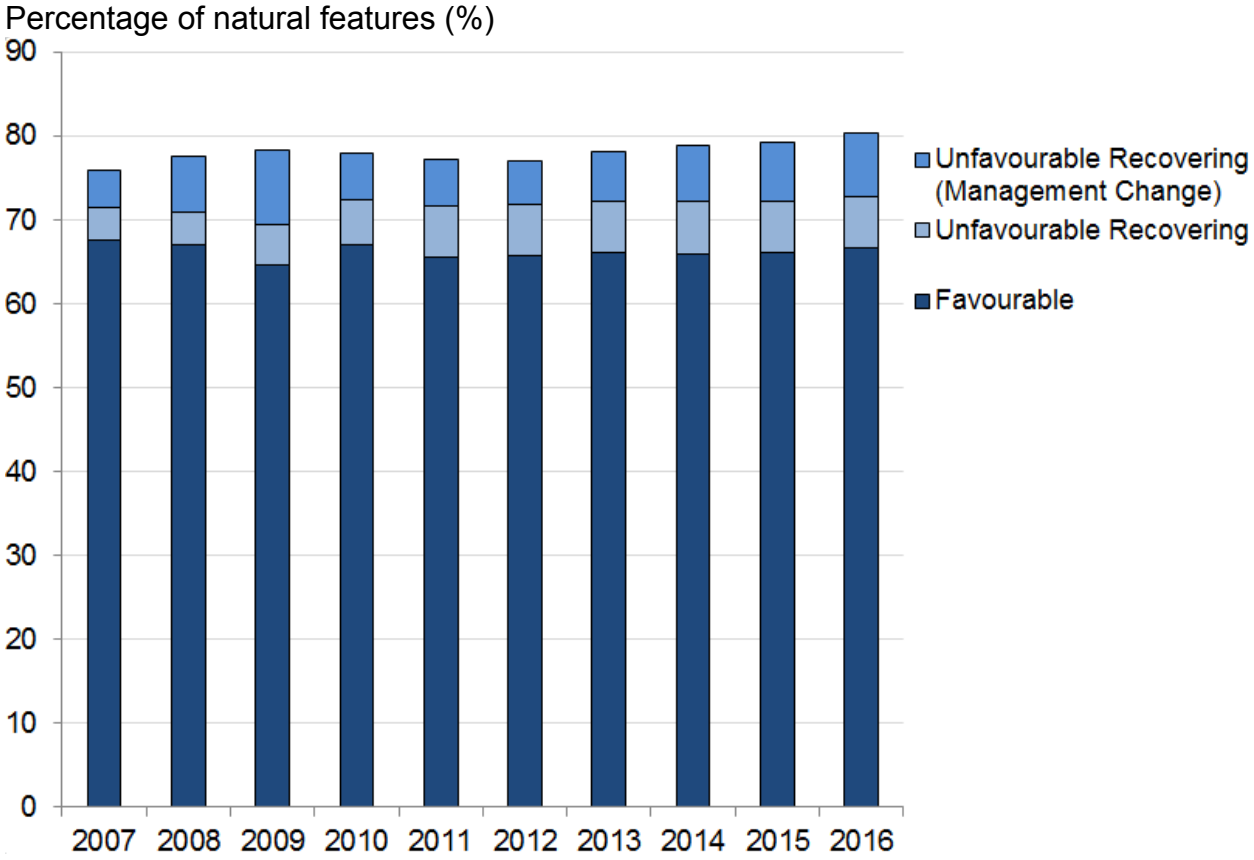
The number of SMs has increased by 74% between 1991 and 2016 and the area they account for has increased by 129% over the same period. In 2016, there were 8,167 designated SMs in Scotland, covering an area of 18,285 hectares (ha). There are also 7 historic Marine Protected Areas, covering 87 ha, that have been designated to protect marine historic assets such as historic shipwrecks.

Factors affecting trend

There are SMs spread across Scotland but numbers vary across local authorities. Recent changes may be due to an on-going review of SMs[127], which may involve the rescheduling, or rationalisation of some sites. Other changes may relate to a review of dual designated sites.[128] Historic Environment Scotland can also add, amend and remove a small number of designated sites in response to external requests to review sites or through day-to-day work in relation to the maintenance of the schedule and list.

Source: Historic Environment Scotland Metadata

Percentage of natural features on protected sites in favourable condition: 2007-2016[129]



Why this measure is important

Scotland's protected sites have been identified as areas with 'special' species, habitats, natural rocks or landforms, or a combination of these. Protecting these areas is important for maintaining sensitive or biologically important natural features and makes a key contribution to safeguarding Scotland's biodiversity.

Background

Data are obtained from Scottish Natural Heritage's (SNH) Site Condition Monitoring programme[130], and are used to inform the National Indicator: Improve the condition of protected nature sites[131].

Trend

As at 31 March 2016, 80.4% of natural features on protected nature sites were assessed as being in favourable condition. This figure represents an increase of 1.1 percentage points from 2015 and has increased by 4.4 percentage points from 76.0% in 2007.

Factors affecting trend

This trend can be affected by the actions of the responsible bodies, landowners and users of individual protected sites. Many natural features assessed as unfavourable need specific, and sometimes complex, collaborative actions (e.g. management of wild deer populations) to bring them into favourable condition. Influences from outside the protected site itself, for example climate change, can also influence the condition of individual sites.

Source: Scottish Natural Heritage Metadata

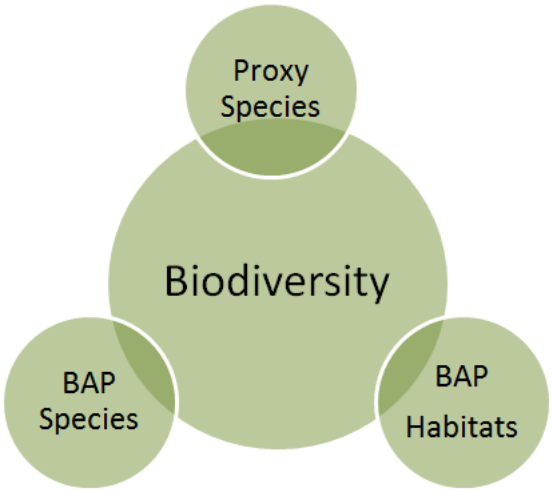
Biodiversity

Background
Biodiversity is the variety of life on Earth. It is the variety within and between all species of plants, animals and microorganisms and the ecosystems in which they live and interact. Although biodiversity is difficult to measure directly, it is estimated that there are around 90,000 species in Scotland.

Importance of biodiversity
Biodiversity is directly related to the provision of environmental services, where a healthy environment provides direct and indirect benefits, such as pollination by insects and carbon sinks from woodland. Scottish Natural Heritage estimates that biodiversity brings a value of almost £17.2 billion to the Scottish Economy[132]. Aspects of biodiversity are also culturally important, with certain iconic species being seen as defining the environment in Scotland, such as red squirrels and capercaillies.

Threats
Biodiversity is threatened by a wide range of factors: development, climate change, habitat destruction, pollution, changing land management and invasive non-native species. In many cases, these are measured in earlier chapters of Key Scottish Environment Statistics, providing an indication of progress.

Proxy indicators



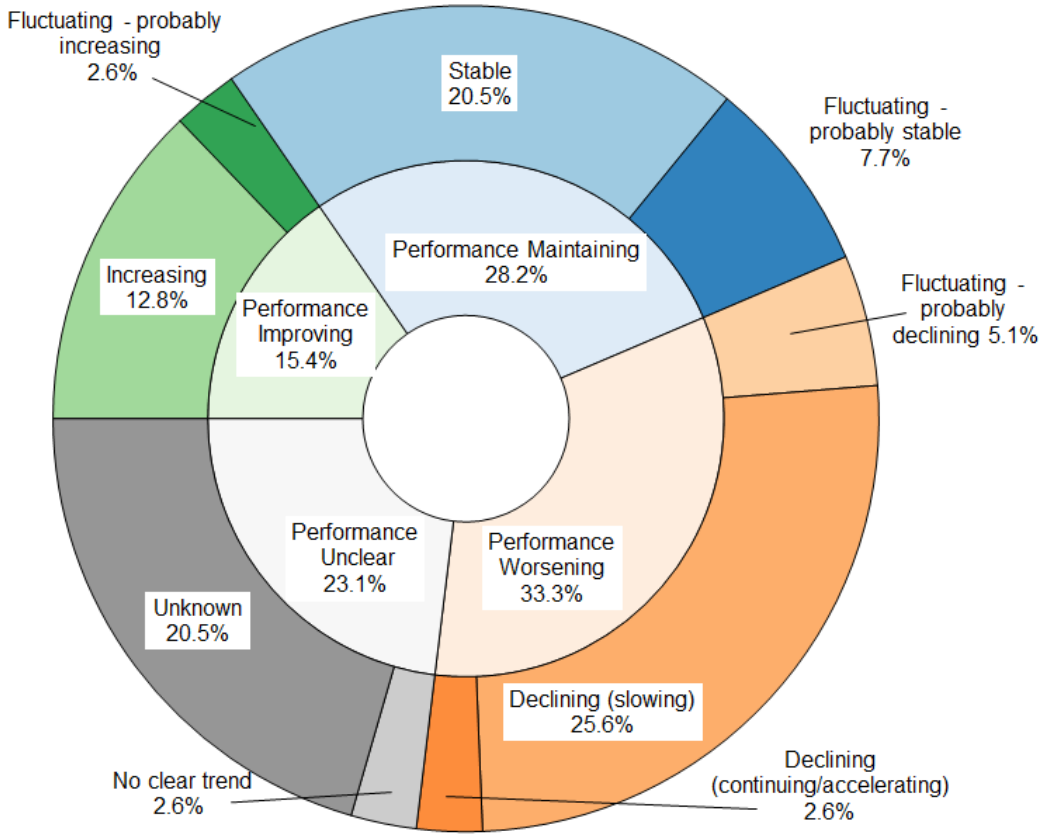
Directly measuring biodiversity would involve taking inventory of all species in an environment, which would be an impractical task. As a result, biodiversity is instead measured by the use of proxy indicators. These are more easily measured traits that are reflective of the overall state of biodiversity.

In addition, efforts are made to directly record priority species that are covered by Biodiversity Action Plans, which form a framework for the conservation of the UK's most at risk species.

Targets and Objectives
- Scottish Biodiversity Strategy aims to conserve biodiversity[133]
- Scotland Performs National Indicator: Increase the abundance of terrestrial breeding birds[134], which is used as a proxy measure of biodiversity.

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

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



Why this measure is important

Biodiversity refers to the variety of plant and animal 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.

Background

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) was launched. The plan aims to conserve and enhance the populations of species and habitats that are considered to be threatened within the UK.

Trend

Between 1995 and 1999, action plans were developed for 45 priority habitats in the UK[135], of which 39 occur in Scotland. As at 2008, of these 39, 15% of the habitats were increasing, 28% were considered stable and 33% were in decline. For the remainder, 23% had an unknown trend and for one habitat, the trend was unclear.

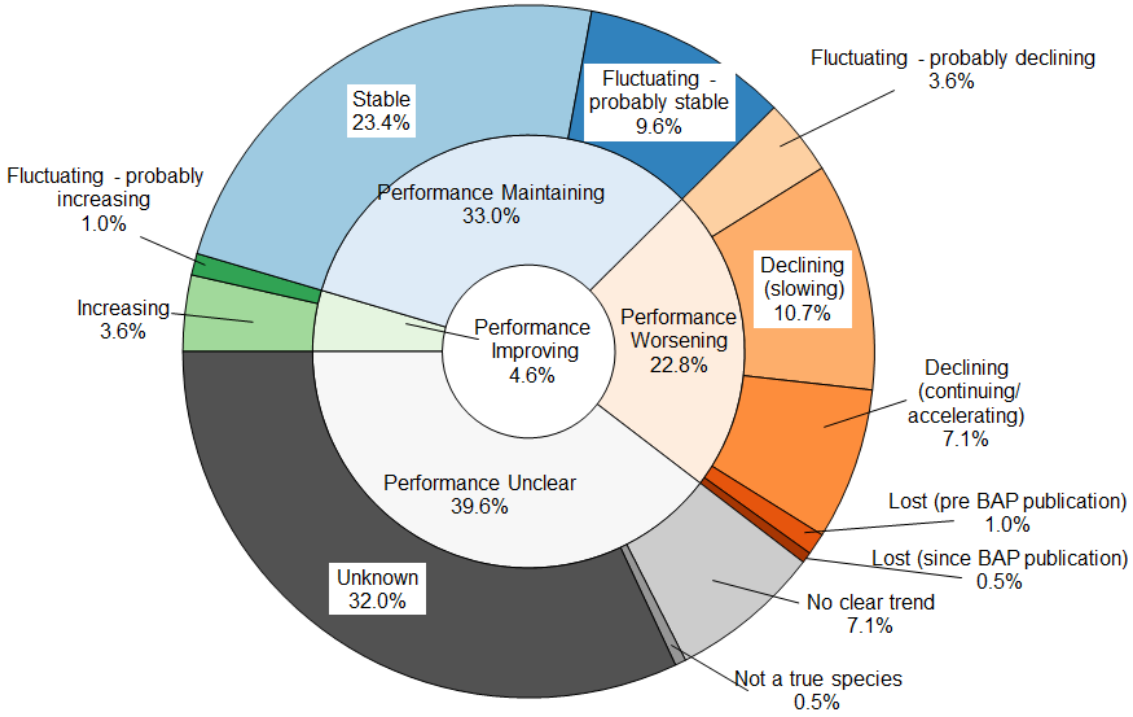
Factors affecting trend

Changes are often associated with land management and atmospheric pollution, although the effects of climate change may become evident in the future.

Source: Biodiversity Action Reporting System (BARS) Metadata

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

Status of UK BAP Species[136] (based on 197 UK BAP priority species)



Why this measure is important

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

Background

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 and the publication of a European Biodiversity Strategy, the Scottish Biodiversity Strategy was refreshed in 2013. Following the publication of the refreshed strategy a revised Scottish Biodiversity List was produced. A formal assessment of the status of these species has not yet been undertaken. Between 1995 and 1999, action plans were developed for 391 species in the UK that had been identified as priorities. 197 of these occur in Scotland.

Trend

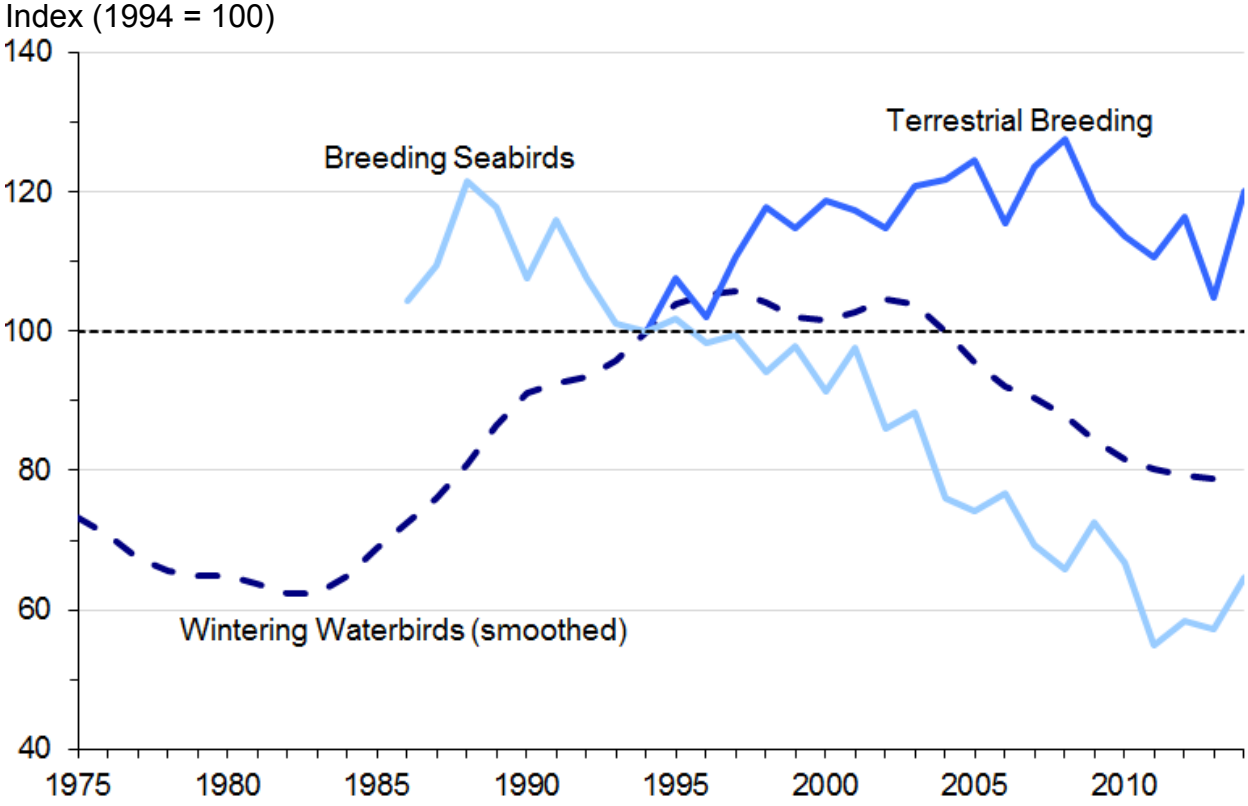
In the 2008 assessment for Scotland, 38% of the priority species were increasing or stable and 21% were in decline. For the remainder of the species considered, 7% showed no clear trend, 32% had an unknown trend, one species (Wryneck) had been lost since the commencement of BAP in 1994, 2 had been lost pre BAP and 1 (scurvy grass) was no longer considered a true species.

Factors affecting trend

Changes are often associated with invasive species and land use patterns.

Source: Biodiversity Action Reporting System (BARS) Metadata

Status of Wild Bird Populations: 1975-2014[R] [137]



Why this measure is important
Bird populations are diverse and easy to monitor. They are sensitive to changes in the wider environment and therefore can provide an indication of the state of biodiversity in Scotland's habitats.

Background
Data are obtained from the British Trust for Ornithology (BTO) Breeding Bird Survey[138], the JNCC Seabird Monitoring Programme[139] and the Wetland Bird Survey[140]. The Breeding Bird Survey and Wetland Bird Survey are both volunteer surveys run by the BTO.

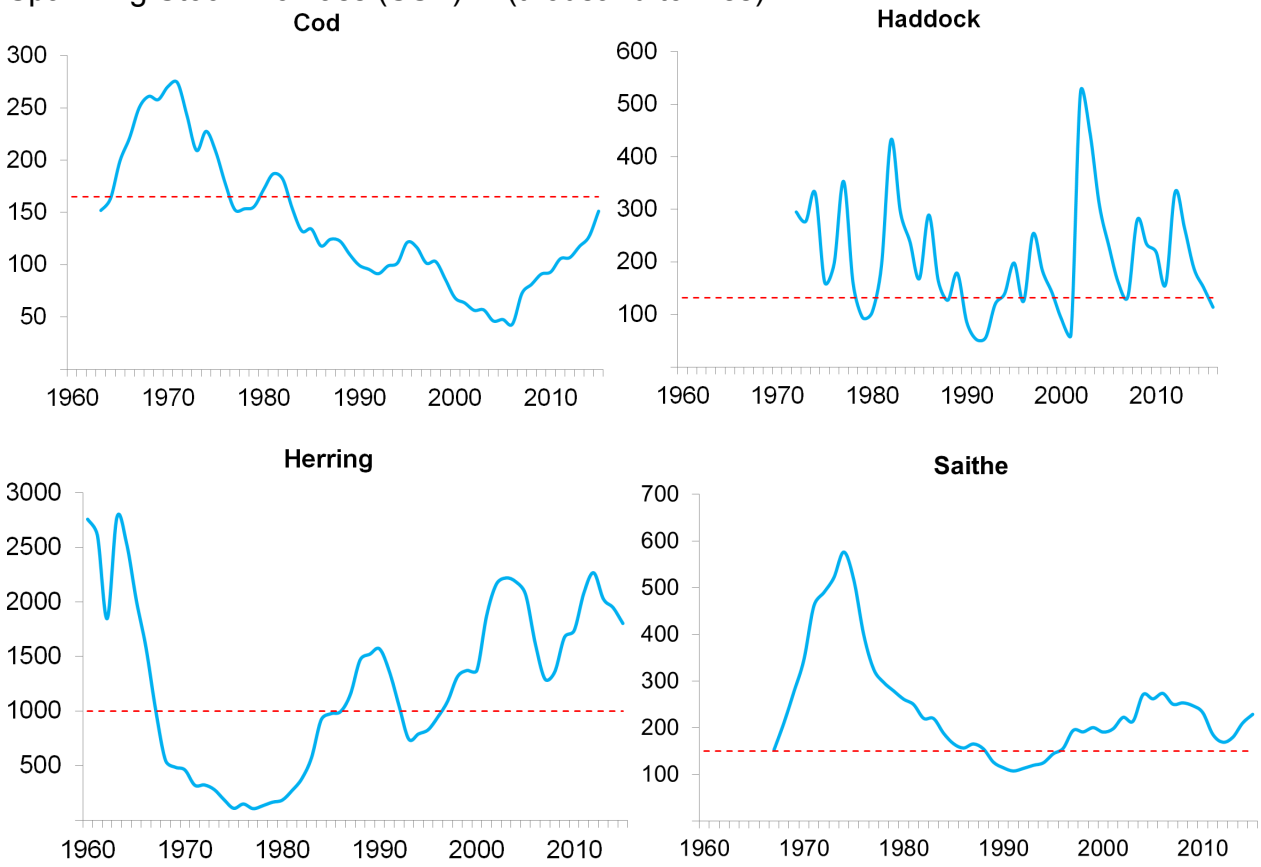
Trend
The number of wintering waterbirds rose between the mid-1980s and mid-1990s, reaching a peak in 1997. Since then there has been a steady decline, with the abundance falling 26% between 1997 and 2013. The abundance of breeding seabirds has declined by 44% between 1991 and 2014. The abundance of terrestrial breeding birds has shown a long-term increase of 20.1% between 1994 and 2014. In the last year, the abundance of terrestrial breeding birds increased by 14.6%, following a general decline from the peak of 2008.

Factors affecting trend
The status of wild bird populations can vary greatly from year to year. The abundance of birds may be affected by many factors such as the weather, changes to habitats and changes in the abundance of food sources.

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

Selected Commercial Fish Stocks: 1960-2016[P, R] 141, 142

Spawning Stock Biomass (SSB)[143] (thousand tonnes)



– – precautionary biological limit (Bpa)

Why this measure is important

If fish stocks are in a poor state it can have a knock-on effect on other parts of the marine ecosystem. The state of commercial fish stocks may be considered, alongside other indicators, as a proxy for the general sustainability of the marine environment.

Background

One measure of the state of a fish stock is the size of its spawning stock biomass (SSB). The health of the fish stock can then be indicated by comparing the SSB with a precautionary value, or reference point (Bpa).[144] Data for haddock are provisional[145].

Trend

The SSB of North Sea cod has increased each year since historical lows in 2006, although the value of 161 kt in 2016 is still just below the Bpa of 165 kt. The SSB of herring stocks has been above the Bpa of 1,000 kt since 1997 and was recorded as 2,008 kt in 2016. The SSB of the North Sea/West of Scotland saithe saw a 20-year decline in SSB levels between 1970s – 1990s. Since then, the SSB of saithe has increased above the Bpa of 150 kt[146] and was recorded as 240 kt in 2016. Provisional data shows that the SSB of haddock has been above the Bpa of 132 kt since 2002, but is expected to fall below the Bpa in 2016, at 114 kt.

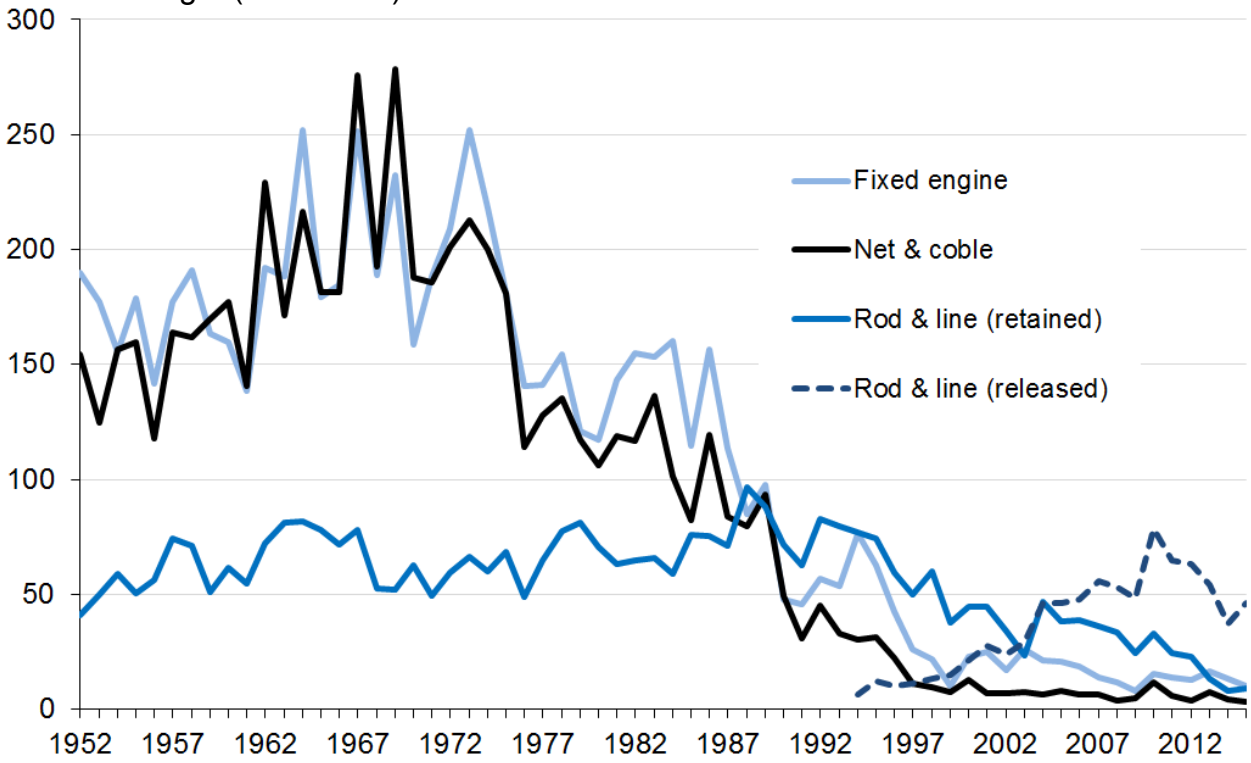
Factors affecting trend

The size of these fish stocks are affected by several factors, including commercial fishing and other factors such as climate change and success of recruitment (the number of young fish entering the adult population each year).

Source: Marine Scotland Science / ICES Metadata

Catches of Wild Salmon: 1952-2015[147]

Number caught (thousands)[148,149]



Why this measure is important

The salmon fishing industry is a significant economic and leisure resource in rural Scotland and so protecting this resource through sustainable management practices is of great importance. Climate change, water pollution, predation and disease may affect populations.

Background

Data are obtained from Marine Scotland and are based on returns from proprietors, occupiers or agents of salmon fisheries throughout Scotland.

Trend

The total reported rod catch (both retained and caught and released) of wild salmon and grilse for 2015 is 54,969. While total reported catch has increased over the return for 2014, it is still nevertheless 69% of the previous 5-year average. The number of salmon caught and released increased from 6,595 in 1994 to 45,973 in 2015. In 2015, 84% of the annual rod catch was released compared to less than 8% in 1994.

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. In 2015, 10,349 wild salmon were reported caught and retained in the fixed engine fishery and 3,234 in the net and coble fishery.[150]

Factors affecting trend

Yearly variations in weather, timing of runs and fishing effort can affect catch sizes; and so a difference in catch does not necessarily indicate a difference in the abundance of the stock that provides the catch. In addition, a proportion of fish released from the rod fishery may be re-caught and so inflate the catch statistics by being reported more than once.

Source: Marine Scotland Science Metadata

References

Background
[1] European Environment Agency DPSIR framework
Population and Households
[2] Population estimates are rebased with each census to ensure a consistent time series. Estimates for 2002 to 2010 were revised using information from the 2011 Census. The population estimates from 2011 onwards are all based on the 2011 Census.
[3] National Records of Scotland (2016). Mid-2015 Population Estimates Scotland.
[4] National Records of Scotland (2016). Estimates of Households and Dwellings in Scotland, 2015.
[5] National Records of Scotland (2015). Population Projections of Scotland (2014-based).
[6] National Records Scotland (2014). Household Projections for Scotland (2012 based).
[7] National Records of Scotland (2015). Scotland's Population 2015 - The Registrar General's Annual Review of Demographic Trends
Gross Domestic Product
[8] 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 (2013) prices, meaning that the effect of price changes is removed from the estimates, and is seasonally adjusted.
Motor Traffic on All Roads
[9] Salisbury, E., Thistlethwaite, G., Pang, Y., & Misra, A. (2015). National Atmospheric Emissions Inventory (2015). Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990 - 2013.
[10] More information is available in Transport and Travel in Scotland 2015 and Scottish Transport Statistics 2015.
[11] Scottish Government. Scotland's People Annual Report: Results from 2014 Scottish Household Survey.
[12] Department for Transport. Vehicle Licensing Statistics: 2015.
Electricity Generation by Source
[13] Includes wind, wave, solar power, thermal renewables and hydroelectric (natural flow).
[14] Pumped storage is not a renewable source of energy because it uses electricity produced by other means to create a store of hydrological power.
[15] Scottish Government (2009). Climate Change (Scotland) Act 2009.
[16] The Scottish Government has set a target for renewable sources to generate the equivalent of 100% of Scotland's gross annual electricity consumption by 2020, with an interim target of 50% set for 2015.
[17] The amount of electricity generated minus net exports (but including losses).

Public Attitudes
[18] Scotland Performs. National Indicator: Improve access to local greenspace.
[19] Scottish Government Social Research (2009). Scottish Environmental Attitudes and Behaviours Survey 2008 (SEABS '08)
[20] Scotland Performs. National Indicator: Increase people's use of Scotland's outdoors.

Global Atmosphere
[21] Climate Change 2014: Synthesis Report, Intergovernmental Panel on Climate Change (IPCC), 2014.
[22] Climate Change (Scotland) Act 2009.
[23] Climate Change (Annual Targets) (Scotland) Order 2010 (2010-2022)
[24] Climate Change (Annual Targets) (Scotland) Order 2011 (2023-2027)
[25] Scottish Government (2015). Sustainability Purpose Target
[26] Scottish Government (2015). Scotland Performs National Indicator 47: Reduce Scotland's Carbon Footprint

Annual Mean Temperature
[27] 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 average used is temperature = 7.03°C. Although 1971-2000 and 1981-2010 averages are available, 1961-1990 averages are used for comparability with UK Climate Projections 2009 (see next).

[28] 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.
[29] Climate Change 2014: Synthesis Report, Intergovernmental Panel on Climate Change (IPCC), 2014.

Annual Precipitation

[30] 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 average used is 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 next).
[31] 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.
[32] For example, projected changes in the East of Scotland are reduced precipitation of 17% (-33% to 0%) in the summer months (June to August) and an increase of 12% (1% to 25%) precipitation in winter months (December to February).
[33] Winter and summer precipitation figures are available on Scottish Environment Statistics Online.
[34] Climate Change 2014: Synthesis Report, Intergovernmental Panel on Climate Change (IPCC), 2014.

Greenhouse Gas Emissions by Sources

[35] 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.
[36] For the purposes of reporting, greenhouse gas emissions are allocated into sectors. The Official Statistics release "Scottish Greenhouse Gas Emissions 2014" contains a categorisation of each sector.
[37] Emissions from offshore oil and gas installations are not included in the Scottish inventory, and are reported as "unallocated" within the disaggregated UK inventory.
[38] IPCC Fifth Assessment Report 2013.

Scotland's Carbon Footprint

[39] 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.
[40] The Carbon Footprint is part of a small set of low carbon attitude and behaviour-related indicators set out in 'Low Carbon Scotland: A Behaviours Framework' and is used to inform the Scottish Government National Indicator Reduce Scotland's carbon footprint.

Column Ozone Measurement

[41] Stratospheric ozone is not the same as tropospheric (ground level) ozone, which is a damaging oxidant.
[42] United Nations Environment Programme. Montreal Protocol.

Air Quality

[43] Through analysis of modelled background $PM_{2.5}$ concentrations (particles less than 2.5 µm in diameter), it is estimated that the effects on annual mortality in 2010 in Scotland were over 2000 deaths and over 22,000 associated life-years lost. (Public Health England (2014). Estimating local mortality burdens associated with particulate air pollution.
[44] 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.
[45] Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right 2015. All rights reserved. Ordnance Survey Licence number 100024655. Scottish Government GI Science & Analysis Team, August 2015, Job5706ab

Emissions of Air Pollutants

[46] PM10 - particulate matter smaller than 10 microns.

Emissions of Sulphur Dioxide and Nitrogen Oxides from Large Combustion Plants

[47] Large combustion plants have a rated thermal output of over 50 megawatts. In 2015, there were 45 LCPs in Scotland, down from 52 in 2014.

[48] The Large Combustion Plants Directive (LCPD), which has now been incorporated into the Industrial Emissions Directive (2010/75/EC), called for a 60% reduction in LCP SO_2 emissions by 2003 and a 30% reduction in LCP NOx emissions by 1998, from a 1980 baseline. By 2012, total UK emissions of SO_2 were 91% below 1980 levels and total UK emissions of NOx were 60% below 1980 levels, according to the Department for Environment, Food and Rural Affairs Environment Statistics website.

Particulate (PM_{10}) Concentrations

[49] 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 a data capture rate of at least 75% are included.

[50] The data capture rate was low (under 50%) for Glasgow Centre in 2010 and so will not be included in any charts or tables. The 2010 figure for Glasgow Centre is: PM_{10} = 23.

[51] This chart contains an illustrative sample of automatic monitoring sites which have been selected based on their geographical location, how long they were in operation, site type (generally 'kerbside sites' are not included) and whether there were consistently high data capture rates. This is mainly to allow the data to be presented clearly, as there are too many monitoring sites to clearly present in one chart. The overall trends are discussed in the 'Trend' section.

[52] National Atmospheric Emissions Inventory (2016). Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990 - 2014.

[53] In 2015, PM_{10} concentration was measured at 76 automatic monitoring sites in Scotland, 64 of which had a data capture rate of at least 75%. Of the sites with data capture under 75%, none exceeded the 40 $\mu g/m^3$ UK AQS. Data for these sites are available on the Scottish Air Quality Database.

[54] Edinburgh Salamander Street is not included in the chart as it did not meet the criteria for inclusion.

Nitrogen Dioxide Concentrations

[55] 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 a data capture rate of at least 75% are included.

[56] The data capture rates were low (under 50%) for Glasgow City Chambers and Glasgow Byres Road in 2011 and for Aberdeen Errol Place in 2013; therefore, these figures will not be included in any charts or tables. The 2011 figures for Glasgow City Chambers and Glasgow Byres Road are NO_2 = 50 and NO_2 = 42 respectively; and the 2013 figure for Aberdeen Errol Place is NO_2 = 20. In 2015, a sampling fault led to all NO_2 data for Edinburgh St Leonards being rejected.

[57] This chart contains an illustrative sample of automatic monitoring sites which have been selected based on their geographical location, how long they were in operation, site type (generally 'kerbside sites' are not included) and whether there were consistently high data capture rates. This is mainly to allow the data to be presented clearly, as there are too many monitoring sites to clearly present in one chart. The overall trends are discussed in the 'Trend' section.

[58] In 2015, concentrations of nitrogen oxides were measured at 79 automatic monitoring sites in Scotland. Of these sites, 70 had a capture rate of at least 75% - data for these sites can be found on the Scottish Air Quality Database.

[59] These sites were not included in the chart as they are both 'Kerbside' sites.

[60] National Atmospheric Emissions Inventory (2016). Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990 - 2014.

Ground Level Ozone

[61] 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 a data capture rate of at least 75% are included.

[62] This chart contains an illustrative sample of automatic monitoring sites which have been selected based on their geographical location, how long they were in operation, site type (generally 'kerbside sites' are not included) and whether there were consistently high data capture rates. This is mainly to allow the data to be presented clearly, as there are too many monitoring sites to clearly present in one chart. The overall trends are discussed in the 'Trend' section.

[63] In 2015, ozone concentrations were measured at 11 sites, which all had a data capture rate of over 75%. Data for these sites are available on the Scottish Air Quality Database.

Sensitive Habitats Exceeding Critical Loads for Acidification and Eutrophication

[64] 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 subsequently been made to the methods for estimating deposition: (i) nitric acid deposition has been included in data from 2001-03 onwards; (ii) aerosol deposition of NH_4, NO_3, SO_4 has been included in data from 2002-04 onwards. Therefore deposition for earlier years may be underestimated and so the actual reductions may be larger than shown here.
[65] Deposition data sets for 2004 to 2013 have been updated following research by NERC, CEH and Defra (report under review), which assessed the current DELTA sampler configuration's specificity for HNO_3 measurement and showed additional sampling of other atmospheric oxidised nitrogen species. A correction factor has been obtained and applied to the HNO_3 concentrations used in the CBED mapping and the trends in critical loads exceedances for the period 2004-06 to 2011-2013 have been updated accordingly.
[66] Hall, J., Curtis, C., Dore, T., Smith, R. 2015. Methods for the calculation of critical loads and their exceedances in the UK. Report to Defra under contract AQ0826. Centre for Ecology and Hydrology.
[67] Hall, J., Smith, R. 2015. Trends in critical load exceedances in the UK. Report to Defra under contract AQ0826. Centre for Ecology and Hydrology.

Water

[68] Eutrophication is the accelerated growth of plants in water bodies caused by excess nutrients. This accelerated growth and subsequent decay of plant organisms depletes oxygen levels, which can have harmful effects upon fish and other aquatic life which require oxygen to survive.
[69] Drinking Water Quality Regulator for Scotland (2001). The Water Supply (Water Quality) (Scotland) Regulations 2001.

Public Water Supplies

[70] Figures for the raw water abstracted are collected over the calendar year, as it is part of the corporate data submitted to SEPA, whereas treated water produced data is collected over the business reporting year (April to March). Therefore, to present both sets of data on the same chart, the raw water abstracted figures shown reflect the first part of the business reporting year. For example, this means that the figure for 2015/16 reflects the raw water abstracted in 2015.
[71] Since 2010, raw water abstracted has been based on metered data. Prior to 2010, it was estimated based on a calculated methodology. Slight corrections were made to the 2007 and 2008 figures in 2010.
[72] 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.
[73] 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. This method is different than the one used to calculate the leakage figure included in the annual Water Industry Output Monitoring Group report and as such, the figures differ slightly each year.
[74] The Economic Level of Leakage (ELL) (where the cost of repair is greater than the value of water leaking from the system) was attained in 2012/13, and leakage has continued to be managed at this level since.

Drinking Water Quality

[75] Drinking Water Quality Regulator for Scotland (2001). The Water Supply (Water Quality) (Scotland) Regulations 2001.
[76] Drinking Water Quality Regulator for Scotland. DWQR Annual Report

River Water Quality

[77] The indicator is based on a 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. Two of the Water Framework Directive standards, invertebrates and phosphorus, used to calculate the indicator were changed in 2013; SEPA is looking into back calculating the indicator values potentially as far back as 2007 using the new standards to provide a consistent time series.

Nitrates

[78] Data are expressed as mg N/l. To convert to mg NO_3/l (nitrate), multiply by 62/14.
[79] This applies to most European rivers though for some rivers up to 1 mg N/l is reported. See European Environment Agency report 'Nutrients in Fresh Water'. for more information.
[80] In Aberdeen, Moray, Banff and Buchan; Strathmore and Fife; Lothians and Borders; Lower Nithsdale and Stranraer Lowlands.

[81] Under The Designation of Nitrate Vulnerable Zones (Scotland) Regulations 2002 and The Designation of Nitrate Vulnerable Zones (Scotland) Regulations 2015 and EC Nitrates Directive (91/676/EEC) Annex 1A(3).

Orthophosphates

[82] 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

[83] The number of bathing waters identified in Scotland has not remained constant in the period 2000-2016. There were 60 identified bathing waters in 2000, two of which were inland bathing waters, rising to 84 in 2013. Three of the 84 designated bathing waters are inland waters, which have all complied with the bathing water standards since designation.

Radiation

[84] Radon in Dwellings in Scotland: 2008 Review and Atlas

[85] SEPA. Radioactivity in Food and the Environment (RIFE) reports.

Sources of radioactivity

[86] 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.

[87] Because of rounding, percentages do not add up to 100.

Radioactivity in milk

[88] 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 1996-2014 figures are not strictly comparable with previous years, although they still represent average concentrations in milk in Scotland.

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

Waste and Recycling

[90] European Waste hierarchy

[91] Scottish Government. Making things last – A circular economy strategy for Scotland.

[92] Scotland Performs. National Indicator: Reduce waste generated.

[93] SEPA waste data technical report

Household Waste

[94] In 2011 the meaning of household waste changed to mean "waste from households" only. Waste which had previously been reported in WasteDataFlow as household waste includes street sweeping, litter bins, parks and gardens waste, and beach cleaning waste. From 2011, combustion of household waste outputs which previously counted as recycled are now included in the Other Diversion category. This includes incinerator bottom ash and metal outputs from incineration. Household waste used to produce compost like outputs from mechanical biological treatment plants also no longer contribute to recycling.

[95] Scotland's Environment Website - interactive household waste data

Land

[96] Scotland's Environment Website – Land.

[97] Scotland's Environment Website - Land - Woodlands and Forests.

[98] © Crown copyright and database right 2014. Ordnance Survey Licence number 100021242.

[99] Scotland Performs Greener Objective.

[100] Scottish Government. Land Use Strategy.

[101] Forestry Statistics 2016.

[102] Scotland Performs. National Indicator: Increase people's use of Scotland's outdoors.

[103] Scotland Performs. National Indicator: Improve the condition of protected nature sites.

[104] Scottish Government. Land Use Strategy indicators.

Derelict and Urban Vacant Land

[105] During 2015, historical data for the years 2009 - 2014 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 2015 survey returns.

[106] Vacant land must either have had prior development on it, or had preparatory work taken place on it in anticipation of future development to be classed as 'vacant land'. Derelict land must currently not be used for

the purpose for which it is held or a use acceptable in the local plan to be classed as 'derelict land'. Land also qualifies as derelict if it has an un-remedied previous use which could constrain future development.

Agricultural Land Use

[107] Changes in trend may reflect changes to the coverage of agricultural holdings included in the June Census register, as well as genuine changes in the area of total agricultural land.

[108] Scotland's Environment Website – Land.

[109] From 2009, data on land use was obtained from the Single Application Form (SAF). This data has been combined with the land use data from all other holdings, collected through the June Agricultural Census Forms, to generate overall June Agricultural Census results. This development has led to a substantial reduction in statistical data collection and an overall improvement in the quality of land use statistics. The use of SAF data has resulted in a step change in some of the land use results from 2009, especially for rough grazing and grass. This means that the trends across 2008 and 2009 for these land use categories represent differences in the way this data has been reported between the 2008 June Agricultural Census and 2009 SAF rather than genuine changes and so should be treated with caution.

[110] In 2015 and 2016, changes to the SAF meant that land use data was not available for about 500,000 ha of rough grazing, woodland, and other land. These were estimated based on previous years. In 2016 this affected 1% of rough grazing, 75% of woodland and 86% of other land. This is in addition to the usual estimation for non-SAF respondents not returning a census.

[111] Only includes woodland on agricultural holdings.

Nutrients Applied to Crops and Grass

[112] 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.

[113] Manufactured fertilisers only - excludes organic fertilisers such as manure and slurry or sewage sludge.

Area of Woodland

[114] 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.

[115] Restocking is the replanting of existing areas of woodland that have been felled. This includes felled areas that have been restocked by natural regeneration.

Conservation

[116] Marine Scotland. National Marine Plan Interactive.

Designated Areas

[117] Figures as at 31 March each year.

[118] 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.

[119] Many protected areas may be covered by more than one conservation designation. In particular, SSSIs overlap to a considerable extent with other designations. About 65% of terrestrial/inshore SACs, 52% of SPAs, and 86% of Ramsar Sites by area are also designated as SSSIs.

[120] In Scotland, SSSIs are designated by Scottish Natural Heritage under the Nature Conservation (Scotland) Act 2004. Some SSSIs overlap and where this occurs the area of overlapping land will be counted more than once. In 2016 this accounted for 2,708 hectares, so the net area of SSSI sites at 31 March 2016 is approximately 1,019,648 hectares.

[121] Special Areas of Conservation (SACs) are designated under the 1992 EU Habitats Directive to protect certain species and habitat types throughout the EU. Some SACs overlap, and where this occurs the area of overlapping land will be counted more than once. In 2016 this accounted for around 5,500 hectares, so the net area of SAC sites at 31 March 2016 is approximately 981,100 hectares. Figures include both designated SACs and candidate SACs submitted to the EC. Figures included in the Offshore Marine category include 2 candidate SACs that straddle the 12 nm inshore/offshore marine boundary.

[122] Special Protection Areas (SPAs) are classified under the 1979 EU Wild Birds Directive (which was codified in 2009) to safeguard the habitat of certain wild bird species. Some SPAs overlap, and where this occurs the area of overlapping land will be counted more than once. In 2016 this accounted for around 58,500 hectares, so the net area of SPA sites at 31 March 2016 is approximately 1,237,700 hectares.

[123] Ramsar sites are designated under the 1971 Convention on Wetlands of International Importance (commonly known as the Ramsar Convention).

Scheduled Monuments

[124] Figures as at 31 March each year.

[125] UK Parliament (1979). Ancient Monuments and Archaeological Areas Act 1979.

[126] Further information about SMs, including maps, is available on the Historic Environment Scotland portal: http://portal.historicenvironment.scot/spatialdownloads.

[127] The designations team within Historic Environment Scotland compiles and maintains the 'Schedule' of monuments of national importance.

[128] The review of dual designated sites is a nationwide project to review structures which are both listed as buildings of special architectural or historic interest and scheduled as monuments of national importance. Where appropriate the 'dual designation' of structures is being removed and they are being either listed or scheduled depending on their individual circumstances. Removing dual designations will help to provide clarity for the future management of sites. Overall it will see a reduction in the number of designations, but not a reduction in the number of sites that are designated.

Percentage of natural features on protected sites in favourable condition

[129] Scottish Natural Heritage's Site Condition Monitoring (SCM) programme is a six-year rolling programme of monitoring which aims to assess the condition of, and management/wider environmental influences on, a sample of designated natural features each year. Sites classed as being in favourable condition include sites assessed as being in favourable condition through SCM, sites assessed as being in unfavourable condition but showing signs of recovery and sites assessed as being unfavourable but benefitting from a change in management measures which, given an appropriate time, will ensure the feature reaches favourable condition.

[130] Scottish Natural Heritage. Site Condition Monitoring (SCM) programme. SCM data is also available via Scotland's Environment Web.

[131] Scotland Performs. National Indicator: Improve the condition of protected nature sites.

Biodiversity

[132] Scottish Natural Heritage. Valuing our environment.

[133] The Scottish Biodiversity Strategy

[134] See status of wild bird populations.

BAP Habitats

[135] 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.

BAP Species

[136] Department of the Environment (1994). Biodiversity: the UK Action Plan. HMSO

Status of wild bird populations

[137] The population of wintering water birds is measured in the winter beginning in the year indicated, i.e. 2013 indicates populations measured from approximately November 2013 – March 2014. Data displayed for wintering water birds is smoothed.

[138] BTO Breeding Bird Survey.

[139] JNCC Seabird Monitoring Programme.

[140] Wetland Birds Survey.

Status of selected fish stocks

[141] 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.

[142] Figures for herring are for North Sea stocks, figures for haddock include North Sea, Skagerrak and West of Scotland, figures for cod include North Sea, Skagerrak and the eastern English channel and figures for saithe include North Sea & Skagerrak, West Coast of Scotland and Rockall.

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

[144] 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).

[145] Figures for haddock have still to be approved by ICES and so are provisional until November 2016.

[146] The Bpa for saithe was revised downwards from 200 kt to 150 kt this year, while the Bpa for haddock has been revised upwards from 88 kt to 132 kt.

Catches of Wild Salmon

Catches of Wild Salmon

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

[148] 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.

[149] 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.

[150] Further information on Scottish salmon and sea trout stocks can be found in the Marine Scotland Science Report 01/15: Status of Scottish salmon and sea trout stocks 2014 report.

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