

AIR QUALITY

Past drivers

- Air quality is affected by pollutants released into the atmosphere through human activities. These include transport, industry, energy and agriculture, as well as some household activities such as heating.
- In urban areas, emissions of particulate matter and nitrogen dioxide from transport are the primary concern.

Where are we now?

- The majority of pollutants are well below limits set for protecting human health and the environment. However, in some areas particulate matter (PM10 and PM2.5) and nitrogen dioxide concentrations are still above such limits.
- Air quality has improved significantly since the 1950s, with reductions in most pollutants, in particular lead, carbon monoxide and sulphur dioxide. Overall, the air we breathe today is cleaner than at any time since the Industrial Revolution.
- Between 1990 and 2017, there have been decreases of 15% for ammonia, 63% for particulate (PM10) concentrations, 65% for non-methane volatile organic compounds (NMVOCs), 71% for nitrogen oxides (NOx), 84% for carbon monoxide, 96% for sulphur dioxide and 97% for lead.
- The decline in sulphur dioxide and nitrogen oxides have been largely driven by a reduction in emissions from large combustion power plants.
- The area of land where critical load exceedance for acidification and eutrophication remains high and there is evidence of changes in the species composition of sensitive habitats due to nitrogen deposition.

Where do we want to be?

- Scotland's air quality will be the best in Europe.¹

Current initiatives

- National Low Emission Framework: The framework sets out a procedure for local authorities to determine effective measures for addressing transport related air quality issues in their areas.
- Low Emission Zones: The Scottish Government announced in the 2017-18 Programme for Government that Low Emission Zones will be established in Scotland's four largest cities by 2020. The first of these became operational in Glasgow in December 2018.
- Phasing out new petrol and diesel cars and vans by 2032.
- Put active travel at the heart of transport planning.

Future drivers

- Nitrogen oxide emissions expected to continue decreasing as ultra-low emission vehicles and renewable energy sources increase.
- Sulphur dioxide emissions expected to decline as the use of gas and renewable energy increases.
- Biomass is a relatively small source of particulate matter, but is expected to become increasingly important, especially in urban areas.
- Agricultural practices, particularly ammonia associated with livestock, can have an impact on air quality within the vicinity of operations.

Key evidence gaps

- Unclear how to quantify and maximise the co-benefits of integrated air quality and climate change policies and how to assess the collective impacts on both target (air quality/climate change) and non-target policies (e.g. biodiversity).
- Uncertainty over what the impacts are (including cumulative impact) of PM2.5 emissions from biomass burning in urban areas on local air quality.
- More research needed to quantify the impacts of air pollution on health and mortality and the wider social and economic costs.
- More evidence needed on the contribution of agriculture to overall emissions.

¹ Cleaner air for Scotland: the road to a healthier future

A Introduction

1. Air quality can be affected by the emission of pollutants into the atmosphere from a wide range of human activities, such as transport, industry and agriculture, as well as from natural sources. Poor air quality, particularly within urban areas, has become one of the biggest environmental risks to human health. Air pollution is estimated to reduce the average life expectancy of every person in Scotland by three to four months. In general, healthy people may not suffer from any serious ill effects, although people with pre-existing health conditions (such as heart disease, lung conditions and asthma), the very young and the elderly may be adversely affected by day-to-day changes in air pollution.
2. Air pollution can also damage the wider environment. It can cause the acidification of soils and water, damaging plant and animal life in forests, lakes and rivers. Air pollution also adds nutrients to water and soils which can damage biodiversity and the fabric of buildings and monuments, including buried archaeological remains.
3. Air quality can also affect the economy through a number of different channels, such as lost working days from ill health. Research in 2012 estimated that the cost of air pollution to the UK economy via its effects on productivity were £2.7 billion.ⁱ
4. In general, air in Scotland's countryside is of much better quality than air in Scotland's towns and cities. However, the rural environment is still affected by air pollution although the sources of this pollution can be very different from those in the urban environment (e.g. agricultural activity).

B Recent trends

5. The quality of Scotland's air has improved considerably over the last few decades and is now cleaner than at any time since the Industrial Revolution (19th century). However, in some areas poor air quality still affects human health and the environment (for particulate matter (PM10 and PM2.5) nitrogen dioxide and ammonia concentrations).
6. Between 1990 and 2017, there have been decreases of 15% for ammonia, 63% for particulate (PM10) concentrations, 65% for non-methane volatile organic compounds (NMVOCs), 71% for nitrogen oxides (NOx), 84% for carbon monoxide, 96% for sulphur dioxide and 97% for lead.ⁱⁱ
7. The decline in sulphur dioxide and nitrogen oxides have been largely driven by a reduction in emissions from large combustion power plants.
8. The stage 2 annual mean objective for particulate (PM10) concentrations was not met at two of 74 automatic monitoring sites in 2018, compared to 10 of 58 sites in 2014. One of these sites also failed to meet the Scottish daily mean.
9. In terms of ground level ozone concentrations, in 2017 the Air Quality Scotland objective was met at 10 of 11 sites with a data capture greater than 75%, compared to 8 of 9 sites in 2014.ⁱⁱⁱ
10. The area of sensitive habitats in Scotland exceeding critical loads for acidification fell from 68% in 1995-97 to 23% in 2014-16, with nutrient nitrogen exceedances falling from 59% to 35% over the same period.^{iv}

C Past drivers of change

11. Tighter controls on emissions such as lead, carbon monoxide and sulphur dioxide.
12. Ammonia emissions have reduced through a combination of decreasing animal numbers and a decline in fertiliser use.
13. Sulphur dioxide emissions have fallen following the move to gas fired power stations, the introduction of flue gas desulphurisation to coal-fired power stations and the closure of Cockenzie and Longannet power stations in 2013 and 2016 respectively.
14. The decline in nitrogen oxides between 1990 and 2017 has been driven, in part, by the installation of catalytic converters in vehicles and more recently the introduction of "Euro standards" for new cars. Furthermore, the decline in nitrogen oxides since 2007 is also linked to the power sector, as Boosted Over-Fire Air abatement systems were fitted which reduces nitrogen oxide emissions formed during coal combustion.
15. Changes in particulate (PM10) concentrations depend on the levels of emissions from several different sources, although recent reductions in PM10 concentrations can be attributed to a reduction in emissions from power generation (largely due to a switch from coal-fired energy generation to gas which produces negligible PM10 emissions).

D Future drivers

16. As renewable energy sources increase, it is expected that the contribution from energy generation to nitrogen oxides will continue to decrease. Similarly, sulphur dioxide emissions are expected to decline as the use of gas and renewable energy sources increase.
17. Biomass (organic matter used as fuel) is a relatively small source of particulate matter, but if the rate of uptake continues as forecast its contribution will become increasingly important, especially in urban areas.
18. The shift to ultra-low emission vehicles will further reduce nitrogen oxide emissions.
19. Green infrastructure can also be developed to mitigate the impacts of air pollution. Placemaking and sustainable design and construction can be used to reduce emissions.
20. In the agricultural and food sectors there is scope to improve nutrient reuse and recovery, which will benefit air quality as well as improving soils and waters.

E Current initiatives

21. National Low Emission Framework: The framework sets out a procedure for local authorities to determine effective measures for addressing transport related air quality issues in their areas.
22. Low Emission Zones: The Scottish Government announced in the 2017/18 Programme for Government that Low Emission Zones would be established in Scotland's four biggest cities by 2020. The first of these became operational in Glasgow in December 2018.
23. Phasing out new petrol and diesel cars and vans by 2032: Within the 2017-18 Programme for Government the Scottish Government outlined its commitment to phasing out new petrol and diesel cars and vans by 2032. This is underpinned by a range of actions to expand the charging network, support innovative approaches and encourage the public sector to lead the way.
24. Promoting sustainable and active travel: Within the 2017-18 Programme for Government the Scottish Government outlined its commitment to put active travel at the heart of transport planning. The Cycling Action Plan for Scotland 2017-2020 aims that by 2020 10% of everyday journeys will be by bike.

Endnotes

- ⁱ Valuing the Impacts of Air Quality on Productivity 2014 https://uk-air.defra.gov.uk/assets/documents/reports/cat19/1511251135_140610_Valuing_the_impacts_of_air_quality_on_productivity_Final_Report_3_0.pdf
- ⁱⁱ National Atmospheric Emissions Inventory Report: Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990-2017, https://naei.beis.gov.uk/reports/reports?report_id=996
- ⁱⁱⁱ Scottish Air Quality Database: Annual Report 2016 http://www.scottishairquality.co.uk/assets/documents/technical%20reports/SAQD_annual_report_2016_issue_1.pdf
- ^{iv} <http://www.gov.scot/seso/DatasetSearch.aspx?TID=207>