Air quality

Past drivers

Air quality is affected by pollutants released into the atmosphere through human activities, such as 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, but in some areas are still above such limits (for Particulate Matter (PM10 and PM2.5) concentrations and Nitrogen Dioxide concentrations).
- Air quality has improved significantly since the 1950s, with dramatic 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.
- Air pollution still damages our health and the environment and the concentrations of some pollutants are decreasing slowly (e.g. ammonia).
- Between 1990 and 2015, there have been decreases of 10% for ammonia, 61% per cent for Particulate (PM10) concentrations, 64% for non-methane volatile organic compounds (NMVOCs), 71% for nitrogen oxides (NOx), 83% for carbon monoxide, 92% for sulphur dioxide and 98% for lead.
- In 2015, Sulphur Dioxide (SO2) emissions from large combustion plants fell by 27% compared with 2014 and NOx emissions fell by 13% over the same period, mainly due to lower emissions from Longannet power station. SO2 and NOx emissions are the lowest on record.

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.
Quantify the impacts of air pollution in terms of equivalent mortality through shortened lifespans or the wider social and economic costs.

Future drivers

Contribution from energy generation to Nitrogen oxides is expected to continue to decrease as renewable energy sources increase.
Similarly, sulphur dioxide emissions are expected to decline as the use of gas and renewable energy sources increase.
Biomass (organic matter used as fuel) is a relatively small source of Particulate Matter, but is expected to become increasingly important, especially in urban areas.
Shift to ultra-low emission vehicles will further reduce nitrogen oxide emissions.

Where do we want to be?

- Our air, freshwater, seas and soils are of excellent quality. [1]
- Scotland's air quality will be the best in Europe. [2]

Current initiatives and their impact

National Low Emission Framework: The framework sets out a procedure for local authorities to determine effective measures for addressing air quality issues in their areas.
Low Emission Zones: a consultation on 'Building Scotland's Low Emission Zones' was undertaken in 2017. The Scottish Government announced in the 2017-18 Programme for Government that Glasgow will be the first to put in place a Low Emission Zone by the end of 2018.
Phasing out new petrol and diesel cars and vans by 2032.

[1] Draft outcome, Developing an Environment Strategy for Scotland: Discussion Paper
[2] Cleaner air for Scotland: the road to a healthier future

Draft Knowledge Account – Air quality

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 and industry, as well as from natural sources. Poor air quality, particularly within urban areas, can be bad for our health. 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.

3. Air quality can also affect the economy through a number of different channels, such as lost working days from ill health, with research in 2012 estimating 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 centrury). However, in some areas poor air quality still affects human health and the environment (for Particulate Matter (PM10 and PM2.5) concentrations and Nitrogen Dioxide concentrations).

6. Between 1990 and 2015, there have been decreases of 10% for ammonia, 61% per cent for Particulate (PM10) concentrations, 64% for non-methane volatile organic compounds (NMVOCs), 71% for nitrogen oxides (NOx), 83% for carbon monoxide, 92% for sulphur dioxide and 98% for lead.

7. The decline in sulphur dioxide and nitrogen oxides have been largely driven by a reduction in emissions from large combustion power plants which fell by 87% and 58% respectively between 1996 and 2015.

8. The stage 2 annual mean objective for Particulate (PM10) concentrations was not met at 4 of 64 automatic monitoring sites in 2015, 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 site in Aberdeen. Salamander Street in Edinburgh has not met the stage two annual mean objective since 2010.

9. In terms of ground level ozone concentrations, in 2016 the Air Quality Scotland objective was met at all 11 sites with a data capture greater than 75%, compared to 8 of 9 sites in 2014. [ii]

10. The area of sensitive habitats in Scotland exceeding critical loads for acidification fell from 68% in 1995-97 to 31% in 2013-15, with nutrient nitrogen exceedances falling from 59% to 43% over the same period. [iii]

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 power station in 2013.

14. The decline in Nitrogen oxides between 1990 and 2014 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 produced 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.

E Current initiatives and their impact

19. National Low Emission Framework: the framework sets out a procedure for local authorities to determine effective measures for addressing air quality issues in their areas.

20. Low Emission Zones: following a consultation undertaken in 2017, the Scottish Government has announced that Glasgow will be the first to put in place a Low Emission Zone by the end of 2018.

21. 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.

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[i] 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] Scottish Air Quality Database: Annual Report 2016 http://www.scottishairquality.co.uk/assets/documents/technical%20reports/SAQD_annual_report_2016_Issue_1.pdf

Key Scottish Environmental Statistics, 2016 http://www.gov.scot/Publications/2016/10/7565

[iii] http://www.gov.scot/seso/DatasetSearch.aspx?TID=207