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# Air Pollution in Scotland 2020


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# Introduction

This brochure has been produced as part of the Scottish Air Quality Database (SAQD) project on behalf of the Scottish Government. The 2020 brochure is the 14th in an annual series. It aims to provide a summary of the local air quality monitoring and associated work carried out by and on behalf of the Scottish Government and local authorities during 2020.

The SAQD project was developed as a comprehensive centralised resource to provide high-quality harmonised data and information. The quality assurance of the data generated by the Scottish network serves to improve research and analysis and supports the evaluation of air quality policy in Scotland. Since the initial development of the SAQD in 2006, it has grown year on year, going from 20 automatic sites in 2006 to 100 in 2020. The total number of automatic air quality monitoring sites in the SAQD during 2020 was 100.

While air quality in most of Scotland is generally good, levels of some pollutants still exceed air quality objectives, particularly in urban areas. Therefore, continued efforts to reduce air pollution are vital, coupled with appropriate monitoring to assess progress. For more information on air quality in Scotland and more specifically, your area, please visit the Air Quality in Scotland website (http://www.scottishairquality.scot/).

A more detailed Annual Report on the SAQD project is available on the Air Quality in Scotland website.

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# Legislation and Policy

Air quality management is shaped by statutory requirements from EU, UK and Scottish legislation and policies. The main pieces of EU legislation are:

- Directive 2008/50/EC - on ambient air quality and cleaner air for Europe (the Air Quality Directive).
- Industrial Emissions Directive 2010/75/EC – Controls emissions from industrial activities.
- National Emission Ceilings Directive 2016/2284/EU – sets emission limits for five important air pollutants
- Clean Air Policy Package and Clean Air Programme for Europe-new air quality objectives to 2030, to improve air quality within cities.

Following the UK's exit from the EU, under retained EU law, the UK is required to continue meeting limit and target values for a range of air pollutants covered by the directives. Domestic air quality legislation is largely derived from the requirements of the Environment Act 1995. In the UK, air quality is a devolved matter, with the Scottish Government having responsibility for the development of air quality policy and legislation for Scotland.

## 2.1 Air Quality Standards and Objectives

A set of air quality standards and objectives have been developed for several pollutants of concern for human health. The objectives are derived from the standards and are a compromise between what is desirable purely on health grounds and what is practicable in terms of feasibility and costs. Each objective has a date by when it must be achieved. The objectives adopted in Scotland for the purpose of local air quality management (LAQM) are set out in the Air Quality (Scotland) Regulations 2000, the Air Quality (Scotland) Amendment Regulations 2002 and the Air Quality (Scotland) Amendment Regulations 2016. Scotland has adopted more stringent objectives for particulate matter up to 10 µm and 2.5 µm in diameter ($PM_{10}$ and $PM_{2.5}$ respectively). A summary of the current Scottish air quality objectives is provided in Table 2.1.

Table 2.1 Summary of air quality in Scotland

| Air Quality objective & pollutant | Concentration | Measured as | Date to be achieved by |
|---|---|---|---|
| Nitrogen dioxide ($NO_2$) | 200 µg $m^{-3}$ not to be exceeded more than 18 times a year | 1-hour mean | 31.12.2005 |
| | 40 µg $m^{-3}$ | Annual mean | 31.12.2005 |
| Particulate matter ($PM_{10}$) | 50 µg $m^{-3}$, not to be exceeded more than 7 times a year | 24-hour mean | 31.12.2010 |
| | 18 µg $m^{-3}$ | Annual mean | 31.12.2010 |
| Particulate matter ($PM_{2.5}$) | 10 µg $m^{-3}$ | Annual mean | 31.12.2020 |
| Sulphur dioxide ($SO_2$) | 350 µg $m^{-3}$, not to be exceeded more than 24 times a year | 1-hour mean | 31.12.2004 |
| | 125 µg $m^{-3}$, not to be exceeded more than 3 times a year | 24-hour mean | 31.12.2004 |
| | 266 µg $m^{-3}$, not to be exceeded more than 35 times a year | 15-minute mean | 31.12.2005 |
| Benzene ($C_6H_6$) | 3.25 µg $m^{-3}$ | Running annual mean | 31.12.2010 |
| 1,3 Butadiene ($C_4H_6$) | 2.25 µg $m^{-3}$ | Running annual mean | 31.12.2003 |
| Carbon monoxide (CO) | 10.0 mg $m^{-3}$ | Running 8-Hour mean | 31.12.2003 |
| Lead (Pb) | 0.25 µg $m^{-3}$ | Annual Mean | 31.12.2008 |
| Poly Aromatic Hydrocarbons* | 0.25 ng $m^{-3}$ | Annual Mean | 31.12.2010 |
| Ozone* | 100 µg $m^{-3}$ not to be exceeded more than 10 times a year | 8 hourly running or hourly mean | 31.12.2005 |

*not required to be monitored or assessed by local authorities under LAQM, however is a UK requirement under EU directive (Directives 2004/107/EC and 2008/50/EC)

## 2.2 Cleaner Air for Scotland – The Road to a Healthier Future

The first 'Cleaner Air for Scotland – The Road to a Healthier Future' (CAFS) strategy was published by the Scottish Government in November 2015. The purpose was to provide a national framework which set out how the Scottish Government and its partner organisations proposed to achieve further reductions in air pollution and fulfil their legal responsibilities to achieve the air quality objectives. It recognised that although progress has been made through Scotland, areas of poorer air quality still exist within some towns and cities.

During the first half of 2019 the Scottish Government carried out an in-depth independent review of CAFS and the documents were published in July 2019[1]. The Scottish Government planned to use the information and recommendations made from this review to update CAFS in 2020. As such, in October 2020 the Scottish Government published a consultation on a draft new air quality strategy. In July 2021, accompanied by a Delivery Plan, and replacing "Cleaner Air for Scotland – The Road to a Healthier Future", Scottish Government published Scotland's second air quality strategy called "Cleaner Air for Scotland 2 – Towards a Better Place for Everyone" (CAFS2).

## 2.3 Cleaner Air for Scotland 2 (CAFS2) Strategy

CAFS2 sets out how the Scottish Government and its partner organisations propose to further reduce air pollution to protect human health and fulfil Scotland's legal responsibilities over the period 2021-2026. CAFS2 aims to achieve the ambitious vision for Scotland "to have the best air quality in Europe".

The CAFS2 key partner organisations are:

- Scottish Government
- Transport Scotland
- Scottish Environment Protection Agency (SEPA)
- Public Health Scotland
- Local authorities

Engagement and support from a wide range of stakeholders including representatives from the transport and planning sectors and Non-Governmental Organisations (NGOs) is also vital to achieving the aims of CAFS2.

Progress is supported by the CAFS2 Delivery Group, which is directly accountable to a Ministerial Group.

### 2.3.1 CAFS2 – Overview

CAFS2 is shaped around 10 policy themes, these are:

1. Health – A Precautionary Approach.

**Evidence justifies adopting a precautionary public health approach to air pollution reduction. As a minimum, compliance is required with domestic and international air quality standards but, where practicable and feasible, there should be continued efforts to reduce preventable air pollution still further beyond these limits.**

2. Integrated Policy.

**Strategies, policies and plans being developed and implemented by central government for placemaking, climate change mitigation and adaptation, and related polices such as noise reduction, should be closely coordinated and aligned with those for air quality in order to maximise co-benefits.**

3. Placemaking.

**National Planning Framework 4 (NPF4) will transform how Scotland's planning system shapes our places and society over the years and decades to come. The Planning (Scotland) Act 2019 requires that the National Planning Framework must have regard to minister's national strategy for the improvement of air quality.**

4. Data.

**There are gaps in both quality and coverage of air quality, transport and human health data in Scotland. Addressing these gaps will help to improve public awareness and engagement, modelling, reporting and ultimately, policy implementation.**

[1] http://www.scottishairquality.scot/lez/cafs-review-documents

5. Public Engagement and Behaviour Change.

**More research is needed to provide clear evidence on levels of knowledge, attitudes, and concern related to air pollution, as well as on willingness to change behaviours which contribute toward air pollution. Development of complementary and co-ordinated public engagement strategies is essential to deliver the required behavioural change outcomes and to avoid confusing or conflicting messages.**

6. Industrial Emissions Regulations.

**The Scottish Government has made clear its commitment to maintain or exceed EU standards, following the UK's departure from the European Union (EU). The UK Withdrawal from the European Union (Continuity) (Scotland) Act 2021 will bring the guiding European principles on the environment into force in Scots law, including the precautionary principle, polluter pays principle, prevention principle, rectification at source principle and the integration principle.**

7. Tackling Non-Transport Emission Sources.

**Domestic (household) burning and agriculture are two sectors not addressed in detail in CAFS, but which make an important contribution to air pollution. Consideration is needed of performance and standards for domestic fires, stoves and fuels, and local authority powers to permit and control these, and a refreshed approach to good agricultural practice, which includes aiming for increased nitrogen use efficiency in farming. Together, these have the potential to deliver significant improvements in air quality beyond current regulatory and management approaches.**

8. Transport.

**Increasing modal shift to active travel and public transport is key to further reductions in transport emissions**

9. Governance, Accountability and Delivery.

**Simple and effective governance arrangements and a focus on practical joined up delivery are imperative for CAFS2. We need to be clear on who is doing what, who is leading, who is supporting and who is ultimately responsible if CAFS2 is to be delivered as a coherent, integrated and successful strategy.**

10. Further Progress Review.

**As in the original version of CAFS, the intention is that CAFS 2 will have a five-year lifespan. A further review of progress on air quality improvements will commence during 2024 in order to track progress on delivering the actions in the new strategy.**

## 2.4 National Modelling Framework

The National Modelling Framework (NMF) will provide a two-tiered standardised approach to modelling air quality in Scotland. Detailed models for the first four cities covering Glasgow, Edinburgh, Aberdeen and Dundee will provide evidence for taking direct actions at the city scale to reduce street-level emissions. The regional model will provide a tool for screening and assessing the potential air quality impacts associated with large-scale planned developments across local authority areas. The NMF will help with providing evidence for actions developed through the National Low Emission Framework (NLEF).

### 2.4.1 National Low Emissions Framework (NLEF)

The NLEF has been developed to assist in the appraisal of air quality improvement options related to transport. Together with the National Modelling Framework (NMF), it provides guidance on the appraisal of such measures to help facilitate consistent assessment and implementation across Scotland. The Scottish Government published the NLEF framework in January 2019[2]. The framework provides a methodology for local authorities to undertake air quality assessment to inform decisions on transport related actions.

The LAQM Annual Progress Report template for 2019 included the 'NLEF Stage 1 Screening Appraisal' for all local authorities with Air Quality Management Areas (AQMAs). The NLEF is directly linked to Air Quality Action Plan (AQAP) and this screening exercise allowed local authorities to carry out an assessment of their AQMAs to determine whether to proceed to Stage 2 Assessment; agreed by the Scottish Government and SEPA. The Stage 2 Assessment main outcome is to determine whether to introduce a Low Emission Zone (LEZ) into the local authority or identify and consider actions that could lead to improved air quality and contribute to the revocation of the AQMA.

## 2.5 Low Emissions Zones

In Sept 2017, the Scottish Government committed to the introduction of Low Emission Zones (LEZs) into Scotland's four biggest cities (Glasgow, Edinburgh, Aberdeen and Dundee) by 2020 and into all other Air Quality Management Areas (AQMAs) by 2023 where the NLEF appraisal advocates such mitigation.

On 31 December 2018, the first Scottish LEZ was introduced into Glasgow city centre. Throughout 2019, Glasgow was in its first phase of its LEZ and applied to local service buses only. However, Glasgow's LEZ development of future phases to incorporate all other vehicle types was postponed due to Covid-19. Planning has resumed at a local authority level and public consultations were carried out during summer 2021 to obtain feedback on the proposed LEZ in Aberdeen, Dundee, Edinburgh and Glasgow. More information is available here: https://www.lowemissionzones.scot/about

[2] http://www.scottishairquality.scot/assets/documents/technical%20reports/00545018.pdf

## 2.6 Local Air Quality Management

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas to determine if the air quality objectives are likely to be achieved. Where an exceedance is considered likely, the local authority must:

- Declare an AQMA
- Assess and identify the reasons for the problem
- Develop an Air Quality Action Plan (AQAP) to help address the problem

In 2016, the Scottish Government produced and updated the Technical Guidance and Policy Guidance for the LAQM regime in the UK. The LAQM policy and technical guidance documents are available online (www.scottishairquality.co.uk/air-quality/legislation).

## 2.7 Air Quality Management Areas

In Scotland, there are 36 AQMAs declared across 14 of the Scottish local authorities. The AQMAs in Scotland are declared for either nitrogen dioxide ($NO_2$) and/or $PM_{10}$ concentrations, with the exception of the Grangemouth AQMA for sulphur dioxide ($SO_2$). The adoption of the $PM_{2.5}$ objective of 10 µg $m^{-3}$ has not resulted in any additional AQMAs being declared. However, $PM_{2.5}$ monitoring continues to increase. The AQMAs declared in Scotland are presented in Table 2.2.

Table 2.2 Current AQMAs in Scotland

| Local authority | Pollutant (no of AQMAs) | Main Source | AQMAs |
|---|---|---|---|
| Aberdeen | $NO_2$ and $PM_{10}$ | Roads | 3 |
| City of Edinburgh | $NO_2$ (5) and $PM_{10}$ (1) | Roads | 6 |
| Dundee City | $NO_2$ and $PM_{10}$ | Roads | 1 |
| East Dunbartonshire | $NO_2$ and $PM_{10}$ | Roads | 2 |
| East Lothian | $NO_2$ | Roads | 1 |
| Falkirk | $SO_2$ (1), $NO_2$ (1), $PM_{10}$ (1), $NO_2$ and $PM_{10}$ (1) | Industry and roads | 3 |
| Fife | $NO_2$ and $PM_{10}$ | Roads | 2 |
| Glasgow City | $NO_2$ and $PM_{10}$ (1), $NO_2$ (1) | Roads | 2 |
| Highland | $NO_2$ | Roads | 1 |
| North Lanarkshire | $PM_{10}$ | Industry and roads | 4 |
| Perth and Kinross | $NO_2$ and $PM_{10}$ | Roads | 2 |
| Renfrewshire | $NO_2$ (2), $NO_2$ and $PM_{10}$ (1) | Roads | 3 |
| South Lanarkshire | $NO_2$ (1) and $PM_{10}$ (2) | Roads | 3 |
| West Lothian | $NO_2$ (2) and $PM_{10}$ (1) | Roads | 3 |

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# Networks and Data

## 3.1 Automatic monitoring in Scotland

Extensive air quality monitoring is carried out across Scotland. Some monitoring sites are run as part of UK-wide monitoring networks and others are operated by local authorities for LAQM purposes. The following AQS pollutants were monitored in Scotland during 2020:

- Benzene ($C_6H_6$)
- 1,3-butadiene ($C_4H_6$)
- Carbon monoxide (CO)
- Lead (Pb)
- Oxides of nitrogen (NOx), comprising nitric oxide (NO) and nitrogen dioxide ($NO_2$)
- Ozone ($O_3$)
- Particles (as $PM_{10}$, $PM_{2.5}$ and black carbon)
- Polycyclic aromatic hydrocarbons (PAH)
- Sulphur dioxide ($SO_2$)

The locations of automatic monitoring stations are shown in Figure 3.1. These stations provide high-resolution, hourly information on a wide range of pollutants. Data from national network monitoring sites are updated hourly in near real time on the SAQD. Data from local authority operated monitoring sites are updated hourly or daily depending on the station configuration. A typical automatic monitoring site is shown in Figure 3.2.

Scotland's automatic monitoring is supplemented by non-automatic monitoring techniques. For example, the pumped-tube samplers used to monitor benzene, the high-volume samplers used to measure PAH and the non-automatic techniques used to monitor nitrogen dioxide and metals (such as lead).

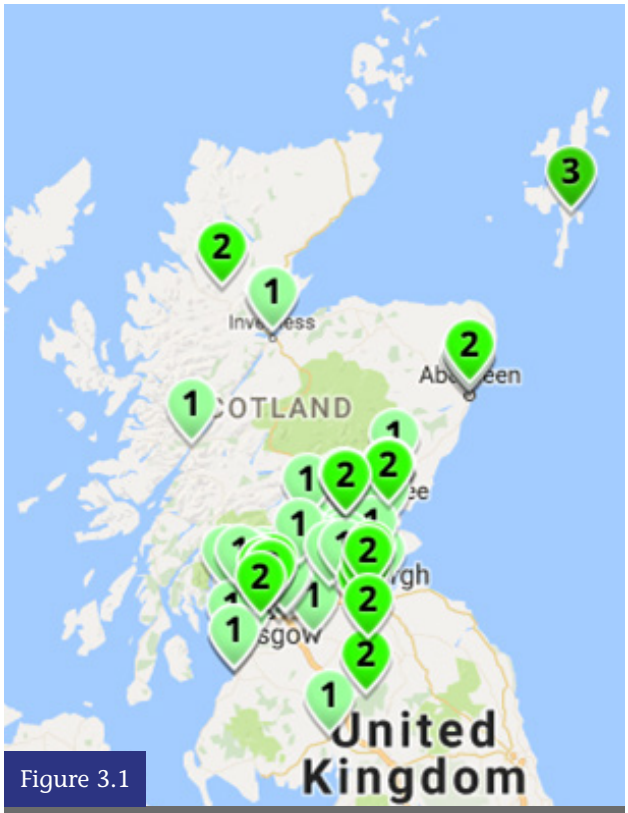



Figure 3.1

Location of automatic monitoring stations

Figure 3.2

Scottish Automatic Monitoring Site

## 3.2 Passive monitoring in Scotland

In 2019, the Scottish local authority diffusion tube site map went live on the SAQD website (http://www.scottishairquality.scot/latest/diffusion-sites) (Figure 3.3). This network of over 1100 sites across the 32 local authorities provides published bias corrected annual mean diffusion tube data, site type information, location and historical data in a format that is easy to understand. Diffusion tubes are used:

- As a low-cost alternative to automatic monitoring at a greater amount of locations of concern for use within Local Air Quality Management.
- To give an indication of longer-term average $NO_2$ concentrations.
- For highlighting areas of high $NO_2$ concentrations where installation of an automatic analyser isn't feasible.

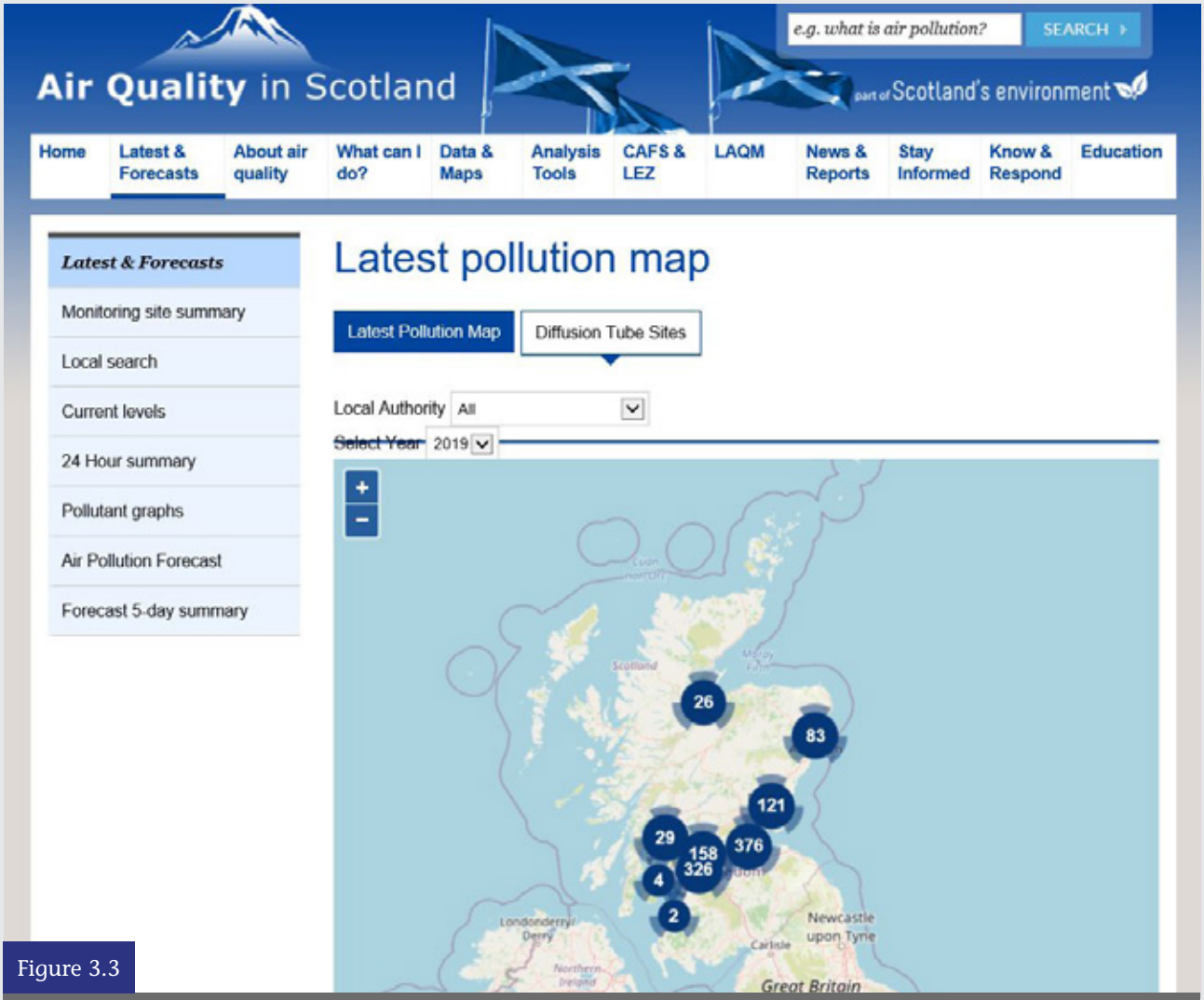



Figure 3.3

Diffusion Tube Site Map

## 3.3 Key Results for 2020

This section provides a summary of results from automatic and non-automatic monitoring in Scotland in 2019 including compliance with AQS objectives. Further information is provided on the Air Quality in Scotland website (www.scottishairquality.co.uk). This will be supplemented by further information and data to be published in the full Annual Report later this year. Data from individual local authorities' $NO_2$ diffusion tube networks are not included.

**Benzene**

This hydrocarbon is a constituent of vehicle exhaust emissions. Benzene was monitored using a non-automatic pumped-tube sampler at two sites (Glasgow Kerbside and Grangemouth) as part of the UK Non-Automatic Hydrocarbon Network. Benzene was also measured using an automatic technique at the rural supersite at Auchencorth Moss. All sites had annual mean concentrations below the AQS objective for the running annual mean.

**1,3-Butadiene**

1,3-butadiene is also a constituent of vehicle exhaust emissions. This pollutant was monitored at one rural site (Auchencorth Moss) as part of the UK Automatic Hydrocarbon Network. There were no exceedances of the 1,3-butadiene objective in 2020, however, the data capture rate is less than 75% and so no conclusion can be made whether the objective is likely to have been exceeded or not. There is no EU Directive covering 1,3-butadiene.

**Carbon monoxide**

This gas is a product of incomplete combustion, with vehicle exhaust emissions being an important source. It was monitored at one site in Scotland in 2020 - Edinburgh St Leonards. Outdoor concentrations of CO were well within the AQS objective, as they have been for many years.

**Lead**

This toxic metal is emitted from some industrial processes (although emissions are now strictly controlled). Lead is monitored at two non-automatic sites in Scotland (Auchencorth Moss and Eskdalemuir). There were no exceedances of the lead objective in 2020.

**Nitrogen dioxide – Automatic monitoring**

This toxic gas is emitted from most combustion processes, including power generation, domestic heating and vehicle engines. It was monitored at 89 automatic sites in Scotland during 2020. Of these, 14 achieved less than the 75% data capture generally considered necessary to calculate a representative annual mean. This was because of instrument/sampling issues and sites starting up or closing down part way through the year.

Of the remaining 75 sites with 75% data capture or more, no sites exceeded the annual mean objective for $NO_2$ (40 µg $m^{-3}$). The objective of not more than 18 exceedances of 200 µg $m^{-3}$ for the hourly mean was also not exceeded at any site.

Figure 3.4 shows annual mean $NO_2$ concentrations at each site (with at least 75% data capture).

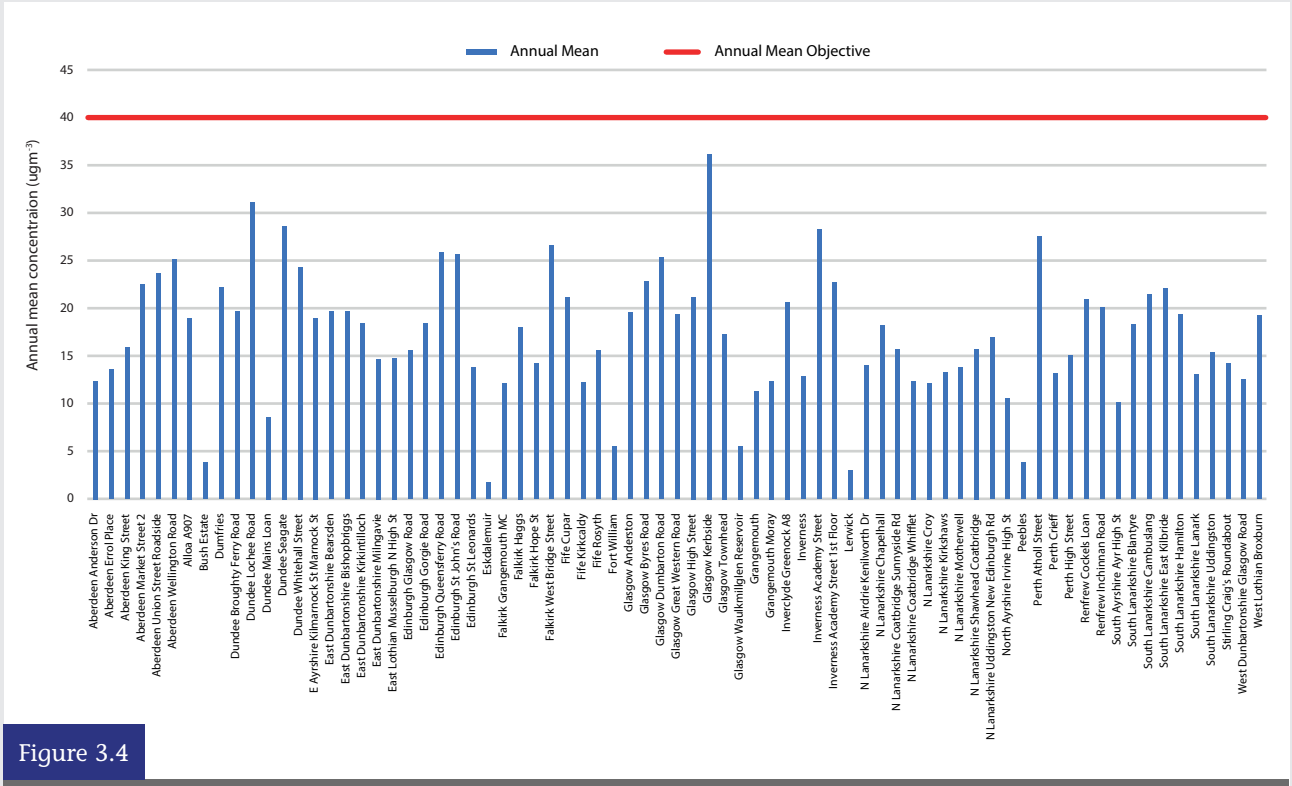



Figure 3.4

Annual mean $NO_2$ concentrations at sites with >75% data capture (2020)

**Nitrogen dioxide – Passive monitoring**

In 2020, seven diffusion tube sites exceeded the annual mean objective for $NO_2$. This is significantly down from previous years as illustrated in Figure 3.5. The seven sites are Aberdeen 39 Market St, Dundee Logie St, Edinburgh London Road/East Norton Place, South Lanarkshire 233 Glasgow Road Blantyre, Renfrewshire Inchinnan Road, Renfrewshire High St Johnstone and Glasgow Hope St (1). The reason for this decrease is attributed to the Covid-19 lockdown restriction imposed at different levels throughout 2020.

For more information on the 2020 data and historical diffusion tube data, go the Diffusion Tube site map on the Air Quality in Scotland website (http://www.scottishairquality.scot/latest/diffusion-sites). This diffusion tube data can also now be download via the data selector tool (http://www.scottishairquality.scot/data/data-selector).

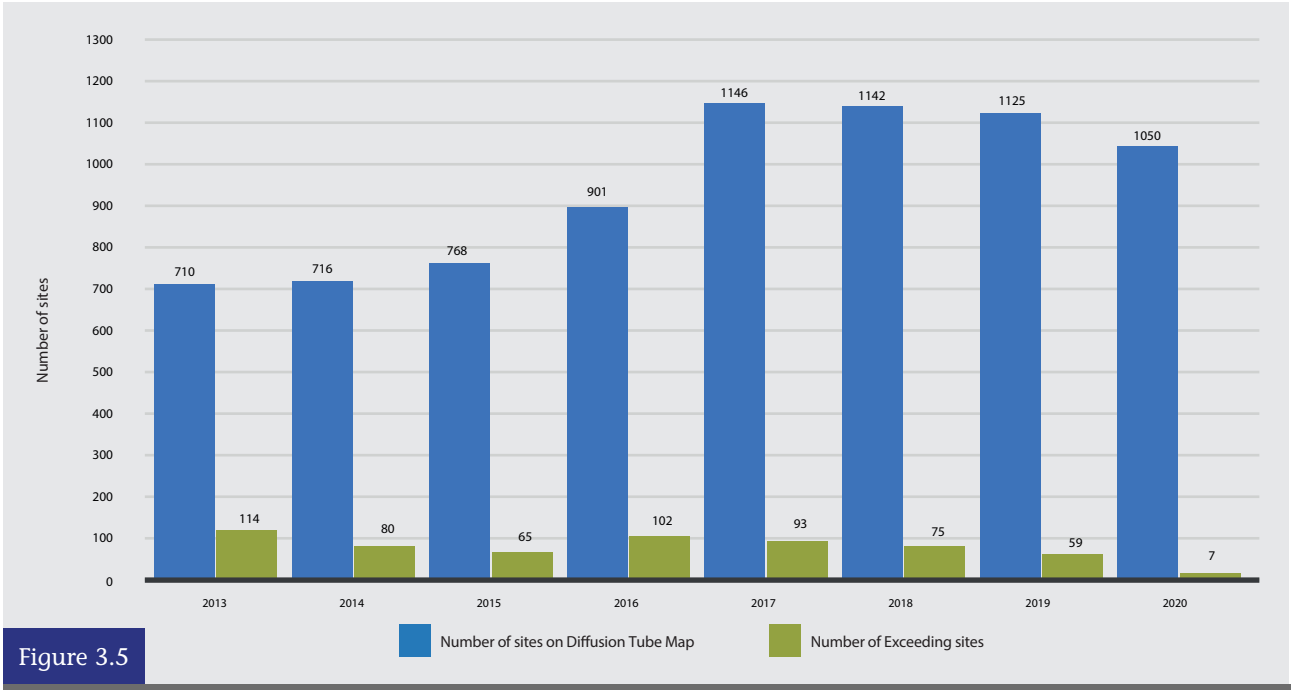



Figure 3.5

Number of $NO_2$ Diffusion Tube sites exceeding the Annual Mean Objective since 2013

**Sulphur dioxide**

This gas is emitted when fuels containing small amounts of sulphur (such as oil and coal) are burned. This pollutant was monitored at eight sites in 2020, though two sites did not achieve a data capture rate greater than 75%. Of the remaining six sites, all met the requirements of the Air Quality Strategy for the 15-minute (no more than 35 times), 1-hour (no more than 24 times) and 24-hour (no more than 3 times) mean objectives $SO_2$ in 2020.

**Particulate matter as $PM_{10}$**

Particulate matter arises from many sources. It can be directly emitted from combustion processes or formed from chemical reactions involving other pollutants. Natural sources (e.g. wind-blown dust and sea salt) also contribute. $PM_{10}$ was monitored at 81 Scottish sites in 2020 using automatic monitoring.

Of the 65 sites with 75% or greater data capture, no sites exceeded the annual average $PM_{10}$ Objective of 18 µg $m^{-3}$. The daily mean objective of 50 µg $m^{-3}$ not to be exceeded more than 7 times in a year was also not exceeded at any site. The maximum $PM_{10}$ annual mean concentration was measured at Edinburgh Salamander St with a measured annual mean concentration of 13.1 µg $m^{-3}$.

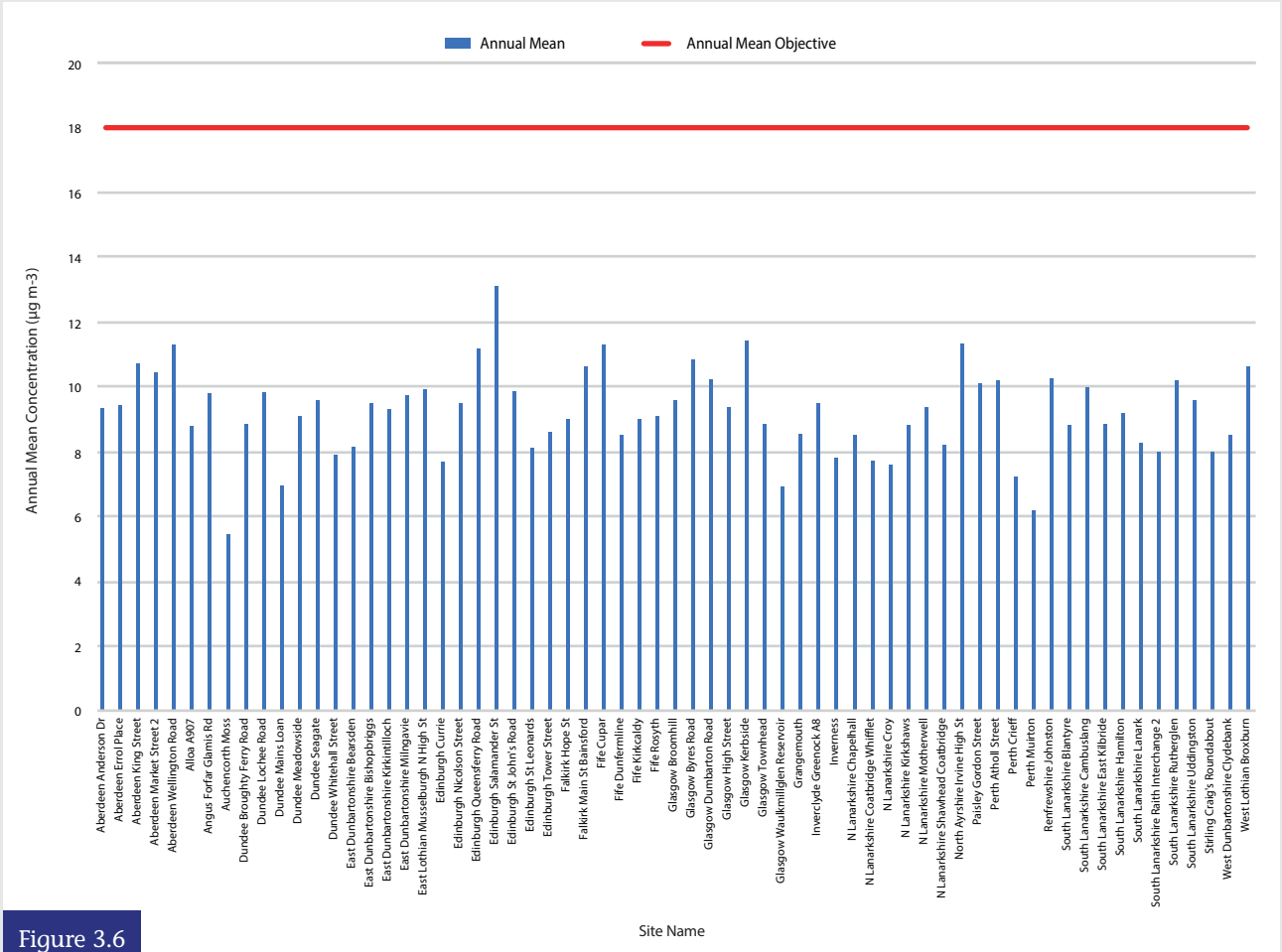



**Figure 3.6**

Annual mean $PM_{10}$ concentrations at sites with >75% data capture (2020)

**Particulate matter as $PM_{2.5}$**

During 2020, the finer particle fraction, $PM_{2.5}$ was monitored at 74 Scottish sites, an increase by eight automatic analysers from 2019. Of these, 16 achieved less than the 75% data capture. This was because of instrument/site faults or instrument installations during the year.

The Scottish AQS annual mean objective of 10 µg $m^{-3}$ was not measured at any sites in 2020. See Figure 3.7 for annual mean concentrations at all sites (with a data capture of 75% or more) compared to the annual mean objective.

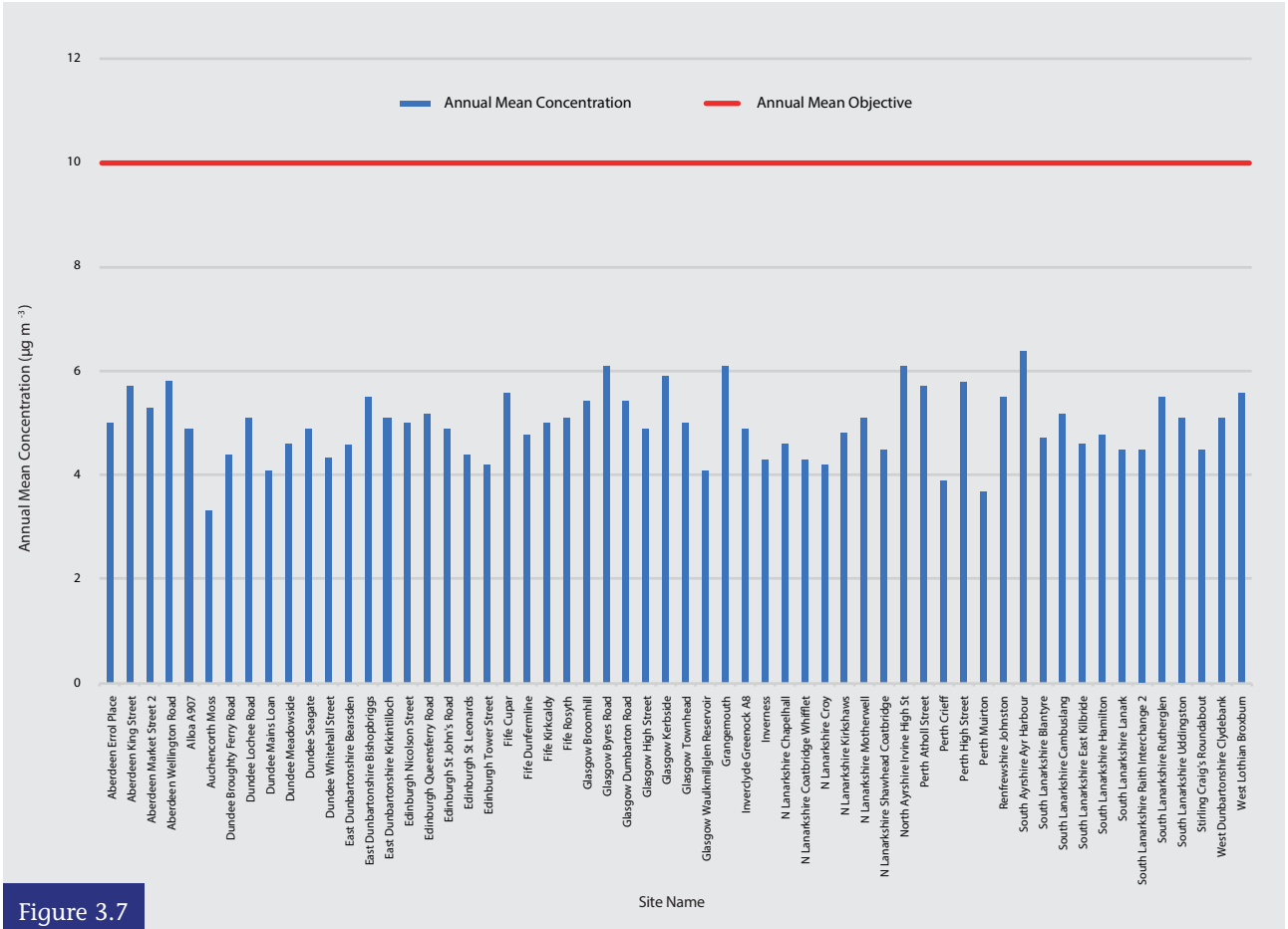



Figure 3.7

Annual mean $PM_{2.5}$ concentrations at sites with >75% data capture (2020)

**Polycyclic aromatic hydrocarbons**

This group of pollutants is monitored at four sites in Scotland (Kinlochleven, Glasgow Townhead, Edinburgh St Leonards and Auchencorth Moss). The AQS objective of 0.25 ng $m^{-3}$ for benzo[a]pyrene was exceeded at one site in 2020 – Kinlochleven, with a measured annual mean concentration of 0.277 ng $m^{-3}$.

**Ozone**

This is a secondary pollutant that is formed by reactions involving other pollutant gases in the presence of sunlight and over several hours. Once formed, it may persist for several days and be transported over long distances.

This makes it difficult to control by local action. It was monitored at 11 sites in Scotland during 2020. Of these, the AQS objective of 100 µg $m^{-3}$ as an 8-hour running mean not to be exceeded more than 10 days was not exceeded at any site (see Figure 3.8). This is a significant change from 2019 when seven sites exceeded the objective.

The AQS objective is not included in regulations. This is in recognition of the fact that it is transboundary in nature and that local authorities have very little control over concentrations in their areas.

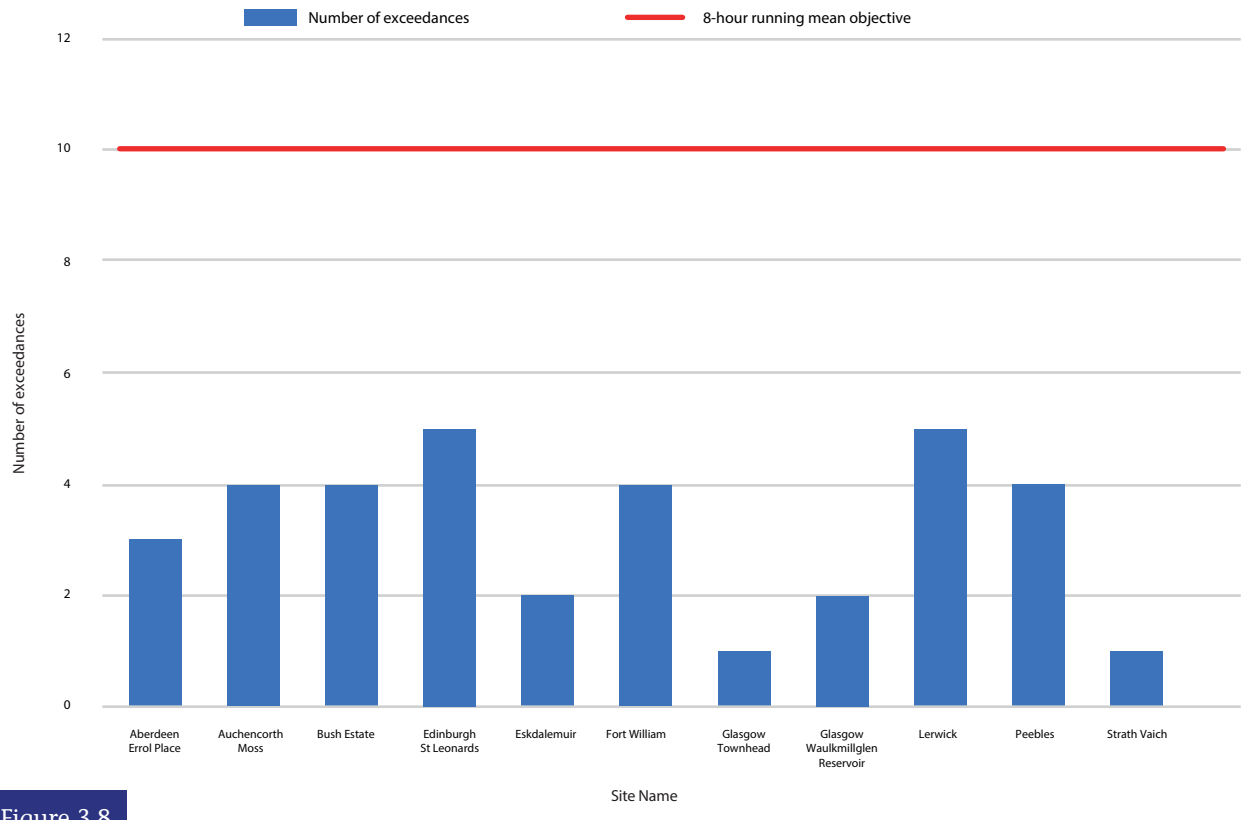



Figure 3.8

Exceedances of the 8-hour running AQS objective for ozone (2020)

4

# Air Quality Trends

This section summarises how air quality in Scotland has changed over recent years. As with previous years, the pollutants of interest are $NO_2$, $PM_{10}$, $PM_{2.5}$ and $O_3$.

Automatic monitoring of NOx has been routinely carried out in Scotland since 1987. However, until 2000, there were relatively few automatic monitoring sites. Subsequent years have seen the number of monitoring sites in the SAQD increase from 20 (in 2000) to the current total of 100 (as of January 2020). The data produced by these monitoring sites has improved our understanding of Scotland's pollution climate. However, the increase in site numbers potentially complicates the investigation of trends in air quality. If trend investigation is based on all available data, the apparent trends seen may not reflect real changes in Scotland's air quality. Instead, they may be due to the changes in the number of sites (and their distribution). Therefore, for this report, investigation of trend analysis has been based on subsets of long-running sites.

All the sites featured in this section have been in operation for a minimum of five consecutive years, as this is usually considered to be the minimum required to assess long-term trends at a monitoring site. In most cases, it is now possible to do trend analysis for longer periods (e.g. 10 years).

The trend analysis presented in this section has been carried out using Openair; the air pollution analytical tool available via the Air Quality in Scotland website[3].

The trend analyses were carried out using the Openair 'TheilSen' tool. This uses the Theil-Sen statistical method to determine trends in pollutant concentrations over several years. The trend analysis is based on monthly mean pollutant concentrations. The data used in these trend graphs has been 'de-seasonalised' (i.e. the data has been statistically modify to remove the influence of seasonal cycles, thus providing a clearer indication of the overall trend over the relevant time).

In these plots, the trend line is shown by a solid red line with 95% confidence intervals for the trend shown by dotted red lines. The trend is given at the top of the plot in green, with confidence intervals shown in square brackets. The trend is given as units (i.e. µg $m^{-3}$) per year, over the period shown. This may be followed by a number of stars:

* indicating that the trend is statistically significant at the 0.05 level

** indicating significance at the 0.01 level

*** indicating significance at the 0.001 level

The + symbol indicates that the trend is significant at the 0.1 level.

Further information on air quality trends for a range of pollutants is reported in more detail within the SAQD Annual Report and Local Air Quality Management (LAQM) reports; available at http://www.scottishairquality.scot/.

[3] Visit http://www.scottishairquality.scot/data/openair for more information on the Openair tools that are available and how to use them.

## 4.1 Nitrogen Dioxide

In Scotland (as elsewhere in the UK), the largest number of Air Quality Management Areas (AQMAs) have been declared in response to exceedances of the nitrogen dioxide ($NO_2$) objectives. This is also reflected in the number of monitoring stations reporting exceedances for this pollutant (see Section 3.3 of this report). In particular, the objective of 40 µg $m^{-3}$ for annual mean $NO_2$ concentration is the most widely exceeded. Therefore, it is important to understand how concentrations of this pollutant vary with time.

### 4.1.1 $NO_2$ at Urban Background Sites

There are relatively few long-running urban background monitoring stations in Scotland. Five urban non-roadside sites have been in operation for the past 15 years. These are as follows: Aberdeen Errol Place, Edinburgh St Leonards, Fort William, Glasgow Anderston and Grangemouth. Fort William is classified as a 'suburban' site, Grangemouth is an 'urban industrial' site, and the other three are 'urban background'.

All sites shown in Figure 4.1 display highly significant negative trends (at the 0.001 level) over this time period. This analysis indicates that the decreasing trend in $NO_2$ concentrations is becoming more substantial over this time period.

Figure 4.2 takes into consideration analysis from all urban background site in Scotland over the past five years. As can be seen the decreasing trends in Figure 4.2 are not consistent across all sites looking at the past five years. Glasgow Anderston has switched from a decreasing to an increasing trend (though not statistically significant) contradicting the long-term perception that $NO_2$ concentrations are decreasing at all urban background sites. The decreasing trend at Grangemouth is also no longer highly significant.

Looking at the influence the Covid-19 lockdown had on the data it is evident from this analysis that background levels though dipping in the first half of 2020 returned to what could be considered pre lockdown trends.

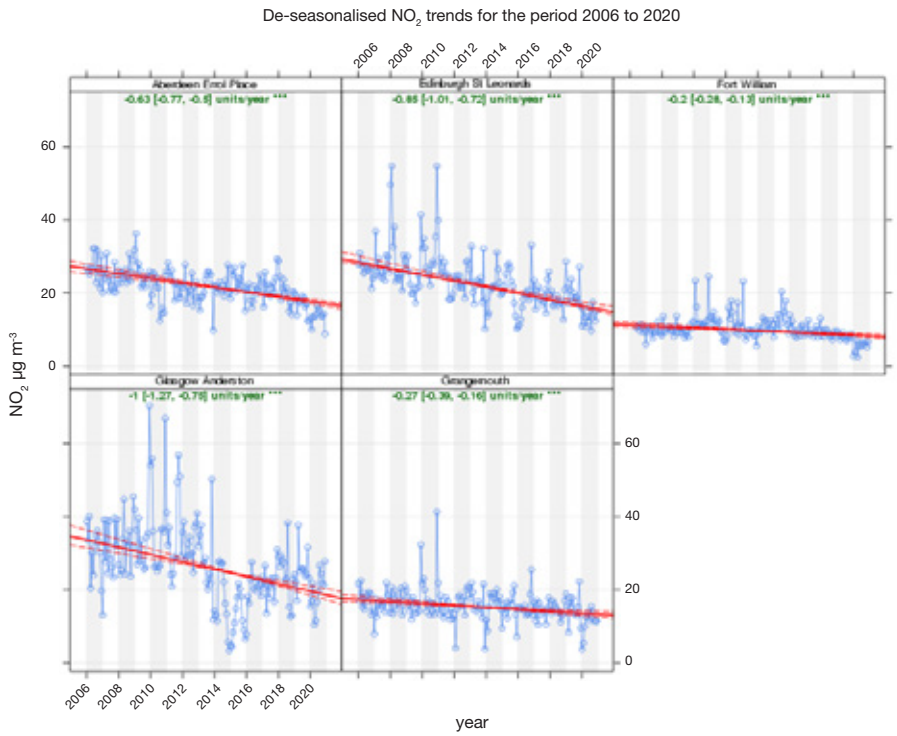



Figure 4.1

Trends in $NO_2$ Concentration at Five Long-running Urban Non-Roadside Sites, 2006-2020

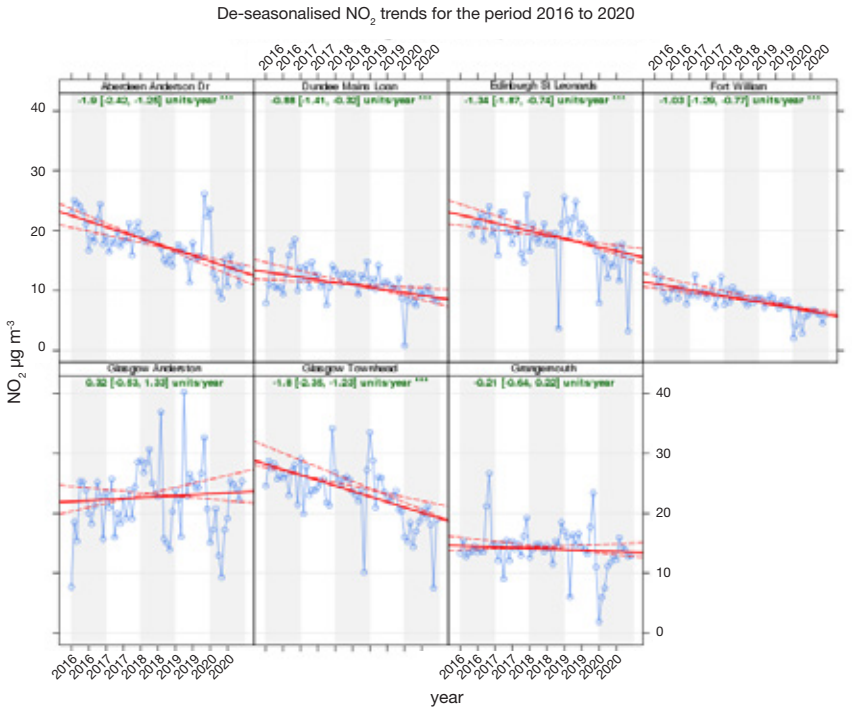



Figure 4.2

Trends in $NO_2$ Concentration at all Urban Non-Roadside Sites, 2016-2020

### 4.1.2 $NO_2$ at Urban Traffic Sites

Recent years have seen a substantial increase in the number of monitoring stations at urban traffic-related sites in Scotland. There are now 40 roadside or kerbside monitoring stations that have been in operation for 10 years or more and are still in operation. To identify where these sites are, please got to http://www.scottishairquality.scot/latest/.

This is a large number of sites, so for the purposes of this brochure we have selected eight sites from the list of long-running sites. These are:

- Aberdeen Union Street,
- Aberdeen Wellington Road,
- Dundee Lochee Road,
- Dundee Seagate,
- Edinburgh St Johns Road,
- Glasgow Kerbside (Hope Street),
- North Lanarkshire Chapelhall,
- Perth Atholl.

Figure 4.3 shows the trend plots. As with the previous years (the 2019 edition), all eight sites show highly significant decreasing trends (at the 0.001 level).

Trends over the most recent five complete years, 2016 – 2020, have also been examined for these sites. These are shown in Figure 4.4. Comparing the 10-year and five-year trends, the patterns are similar in that they all have decreasing trends but of varying significance. At all sites, the decreasing trend has become greater in magnitude over the past five years compared to the past 10.

The influence of the lockdown in 2020 is far more evident at the urban traffic sites which has resulted in the significant increase in the decreasing trends when looking at the past five years data. It also shows the difference the lockdown has had between urban and background/rural sites. Where at background sites the drop is only really seen in the first half of 2020, at urban sites the step change is seen across the whole year.

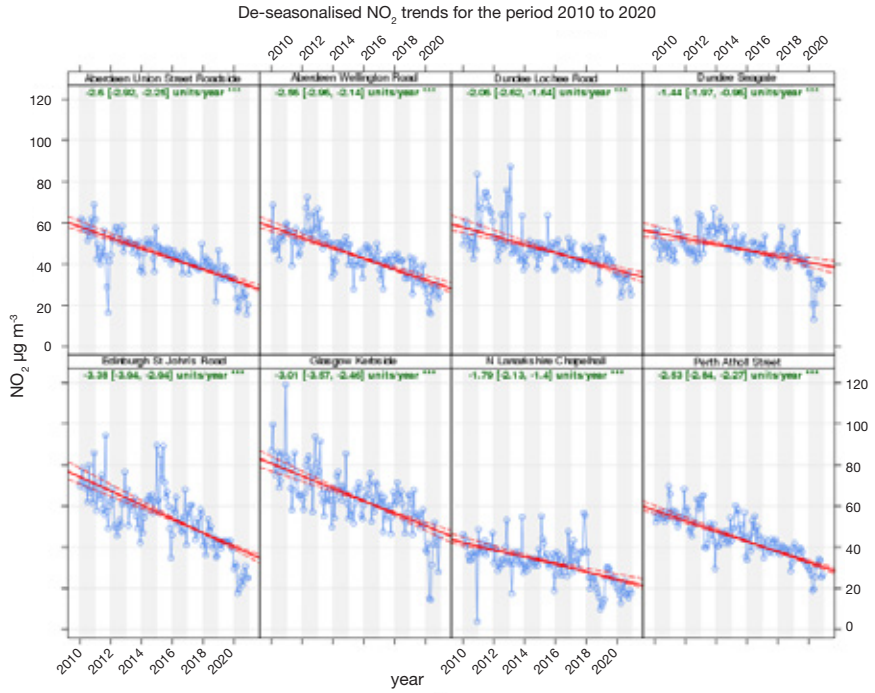



Figure 4.3

Trends in $NO_2$ Concentration at Eight Long-running Urban Traffic Sites with Exceedances (2010-2020)

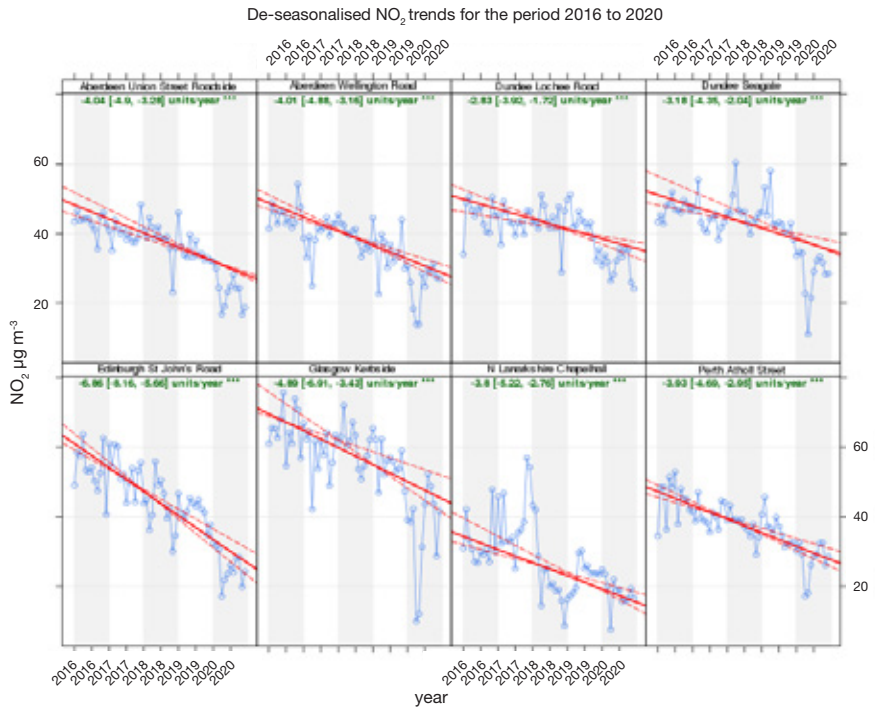



Figure 4.4

Recent trends in $NO_2$ Concentration at Eight Long-running Urban Traffic Sites with Exceedances (2016-2020)

## 4.2 Particulate Matter ($PM_{10}$ and $PM_{2.5}$)

This pollutant is of interest because:

- Current evidence suggests that there is no safe level of particulate matter in terms of human health effects.
- Scotland's current annual mean $PM_{10}$ objective is 18 µg $m^{-3}$, which is more stringent than the objective of 40 µg $m^{-3}$ adopted in the rest of the UK.
- In 2016 Scotland opted to make its annual mean $PM_{2.5}$ objective more stringent, by reducing it from 12 µg $m^{-3}$ to 10 µg $m^{-3}$ in line with the World Health Organization guideline.

### 4.2.1 $PM_{10}$ at Urban Traffic Sites

There are 34 $PM_{10}$ monitoring sites in Scotland that have been monitoring for over 10 years. Trends in de-seasonalised monthly mean $PM_{10}$ concentrations for eight traffic-related sites in operation since 2010 or earlier are shown in Figure 4.5. The sites selected for this analysis are Aberdeen Wellington Road, East Dunbartonshire Bearsden, Edinburgh Salamander, Fife Cupar, Glasgow Anderston, Glasgow Byres Road, Perth Crieff and West Lothian Broxburn. These sites were chosen to be analysed because of the length of time they have been monitoring (10 years or more), historical exceedances of the annual mean objective and geographical coverage. All of these sites have changed monitoring techniques during the period analysed. For more information on this see the Scottish Air Quality Database Annual report 2020[4].

All sites showed highly statistically significant decreasing trends (at the 0.001 level). The trends indicate that $PM_{10}$ over the past 10 years is decreasing year on year at these roadside sites.

Trends in monthly mean $PM_{10}$ concentrations for the same eight sites (plus Edinburgh Queensferry Road), for the most recent five complete years 2016 – 2020, are shown in Figure 8-9. Figure 8-9 shows that $PM_{10}$ concentrations over the past 5 years also show a highly significant decreasing trend with the exception of Edinburgh Queensferry Street and Glasgow Byres Road sites. Here the trend is still decreasing however not statistically significant, indicating a level off.

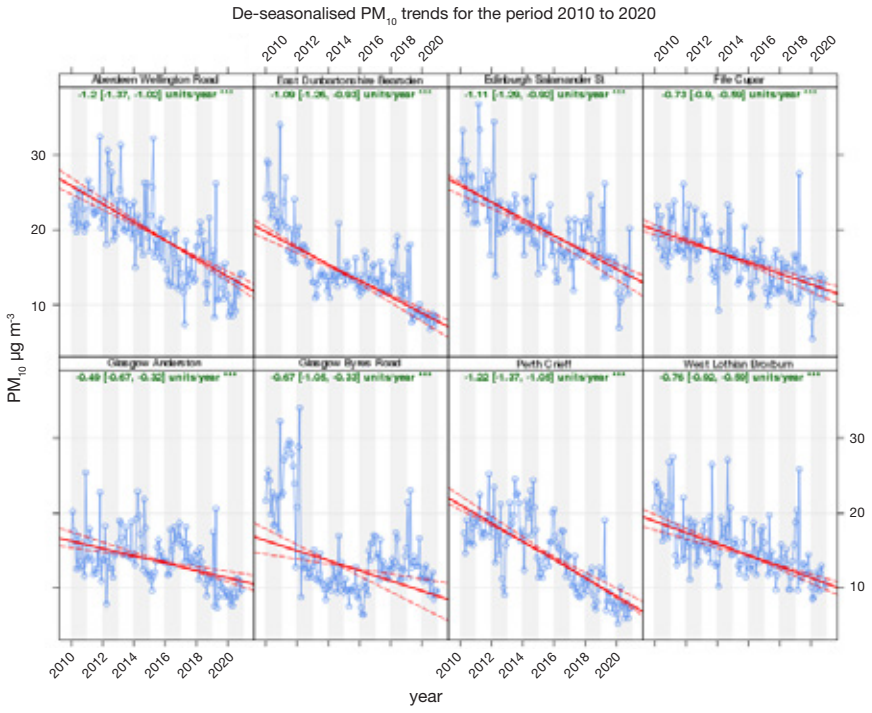



Figure 4.5

Trends in $PM_{10}$ concentration at eight long-running urban traffic sites, 2010 – 2020

[4] http://www.scottishairquality.scot/news/reports?view=technical

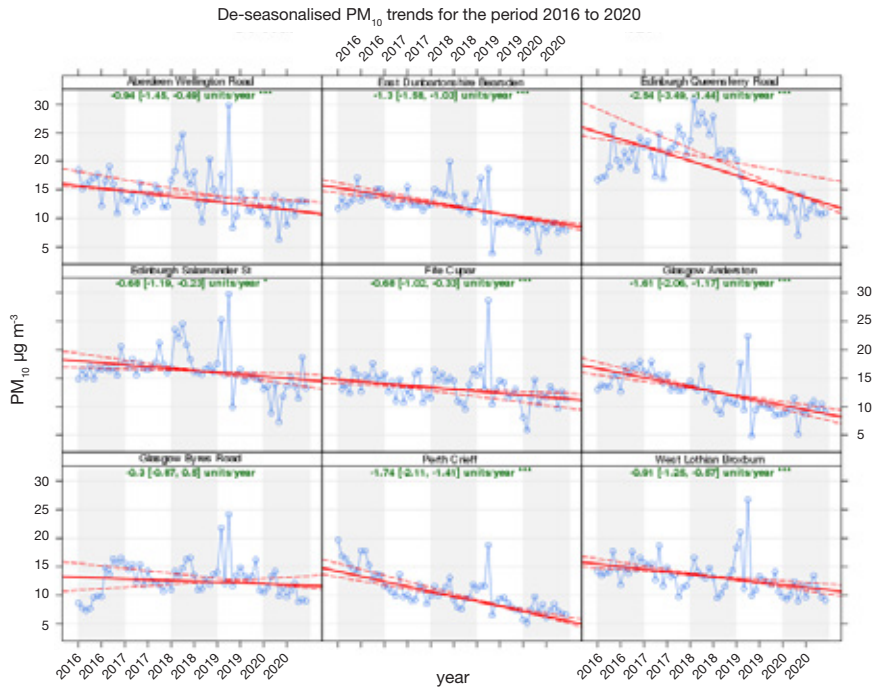



Figure 4.6

Recent trends in $PM_{10}$ concentrations at eight urban traffic sites 2016 – 2020

### 4.2.2 Particulate Matter ($PM_{2.5}$)

At the time of writing this report there are 76 sites monitoring $PM_{2.5}$ in Scotland. However, the vast majority of these sites started monitoring in the last five years with the introduction of the $PM_{2.5}$ objective and the requirement for local authorities to measure the pollutant. By the end of 2020 there were four sites with 10 consecutive years of $PM_{2.5}$ data. These sites are as follows: Aberdeen Errol Place (urban background), Auchencorth Moss (rural), Edinburgh St Leonards (urban background), and Grangemouth (urban industrial). The trend plot for these sites is shown in Figure 4.7.

Aberdeen Errol Place, Edinburgh St Leonards, and Grangemouth sites show slight but highly statistically significant (at the 0.001 level) downward trends for $PM_{2.5}$. Contrary to this, the rural site Auchencorth Moss shows no trend indicating no real change in concentrations over the past 10 years.

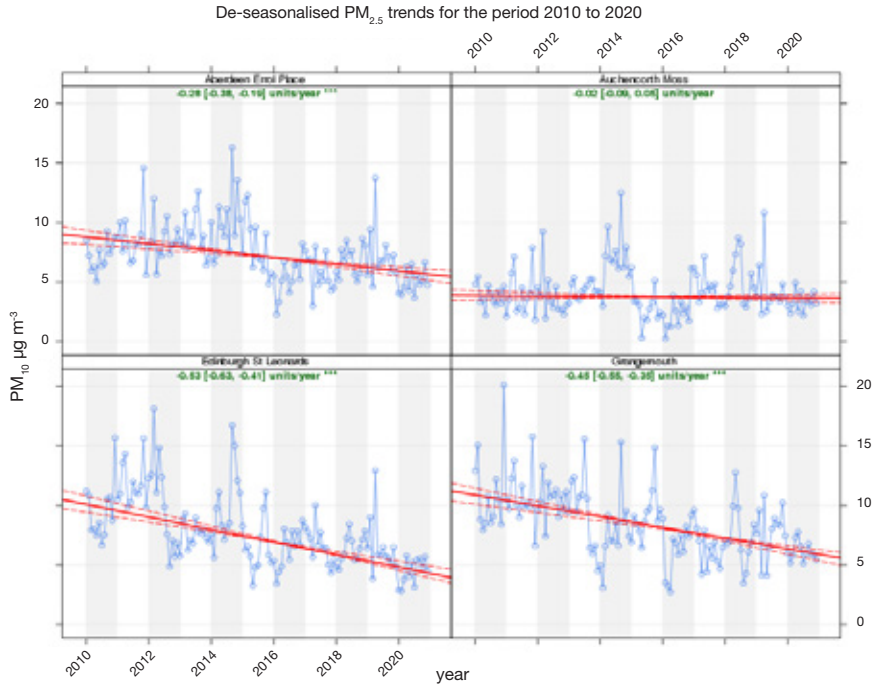



Figure 4.7

Recent trends in $PM_{2.5}$ concentration at four long-running monitoring sites, 2010 – 2020

## 4.3 Ozone ($O_3$)

### 4.3.1 Rural Ozone

Three of Scotland's rural air quality monitoring stations have been monitoring ozone for 34 years, 1986 – 2020. These are Bush Estate, Eskdalemuir and Strath Vaich. Figure 4.8 shows long-term trends in de-seasonalised monthly mean ozone ($O_3$) concentrations at these three exceptionally long-running rural monitoring sites. All three sites showed a small increasing trend in monthly mean rural ozone concentrations over this period. For Bush Estate and Eskdalemuir this trend was highly statistically significant. For Strath Vaich the trend was minimal and not statistically significant. The graphs also show considerable fluctuation; this may reflect the fact that ozone is formed by reactions involving other pollutant gases, in the presence of sunlight. Thus, ozone concentrations depend substantially on weather conditions. There is also evidence that the "hemispheric background" concentration of $O_3$ has increased since the 1950s due to the contribution from human activities[5].

Six sites have been in operation for over 10 years. These are the aforementioned three sites, plus Auchencorth Moss, Glasgow Waulkmillglen Reservoir and Lerwick. Trends in ozone concentration at these six sites are shown in Figure 4.9. In contrast to the thirty-year trends, the ten-year trends were less consistent. Five of the sites showed increasing trends with varying levels of statistical significance. The remaining site, Glasgow Waulkmillglen showed a not statistically significant decreasing trend.

[5] See the APIS webpage "Ozone" at http://www.apis.ac.uk/overview/pollutants/overview_O3.htm

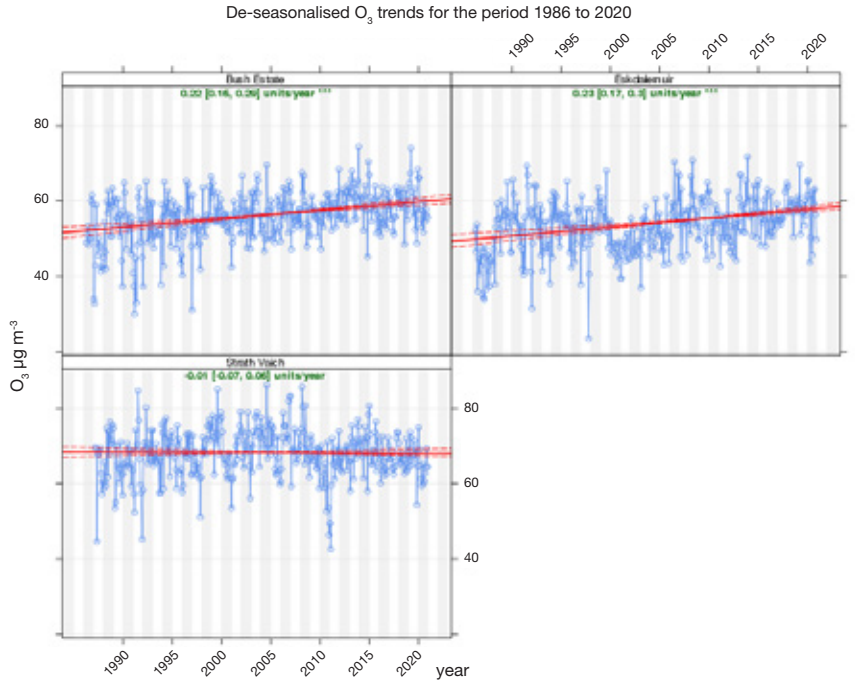



Figure 4.8

Trends in $O_3$ concentrations at long running rural sites,1986 – 2020

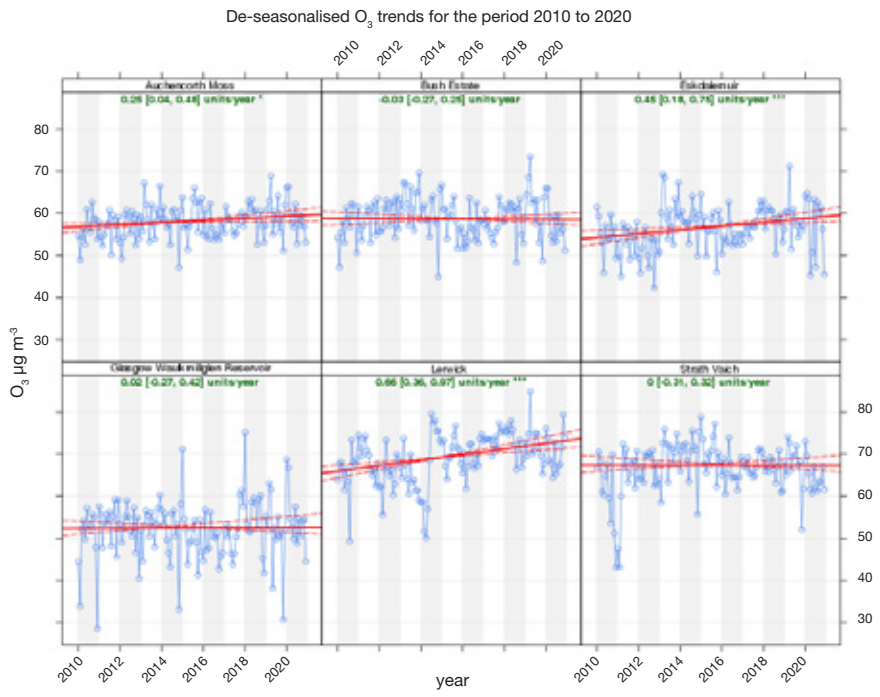



Figure 4.9

Trends in $O_3$ concentrations at six long-running rural sites, 2010 – 2020

5

# Air Quality Mapping for Scotland

As part of the SAQD project, Ricardo Energy & Environment provides mapped concentrations of modelled background air pollutant concentrations on a 1 km x 1 km basis for the whole of Scotland. Modelled roadside air pollutant concentrations are provided for road links in Scotland. The air pollution maps are derived from a combination of:

1. Measurements from Scotland's network of air quality monitoring stations, and
2. Spatially disaggregated emissions information from the UK National Atmospheric Emissions Inventory (NAEI)

The maps provide estimated pollutant concentrations for the whole of Scotland. The methodology for producing the Scottish maps is based on the UK Pollution Climate Mapping (PCM) approach. This is used for producing air pollution maps for the whole of the UK for the purposes of annual compliance reporting to the European Commission and subsequently reporting under the Air Quality Standards Regulations 2010 (now superseded by EU exit legislation).

The PCM methodology has been applied to provide pollution maps of Scotland for the Scottish Government for 2019 (the most recent year available) using measurements exclusively from Scottish air quality monitoring sites and Scottish meteorology. The maps provide spatial representation of the annual mean concentrations of:

- $PM_{10}$ (gravimetric equivalent), and
- NOx and $NO_2$

The air pollution measurements used to prepare the maps consists of appropriately scaled $PM_{10}$ monitoring data and automatic monitoring measurements for NOx and $NO_2$ from the model year. The model also uses Scottish meteorology observations (from Royal Air Force Station Leuchars) to create the Scotland-specific maps as shown in Figure 5.1.

This section discusses the maps of pollutant concentrations produced for the Scottish Government. Updates to these Scotland-specific air pollutant source apportionment data and forward-projected concentrations have been made for LAQM are available from a base year of 2018 at www.scottishairquality.co.uk/maps.php?n_action=data.

Please note the available projections from a base year of 2018 are based on assumptions that were applicable prior to the Covid-19 pandemic, and as such, do not reflect short- or long-term impacts on emissions in 2020 and beyond.

This online, interactive reporting format makes reading the report a more dynamic experience. It does so by enabling the reader to interact with the maps and tables within the report itself allowing them to obtain usable data.

## 5.1 Air Quality Maps for Scotland

The details of the methodology and full results of the mapping study are provided in a separate report[6]. In this report, we summarise the main findings of this work.

The 2019 annual mean $NO_2$ concentrations for Scotland were modelled for background and roadside locations. Figure 5.1 and Figure 5.2 show modelled annual mean $NO_2$ concentrations in Scotland for background and roadside locations, respectively.

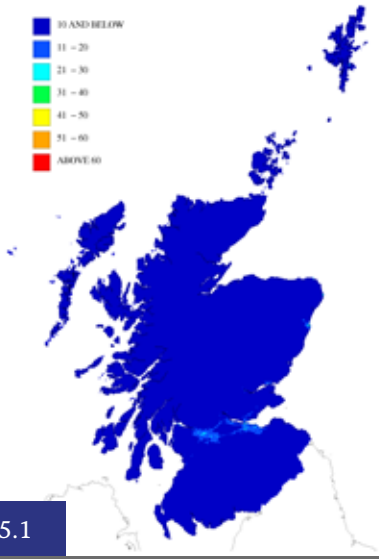



Figure 5.1

Background $NO_2$ map for 2019 (µg $m^{-3}$) (Scotland specific)

[6] Wareham, J., Goodhand, A. Stedman, J. and Morris, R. (2021). Scottish Air Quality Maps. Annual mean NOx, $NO_2$, and $PM_{10}$ modelling for 2019. http://www.scottishairquality.scot/assets/documents/Scottish_mapping_report_2019.html

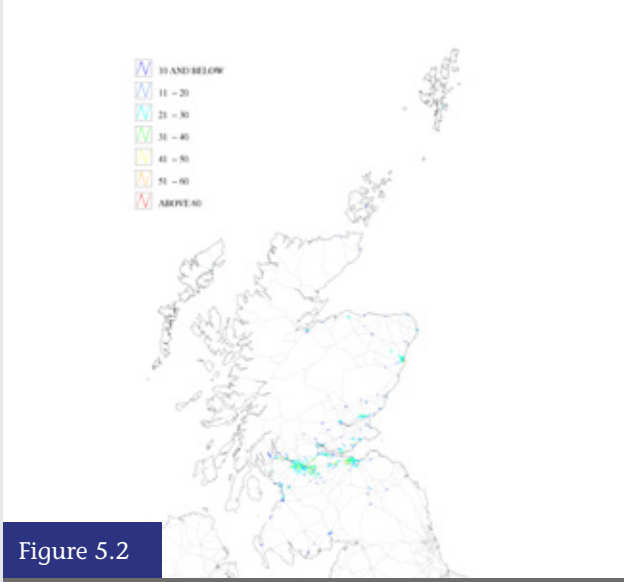


Figure 5.2

Roadside $NO_2$ map for 2019 (µg $m^{-3}$) (Scotland specific)

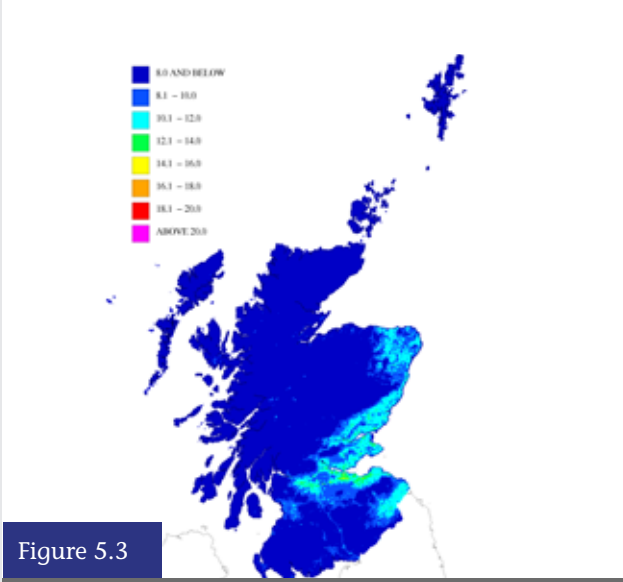


Figure 5.3

Background $PM_{10}$ map for 2019 (µg $m^{-3}$) (Scotland specific)

There were no modelled exceedances of the Scottish annual mean $NO_2$ objective of 40 µg $m^{-3}$ at background locations. Overall exceedances of the Scottish annual mean $NO_2$ air quality objective were modelled at roadside locations in four of the six zones and agglomerations in Scotland.

Exceedances of the annual mean $NO_2$ objective at roadside locations were modelled at 52 road links (102.5 km of road) in the Glasgow Urban Area and at 20 road links (45.0 km of road) in Central Scotland. In the Edinburgh Urban Area there were nine road links (11.0 km of road) where exceedances of the Scottish annual mean $NO_2$ air quality objective were modelled, and in the North East Scotland zone, four roads had an exceedance (8.5 km of road).

No roadside exceedances of the Scottish annual mean $NO_2$ air quality objective were modelled in the more rural zones of Scotland, i.e., the Highlands and Scottish Borders. More detailed maps showing the roadside annual mean $NO_2$ concentrations can be found in the Scottish Air Quality Mapping report 2019.

## 5.2 $PM_{10}$ Maps for 2018

Maps of the modelled 2019 annual mean $PM_{10}$ concentrations for Scotland's background and roadside locations are shown in Figures 5.3 and 5.4, respectively.

The modelling methodology used to calculate the annual mean $PM_{10}$ concentration was similar to that used in previous years and used a mixture of appropriately scaled $PM_{10}$ monitoring data (FIDAS, FDMS, Partisol and VCM corrected TEOM). Many of the chemical components of the $PM_{10}$ model are not affected by the Scotland-specific changes to the UK PCM model. This includes the contribution to the total $PM_{10}$ mass from the following components:

- Secondary inorganic aerosols (SIA) (e.g. sulfate, nitrate and ammonium-based particles)
- Secondary organic aerosols (SOA)
- Primary particles from long-range transport (e.g. soot particles from biomass burning)
- Sea-salt aerosol
- Iron- and calcium-based dusts

There were no modelled exceedances of the Scottish annual mean $PM_{10}$ objective of 18 µg $m^{-3}$ at background or roadside locations.

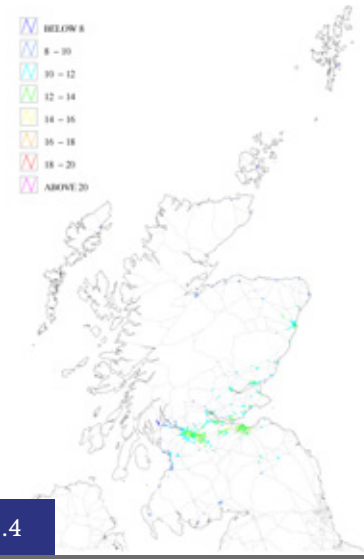



Figure 5.4

Roadside $PM_{10}$ map for 2019 (µg $m^{-3}$) (Scotland specific)

## 5.3 Forward projections from a base year of 2018

Forward projections of air pollutant concentrations to future years are not produced annually and were not carried out from a base year 2019. The most recently available forward projections are from a base year of 2018. Background maps of $PM_{10}$, NOx and $NO_2$ for the years 2018 to 2030 are provided to assist Scottish local authorities in support of the Review and assessment of local air quality. These are available for download from the Data for Local Authority Review and Assessment purposes page on the Air Quality in Scotland website[7]. Please note the available projections from 2018 are based on assumptions that were applicable prior to the Covid-19 pandemic, and as such, do not reflect short- or long-term impacts on emissions in 2020 and beyond.

[7] http://www.scottishairquality.co.uk/data/mapping?view=data

6

# Covid-19 Lockdown and its Effect on Air Quality in Scotland 2020

In July 2021, Ricardo Energy and Environment produced a technical report for the Scottish Government which analysed the impact the Covid-19 lockdown measures had on air quality in Scotland[8]. An issue when assessing changes in pollutant concentrations as a result of an intervention or mitigation measure, is determining how much is due to changes in emissions and how much is the result of variations in meteorology. One way of addressing this problem is to develop statistical models to determine what the pollutant concentrations would be if no changes were implemented, based on pollutant and weather data from previous years, i.e. the counterfactual or "business-as-usual" (BAU) scenario. For this analysis, Ricardo used the deweather (https://github.com/davidcarslaw/deweather) R package. Furthermore, in this report they use cumulative sum (cusum) analysis to determine how measured concentrations deviate from BAU concentrations. The cusum analysis can be useful when identifying small changes.

## 6.1 Background

On March 23rd, 2020, a "stay at home" requirement was implemented by the UK Government in response to the Covid-19 pandemic. The lockdown continued until 29th May, at which point Scotland entered various phases of lockdown easing.

The initial lockdown and subsequent measures put in place, resulted in a large reduction in the volume of traffic on the road network in Scotland.

With a reduction in traffic, we may expect to see a change in the air quality. However, it is important to think about the best way to quantify any changes and also take into account any effects due to weather conditions, as the weather can have a large impact on pollutant levels observed.

This brochure summaries the changes in nitrogen dioxide ($NO_2$) and particulate matter ($PM_{10}$ and $PM_{2.5}$), during 2020. Additional explanation and pollutant analysis can be found in the SAQD Annual Report and the "Impact of Lockdown Measures on Scottish Air Quality in 2020"[8] Report.

Analysis of the affect the Covid-19 pandemic lockdown has had on air pollution at a local authority level can be found here http://www.scottishairquality.scot/news/reports?view=laqm.

[8] "Impact of Lockdown Measures on Scottish Air Quality in 2020",July 2021, Dr L Kramer http://www.scottishairquality.scot/news/reports?view=technical&id=653

## 6.2 Nitrogen Dioxide Data Analysis

Figure 6.1 and Figure 6.2 show the daily averaged concentrations and cusum analysis for $NO_2$ concentrations for 16 sites across Scotland. The dark grey shading represents the national lockdown period between 23rd March and 29th May. The lighter grey shadings represent the periods of Phase 1 and Phase 2 easing of restrictions, ending on 10th July.

The cusum analysis indicates a decrease in $NO_2$ concentrations when compared to BAU, at the time lockdown started on the 23rd March (represented by the dashed line). However, the sites that show the greatest decrease in $NO_2$ (highlighted lines in Figure 6.2) are not necessarily the same sites with the greatest decrease in NOx, due to the non-linear relationship between NOx and $NO_2$.

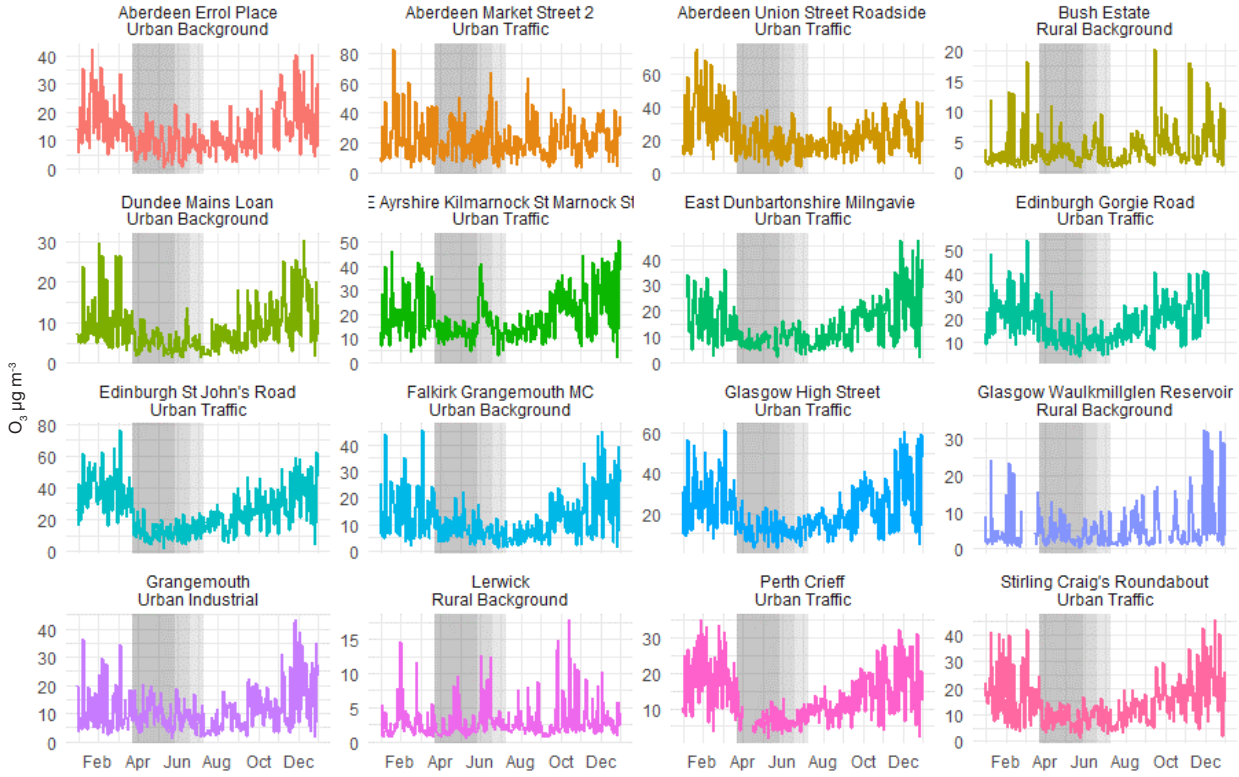



Figure 6.1

Time series of daily averaged $NO_2$ in 2020 for a range of monitoring sites across Scotland.

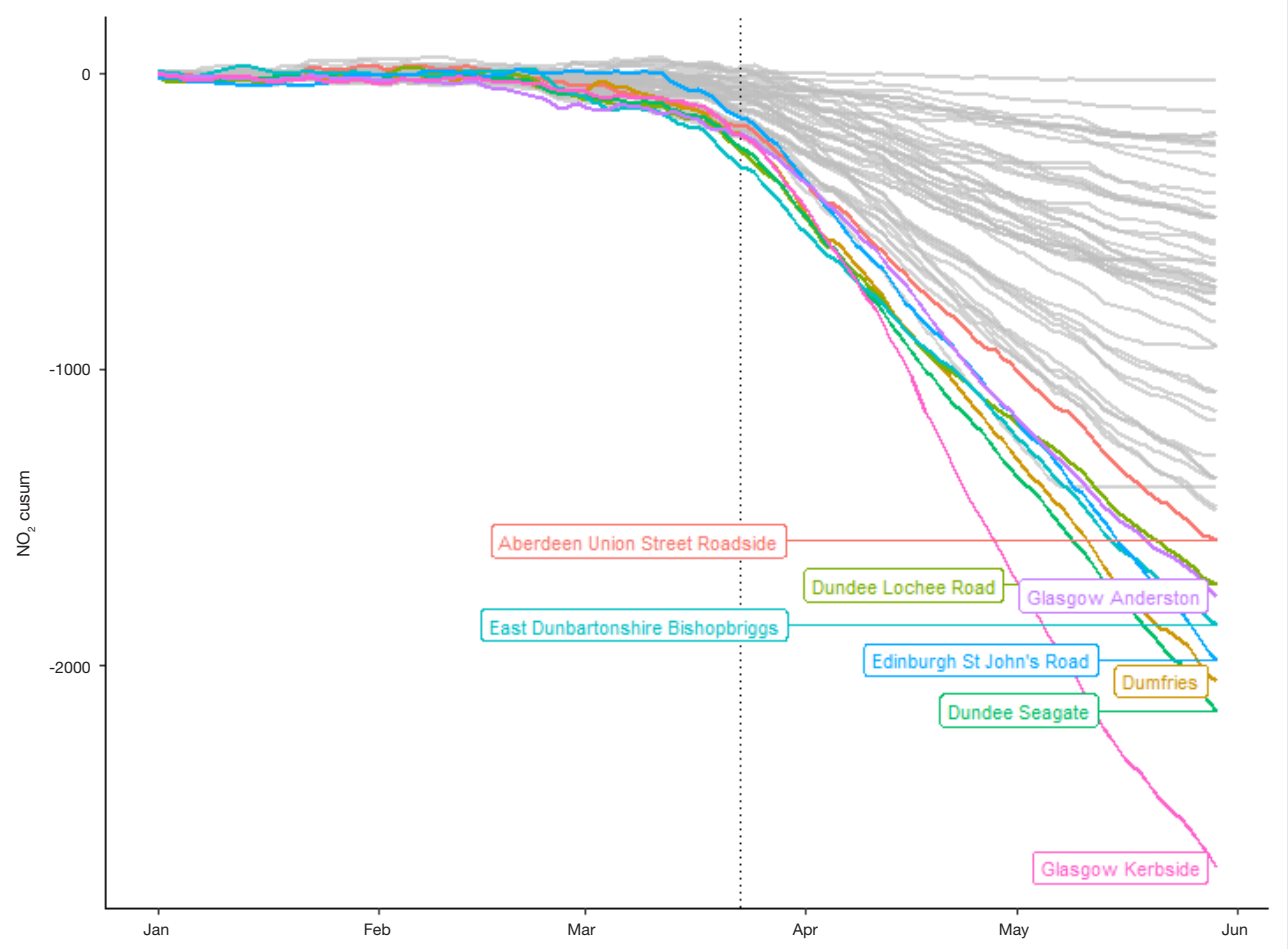



Figure 6.2

Time series of daily averaged $NO_2$ in 2020 for a range of monitoring sites across Scotland.

A comparison of annual mean measured and modelled BAU $NO_2$ concentrations for 2020 found that for most of the sites the annual mean measured $NO_2$ is lower than predicted by the model. Glasgow Kerbside, Dumfries, and Edinburgh St John's Road observe the greatest decrease in $NO_2$, when compared to BAU with the measured annual average $NO_2$ between 14 and 15 $\mu g m^{-3}$ lower than predicted. At Glasgow Kerbside, the BAU $NO_2$ annual mean concentration exceeded the UK $NO_2$ annual mean limit of 40 $\mu g\ m^{-3}$, however the measured $NO_2$ concentration was actually much lower, at 36 $\mu g\ m^{-3}$, therefore no exceedance was observed at this site.

Overall, the average $NO_2$ concentrations across Scotland monitoring sites were lower in 2020 when compared to BAU, by 20.5%. If we focus specifically on the lockdown period between 23rd March and 29th May, the difference between measured and modelled concentrations were even greater, with reductions of 48.8% when compared to BAU. The greatest decreases in $NO_2$ during lockdown, on average, were at Urban Traffic sites.

## 6.3 Particulate Matter

PM can come from natural sources (e.g. soil, sea salt, pollen), emitted directly from anthropogenic sources (vehicle exhausts, industrial combustion processes, domestic heating), and also formed via reactions between sulphur dioxide, NOx and other chemical species (known as secondary PM).

Secondary PM can be transported long distances, so PM in one location may be strongly influenced by the regional and continental transport of pollutants. As a result, it is much more challenging to assess changes in particulate matter as a result of lockdown, compared to $NO^2$.

Figure 6.3 shows the daily mean $PM_{2.5}$ concentrations at various sites across Scotland. Unlike $NO_2$, which indicated a decrease in concentrations during lockdown, the $PM_{2.5}$ actually seems to increase during this period. A springtime peak in $PM_{2.5}$ is however not uncommon, as agricultural activity over Europe increases during this period, resulting in an increase in ammonium nitrate from fertilisers, which can contribute to secondary $PM_{2.5}$.

### 6.3.1 Increment in PM

Investigating changes in PM as a result of lockdown requires careful consideration as any local change may be masked by long range transported pollutants.

Instead, we can consider the *urban increment in PM*, i.e. the PM level above the background. Subtracting the PM concentration measured at a rural background location (which is more representative of a wider area) from the PM measured at each site, should provide more information on changes in concentrations at a local level.

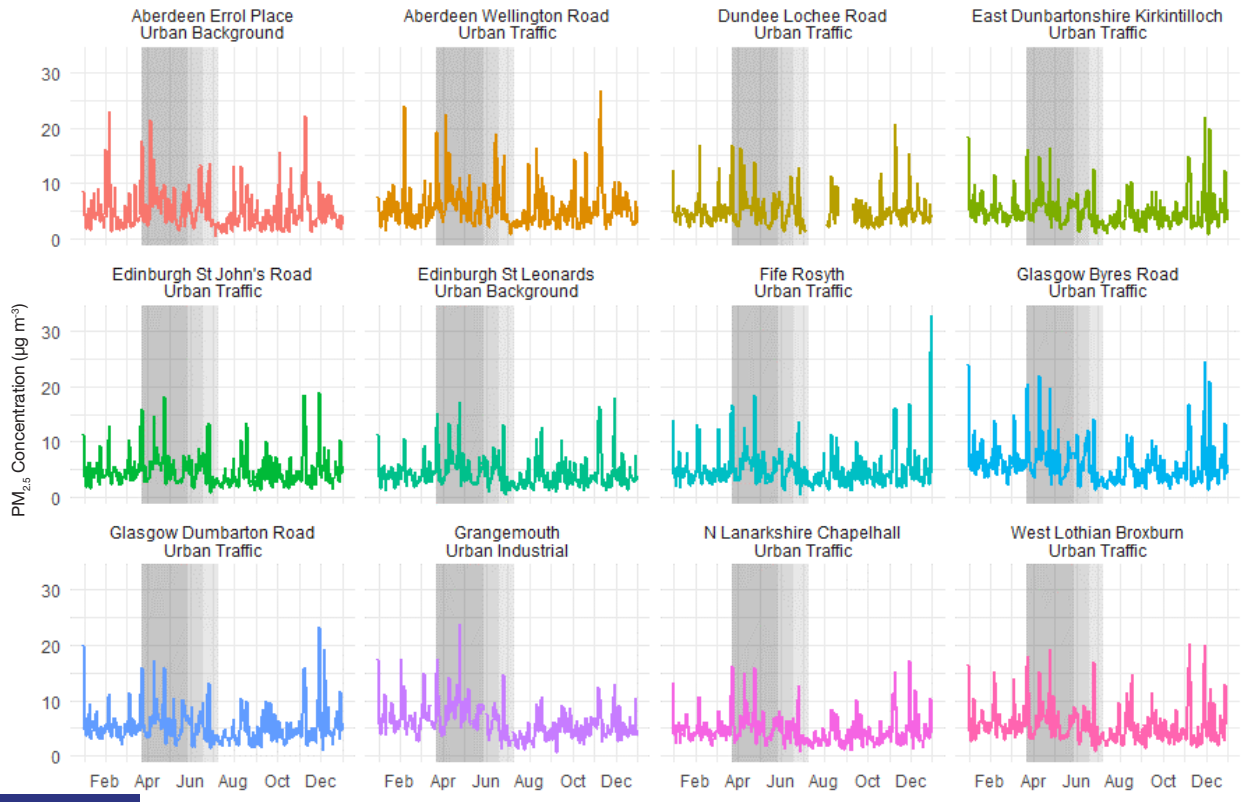



Figure 6.3

Time series of daily averaged $PM_{2.5}$ in 2020 monitoring sites across Scotland.

In the analysis presented here, concentrations measured at the Auchencorth Moss rural monitoring site were used to calculate the increment in $PM_{2.5}$ and $PM_{10}$.

The cusum analysis for the $PM_{2.5}$ and $PM_{10}$ increments above background concentrations are shown in Figures 6.4 and Figure 6.5, respectively. Compared to $NO_2$, it is less clear if changes in PM occurred when lockdown started (represented by the dashed line), and there is a large variation between sites. As previously, the Highlighted lines represent monitoring sites which displayed the largest decrease. However, there does appear to be some evidence of a decrease in $PM_{2.5}$ and $PM_{10}$ (above background levels) at some sites.

Across all sites, the change in absolute PM when compared to BAU is very small over the lockdown period, with an average decrease of 1.5 $\mu gm^{-3}$ in $PM_{10}$ and 0.59 $\mu gm^{-3}$ in $PM_{2.5}$. These values are also more uncertain than for $NO_2$, as the choice of the background site used for calculating the PM increment can have a large impact on the estimated PM increment.

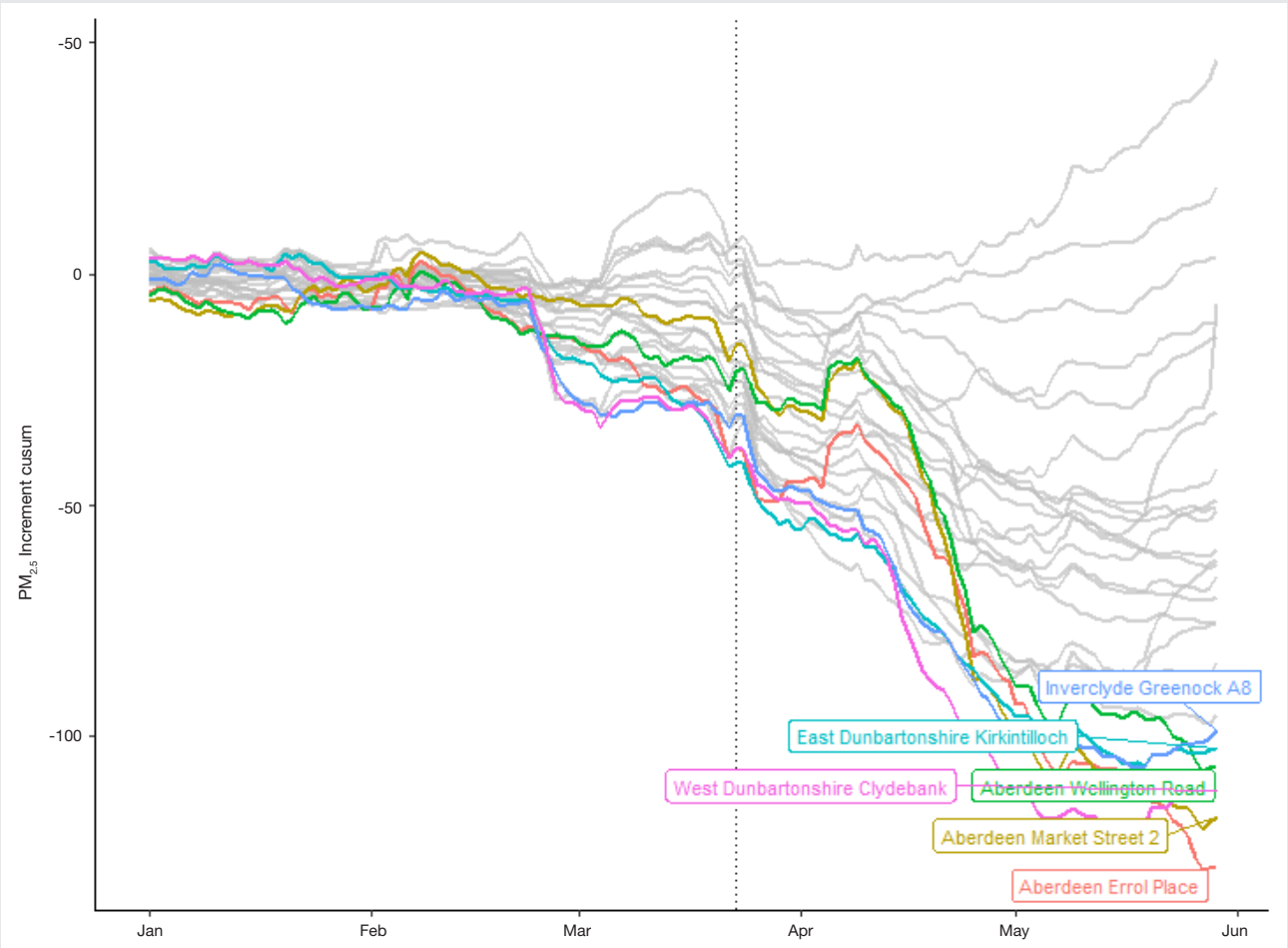



Figure 6.4

Cusum analysis of daily averaged measured minus BAU increment in $PM_{2.5}$ for sites in Scotland from 1st January to 29th May.

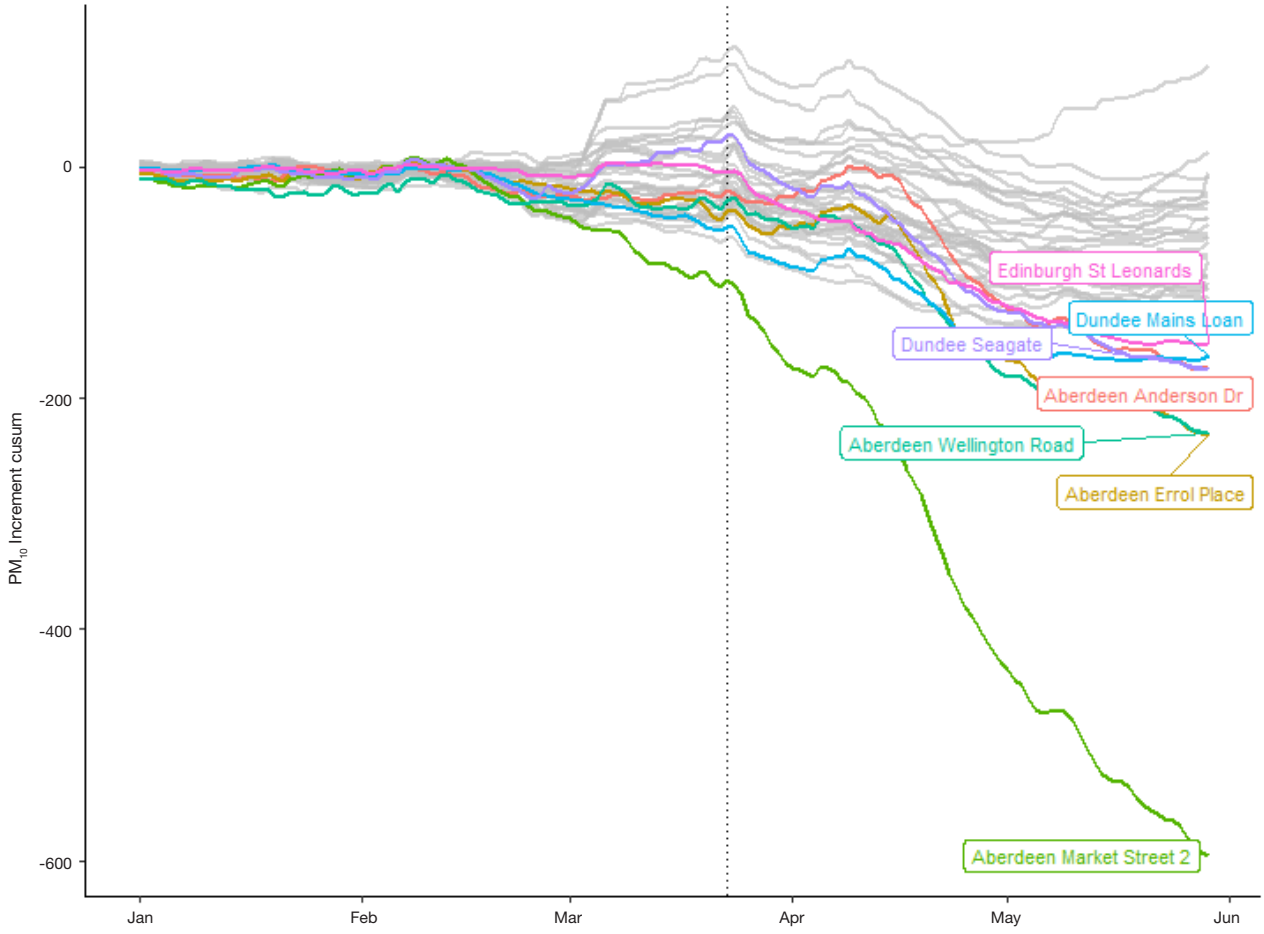



Figure 6.5

Cusum analysis of daily averaged measured minus BAU increment in $PM_{10}$ for sites in Scotland from 1st January to 29th May.

7

# Education

Education has been an ongoing element of air quality policy in Scotland. Interactive education packages have been developed through the creation of two sections that form part of the Air Quality in Scotland website. The first education website, 'Air Pollution Detectives', was created for schoolchildren in P5 to P7 (8-11 years old). The second website, 'Clear the Air', was developed in partnership with a number of secondary schools for pupils in S1 to S3 (12-15 years old).

The education packages can be accessed from the Air Quality in Scotland website
www.scottishairquality.co.uk/education

## 7.1 Air Pollution Detectives

Initially launched in 2011, the Air Pollution Detectives website has been continuously revised and updated. It was designed to introduce air quality issues to primary school pupils between the ages of 8 and 11. The animated, interactive webpages provide an introduction to air pollution sources and how pupils' actions can impact the air quality around them. Pupils can select individual pollutants to learn more and can take the quiz after each section to see what they have learned. The website is accompanied by a set of teachers' notes to enhance the learning experience and worksheets for pupils are provided.

Figure 7.1 shows the additional educational information that accompanies the Air Pollution Detectives website.

Visit the Air Pollution Detectives website at
www.scottishairquality.co.uk/education/


Figure 7.1
Air Pollution Detectives webpage

## 7.2 Clear the Air

The Clear the Air website was developed following the success of Pollution Detectives. The webpage, as presented in Figure 7.2, provides an interactive learning experience for air quality and citizen science aimed at secondary school age and above.


Figure 7.2

Clear the Air webpage

The Clear the Air package includes a series of interactive webinars and exercises designed to be undertaken by pupils. These interactive exercises include 'What air pollution is like near me', 'Calculating your emissions to school' and a citizen science project that enables classes to monitor air quality around the school by using $NO_2$ diffusion tubes. Pupils are given an $NO_2$ diffusion tube to take home so they can monitor outside their house.

### 7.2.1 The Clear the Air – Air Quality Monitoring Pack

The Clear the Air monitoring pack has been designed to give pupils hands-on experience with air quality monitoring equipment and a better understanding of the underlying science. As a class or group, pupils can undertake air quality monitoring around their school grounds, or at, or near their homes. Once the results have been analysed, the monitoring data (location and measured concentration) can be uploaded via the school's private user portal so that the results can be displayed on a map (see Figure 6.3).

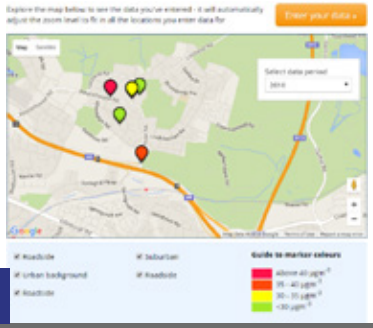


Figure 7.3

Data entry available for each school profile

The package encourages pupils to discuss the results and the factors influencing the air quality measured within the area. The Clear the Air package is supported by a teachers' pack including notes to supplement the monitoring equipment, and webinars to help introduce the concept of local air quality and how to conduct the monitoring.

Further information can be obtained at: http://cleartheair.scottishairquality.co.uk.

8

# Stay Informed

## 8.1 Scotland Air Pollution Forecast

A 5-day forecast for each local authority in Scotland is available on the Air Quality in Scotland website. The forecasts provide a greater level of detail, which can benefit the public – particularly those with health issues. Forecasts are displayed through a summary table and a map. The 5-day forecast map and summary table are available at www.scottishairquality.co.uk/latest/forecast

## 8.2 Air Quality in Scotland App

The Air Quality in Scotland app gives the latest air quality levels for each site, forecasts for the day ahead and alerts when air pollution levels are forecast to increase and when you are entering an AQMA. The free Air Quality in Scotland app is available for most mobile devices.


The AQ Scotland App was updated in 2019 with new functionality and can be downloaded from the Apple Store and Google Play now.

The App provides:

- Easy access to the latest pollution levels from the monitoring sites
- Colour coded map showing the pollution forecasts, plus a detailed breakdown
- Approved health advice based on the pollution levels
- Information on Air Quality management Areas (AQMA) in Scotland in the form of an interactive map
- Subscribe to free notification alerts when moderate, high and very high pollution is measured or forecast
- Subscribe to free notification alerts when you enter an AQMA

## 8.3 Know & Respond

Know & Respond is a free service providing alerts when pollution levels are forecast to increase (http://www.scottishairquality.scot/know-and-respond/). Users can subscribe to a specific local authority and will receive push notifications directly to their device if 'moderate' or higher air pollution is forecast each day. Users can choose to receive alerts by text, voicemail or email. Know & Respond alerts are also available via the Air Quality in Scotland app.


## 8.4 Email Alerts

Sign up to our email bulletins and receive summaries directly to your inbox (http://www.scottishairquality.scot/stay-informed/) . You can choose how frequently you receive them and what type of summary you are interested in.

## 8.5 Interactive Mapping and Analytical Tools

Visualisation and data analysis tools are available on the Air Quality in Scotland website (http://analysistools.scottishairquality.scot/). The tools pull data from the SAQD and present it in several pre-analysed formats. These tools enable the data to be customised and filtered to meet individual requirements, such as viewing air quality in a particular area or for local authorities when preparing annual reports.

## 8.6 Twitter

Follow Air Quality in Scotland on Twitter (@scotairquality) for air quality forecasts and summaries of measurements from Scotland.

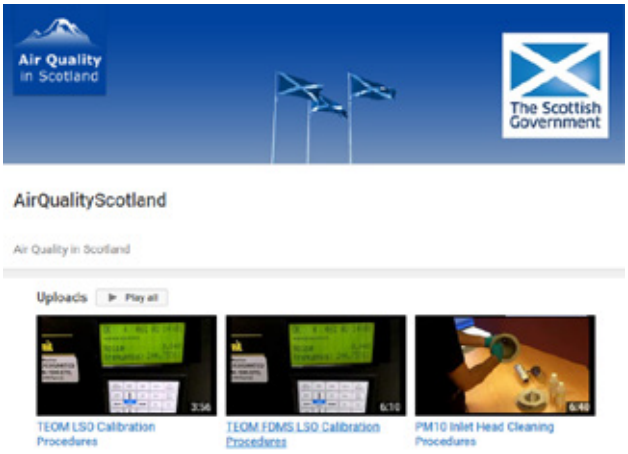
@scotairquality

The service enables you to stay informed about current and forecast air quality including the occurrence of air quality episodes. Health advice and information on the UK Air Quality Index should be considered in conjunction with the tweets, particularly when air pollution is elevated.

## 8.7 Youtube™

The Air Quality in Scotland YouTube account was initially launched to provide a platform for related videos, and it hosts the 'How To' videos for the Local Site Operator manual.

Each video is available through the YouTube website itself, but can also be accessed directly on the Air Quality in Scotland website (https://www.youtube.com/user/AirQualityScotland).



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