Air Pollution in Northern Ireland 2021

Contents

Tables

Figures

1. Report Highlights

This is the twentieth in a series of annual reports on air quality in Northern Ireland. It has been written and produced by Ricardo, on behalf of the Department of Agriculture, Environment and Rural Affairs (DAERA).

The key purpose of this report is to summarise air quality monitoring results for Northern Ireland in 2021, in order to inform the public, government and wider air quality community in Northern Ireland. This report also contains useful information on air quality policy and legislation as well as on sources of pollution. Figure 1.1 shows the locations of all air quality monitoring sites in Northern Ireland that were in operation during part or all of 2021.

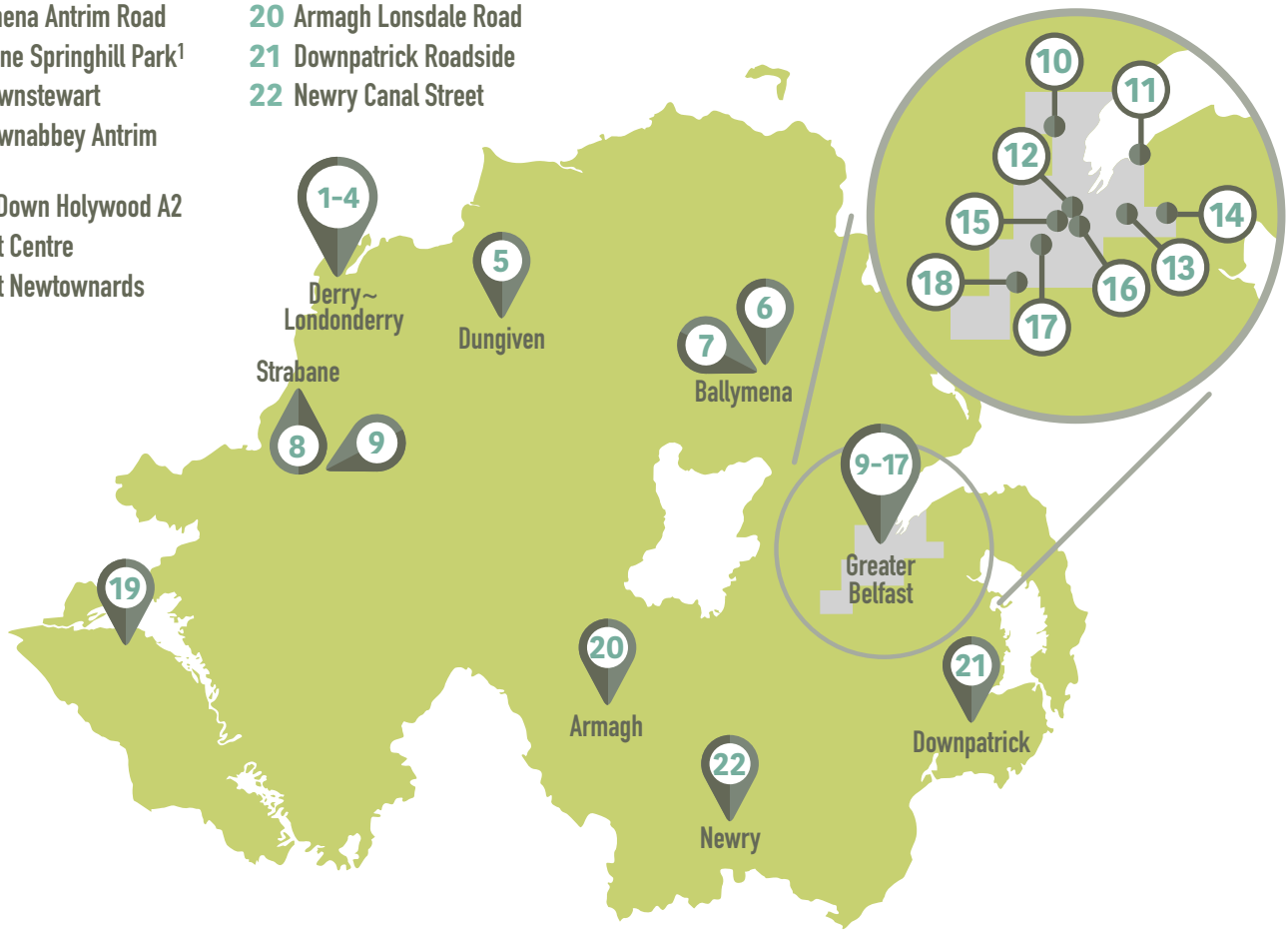
Figure 1.1: Air Quality Monitoring Stations

1 Londonderry Rosemount
2 Londonderry Dale's Corner
3 Strathfoyle Bawnmore Place
4 Derry Brandywell
5 Limavady Dungiven
6 Ballymena Ballykeel
7 Ballymena Antrim Road
8 Strabane Springhill Park[1]
9 Newtownstewart
10 Newtownabbey Antrim Road
11 North Down Holywood A2
12 Belfast Centre
13 Belfast Newtownards Road
14 Castlereagh Dundonald
15 Belfast Westlink Roden Street
16 Belfast Ormeau Road
17 Belfast Stockman's Lane
18 Lisburn Dunmurry Seymour Hill[2]
19 Lough Navar
20 Armagh Lonsdale Road
21 Downpatrick Roadside
22 Newry Canal Street

22 sites operating in 2021. This map has been updated from the previous years to show the location of sites in the UK Black carbon and PAH Networks

[1] Black Carbon is measured at Strabane 2 which is at the same location as Strabane Springhill Park

[2] Black Carbon and PAHs are measured at Kilmakee Leisure Centre which is at the same location as Lisburn Dunmurry Seymour Hill



The Peace Bridge and Guild Hall, Londonderry/Derry

This report has been compiled from data supplied by Northern Ireland's network of air quality monitoring stations (Figure 1.1). Some of these are operated on behalf of DAERA, while others are managed by district councils, via the Local Air Quality Management framework, for which DAERA provides funding support. An interactive map of the automatic monitoring stations shown in Figure 1.1 can be found on the Northern Ireland Air Quality Website at www.airqualityni.co.uk. Information on the sites in Northern Ireland within the Black Carbon, PAH, Hydrocarbon, and Heavy Metals Networks, can be found on the UK-AIR website at https://uk-air.defra.gov.uk/interactive-map.

This report reviews the pollutants monitored, and highlights compliance as well as exceedances of air quality objectives. It also highlights emerging trends in air quality over time. Each edition of the report takes an issue to examine in-depth, and this year's focus is on domestic solid fuel burning in Northern Ireland.

An overall decreasing trend in NO_2 concentrations is observed at many monitoring sites in Northern Ireland over the past decade.

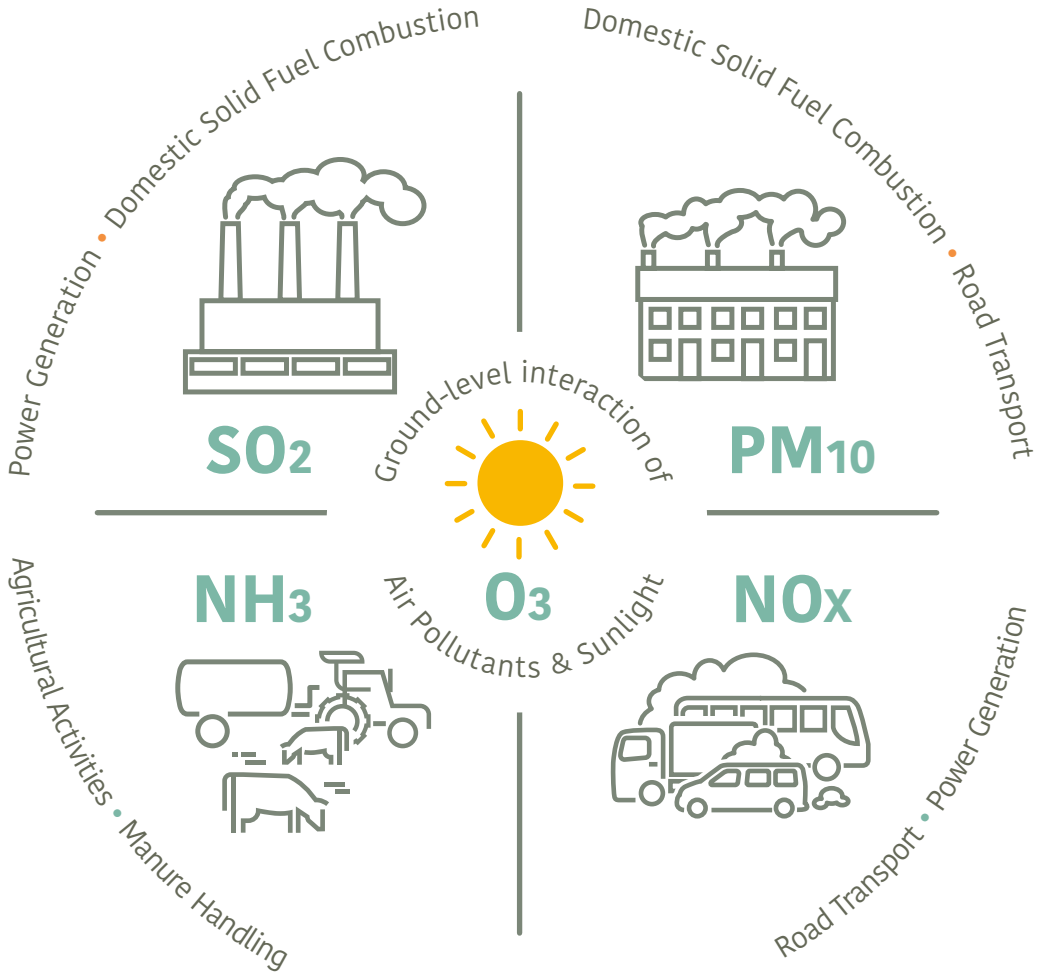
Air quality in Northern Ireland has improved substantially in recent decades. Concentrations of sulphur dioxide, a pollutant associated with coal and oil combustion, have declined significantly since the 1990's. An overall decreasing trend in NO_2 concentrations is also observed at many monitoring sites in Northern Ireland over the past decade. However, some pollutants in some parts of Northern Ireland continue to exceed air quality objectives. A continued effort to reduce air pollution is therefore important, together with monitoring to assess progress and to provide sound, science-based input into policy development.

2. Sources of Air Pollution in Northern Ireland

Figure 2.1 illustrates the most significant air pollutants for our region, and provides information on their sources:

- Nitrogen oxides (NOx, which includes nitrogen monoxide (also called 'nitric oxide') NO and nitrogen dioxide, NO_2): from combustion of fuels, most importantly in transport and energy generation. The NOx emitted by road transport, however, is of particular concern because it leads to increased concentrations of NO_2 at ground level in busy streets where people are present. NO_2 is a respiratory irritant: it can irritate the airways and lungs. This can worsen the symptoms of people who have already have lung problems.
- Sulphur dioxide, SO_2: a pollutant produced during combustion of fuels containing sulphur (such as coal), particularly from power generation, industry, and household heating. SO_2 is a respiratory irritant that can cause the airways to constrict: people with asthma are likely to be particularly sensitive to it.

Figure 2.1: Main Sources of Air Pollution



Giant's Causeway, County Antrim, Northern Ireland

- Particulate matter, PM_{10} and $PM_{2.5}$: by-products of burning fuels, in particular use of solid fuels (e.g. domestic wood and coal burning), industrial combustion and road transport. Based on the 2019 NAEI emission estimates, in the UK, approximately one third of the $PM_{2.5}$ and ~20% of the PM_{10} produced from road transport is from fuel combustion, while the remainder comes from tyre and brake wear and road dust[1]. PM_{10} particles can travel into our airways where they can cause inflammation, and a worsening of the condition of people with heart and lung diseases. $PM_{2.5}$ particles are smaller still, and can be carried deep into the lungs: these ultrafine particles may carry surface-absorbed toxic, or carcinogenic, compounds into the body.
- Ground-level ozone, O_3: a secondary pollutant, formed by the interaction of other air pollutants in the presence of sunlight. Ozone irritates the eyes, airways and lungs, increasing the symptoms of those suffering from asthma and lung diseases.
- Ammonia, NH_3: a gas that is emitted from waste and agricultural activities – in particular, manure handling, storage and spreading. Ammonia contributes to air pollution because it can react with other pollutants (the oxides of nitrogen and sulphur) to produce fine particles of ammonium nitrate and ammonium sulphate.
- Polycyclic aromatic hydrocarbons, PAHs: typically formed by incomplete combustion or pyrolysis. Domestic combustion accounts for the majority of PAH emissions to the atmosphere. Several PAHs are toxic or can be carcinogenic, such as benzo[a]pyrene, which is used as a marker compound for PAHs in the UK.

[1] Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 2005-2019 (https://naei.beis.gov.uk/data/das?view=by-source)

3. Legislation and Policy: What Can Be Done

During 2021 the management of air quality in Northern Ireland was based on the requirements of the Air Quality Standards Regulations (Northern Ireland) 2010, the 2007 UK Air Quality Strategy and the Environment Order (NI) 2002.

The Air Quality Standards Regulations (Northern Ireland) 2010

Ambient air quality in Northern Ireland is regulated by the Air Quality Standards Regulations (Northern Ireland) 2010 and their subsequent 2016 amendment[2]. These Regulations transposed the following European Commission Directives:

- Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe (the Air Quality Directive), which relates to sulphur dioxide, oxides of nitrogen, particulate matter, lead, carbon monoxide, benzene and ozone in ambient air; and
- Directive 2004/107/EC (the Fourth Daughter Directive) relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons (PAH) in ambient air.

These Directives came into operation while the UK was a member state of the European Union (EU). The provisions of the Directives were required to be incorporated (or 'transposed') into Northern Ireland's own legislation, and the Regulations were the means by which this was done. The full provisions of the above Directives therefore remain part of Northern Ireland's own legislation, even after the UK's departure from the EU in early 2020.

As well as limit values and non-mandatory target values for ambient concentrations of pollutants, the Regulations set out requirements for ambient air quality monitoring, including the number of monitoring sites required, siting criteria and acceptable methodology. They also identify the duties of Northern Ireland's Government Departments in relation to achieving limit and target values. It is the responsibility of DAERA to inform the public about air quality in the region, particularly with regard to warning the public when air quality is poor.

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, first published in 1997 and updated in 2007, provides a comprehensive framework for tackling air pollution. It was established on the basis of strong scientific evidence and a science-based understanding of the effects of air pollutants on health and the environment. The Strategy sets objectives to be met within the UK for a suite of pollutants. The scientific basis, the objectives set, and provisions contained within the Strategy are closely associated with the corresponding standards set within the European Air Quality Directives, as listed above. The Strategy's provisions for some pollutants differ from those in the Directives, with these differences relating to scientific evidence and expert opinion that is specific to the UK situation. As the Air Quality Standards Regulations have their origins in the EU Directives, this also means that there are some differences between the Strategy's provisions and those of the Regulations.

[2] Available at: https://www.legislation.gov.uk/nisr/2010/188/contents/made

However, all the Air Quality Strategy objectives are at least as stringent as the corresponding limit values in the Air Quality Directive or 4th Daughter Directive and the Regulations. The full Air Quality Strategy and its technical annexes are available online and can be downloaded from https://www.gov.uk/government/publications/the-air-quality-strategy-for-england-scotland-wales-and-northern-ireland-volume-1.

The Environment Act 2021 requires the Secretary of State to undertake regular five-yearly reviews of the Air Quality Strategy. The Department for Environment, Food & Rural Affairs (Defra) is currently reviewing the Air Quality Strategy. In a significant change, the forthcoming updated Air Quality Strategy will not include the Devolved Administrations.

The Air quality: Provisional Common Framework

In February 2022, the UK Government published the Air Quality Common Framework (UK Government, 2022). This policy paper, which is available online at https://www.gov.uk/government/publications/air-quality-provisional-common-framework, explains how the UK Government and the Devolved Administrations propose to work together to develop air quality policy, following the UK's exit from the European Union.

World Health Organisation (WHO) Guidelines

The World Health Organisation publish guidelines for key pollutants based on the scientific evidence on the health effects of the pollutants available at the time. In 2005 an update to the guidelines was undertaken and threshold limits for PM_{10}, $PM_{2.5}$, O_3, NO_2 and SO_2 published[3]. A further update was issued in 2021[4], with revised guidelines published for these pollutants. It also provides interim targets to guide reduction efforts towards the ultimate and timely achievement of the Air Quality Guideline levels. Table 3.1 shows the 2021 WHO Air Quality Guideline levels and interim targets for NO_2, PM_{10} and $PM_{2.5}$. The WHO guidelines are not legally binding but are valuable for providing guidance for future UK legislations.

Table 3.1: WHO 2021 air quality guidelines for NO_2, PM_{10} and $PM_{2.5}$

Pollutant	Averaging Period	2021 WHO Interim Targets				2021 WHO Air Quality Guideline Level
		1	2	3	4	
NO_2 (µg m^{-3})	Annual	40	30	20	-	10
	24 hour*	120	50	-	-	25
PM_{10} (µg m^{-3})	Annual	70	50	30	20	15
	24 hour*	150	100	75	50	45
$PM_{2.5}$ (µg m^{-3})	Annual	35	25	15	10	5
	24 hour*	75	50	37.5	25	15

* measured as the 99th percentile of the 24 hour means in a year (equivalent to 3–4 exceedances)

[3] World Health Organization. Regional Office for Europe. (2006). Air quality guidelines: global update 2005: particulate matter, ozone, nitrogen dioxide and sulfur dioxide. World Health Organization. Regional Office for Europe. https://apps.who.int/iris/handle/10665/107823

[4] World Health Organization. (2021). WHO global air quality guidelines: particulate matter ($PM_{2.5}$ and PM_{10}), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. World Health Organization. https://apps.who.int/iris/handle/10665/345329. License: CC BY-NC-SA 3.0 IGO

Local Air Quality Management

Local Air Quality Management (LAQM) provides the framework under the Environment Order (NI) 2002, within which air quality is managed by the 11 district councils in Northern Ireland. LAQM requires district councils to review and assess a range of air pollutants against the objectives set by the UK Air Quality Strategy, using a range of monitoring, modelling, observations and corresponding analyses.

For locations where objectives are not expected to be met by the relevant target date, district councils are required to declare an Air Quality Management Area (AQMA), and (along with relevant authorities), to develop an Action Plan addressing the problem. In 2021 there were 19 AQMAs in Northern Ireland, as shown in Table 3.2. Nine councils have AQMAs: of these, seven have AQMAs for NO_2 only, and two have AQMAs for PM_{10} and NO_2. There are no AQMAs in place for any other pollutants, in Northern Ireland.

Table 3.2: Air Quality Management Areas in Northern Ireland (as of August 2022)

District Council	Number of AQMAs	Pollutant that triggered designation	Sources
Antrim and Newtownabbey Borough Council	1	Nitrogen dioxide	Road traffic
Armagh City, Banbridge and Craigavon Borough Council	1	Nitrogen dioxide	Road traffic
Belfast City Council	4	Nitrogen dioxide	Road traffic
Causeway Coast and Glens Borough Council	1	Nitrogen dioxide	Road traffic
Derry City and Strabane District Council	4	Nitrogen dioxide	Road traffic
Fermanagh and Omagh District Council	0	-	-
Lisburn and Castlereagh City Council	1	Nitrogen dioxide	Road traffic
Mid and East Antrim Borough Council	2	Nitrogen dioxide (1) and PM_{10} (1)	NO_2: Road traffic PM_{10}: Domestic Heating
Mid Ulster District Council	3	Nitrogen dioxide	Road traffic
Newry, Mourne and Down District Council	2	Nitrogen dioxide (1) and PM_{10} (1)	Road traffic
North Down and Ards District Council	0	-	-

4. Air Quality Monitoring Results for 2021

Monitoring in Northern Ireland

A wide range of air quality monitoring is carried out in Northern Ireland. Some monitoring sites are run as part of UK-wide monitoring networks; others are operated by district councils in order to meet local objectives.

The Air Quality Standards Regulations require Northern Ireland to be divided into 'zones' for reporting purposes. Northern Ireland comprises two reporting zones – the 'Belfast Metropolitan Urban Area' agglomeration (the conurbation of Greater Belfast), and the 'Northern Ireland' zone (the rest of the region). The Regulations then specify how many monitoring sites (or 'stations') are needed in each zone (based on its size and population). Only sites which meet the stringent siting criteria of the Regulations may be used for reporting compliance. The Regulations' siting criteria are different from those used for LAQM: for example, sites located close to major road junctions are used in LAQM but must not be used for compliance monitoring purposes. There are also different criteria regarding relevant public exposure.

The following pollutants were monitored in Northern Ireland during 2021:

- Carbon monoxide (CO);
- Oxides of nitrogen (NO_x), comprising nitric oxide (NO) and nitrogen dioxide (NO_2);
- Sulphur dioxide (SO_2);
- Particles (as PM_{10}, $PM_{2.5}$, and black carbon);
- Ozone (O_3);
- Benzene;
- Polluting elements – including lead, arsenic, cadmium, nickel and mercury; and
- Polycyclic Aromatic Hydrocarbons (PAH).

There were 22 air quality monitoring stations that operated for all or part of 2021 in Northern Ireland. Each was equipped with continuous monitoring equipment for one or more of the pollutants for which automatic methods are used: CO, NO_x, SO_2, PM_{10}, $PM_{2.5}$, O_3, and black carbon, and/or a non-automatic sampler for PAH. These sites (shown previously in Figure 1.1) provide information on a wide range of pollutants. Data from the continuous monitoring sites are communicated rapidly to the public via the website www.airqualityni.co.uk and the Northern Ireland Air app, which can be downloaded free of charge from https://www.airqualityni.co.uk/stay-informed. Public health warnings are issued when levels are forecast to, or reach 'high' levels as defined by the Daily Air Quality Index (see https://uk-air.defra.gov.uk/air-pollution/daqi for an explanation of this Index).

Belfast high street

Seven of the automatic monitoring sites (Armagh Lonsdale Road, Ballymena Antrim Road, Ballymena Ballykeel, Belfast Centre, Belfast Stockman's Lane, Derry/Londonderry Rosemount and Lough Navar) were part of the UK's national monitoring network and were used to assess compliance with the Air Quality Standards Regulations. Non-automatic monitoring techniques are used for benzene, metallic pollutants, and PAHs. Some of these measurements are used to assess compliance with the Air Quality Standards Regulations and the Air Quality Strategy.

Upgrade of PM Monitoring Instruments in 2021

The Filter Dynamic Measurement System (FDMS) instrument has, in the past, been used to measure PM_{10} and $PM_{2.5}$ at many of Northern Ireland's monitoring sites, including those which are part of the national monitoring network. However, many of these instruments were approaching the end of their functional lifetime, and the FDMS is no longer supported by the manufacturer. Therefore in 2018 the Environment Agency began a programme of upgrades, replacing old FDMS at national network sites with new instruments of different types: either the Beta Attenuation Monitor or Fidas 200™ (the latter is an optical technique). Lough Navar, Belfast Centre, Derry Rosemount and Armagh Lonsdale Road all had their FDMS replaced between 2018 and 2020. DAERA has done the same for the other FDMS sites in Northern Ireland: Lisburn Dunmurry Seymour Hill's FDMS was replaced in January 2021 and Ballymena Ballykeel's TEOM was replaced in June 2021.

In April 2021, a new monitoring site was installed at Newtownstewart for measuring PM_{10}. The instrument initially installed was a Tapered Element Oscillating Microbalance (TEOM). This TEOM along with the one at Strathfoyle Bawnmore Place were replaced in 2022.

The Volatile Correction Model

Three of Northern Ireland's twelve PM_{10} monitoring sites used TEOMs to measure PM_{10} during 2021: Ballymena Ballykeel, Strathfoyle Bawnmore Place and Newtownstewart. The relatively high operating temperature of the TEOM (necessary to prevent condensation on the filter) can result in the loss of volatile components of the particulate matter sampled, causing under-estimation of the PM_{10} concentration. However, the data have historically been corrected for this using the Volatile Correction Model (VCM) developed by King's College, London and now administered by Imperial College, London. The VCM uses data from Filter Dynamic Measurement Systems (FDMS) PM_{10} analysers in the region, which measure both the volatile and non-volatile fractions, to calculate an appropriate correction based on the location of the instrument and the period of the measurements. The resulting corrected measurements have been demonstrated as equivalent to the European reference method. For more information, visit the Volatile Correction Model page[5]. This issue only arises for PM_{10}: there is at present no requirement to correct TEOM measurements of $PM_{2.5}$.

The ability of the VCM to calculate a reliable volatile correction depends on there being an FDMS within a specified distance. Historically this has been 130 km. However, as explained above, the majority of the FDMS instruments have been replaced with other instrument types in recent years, as they reach the end of their functional lifetime and are no longer supported by the manufacturer. In 2020, with the agreement of Imperial College London, the radius was extended to 200 km. This allowed two FDMS sites in Ayrshire, western Scotland, to be used to correct data from TEOMs in Northern Ireland using the VCM method.

[5] http://www.volatile-correction-model.info/

The Custom House and Lagan River, Belfast

However, on 11th September 2021 these two FDMS in Scotland also ceased operation and were replaced by other types of instrument. Therefore, from this date onwards, it has no longer been possible to use the VCM method to correct TEOM data from sites in Northern Ireland. As such, to estimate the gravimetric equivalent PM_{10} concentrations from the TEOMs, it has been necessary to return to a method that was historically used to correct TEOM data before the implementation of the VCM method in 2004. This consists of applying a factor of 1.3 to the TEOM PM_{10} data, to approximately correct for the lost volatile component. This correction factor cannot take account of local or day-to-day variation in the volatile component of PM_{10}. Therefore, TEOM PM_{10} data corrected in this way are classified as indicative gravimetric equivalent (rather than gravimetric equivalent like VCM-corrected TEOM data, FDMS, BAM or Fidas 200™ data).

The affected sites in 2021 are: Strathfoyle Bawnmore Place and Newtownstewart. Ballymena Ballykeel also used a TEOM during the early part of 2021 but as mentioned above, this was replaced on 1st June. Therefore the PM_{10} data from Strathfoyle Bawnmore Place from 11th September 2021 to 25th February 2022, and Newtownstewart from 11th September 2021 to 10th March 2022 are indicative only.

Key Results for 2021

This section summarises key monitoring results from 2021, including compliance with Air Quality Standards Regulations limit values and the corresponding Air Quality Strategy (AQS) objectives. Further information is provided on the Northern Ireland Air website.

Carbon Monoxide was monitored using an automatic instrument at one site – Belfast Centre. The results were well within the Regulations limit value and AQS objective for this pollutant and have been for many years.

Benzene was monitored at one site, Belfast Centre, which met the annual mean limit value and AQS objective (for the running annual mean) in 2021, as it has for many years.

Metallic and Other Polluting Elements including lead, arsenic, cadmium and nickel – were monitored using non-automatic techniques at Belfast Centre, as part of the Heavy Metals Network. The results for 2021 were within the annual mean limit value and AQS objective for lead, and within the Regulations annual mean target values for arsenic, cadmium and nickel.

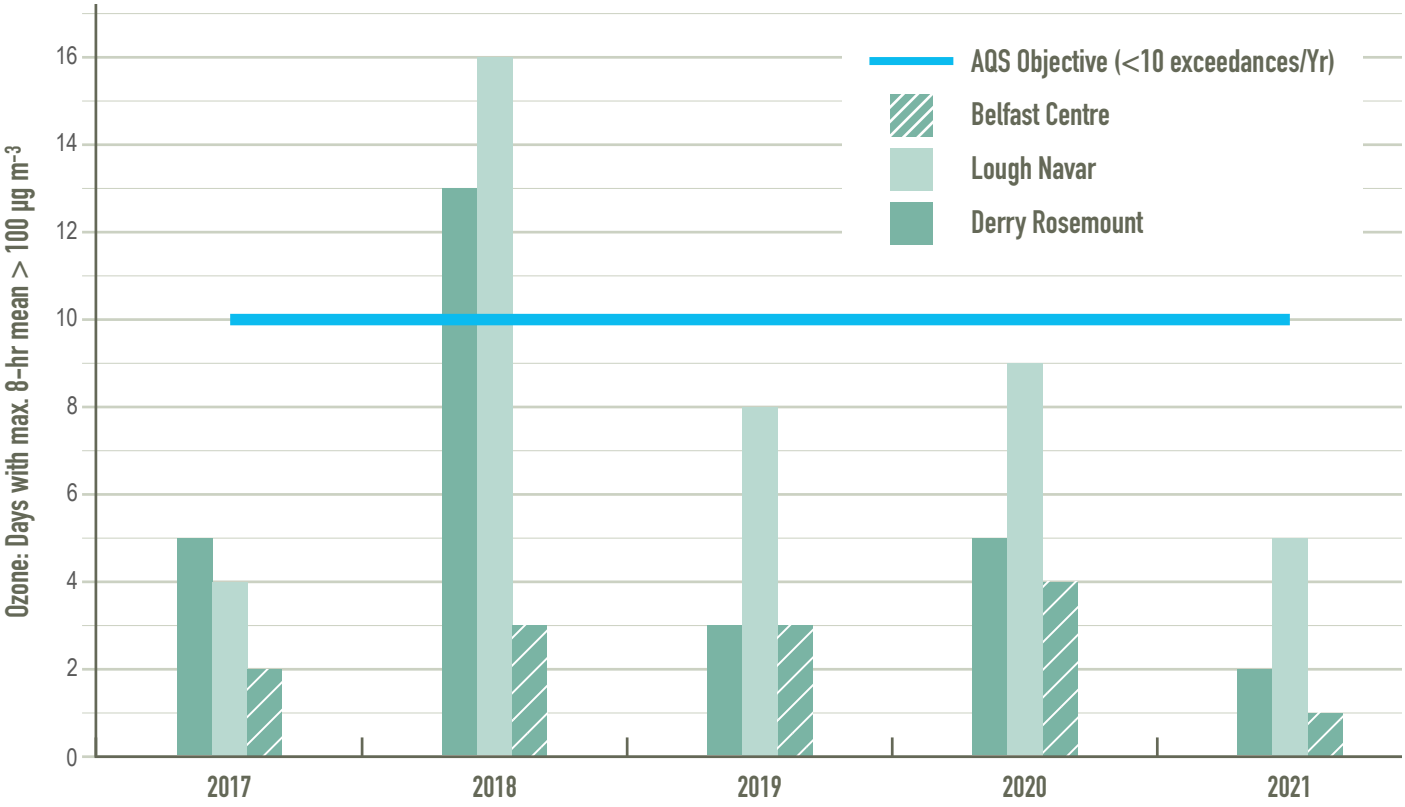
Sulphur Dioxide was monitored at five automatic sites during 2021. All sites met the limit values for SO_2 (1-hour and 24-hour mean), and the AQS objective for the 15-minute mean.

St Eugene's Cathedral

Ozone was monitored at Belfast Centre, Derry Rosemount, and the rural Lough Navar site. No sites exceeded the target value for human health of 120 µg m^{-3} (for the maximum daily 8-hour mean) on more than the permitted 25 days or exceeded the more stringent AQS objective of 100 µg m^{-3} on more than the permitted 10 days in 2021 (Figure 4.1).

Unlike some other pollutants, levels of ozone (O_3) in Northern Ireland do not appear to be decreasing but remain variable from year to year. Ozone exceedances happen in some years but not others. The reasons for this relate to how ozone is formed: it is a 'secondary' pollutant – that is, it is formed by reactions involving other pollutants, in the presence of sunlight, and over several hours. This means that the number of ozone exceedances in any given year depends 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 global human activities[6]. O_3 exceedances therefore remain possible in future. Ozone is also a 'transboundary' pollutant: once formed it may persist for several days and be transported over long distances. This means that much of the ozone measured in a particular area may have been generated elsewhere, and so it is more difficult to reduce concentrations by local action.

Figure 4.1: Days with Maximum 8-hour mean Ozone Concentrations > 100 µg m^{-3} for Five Years 2017-2021

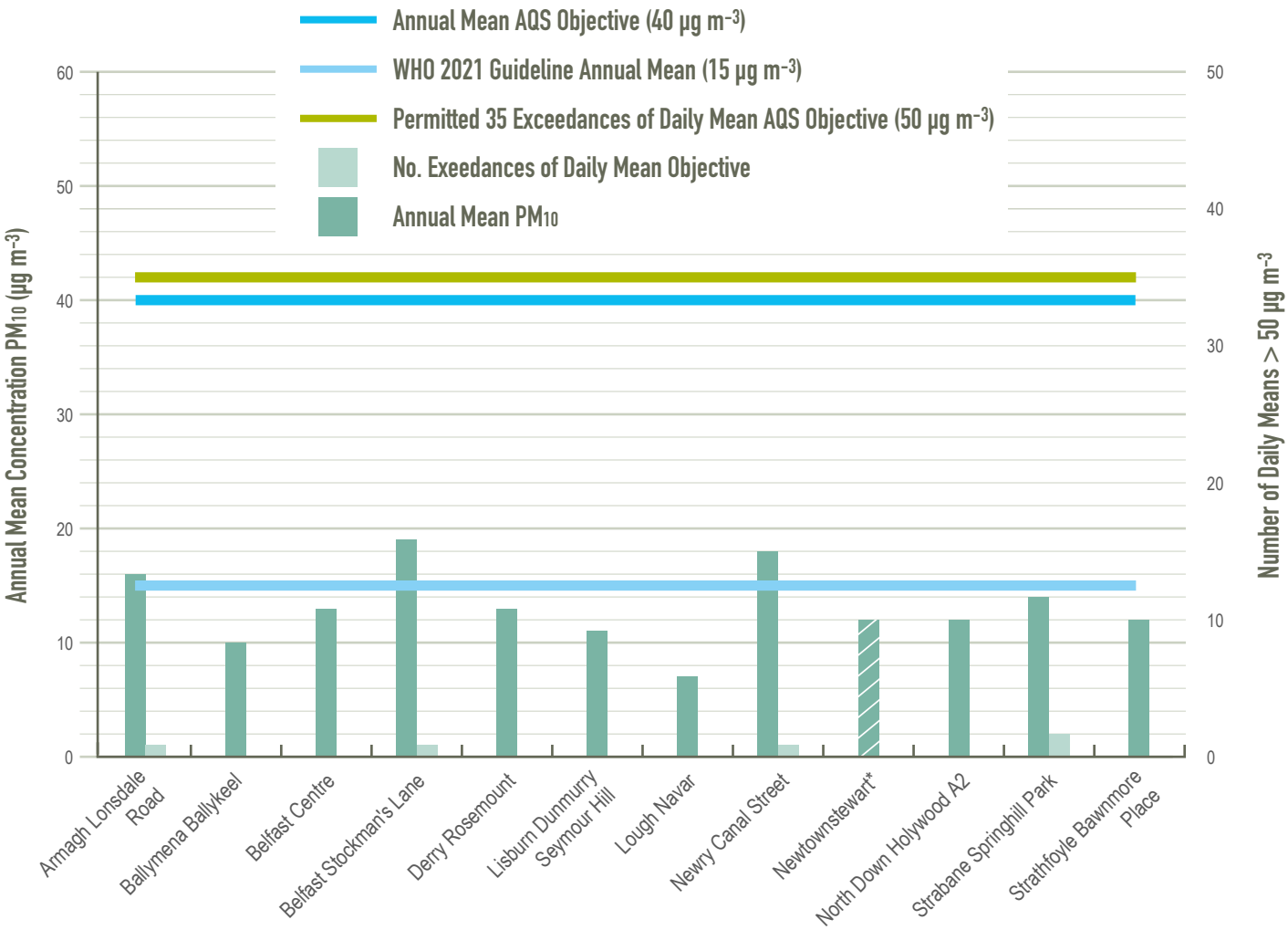


[6] Vingarzan, R., 2004. A review of surface ozone background levels and trends. Atmospheric environment, 38(21), pp.3431-3442

Particulate Matter PM_{10} Particulate matter as PM_{10} was monitored at twelve locations in 2021. Figure 4.2 shows the annual mean PM_{10} concentrations (shown by the darker coloured bars), and the number of exceedances of the daily mean limit value and objective (shown by the lighter coloured bars). As explained above, three of these sites (Ballymena Ballykeel, Strathfoyle Bawnmore Place and Newtownstewart) used the TEOM instrument during all or part of 2021, so data from these sites have been corrected. The TEOM at Ballymena Ballykeel was replaced with a Fidas 200™ on 1st June 2021, as such the data for the period while the TEOM was in use was corrected to gravimetric equivalent using the King's College VCM – with the increased radius threshold previously used in 2020. Strathfoyle Bawnmore Place and Newtownstewart were corrected to the gravimetric equivalent using the VCM up to 11th September 2021. For the remainder of 2021, the data from these two sites were corrected to indicative gravimetric equivalent using the agreed correction factor of 1.3 as explained above.

For sites with less than 75% data capture, the data have been annualised to estimate the annual mean, as per the procedure laid out in LAQM.TG(22) (Box 7.9)[7].

Figure 4.2: Annual Mean PM_{10} Concentrations and Exceedances of Daily Mean Objective, 2021



*** Asterisk indicates sites with < 85% data capture**
Where the valid data capture is less than 75%, the means have been "annualised" and shown as a striped bar

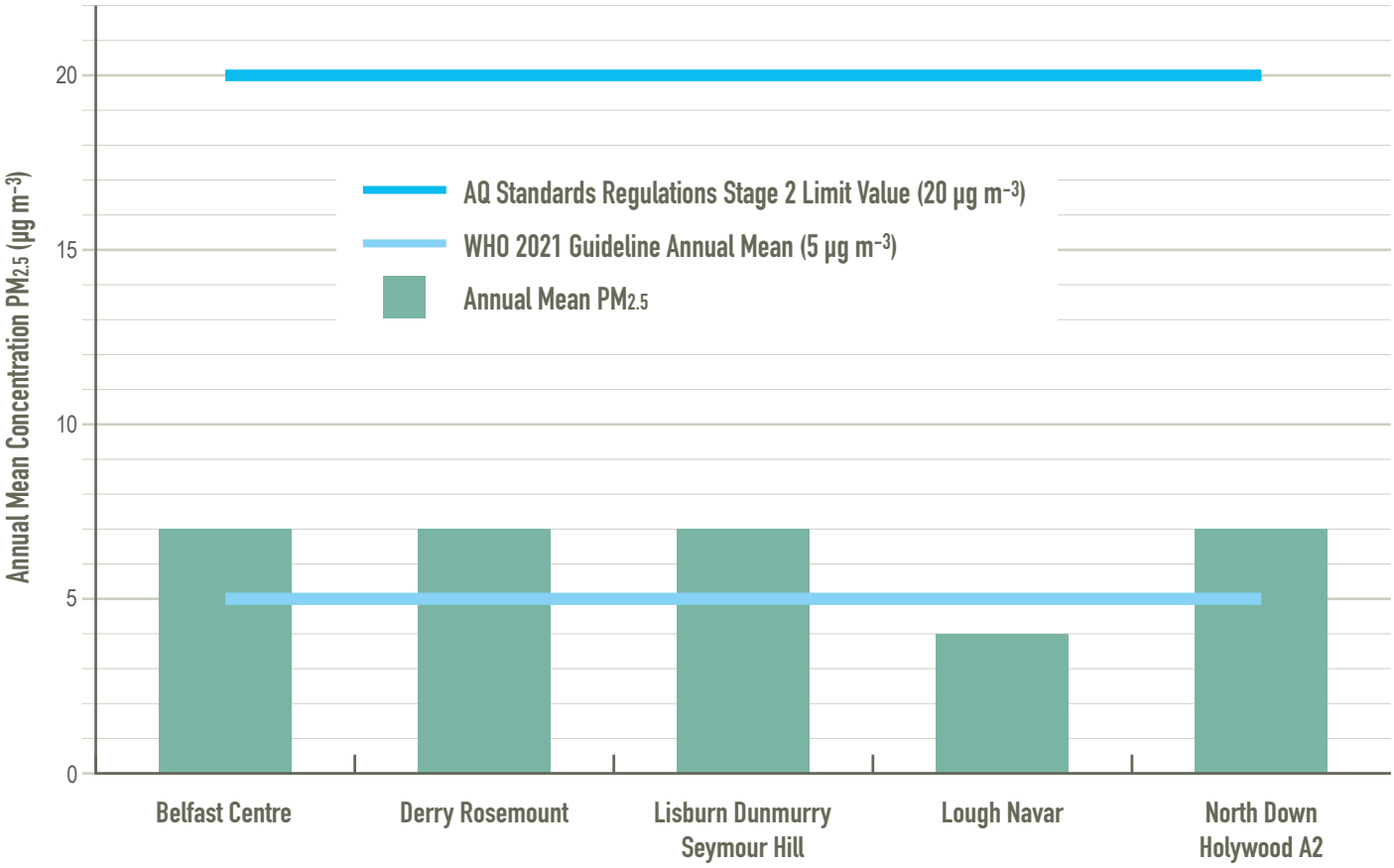
[7] Local Air Quality Management - New Technical Guidance TG(22): Available at https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf

For PM_{10}, this was the case for Newtownstewart, as this was a new instrument installed in April 2021. To perform annualisation, data from two to four nearby continuous background monitors with capture rates greater than 85% should be used to calculate an annualisation factor. Data from Strabane Springhill Park and Derry Rosemount were used to calculate an annualisation factor for PM_{10}.

All sites met the limit value and objective of 40 µg m^{-3} for annual mean PM_{10}, and no sites exceeded the daily mean limit value and objective of 50 µg m^{-3} on more than the maximum permitted 35 occasions during the year (after correction for lost volatile component in the case of TEOM data). Where data capture is less than 85%, the daily mean objective is judged on whether the 90.4th percentile of 24 hour mean PM_{10} concentrations has exceeded 50 µg m^{-3}, rather than the number of exceedances. For Newtownstewart the 90.4th percentile was below 50 µg m^{-3}. Three of the twelve sites (Armagh Lonsdale Road, Belfast Stockman's Lane and Newry Canal Street) exceeded the WHO 2021 guideline for annual mean PM_{10} concentrations, in 2021.

Particulate matter $PM_{2.5}$ Fine particulate matter as $PM_{2.5}$ was continuously monitored at five sites in 2021; Belfast Centre, Derry Rosemount, Lisburn Dunmurry Seymour Hill, Lough Navar and North Down Holywood A2. Figure 4.3 shows the annual mean $PM_{2.5}$ concentrations at these five sites for 2021. All five sites reported annual mean $PM_{2.5}$ concentrations well below the Air Quality Regulations Stage 2 limit value of 20 µg m^{-3} (which had to be achieved by 1st Jan 2020). All sites, with the exception of the rural site at Lough Navar, exceeded the new WHO guideline for annual mean $PM_{2.5}$ concentrations (5 µg m^{-3}), in 2021. Ballymena Ballykeel began monitoring $PM_{2.5}$ in June 2021 (when its old TEOM was replaced with a Fidas 200™, which measures both PM_{10} and $PM_{2.5}$). Its first valid annual mean for $PM_{2.5}$ will therefore be reported in the 2022 report.

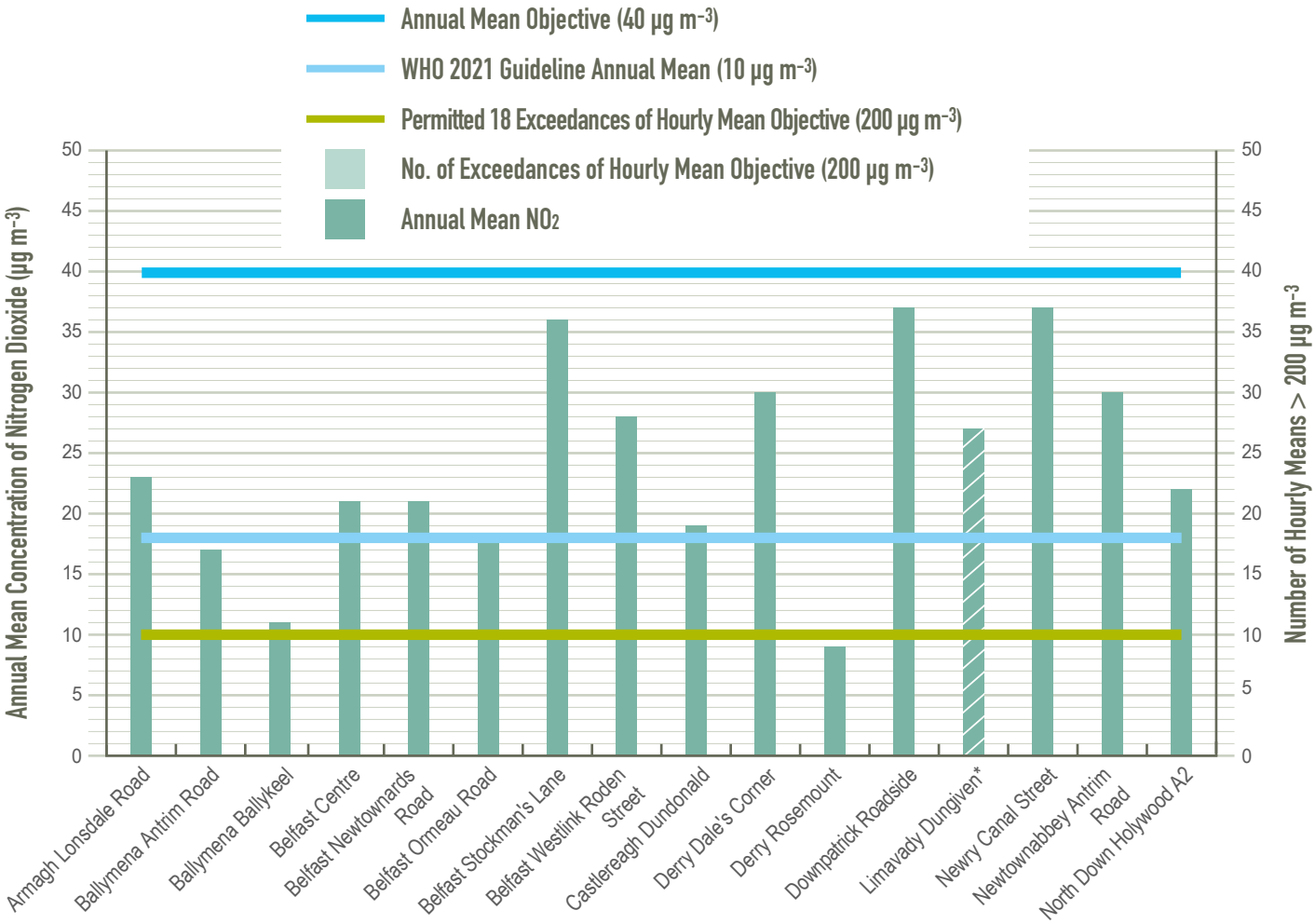
Figure 4.3: Annual Mean $PM_{2.5}$ Concentrations for 2021



Nitrogen Dioxide was monitored using automatic analysers at 16 sites during 2021. Figure 4.4 shows the annual mean NO_2 concentrations for all sites. For sites with less than 75% data capture, the data have been annualised to estimate the annual mean as per the procedure laid out in LAQM TG(22) (Box 7.9)[8]. This was the case for Limavady Dungiven in 2021. To perform annualisation, data from two to four nearby continuous background monitors with capture rates greater than 85% should be used to calculate an annualisation factor. Data from Derry Rosemount and Ballymena Ballykeel were used to calculate an annualisation factor and estimate the annual mean for Limavady Dungiven.

No sites exceeded the AQS objective for annual mean NO_2 concentration (40 µg m^{-3}). However, at only one of the 16 sites (Derry Rosemount), was the annual mean NO_2 concentration below the WHO 2021 guideline (10 µg m^{-3}), in 2021. For the hourly mean limit, a concentration of 200 µg m^{-3} must not be exceeded more than the permitted 18 occasions in a year. Where the data capture is less than 85%, exceedance of the hourly mean objective is judged on whether the 99.8th percentile of hourly values has exceeded 200 µg m^{-3} rather than the number of hourly means above the objective. There were no exceedances of the hourly mean limit value of 200 µg m^{-3} at any site in 2021.

Figure 4.4: Annual Mean NO_2 Concentrations and Exceedances of Hourly Objective, 2021

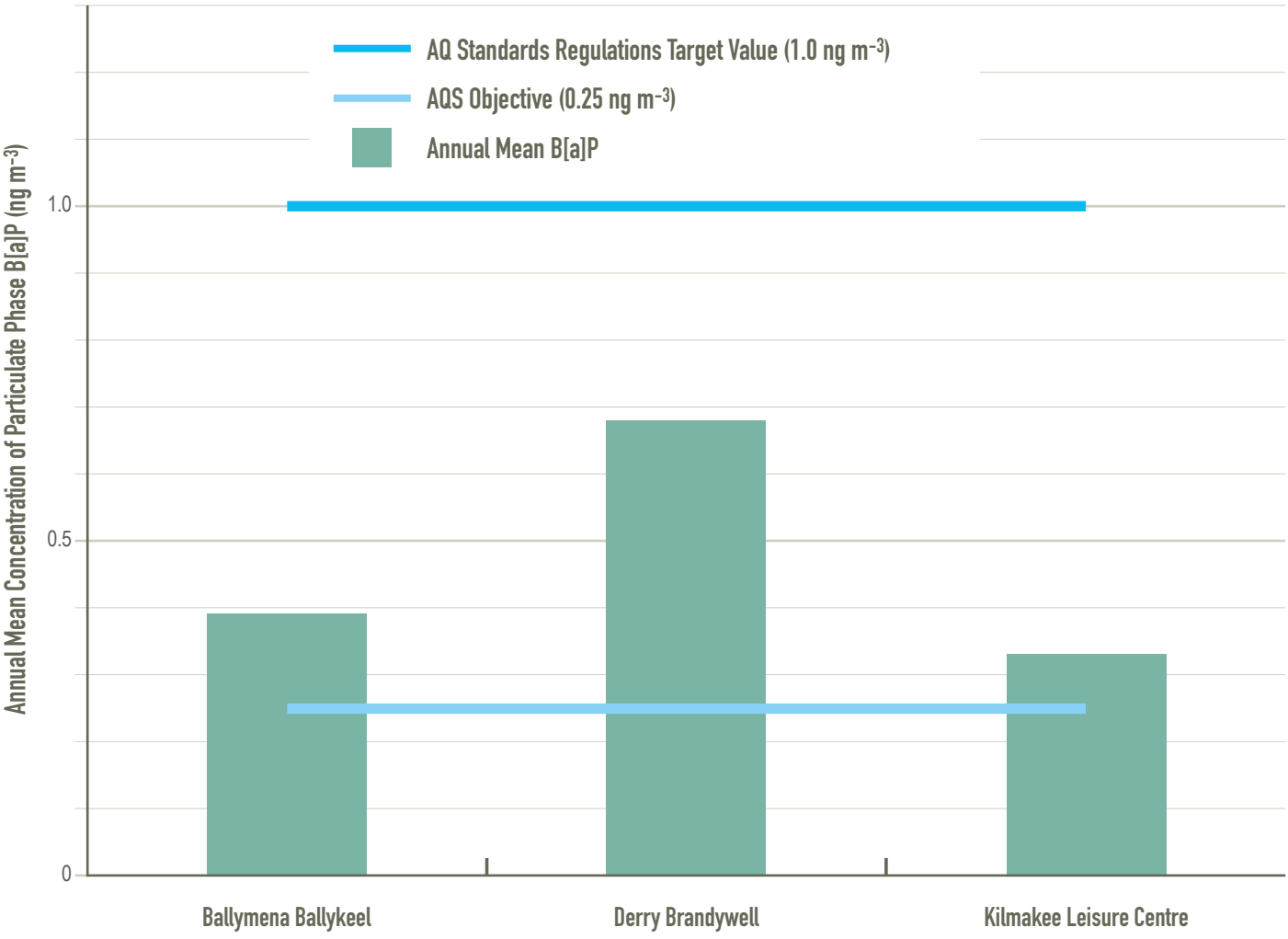


*** Asterisk indicates sites with < 85% data capture**
Where the valid data capture is less than 75%, the means have been "annualised" and shown as a striped bar

[8] Local Air Quality Management - New Technical Guidance TG(22): Available at https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf

Polycyclic Aromatic Hydrocarbons (PAHs) were monitored at three sites in 2021; Ballymena Ballykeel, Derry Brandywell and Kilmakee Leisure Centre in Dunmurry. All are part of the UK PAH Monitoring Network. The network measures a range of PAH compounds, but one species in particular, benzo[a]pyrene (B[a]P), is used as a 'marker' for PAH compounds and is the subject of an AQS objective and Air Quality Standards Regulations target value. Figure 4.5 shows the annual mean concentrations at these three sites for 2021. No site exceeded the target value of 1 ng m^{-3} for annual mean B[a]P concentration during 2021 (which was to be met by 31st Dec 2012). All three sites exceeded the more stringent AQS annual mean objective of 0.25 ng m^{-3} for this PAH species, which was to have been achieved by 31st Dec 2010.

Figure 4.5: Annual Mean Concentrations of Benzo[a]pyrene in 2021



Blackhead Lighthouse, Belfast Lough

Summary

Regulations limit values, target values and corresponding AQS objectives, have been met for the following pollutants in Northern Ireland –

- Particulate matter as PM_{10}
- Particulate matter as $PM_{2.5}$
- Nitrogen Dioxide
- Ozone
- Carbon monoxide
- Benzene
- Sulphur dioxide
- The elements lead, arsenic, cadmium and nickel

All three sites where benzo[a]pyrene is monitored exceeded the AQS objective of 0.25 ng m^{-3} in 2021.

A summary of compliances for the pollutants measured in Northern Ireland with the Air Quality Standards Regulations Limits/Targets, the UK Air Quality Strategy Objectives and the WHO Air Quality Guidelines 2021, is shown in Table 4.1.

Table 4.1: Summary of compliances for pollutants measured in Northern Ireland

Pollutant	Monitoring sites	Averaging time	Air Quality Standards Regulations (Northern Ireland) Limits/ Targets	Compliance	UK Air Quality Strategy Objective	Compliance	WHO Air Quality Guidelines 2021	Compliance
$PM_{2.5}$ µg m^{-3}	Belfast Centre Derry Rosemount Lisburn Dunmurry Seymour Hill Lough Navar North Down Holywood A2	Annual Mean	25	Compliant	20	Compliant	5	Non-compliant at all sites except Lough Navar
		24 hour	–	–	–	–	15	Non-compliant at all sites except Lough Navar
PM_{10} µg m^{-3}	Armagh Lonsdale Road Ballymena Ballykeel Belfast Centre Belfast Stockman's Lane Derry Rosemount Lisburn Dunmurry Seymour Hill Lough Navar Newry Canal Street Newtownstewart North Down Holywood A2 Strabane Springhill Park Strathfoyle Bawnmore Place	Annual Mean	40	Compliant	40	Compliant	15	Non-compliant at the following sites: Armagh Lonsdale road Belfast Stockman's Lane Newry Canal Street
		24 hour	50 (not to be exceeded more than 35 times a year)	Compliant	50 (not to be exceeded more than 35 times a year)	Compliant	45	Compliant
O_3 µg m^{-3}	Derry Rosemount Lough Navar Belfast Centre	8-hour	120 (not to be exceeded more than 25 times a year, averaged over 3 years)	Compliant	100 (not to be exceeded more than 10 times a year)	Compliant	100	Non-compliant at all sites
NO_2 µg m^{-3}	Armagh Lonsdale Road Ballymena Antrim Road Ballymena Ballykeel Belfast Centre Belfast Newtownards Road Belfast Ormeau Road Belfast Stockman's Lane Belfast Westlink Roden Street Castlereagh Dundonald Derry Dale's Corner Derry Rosemount Downpatrick Roadside Limavady Dungiven Newry Canal Street Newtownabbey Antrim Road North Down Holywood A2	Annual Mean	40	Compliant	40	Compliant	10	Non-compliant at all sites except Derry Rosemount
		24 hour	–	–	–	–	25	Non-compliant at all sites
		1 hour	200 (not to be exceeded more than 18 times a calendar year)	Compliant	200 (not to be exceeded more than 18 times a calendar year)	Compliant	–	–
SO_2 µg m^{-3}	Ballymena Ballykeel Belfast Centre Derry Rosemount Strabane Springhill Park	24 hour	125 (not to be exceeded more than 3 times a year)	Compliant	125 (not to be exceeded more than 3 times a year)	Compliant	40	Compliant
CO mg m^{-3}	Belfast Centre	8 hour	10	Compliant	10	Compliant	–	–
		24 hour	–	–	–	–	4	Compliant

5. Air Quality Changes Over Time

The Air Pollution in Northern Ireland report for 2020 looked at how NO_2 concentrations in Northern Ireland have changed over the past decade. For this report the trends in Particulate Matter (PM_{10} and $PM_{2.5}$) concentrations have been compared with UK average trends provided by Defra[9].

In Northern Ireland a large source of particulate matter is from residential combustion (e.g. solid fuel burning).

Particulate Matter as PM_{10}: Emissions of PM_{10} in Northern Ireland were estimated to be 8.7kt in 2019 and accounted for 5.1% of the UK total. The main sources were Residential, Commercial & Public Sector Combustion (42%), Industrial Combustion (18%) and Agriculture (16%)[10]. Figure 5.1 shows the annual mean concentrations of PM_{10}, measured at urban traffic and urban background sites in Northern Ireland since 2012, along with the UK average concentrations.

PM_{10} annual mean concentrations measured in Northern Ireland at urban background locations in 2021, were similar to, or below the UK average concentration at urban traffic and urban background locations.

A general downward trend is observed in PM_{10} concentrations for many sites in Northern Ireland, since 2012. A Theil-Sen trend analysis (not shown here) shows significant downward trends (statistically significant at 0.1%) for Ballymena Ballykeel, Belfast Centre, Belfast Stockman's Lane, Lisburn Dunmurry Seymour Hill, Newry Canal Street, North Down Holywood A2 and Strabane Springhill Park between 2012 and 2021.

On average, annual mean PM_{10} concentrations measured at urban traffic locations are typically higher than those measured at urban background sites. This is likely due to the contribution of emissions from road transport (both exhaust emissions, and non-exhaust emissions like tyre and brake dust). However, this is not always the case. For example, annual mean concentrations at Strabane Springhill Park (an urban background site), have often been similar to or even higher than those measured at North Down Holywood A2 (a roadside site) over the past decade, as shown in Figure 5.2. In Northern Ireland a large source of particulate matter is residential combustion (e.g. solid fuel burning as the main or supplementary source of heating in households). The monitoring site at Strabane Springhill Park is located within a residential area, therefore elevated PM_{10} concentrations observed at this site may be due to emissions from residential heating in the area. The impact of residential solid fuel burning on PM emissions is discussed in more detail in Section 6 below.

[9] https://www.gov.uk/government/statistics/air-quality-statistics

[10] Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 2005-2019 https://naei.beis.gov.uk/data/das?view=by-source

Figure 5.1: Comparison of annual mean concentrations of PM_{10} at urban traffic and urban background sites (with a data capture > 75% for each year) in Northern Ireland (solid lines) to the UK average (dashed line), from 2012 to 2021

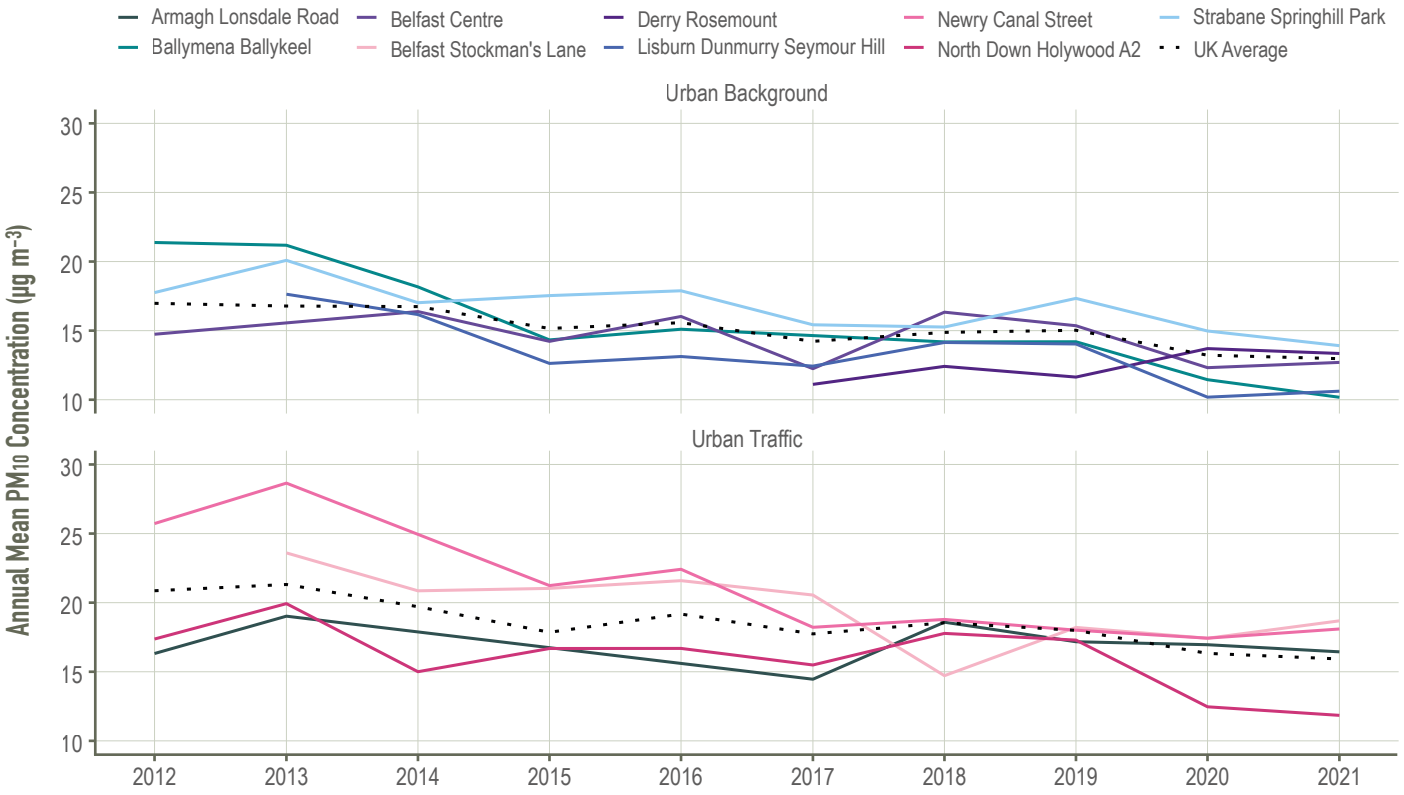
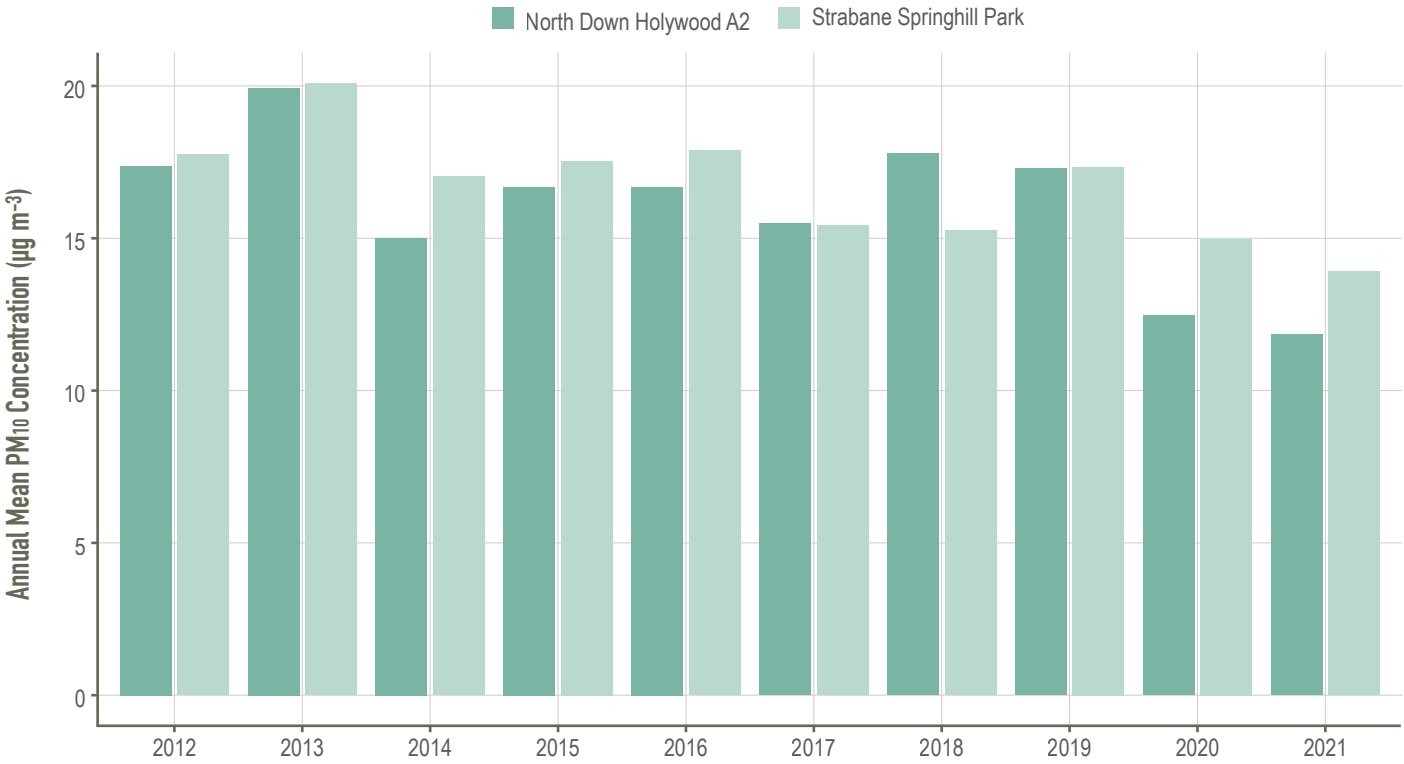


Figure 5.2: Comparison of annual mean concentrations of PM_{10} at North Down Holywood A2 and Strabane Springhill Park from 2012 to 2021

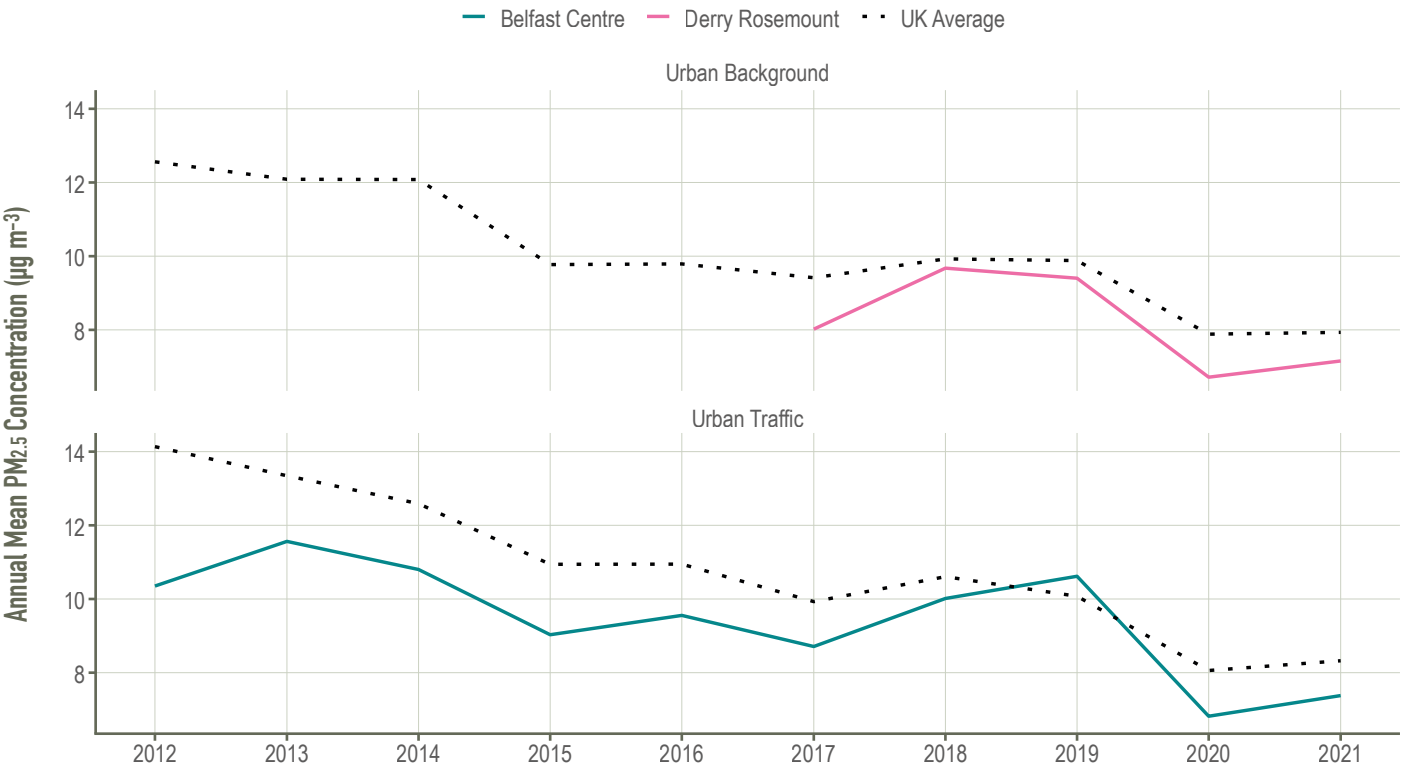


Particulate Matter as $PM_{2.5}$: Emissions of $PM_{2.5}$ in Northern Ireland were estimated to be 6.3kt in 2019 and accounted for 5.8% of the UK total. The main sources were Residential, Commercial & Public Sector Combustion (56%), Industrial Combustion (24%) and Transport (9%)[11]. Figure 5.3 shows the annual mean concentrations of $PM_{2.5}$, measured at Belfast Centre (an urban centre site) and Derry Rosemount (an urban background site), along with the UK average concentrations for urban traffic and urban background sites.

Between 2017 (when measurements first began) and 2021, annual mean $PM_{2.5}$ concentrations measured at Derry Rosemount show a similar pattern to the UK average, with a rapid decrease from 2019 to 2020, followed by a small increase again in 2021. Concentrations at Derry Rosemount were consistently below the UK average.

The $PM_{2.5}$ annual mean concentrations measured at Belfast Centre follows a similar pattern to the UK average for urban traffic sites between 2012 and 2021, as shown in Figure 5.3. With the exception of 2019, the annual mean $PM_{2.5}$ is lower at Belfast Centre than the UK average. A lower concentration is expected, as the Belfast site is located approximately 15 metres from the nearest road, therefore is likely to be less influenced by traffic emissions than urban traffic sites located closer to the road.

Figure 5.3: Comparison of annual mean concentrations of $PM_{2.5}$ at an urban traffic and urban background site (with a data capture > 75% for each year) in Northern Ireland (solid lines) to the UK average (dashed line), from 2012 to 2021



[11] Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 2005-2019 https://naei.beis.gov.uk/data/das?view=by-source

6. Domestic Solid Fuel Burning in Northern Ireland

Solid fuel burning in Northern Ireland was previously discussed in Section 6 of the Air Pollution in Northern Ireland 2017 report[12]. This subject has been revisited here with more recent data to investigate the current impact of solid fuel burning in households on air quality in Northern Ireland.

Emissions from households was also included as a chapter of the Clean Air Strategy for Northern Ireland – Public Discussion Document[13] issued to public consultation on 23rd November 2020 and closed on 15th February 2021.

Solid fuel burning is a source of many air pollutants such as particulate matter, sulphur dioxide, nitrogen oxides, black carbon, carbon monoxide, volatile organic compounds (VOCs) and PAHs. The amount of pollutant emitted varies considerably with the type of fuel used. Table 6.1 shows emission factors for various pollutants in grammes of pollutant per unit energy (net) derived for different fuel types used in domestic heating. Charcoal, coal, peat and wood have the highest emission factors for PM_{10}, $PM_{2.5}$ and black carbon than other fuels. These fuels along with Solid Smokeless Fuel (SSF) (manufactured smokeless fuels) also have the highest emissions factors of B[a]P.

Portstewart, Northern Ireland

[12] 0369_DAERA_Air_Pollution_Report_2017_screen_Feb_19.pdf (airqualityni.co.uk)
[13] https://www.daera-ni.gov.uk/clean_air_strategy_discussion_document

The amount of pollutant emitted also depends on the type of appliance used in the home. Specially designed eco-stoves approved by Defra under the Ecodesign for Energy-Related Products Regulations 2010[14] are much cleaner than open-fire solid fuel burning. From 1st January 2022, all new stoves available for purchase in the UK are required by law to be "Ecodesign" stoves.

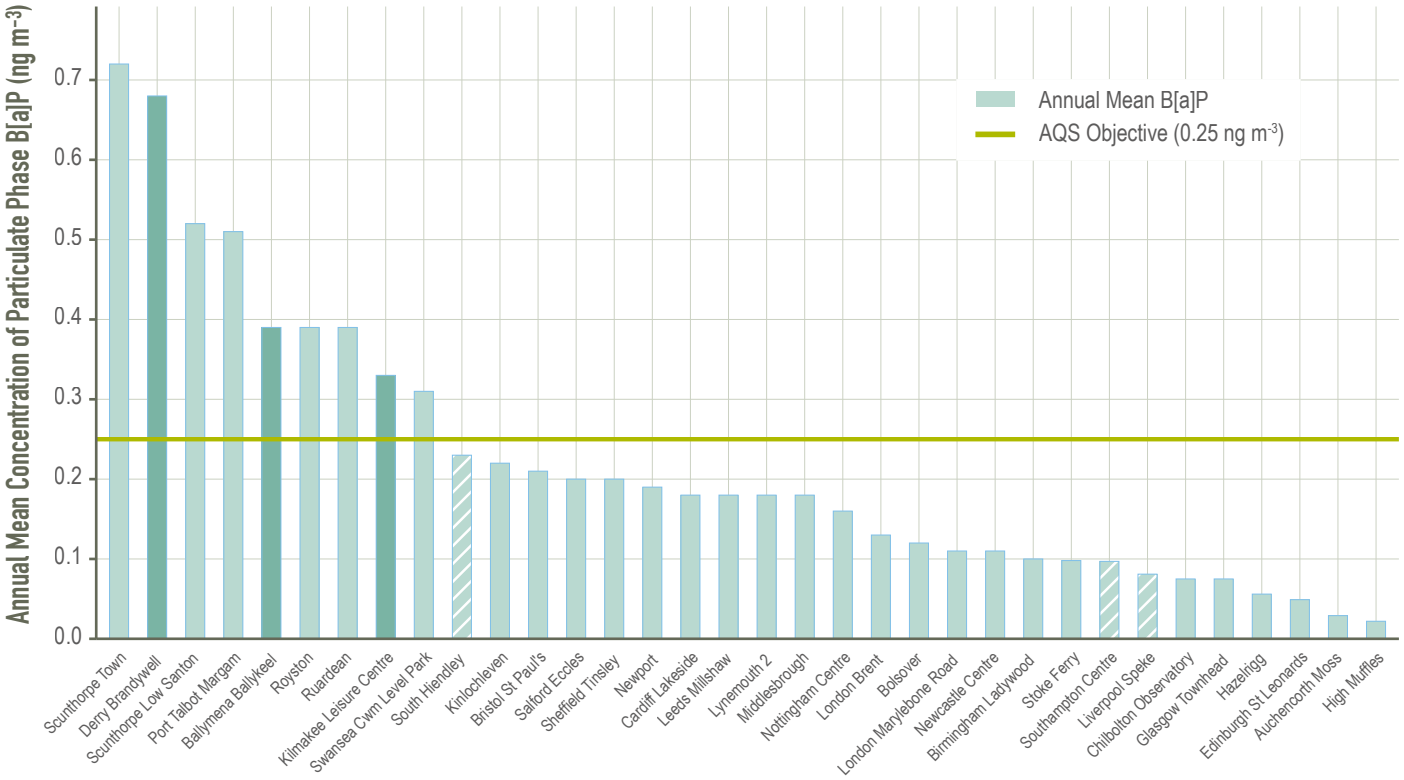
Table 6.1: Domestic fuel emission factors for 2020 for various pollutants in grammes of pollutant per unit energy (g/GJ(net))[15]

Fuel	PM_{10}	$PM_{2.5}$	Black carbon	NO_X	SO_2	B[a]P
Anthracite	57	57	5.6	134	408	9.2×10^{-4}
Burning oil	1.9	1.9	0.16	51	7.9	8.0×10^{-5}
Charcoal	263	256	18	100	11.0	4.4×10^{-2}
Coal	324	319	31	124	758	5.4×10^{-2}
Gas oil	1.9	1.9	0.16	51	6.4	8.0×10^{-5}
LPG	1.2	1.2	0.10	51	0.30	5.6×10^{-7}
Natural gas	1.2	1.2	0.06	20	0.30	5.6×10^{-7}
Peat	809	788	78	50	11	1.3×10^{-1}
Petroleum coke	57	57	4.8	134	4186	8.8×10^{-4}
Solid Smokeless Fuel (SSF)	57	57	5.6	134	515	1.1×10^{-2}
Wood	470	459	43	72	11	7.1×10^{-2}

[14] https://www.gov.uk/guidance/placing-energy-related-products-on-the-uk-market
[15] Emission factors detailed by source and fuel - NAEI, UK (beis.gov.uk)

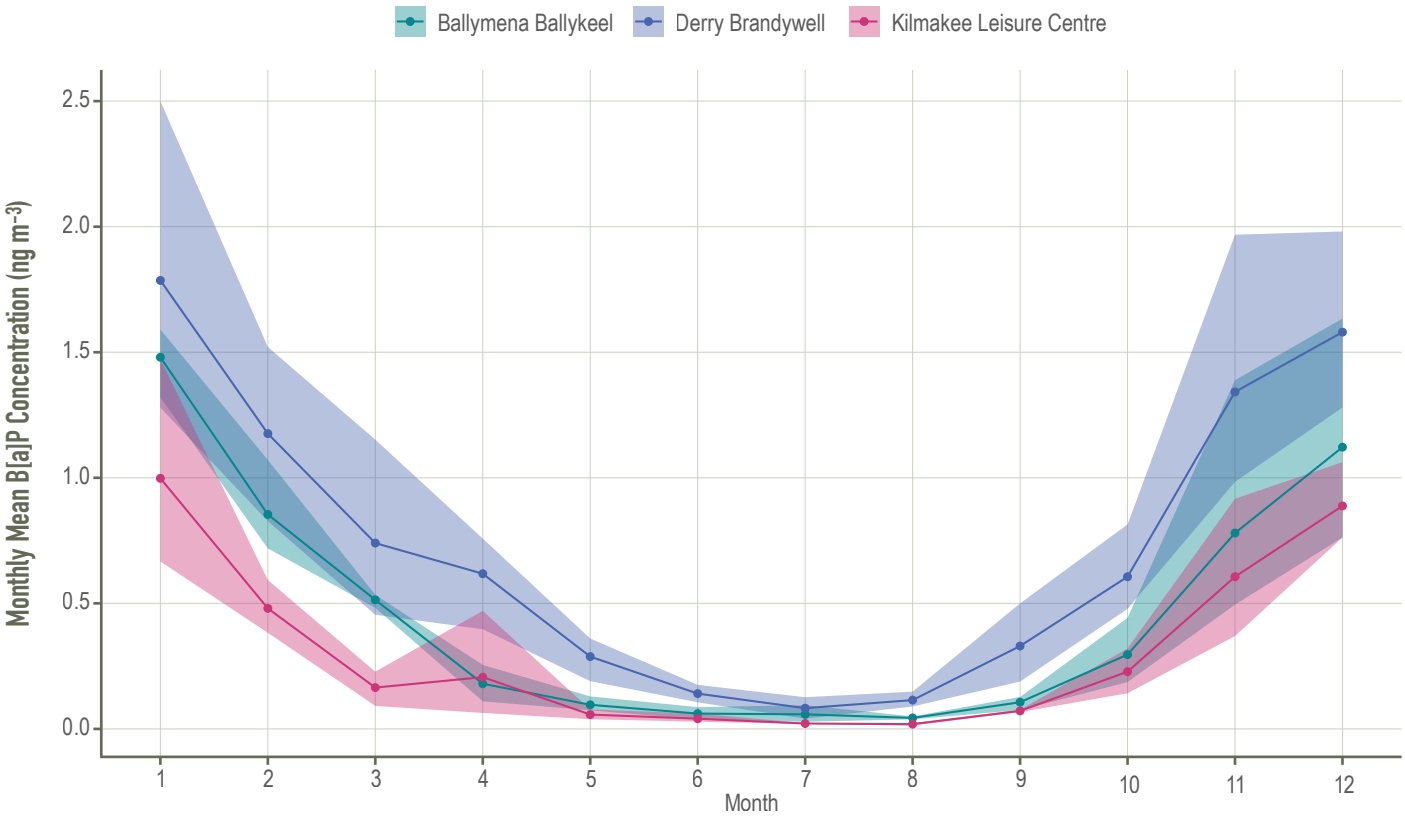
Benzo[a]pyrene (B[a]P): As shown in Section 4, B[a]P exceeded the annual mean AQS objective at all three sites in Northern Ireland in 2021. Comparing annual mean concentrations of B[a]P, with those in the UK PAH network, shows that all three sites in Northern Ireland are within the top eight of highest annual means in measured in the UK for 2021 (Figure 6.1).

Figure 6.1: Annual mean concentrations of B[a]P for 2021 measured at monitoring sites in the UK. Dark green bars represent the Northern Ireland monitoring sites. Striped bars represent sites with annual data capture < 75%



The average seasonal cycle for B[a]P between 2017 and 2021 (Figure 6.2) shows that concentrations measured at the three sites peak during the winter months, with a minimum in summer. During winter domestic heating activity is at its highest, and periods of cold stable weather conditions can lead to a build-up of pollutants. A study in 2012 identified solid fuel burning as the likely cause of the high B[a]P in Northern Ireland[16]. However, Northern Ireland's new Energy Strategy - Path to Net Zero Energy[17] was published by the Department for the Economy (DfE) in December 2021 after being agreed by the Executive and sets out a commitment to "phase out coal and certain solid fuels for home heating". This means that future levels of B[a]P have the potential to be reduced following any future restrictions which may be brought in by DfE with regards residential burning of coal and certain other solid fuels.

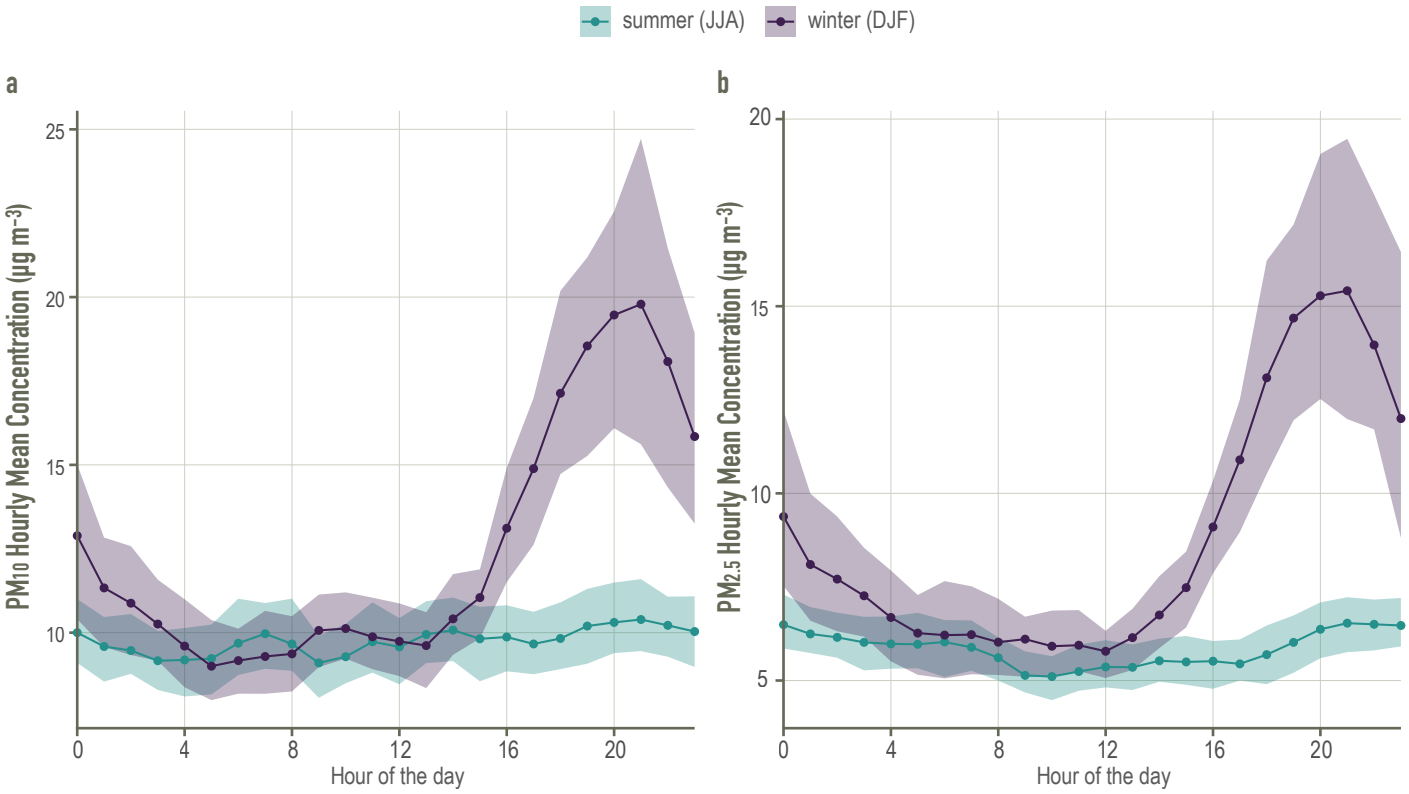
Figure 6.2: Average monthly concentrations of Benzo[a]pyrene for 2017-2021 measured in Northern Ireland. Shaded regions represent the 95th percentile of the mean



Particulate matter: Domestic combustion activities are a large source of particulate matter in Northern Ireland. The NAEI emissions estimates for PM_{10} and $PM_{2.5}$ from domestic combustion in 2019 in Northern Ireland were 3.39 kt and 3.31 kt, respectively, accounting for 39% of the total PM_{10} emissions and 53% of the $PM_{2.5}$ emissions in Northern Ireland[18].

[16] Butterfield, D M; Brown, R J C (2012) Polycyclic aromatic hydrocarbons in Northern Ireland. NPL Report. AS 66
[17] https://www.economy-ni.gov.uk/publications/energy-strategy-path-net-zero-energy
[18] NAEI: Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990-2019 https://naei.beis.gov.uk/data/das?view=by-source

Figure 6.3: Diurnal graph of hourly averaged concentrations of a) PM_{10} and b) $PM_{2.5}$ for winter and summer months in 2021, measured at Lisburn Dunmurry Seymour Hill. Shaded regions represent the 95th percentile of the mean



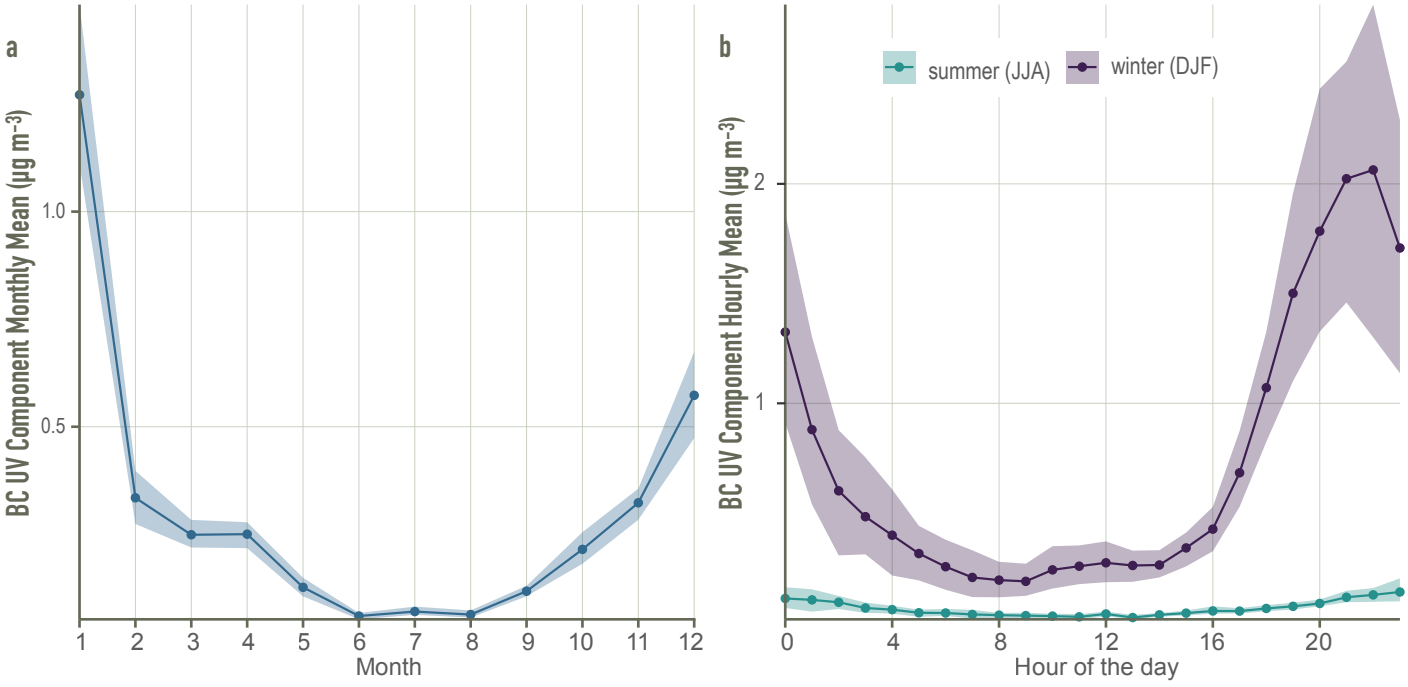
As expected, domestic combustion emissions are typically highest during the winter months. Figure 6.3a shows diurnal variation (that is, variation over the course of a day) in the average hourly PM_{10} concentrations for summer (June, July, August) and winter (December, January, February) months, measured at Lisburn Dunmurry Seymour Hill in 2021. The average hourly PM_{10} during the summer varies by a few µg m^{-3} over the day, whereas during winter, a large peak in PM_{10} is observed between 8-9 pm. The same diurnal pattern is observed for $PM_{2.5}$ at the same site (Figure 6.3b). Lisburn Dunmurry Seymour Hill is an urban background site, located in a residential area, therefore the elevated concentrations of PM in the evening during winter are likely due to residential heating emissions.

Belfast, Northern Ireland

Black Carbon: Black carbon (BC) is measured using an automatic instrument known as an aethalometer, at three sites in Northern Ireland as part of the UK Black Carbon Monitoring Network. The aethalometer works by measuring the amount of light absorbed at different wavelengths as it passes through a sample deposited on a filter. The "UV component" of the measurement from an aethalometer is a useful indicator for PAHs present in the BC sample.

Figure 6.4a shows the monthly averaged UV component of BC measured at Kilmakee Leisure Centre in 2021. A distinct seasonal pattern can be observed with higher concentrations in the winter and a minimum in the summer. A diurnal graph of hourly averaged UV component of BC for summer and winter in 2021 at the same site is shown in Figure 6.4b. Similar to PM_{10} and $PM_{2.5}$, the concentrations of the UV component show a clear peak in the evening during winter, which is less obvious during the summer, suggesting a residential heating is a source of PAHs.

Figure 6.4: a) Monthly averaged concentrations and b) hourly averaged concentrations for winter and summer months of the UV component of BC measured at Kilmakee Leisure Centre. Shaded regions represent the 95th percentile of the means



Sulphur Dioxide (SO_2): As a result of restrictions on the sulphur content of fuels and the phasing out of coal-fired power stations, ambient SO_2 concentrations in the UK have decreased dramatically over the past few decades. Domestic combustion is now the largest source of SO_2, contributing approximately 38% of total SO_2 emissions in Northern Ireland, based on the 2019 NAEI estimates. As shown in Table 6.1, anthracite, coal, petroleum coke and SSF are the highest emitters of SO_2, when compared to the other household heating fuels.

Smoke Control Areas (SCA) and Energy Efficiency Schemes

To reduce pollution from solid-fuel burning, local authorities may declare areas as Smoke Control Areas (SCAs). Within a SCA, only smokeless fuels or authorised fuels are allowed to be burned unless an exempt appliance is being used. Further information on the authorised fuels and exempt appliances for Northern Ireland can be found here https://www.daera-ni.gov.uk/articles/air-pollution#toc-6. With the exception of Mid Ulster and Fermanagh and Omagh, all other districts in Northern Ireland have at least one SCA declared.

Various schemes have been implemented to improve the energy efficiency of housing, thereby reducing the need for supplementary heating using solid fuels. These include:

- The Affordable Warmth Scheme - to provide help for low-income households in improving the energy efficiency of their home. To find out more, please visit: https://www.nihe.gov.uk/Housing-Help/Affordable-Warmth-Boiler-Replacement/Affordable-Warmth-Scheme
- The Boiler Replacement Scheme - provides grants to those who qualify to upgrade old boilers (over 15 years old). To find out more, please visit: https://www.nihe.gov.uk/Housing-Help/Affordable-Warmth-Boiler-Replacement/Boiler-replacement-Scheme
- Northern Ireland Sustainable Energy Programme (NISPEP) - includes a number of schemes to improve energy efficiency in buildings for both domestic homes and businesses. The priority is for low-income households. Further information on the schemes for 2022/2023 can be found here: https://www.uregni.gov.uk/news-centre/nisep-list-schemes-20222023-published

DAERA are continuing to address emissions of pollutants from solid fuel burning in households. The Clean Air Strategy for Northern Ireland Public Discussion Document (see Section 7 for more information) outlines potential actions to control solid fuel burning emissions. In addition to this, the Northern Ireland Energy Strategy alongside its 2022 Action Plan[19] includes actions to "Replace high carbon heating sources with lower and zero carbon sources in households and businesses", "Launch a domestic energy efficiency scheme" and "Phase out coal and certain solid fuels for home heating". DfE is leading on these actions which are primarily aimed at reducing carbon emissions, however, they will also have an impact on reducing emissions from air pollutants.

[19] https://www.economy-ni.gov.uk/sites/default/files/publications/economy/energy-strategy-path-to-net-zero-action-plan.pdf

7. Measures, Initiatives and Reports

Environment Strategy for Northern Ireland: In November 2021, the Department of Agriculture, Environment & Rural Affairs (DAERA) launched a consultation exercise on Northern Ireland's first overarching Environment Strategy at the UN Climate Change Conference of the Parties (COP26) in Glasgow, found here: https://www.daera-ni.gov.uk/sites/default/files/consultations/daera/Draft%20Environment%20Strategy.PDF. 336 responses were received by the closing date of 18 January 2022. The draft Strategy sets out 6 Strategic Environmental Outcomes (SEOs). The Strategy covers Air Quality under SEO1: "Excellent air, water, land & neighbourhood quality", with a focus on providing cleaner air in Northern Ireland and reducing pollutants via the forthcoming 'Clean Air Strategy' and 'Ammonia Strategy'. The draft Strategy has been revised to take into account comments received from stakeholders and the Agriculture, Environment and Rural Affairs (AERA) Committee, and a summary report of the consultation responses was published in March 2022 and can be found here: https://www.daera-ni.gov.uk/publications/environment-strategy-northern-ireland-summary-consultation-responses. The final Executive endorsed Environment Strategy cannot be published until it has received final sign-off from the Northern Ireland Executive.

The Clean Air Strategy: Work is progressing well within DAERA on the development of Northern Ireland's first Clean Air Strategy. In autumn 2020, a Discussion Document was issued to public consultation. It invited views on a range of matters relating to air quality and was an opportunity for stakeholders to put ideas to the Department. The consultation closed in spring 2021 and responses were analysed in detail. A synopsis of the responses was published in June 2022 and is available to view at: https://www.daera-ni.gov.uk/clean_air_strategy_discussion_document. An inter-departmental working group has been established to further develop proposals and identify policies for cross-departmental consideration and inclusion within the final Strategy. The Draft Clean Air Strategy is to be drafted in Autumn 2022. A further public consultation is planned, to seek views on the proposed draft strategy. While work is progressing well at an official level, Northern Ireland currently does not have a functioning Executive, which may impact the planned timeline for this strategy.

Since 2017, the trend in Ammonia emissions has plateaued with increases in total emissions from dairy cattle offset by declines in total emissions from beef cattle.

Ammonia Reduction: Northern Ireland is a relatively high contributor to ammonia emissions. Agriculture is the main source of ammonia emissions in Northern Ireland, accounting for 97% of the total ammonia emissions in 2019. In 2019, Northern Ireland accounted for 12% of the UK's total ammonia emissions despite having only 3% of the UK's population and 6% of the UK's land mass. Ammonia emissions in Northern Ireland peaked in the mid-1990s and by 2010, ammonia emissions were 17% less than they had been in 1996. From 2010 to 2017 ammonia emissions increased by 16% due primarily to a trend of increasing livestock numbers, greater use of indoor housing systems, and insufficient uptake of ammonia reduction measures.

Carrickfergus Castle

Since 2017, the trend has plateaued with increases in total emissions from dairy cattle offset by declines in total emissions from beef cattle. DAERA is developing an ammonia strategy to achieve sustained and tangible reductions in ammonia emissions which will facilitate a flourishing environment and a sustainable and prosperous farming sector, while facilitating the development of a successful agri-food sector.

The new **Energy Strategy – The Path to Net Zero Energy**[20] was published in December 2021 after being agreed by the Executive. It outlines a roadmap to 2030 aiming to deliver a 56% reduction in our energy-related emissions, on the pathway to deliver the 2050 vision of net zero carbon and affordable energy. An Annual Action Plan[21] was subsequently published in January 2022 outlining twenty-two specific actions to be taken to support the delivery of the Energy Strategy.

Throughout the development of this strategy DfE worked closely with a broad representation of energy consumers, businesses, government and the energy industry. An expert panel, bringing together expertise from across the UK and Republic of Ireland, has also supported this work. The Energy Strategy will provide the confidence to invest in infrastructure and the workforce and give clear signals for industry and consumers.

Green Growth Strategy for Northern Ireland: DAERA is leading on the development of the Executive's multi-decade Green Growth Strategy[22]. Green Growth means using the move from a high to a low greenhouse gas emissions society to improve people's quality of life through green jobs and a clean environment. Through tackling climate change together, we can deliver outcomes which will contribute to a resilient, greener, low carbon and circular economy for Northern Ireland. Therefore, the aim of the Green Growth Strategy will be to ensure future Government policy making has climate and environment action at its core and therefore will set out the long-term vision, ambition and a solid framework for tackling the climate crisis in the right way.

The last Executive approved the draft strategy for consultation in advance of the COP26 last year. Analysis of the feedback from the consultation and an associated EQIA has been used to amend the Strategy which has also been adjusted to align with the new Climate Change Act (NI) 2022. Due to the cross-cutting nature of the Green Growth Strategy, final approval has not yet been possible due to the absence of a functioning Executive.

[20] https://www.economy-ni.gov.uk/publications/energy-strategy-path-net-zero-energy
[21] The Path to Net Zero Energy. Safe. Affordable. Clean. (economy-ni.gov.uk)
[22] https://www.daera-ni.gov.uk/consultations/consultation-draft-green-growth-strategy-northern-ireland

However, attention is now focused on development of a Climate Action Plan, in line with the target set within the new Climate Change legislation. The Action Plan will set out in more detail the actions that will be taken to meet sector-specific greenhouse gas emission targets. Inter-departmental working and stakeholder engagement will continue to be an important element throughout the development of the Action Plan.

Climate Change Act (Northern Ireland) 2022: The Climate Change Act (Northern Ireland) 2022 ("the Act") came into operation on 7th June 2022. The Act sets out the Northern Ireland-specific legal framework for tackling climate change and reducing emissions. It sets a Northern Ireland net zero greenhouse gas emissions target by 2050, along with interim targets for 2040 and 2030, with a level for the reduction of methane emissions for the year 2050 now required to be more than 46% lower than the baseline. The Act also requires annual air quality targets to be set in five-yearly Climate Action Plans, the first of which is expected to be published by DAERA in December 2023.

Planning for the Future of Transport – Time for Change outlines how the Department for Infrastructure's priorities for the future of transport here can be supported by the improved planning, management and development of the transport networks over the next 10 to 15 years.

We will reduce carbon by reducing how much we travel and by using more energy efficient modes and active modes where possible.

We will take full account of the structured hierarchy in reducing the carbon impact of transport in the order of:

- Substitute trips
  - Remove them completely
  - Shorten them;
- Shift modes (increase the percentage of journeys made by walking, wheeling, cycling or public transport
  - Use a more energy efficient mode of transport;
  - By increasing the percentage of journeys made by walking, wheeling, cycling or public transport.
- Switch fuels
  - Use zero or less carbon intensive fuels

Exploration will be taken forward of other, more energy efficient modes of transport, through mobility innovation with new technologies and enhanced mobility choices such as Micro-mobility (e-scooters and e-bikes); Mobility as a service (MaaS, technology that provides the opportunity for digital services); Shared mobility (car-sharing/pooling, bike-sharing and ride); and Dynamic demand responsive transport (shared public transport that respond to passenger demands for pick-up and drop-off).

In respect of public transport, the Department for Infrastructure has been supporting Translink, the public transport body for Northern Ireland, to green its fleet. This includes replacing approximately 100 diesel buses with zero emission vehicles by December 2022 and removing all diesel buses in Belfast Metro service by 2030.

In addition, an additional order for 38 electric vehicles to bring the Derry City urban fleet to full zero emission was placed in 2021 whilst, 1500 additional Bus & Rail Park and Ride spaces will be available across Northern Ireland by 2023.

In partnership, Translink and the Department for Infrastructure have already delivered Phase 1 of the Belfast Rapid Transport project (BRT Glider) and the development of Phase 2 of the project is under consideration following conclusion of a public consultation on route options. In addition a new integrated Transport Hub for Belfast is being developed. Further strategic projects are also being advanced.

M2 Motorway, Northern Ireland

The Department has established a Blue/Green Infrastructure Fund, which supports a number of projects designed to encourage modal shift. Projects include walking and cycling schemes; capital grant funding for Local Councils to construct greenways; a pilot project with the overall aim of assessing the feasibility of using electric vehicles for Community Transport while also increasing awareness of Blue-Green energy across Northern Ireland; a pilot scheme to introduce electric vehicles into the Department's operational fleet and a pilot project to reduce use of petrol and diesel vehicles on Rathlin island as part of a wider Executive aim for the island to become carbon neutral by 2030.

When assessing potential investment, the Department carries out an Environmental Impact Assessment Report (EIAR) which is published for roads projects. EIAR includes an assessment of the potential impacts of the proposed scheme on local and regional air quality and pollution both during construction and operation.

Where to find out more about air quality

The Northern Ireland Air Quality Website at www.airqualityni.co.uk provides information covering all aspects of air pollution in Northern Ireland.

DAERA's website at https://www.daera-ni.gov.uk/ provides links to information on a range of environmental issues including biodiversity, waste and pollution. DAERA's 'Protect the Environment' web page at https://www.daera-ni .gov. uk/topics/protect-environment covers air quality, climate change and local environmental issues including noise.

National and local air quality forecasts are available from:

- The Defra UK Air Information Resource (UK-AIR) at http://uk-air.defra.gov.uk/
- The Northern Ireland Air Quality website www.airqualityni.co.uk.

Download the Northern Ireland Air app for iPhone and Android, keeping you updated about air pollution in Northern Ireland.

The app provides:

- Easy access to the latest pollution levels from the monitoring sites
- Colour coded map showing the pollution forecasts
- Approved health advice based on the pollution levels
- Subscribe to free alerts when moderate, high and very high pollution is forecast.

DAERA, in conjunction with Department of Health, launched the updated "Air Aware" SMS subscription service on 16th June 2022. The service allows members of the public to receive SMS text alerts when periods of high air pollution are forecast or being experienced in Northern Ireland. The service is targeted at those with chronic health conditions such as heart disease and lung disease and can be initiated by texting '**AIR**' to **07984405722**.

For information on air quality issues in your local area please contact the Environmental Health Department of your district council: https://www.nidirect.gov.uk/contacts/local-councils-in-northern-ireland.

Department of
Agriculture, Environment and Rural Affairs
www.daera-ni.gov.uk

RICARDO

This report has been produced by Ricardo Energy & Environment on behalf of the Department of Agriculture, Environment and Rural Affairs

Air Aware

Do you suffer from a chronic illness that affects your breathing?

You can receive alerts FREE to your mobile phone to let you know when air pollution levels are high.

Just text Air to 079 8440 5722 or download the Northern Ireland Air App

If you use regular treatment for respiratory problems and think your breathing may be affected by air pollution levels, consider adjusting your treatment as you would do for a normal increase in symptoms. If this is not effective, consult your doctor.

You may wish to consider avoiding busy, congested streets and not participating in strenuous outdoor activity on days when air pollution levels are high.

If you suffer from a heart condition and notice a change in your symptoms, you should seek medical advice as you normally would.

Northern Ireland Air
Air Quality in Northern Ireland

ANDROID APP ON Google play

Download on the App Store

For more information visit: www.airqualityni.co.uk

Text messages to the service will be charged at your normal standard rate. Alerts are received free of charge. To opt out, text STOPAIR to 079 8440 5722

Department of Agriculture, Environment and Rural Affairs
www.daera-ni.gov.uk

Department of Health
www.health-ni.gov.uk

DMS 21.22.228