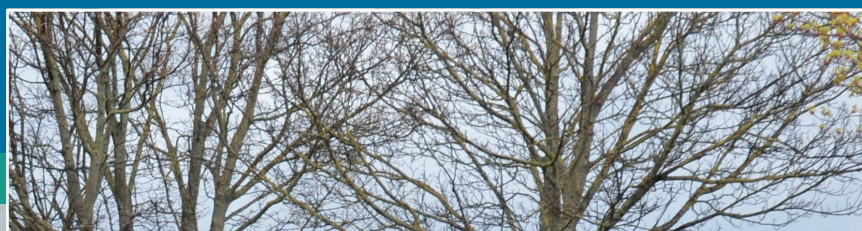


Air Quality in Ireland 2020



ENVIRONMENTAL PROTECTION AGENCY

The Environmental Protection Agency (EPA) is responsible for protecting and improving the environment as a valuable asset for the people of Ireland. We are committed to protecting people and the environment from the harmful effects of radiation and pollution.

The work of the EPA can be divided into three main areas:

Regulation: *We implement effective regulation and environmental compliance systems to deliver good environmental outcomes and target those who don't comply.*

Knowledge: *We provide high quality, targeted and timely environmental data, information and assessment to inform decision making at all levels.*

Advocacy: *We work with others to advocate for a clean, productive and well protected environment and for sustainable environmental behaviour.*

Our Responsibilities

Licensing

We regulate the following activities so that they do not endanger human health or harm the environment:

- waste facilities (e.g. landfills, incinerators, waste transfer stations);
- large scale industrial activities (e.g. pharmaceutical, cement manufacturing, power plants);
- intensive agriculture (e.g. pigs, poultry);
- the contained use and controlled release of Genetically Modified Organisms (GMOs);
- sources of ionising radiation (e.g. x-ray and radiotherapy equipment, industrial sources);
- large petrol storage facilities;
- waste water discharges;
- dumping at sea activities.

National Environmental Enforcement

- Conducting an annual programme of audits and inspections of EPA licensed facilities.
- Overseeing local authorities' environmental protection responsibilities.
- Supervising the supply of drinking water by public water suppliers.
- Working with local authorities and other agencies to tackle environmental crime by co-ordinating a national enforcement network, targeting offenders and overseeing remediation.
- Enforcing Regulations such as Waste Electrical and Electronic Equipment (WEEE), Restriction of Hazardous Substances (RoHS) and substances that deplete the ozone layer.
- Prosecuting those who flout environmental law and damage the environment.

Water Management

- Monitoring and reporting on the quality of rivers, lakes, transitional and coastal waters of Ireland and groundwaters; measuring water levels and river flows.
- National coordination and oversight of the Water Framework Directive.
- Monitoring and reporting on Bathing Water Quality.

Monitoring, Analysing and Reporting on the Environment

- Monitoring air quality and implementing the EU Clean Air for Europe (CAFÉ) Directive.
- Independent reporting to inform decision making by national and local government (e.g. *periodic reporting on the State of Ireland's Environment and Indicator Reports*).

Regulating Ireland's Greenhouse Gas Emissions

- Preparing Ireland's greenhouse gas inventories and projections.
- Implementing the Emissions Trading Directive, for over 100 of the largest producers of carbon dioxide in Ireland.

Environmental Research and Development

- Funding environmental research to identify pressures, inform policy and provide solutions in the areas of climate, water and sustainability.

Strategic Environmental Assessment

- Assessing the impact of proposed plans and programmes on the Irish environment (e.g. *major development plans*).

Radiological Protection

- Monitoring radiation levels, assessing exposure of people in Ireland to ionising radiation.
- Assisting in developing national plans for emergencies arising from nuclear accidents.
- Monitoring developments abroad relating to nuclear installations and radiological safety.
- Providing, or overseeing the provision of, specialist radiation protection services.

Guidance, Accessible Information and Education

- Providing advice and guidance to industry and the public on environmental and radiological protection topics.
- Providing timely and easily accessible environmental information to encourage public participation in environmental decision-making (e.g. *My Local Environment, Radon Maps*).
- Advising Government on matters relating to radiological safety and emergency response.
- Developing a National Hazardous Waste Management Plan to prevent and manage hazardous waste.

Awareness Raising and Behavioural Change

- Generating greater environmental awareness and influencing positive behavioural change by supporting businesses, communities and householders to become more resource efficient.
- Promoting radon testing in homes and workplaces and encouraging remediation where necessary.

Management and structure of the EPA

The EPA is managed by a full time Board, consisting of a Director General and five Directors. The work is carried out across five Offices:

- Office of Environmental Sustainability
- Office of Environmental Enforcement
- Office of Evidence and Assessment
- Office of Radiation Protection and Environmental Monitoring
- Office of Communications and Corporate Services

The EPA is assisted by an Advisory Committee of twelve members who meet regularly to discuss issues of concern and provide advice to the Board.

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1 Executive Summary

Air Quality and Health

Air pollution is the single biggest environmental health risk in Europe. It is estimated that there are approximately 1,300¹ premature deaths annually in Ireland due to poor air quality from fine particulate matter (PM_{2.5}). In September the WHO have further revised down their air quality guideline values² to protect human health, which highlights the need to improve air quality even further.

Monitoring carried out by the Environmental Protection Agency (EPA) in 2020 continues to highlight the need for action on the two key issues that have a negative impact on air quality in Ireland: emissions from the burning of solid fuels in our homes and transport emissions from vehicles in urban areas.

Ireland was compliant with EU legal limits in 2020, largely assisted by the reduction in traffic due to Covid-19 restrictions, however monitored levels were above the WHO air quality guideline values at 52 monitoring stations, largely due to the burning of solid fuel for home heating.

Particulate Matter

Particulate matter levels in 2020 continue to be a concern in villages, towns and cities. All solid fuels (e.g. coal, peat and wood) produce fine particulate matter emissions when burned in open fires or stoves. Fine particulate matter in our air greatly impacts respiratory and cardiovascular health. This is particularly problematic in or near villages, towns and cities because of the cumulative effects of multiple sources of the pollutant and the large numbers of people exposed.

Monitored levels of particulate matter were above WHO air quality guideline values at 38 of the 67 monitoring stations. (Table 1 outlines the overall compliance for all pollutants). Most of these were as a result of pollution from the burning of solid fuel for home heating.

The announcement that Dublin has become the first Irish city to sign up to the WHO Breathe Life campaign, which entails making a commitment to meeting the WHO guideline values by 2030 (Breathe Life, 2020), is a positive step for the future.

Home Heating

Moving to cleaner ways of heating our homes will significantly improve air quality in our villages, towns and cities. The EPA infographic on heating your home and its impact on air quality and health on page 8 outlines the spectrum of home heating choices. Any move along

¹ European Environment Agency (EEA) 2021

² This report makes reference and comparison to the 2005 WHO Air Quality Guideline Values only

the spectrum towards cleaner choices will reduce air pollution in your local area and will also reduce the linked negative health impacts.

The Government has announced that new regulations on the use of solid fuels will come into force in 2022 – all coal products sold will be required to be low-smoke and all wood sold for immediate use must have a moisture content of 25 per cent or less. This is a positive step for air quality, which will need to be supported by clear communications to ensure public engagement and the best outcome for air quality and health. The ‘ABC for Cleaner Air’ campaign, launched by the Department of Environment, Climate and Communications, highlights some simple steps we can all make and help reduce pollution from solid fuels. Air quality considerations also need to be integrated into planning decisions at national and local levels. This includes considering healthier home heating options at the design stage for new homes and large-scale home renovations.

Nitrogen dioxide

Monitored nitrogen dioxide levels were much reduced in 2020 when compared to previous years. Reductions of up to 50% compared to 2019 were observed at many traffic-oriented monitoring stations. Recent figures from the Central Statistics Office (CSO) show that traffic volumes have not yet returned to pre-Covid-19 levels, but 2021 traffic levels are not significantly less than 2019 levels. If we return to these pre-COVID traffic levels in 2022 we will face exceedances of the nitrogen dioxide EU limit value in our cities.

Transport

Key to reducing transport pollution and improving air quality in Ireland is decreasing traffic volumes on our roads. To achieve this, we must implement both a modal-shift to cycling and walking by upgrading infrastructure and the transport options (better and cleaner public transport and increasing the use of electric vehicles) as identified in the Government’s Climate Action Plan.

The Dublin Local Authorities are currently developing an action plan to deal with a nitrogen dioxide exceedance in 2019. This plan is due for submission to the European Commission before the end of 2021. This must be followed by full implementation.

The joint Departmental working group on Urban Transport Related Air Pollution (UTRAP) informed by the Department of Transport’s 5 Cities Demand Management Study will identify solutions for Dublin and our major urban centres.

National Ambient Air Quality Monitoring Programme (AAMP)

The EPA, working with local authorities and other public bodies has established 96 air monitoring stations, 18 of which were installed in 2020. Monitoring data from these stations is available in real time on the website www.airquality.ie and the data is used to inform

national policy to reduce public health impacts, and to meet Ireland's commitments to European reporting.

The EPA was successful in 2020 in gaining European funding for a project, LIFE Emerald, which will deliver Ireland's first national air quality forecast for the public. The EPA is also supporting citizen science projects such as the GLOBE project and Clean Air Together.

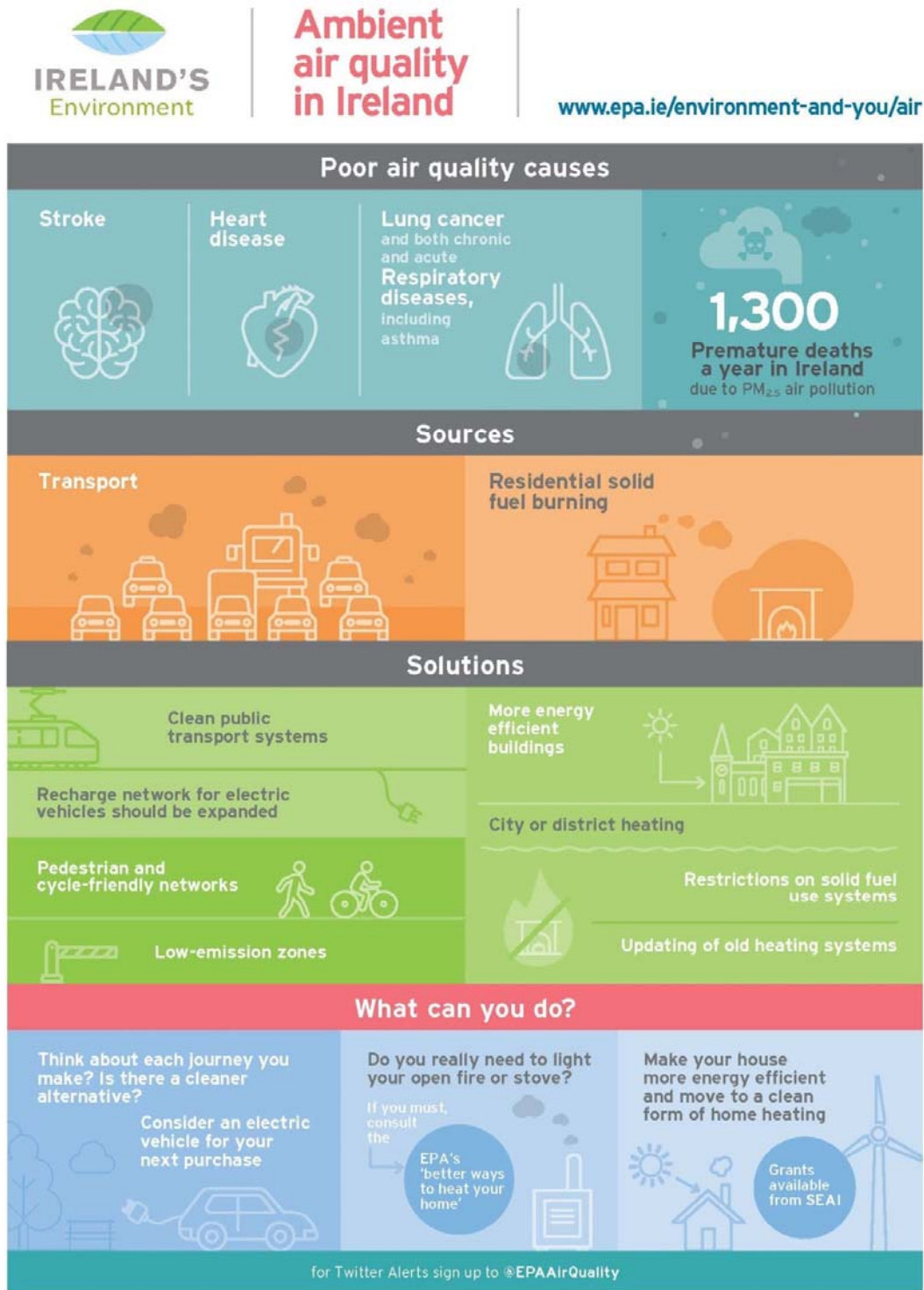
More information on the AAMP and these projects is detailed in Appendix 1.

Table 1 selected pollutants measured in 2020 and their adherence to EU legal limit values and WHO air quality guideline values

Pollutant	Number of stations where parameter monitored 2020	EU legal limit values	WHO Air Quality Guideline (AQG) level or EEA reference level
PM₁₀	67	No exceedances	Above annual WHO AQG value at 1 station. Above daily WHO AQG value at 14 stations
PM_{2.5}³	64	No exceedances	Above annual WHO AQG value at 9 stations. Above daily WHO AQG value at 34 stations
NO₂	27	No exceedances	Below WHO AQG values
Ozone	18	No exceedances	Above WHO AQG value at 17 stations
Sulphur dioxide (SO₂)	14	No exceedances	Above WHO AQG value at 3 stations
PAHs	5	No exceedances	Above EEA reference level at 4 stations
Heavy metals	5	No exceedances	N/A
Dioxins⁴	22	No exceedances	N/A
All other pollutants		No exceedances	

³ Ireland successfully achieved its 10% National Exposure Reduction Target (NERT) for PM_{2.5} in 2020. The NERT is a requirement under EU ambient air quality legislation.

⁴ Dioxins monitoring is not carried out at 'monitoring stations' but taken as samples in milk from selected creameries across Ireland



09/2021

Figure 1 Ambient air quality in Ireland

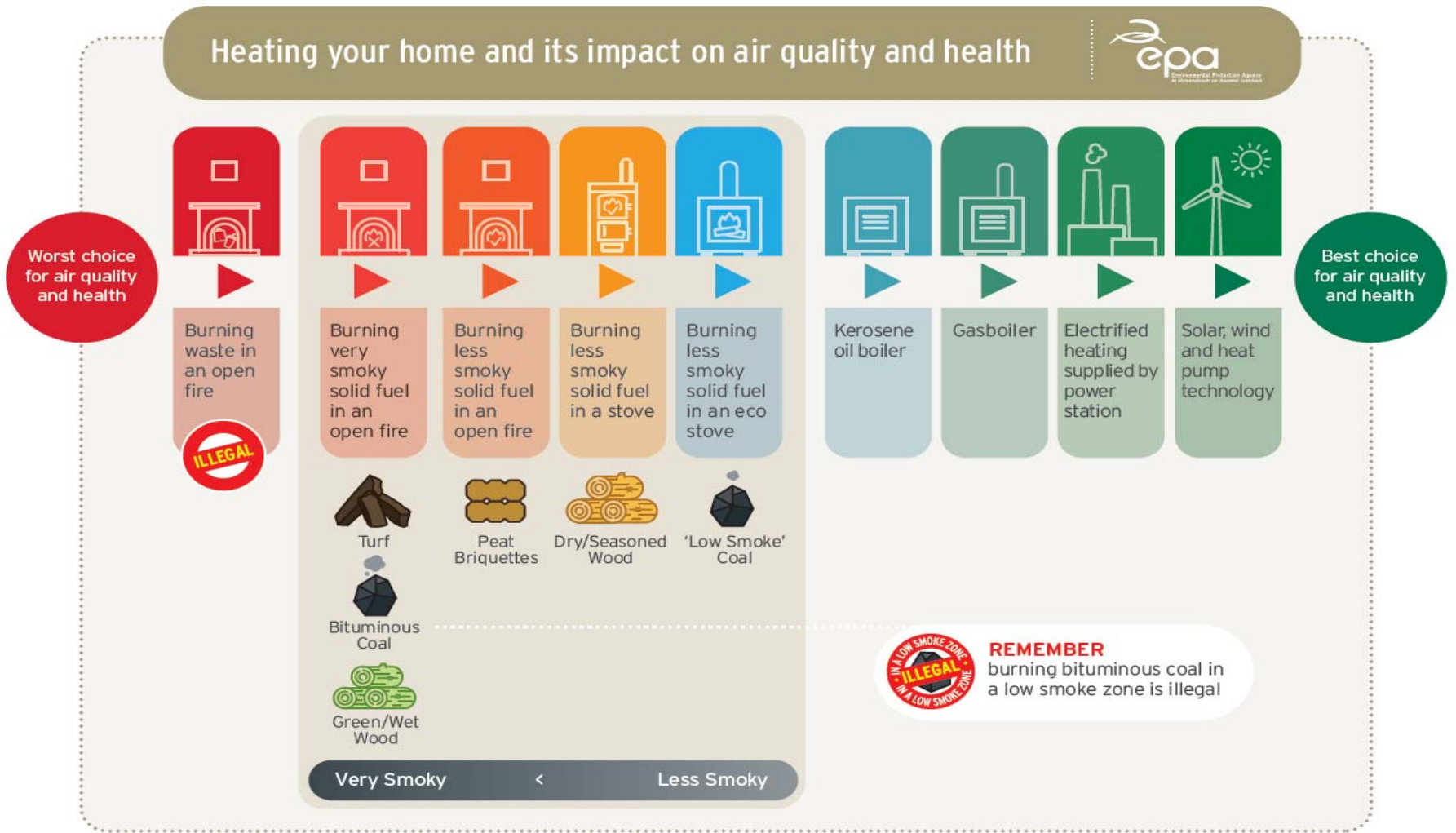


Figure 2 better ways to heat your home

2 Particulate matter

Particulate matter is the main pollutant of concern in Ireland. It is responsible for a broad range of health impacts and decreased quality of life, not only in this country but across the globe. In this section we describe what particulate matter is, its main sources in Ireland and what you can do to decrease particulate matter in your locality.

What is particulate matter?

Particulate matter (PM) consists of very small particles which can be solid or liquid. Some of these particles occur naturally, and many are man-made. The EPA monitors two types of PM and compares levels to limit values in the CAFE (Cleaner Air for Europe) Directive and WHO guidelines. These are PM₁₀ and PM_{2.5}.



What are the main sources of PM in Ireland?

In Ireland the main source – especially of the smaller and more impactful PM_{2.5} particles – is solid fuel burning for home heating. PM₁₀ can be made up of several sources, many of which can be natural sources such as pollen, or wind-blown sea salt and others are man-made sources such as pollution from road transport or construction activities.

Figure 3 shows the average concentrations of PM_{2.5} by hour of day, at selected monitoring stations in Ireland for 2020. This graph clearly shows that the times of high concentrations of PM_{2.5} coincide with times that people typically light fires and burn solid fuel to heat their homes (16:00 – 23:00). Figure 4 shows the average concentrations of PM_{2.5} by month of the year, at selected EU-level monitoring stations for 2020. This graph shows the impact of the ‘winter heating season’ on concentrations of fine particulate matter. The winter heating season is considered to run from October to March and is the period of the year when solid fuel burning for home-heating is more common.

Why is PM so bad?

While PM₁₀ can penetrate and lodge deep inside the lungs, PM_{2.5} is even more health-damaging because these tiny particles can penetrate the lung barrier and enter the blood system. Chronic exposure to particles contributes to the risk of developing cardiovascular and respiratory diseases, as well as of lung cancer. Small particulate pollution has health impacts even at very low concentrations – indeed no threshold has been identified below which no damage to health is observed.

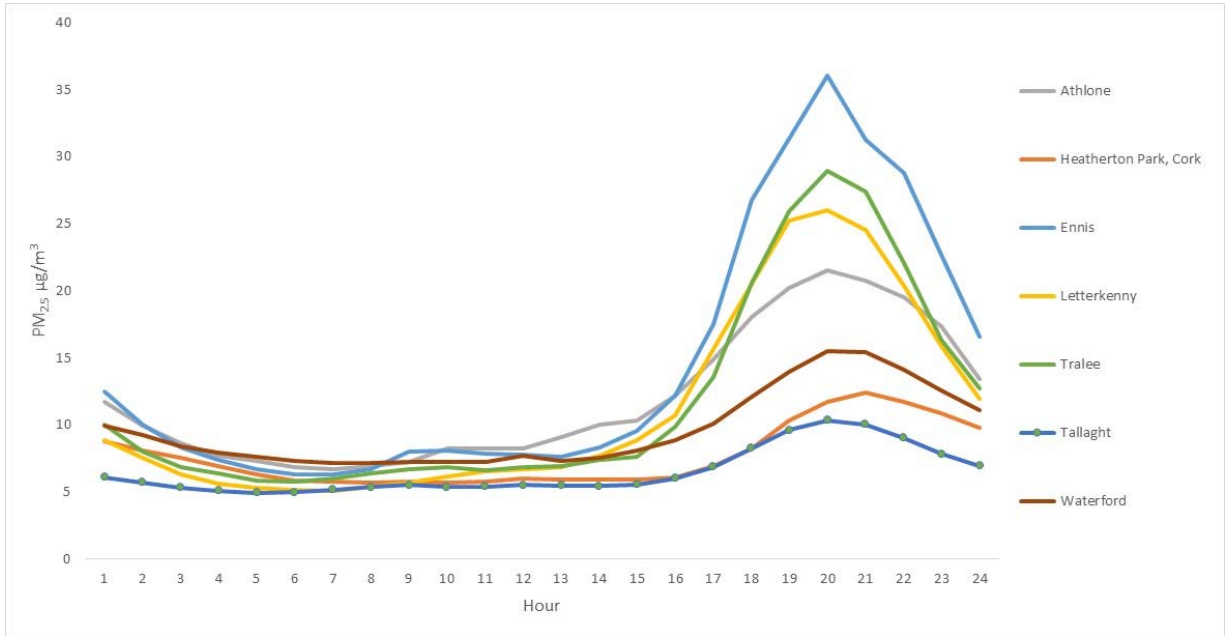


Figure 3 Average concentrations of PM_{2.5} by time of day at selected monitoring stations in Ireland in 2020

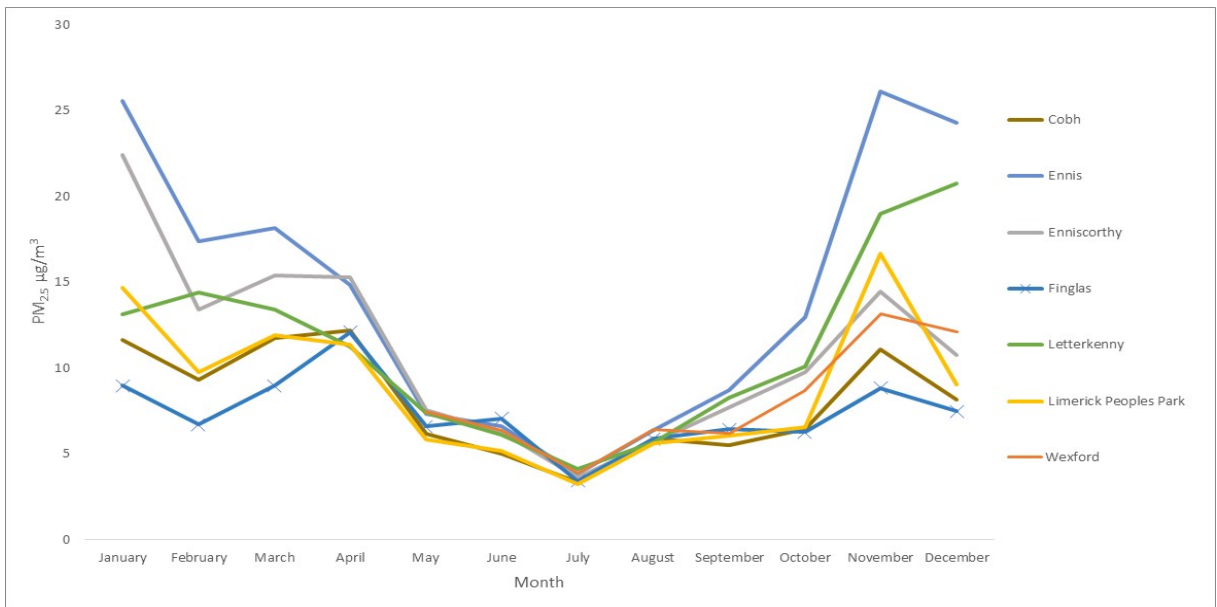


Figure 4 Average concentrations of PM_{2.5} by month of year at selected monitoring stations in Ireland in 2020

Figure 5 – PM_{2.5} concentrations by zones⁵ in Ireland shows that the problem is not confined to our larger cities such as Dublin and Cork. On the contrary **elevated PM_{2.5} is more prevalent in our smaller cities, towns and villages**, where the burning of solid fuel is often more common or there are less-alternatives for home-heating.

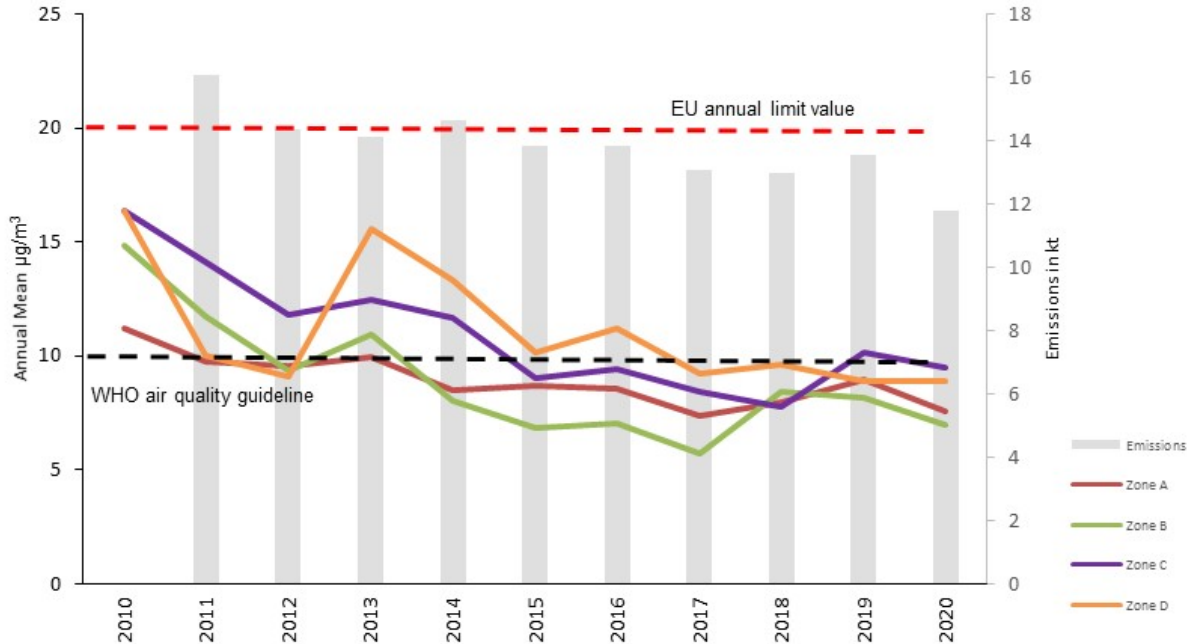


Figure 5 Long-term trends in ambient PM_{2.5} concentrations for Zones (using selected stations) in Ireland (with national emissions figures presented in bar chart)

Why is solid fuel burning such a problem for air quality?

Burning solid fuel in stoves and especially in open fires is an inefficient process – a lot of heat is lost and not all the solid fuel is fully burned. These unburnt particles leave the fireplace or stove by the chimney, or directly into the room they are heating. This causes both indoor and outdoor PM air pollution. This PM air pollution is then breathed in and leads to the health effects described in Figure 12 in appendix 1. More PM is emitted from ‘smoky’ fuels such as smoky coal, wet wood and peat. This direct link between solid fuel burning in Ireland and PM has been established both by EPA monitoring and EPA-funded research projects such as the SAPPHERE project⁶ and AEROSOURCE project⁷.

⁵ For explanation of zones please see www.airquality.ie/information/air-quality-zones

⁶ www.epa.ie/publications/research/environment--health/research-318-source-apportionment-of-particulate-matter-in-urban-and-rural-residential-areas-of-ireland-sapphire.php

⁷ www.epa.ie/publications/research/air/research-385-air-pollution-sources-in-ireland.php

Summary of results for 2020

PM₁₀ was measured at 67 monitoring stations in 2020.

- ✓ There were no exceedances of the EU limit values (annual or daily).

However, for PM₁₀:

- ✗ The World Health Organisation (WHO) air quality guideline annual value was exceeded at 1 monitoring station.
- ✗ The World Health Organisation (WHO) air quality guideline daily value was exceeded at 14 monitoring stations.
- ✗ A World Health Organisation (WHO) air quality guideline value (either annual or daily) was exceeded at a total of 14 monitoring stations.

PM_{2.5} was measured at 64 monitoring stations in 2020.

- ✓ There were no exceedances of the EU annual limit.

However, for PM_{2.5}:

- ✗ The WHO air quality guideline annual value was exceeded at 9 monitoring stations.
- ✗ The WHO air quality guideline daily value was exceeded at 34 monitoring stations
- ✗ A World Health Organisation (WHO) air quality guideline value (either annual or daily) was exceeded at a total of 34 monitoring stations

Overall:

- ✗ A World Health Organisation (WHO) air quality guideline value for PM (PM₁₀ or PM_{2.5}) was exceeded at a total of 38 monitoring stations

When we compare our PM levels to the WHO air quality guidelines, we are failing to meet these health standards. While there are no legal consequences to this failing, it is something Ireland should strive to change to improve our health, the health of our families and communities. For better ways to heat your home and improve air quality in your locality, see our infographic Figure 2.

3 Nitrogen oxides, transport and the impact of COVID-19 restrictions

Nitrogen Oxides (NO_x) are one of the main pollutants that impact people's health in Ireland. Here, we explain what nitrogen oxides are, what are the main sources of nitrogen dioxide (NO₂) in Ireland and why are NO₂ and NO_x a problem. We also discuss the 2019 NO₂ exceedance in Dublin, monitoring results in 2020 and examine what impact the COVID-19 restrictions have had on NO₂ levels in Ireland.

What are nitrogen oxides?

Nitrogen oxides – or NO_x – are the gases nitric oxide (NO) and nitrogen dioxide (NO₂). Both pollutants are emitted during high temperature combustion processes. However, NO₂ is more important from an ambient air quality perspective due to its increased impact on health (See Figure 12 in appendix 1).



What are the main sources of NO₂ in Ireland?

In terms of ambient air quality, the main source of NO₂ in our towns and cities is road transport. Diesel engine vehicles produce more NO₂ than petrol vehicles. Other sources of NO₂ in Ireland include:

- off-road machinery (for example, earth movers and lawnmowers),
- industrial and construction activities, and
- electricity and heat production equipment such as central heating boilers and generators.

Why is NO₂ and NO_x bad?

Short-term exposure to NO₂ is linked to adverse respiratory effects including airway inflammation in healthy people and increased respiratory symptoms in asthmatics. Long-term exposure is associated with increased risk of respiratory infection in children.

NO_x is a major precursor in the formation of ground level ozone, which is itself an air pollutant. NO_x is also a major precursor in the formation of photochemical 'smog' and NO_x, along with SO₂, can form acid rain which can harm ecosystems and degrade historical buildings.

2019 NO₂ exceedance in Dublin

There was an exceedance of the EU Air Quality legal limit value for NO₂ in Dublin in 2019. The exceedance was at the St. John's Road West monitoring station. An annual average concentration of 43 µg/m³ was measured for 2019. This was above the EU annual limit value for NO₂ of 40 µg/m³. The main contribution to this exceedance were emissions from heavy

traffic passing this monitoring station. The four Local Authorities of Dublin City Council, Dun Laoghaire Rathdown County Council, Fingal County Council and South Dublin County Council are now in the process of preparing an Air Quality Action Plan to address this exceedance. The action plan must be produced by the end of 2021. Development of an action plan involves examining both the causes and providing solutions in the affected areas. The EPA is carrying out the ambient air quality modelling to support preparation of the action plan and working to support the four local authorities. The Department of Environment, Climate and Communications (DECC) together with the Department of Transport (DOT) established a joint working group – UTRAP (Urban Transport Related Air Pollution) to address the exceedance and a report on this group's recommendations is currently being prepared. The DOT have also commissioned a study into transport demand management in Ireland's five largest cities to review and address transport related environmental impacts which will assist this group's findings.

Summary of results in 2020

NO₂ was measured at 27 monitoring stations in Ireland in 2020. All concentrations observed were below the annual limit values. It is clear that the year 2020 was a very unusual one from the point of view of traffic levels and associated pollution from vehicles. Restrictions associated with COVID-19 significantly reduced transport across the country. Reductions of up to 50% in NO₂ concentrations in comparison to previous years were observed at many traffic-oriented monitoring stations.

COVID-19 restrictions and the impact on transport emissions

In March 2020 the Irish Government imposed a series of restrictions on economic and social activity aimed at slowing the spread of COVID-19. There is clear evidence that restrictions on movement had a dramatic impact on the concentrations of NO₂, especially in our urban areas. Concentrations at many monitoring stations were reduced by up to 50% in comparison to previous years. Although concentrations rebounded somewhat following the exiting of the initial lockdown in June and subsequent easing of restrictions in July/August they were still well-below expected levels for 2020.

As previously noted, concentrations of NO₂ at the St. John's Road West monitoring site were above the EU annual legal limit value in 2019, with an annual average of 43 µg/m³. However, the annual average concentration in 2020 was 30 µg/m³ compared to the limit value of 40 µg/m³ predominantly as a result of restrictions imposed to reduce transmission of COVID-19.

Figure 6 shows average NO₂ concentrations by hour of day at St. John's Road West in 2019 and 2020. In both years the classic diurnal pattern of transport pollution due to commuting traffic is evident, however the average concentrations observed are much less in 2020 due to the large decrease in daily commuting and traffic numbers brought about by the COVID-19 restrictions. Figure 7 shows a similar graph for the monitoring station at Blanchardstown,

which is a suburban traffic station, over the longer time period of 2016 to 2020. Again, the dramatic decrease in traffic emissions can be observed at this location.

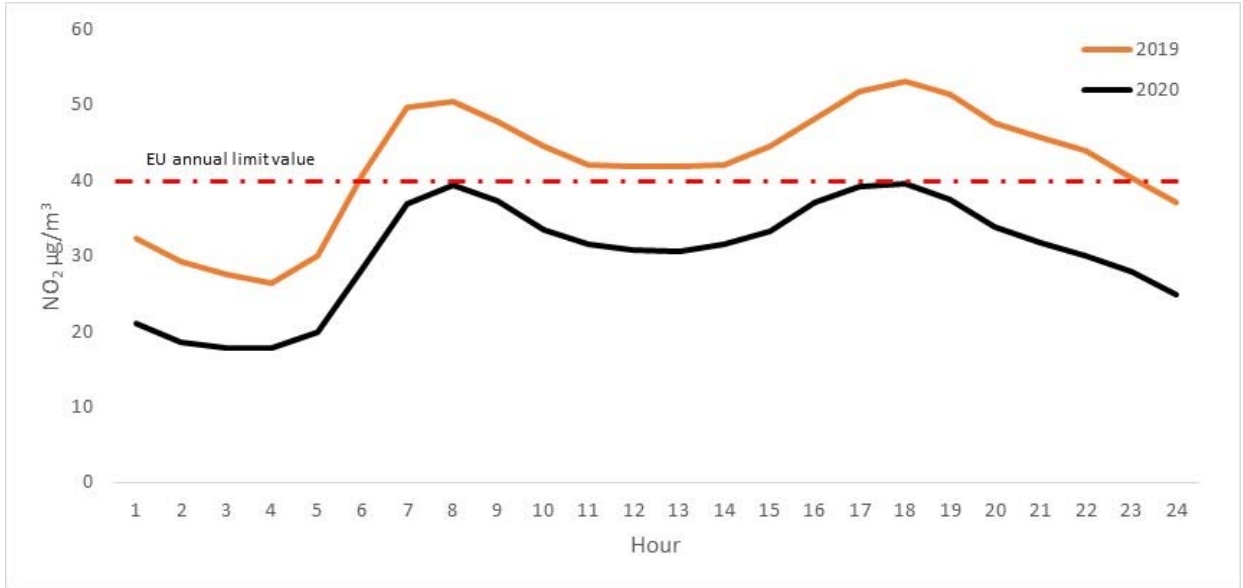


Figure 6 Average NO₂ concentrations by hour of day at St. John's Road West in 2019 and 2020

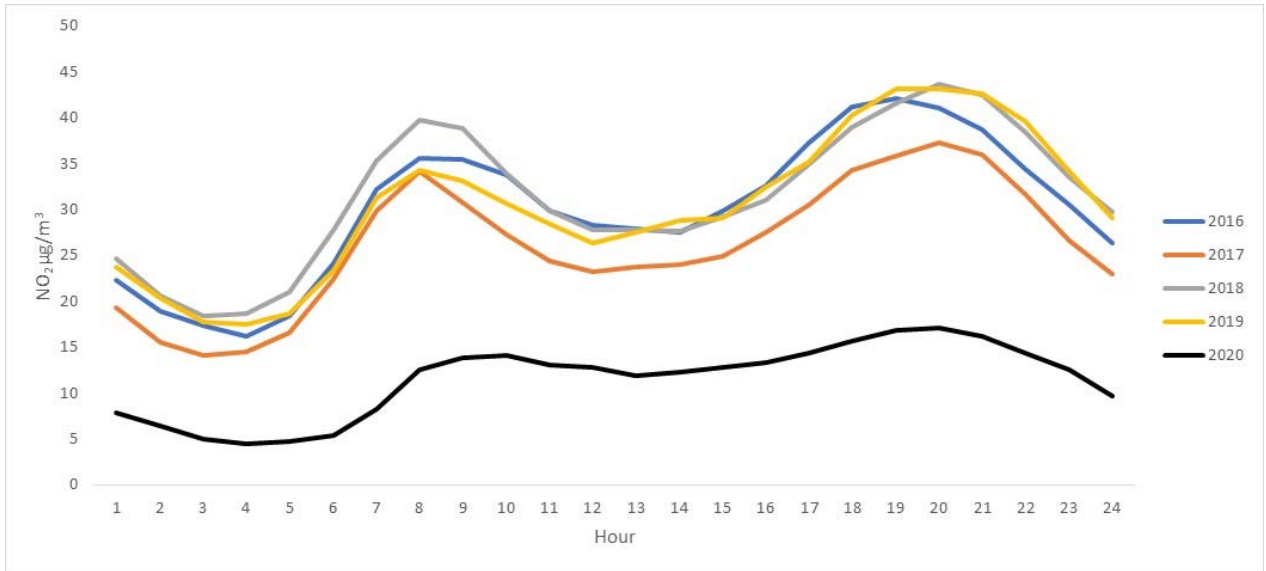


Figure 7 Average NO₂ concentrations by hour of day at Blanchardstown, 2016 - 2020

Figure 8 shows average NO₂ concentrations by week for 2020 for the Dublin urban traffic site at St. John’s Road West. This graph shows the fall in traffic pollution when restrictions were imposed along with increasing levels following easing of restrictions. Very similar decreases were observed at many other monitoring stations across the network.

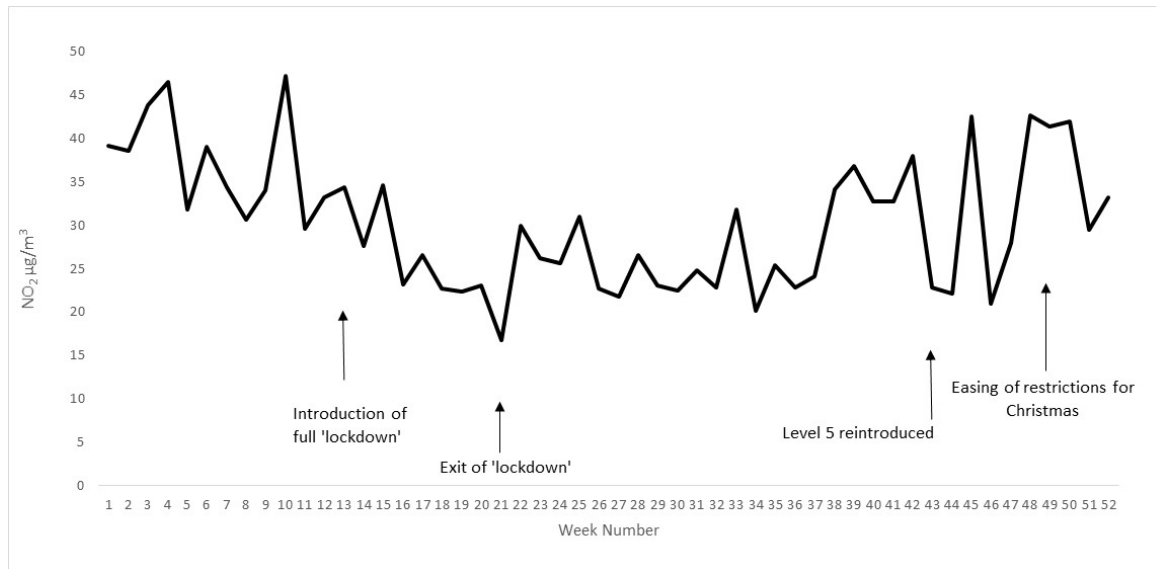


Figure 8 Average concentrations of NO₂ by week at St. John’s Road West, Dublin for 2020

Solutions to traffic pollution?

Key to reducing transport pollution and improving air quality in Ireland is decreasing traffic volumes on our roads. Monitoring in 2020 has shown that reduced traffic volumes result in improved air quality. Policy interventions which increase the usage of clean public transport along with the continued efforts to implement a modal-shift to cycling and walking by upgrading infrastructure could play a significant role. The Government’s plans to improve electric vehicle (EV) infrastructure and increase the share of EVs in our transport fleets, as indicated in the Climate Action Plan, would lead to reductions in NO₂ emissions with associated health benefits. The joint Departmental working group on Urban Transport Related Air Pollution (UTRAP) together with the Department of Transport’s 5 Cities Demand Management study will identify solutions for Dublin and our major urban centres.



Air quality & transport in Ireland

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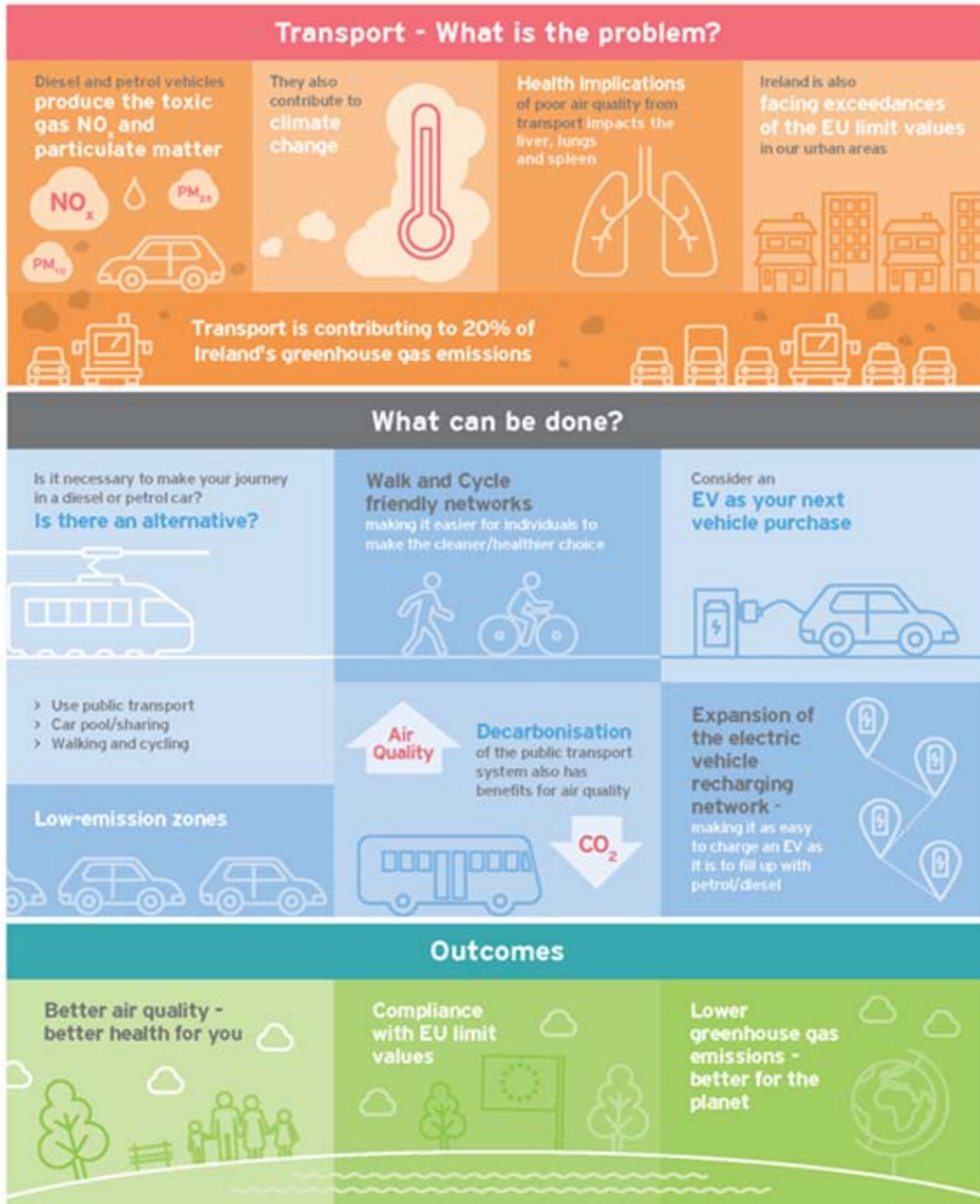


Figure 9 Air quality and transport in Ireland

4 Conclusions

Air pollution and the poor air quality it causes is a major environmental health risk (WHO 2018). The European Environment Agency estimates that there were approximately 1,300 premature deaths in Ireland due to fine particulate matter⁸.

For Ireland, the key to improving air quality lies in the incentivisation, promotion and support for a shift in society away from solid fuel for home heating to cleaner alternatives and the promotion of clean transport options. The EPA supports the EU 'zero-pollution objective' as part of the Green Deal – that has made clear the direction of travel towards the adoption of the WHO guideline values across Europe.

Legal requirements met in 2020 but failure to meet WHO guideline values for health

Ambient air quality monitoring carried out by the EPA in 2020 shows that Ireland met all the legal requirements under the CAFE Directive by being within legal limit values.

However, our air quality is above the WHO air quality guidelines for a number of pollutants and these guidelines are the benchmarks for good air quality globally. PAHs in ambient air are also above the related EEA reference level.

Domestic use of solid fuel, such as coal, peat and wood, is having a negative impact on our air quality

The use of solid fuels, such as coal, peat and wood, for home heating has been identified by EPA-funded Irish research as the leading contributor to PM_{2.5} concentrations in our cities, towns and villages. This pollutant is the most problematic in Ireland from an air quality point of view and it has the most health-impacts. Especially problematic is the use of so-called smoky fuels such as smoky coal, wet wood and peat.

Air pollution from transport – long-term changes must be made

Although pollution from transport was dramatically reduced in 2020 because of changes adopted and imposed during the COVID-19 pandemic, we will once again face exceedances of EU limit values for NO₂ if traffic numbers return to pre-2020 levels. Monitoring and modelling by the EPA indicates that exceedances will occur at more locations in the future if we return to typical transport patterns and modes of transport.

⁸ European Environment Agency 2021

What can be done?

- Solid fuel

To reduce the negative impact of solid fuel burning it will be crucial to reduce this source of air pollution in Ireland.

Key to this reduction will be a change away from more smoky solid fuels such as wet wood, peat and smoky coal as well as a move towards more efficient ways of heating our homes supported by policies that assist us in making these changes. See Figure 2 on page 8 for an illustration on how changes to our home heating choices can improve our local air quality and improve our health. These changes will also reduce Ireland's greenhouse gas emissions and are supported by actions under the Government's Climate Action Plan.

The Government's proposed measures to restrict smoky fuels nationwide in 2022, which include that all coal products sold must be low-smoke and all wood sold must have a moisture content of 25% or less, should facilitate people making the clean air choice when deciding how to heat their homes, which will improve air quality and health outcomes.

- Transport

Travel restrictions imposed in 2020 to reduce the transmission of COVID-19 have highlighted the clear link between traffic and NO₂ in the ambient air. Any reduction in traffic volumes will lead to a resultant improvement in air quality. A modal-shift to clean public transport, improving bicycle infrastructure and further pedestrianisation of roads along with the proposed increased use of electric vehicles and associated infrastructure, outlined in the Government's Climate Action Plan (2019), will help to reduce traffic emissions.

As we return to 'normal' following pandemic restrictions it will be important to try and mitigate increased levels of NO₂ or we will face future exceedances of the EU legal limit value for this pollutant, similar to that observed in 2019 at St. John's Road West in Dublin. The four Dublin Local Authorities are currently working to produce an air quality action plan to address this exceedance. They are supported by the Department of Transport (DOT) and Department of the Environment, Climate and Communications, these bodies have established a joint working group to address this matter – Urban Transport Related Air Pollution (UTRAP).

Public awareness and behavioural change

Key to improving air quality and our health will be increasing public awareness of the impacts that our home-heating choices and modes of transport have on air quality and facilitating behavioural change.

Encouraging and supporting the public to make cleaner choices in the context of a sustainable society and economy will be important. In this regard, the EPA looks forward to the publication of the Government's first 'Clean Air Strategy'. The Climate Action Plan (2019), to address climate change, contains many measures which will also benefit air quality.

Appendix 1 – Additional information on Ireland's air quality in 2020

National Ambient Air Quality Network

The network is a series of air quality monitoring stations that are located across the country. These stations monitor air quality and deliver data for public information on www.airquality.ie. This is assessed against the following values to help protect our health:

- European legal limit values⁹ and
- the World Health Organization (WHO) guideline values

The network is managed by the Environmental Protection Agency, in partnership with Local Authorities and other public/semi-state bodies and universities such as Met Eireann, UCC, NUIG, TCD and CIT.

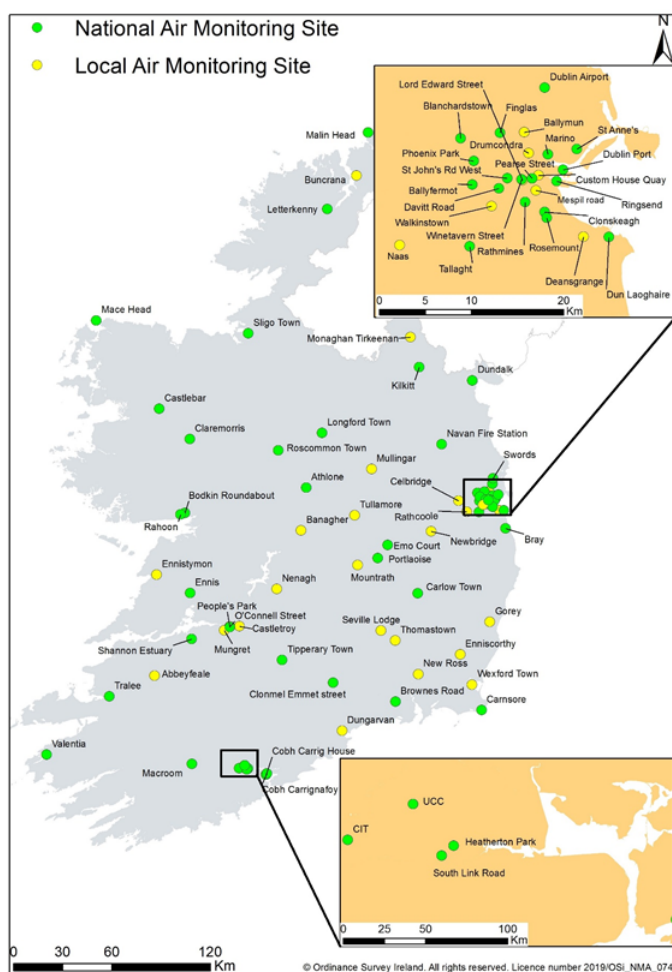


Figure 10 National Ambient Air Quality Monitoring Network in 2020

⁹ The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). The 4th Daughter Directive was transposed by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. No. 58 of 2009).

How do we assess air quality?

We assess air quality for the following parameters – particulate matter, nitrogen dioxides, ozone, sulphur dioxides, carbon monoxide, benzene, heavy metals, dioxins and PAHs (a toxic chemical). This report looks at the two pollutants of most concern, PM and NO₂ in the main report with a summary of the findings in relation to other pollutants in this appendix.

WHO Air Quality Guideline Values

The World Health Organization (WHO) has developed air quality guidelines for PM₁₀ and PM_{2.5}, ozone, nitrogen dioxide and sulphur dioxide. These guidelines were developed to inform policy makers and provide appropriate air quality targets worldwide, based on the latest health information available. These guideline values for many parameters are stricter than the EU Limit Values to reflect the increased understanding of the health impacts that even low levels of air pollution, in particular PM_{2.5} can have. Indeed, the WHO have said that for PM_{2.5} – **‘there is no safe level of air pollution’**. Therefore, every measure should be encouraged to decrease PM concentrations in the air we breathe.

How can I find out about air quality?

Live information on air quality is available to view at www.airquality.ie. Here you can find our air quality index for health and see what air quality is like in your locality.

To get further information on air quality you can visit the EPA’s section on air quality on our website at www.epa.ie/environment-and-you/air/. You can sign up to the EPA’s @EPAAirQuality Twitter channel for automatic daily updates and see @EPAIreland for further information on air quality and the environment.

How can I find out about air quality and health advice?

The **Air Quality Index for Health (AQIH)** can be viewed at www.airquality.ie. The AQIH is an interactive map of Ireland which shows monitoring stations that are colour-coded based on live monitoring results. This can quickly show you what air quality is like in your area now and in the past. Stations that are coloured **green** indicate good air quality and **red** indicates poor. This website also includes health advice for the general public and for those of us who are more sensitive to air pollution – for example, people with heart or lung conditions. The AQIH guidance explains what to do if you or your child is likely to be at risk from air pollution. For more information on how the AQIH is calculated, please see www.airquality.ie/information/air-quality-index-for-health. Figure 11 below shows you a depiction of the web page where you can find the air quality index for health.

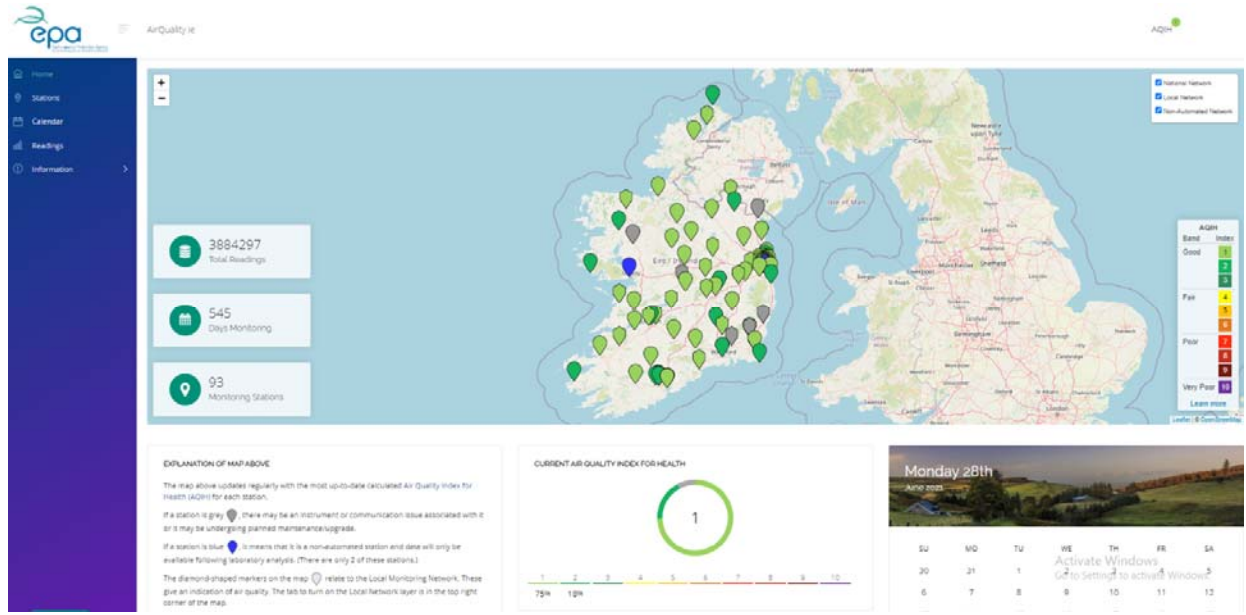


Figure 11 The Air Quality Index for Health (www.airquality.ie)

Why is poor air quality a problem?

Poor air quality has been described by the WHO as ‘World’s largest environmental health threat’, accounting for 7 million deaths around the world every year. Poor air quality has serious health implications both in:

- the short-term (acute – temporary illnesses like headache, breathing difficulty, eye irritation or cardiac issues), and
- the long-term (chronic – ongoing illnesses like asthma, reduced liver function or cardiovascular (heart) disease).

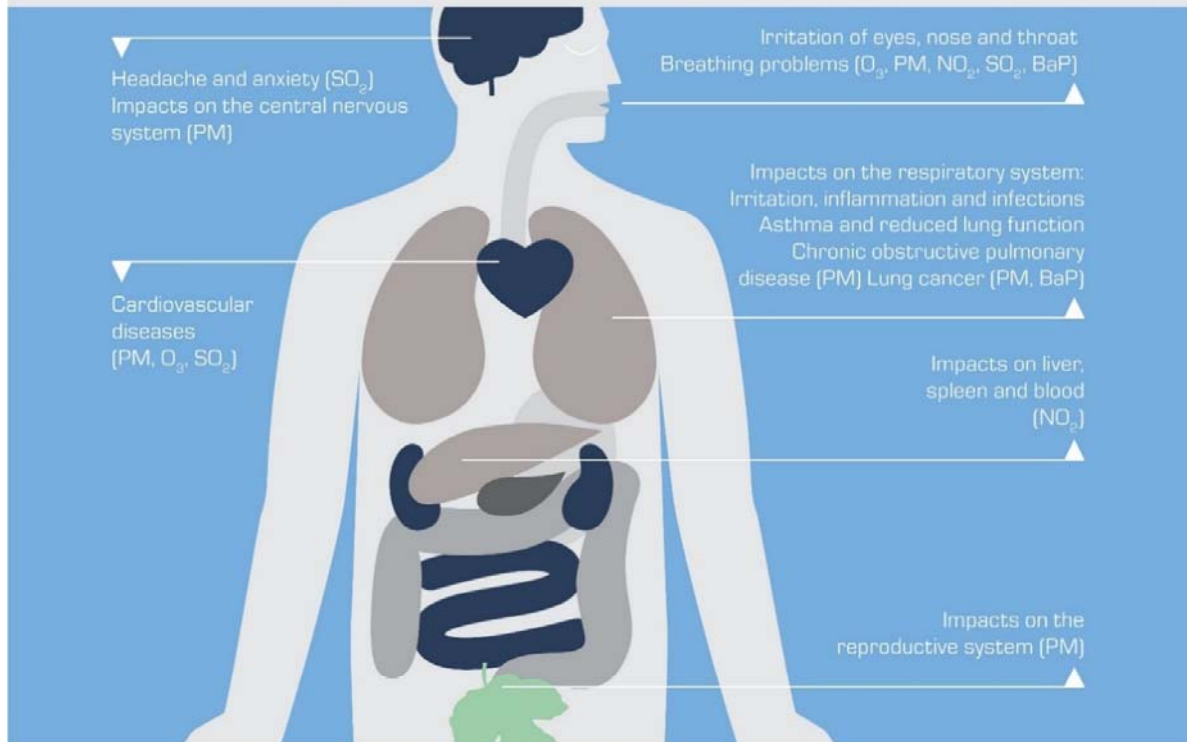
Poor air quality also causes premature deaths (which are deaths that would be avoided if air quality was improved). Using Irish air quality data from 2018, the EEA estimated that PM_{2.5} caused approximately 1,300 premature deaths in Ireland in that year.

Figure 12 Health impacts of air pollution (source European Environment Agency) summarises the health impacts of air pollution.



Health impacts of air pollution

Air pollutants can have a serious impact on human health. Children and the elderly are especially vulnerable.



Particulate matter (PM) are particles that are suspended in the air. Sea salt, black carbon, dust and condensed particles from certain chemicals can be classed as a PM pollutant.

Nitrogen dioxide (NO_2) is formed mainly by combustion processes such as those occurring in car engines and power plants.

Ground-level ozone (O_3) is formed by chemical reactions (triggered by sunlight) involving pollutants emitted into the air, including those by transport, natural gas extraction, landfills and household chemicals.

Sulphur dioxide (SO_2) is emitted when sulphur containing fuels are burned for heating, power generation and transport. Volcanoes also emit SO_2 into the atmosphere.

Benzo(a)pyrene (BaP) originates from incomplete combustion of fuels. Main sources include wood and waste burning, coke and steel production and motor vehicles' engines.

Figure 12 Health impacts of air pollution (source European Environment Agency)

National Ambient Air Quality Monitoring Programme (AAMP)

The national ambient air quality monitoring programme (commenced 2017) was initiated to expand the existing national ambient air quality monitoring network, enhance our modelling capacity and further citizen science.

This national monitoring network is providing comprehensive, real-time localised air quality information linked to public health advice. The monitoring network will be completed in mid-2022 with a planned final total of 112 monitoring stations. The monitoring network is currently at 96 monitoring stations.

There is a focus to support this monitoring network with increased modelling and forecasting capability, with the eventual goal of providing air quality forecasts and nowcasts to the public. Modelling and forecasting involve looking at different situations (different ‘models’) using computer programmes that can predict (forecast) how air quality might change depending on different circumstances and how air pollution has behaved in the past. Advanced modelling can be used to fill in the gaps between monitoring stations (nowcasts) so that local air quality can be provided for all locations in Ireland.

The programme also aims to involve the public by engaging with citizens through various citizen science initiatives to encourage greater public understanding of and involvement with air quality issues.

New monitoring stations established in 2020

The expansion of the National Ambient Air Quality Monitoring Network has continued apace during 2020. There were **18 new monitoring stations** brought online in 2020 (8 ‘EU-level’ monitoring sites and 10 ‘local’ monitoring sites¹⁰). The new monitoring stations were:

EU-level monitoring sites

- Wexford Town
- Tipperary-Clonmel
- Sligo Town
- Dublin Port
- Offaly-Birr
- Dublin Airport
- Cavan Town
- Leitrim - Carrick-on-Shannon

Local monitoring sites

- Waterford-Dungarvan
- Dublin-Amiens Street
- Dublin-Ballymun
- Dublin-Custom HSE Quay
- Dublin-Drumcondra
- Dublin-Lord Edward St
- Dublin-Walkinstown
- Mayo-Ballina
- Dublin-Coolock
- Dublin-Weaver Street

¹⁰ Local air monitoring stations provide real-time data to the public using the Air Quality Index for Health, however, they do not use EU reporting-level monitoring instruments.

There were also **4 upgrades** to existing monitoring stations in 2020. These upgrades focused on providing more real-time information about particulate matter concentrations.

Air quality forecasting and modelling – LIFE Emerald

The EPA are leading a consortium of stakeholders to further air quality management in Ireland. As part of this, a proposal entitled 'LIFE Emerald' was accepted for part European



funding under the 2019 Life programme. The 3-year LIFE Emerald project, approved to proceed in 2020 and which began in January 2021, is expected to deliver Ireland's first national air quality forecast for the public. It will also provide a mapping service for historical pollutants and near real time measurements as a 'now-cast'. The outputs from the project will support Irish citizens in making decisions that positively benefit their

health on a day-to-day basis.

Citizen Science

The Environmental Protection Agency (EPA) has further developed two air quality - citizen science initiatives. These are described below.

The GLOBE project

GLOBE is an international science education programme running in 126 countries across the world. In Ireland, it is co-ordinated by the Environmental Education Unit of An Taisce with the support of the EPA.

A total of 105 schools participated in GLOBE's air quality measurement campaigns in the Spring and Autumn of 2020. The students have shared their experience of collecting and analysing air quality data at several national and international events. The students used diffusion tubes to measure nitrogen dioxide (NO₂) – a principal pollutant from car exhaust emissions – at locations around their schools. NO₂ levels were higher for schools in major towns and cities when compared to schools in rural areas. However, results showed mostly good air quality in the school environment, but some schools measured elevated levels of NO₂ at the school gate, relative to that in other parts of the school.

Clean Air Together

Building on the success of GLOBE, the EPA and An Taisce are working together on a large-scale citizen-based NO₂ monitoring project to increase public awareness of and engagement with the topic of air quality: 'Clean Air Together'. The project was piloted during Autumn 2020 in Dublin with 70 participants involved (see Figure 13). The full-scale project for Dublin will involve 1200 participants deploying NO₂ monitoring tubes in the Autumn of 2021. The measurement areas to be included in the project are those that are vulnerable to elevated NO₂ concentrations. This includes Dublin city centre, orbital routes in sub-urban areas and the

main orbital and radial transport routes within the M50. This distribution and density of data is required for the scientific objective of validating air quality forecast models. Other objectives of 'Clean Air Together' are to assess the impacts of citizen-based air quality monitoring on awareness, attitudes and potential to lead to behaviour change and to affect policy-change by working in partnership with stakeholders.

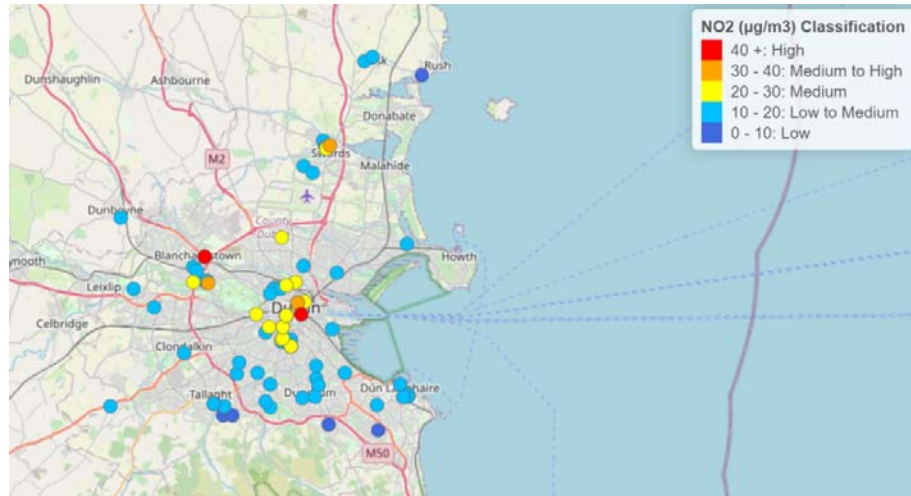


Figure 13 NO₂ results measured in Dublin during the Clean Air Together pilot in Autumn 2020

Other pollutants in 2020

This section of the report presents a short summary of the pollutants - ozone, dioxins, sulphur dioxide and PAHs. Further details of air quality results for 2020 can be found at www.epa.ie/environment-and-you/air/. For a summary of the findings see Table 1.

Ozone

Normally, ozone is a **'transboundary'** pollutant in Ireland – this means that the sources of ozone are outside Ireland (normally mainland Europe). When certain weather conditions are satisfied, these pollutants can be carried in an air mass and impact Ireland. In addition, ozone is formed in urban areas when you have car exhaust emissions, namely NO_x and Volatile Organic Compounds (VOCs) mixing together and undergoing chemical reactions in sunny weather. Ozone can also contribute to the formation of a brown, hazy atmosphere which is called 'photochemical smog'. Ground level ozone can be bad for your health, see Figure 12 for further details. Ozone also has negative impacts on ecosystems where it can damage plants and impact crop growth. On occasion in Ireland we have sufficiently dry and sunny weather to produce our own ground-level ozone in our cities and towns.

The main way to reduce the impact of ground-level ozone is to reduce the levels of NO_x in urban areas. Again, a modal shift away from internal combustion engine powered vehicles will reduce the impact of ground-level ozone. A reduction in the impact of transboundary ozone is more problematic as it will take a Europe-wide reduction in ground-level ozone formation.

Dioxins

'Dioxins' is a collective term for a group of chemical compounds that can be formed when carbon containing material is burned at low-temperature. Dioxin formation and emission happens predominantly from residential and backyard burning of waste. This pollutant is measured in samples of cow's milk, collected from milk collection tankers from selected locations in Ireland, and compared to European standards. Dioxins was measured at 22 locations across Ireland in 2020 and concentrations observed were in line with previous years measured results and were well below European limit values.

Sulphur Dioxide (SO₂)

SO₂ is a gas which is formed when sulphur containing fuels are combusted industrially, commercially and domestically. Volcanic eruptions are the predominant natural source of SO₂.

Impacts of high concentrations of SO₂ include temporary breathing difficulties for those who suffer from respiratory conditions such as asthma. Longer-term exposure to high SO₂ concentrations can aggravate existing cardiovascular disease and respiratory illness.

In recent years, SO₂ levels have been consistently low. This is reflective of the shift in fuel choice across Ireland in both the commercial and residential heating sector and the energy production sector, from sulphur containing bituminous coal and oil to fuels which are low in SO₂ production such as natural gas and low-sulphur coal and oil. However, in 2020 at monitoring stations such as Ennis and Letterkenny relatively large spikes in SO₂ were observed during the winter heating season as can be seen in Figure 14. Figure 15, shows the average concentrations of SO₂ at Letterkenny station by hour of day, which shows that concentrations of SO₂ at this location coincide with the typical hours when fires are lit for home heating. This indicates that the dominant source of this SO₂ pollution is the burning of solid fuel, possibly with sulphur content in excess of the legal limit. This issue needs further investigation and requires co-ordinated and enhanced enforcement on the part of the Local Authorities in association with a public information campaign.

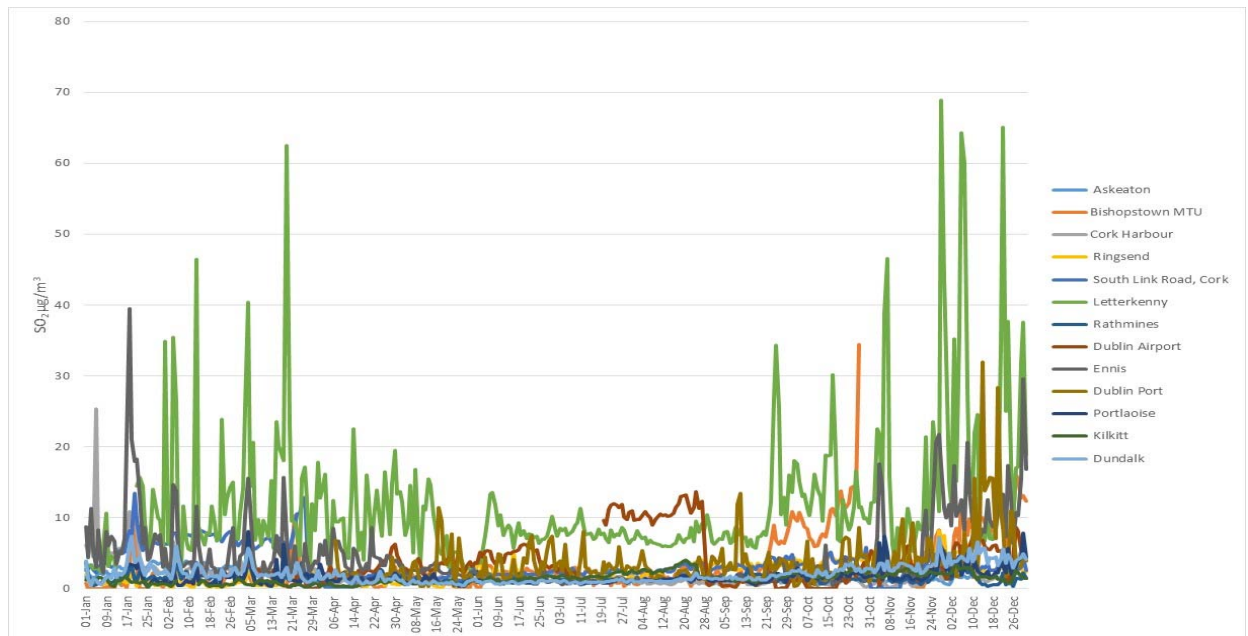


Figure 14 Average daily concentrations of SO₂ at selected stations in 2020

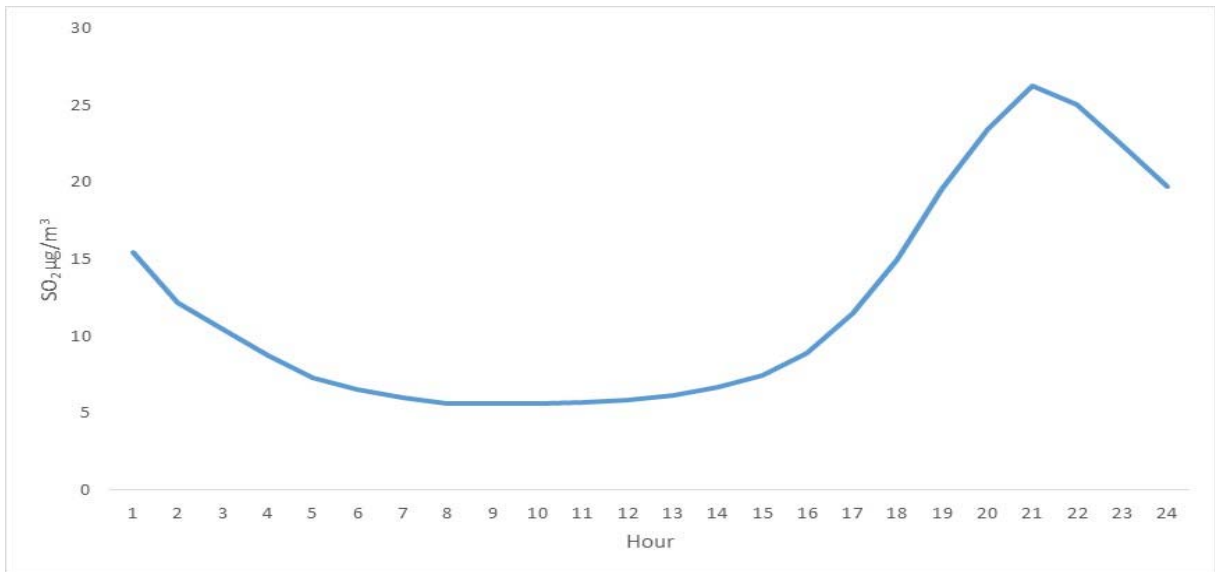


Figure 15 Average SO₂ concentrations at Letterkenny by hour of day in 2020

PAHs

Polycyclic aromatic hydrocarbons (PAHs) are chemical compounds which consist of two or more fused aromatic rings made entirely from carbon and hydrogen. PAHs are emitted from the combustion of solid fuels, such as peat, wood and coal. Domestic heating is the dominant source. PAHs and in particular benzo (a) pyrene (BaP), which is used as a marker for PAHs, are known carcinogens. We are above the EEA reference levels at 4 of our 5 monitoring stations for PAHs. A move away from the burning of solid fuels to cleaner ways of heating our homes will reduce the levels of PAHs in our ambient air.

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The Air Quality Unit would like to particularly acknowledge the contribution of Dr. Ciara McMahon, who’s untimely death occurred in January 2021. She is sadly missed by her family, friends and colleagues.

AN GHNÍOMHAIREACHT UM CHAOMHNÚ COMHSHAOIL

Tá an Gníomhaireacht um Chaomhnú Comhshaoil (GCC) freagrach as an gcomhshaoil a chaomhnú agus a fheabhsú mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaoil a chosaint ó éifeachtaí díobhálacha na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

Rialú: Déanaimid córais éifeachtacha rialaithe agus comhlionta comhshaoil a chur i bhfeidhm chun torthaí maithe comhshaoil a sholáthar agus chun díriú orthu siúd nach gcloíonn leis na córais sin.

Eolas: Soláthraimid sonraí, faisnéis agus measúnú comhshaoil atá ar ardchaighdeán, spriocdhírithé agus tráthúil chun bonn eolais a chur faoin gcinnteoireacht ar gach leibhéal.

Tacaíocht: Bímid ag saothrú i gcomhar le grúpaí eile chun tacú le comhshaoil atá glan, táirgiúil agus cosanta go maith, agus le hiompar a chuirfidh le comhshaoil inbhuanaithe.

Ár bhFreagrachtaí

Ceadúnú

Déanaimid na gníomhaíochtaí seo a leanas a rialú ionas nach ndéanann siad dochar do shláinte an phobail ná don chomhshaoil:

- saoráidí dramháiola (*m.sh. láithreáin líonta talún, loisceoirí, stáisiúin aistrithe dramháiola*);
- gníomhaíochtaí tionsclaíoch ar scála mór (*m.sh. déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta*);
- an dionalmhaíocht (*m.sh. muca, éanlaith*);
- úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe (*OGM*);
- foinsí radaíochta ianúcháin (*m.sh. trealamh x-gha agus radaiteiripe, foinsí tionsclaíochta*);
- áiseanna móra stórála peitрил;
- scardadh dramhuisce;
- gníomhaíochtaí dumpála ar farraige.

Forfheidhmiú Náisiúnta i leith Cúrsaí Comhshaoil

- Clár náisiúnta iniúchtaí agus cigireachtaí a dhéanamh gach bliain ar shaoráidí a bhfuil ceadúnas ón nGníomhaireacht acu.
- Maoirseacht a dhéanamh ar fhreagrachtaí cosanta comhshaoil na n-údarás áitiúil.
- Caighdeán an uisce óil, arna sholáthar ag soláthraithe uisce phoiblí, a mhaoirsiú.
- Obair le húdarás áitiúla agus le gníomhaireachtaí eile chun dul i ngleic le coireanna comhshaoil trí chomhordú a dhéanamh ar líonra forfheidhmiúcháin náisiúnta, trí dhírú ar chiontóirí, agus trí mhaoirsiú a dhéanamh ar leasúchán.
- Cur i bhfeidhm rialachán ar nós na Rialachán um Dhramhthrealamh Leictreach agus Leictreonach (DTLL), um Shrian ar Shubstaintí Guaiseacha agus na Rialachán um rialú ar shubstaintí a ídíonn an ciseal ózón.
- An dlí a chur orthu siúd a bhreiseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaoil.

Bainistíocht Uisce

- Monatóireacht agus tuairiscí a dhéanamh ar cháilíocht aibhneacha, lochanna, uisce idirchriosacha agus cósta na hÉireann, agus screamhuiscí; leibhéil uisce agus sruthanna aibhneacha a thomhas.
- Comhordú náisiúnta agus maoirsiú a dhéanamh ar an gCreat-Treoir Uisce.
- Monatóireacht agus tuairiscí a dhéanamh ar Cháilíocht an Uisce Snámha.

Monatóireacht, Anailís agus Tuairiscí ar an gComhshaoil

- Monatóireacht a dhéanamh ar cháilíocht an aeir agus Treoir an AE maidir le hAer Glan don Eoraip (CAFÉ) a chur chun feidhme.
- Tuairiscí neamhspleách le cabhrú le cinnteoireacht an rialtais náisiúnta agus na n-údarás áitiúil (*m.sh. tuairiscíu tréimhsiúil ar staid Chomhshaoil na hÉireann agus Tuarascálacha ar Tháscairí*).

Rialú Astaíochtaí na nGás Ceaptha Teasa in Éirinn

- Fardail agus réamh-mheastacháin na hÉireann maidir le gáis cheaptha teasa a ullmhú.
- An Treoir maidir le Trádáil Astaíochtaí a chur chun feidhme i gcomhair breis agus 100 de na táirgeoirí dé-ocsaíde carbóin is mó in Éirinn.

Taighde agus Forbairt Comhshaoil

- Taighde comhshaoil a chistiú chun brúnna a shainiú, bonn eolais a chur faoi bheartais, agus réitigh a sholáthar i réimsí na haeraíde, an uisce agus na hinbhuanaitheachta.

Measúnacht Straitéiseach Timpeallachta

- Measúnacht a dhéanamh ar thionchar pleananna agus clár beartaithe ar an gcomhshaoil in Éirinn (*m.sh. mórphleananna forbartha*).

Cosaint Raideolaíoch

- Monatóireacht a dhéanamh ar leibhéil radaíochta, measúnacht a dhéanamh ar nochtadh mhuintir na hÉireann don radaíocht ianúcháin.
- Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as taismí núicléacha.
- Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta.
- Sainseirbhísí cosanta ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

Treoir, Faisnéis Inrochtana agus Oideachas

- Comhairle agus treoir a chur ar fáil d'earnáil na tionsclaíochta agus don phobal maidir le hábhair a bhaineann le caomhnú an chomhshaoil agus leis an gcosaint raideolaíoch.
- Faisnéis thráthúil ar an gcomhshaoil ar a bhfuil fáil éasca a chur ar fáil chun rannpháirtíocht an phobail a spreagadh sa chinnteoireacht i ndáil leis an gcomhshaoil (*m.sh. Timpeall an Tí, léarscáileanna radóin*).
- Comhairle a chur ar fáil don Rialtas maidir le hábhair a bhaineann leis an tsábháilteacht raideolaíoch agus le cúrsaí práinnfhreagartha.
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- Feasacht chomhshaoil níos fearr a ghiniúint agus dul i bhfeidhm ar athrú iompraíochta dearfach trí thacú le gnóthais, le pobail agus le teaghlaigh a bheith níos éifeachtúla ar acmhainní.
- Tástáil le haghaidh radóin a chur chun cinn i dtithe agus in ionaid oibre, agus gníomhartha leasúcháin a spreagadh nuair is gá.

Bainistíocht agus struchtúr na Gníomhaireachta um Chaomhnú Comhshaoil

Tá an gníomhaíocht á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóirí. Déantar an obair ar fud cúig cinn d'Oifigí:

- An Oifig um Inmharthanacht Comhshaoil
- An Oifig Forfheidhmithe i leith cúrsaí Comhshaoil
- An Oifig um Fianaise is Measúnú
- Oifig um Chosaint Radaíochta agus Monatóireachta Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag comhaltaí air agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair inní agus le comhairle a chur ar an mBord.



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