Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Ireland's Air Pollutant Emissions

1990-2030

May 2023

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 coordinating 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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KEY FINDINGS

Assessment of targets	Ireland exceeded its emission reduction commitment for ammonia, in 2021, continuing a trend of non-compliance with emission reduction targets for this pollutant. The EU Commission issued a Letter of Formal Notice to Ireland for the 2020 exceedance of its ammonia emission reduction commitment in January 2023.
	Emissions of non-methane volatile organic compounds exceeded the 2021 emission reduction commitment, due to use of better scientific data which was unavailable when the emission reduction commitments were set. Ireland is adjusting the emissions of non-methane volatile organic compounds to achieve compliance, as allowed under Article 5(1) of Directive (EU) 2016/2284.
	Ireland is compliant with the emission reduction commitments for nitrogen oxides and fine particulate matter ($PM_{2.5}$). Much deeper cuts in emissions of these pollutants is required by 2030 however.
	Emissions of sulphur dioxide continue to be well below the required EU emission reduction commitments despite an increase in 2021 driven by greater coal and fuel oil use in electricity generation.
Main drivers	Nitrogen oxide (NO_x) emissions increased in 2021 driven largely by an increase in the use of fuel oil and coal in electricity generation. The use of cleaner vehicles meant that transport NO_x emissions reduced slightly despite increased transport activity following the lifting of pandemic restrictions.
	Overall fine particulate matter ($PM_{2.5}$) emissions were at the same level as in 2020, and continue to meet the emission reduction commitment. Reduced residential sector emissions were offset by increased emissions from electricity generation.
	Growth in non-methane volatile organic compound emissions (up by 2% in 2021 vs 2020) is being driven largely by expansion in spirit production in the food and beverages industry, but also by a wide range of sources linked to population growth and agricultural activity.
	In addition to the five key air pollutants for which emission reduction commitments apply, this report also highlights the emissions trends for other pollutants such as carbon monoxide, lead, dioxins and Polycyclic Aromatic Hydrocarbons (PAHs). Emissions of most of these pollutants have greatly decreased since 1990 because of measures such as banning leaded fuel, catalytic converters and the move away from solid fuel for residential heating.
Future outlook	Mitigation measures to achieve compliance with emission reduction commitments out to 2030 are outlined in the National Air Pollution Control Programme (NAPCP) and Clean Air Strategy and include measures specifically to tackle air pollutants as well as greenhouse gas emission mitigation measures that have air pollutant emission co-benefits.
	The 2030 emission reduction commitments for nitrogen oxides will require full implementation of the measures in the NAPCP, Clean Air Strategy and Climate Action Plan measures such as significant electrification of the transport sector.
	Measures to tackle growing NMVOC emissions from spirit production have yet to be devised or implemented. In addition, further research is necessary on the broader range of NMVOC sources where emissions growth has historically been coupled with population growth.
	Projected compliance with the 2030 emission reduction commitment for ammonia is dependent on full implementation at farm level of all known ammonia abatement measures outlined in the AgClimatise plan (in line with the Teagasc Marginal Abatement Cost Curve analysis on ammonia emissions) and 2023 Climate Action plan. As the projected margin for compliance in 2030 is so narrow, any underperformance of mitigation measures or activity expansion beyond the latest projection will result in failing to achieve the 2030 commitment.
	An extremely narrow compliance margin with the 2030 emission reduction commitment is also being projected for fine Particulate matter ($PM_{2.5}$) emissions. A continued transition away from solid fuels for residential heating is required to minimise $PM_{2.5}$ emissions and address air quality issues in towns and villages.

1. Introduction

This report provides details of emissions of air pollutants in Ireland in the period 1990 to 2021 and projected emissions of these pollutants for 2030. The information used to compile this report is sourced from many Agencies and Government Departments, as well as from Annual Environmental Reports submitted by industry and waste management activities licensed by the EPA. The EPA has calculated emissions using the methodologies described in EU[1] and UN[2] reporting guidelines, to comply with the annual reporting requirements of the Convention on Long Range Transboundary Air Pollution (CLRTAP), and the National Emission reduction Commitments Directive (NECD).

This report focuses on the five key pollutants with emission reduction commitments (ERCs) for which Ireland must comply with under the National Emission reduction Commitments Directive (Directive (EU) 2016/2284)[3]. These pollutants are Sulphur Dioxide (SO_2), Nitrogen Oxides (NO_x), Ammonia (NH_3), Non-Methane Volatile Organic Compounds (NMVOCs) and Fine Particulate Matter ($PM_{2.5}$). For these pollutants the EPA has produced emission projections to give an indication of the likelihood of compliance with future emission reduction commitments. A summary of emission trends in air pollutants for which there are no emission reduction commitments under Directive (EU) 2016/2284 is also presented in section 4.

1 https://www.eea.europa.eu/publications/emep-eea-guidebook-2019

2 https://unece.org/DAM/env/documents/2013/air/eb/ece.eb.air.125_E_ODS.pdf

3 Transposed into Irish law via S.I. No. 232/2018.

2. National Emission Reduction Commitments

The five air pollutants for which emission reduction commitments are set affect the environment and human health in different ways. SO_2, NO_x and NH_3 are primarily associated with acid deposition leading to toxicity of soils and waters[4]. The EPA water quality reports highlights many of the same drivers for Nitrate pollution as this report highlights for ammonia emissions. Ammonia is also responsible for secondary particulate matter formation and nitrogen oxides are precursors to tropospheric (ground level) Ozone formation. Fine Particulate Matter, tropospheric Ozone, NO_x and NMVOCs impact directly on human health, especially in higher concentrations in urban areas. In its 2021 Air Quality in Europe report[5], the EEA estimated that approximately 1,300 premature deaths a year occur in Ireland due to poor Air Quality. The EPA, working with local authorities and other public bodies has established 97 air monitoring stations and monitoring data from these stations is available in real time. The EPA's annual Air Quality in Ireland Report presents the key findings from these stations[6].

The National Emission reduction Commitments Directive (Directive (EU) 2016/2284) on the reduction of national emissions of certain atmospheric pollutants, harmonises the reporting obligations to the European Union under the Convention on Long Range Transboundary Air Pollution (CLRTAP) and details emission reduction commitments for the above-mentioned air pollutants for 2020 and 2030. A full outline of the reporting obligations and submission deadlines are outlined in Article 8 and Annex I of Directive (EU) 2016/2284[7].

The emission reduction commitment for Ireland for 2020 and 2030 are as follows and are set as a percentage reductions on 2005 emission levels:

	2020	2030
• Sulphur Dioxide (SO_2)	-65%	-85%
• Nitrogen Oxides (NO_x)	-49%	-69%
• Ammonia (NH_3)	-1%	-5%
• Non-Methane Volatile Organic Compounds (NMVOCs)	-25%	-32%
• Particulate Matter < 2.5 µm ($PM_{2.5}$)	-18%	-41%

Additionally, emissions in 2025 should follow a linear reduction trajectory between the levels defined by the emission reduction commitments in 2020 and 2030.

2.1 Compliance with National Emission Reduction Commitments

Current emission reduction commitments

The current emission reduction commitments to which Ireland must comply under Directive (EU) 2016/2284, are set out in Table 1 along with the latest emission estimates for 2021. Emission reduction commitments are based on percentage reductions compared to 2005 emission levels. As the reductions are relative to a base year (2005), the absolute value of allowed emissions will continue to vary as emission estimates are revised and updated.

4 https://www.epa.ie/publications/research/air/research-390-nitrogensulfur-critical-loads-assessment-of-the-impacts-of-air-pollution-on-habitats.php

5 Tables 3 and 4 – European Environment Agency (europa.eu)

6 EPA-Air_Quality_in-Ireland-Report_2021_-interactive-pdf.pdf

7 Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC.

The findings of the EPA's assessment of Ireland's air pollutant emissions for 2021 are set out in Table 1 and show that;

- Ireland complied with the SO_2, NO_x and $PM_{2.5}$ emission reduction commitments for 2021.
- Ireland did not comply with its emission reduction commitments for NH_3 and NMVOC for 2021.
- Emissions of NMVOC reduced by only 8.8 per cent compared to the required 25 per cent emission reduction commitment.
- Emissions of NH_3 increased by 3.8 per cent compared to the required 1 per cent emission reduction commitment.

Table 1. Actual emissions for 2005 and 2021 and Emission reduction commitments for 2020 for NEC relevant pollutants for 2021 compared to 2005

	2005	2021
Nitrogen Oxides (NO_x (kt)	134.144	62.017
Emission reduction commitment for 2020 (%)		-49%
Actual reduction in emissions 2021 (%)		-53.8%
Sulphur Dioxide SO_2 (kt)	72.813	11.768
Emission reduction commitment for 2020 (%)		-65%
Actual reduction in emissions 2021 (%)		-83.8%
Non-Methane Volatile Organic Compounds (NMVOC) (kt)	77.100	70.295
Emission reduction commitment 2020 (%)		-25%
Actual reduction in emissions 2021 (%)		-8.8%*
Ammonia (NH_3) (kt)	120.148	124.654
Emission reduction commitment for 2020 (%)		-1%
Actual reduction in emissions 2021 (%)		+ 3.8%*
Fine Particulate Matter ($PM_{2.5}$) (kt)	18.715	12.599
Emission reduction commitment 2020 (%)		-18%
Actual reduction in emissions 2021 (%)		-32.7%

* Data in red highlights where the 2020 emission reduction commitments have not been complied with.

Directive (EU) 2016/2284 has a flexibility mechanism that allows Member States to make an adjustment to their national inventory estimates for compliance purposes. This is allowed where non-compliance with national emission reduction commitments would result from applying improved emission inventory methods, updated in accordance with scientific knowledge. This flexibility applies to the five key pollutants and is available to all Member States, ensuring that countries are not penalised for updating estimates with information that could not have been foreseen when the emission reduction commitments were agreed in 2012.

Emissions of NO_x and NMVOCs from manure management and agricultural soils are not accounted for the purpose of compliance assessment (Article 4 (3) Directive (EU) 2016/2284).

Ireland is non-compliant with national emission reduction commitments for NMVOCs for 2021 as a result of applying improved emission inventory methods which consists of using more up-to-date emission factors and recognising new sources of emissions. As a result, and in accordance with Directive 2016/2284, Ireland is allowed to utilise the prescribed flexibility mechanism.

Adjusted total emissions for NMVOC are presented in Table 2. When the adjustment is considered, Ireland is compliant with the emission reduction commitment for NMVOC for 2020 and 2021. Detailed information relating to the use of the flexibility mechanism is outlined in Ireland's Informative Inventory Report 2023[8].

Table 2. Adjusted emission estimates for NMVOCs*

	2005	2021
NMVOC (kt)	77.100	70.295
2020 ERC (%)		-25%
Actual reduction in emissions (%)		-8.8%*
Adjustment (kt)	-8.376	-23.874
Adjusted NMVOC (kt)	68.723	46.421
Adjusted reduction in emissions (%)		-32.5%

* Data in red highlights where emission reduction commitment has not been complied with

As the non-compliance for NH_3 has not been attributed to improved inventory methods and is as a direct result of increased agricultural activity, the criteria for use of the flexibility mechanism does not apply in this case.

Future emission reduction commitments

Ireland must implement significant mitigation measures to achieve compliance with emission reduction commitments out to 2030 as outlined in the National Air Pollution Control Programme (NAPCP) and the recently published Clean Air Strategy[9]. Table 3 sets out the latest estimated values for the reduction commitments in 2030 along with projected emissions under two scenarios, *With Existing Measures* (WEM) and *With Additional Measures (WAM)*.

The WEM scenario assumes that no future policy actions are taken beyond those already implemented by the end of 2021, the latest inventory year.

8 Informative Inventory Report: Monitoring & Assessment: Climate Change: Air emissions Publications | Environmental Protection Agency (epa.ie)

9 https://assets.gov.ie/255392/efe212df-d9a7-4831-a887-bea2703e2c64.pdf

The WAM scenario provides an alternative scenario which includes additional planned policies and measures beyond 2021, such as the effect of Ireland's Climate Action Plans (2021 and 2023) which sets out a major programme of policies and measures aimed to help Ireland achieve its decarbonisation goals. It also includes the effect of full implementation of AgClimatise[10] which is the roadmap for the agriculture sector towards climate neutrality and the latest Teagasc Marginal Abatement Cost Curve for NH_3 emissions from the agriculture sector[11]. Furthermore, the Government submitted to the EU a National Air Pollution Control Plan[12] in 2021 to meet the 2030 emission reduction commitments as assigned by Directive 2016/2284. Often similar measures exist in both scenarios, for example Low Emission Slurry Spreading or the uptake of Electric Vehicles. For both of these measures the WEM scenario represents a projected uptake of the technology that is consistent with actions already in place and committed to whereas the WAM scenario reflects a higher level of ambition as expressed in Government plans. The recently published Clean Air Strategy[13] includes many of the measures included in the WAM scenario.

As can be seen from Table 3, compliance with the Emission Reduction Commitments (ERCs) for 2030 for SO_2, NO_x, NH_3 and $PM_{2.5}$ is projected based on the continued adoption of measures in the WEM scenario. Further reductions are then seen with adoption of planned polices and measures under the WAM scenario.

Ammonia emissions are projected to remain non-compliant initially, but with the adoption of abatement measures, emissions of this pollutant are forecasted to become compliant by 2025 and in 2030, however only by small margins. If emissions of NH_3 were to increase over and above those forecasted, it will put the compliance with reduction commitments at risk and further measures may be required.

For NMVOC emissions, compliance is not achieved in either scenario without the inclusion of an adjustment under the flexibility mechanism in Directive (EU) 2016/2284. Furthermore, even with the inclusion of an adjustment under the flexibility mechanism, non-compliance is still projected under the WEM scenario. Further measures to tackle NMVOC emissions will need to be identified.

For $PM_{2.5}$ it is projected that under the WEM scenario the ERC for 2030 will not be met and that it will only be met in the WAM scenario by a small margin.

10 https://www.gov.ie/en/publication/07fbe-ag-climatise-a-roadmap-towards-climate-neutrality/

11 https://www.teagasc.ie/news--events/news/2020/reduce-ammonia-emissions.php

12 https://www.gov.ie/en/publication/23bdb-national-air-pollution-control-programme-napcp/

13 https://www.gov.ie/en/press-release/aa501-government-approves-irelands-first-ever-clean-air-strategy/

Table 3. Actual emissions for 2021, projected emissions for 2025 and 2030 and reduction commitments for NEC relevant pollutants

Pollutant	Emissions (kilotonnes)			2020-2029 and 2030 Reduction Commitments (% reduction compared with 2005 levels) based on latest inventory estimates	
	2021	2025	2030	2020-2029	2030
Total SO_2 *WEM*	11.77	7.18	6.25	**25.48**	**10.92**
Total SO_2 *WAM*	11.77	7.22	5.53	-65%	-85%
Total NO_x *WEM**	62.02	45.54	37.14	**68.41**	**41.58**
Total NO_x *WAM**	62.02	45.46	34.55	-49%	-69%
Total NMVOC *WEM**	70.30	74.70	80.72	**57.82**	**52.43**
Total NMVOC *WAM**	70.30	74.50	78.40	-25%	-32%
Adjusted NMVOC *WEM**	46.42	46.96	47.27	**51.54**	**46.73**
Adjusted NMVOC *WAM**	46.42	46.76	44.95	-25%	-32%
Total NH_3 *WEM*	124.65	116.65	114.14	**118.95**	**114.14**
Total NH_3 *WAM*	124.65	118.24	113.05	-1%	-5%
Total $PM_{2.5}$ *WEM*	12.60	11.60	11.77	**15.35**	**11.04**
Total $PM_{2.5}$ *WAM*	12.60	11.45	11.03	-18%	-41%

* Article 4 (3) of the National Emission reduction Commitments Directive provides that emissions of NO_x and NMVOC from categories 3B (manure management) and 3D (agricultural soils) are not accounted for the purpose of complying with 2020 and 2030 emission reduction commitments.

Section 3 of this report provides insights to current and historic trends of the five pollutants for which emission reduction commitments are in place for 2020 and 2030. It also provides an assessment of projected future emissions in 2030 of these pollutants, focusing on the *With Additional Measures* scenario.

Other pollutants

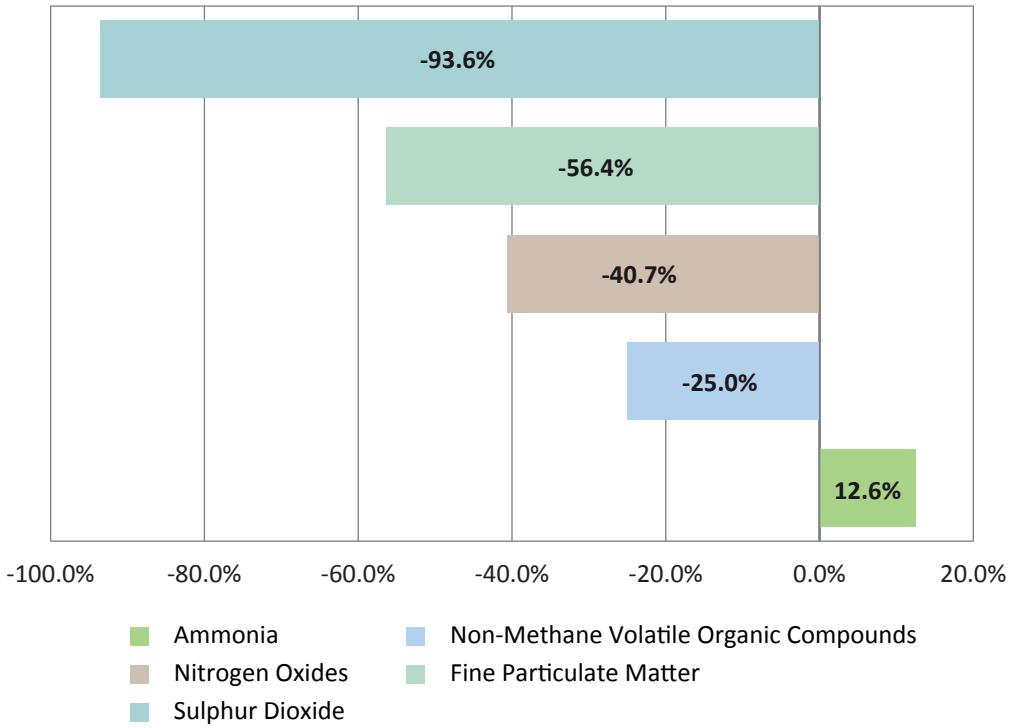
A large number of other pollutants for which no emission reduction commitments exist under Directive 2016/2284 are also reported on annually by the EPA. The general trend with these pollutants is downward, largely as a result of fuel switching from coal and peat to natural gas and kerosene in the residential sector, penetration of renewables for electricity generation and reductions in the quantities of coal and peat combusted for electricity generation. Changes in the age structure of the national vehicle fleet have also had a positive impact. Further detail on these pollutants is presented in section 4. Detailed information on these pollutants is also provided in Ireland's Informative Inventory Report 2023[8].

3. Key Air Pollutants under the National Emission reduction Commitments Directive

The Revised Gothenburg Protocol to abate Acidification, Eutrophication and Ground-level Ozone was adopted in May 2012. The Protocol set national emission reduction commitments for 2020 and beyond for five pollutants; sulphur dioxide (SO_2), nitrogen oxides (NO_x), volatile organic compounds (VOCs), ammonia (NH_3) and particulate matter < 2.5 µm ($PM_{2.5}$). The EU has implemented its provisions via the National Emission reduction Commitments Directive, setting out emission reduction commitments for the five air pollutants described in this section.

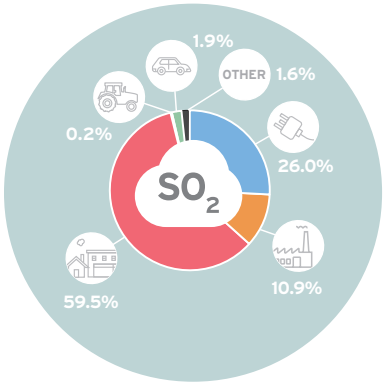
Ireland has seen big reductions in the emissions of all but one of these pollutants over the last thirty years as can clearly be seen in Figure 1 below. Despite this progress, challenges still remain to maintain a decreasing trend in the face of increasing economic activity, particularly in relation to emissions from Transport, Agriculture and Industry. Future expansion of these sectors can result in increased emissions of all the key pollutants in the absence of decoupling, such as has occurred with emissions of sulphur dioxide from electricity generation.

Figure 1: Percentage change in key NECD Air Pollutants 1990-2021



3.1 Sulphur Dioxide

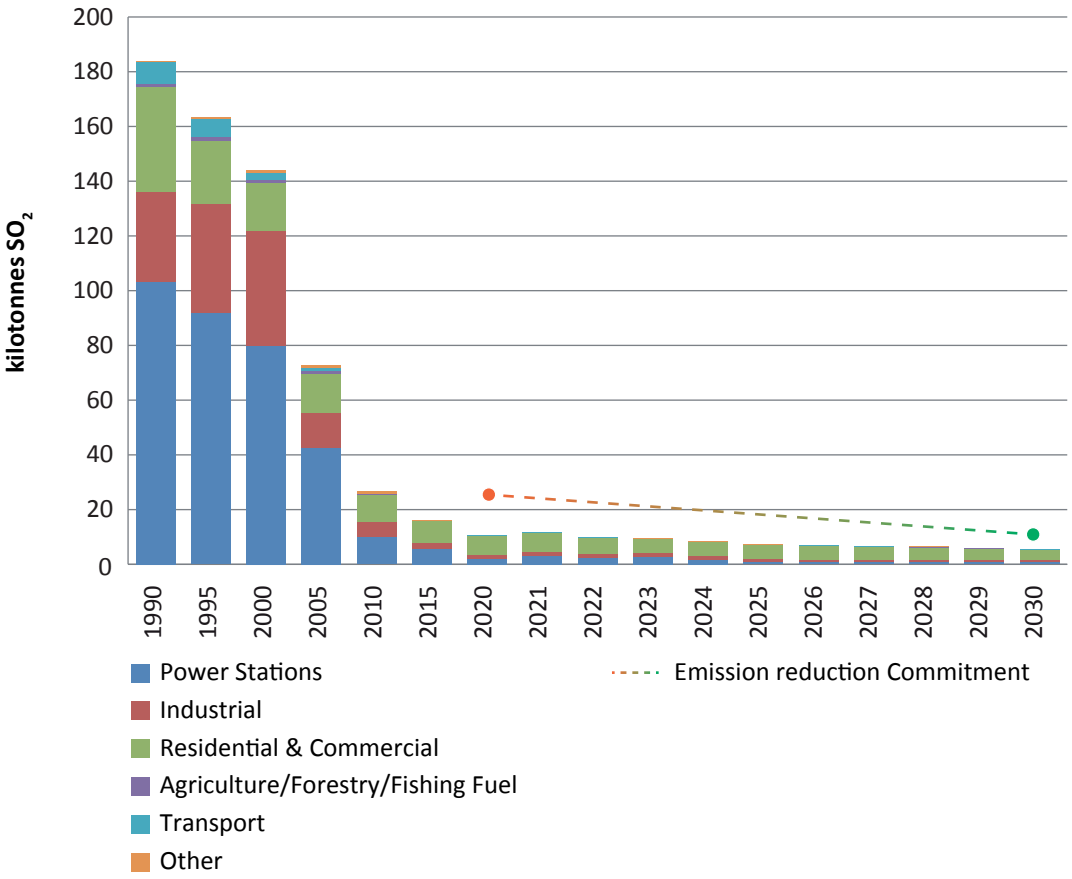
Sulphur dioxide (SO_2) is the major precursor to acid deposition, which is associated with the acidification of soils and surface waters and the accelerated corrosion of buildings and monuments. Emissions of SO_2 are derived from the sulphur in fossil fuels such as coal and oil used in combustion activities.



National Emission Reduction Commitments

Ireland's national emission reduction commitment for SO_2 under the NEC Directive is a 65% reduction on 2005 levels to be achieved for 2020 and an 85% reduction to be achieved for 2030. (Figure 2). Emissions have reduced by 83.8 per cent in the period 2005-2021 and therefore Ireland remains in compliance with the emission reduction commitment for 2020.

Figure 2: Trend in SO_2 emissions 1990-2030 and emission reduction commitments 2020-2030



Current and future trends in SO_2 emissions

Total national emissions of SO_2 were 9.7 per cent higher in 2021 compared to 2020 mainly as a result of the tripling of both coal and fuel oil use in electricity generation. Power stations and combustion of fossil fuels in residential and commercial sectors for heating are the two principal sources of SO_2 emissions, contributing 26.0 and 59.5 per cent respectively to the total in 2021. Combustion sources in the industrial sector accounted for 10.9 per cent in 2021. Increases in emissions were seen in power stations, manufacturing industry and construction sectors in 2021. Emissions in the residential and commercial sectors decreased by 2.4 per cent, reflecting decreased home heating due to the 2.5% less heating degree days[14] in 2021 than in 2020 and continued fuel switching to cleaner fuels.

In terms of the outlook for 2030, the emission projections predict compliance with the 2030 emission reduction commitment which require an 85 per cent reduction on 2005 levels. It is projected that in 2030 emissions will be 92.4 per cent below those in 2005. Key sources of projected SO_2 emissions, similar to current trends, include fossil fuel combustion for electricity generation in power stations and emissions from fuel combustion within the residential, commercial and manufacturing industry and construction sectors. Projected emission reductions are provided in Table 4.

Table 4. Projected SO_2 emission reduction in 2025 and 2030 compared to 2005

Projected SO_2 emissions	2025	2030
With Additional Measures Scenario (%)	-90.1	-92.4
Emission Reduction Commitment (%)	-65.0	-85.0

Historic SO_2 Emissions

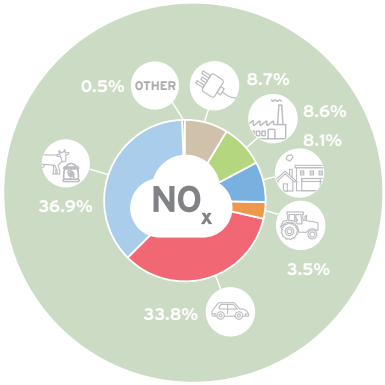
Sulphur dioxide emissions in Ireland reduced considerably between 1990 and 2021. The latest estimates indicate a decrease of 93.6 per cent from 183.8 kt in 1990 to 11.8 kt in 2021. Emissions from Power stations and combustion in residential and commercial sectors decreased by 97.0 and 81.6 per cent respectively since 1990. The emissions from industrial sources decreased by 96.1 per cent from 1990 while the emissions in the transport sector decreased by 97.2 per cent. These large reductions reflect significant switching from the use of oil and solid fuels to natural gas, reduced sulphur content in coal and oil and implementation of abatement measures in electricity generation to meet emission limit values. Increased use of renewables rather than combustion of fossil fuels to meet increased electricity demand also contributes to this trend. Emissions from transport have decreased by 97.2 per cent as a result of reduced sulphur content of fuels.

The remainder of SO_2 emissions are from combustion in oil refining, and combustion of fuels in agriculture, forestry, fishing. Emissions in these sectors decreased by 70.0 per cent and 98.3 per cent, respectively since 1990.

14 Degree days are a measure of the heating or cooling requirement on a given day with reference to a level where neither is required (typically 15.5°C). The number of degree days in a year is a strong indicator of the annual Residential energy demand.

3.2 Nitrogen Oxides

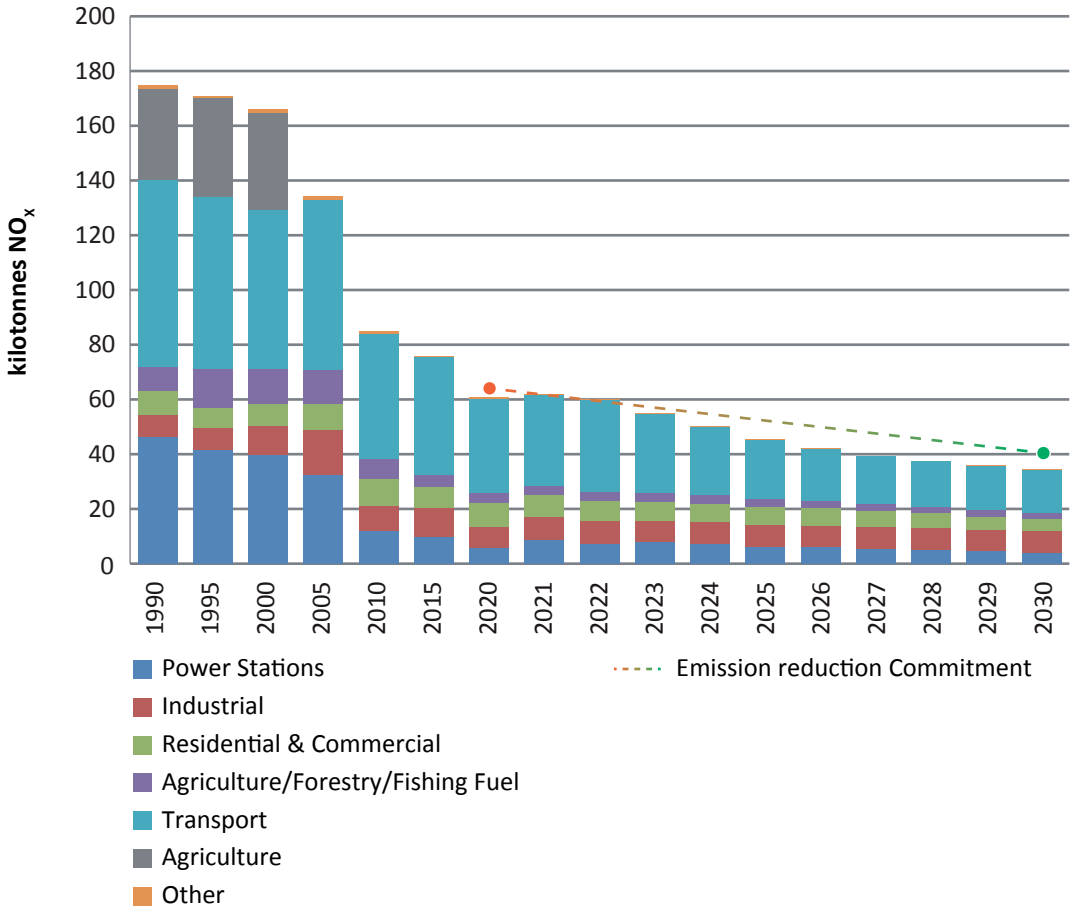
Emissions of nitrogen oxides (NO_x) contribute to acidification of soils and surface waters, ground level ozone formation and excess nitrogen or saturation in terrestrial ecosystems. Agriculture (as a result of both organic and synthetic nitrogen use) and fossil fuel combustion in power generation and transport are the principal sources.



National Emission Reduction Commitments

Ireland's national emission reduction commitment for NO_x for 2020 under the NECD was a 49 per cent reduction compared to a 2005 baseline level. Article 4 (3) of Directive (EU) 2016/2284 states that emissions from manure management and agricultural soils are not accounted for the purpose of compliance assessment. On that basis emissions have reduced by 53.8 per cent in the period 2005-2021 and therefore Ireland remains in compliance with the emission reduction commitment for 2020 (Figure 3).

Figure 3: Trend in NO_x emissions 1990-2030 and emission reduction commitments 2020-2030



Current and future trends in NO_x emissions

The latest estimate is that in total 98.21 kt of NO_x was emitted in 2021, including Agriculture emissions from manure management and agricultural soils that are not accounted for the purpose of the NECD compliance assessment under Article 4 (3) of Directive (EU) 2016/2284. Emissions of NO_x increased by 2.9 per cent in 2021 compared to 2020, primarily as a result of increased emissions from power stations due to more coal and fuel oil being used. There were also smaller increases in emissions from manufacturing industry, construction and agriculture sectors as the level of activity in the sectors increased. The agriculture sector, which consists of emissions from synthetic fertiliser application and emissions from urine and dung deposited by grazing animals, contributing approximately 36.9 per cent of the 2021 total. Transport (of which road transport is the main contributor), is the second biggest source of NO_x contributing approximately 33.8 per cent of the 2021 total. The industrial, power generation and residential/commercial sectors are the other main sources of NO_x emissions, with contributions of 8.6 per cent, 8.7 per cent and 8.1 per cent respectively in 2021. The remainder of NO_x emissions emanate from combustion in the agriculture and other (refining and storage, solid fuel manufacture, fugitive emissions and waste) sectors, which together produced around 4.0 per cent of the total in 2021.

Total NO_x emissions in 2021, and projections for all subsequent years to 2030, are compliant with emission reduction commitments.

Table 5. Projected NO_x emission reduction in 2025 and 2030 compared to 2005

Projected NO_x emissions	2025	2030
With Additional Measures Scenario (%)	-66.1	-74.2
Emission Reduction Commitment (%)	-49.0	-69.0

Historic NO_x Emissions

NO_x emissions in Ireland have decreased by 43.8 per cent between 1990 and 2021 and emissions have decreased by 48.85 kt, or 33.2 per cent since 2008. This reduction was achieved due to improved abatement in Moneypoint power plant, reduced demand for clinker/cement and a reduction in emissions from road transportation. The application of low-NO_x burner technology in several major power stations and the increased use of natural gas have reduced NO_x emissions from electricity generation by 81.6 per cent on 1990 levels, even though electricity total final consumption has increased by 149.0 per cent over the same period. Emissions of NO_x from the coal-fired power plant at Moneypoint have decreased by 94.1 per cent between 1990 and 2021.

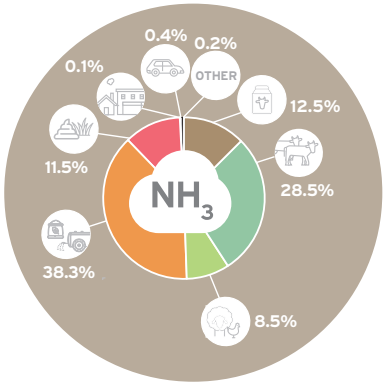
Road transport has seen a decline in emissions of 26.6 kt, or 53.0 per cent, between 2008 and 2021 due to the economic recession initially and in later years improvements in vehicle technologies. The effects of Covid-19 restrictions had a significant impact in 2020 and 2021.

The NO_x figures for transport reported here are based on fuel used and not fuel sold, and therefore take into account fuel tourism. This means that the impact on emissions of fuel sold in the Republic of Ireland for consumption across the border in Northern Ireland is removed as allowed for under the *Guidelines for Reporting Emissions and Projections Data under the Convention on Long-range Transboundary Air Pollution*[15], paragraph 23. It is estimated that fuel tourism accounted for 1.8 kt of NO_x in 2021.

15 Paragraph 23, https://unece.org/DAM/env/documents/2013/air/eb/ece.eb.air.125_E_ODS.pdf

3.3 Ammonia

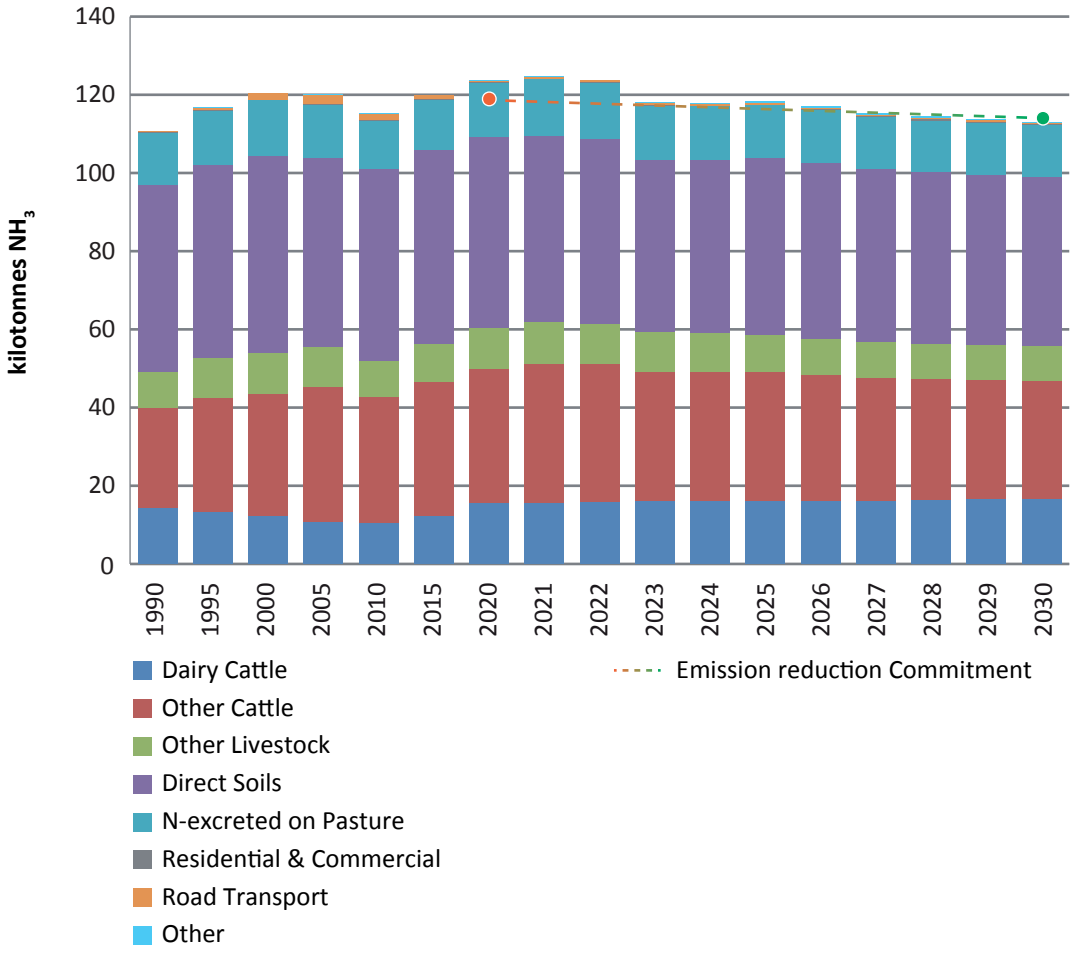
Ammonia (NH_3) emissions to air are associated with nitrogen deposition, acid rain and the formation of secondary particulate matter. The agriculture sector accounts for virtually all (99.4 per cent) of ammonia emissions in Ireland. Grasslands ultimately receive the bulk of the 41 million tonnes (Mt) of animal manures (equivalent to 572,509 tonnes of nitrogen) produced in Ireland along with nitrogen fertilisers which amounted to 399,160 tonnes (as nutrient nitrogen) in 2021. A proportion of the nitrogen in these inputs is volatilised into the air as ammonia.



National Emission Reduction Commitments

Ireland's national emission reduction commitment for NH_3 for 2020 under the NECD was a 1 per cent reduction compared to a 2005 baseline level. As emissions in 2020 and 2021 were 3.0 and 3.8 per cent higher, respectively than in 2005, Ireland is non-compliant with the emission reduction commitment for 2020 (Figure 4). As a result of Ireland's non-compliance with the 2020 emission reduction commitment the European Commission in January 2023 served Ireland with an infringement notice for non-compliance with the NECD.[16]

Figure 4: Trend in NH_3 emissions 1990-2030 and emission reduction commitments 2020-2030



16 https://ec.europa.eu/commission/presscorner/detail/EN/inf_23_142

As shown in Figure 4 growth in emissions (due to increased bovine population and increased nitrogen fertiliser use) since the removal of milk quotas in 2015 is the main driver of non-compliance in 2020 and 2021. Even though emission levels are in non-compliance, they had reduced in recent years in response to the adoption of abatement measures such as low emission spreading techniques and the use of inhibited urea fertiliser products.

However, in 2021 growth in livestock numbers, 0.8 per cent increase in total cattle herd (2.8 per cent increase in dairy cow numbers), 0.4 per cent increase in the sheep flock and along with a 4.5 per cent increase in pig numbers led to an increase of 0.7 per cent in total national emissions.

Increased use of low emission slurry spreading to 48 per cent of all cattle slurry was not sufficient to counteract overall growth in livestock numbers. Use of inhibited urea fertiliser remained similar to 2020 levels due to supply issues.

Current and future trends in NH_3 emissions

The emissions in 2021 were 14.0 kt or 12.6 per cent higher than emissions in 1990. Emissions in 2021 were 0.7 per cent higher than those in 2020, mainly as a result of increased cattle, sheep and pig populations. Animal manures produce about 90 per cent of ammonia emissions in agriculture and chemical fertilisers and road transport account for the remainder. It is estimated that approximately 12.5 per cent of the nitrogen in animal manures and 2.6 per cent of nitrogen contained in chemical fertilisers is lost to the atmosphere annually as NH_3 on average. In 2021, 48 per cent of cattle slurry was applied using low emission techniques (38 per cent in 2020) and there was a 2.8 per cent increase (following a 62.1 per cent increase in 2020) in the use of inhibited urea fertiliser products. These are positive actions and are welcomed.

Under both the With Existing Measures and the With Additional Measures scenarios, emission levels follow similar pathways with only a 1.1 kt difference in projected emissions in 2030.

Under the With Existing Measures scenario, it is projected that low emission slurry spreading techniques continue to grow in use with 90 per cent of all cattle slurry applied with these techniques by 2027. Additionally, the fertiliser replacement value of increased use of lime to address soil fertility and enhanced nutrient use efficiency is also included. Both measures are outlined in the Teagasc NH_3 MACC[11] and the DAFM AgClimatise[10] documents.

The With Additional Measures scenario includes the following measures: a reduction in crude protein content of concentrates fed to pigs; cattle and pig slurry amendments; covering of slurry stores; drying of poultry manure, reduced slaughter age for cattle, reduced age of beef (suckler) cows at first calving, use of low emission slurry spreading techniques for pig slurry; replacement of calcium ammonium nitrate (CAN) and CAN based compounds with inhibited urea products and target nitrogen fertiliser application of 300,000 tonnes in 2030. These measures are outlined in the Teagasc NH_3 MACC[11] and the DAFM AgClimatise[10] documents and the Climate Action Plan 2023.

Achievement of the 2030 Emission reduction Commitment is projected under the With Additional Measures scenarios, however achieving the adoption of these measures in full will require significant policy levers. Further measures such as a ban on the use of straight urea as outlined in AgClimatise[10] would provide an increased level of compliance in 2030.

Table 6: Projected NH_3 emission reduction in 2025 and 2030 compared to 2005

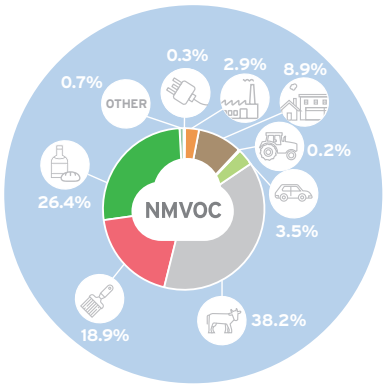
Projected NH_3 emissions	2025	2030
With Additional Measures Scenario (%)	-1.6	-5.9
Emission Reduction Commitment (%)	-1.0	-5.0

Historic NH_3 Emissions

The NH_3 emissions trend is largely determined by the cattle population and showed a steady increase up to 128.3 kt in 1998. There was some decline in the populations of cattle and sheep after 1998, as well as a decrease in fertiliser use, which contributed to a decrease in NH_3 emissions in the period 2000 to 2011. Subsequently, increases in cattle numbers and fertiliser use have seen NH_3 emissions increase especially in response to the removal of milk quotas in 2015. NH_3 emissions increased up to 2018 to 136.4 kt, the highest emissions across the timeseries (response to significant drought conditions in 2018 and increase nitrogen fertiliser and concentrate feeding to bovines). Road transport produces a small proportion of emissions of ammonia (< 1 per cent) mainly from petrol passenger cars with three-way catalysts.

3.4 Non-Methane Volatile Organic Compound (NMVOC) emissions

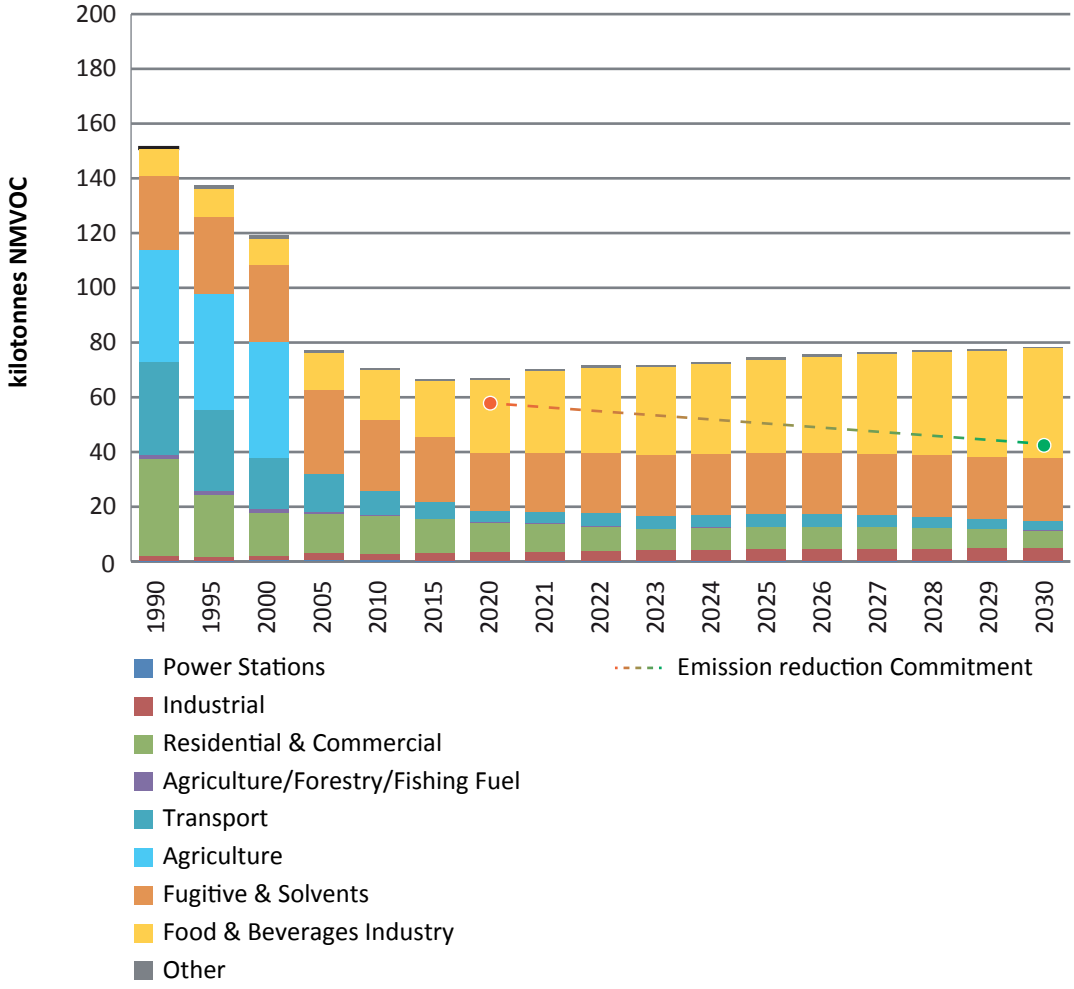
Non-methane volatile organic compounds (NMVOC) are emitted as gases by a wide array of products including paints, paint strippers, glues, cleaning agents and adhesives. They also arise as a product of incomplete combustion of fuels, from the storage and handling of animal manure and fertilisers in agriculture and from the food and beverages industry.



National Emission Reduction Commitments

Ireland's national emission reduction commitment for NMVOC for 2020 under the NECD was a 25 per cent reduction compared to a 2005 baseline level. As per Article 4 (3) of the NECD, emissions from manure management and agricultural soils are not accounted for the purpose of compliance targets. When this is taken into account emissions have reduced by 8.8 per cent in the period 2005-2021 and therefore Ireland is non-compliant with the emission reduction commitment for 2020 (Figure 5).

Figure 5: Trend in NMVOC emissions 1990-2030 and emission reduction commitments 2020-2030



Ireland has applied an adjustment to NMVOC emission inventories, as allowed under Article 5(1) of Directive 2016/2284 in accordance with Part 4 of Annex IV, as Ireland is non-compliant with its national emission reduction commitment for NMVOC as a result of applying improved emission inventory methods updated in accordance with better scientific knowledge. This adjustment relates to the inclusion of emissions from spirit production in the food and beverage industry category. When this flexibility is taken into account emissions in 2021 are 32.5 per cent below 2005 levels bringing Ireland into compliance with its emission reduction commitment.

Current and future trends in NMVOC emissions

The main sources of NMVOC emissions in Ireland are from manure management in agriculture, solvent use and fugitive emissions and the food and beverages industry. These sources produced 38.2 per cent, 18.9 per cent and 26.4 per cent, respectively of the annual total in 2021. Emissions in 2021 were 1.9 per cent above those in 2020, mainly driven by 12.7 per cent increase in emissions from the food and beverage industry. Emissions from combustion of fossil fuels across all sectors; power stations, industrial, residential, commercial and agriculture accounted for 12.2 per cent of national total NMVOC emissions in 2021. Transport emissions accounted for 3.5 per cent of national total emissions of NMVOC, mainly from exhaust and fugitive releases from gasoline vehicles.

Total NMVOC emissions under the WAM scenario are projected to be 1.7 per cent above 2005 levels in 2030. The emission reduction commitment for 2030 is a reduction of 32 per cent on 2005 emission levels (Table 7). The emission projections thus predict non-compliance with the 2030 emission reduction commitment. Key drivers in emissions over the projected period include solvents and other product use, and emissions from food and beverages industry.

Table 7 also presents a scenario where the NMVOC emissions from source category 2.H (spirit production) are excluded, as this source was not included in the national inventory at the time the 2020 and 2030 emission reduction commitments were established. Emissions in 2030 are projected in this case to be 34.6 per cent below emission levels in 2005. The emission reduction commitment for 2030 is a 32 per cent reduction, thus compliance with the emission reduction commitment is projected when the flexibility outlined in Article 5(1) of Directive 2016/2284 in accordance with Part 4 of Annex IV is applied.

Table 7. Projected NMVOC emission reduction in 2025 and 2030 and associated emission reduction commitments compared to 2005

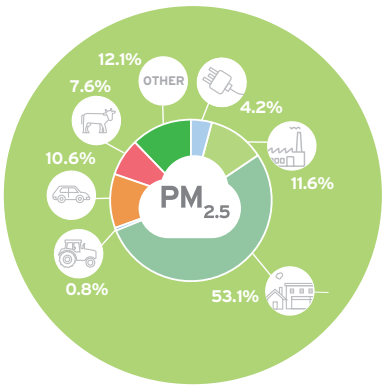
Projected NMVOC emissions	2025	2030
(excluding emissions from agricultural categories 3B and 3D)		
With Additional Measures Scenario (%)	-3.4	+ 1.7
Emission Reduction Commitment (%)	-25.0	-32.0
(excluding emissions from agricultural categories 3B and 3D and source category 2.H (spirit production)		
With Additional Measures Scenario (%)	-32.0	-34.6
Emission Reduction Commitment (%)	-25.0	-32.0

Historic NMVOC Emissions

Reductions corresponding to 25.0 per cent of NMVOC emissions have been achieved from 1990 to 2021. Technological controls for NMVOCs in motor vehicles, which have led to a significant reduction in emissions from road transport, have largely been responsible for the decrease in overall emissions along with reduced use of coal and peat as a source of heating in the residential sector. On the other hand, emissions from the agriculture sector have increased by 6.1 per cent since 1990. Emissions from the food and beverage industry, mainly spirit production have increased by 212.0 per cent over the same period.

3.5 Fine Particulate matter ($PM_{2.5}$) emissions

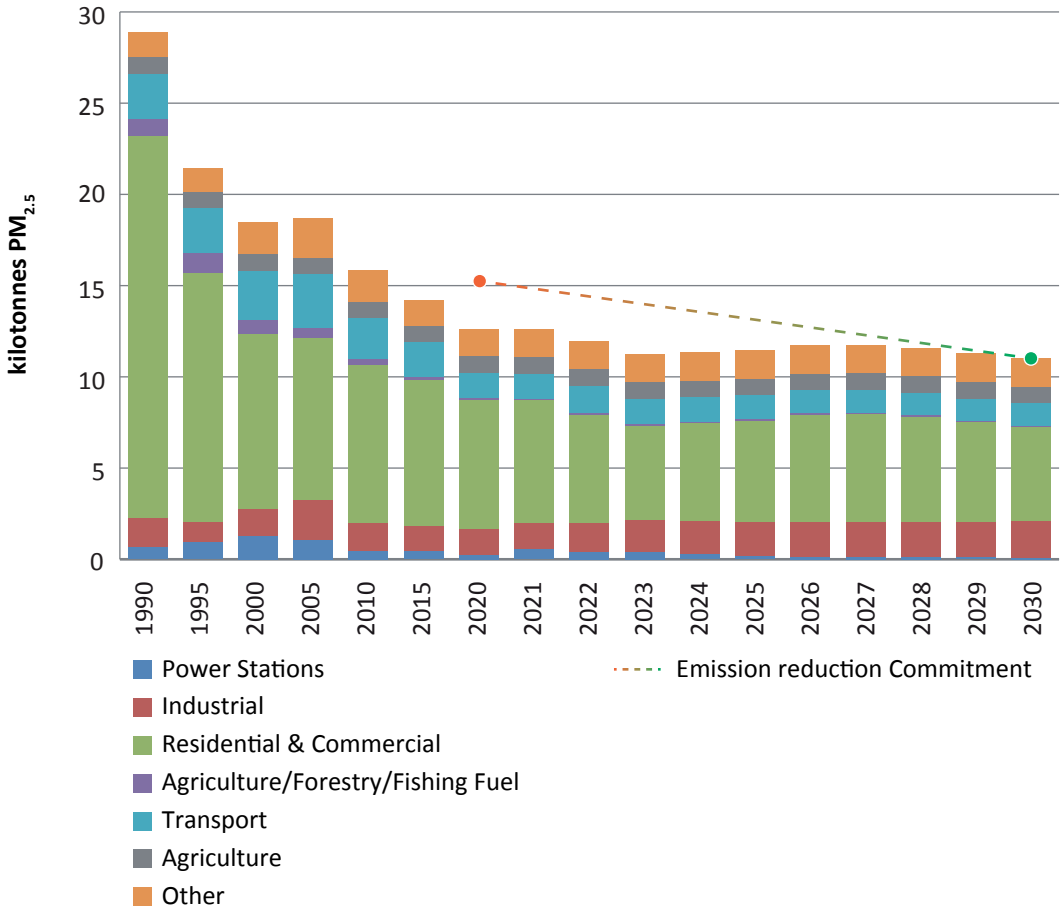
There are many sources of particulate matter (dust) including vehicle exhaust emissions, soil and road surfaces, construction works and industrial emissions. Particulate matter can be formed from reactions between different pollutant gases. Small particles can penetrate the lungs and cause damage. These are known as PM_{10} (diameter less than 10µm) and $PM_{2.5}$ (diameter less than 2.5µm). $PM_{2.5}$ is a better indicator of anthropogenic (man-made) emissions. Fine particulate matter $PM_{2.5}$ is responsible for significant negative impacts on human health.



National Emission Reduction Commitments

Ireland's national emission reduction commitment for PM2.5 for 2020 under the NECD was a 18 per cent reduction compared to a 2005 baseline level. Emissions have decreased by 32.7 per cent in the period 2005-2021 and therefore Ireland remains in compliance with the emission reduction commitment for 2020. (Figure 6).

Figure 6: Trend in $PM_{2.5}$ emissions 1990-2030, and emission reduction commitments 2020-2030



Current and future trends in $PM_{2.5}$ Emissions

Emissions in 2021 were 0.1 per cent below those in 2020. The main sources of $PM_{2.5}$ emissions in Ireland are from combustion of fossil fuels in the residential & commercial and manufacturing industries and construction sectors which produced 53.1 per cent and 11.6 per cent of the annual total, respectively in 2021.

$PM_{2.5}$ emissions in the Other sectors account for 12.1 per cent of the total in 2021. These emissions arise from Manufacture of solid fuels, oil refining/storage sectors, coal mining and handling, quarrying and mining of minerals other than coal, construction and demolition, storage, handling and transport of mineral products, road paving with asphalt, fireworks, use of tobacco, storage handling and transport of agricultural products and accidental vehicle and building fires.

Transport was responsible for a 10.6 per cent share to the national total in 2021. Emissions from Agriculture arise from Manure Management and Inorganic Nitrogen fertilisers, together accounting for 7.6 per cent of the national total in 2021. Emissions from public electricity and heat production accounted for 4.2 per cent of the total. However, emissions from this source increased by 112.8 per cent compared to 2020 as a result of the tripling of both coal and fuel oil use in electricity generation.

It must be noted that while national emission levels are in compliance with the emission reduction commitment, localised air quality issues exist. Particulate matter levels recorded at ambient monitoring stations continue to be a concern in villages, towns and cities. Monitored levels of particulate matter were above the annual World Health Organisation air quality guidelines at 65 of 81 monitoring stations in 2021. Continued reductions in solid fuel burning for residential heating is necessary to continue the reduction in particulate matter emissions and associated particulate matter concentrations in ambient air. Additionally, research is underway to better understand emissions of particulate matter from the combustion of fuels in the residential sector and the contribution of agriculture to particulate matter.

Total $PM_{2.5}$ emissions under the With Additional Measures scenario are projected to be 41.1 per cent below 2005 levels in 2030 (Table 8). The emission reduction commitment for 2030 is a 41.0 per cent reduction. It is therefore projected that Ireland will be in compliance with its emission reduction commitment for $PM_{2.5}$ in 2030 under this scenario, however only by a very small margin. Key contributors to emissions over the projected period include the combustion of fossil fuels in the Residential, Commercial and Manufacturing Industry sectors.

Table 8. Projected $PM_{2.5}$ emission reduction and emission reduction commitments

Projected $PM_{2.5}$ emissions	2025	2030
With Additional Measures Scenario (%)	-38.8	-41.1
Emission Reduction Commitment (%)	-18.0	-41.0

Historic $PM_{2.5}$ Emissions

Total $PM_{2.5}$ emissions in 2021, at 12.6 kt, show a reduction of 56.4 per cent since 1990. Reduced use of coal and peat in the residential & commercial sectors, with increased use of gasoil, kerosene and natural gas has resulted in 68.1 per cent lower emissions between 1990 and 2021 in those combined sectors. Agriculture emissions have increased by 6.5 per cent from their 1990 level largely as a result of the increased cattle herd. Emissions from Transport sector, dominated by Road Transport have been decreasing since 2005, with a 46.8 per cent reduction between 1990 and 2021. This was largely due to technological advances and the age structure of the national fleet (whereby in recent times an increasing proportion of the fleet is newer vehicles), which has in turn been offset somewhat by increases in vehicle numbers over the time series.

4. Air Pollutants with no NEC Directive emission reduction commitment

The reporting obligations outlined in Article 8 and Annex I of the Directive (EU) 2016/2284 also include the mandatory reporting of emissions to air of carbon monoxide, cadmium, mercury, lead, polycyclic aromatic hydrocarbons, dioxins and furans, polychlorinated biphenyls (PCB), hexachlorobenzene, coarse particulate matter < 10µm and black carbon. Voluntary reporting of annual emissions of arsenic, chromium, copper, nickel, selenium, Zinc and total suspended particulates (TSP) is also undertaken. Emission reduction commitments are not set for any of the aforementioned pollutants in the Directive.

A brief overview of the pollutants involved and the trend in emissions of these pollutants over time is presented below. A summary table (Table 9) indicates the relative importance of each sector to emissions of each air pollutant. If a sector is the largest source of a pollutant, this is indicated in the second column, followed in the third column by other air pollutants for which the sector is a significant source.

Table 9. Sectoral sources of Pollutants

Sector	Largest source	Significant source
Transport	Cu, Pb, Cr, Zn	CO, $PM_{10,}$ $PM_{2.5}$, TSP, BC, As, Hg, Ni, Dioxins, PAH
Power Stations	Ni,	CO, PM_{10}, $PM_{2.5}$, TSP, BC, Pb, Cd, Hg, As, Cr, Cu, Se, Zn, Dioxins HCB
Combustion in manufacturing industries	Cd,	CO, PM_{10} $PM_{2.5}$, TSP, BC, Pb, Cd, Hg, As, Cr, Ni, Se, Zn, PCB, PAH
Industrial Processes	TSP	PM_{10}, $PM_{2.5}$, BC, Cd, Cr, Cu, Ni, Se, Zn
Residential and Commercial Combustion	CO, $PM_{2.5}$, BC, Pb, Se, Dioxins, PAH	PM_{10}, TSP, Cd, Hg, As, Cr, Ni, Zn, PCB
Agriculture	HCB	PM_{10}, $PM_{2.5}$, TSP
Industrial waste incineration	As, Cr	
Solid waste disposal (landfills)		Hg,
Vehicle and building fires and waste burning		Dioxins

Carbon monoxide (CO) emissions continue to decline, driven by major reductions due to three-way catalysts in gasoline vehicles in Road Transport, and a large decrease in the use of solid fuels for space heating in the Residential sector. National total CO emissions have reduced by 78.8 per cent over the period 1990 to 2021.

Emissions of *coarse particulate matter* (PM_{10}) have reduced by 32.5 per cent since 1990. The main determinant of the trend in PM_{10} emissions is the Agriculture sector with a 31.4 per cent share of the national total, and combustion in the Residential and Commercial/Institutional sectors combined with 22.1 per cent share of the total in 2021. Total suspended particulate (TSP) emissions have decreased by 17.7 per cent, since 1990. Total suspended particulates emissions are driven by a wide range of minor sources. *Black Carbon* (BC) emissions have decreased by 64.0 per cent, between 1990 and 2021. The main driver of the BC trend is the Residential and Commercial/Institutional sectors combined with a 39.9 per cent share of the total in 2021.

Over the period 1990–2021, total national *lead* (Pb) emissions have decreased by 95.7 per cent with the Pb emissions trend largely determined by the Road Transport sector. There was a marked decrease between 1999 and 2005 when the lead content of petrol was reduced. Combustion of fuels in the Transport sector is the largest source of Pb in 2021 accounting for 65.5 per cent of the national total.

Total national emissions of *cadmium* (Cd) have decreased by 52.8 per cent. Emissions of Cd are largely determined by combustion of fuels in the Manufacturing Industries and Construction sector, specifically combustion sources in Non-Ferrous Metals.

Total national emissions of *mercury* Hg have decreased by 54.2 per cent between 1990 and 2021. Emissions from Manufacturing Industries and Construction are the largest source of Hg. Emissions from the Residential and Commercial/Institutional and Public Electricity and Heat Production sectors are also an important source of Hg.

Emissions of *arsenic* (As) are largely dominated by incineration of hazardous and clinical wastes and crematoria. In the past Public Electricity and Heat Production was the largest however both a reduction in coal and peat power generation and move towards cleaner fuels has reduced its contribution substantially.

Emissions of *chromium* (Cr) have decreased by 34.5 per cent between 1990 and 2021. Transport, fuel combustion in the Manufacturing Industries and Construction sectors and Waste Incineration are the main sources.

Total *copper* (Cu) emissions in Ireland were steadily increasing over the 1990–2008 period and have been steadily decreasing since. Total emissions in 2021 were 17.2 per cent lower than in their peak in 2008 but they are 82.2 per cent higher than in 1990. Transport and industrial processes are the main sources.

National total emission estimates of *nickel* (Ni) were steadily increasing over the 1990–1999 period and have been generally decreasing from 1999 onwards. The main contributor to the trend is combustion of fuels in the Public Electricity and Heat Production, Residential and Commercial/Institutional and Manufacturing Industries and Construction sectors. Total emissions in 2021 were 62.6% below the 1990 level.

The main contributor to national *selenium* (Se) emissions has been fuel combustion in the Residential and Commercial/Institutional sectors which combined accounted for 64.5 per cent of selenium emissions in 2021.

National total emissions of *zinc* (Zn) have fallen by 51.5 per cent between 1990 and 2021. In the 1990–2001 period, the main determinant of the trend in zinc emissions was Metal Production. Since the closure of Ireland's only steel plant in 2001, fuel combustion in the Transport and Residential and Commercial/Institutional and Manufacturing Industries and Construction and Public Electricity and Heat Production sectors are the largest sources.

Dioxin and *furan* emission levels decreased having reduced by 61.9 per cent between 1990 and 2021. The main contributors to national emissions are the combined Residential and Commercial/Institutional sectors, with a 72.1 per cent share of total emissions in 2021.

Hexachlorobenzene (HCB) emissions from secondary aluminium processing were the largest source of HCB emissions in Ireland up to 1996. Since then the use of pesticides (in which HCB is a contaminant) in agriculture is the largest source accounting for 82.0 per cent of national emissions in 2021.

Emissions of *polychlorinated biphenyls* (PCBs) have decreased by 83.3 per cent between 1990 and 2021. Emissions from the Waste sector, specifically vehicle and building fires and other burning such as bonfires and household waste are the largest sources in 2021.

Polycyclic Aromatic Hydrocarbon (PAHs) emissions, which include emissions of *benzo[a]pyrene*, *benzo[b] fluoranthene*, *benzo[k]fluoranthene*, and *indeno[1,2,3-cd]pyrene*, are dominated by combustion in the Residential and Commercial/Institutional sectors. Declines in the use of coal and sod peat have led to reduced emissions from these sectors across the timeseries 1990-2021.

Appendix – Emissions of key NEC Directive Air Pollutants, 1990-2021

	SO_2	NOx	NMVOC	NH_3	$PM_{2.5}$
			kilotonnes		
1990	183.840	174.886	151.596	110.703	28.883
1991	183.654	175.612	151.204	112.730	28.632
1992	171.338	183.443	146.127	115.538	25.194
1993	162.357	175.611	143.448	114.974	24.846
1994	177.246	172.766	139.307	115.978	22.773
1995	163.288	170.959	137.315	116.713	21.444
1996	150.290	175.443	138.261	121.002	22.008
1997	168.633	165.663	134.028	124.084	20.158
1998	178.724	169.698	135.367	128.340	21.187
1999	160.891	167.829	125.780	126.099	18.240
2000	143.918	165.906	119.147	120.520	18.468
2001	141.999	166.675	119.702	120.644	18.451
2002	106.419	158.629	120.043	121.051	17.714
2003	82.458	160.261	118.933	121.108	17.686
2004	73.142	163.505	118.623	118.566	17.943
2005	72.813	167.073	119.425	120.148	18.715
2006	60.749	162.429	119.709	121.779	18.261
2007	54.953	156.679	119.017	114.978	17.655
2008	45.633	147.052	116.034	117.027	17.585
2009	32.656	123.244	114.169	117.197	16.741
2010	26.672	116.654	110.977	115.193	15.860
2011	24.621	104.878	107.789	111.219	14.030
2012	23.328	107.525	109.226	117.487	13.988
2013	23.338	108.797	111.150	118.360	14.344
2014	17.323	107.198	108.186	114.700	13.790
2015	15.897	107.329	109.528	119.963	14.170
2016	15.263	109.612	111.594	125.276	14.231
2017	14.518	108.893	115.285	129.629	13.095
2018	13.677	110.303	115.687	136.362	13.488
2019	10.876	101.573	115.437	126.095	12.487
2020	10.732	95.413	111.602	123.748	12.616
2021	11.768	98.206	113.675	124.654	12.599

An Ghníomhaireacht um Chaomhnú Comhshaoil

Tá an Ghníomhaireacht um Chaomhnú Comhshaoil (GCC) freagrach as an gcomhshaol a chaomhnú agus a fheabhsú mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol a chosaint ar thionchar díobhálach na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

- **Rialú:** Déanaimid córais éifeachtacha rialaithe agus comhlíonta comhshaoil a chur i bhfeidhm chun torthaí maithe comhshaoil a sholáthar agus chun díriú orthu siúd nach gcloíonn leis na córais sin.
- **Eolas:** Soláthraímid sonraí, faisnéis agus measúnú comhshaoil atá ar ardchaighdeán, spriocdhírithe agus tráthúil chun bonn eolais a chur faoin gcinnteoireacht ar gach leibhéal.
- **Tacaíocht:** Bímid ag saothrú i gcomhar le grúpaí eile chun tacú le comhshaol atá glan, táirgiúil agus cosanta go maith, agus le hiompar a chuirfidh le comhshaol inbhuanaithe.

Ár bhFreagrachtaí

CEADÚNÚ

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

- saoráidí dramhaíola (m.sh. láithreáin líonta talún, loisceoirí, stáisiúin aistrithe dramhaíola);
- gníomhaíochtaí tionsclaíocha ar scála mór (m.sh. déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta);
- an diantalmhaíocht (m.sh. muca, éanlaith);
- úsáid ghlanscartha agus scaoileadh rialaithe Orgánach Géinmhodhnaithe (OGanna);
- foinsí radaíochta ianúcháin (m.sh. trealamh x-gha agus radaiteiripe, foinsí tionsclaíocha);
- áiseanna móra stórála peitril;
- sceitheadh fuíolluisce;
- 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 húdaráis áitiúla agus gníomhaireachtaí eile chun dul i ngleic le coireacht chomhshaoil trí chomhordú a dhéanamh ar líonra forfheidhmiúcháin náisiúnta, díriú ar chiontóirí, agus maoirsiú a dhéanamh ar fheabhsúchán.
- Cur i bhfeidhm rialachán ar nós na Rialachán um Dhramhthrealamh Leictreach agus Leictreonach (WEEE), um Shrian ar Shubstaintí Guaiseacha agus na Rialachán um rialú ar shubstaintí a ídíonn an ciseal ózóin.
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

BAINISTÍOCHT UISCE

- Monatóireacht agus tuairisciú a dhéanamh ar cháilíocht aibhneacha, lochanna, uiscí idirchreasa 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 tuairisciú a dhéanamh ar Cháilíocht an Uisce Snámha.

MONATÓIREACHT, ANAILÍS AGUS TUAIRISCIÚ AR AN GCOMHSHAOL

- Monatóireacht a dhéanamh ar cháilíocht an aeir agus Treoir an AE maidir le hAer Glan don Eoraip (CAFÉ) a chur chun feidhme.
- Tuairisciú neamhspleách le cabhrú le cinnteoireacht an rialtais náisiúnta agus áitiúil (m.sh. tuairisciú tréimhsiúil ar Staid Chomhshaol na hÉireann agus Tuarascálacha ar Tháscairí).
- Rialú Astaíochtaí na nGás Ceaptha Teasa in Éirinn.
- Fardail agus réamh-mheastacháin na hÉireann maidir le gás ceaptha 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 shainaithint, bonn eolais a chur faoi bheartais, agus réitigh a sholáthar i réimsí na haeráide, an uisce agus na hinbhuanaitheachta.

MEASÚNÚ STRAITÉISEACH COMHSHAOIL

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

COSAINT RAIDEOLAÍOCH

- Monatóireacht a dhéanamh ar leibhéil radaíochta, agus measúnacht a dhéanamh ar a oiread is atá muintir na hÉireann gan chosaint ar an 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 gcomhshaol ar a bhfuil fáil éasca a chur ar fáil chun rannpháirtíocht an phobail a spreagadh sa chinnteoireacht i ndáil leis an gcomhshaol (m.sh. Timpeall an Tí, Mapaí Radóin).
- Comhairle a chur ar fáil don Rialtas maidir le hábhair a bhaineann leis an tsábháilteacht raideolaíoch agus le cúrsaí práinnfhreagartha.
- Plean Náisiúnta Bainistíochta Dramhaíola Guaisí a fhorbairt chun dramhaíl ghuaiseach a chosc agus a bhainistiú.

MÚSCAILT FEASACHTA AGUS ATHRÚ IOMPRAÍOCHTA

- 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 AN GCC

Tá an ghníomhaíocht 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 Inbhuanaitheacht Comhshaoil
- An Oifig Forfheidhmithe i leith cúrsaí Comhshaoil
- An Oifig um Fhianaise agus Measúnú
- An Oifig um Chosaint Radaíochta agus Monatóireacht 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 imní agus le comhairle a chur ar an mBord.