



A suite of EU directives and national regulations control the monitoring, assessment and management of air quality in Ireland. The EPA, as the designated competent authority, has been implementing national monitoring programmes to comply with these directives and supply real-time data on air quality to the public.

Due to prevailing clean Atlantic air and lack of large cities and heavy industry, Ireland is one of the only countries in Europe to have had no exceedances of any ambient air quality limit values in recent years. None of the current EU or national air quality standards have been breached, and levels of pollutants have remained stable for the past five or more years.

There is no room for complacency however, as the main threat to urban air quality is the emission of pollutants from road traffic. In Dublin and Cork emissions from traffic have resulted in levels of nitrogen dioxide and particulate matter approaching the specified EU limit values. Government departments, national agencies and local authorities must make air quality protection an integral part of their planning and traffic management processes, and there needs to be a modal shift from the private car to high-quality public transport.

While air quality in Ireland remains very good, one of the key issues for Ireland is to reduce its emissions of transboundary air pollutants in line with international commitments. The emissions of these main acidifying air pollutants and ozone precursors – sulphur dioxide (SO₂), nitrogen oxides (NO_x), volatile organic compounds (VOCs) and ammonia (NH₃) – are controlled by the EU National Emissions Ceilings (NEC) Directive (European Parliament and Council, 2001). The national strategies, supported by the EPA Integrated Pollution Prevention and Control (IPPC) licensing regime, are expected to achieve compliance with the 2010 ceilings for SO₂, NH₃ and VOCs, but there is considerable difficulty in reducing NO_x emissions to the level required and the target will not be met.

AMBIENT AIR QUALITY AND TRANSBOUNDARY EMISSIONS



Introduction

This chapter provides an overview of ambient air quality in Ireland and gives details on the emission levels and trends of acidifying pollutants emitted into the atmosphere.

Air quality in Ireland is assessed by comparing monitoring data with air quality standards and limit values for a variety of air pollutants that affect health and, in some cases, ecosystems. The EU Air Framework Directive (European Council, 1996a) set out a European wide approach to the monitoring, assessment and management of air quality. The associated daughter directives incorporate stringent standards for a range of pollutants, several of which were not measured in Ireland before. The directives were transposed into Irish law with the Air Quality Standards Regulations 2002 and Ozone in Ambient Air Regulations 2004.

The EPA is designated as the competent authority and body responsible for implementation of the EU Air Quality Directives. This includes assessing and reporting on ambient air quality. The monitoring stations are run by local authorities in the cities and by the EPA in smaller towns and rural areas.



Air pollutants emitted in industrialised areas and cities in Europe can be transported across large distances. These transboundary pollutants contribute to ground-level ozone and PM₁₀ in neighbouring countries. Deposition of transboundary pollutants causes acidification and eutrophication, damaging the natural and built environment. Emissions of transboundary pollutants are controlled by a variety of EU legislation and the 1999 UNECE Gothenburg Protocol, which limits emissions of the four main transboundary pollutants: sulphur dioxide (SO₂), nitrogen oxides (NO_x), volatile organic compounds (VOCs) and ammonia (NH₃).

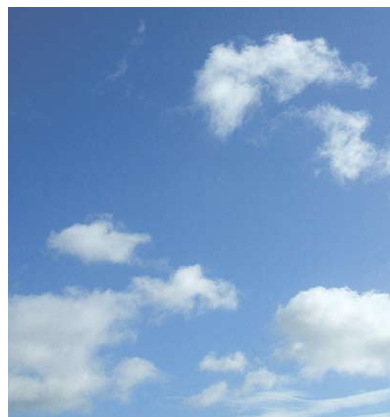
Real-time air quality data, updated hourly, is available at www.epa.ie/whatwedo/monitoring/air/data

The Current Situation

The air quality analysis presented here is based on concentration measurements of the following pollutants: particulate matter, ozone, NO_x, SO₂, lead, carbon monoxide (CO) and benzene. The principal sources of these air pollutants, and the adverse health and environmental effects associated with exposure to each pollutant, are outlined in this chapter. Monitoring results are compared with the limit values in the regulations.

Air Quality Zones

The EU Air Framework Directive (European Council, 1996a) requires that member states divide their territory into zones for the assessment and management of air quality, based on pollution levels and population. The zones adopted in Ireland are shown in Map 4.1. They can be summarised as follows.



- Zone A – Dublin urban.
- Zone B – Cork urban.
- Zone C – Galway, Limerick, Waterford, Dundalk, Drogheda, Naas, Bray, Carlow, Kilkenny, Wexford, Clonmel, Tralee, Ennis, Athlone and Sligo.
- Zone D – Remainder of state.

The air quality in each zone is assessed and classified with respect to upper and lower assessment thresholds based on the measurements over the previous five years. These thresholds are prescribed in national regulations for each pollutant. The number of monitoring locations required depends on population size and whether ambient air quality concentrations exceed the upper assessment threshold, are between the upper and lower assessment thresholds, or are below the lower assessment threshold.

The greatest monitoring effort applies where concentrations are above the upper assessment threshold, i.e. where they approach or exceed the limit value. Where concentrations are between the two thresholds, less intensive measurement combined with other assessment methods, such as air quality modelling, will suffice.

Monitoring Stations

Ireland's small population and generally good air quality means

that a relatively small number of monitoring stations across the country are sufficient for the purposes of implementing the EU air directives. In 2007 there were 26 continuous-monitoring stations operating in Ireland. Five of these were mobile. Mobile monitoring units carry out air quality monitoring primarily in Zones C and D, where no continuous monitoring was previously conducted.



Air quality monitoring stations in operation in Ireland in 2007 are illustrated in Map 4.2. The stations are used to implement the national air quality monitoring programme. Local authorities operate the monitoring networks in Zone A (Dublin) and Zone B (Cork), while the EPA operates the monitors in the rest of the country (with exceptions) and mobile monitoring stations.

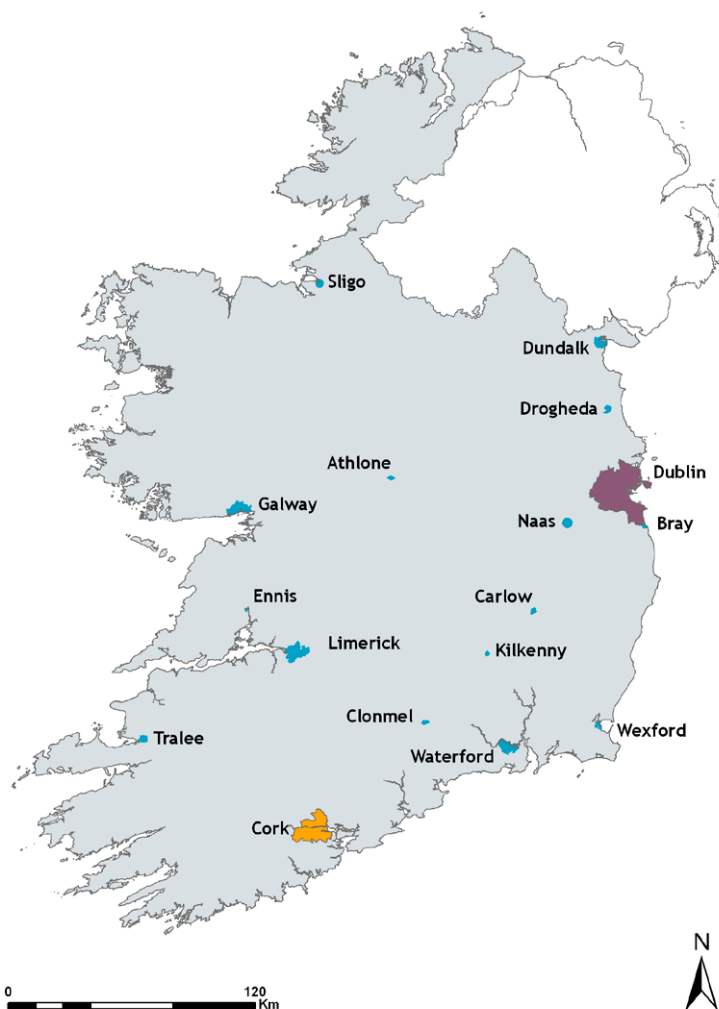
The parameters measured are particulate matter, ozone, NO_x , SO_2 , lead, CO and benzene. The pollutants of most concern are fine particulate matter (PM_{10}), nitrogen dioxide (NO_2) and, to a lesser extent, ozone.

Particulate Matter

Nature, Sources and Effects

PM_{10} are very small particles; their main sources are the combustion of solid fuels and road traffic, in particular emissions from diesel

Map 4.1 Zones for Air Quality Assessment and Management in Ireland (Source: EPA, 2008)



engines. Other particulates include dust from roads, industrial emissions and natural substances such as windblown sea salt. PM_{10} can also be caused by emissions of gaseous precursors (NO_x , SO_2 and NH_3), which are transformed by chemical reaction in the atmosphere.

Because of their small size, PM_{10} can penetrate deep into the respiratory tract. Inhalation of these particles can increase the risk, frequency and severity of respiratory and cardiopulmonary disorders.

Results

PM_{10} is one of the most significant pollutants in Ireland. PM_{10} was monitored at 18 stations across the country in 2007; all stations were compliant with the 2005 limit value, which permits no more than 35 exceedances greater than $50 \mu\text{g}/\text{m}^3$ in a calendar year. Although below limit values, levels are above the upper assessment thresholds in all four air quality assessment zones. Average levels of PM_{10} are higher in small towns than in cities, due to higher use of solid fuel for domestic heating.



The highest PM_{10} was recorded in Ennis, Waterford and Navan. Levels were also relatively high at Carnsore Point, a rural station in Co. Wexford. This site is very close to the sea, and the high levels are due to windblown sea salt. In Dublin and Cork cities levels of PM_{10} are higher at traffic-influenced sites than at background locations. Levels have been stable for the past five years because increased traffic levels are offset by the lower emissions from modern vehicles.

Figure 4.1 shows the number of days exceeding $50 \mu\text{g}/\text{m}^3$ recorded at Winetavern Street (city centre), Rathmines (suburban) and Phoenix Park (urban background) in Dublin from 1998 to 2007. Concentration

Map 4.2 Air Quality Monitoring Stations in 2007 (Source: EPA, 2008)

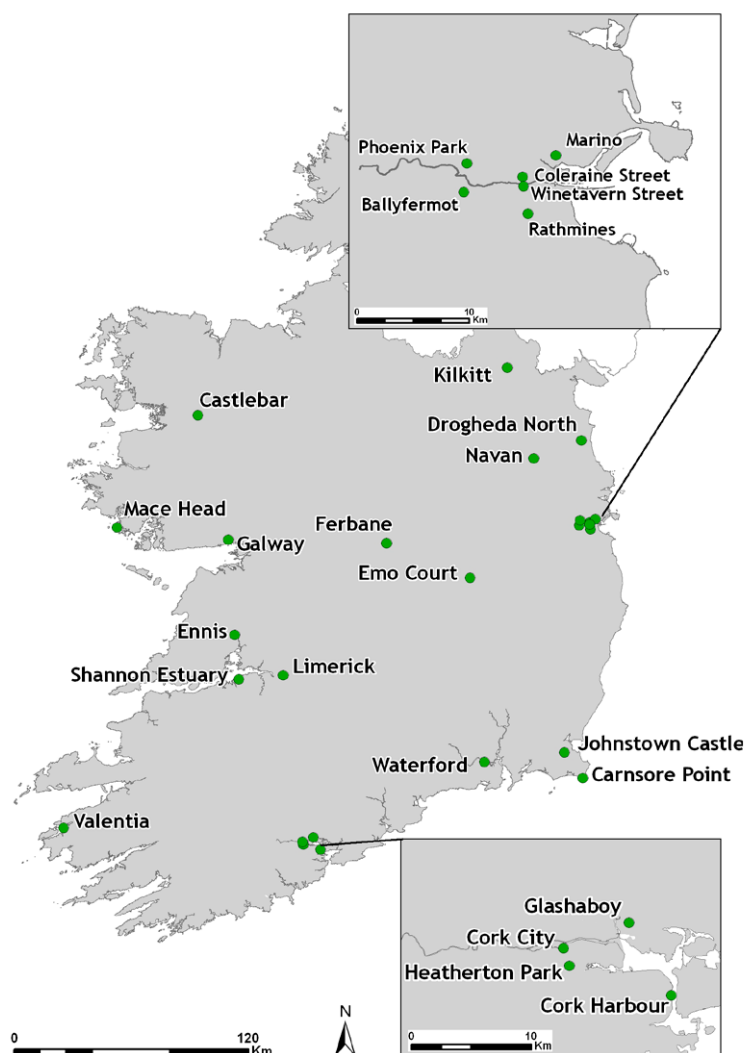
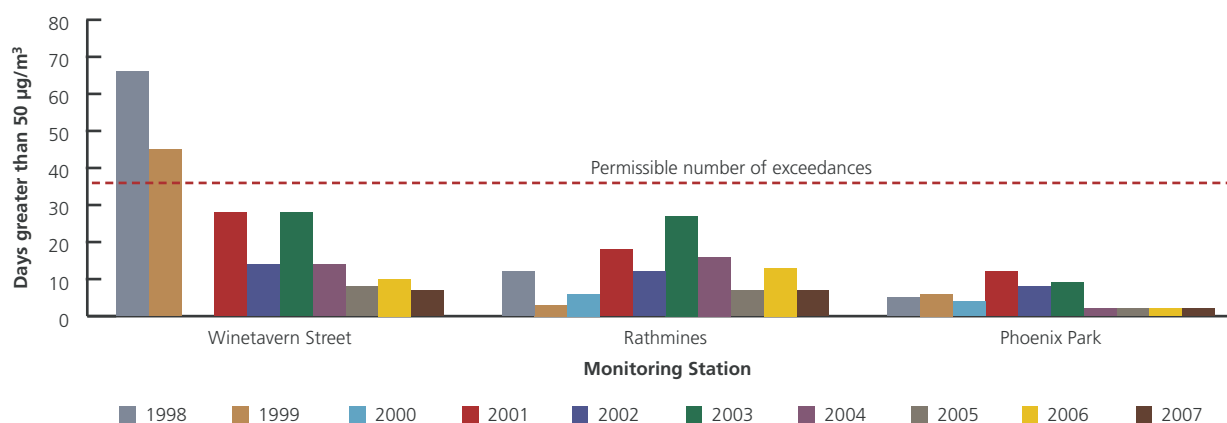


Figure 4.1 Number of Days with PM_{10} Concentrations Greater than $50 \mu\text{g}/\text{m}^3$ 1998–2007 (Source: EPA)



levels have decreased significantly at Winetavern Street since 1998 and are now similar to those measured at the suburban site in Rathmines, possibly due to changes in traffic patterns. The threat of exceeding the limit value (35 days per calendar year greater than $50 \mu\text{g}/\text{m}^3$) remains a possibility at these and other locations affected by emissions from traffic or from solid fuel burning.

Nitrogen Dioxide and Oxides of Nitrogen

Nature, Sources and Effects

NO_x includes the two pollutants nitric oxide (NO) and nitrogen dioxide (NO_2). Power-generation plants and motor vehicles are the principal sources of NO_x , through high-temperature combustion. NO_x contributes to the formation of acid rain and is also a recognised ozone precursor.

NO_2 has a direct effect on health. Short-term exposure is associated with reduced lung function and airway responsiveness and increased reactivity to natural allergens. Long-term exposure is associated with increased risk of respiratory infection in children.

Results

NO_2 was measured at 13 stations across Ireland in 2007; all stations were compliant with the limit values. Annual NO_2 concentrations measured at suburban and rural sites are significantly lower than those measured at urban stations, indicating that compliance with the new limits should not be problematic in areas that are not subject to heavy traffic.

Figure 4.2 shows annual average NO_2 concentrations recorded at urban locations (Winetavern Street in Dublin and Old Station Road in Cork) and at a rural station at Glashaboy, Co. Cork from 2001 to 2007. There was no discernible change in levels during these years. The results show that while NO_2 levels are low in rural areas, higher levels in urban areas have the potential to pose a threat to compliance with the annual limit value.

Ozone

Nature, Sources and Effects

Ozone (O_3) is a secondary pollutant formed from the interaction of NO_x , CO and various VOCs in the presence of sunlight. It is present in air masses across the globe and is transported

from Atlantic and European regions. Ozone also occurs naturally in the stratosphere and provides a protective layer high above the earth, which filters dangerous UV radiation. Levels of ozone in Ireland are highly influenced by transboundary sources.

Higher concentrations of ozone in the troposphere have adverse implications for human health and affect the functioning of the respiratory system. Ozone also affects crops and other vegetation and can damage buildings.

Results

Ozone was measured at 10 stations in Ireland in 2007. Levels are low in comparison to mainland Europe.

Average concentrations in Ireland are generally well below the thresholds for effects on human health and vegetation set down in the Ozone in Ambient Air Regulations 2004.

The hourly information threshold of $180 \mu\text{g}/\text{m}^3$ was not exceeded in 2007. This threshold is breached occasionally when there is a combination of transboundary pollution and hot, sunny weather. The public are informed via Met Éireann weather bulletins of such exceedances. Exceedances of

Figure 4.2 Annual Mean NO_2 Concentrations 2001–2007 (Source: EPA)

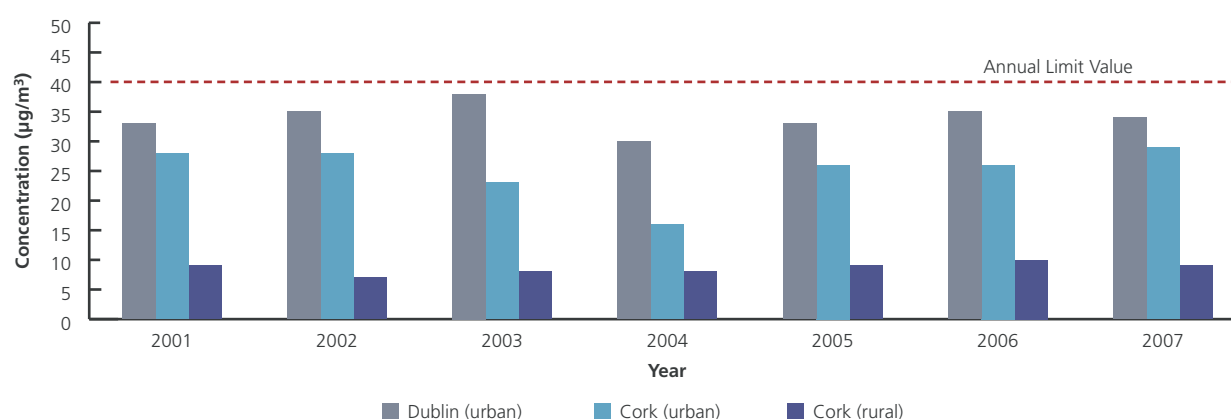
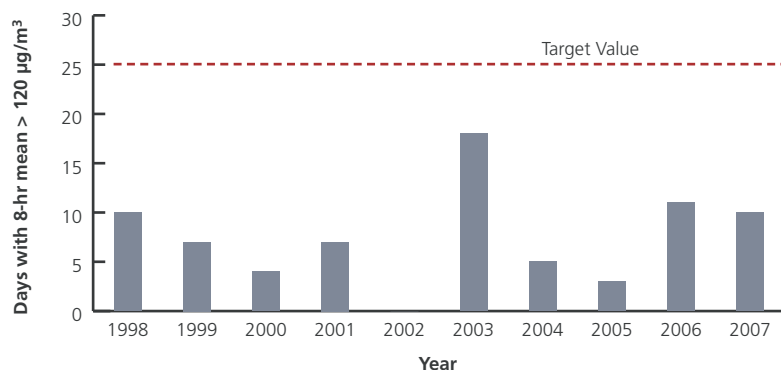


Figure 4.3 Number of Days with Maximum 8-hour Ozone Concentrations Greater than $120 \mu\text{g}/\text{m}^3$, 1998-2007 (Source: EPA)



the hourly information threshold occurred in 1995, 2003 and 2006.

Figure 4.3 shows the number of days across the ozone network where maximum 8-hour levels greater than $120 \mu\text{g}/\text{m}^3$ were recorded for the years 1998-2007. Results were within the 25 days permitted by the target value for all years but above the long-term objective of 1 day for most years. The number of days in both 2003 and 2006 on which the maximum 8-hour average recorded was greater than $120 \mu\text{g}/\text{m}^3$ was higher than average. This is most likely due to the warm weather conditions experienced during both years as ozone concentrations are

strongly influenced by meteorological conditions, with higher levels of ozone occurring in warm, sunny conditions.

As noted above, the main source of ozone in Ireland is transboundary. Emissions of NO_x and VOCs, from industrialised areas and large cities in Europe react, in hot sunny weather to form ozone. Under certain meteorological conditions this is transported in air masses across the continent, causing the limit value to be breached in Ireland. Map 4.3 shows the number of exceedances in Europe in 2006 of the long-term objective for the protection of human health. The highest number

of exceedances are in countries with high emissions of ozone precursors and hot, sunny weather.

Sulphur Dioxide

Nature, Sources and Effects

SO_2 is formed when fuel (mainly coal and oil) containing sulphur is burned at power plants, in homes and elsewhere.

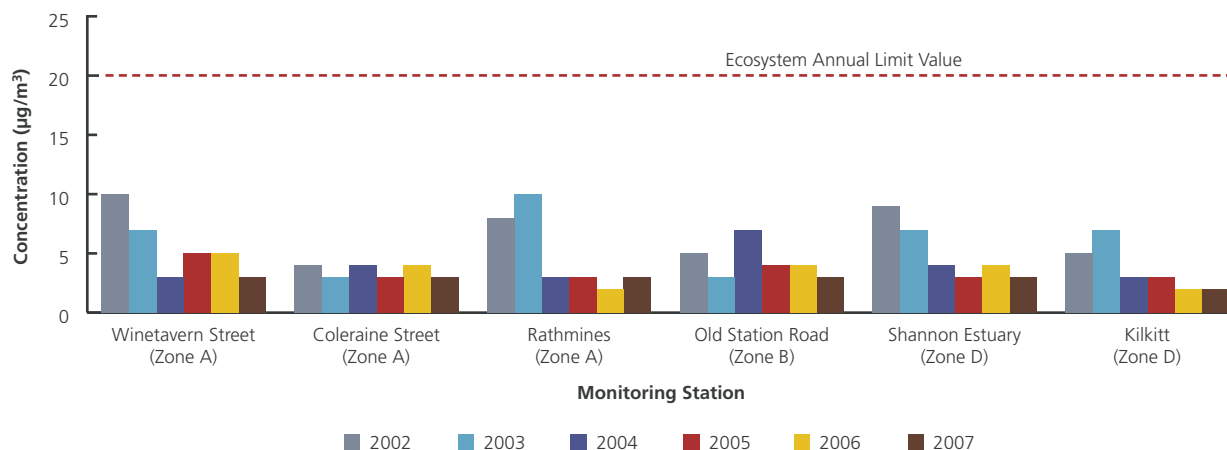
High concentrations of SO_2 can result in temporary breathing impairment for asthmatics who are active outdoors. Longer-term exposure to high concentrations of SO_2 , in conjunction with high levels of PM_{10} , can cause aggravation of existing cardiovascular disease, respiratory illness and alterations in the lung's defences. Together, SO_2 and NO_x are the major precursors to acidic deposition (acid rain), which is associated with the acidification of soils, lakes and streams and the accelerated corrosion of buildings and monuments.

Results

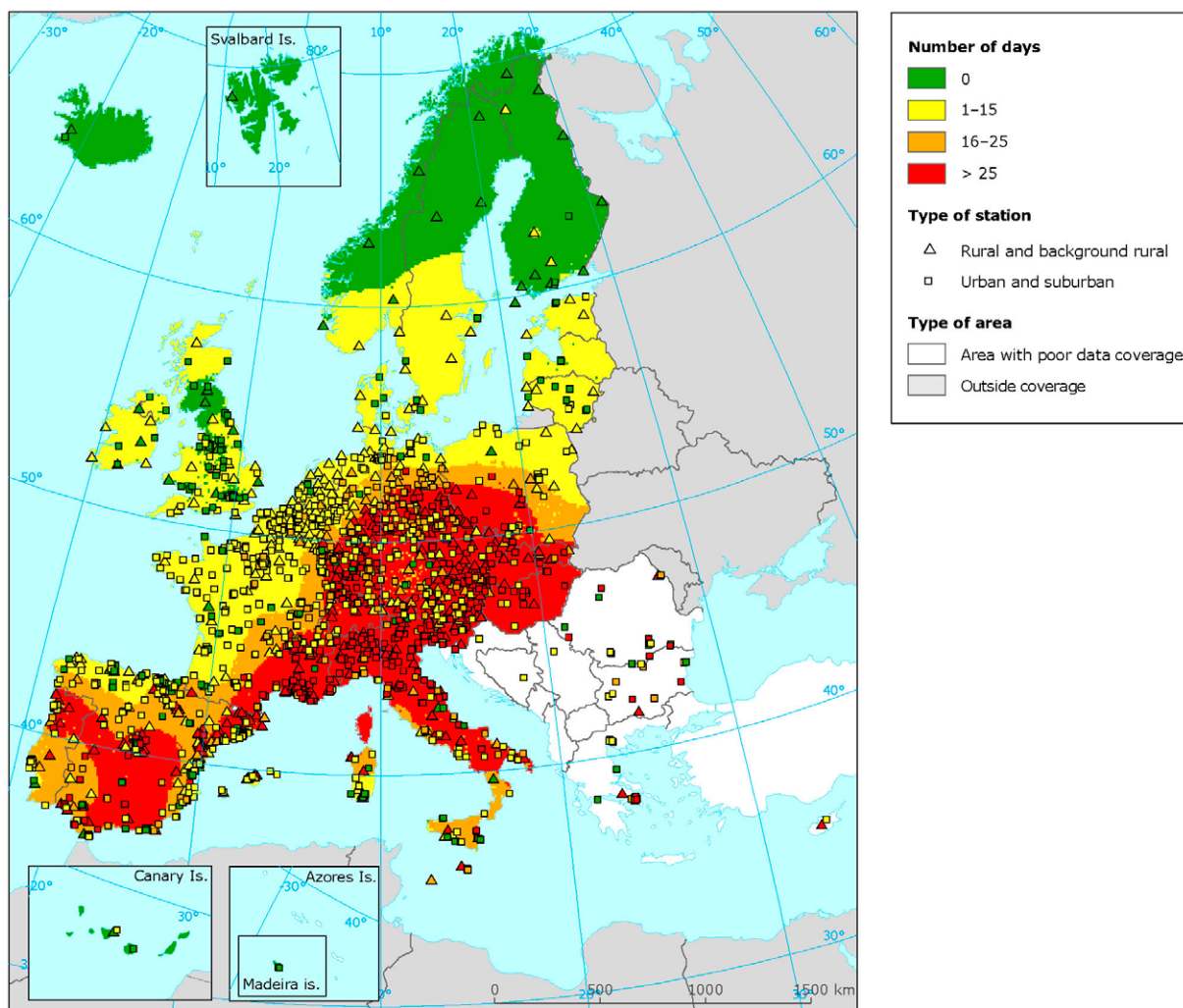
SO_2 was measured continuously at 12 stations in 2007.

Figure 4.4 shows average annual SO_2 results from a number of

Figure 4.4 Annual Mean SO_2 Concentrations 2002-2007 (Source: EPA)



Map 4.3 Exceedance of the 120 $\mu\text{g}/\text{m}^3$ Ozone Long-Term Objective for the Protection of Human Health in Europe 2007 (Reproduced with the permission of the European Environment Agency)



monitoring stations. Concentrations have declined significantly since the early 1990s. The reduction can be attributed to a number of factors including the ban on bituminous coal which was initially introduced in Dublin in 1990 and has since been extended to a number of other urban centres, the lower sulphur content of fuel, and fuel switching from solid fossil fuel to oil and gas.

Lead

Nature, Sources and Effects

The main source of ambient lead was petrol. Airborne lead levels

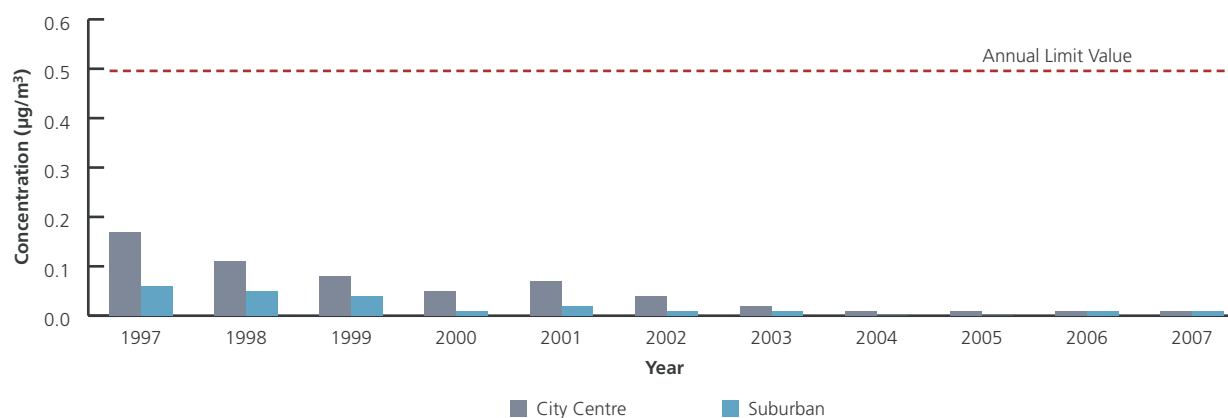
have dramatically reduced since the phasing out of leaded petrol which was completed in 1999.

Excessive exposure to lead may cause neurological impairments such as seizures, mental retardation and behavioural disorders. Even at low doses, lead exposure is associated with damage to the nervous system of foetuses and young children. Lead can also be deposited on the leaves of plants, presenting a hazard, through ingestion, to grazing animals and thence to humans.

Results

Lead was measured at ten stations in Ireland in 2007. The annual mean lead levels measured at all stations were less than 0.05 $\mu\text{g}/\text{m}^3$, one-tenth of the annual limit value of 0.5 $\mu\text{g}/\text{m}^3$ set out in the Air Quality Standards Regulations 2002.

Figure 4.5 shows annual lead concentrations measured at a city centre and suburban station in Dublin from 1997 to 2007. Levels have been consistently low since leaded petrol was phased out in 1999.

Figure 4.5 Annual Mean Lead Concentrations in Dublin 1997–2007

Benzene

Nature, Sources and Effects

Road traffic is the major source of benzene in Ireland. Benzene is found in the air from the emissions of burning coal and oil, from petrol service stations and from motor-vehicle exhaust and cigarette smoke.

Benzene is a significant carcinogen. In addition, chronic long-term inhalation exposure can cause various disorders in the blood, including reduced numbers of red blood cells and anaemia, in occupational settings.

Results

Benzene concentrations were measured at three stations in 2007; all stations were compliant with the limit value.

Figure 4.6 shows annual mean benzene concentrations measured in Dublin and Cork from 2001 to 2007. The levels recorded have decreased significantly since 2001, when the mean level recorded at Winetavern Street, Dublin, was close to the $5 \mu\text{g}/\text{m}^3$ limit value. The levels recorded at both stations in the past three years were much lower and well within the limit value, which comes into force

in 2010. Benzene concentrations in petrol have reduced in recent years. In Europe, the average benzene concentration in petrol is approximately 0.7 per cent while the EC limit is 1 per cent.

Carbon Monoxide

Nature, Sources and Effects

CO is a colourless and odourless gas, formed when carbon in fuel is not burned completely. It is a component of motor-vehicle exhaust, which accounts for most of the CO emissions nationwide. Consequently, CO concentrations are generally higher in areas with heavy traffic congestion.

CO enters the bloodstream through the lungs and reduces oxygen delivery to the body's organs and tissue. The health threat from levels of CO sometimes found in the ambient air is most serious for those who suffer from cardiovascular disease such as angina.

Results

CO was measured at seven locations across the country in 2007. The air quality limit of $10 \text{ mg}/\text{m}^3$ has never been exceeded at any station in Ireland. The highest value measured

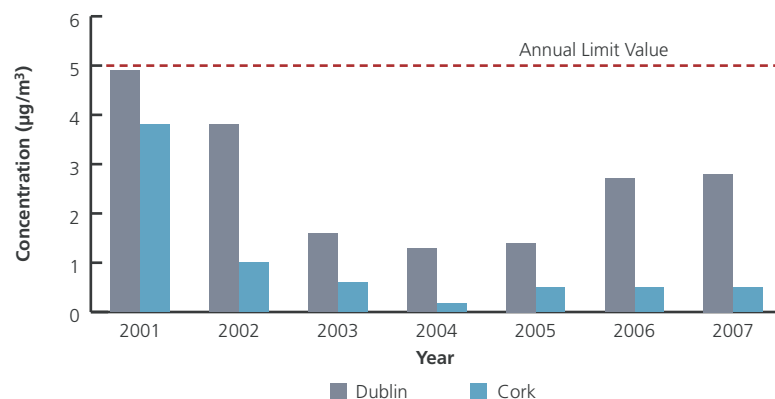
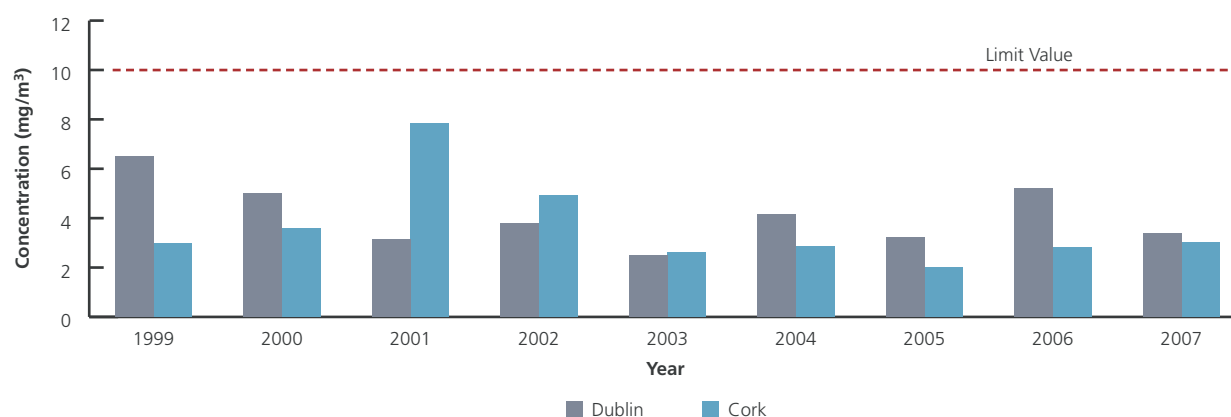
Figure 4.6 Annual Mean Benzene Concentrations in Dublin and Cork 2001–2007 (Source: EPA)

Figure 4.7 Maximum 8-hour mean CO concentrations in Dublin and Cork 1999-2007 (Source: EPA)


in 2007 was 3.4 mg/m³ recorded at Winetavern Street in Dublin city.

Figure 4.7 shows maximum eight-hour CO concentrations measured at Winetavern Street in Dublin and at Old Station Road in Cork from 1998 to 2007. The levels vary year on year and there is no discernible trend in the changes. All levels recorded are well within the limit value which came into force on 1 January 2005.

Emissions of Transboundary Pollutants

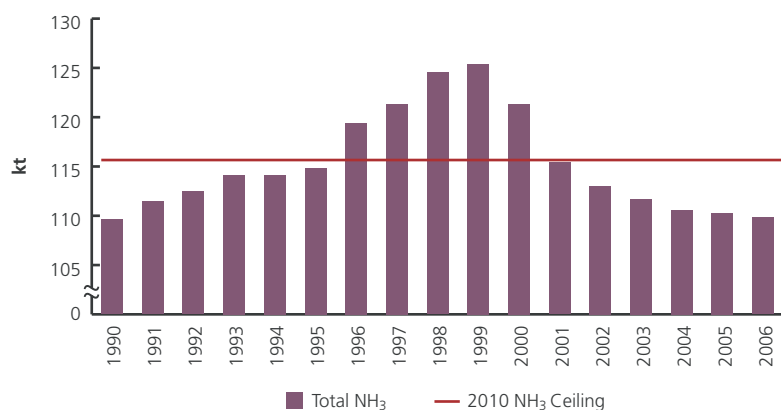
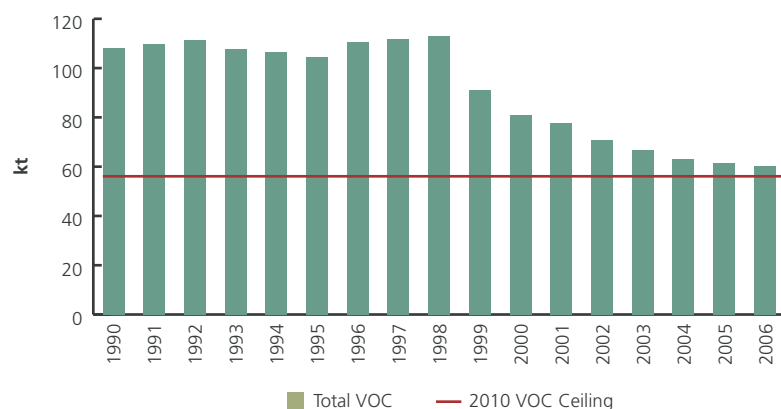
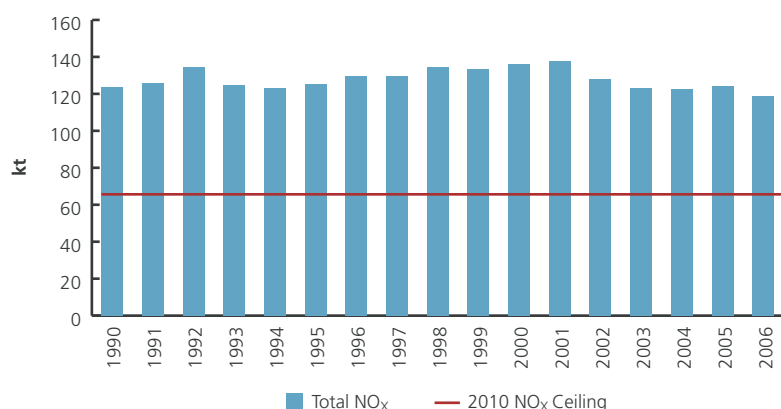
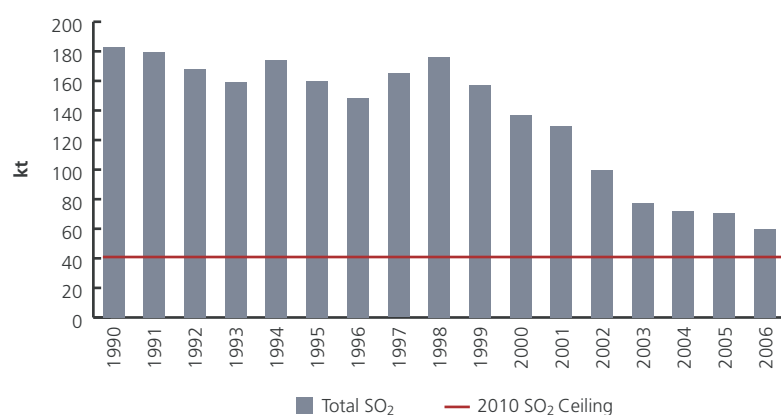
The emissions of the main acidifying air pollutants and ozone precursors have been declining in general throughout Europe since the 1990s. Substantial progress on emissions reduction in recent years can be attributed to the 1999 UNECE Gothenburg Protocol and to the EU National Emissions Ceiling (NEC) Directive (European Parliament and Council, 2001). These instruments prescribe limits for the four main transboundary gases – SO₂, NO_x, VOCs and NH₃ – that have given rise to acidification, eutrophication and ground-level ozone in many parts of Europe in the past. The limits were the first to be established for

Table 4.1 Major EU Legislation on Emissions

Legislation/Instrument	Measures	Gases and Sources Covered
Large Combustion Plants Directive	Emission limit values	SO ₂ , NO _x , dust from large combustion plants
IPPC Directive	Integrated pollution prevention and control using Best Available Techniques (BAT)	Wide range of substances and sources
Euro Standards	Vehicle emission standards	NO _x , VOCs, CO, PM from cars, light-duty and heavy-duty vehicles
Directive on the sulphur content of certain liquid fuels	Fuel regulations	SO ₂
Directive on the quality of petrol and diesel fuels	Ban on sale of leaded petrol; obligation to make sulphur-free fuels available	Lead and SO ₂
VOC Stage I Directive	Technical measures to reduce emissions from petrol storage and distribution	VOCs
Solvents Directive	Product-based limits for VOC emissions	VOCs

Table 4.2 Reductions Required to reach National Emissions Ceilings

	1990 Emissions baseline (kt)	2006 Emissions (kt)	2010 Emissions ceiling (kt)	Reduction required on baseline (%)	Reduction required from 2006 (%)
SO ₂	178	59.6	42	76	30
NO _x	115	119	65	43	45
VOCs	110	60.4	55	50	9
NH ₃	126	109.8	116	8	0

Figure 4.8 Progress towards National Emissions Ceilings (Source: EPA)

the emission totals from individual countries using an effects-based and cost-effective approach designed to achieve quantified environmental objectives in the abatement of acidification, eutrophication and ground-level ozone. A range of supporting EU legislation specific to sources, gases or fuels (Table 4.1) is contributing to the progress towards attainment of the NEC Directive limits that is currently evident for the majority of member states.

Progress towards National Emissions Ceilings in Ireland

The NEC Directive prescribes emissions ceilings for SO₂, NO_x, VOCs and NH₃ to be achieved in 2010 based on the level of emissions in 1990. The 2006 position with respect to the 2010 emissions ceilings is given in Figure 4.8 and Table 4.2 and the trends in the emissions of these gases in Ireland are shown in Figure 4.9a through Figure 4.9d. The progress indicated is typical of most Member States, i.e. the ceilings for SO₂, VOCs and NH₃ are expected to be achieved or surpassed but there is considerable difficulty in reducing NO_x emissions to the level required.

There has been a major reduction in SO₂ emissions since 1998 across all major contributing sectors, which corresponds to 87 per cent achievement of the SO₂ ceiling by 2006. This is due to a substantial shift from heavy fuel oil to natural gas in electricity generation and in industry, reductions in the sulphur content of fuel oil and gas oil, and decreased use of coal and peat in the residential sector. The application of flue gas desulphurisation at the Moneypoint coal-fired electricity station, which produces up to 30 kt SO₂ annually, will bring national emissions of SO₂ below the 42 kt ceiling.

Fuel switching does not deliver significant reductions in the case of NO_x emissions. This outcome together with the large increase in road transport (Chapter 3), which has become the major source of NO_x and for which the benefits from catalyst control technology have been offset by increases in vehicle numbers, means that NO_x emissions in Ireland remain close to the NEC baseline level. While reductions are taking place in the electricity sector, and these will increase as further controls are implemented, the difficulty in realising the required reductions in the transport sector means that NO_x emissions will be well in excess of the 65 kt ceiling in 2010 and will remain high for the short term.

Catalyst controls and other technologies in gasoline cars have given large VOC reductions in the transport sector, which accounted for approximately 60 per cent of VOC emissions up to 1998, thereby bringing the total close to the 2010 ceiling of 55 kt. The contribution from solvent use, the other major source of VOC, has remained relatively constant in absolute terms even though drivers such as population, paint use, dry cleaning and pharmachem industrial activity have increased. This stabilisation reflects reduction in the VOC content of paints and IPC controls in solvent-emitting activities.

The sustained application of substantial quantities of animal manures and chemical fertilisers to agricultural lands has produced large emissions of NH_3 for many years in Ireland. Little change is taking place in farming practice, with the result that the level of such emissions is determined principally by cattle population. The reductions in NH_3 evident in recent years reflect a decline in cattle population linked to the EU Common Agricultural Policy

Figure 4.9a SO_2 Emissions Trend 1990-2006 (Source: EPA)

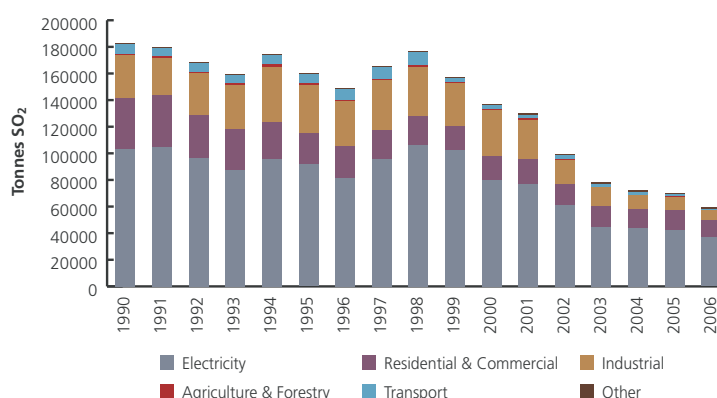


Figure 4.9b NO_x Emissions Trend 1990-2006 (Source: EPA)

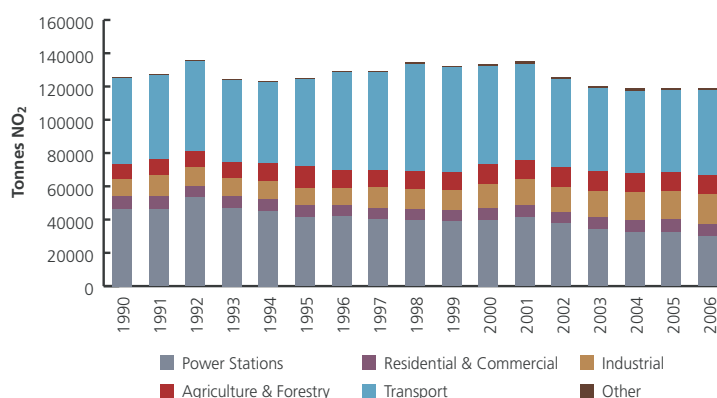


Figure 4.9c VOC Emissions Trend 1990-2006 (Source: EPA)

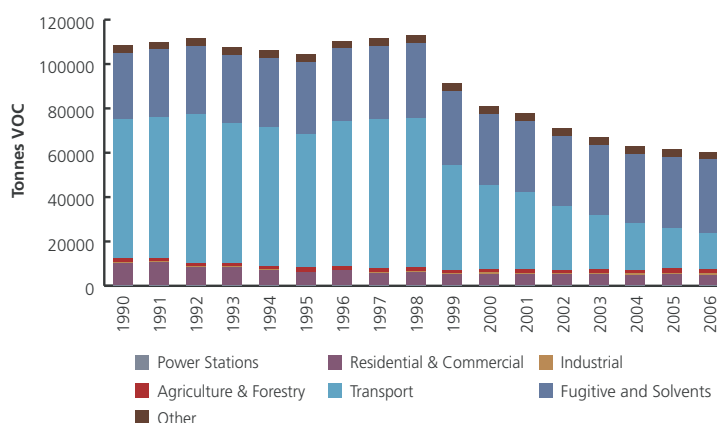


Figure 4.9d NH_3 Emissions Trend 1990-2006 (Source: EPA)

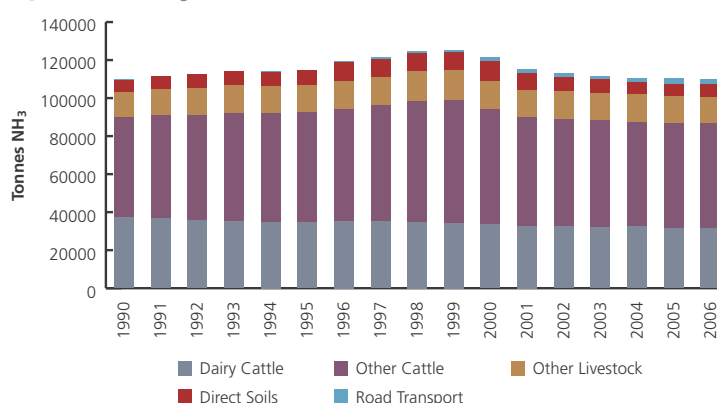
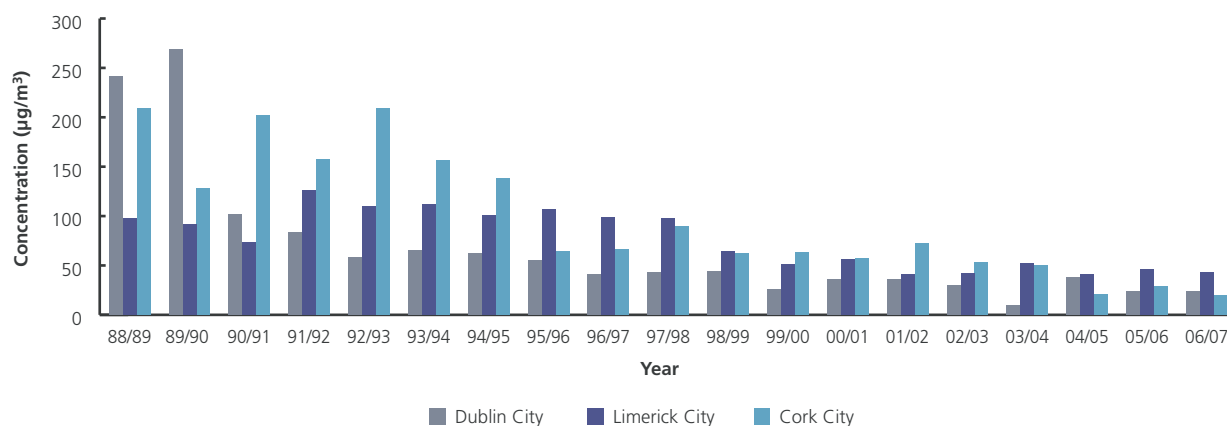


Figure 4.10 Black Smoke Concentrations in Dublin, Cork and Limerick 1988–2007 (Source: EPA)

rather than any specific measure aimed at controlling emissions from agriculture. The decrease has already resulted in compliance with the national ceiling of 116 kt NH_3 in 2010 and this situation will be maintained unless cattle numbers return to their pre-2000 levels.

Other Substances

The strategies aimed at reducing emissions of the key transboundary gases subject to national emissions ceilings are bringing additional benefits by way of decreases in the emissions of other substances associated with fuel combustion. Emissions of carbon monoxide have decreased by approximately 50 per cent since 1990 due to the success of technological controls for this pollutant in gasoline cars and major reductions in the use of solid fuels in residential combustion. Primary particulate matter emissions have also reduced and, as emitted sulphur and nitrogen are the principal constituents of secondary PM and their emissions have fallen considerably, the concentrations of PM in the atmosphere are decreasing. Emissions of lead are no longer of any concern following the 1999 ban on leaded petrol and Ireland does not have important sources of other heavy metals.

Our Response

Due to the supply of predominantly clean air and our relative lack of large cities and heavy industry, Ireland is one of the only countries in Europe to have had no exceedances of any ambient air quality limit values. Consequently no mandatory measures to improve ambient air quality have been necessary since the Air Framework Directive (European Council, 1996a) came into force.

The continued implementation and enforcement of the existing policy measures is vital to maintain Ireland's good air quality. Emissions from industry are currently not impacting on air quality due to the controls brought in by Integrated Pollution Prevention and Control (IPPC) licensing. The ban on bituminous coal in large cities and towns has greatly reduced levels of particulate matter and should be maintained. Figure 4.10 shows the effectiveness of the coal ban in three major urban areas. Concentrations of black smoke, another parameter of particulate matter, decreased significantly after the introduction of the ban in Dublin in 1990, in Cork in 1995 and in Limerick in 1998. A widening of the ban on bituminous coal to other urban areas would be expected

to decrease levels of particulate matter across the country in a similar manner.

Emissions of air pollutants, particularly PM_{10} and NO_x , from road traffic remain the main threat to air quality in urban areas. While new standards for car emissions and the resultant cleaner technology have curbed emissions from individual vehicles, this has been offset by the increasing number and bigger engine sizes of vehicles on Ireland's roads. Air quality issues must therefore be an integral part of traffic management and planning processes, and there needs to be a modal shift from the private car to high-quality public transport.

As noted above, long-term exposure to air pollutants can impact on human health, while improved air quality can have a positive impact on health. As such, the links between health and air quality must be better communicated to raise awareness and understanding of the issues.

In addition, it is important that policies implemented to address other issues do not unintentionally impact on air quality in Ireland. For example, the national Climate Change Strategy should therefore

take account of possible negative effects on air quality of any measures proposed and ensure that these are addressed in a holistic manner.

The strategies to achieve compliance with the National Emissions Ceiling EU Directive have successfully reduced our emissions of SO₂ and VOCs to below their respective ceilings. These strategies need to be maintained and growth in traffic must be curtailed to reduce NO_x emissions.

As part of the EPA-funded Transboundary Air Pollution research project, new monitoring sites were established, extending the capacity for background air quality monitoring and contributing to the Convention of Long-Range Transboundary Air Pollution European monitoring network. PM₁₀ is collected on filters in Oak Park (Carlow), Malin Head and Carnsore Point, and precipitation samples are taken at Glenveagh, Oak Park and Johnstown Castle (Wexford).

Forthcoming Legislation

The fourth and final EU Air Quality Daughter Directive (European Parliament and Council, 2004) established target values for arsenic, cadmium, nickel and polycyclic aromatic hydrocarbons (measured as benzo(a)pyrene) in ambient air. The directive also requires member states to monitor mercury in ambient air. Preliminary assessment of these parameters indicates that levels of all metals are likely to be low but levels of polycyclic aromatic hydrocarbons may be high in urban areas due to emissions from traffic.

The Clean Air for Europe (CAFÉ) Programme has been running under the auspices of the EC since 2001. It has resulted in a new Air Quality Directive, published in 2008, which introduces a limit value for PM_{2.5}, also known as fine particulate matter. PM_{2.5} has similar effects on health

to PM₁₀; however, PM_{2.5} is a better indicator of anthropogenic (man-made) emissions than PM₁₀. It is likely that Ireland will meet its annual mean limit values for PM_{2.5}, although longer-term objectives may be more challenging.

Both EU directives will need to be implemented fully to maintain good air quality in Ireland and contribute to improving air quality in Europe.

Conclusion

Air quality in Ireland remains good, due largely to prevailing westerly air-flow from the Atlantic and the relative absence of large cities and heavy industry. The pollutant of most concern is PM₁₀, daily mean levels of which are close to the EU limit value across the country, and efforts must be made to address this situation. The ban on bituminous coal has had a positive impact on limiting PM₁₀ emissions from home heating and should be extended to all urban areas. The EPA Integrated Pollution Prevention and Control (IPPC) licensing regime has largely controlled emissions to air from industry. A key issue for policy-makers is to ensure that air quality is considered an integral part of traffic management and planning processes.

The strategies to achieve compliance with the National Emissions Ceiling Directive are successfully reducing emissions of SO₂ and VOCs, while emissions of NH₃ are below the 2010 ceiling. Emissions of NO_x are currently well above the 2010 ceiling and are expected to remain high in the short term. The growth in road traffic must be curtailed to reduce NO_x emissions and the strategies for SO₂, VOCs and NH₃ emissions continued.

References

- Air Quality Standards Regulations 2002 (SI 271 of 2002).
- European Council (1993) Council Directive 1993/12/EEC of 23 March relating to the sulphur content of certain liquid fuels (as amended). *OJ* L74, March.
- European Council (1996a) Council Directive 1996/62/EC of 27 September on ambient air quality assessment and management. *OJ* L296, November.
- European Council (1996b) Council Directive 1996/61/EC of 24 September concerning integrated pollution prevention and control. *OJ* L257, October.
- European Council (2001) Council Directive 2001/80/EC of 23 October on the limitation of emissions of certain pollutants into the air from large combustion plants. *OJ* L309, November.
- European Parliament and Council (1994) Directive 1994/63/EC of 20 December on the control of volatile organic compound (VOC) emissions resulting from the storage of petrol and its distribution from terminals to service stations. *OJ* L365, December.
- European Parliament and Council (2001) Directive 2001/81/EC of 23 October on national emissions ceilings for certain atmospheric pollutants. *OJ* L309, November.
- European Parliament and Council (2004) Directive 2004/107/EC of 15 December relating to arsenic, cadmium, nickel and polycyclic aromatic hydrocarbons in ambient air. *OJ* L23, January.
- European Parliament and Council (2008) Directive 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe. *OJ* L152, June.
- Ozone in Ambient Air Regulations 2004 (SI 53 of 2004).