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IRELAND'S TRANSBOUNDARY GAS EMISSIONS IN 2013

Introduction

The pollutants sulphur dioxide (SO₂), nitrogen oxides (NO_x), volatile organic compounds (VOC) and ammonia (NH₃) are responsible for long-range transboundary air pollution such as acidification, eutrophication and ground-level ozone pollution.

Under Article 4.1 of the National Emissions Ceiling Directive [2001/81/EC], Member States shall limit their annual national emissions of the pollutants sulphur dioxide (SO₂), nitrogen oxides (NO_x), ammonia (NH₃) and volatile organic compounds (VOC) to amounts not greater than the emissions ceilings laid down in Annex 1 of the Directive, by the year 2010 at the latest, and in each year after 2010 (Article 4.2). Ireland's limits are as follows:

- SO₂ 42 kilotonnes
- NO_x 65 kilotonnes
- NH₃ 116 kilotonnes
- VOC 55 kilotonnes

Under Article 8.1 of the Directive, Member States shall report each year, by the 31st of December, their final national emission inventories for the previous year but one (x-2, 2012) and their provisional national emission inventories for the previous year (x-1, 2013). This inventory submission covers the time series from 1990 to 2013.

The emission inventories presented here for reporting under the National Emissions Ceiling Directive (NECD) are the first air pollutant inventories prepared under new reporting guidelines and reporting templates using in the main emission factors (EFs) provided in the latest EMEP/EEA Guidebook 2013¹.

¹ Revised air emission inventory and projections reporting guidelines were adopted for use; "*Guidelines for Reporting Emissions and Projections Data under the Convention on Long-range Transboundary Air Pollution*" by the Steering Body to the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe at its thirty-seventh session and amended by the Executive Body in December 2013. The new reporting guidelines are available here, ECE/EB.AIR/125.

The technical guidance document used to prepare national emission inventories, "*the EMEP/EEA air pollutant emission inventory guidebook*" supports the reporting of emissions data under the UNECE Convention on Long-range Transboundary Air Pollution

This inventory submission shows Ireland in compliance with 2 of the 4 Annex 1 ceilings for 2010, 2011, 2012 and provisional 2013 (Table 1). The submission also shows Ireland exceeding its 2010 NO_x and VOC ceilings for all years since 2010. This is the first time that Ireland will report that VOC emissions are above the national emission ceiling which is primarily due to including a new source category (emissions from manure management in agriculture). NO_x emissions have been consistently above the national emission ceiling.

Table 1

	National Total Emission	National Emission Ceiling	National Total Emission	National Emission Ceiling	National Total Emission	National Emission Ceiling	National Total Emission	National Emission Ceiling
(kt)	SO ₂		NO _x		VOC		NH ₃	
2010	28.257	42.000	82.395	65.000	91.402	55.000	108.900	116.000
2011	26.680	42.000	73.399	65.000	88.724	55.000	104.873	116.000
2012	25.191	42.000	75.873	65.000	88.204	55.000	105.905	116.000
2013p	25.393	42.000	76.542	65.000	90.001	55.000	107.758	116.000

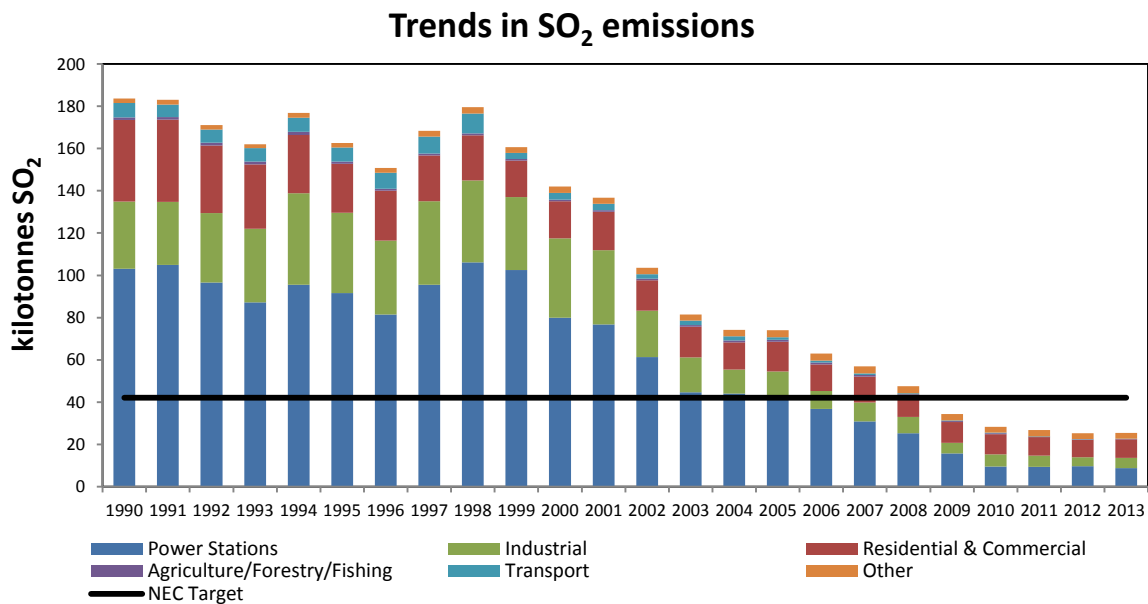
(CLRTAP) and the EU National Emission Ceilings Directive. The latest version of the guidebook was published in August 2013 and is available here, [EMEP/EEA Guidebook 2013](#)

Sulphur Dioxide

Sulphur dioxide (SO₂) 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 SO₂ are derived from the sulphur in fossil fuels such as coal and oil used in combustion activities.

National Emissions Ceiling

Ireland's national emission ceiling for SO₂ under the NEC Directive is 42 kilotonnes (kt) to be achieved by 2010 and in each year after 2010. This is equivalent to a 77 per cent reduction from the 1990 baseline level of 183.7 kt SO₂.



Trends in SO₂ Emissions

SO₂ emissions in Ireland reduced considerably between 1990 and 2013. The latest estimates indicate a decrease of 86 per cent from 183.7 kt in 1990 to 25.4 kt in 2013. Power stations and combustion in residential and commercial sector are the two principal sources of SO₂ emissions, contributing 34 and 35 per cent respectively to the total in 2013. Emissions in these sectors decreased by 92 and 77 per cent respectively since 1990. Combustion sources in the industrial sector account for 19 per cent in 2013. The remainder of emissions are from combustion in oil refining, agriculture, forestry and transport.

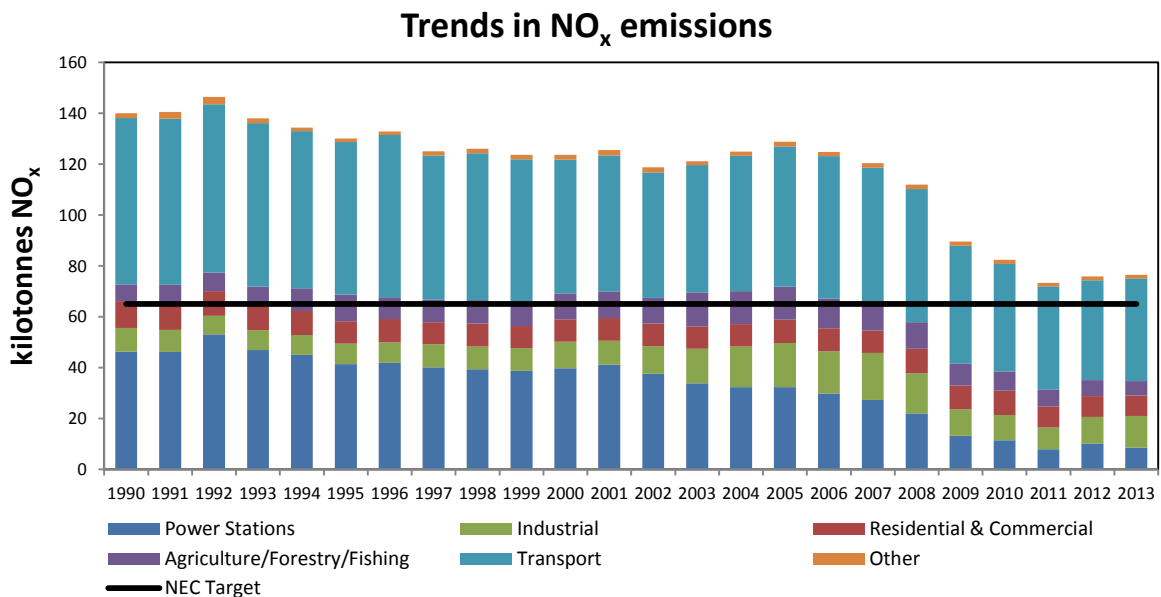
The emissions from industrial sources decreased by 85 per cent from 1990 while the emissions in the transport sector decreased by 96 per cent. Total SO₂ emissions in 2010, and all subsequent years, are compliant with the 2010 ceiling. This reflects significant switching from the use of oil and solid fuels to natural gas, reduced sulphur content in coal and oil and implemented abatement in the power generation sector.

Nitrogen Oxides

Emissions of nitrogen oxides (NO_x) contribute to acidification of soils and surface waters, tropospheric ozone formation and nitrogen saturation in terrestrial ecosystems. Power generation plants and motor vehicles are the principal sources of nitrogen oxides, through high-temperature combustion.

National Emissions Ceiling

Ireland's national emission ceiling for NO_x under the NEC Directive is 65 kilotonnes (kt), to be achieved by 2010 and in each year after 2010. This is equivalent to a 54 per cent reduction from the 1990 baseline level of 140.02 kt NO_x.



Trend in NO_x Emissions

NO_x emissions in Ireland have decreased by 45 per cent between 1990 and 2013 and emissions have decreased by 35.4 kt, or 32 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 fuel used in road transportation. The latest estimates are 76.5 kt in 2013. The transport sector, which mainly consists of road transport, is the principal source of NO_x emissions, contributing approximately 53 per cent of the total in 2013. The industrial and power generation sectors are the other main source of NO_x emissions, with contributions of 16 and 11 per cent, respectively in 2013. The remainder of NO_x emissions emanate from combustion in the residential/commercial and the agriculture sectors, which together produced around 20 per cent of the total in 2013.

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 82 per cent on 1990 levels, even though electricity total final consumption has increased by

104 per cent over the same period. Emissions of NO_x from the coal-fired power plant at Moneypoint have decreased by 72 per cent between 2007 and 2013.

The increase in vehicle numbers and in road transport in general sustained emissions of NO_x through the period 2000 to 2008 even though improved technologies are reducing the emissions from individual vehicles. In recent years, however, road transport has seen a decline in emissions of 11.9 kt, or 23 per cent, between 2008 and 2013 due to the economic recession and improvements in vehicle technologies. Progress towards limiting emissions to below the ceiling of 65 kt for NO_x in 2010 and beyond has proved difficult even with large reductions in emissions from power stations and road transport in recent years. The most recent provisional data for 2013 show emissions have increased by 1 per cent since 2012 due to an increase in emissions from transport and an increase in clinker production. As a result, Ireland is 11.5 kt above the 2010 emission ceiling in 2013.

The NO_x figures reported here are based on, fuel use, and not, fuel sold, and therefore take into account fuel tourism i.e. 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*,² paragraph 23. It is estimated that fuel tourism accounted for 2.5 kt of NO_x in 2013.

It is intended that Ireland will apply an adjustment to NO_x emission inventories, as allowed by the reporting guidelines, in terms of submitting data for compliance with the 2010 NO_x ceiling under the National Emissions Ceiling Directive. This adjustment will estimate the effect of the reduced ‘real world’ efficacy of the EURO vehicle standard technologies and the impact of using the revised EFs from the EMEP/EEA Guidebook 2013, using the adjustment mechanism provided for under the Gothenburg Protocol (EB Decisions 2012/3, 4&12) (see [ECE/EB.AIR/111/Add.1](#)).

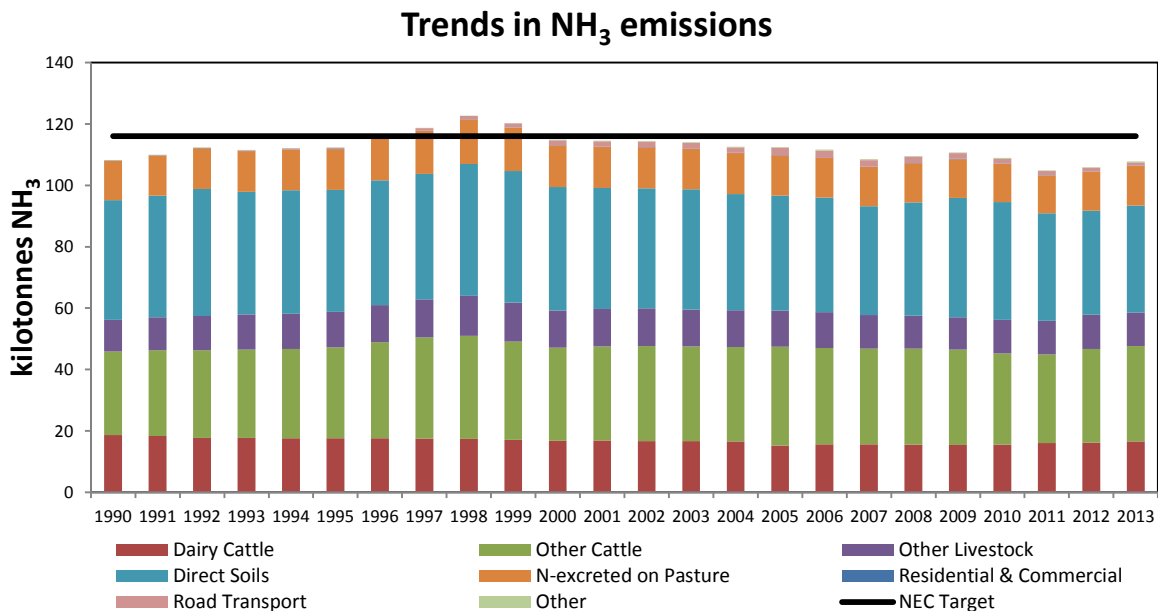
² [Paragraph 23, ECE/EB.AIR/125](#)

Ammonia

Ammonia (NH₃) emissions are associated with acid deposition and the formation of secondary particulate matter. The agriculture sector accounts for virtually all (99 per cent) of ammonia emissions in Ireland. Grasslands ultimately receive the bulk of the 40 million tonnes (Mt) of animal manures produced annually in Ireland along with approximately 300,000 tonnes of nitrogen in fertilisers. A proportion of the nitrogen in these inputs is volatilised into the air as ammonia.

National Emissions Ceiling

Ireland's national emission ceiling for NH₃ under the NEC Directive is 116 kilotonnes (kt), to be achieved by 2010 and in each year after 2010. This is equivalent to a 6.7 per cent permitted increase in emissions from the 108.2 kt 1990 baseline figure.



Trend in NH₃ Emissions

The emissions in 2013 were 107.8 kt or 0.4 per cent less than emissions in 1990. Animal manures produce about 87 per cent of ammonia emissions in agriculture and chemical fertilisers and road transport account for the remainder. It is estimated that approximately 17 per cent of the nitrogen in animal wastes and 2 per cent of nitrogen contained in chemical fertilisers is lost to the atmosphere as NH₃. The NH₃ emissions trend is consequently largely determined by the cattle population and showed a steady increase up to 122.7 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 downturn in NH₃ emissions in the period 2000 to 2011. Recent increases in cattle numbers and fertiliser use have seen NH₃ emissions increase for the last two years. NH₃ emissions increased in 2013 by 1.9 kt, primarily as a result of a 19 per cent increase in synthetic fertiliser use.

Road transport produces a small proportion of emissions of ammonia (< 1 per cent) mainly from petrol passenger cars with three way catalysts.

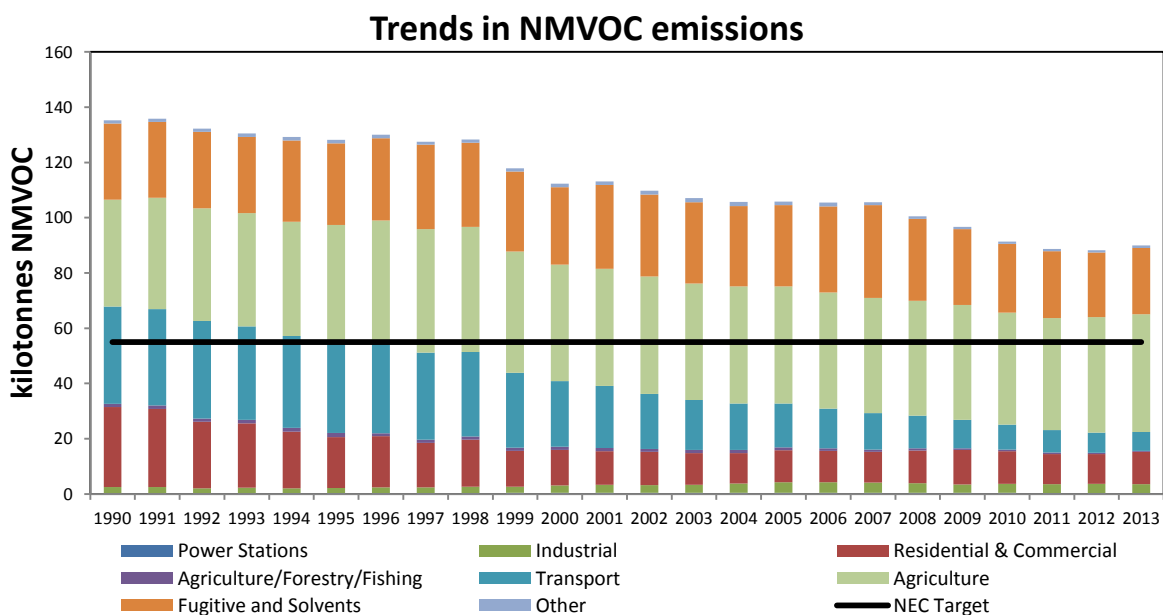
The emissions of NH₃, for all years since 2010, are compliant with the 2010 ceiling. However, limiting and reducing NH₃ emissions into the future could be problematic given the strong performance of the agriculture sector in line with the ambitious targets of Food Harvest 2020.

Volatile Organic Compound (VOC) emissions

Volatile organic compounds (VOC) 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 and, as such, are a component of car exhaust emissions. VOC emissions from manure management in the agriculture sector is included as a new source in the 1990-2013 inventory which is reported for the first time in this reporting cycle.

National Emissions Ceiling

The EU National Emissions Ceilings (NEC) Directive has set a target of 55 kilotonnes (kt) of VOC emissions in Ireland by 2010 and in each year after 2010. This is equivalent to a 59.3 per cent reduction in emissions from the 135.3 kt 1990 baseline figure.



Trend over time

The main sources of VOC emissions in Ireland are from manure management in agriculture and solvent use. These sources combined produce 74 per cent of the annual total in 2013. Coal burning in the residential sector is another important but declining source as coal consumption decreases. Emissions from stationary combustion of fossil fuels across all sectors; power stations, residential, commercial and agriculture account for 17 per cent of national total VOC emissions. Transport emissions account for almost 8 per cent of national total emissions of VOC, mainly from exhaust and fugitive releases from gasoline vehicles. Technological controls for VOCs 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.

The inclusion of VOC emissions from manure management, adds an additional 42 kt of VOCs per annum, on average, to Ireland's national total, effectively doubling the national emissions for this pollutant. The agriculture sector is now the principal source of VOC emissions, contributing approximately 47 per cent of the total in 2013.

Emissions in 2013, at 90.0 kt, are not compliant with the 2010 ceiling, even though reductions corresponding to 33 per cent have been achieved from 1990 to 2013. National total emissions are, on average, 35 kt above the 2010 emission ceiling.

Further reductions in VOC emissions depend largely on cattle numbers in the agriculture sector, the effects of legislative controls on hydrocarbon emissions from road vehicles, reducing solid fuel combustion in the residential sector and on the benefits that result from implementation of EU Directives on solvents and on the solvent content of paints.

It is intended that Ireland will apply an adjustment to VOC emission inventories, as allowed by the reporting guidelines, in terms of submitting data for compliance with the 2010 VOC ceiling under the National Emissions Ceiling Directive. This adjustment will estimate the effect of the inclusion of the new emission source category from agriculture, using the adjustment mechanism provided for under the Gothenburg Protocol (EB Decisions 2012/3, 4&12) (see [ECE/EB.AIR/111/Add.1](#)).