
2.1 AIR



Atmospheric emissions of pollutants lead to lower air quality and are the cause of some of the main global problems affecting the planet's environmental, social and economic stability. This chapter details emissions of pollutant gases in Spain using a specific range of indicators which present a varied panorama, with clear improvements in some aspects and a certain degree of deterioration elsewhere.

The upward trend in Greenhouse Gas (GHG) emissions continues: over the period 1990-2005, levels rose by 52.2%, some distance removed from the 37.2% Kyoto commitment, meaning that the Kyoto mechanisms will need to be implemented in order to fulfil this promise.

Directive 2001/81/EC establishes the National Emission Ceilings defining the limits to be achieved by 2010 for a series of pollutants (acidifying and eutrophying gases and ozone precursors above all). Major difficulties in achieving the established targets are apparent, with only SO₂ showing a clear downward trend. With regard to total acidifying substance emissions, Spain is positioned mid-table among the European countries, although it is one of the lowest ranked in terms of achieving the target figures. For ozone precursors, significant reductions can be seen only for CO.

Regarding regional background air quality, it is worth highlighting the fact that, in terms of both health and



INDICATOR	GOAL	TREND
Atmospheric emissions of greenhouse gases (GHGs)	Reduce GHG emissions to meet the Kyoto targets (15% of the 1990 level) by 2012	Overall emissions continued to rise in 2005, reaching levels over 52% above 1990 figures
Atmospheric emissions of acidifying and eutrophying gases	Achieve Directive targets for national emission ceilings by 2010	Only SO ₂ shows a clear downward trend in emissions, whilst NH ₃ and NO _x are increasing. Desired progress towards achieving the established targets is not being made
Emissions of tropospheric ozone precursor gases	Achieve Directive targets for national emission ceilings by 2010	Increase in emissions of CO ₂ and NO _x and reduction in CO and NMVOCs. Failure to make the desired progress towards any of the established targets for pollutants
Regional background air quality (vegetation protection): ozone	Achieve background air quality targets based on the Framework Directive (96/62/EC)	Only ozone exceeds the established target figure. The remaining pollutants have concentration levels below the established limit figures
Regional background air quality (health protection): ozone and PM₁₀	Achieve background air quality targets based on the Framework Directive (96/62/EC)	Only ozone exceeds the established target figure. The remaining pollutants have concentration levels below the established limit figures

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vegetation protection, problems exist only with ozone concentrations, which exceed the established target figures at various monitoring stations. Finally, regarding ozone-depleting substances, most emissions are falling, except for CFCs and HCFCs from refrigeration, which have stabilised.

The outlook presented by these indicators shows clear warning signs in terms of the quality of the air we breathe: atmospheric pollution continues to be a major cause for concern in Spain and the rest of Europe, with levels of pollution that have an extremely significant negative impact on human health and the environment, in particular in major cities and industrial and energy-generating areas.

Within this context, the Spanish Ministry of the Environment (*Ministerio de Medio Ambiente*) has proposed a guideline framework for action, the Spanish Air Quality Strategy (*Estrategia Española de Calidad del Aire*), which is to serve as a benchmark for all of the public authorities involved, in accordance with their responsibilities. Following analysis of the current situation and the legislation in force, this proposal puts forward solutions that involve updating the legislative framework, strengthening administrative instruments and developing plans and programmes. The aim is to guarantee the effective implementation in Spain of the EU Thematic Strategy and the new Air Quality Framework Directive, currently under development, which will establish targets for 2020.

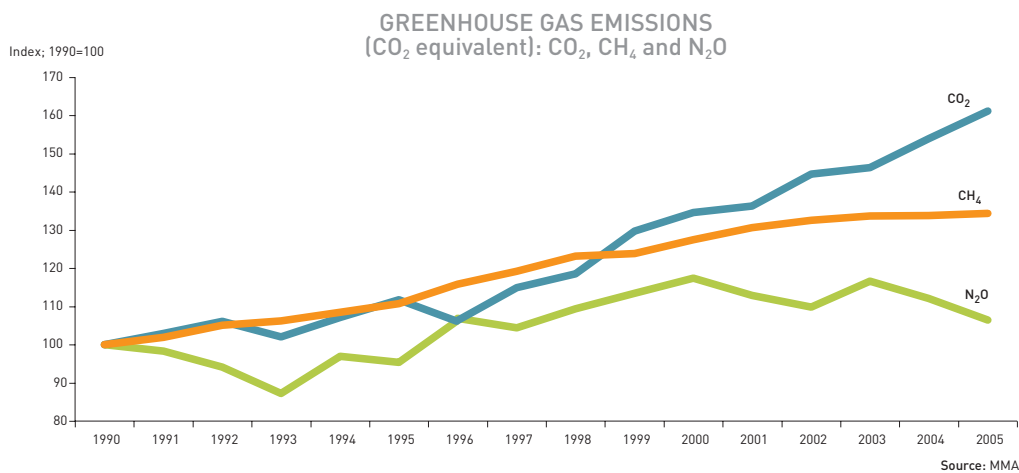
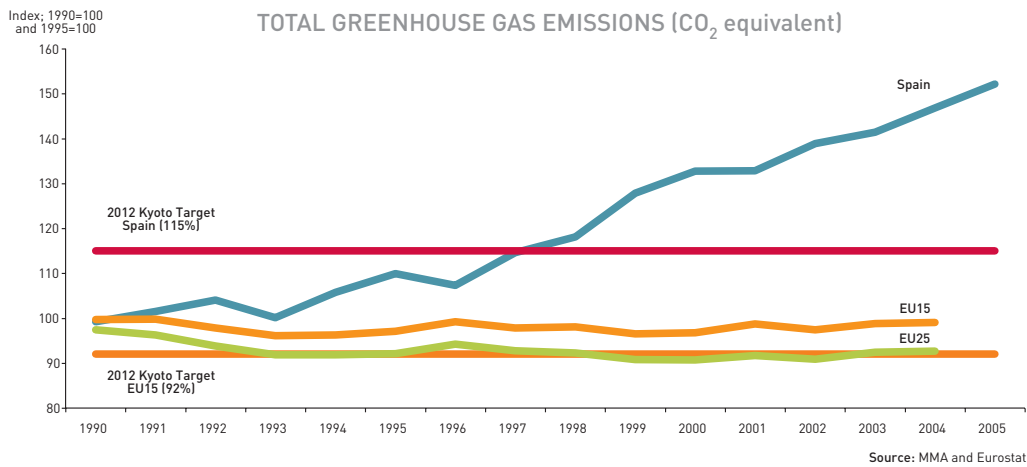
The Strategy places particular emphasis on technological development as an essential element in working towards improved air quality. It is closely linked to research under the National R&D&I Plan 2004-2007 (*Plan Nacional de I+D+I 2004-2007*), sponsored by grants to encourage companies and other organisations to work on projects connected with energy efficiency and reductions in atmospheric emissions. The Strategy also aims to integrate air quality issues into fields such as energy, transport, agriculture, and the urban and residential environments, as well as into economic planning and financial measures.

Within this integrating framework established by the Spanish Air Quality Strategy, the Spanish cabinet has approved an Air Quality and Atmospheric Protection Bill (*propuesta de Ley de Calidad del Aire y Protección de la Atmósfera*), which began its Parliamentary process in February 2007. This proposed legislation is based on the principles of precaution and preventive action, addressing pollution at source and effectively applying the “Polluter pays” principle.

The Bill sets out obligations for municipalities with a population of more than 250,000 inhabitants. These include establishing assessment facilities and networks, informing the public about air quality and pollution levels, and drafting plans and programmes to meet the established targets. The new legislation will allow the Autonomous Communities to exert more rigorous control, and also regulate inspection procedures and the penalty system.

Atmospheric emissions of Greenhouse Gases (GHGs)

The increase in Greenhouse Gas emissions, rising by 52.2% between 1990 and 2005, means that Kyoto targets are unlikely to be met



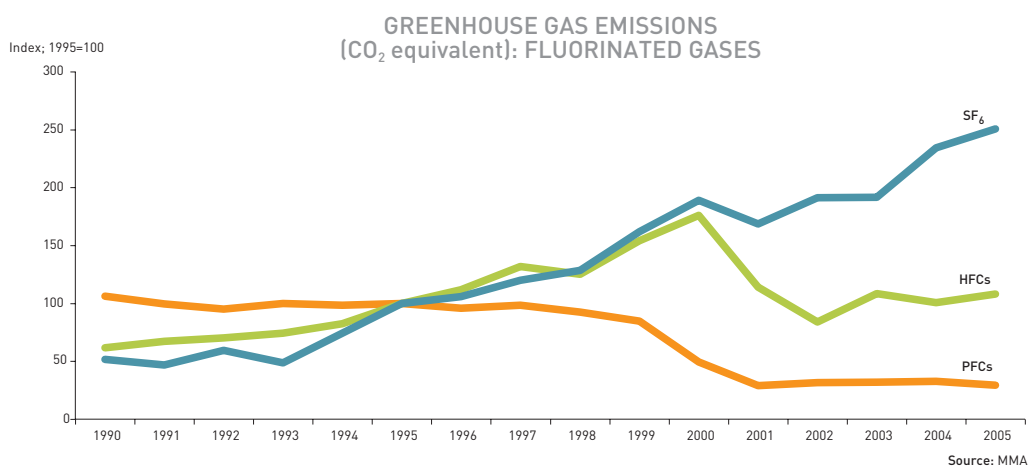
Over the period 1990-2005, total GHG emissions, expressed as CO₂ equivalent, rose by 52.2%, 37.2% above the target established in the Kyoto Protocol, under which emissions should be no more than 15% higher than 1990 levels by the period 2008-2012.

By pollutant type, emissions of the three main gases increased over the period, in particular CO₂, which rose by 61.2%, and CH₄, by did likewise by 34.4%.

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N₂O rose by only 6.5%, with emissions falling 5% in 2005 compared with 2004.

As regards fluorinated gases and their contribution to total emissions, there was a major fall of 70.6% in emissions of perfluorated carbons (PFCs), compared with an increase of 7.9% in hydrofluorocarbons (HFCs), and in particular a rise of 150.7% in emissions of sulphur hexafluoride (SF₆). It should however be remembered that, in absolute terms, this gas' contribution to the overall figure is marginal.



By sector, in 2005 energy processing (including the energy, manufacturing, construction and transport industries) was responsible for 78.9% of total emissions, followed by agriculture (10.2%), industrial processes (7.7%), waste treatment and disposal (2.9%) and solvent and other product use (0.3%).

Within the European Union, total EU15 GHG emissions had fallen in 2004 by only 0.9% on 1990 levels, the Kyoto target being an 8% reduction. The reduction was greater in the EU25, reaching 7.3%.

NOTES

- This indicator presents total emissions of the six main greenhouse gases, expressed jointly as CO₂ equivalent (index: 1990 = 100 and 1995 = 100 for fluorinated gases).
- The United Nations Framework Convention on Climate Change (1992), and specifically the Kyoto Protocol (1997), set out the commitments of developed countries in reducing emissions of these gases and regulate emissions trading among countries, while also establishing mechanisms to help less developed countries meet their emission reduction commitments. Within this context, the EU undertook to reduce its greenhouse gas emissions by 8% on 1990 levels by the period 2008-2012. Each Member State of the EU has different obligations with regard to the European emissions reduction commitment. Spain has to stabilise GHG emissions at 115% of 1990 levels.
- The Spanish National Atmospheric Emissions Inventory (Inventario Nacional de Emisiones a la Atmósfera) was created to produce a standardised series of data on atmospheric pollutant emissions generated throughout Spain, broken down by province. It covers both anthropogenic and natural activities generating pollutants which fall within any of the following groupings: acidifying gases, ozone precursors and greenhouse gases, heavy metals and particles and persistent organic compounds. Since 1990 the SNAP (*Selected Nomenclature for Sources of Air Pollution*) system has been used, this being consistent with the Intergovernmental Panel on Climate Change (IPCC) categories.

SOURCES

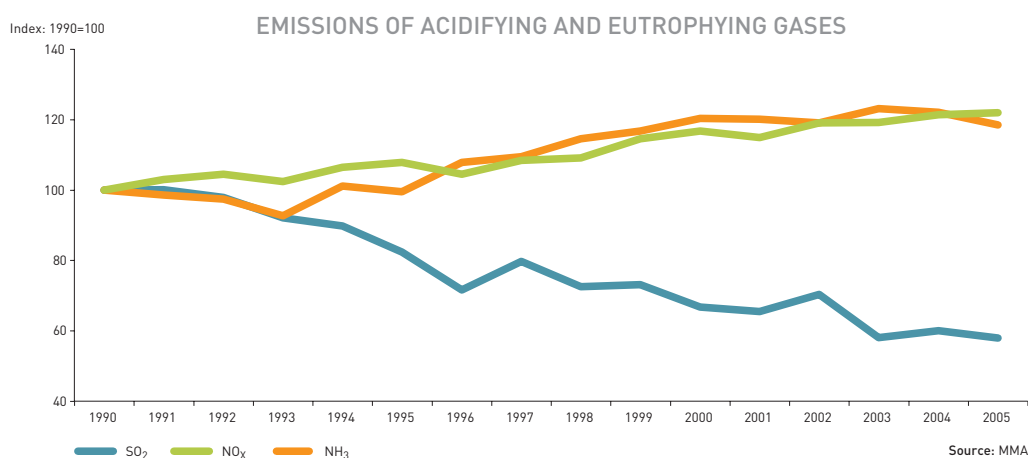
- Figures for Spain: Spanish National Atmospheric Emissions Inventory. Sub-Directorate General for Air Quality and Risk Prevention (*Subdirección General de Calidad del Aire y Prevención de Riesgos*). Spanish Ministry of the Environment.
- Figures for the European Union: Eurostat. Query conducted on the website <http://epp.eurostat.ec.europa.eu/> (Environment/Air Pollution and Climate Change data)

FURTHER INFORMATION

- www.mma.es
- www.eea.europa.eu/
- cdr.eionet.eu.int/es/eu

Atmospheric emissions of acidifying and eutrophying gases

Since 1990, SO₂ emissions have fallen, while those of NO_x and NH₃ continue to rise, making Spain unlikely to meet the targets set for 2010



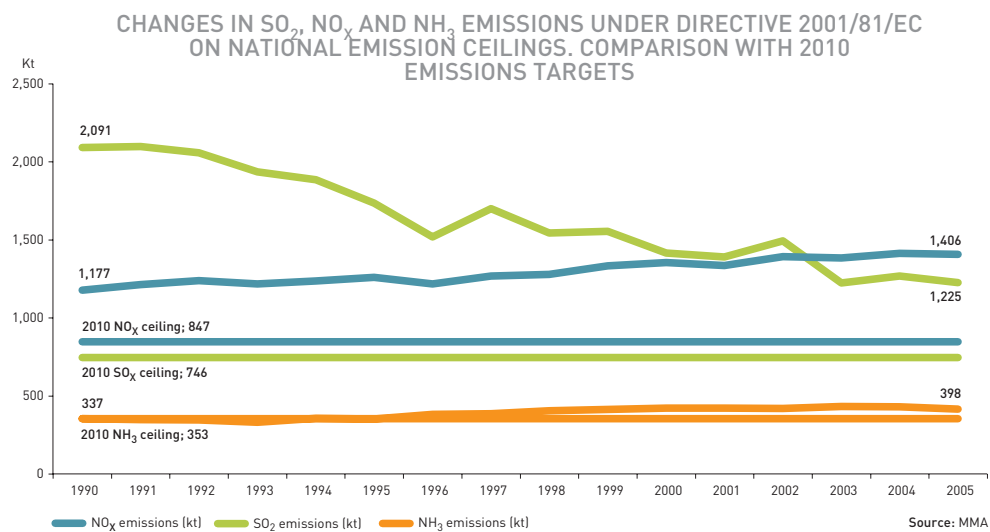
Over the period 1990-2005, total emissions of SO₂ fell by 42%. The drop in 2005 makes up for the slight upturn seen in 2004, with levels falling from 1,300,826 tonnes in 2004 to 1,256,702 tonnes in 2005. As regards the breakdown by sector, in 2005 combustion in energy and transformation industries was responsible for 80.6% of such emissions, followed by combustion in manufacturing industry (8.6%) and transport (3.9%).

Meanwhile, emissions of NO_x and NH₃ maintained their upward trend of recent years, rising over the same period by 21.9% and 18.4% respectively. In the case of NO_x, for which total emissions in 2005 were 1,571.2 kilotonnes, transport was the most significant sector, accounting for 50.8% of all emissions, followed by combustion in energy and transformation industries (22.7%) and emissions from combustion in manufacturing industry (18.0%). As regards NH₃, atmospheric emissions in 2005 stood at 406.5 kilotonnes, mostly from agriculture (90.9%), non-combustion production processes (3.7%) and waste treatment and disposal (2.0%).

Monitoring emissions of these pollutants in terms of fulfilment of national emission ceilings targets (Directive 2001/81/EC) reveals an increase for the period 1990-2005 in emissions of NO_x and NH₃ (19.5% and 18.2% respectively), a trend taking us further away from

achieving the targets for set 2010. Emissions of SO₂, meanwhile, fell by 41.4% over the same period.

Compared with 2004, 2005 saw slight reductions of 3.5% in NH₃ emissions, 3.4% in SO₂ emissions and 0.6% in NO_x emissions. These percentage reductions will need to be increased over the coming years if the targets set by the Directive are to be achieved.



NOTES

- European Directive 2001/81/EC of the European Parliament and of the Council, of 23 October 2001, on national emission ceilings for certain atmospheric pollutants, which does not apply to total pollutant emissions (see Appendix 1 of the Directive), establishes that Member States must limit their annual national emissions of sulphur dioxide (SO₂), nitrogen oxides (NO_x), volatile organic compounds (VOCs) and ammonia (NH₃) to levels no higher than the established emission ceilings in order to guarantee that critical levels are not exceeded, and so protect the population against health risks derived from atmospheric pollution.

SOURCES

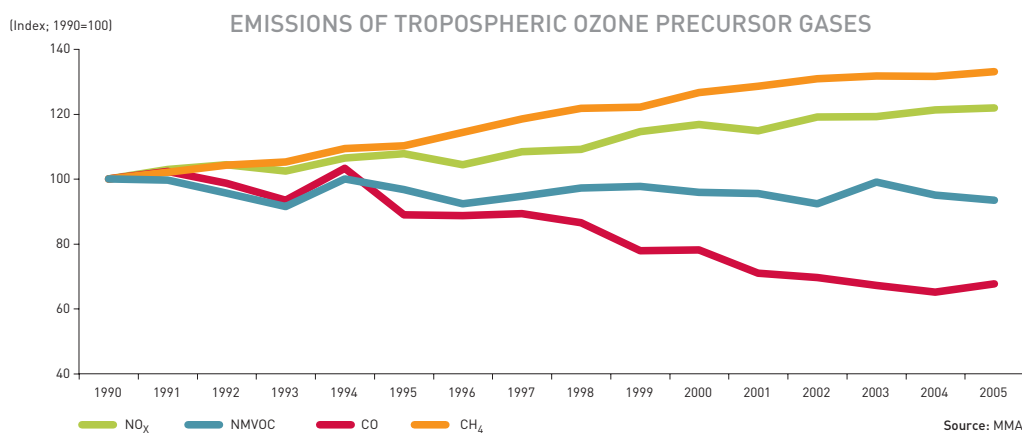
- Spanish National Atmospheric Emissions Inventory. Sub-Directorate General for Air Quality and Risk Prevention. Spanish Ministry of the Environment.

FURTHER INFORMATION

- www.mma.es
- www.eea.europa.eu/

Emissions of tropospheric ozone precursor gases

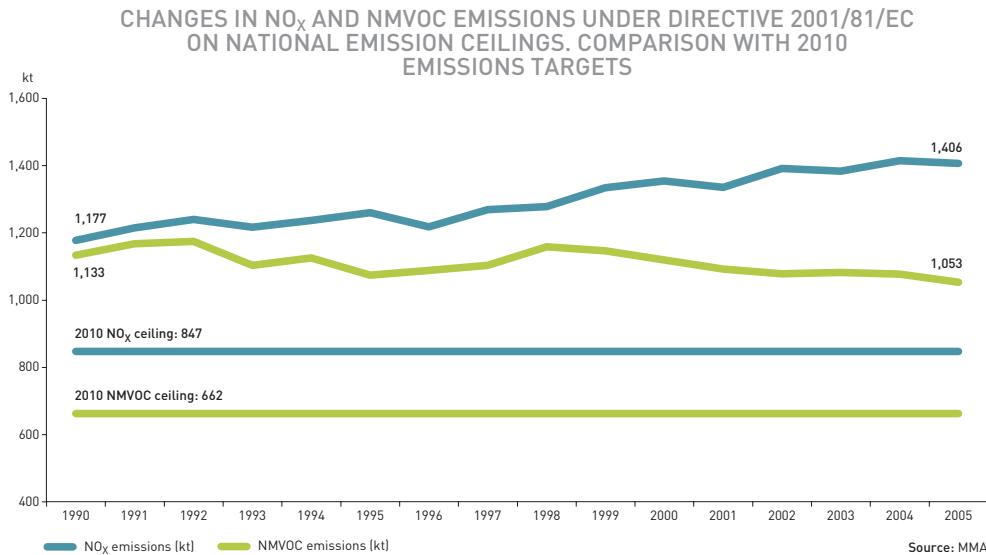
The rise in NO_x emissions and the limited reduction in NMVOC emissions make Spain unlikely to meet the targets set for 2010



Over the period 1990-2005, overall CO emissions fell by 32.3%, while the figure for NMVOCs fell by only 6.6%. Emissions of CH₄, meanwhile, rose by 33.1%, and those of NO_x by 21.9%.

In 2005, atmospheric emissions of CO stood at 2,685.9 kt, with the transport sector being the biggest polluter, accounting for almost 40.7% of the total (37.8% coming from road transport), followed by non-industrial combustion plants (at around 18.3%). During the same year, 2,497.3 kt of NMVOCs were emitted, 47.1% coming from other sources and sinks (nature) and 20.1% from solvent and other product use.

Meanwhile, emissions of CH₄ and NO_x maintained their upward trend of recent years, rising over the period 1990-2005 by 33.1% and 21.9% respectively. In the case of CH₄, emissions in 2005 totalled 1,865.1 kt, of which 57.9% came from agriculture and 29.5% from waste treatment and disposal. A total of 1,571.2 kt of NO_x were emitted, with transport making the largest contribution to overall emissions (50.8%, of which 33.2% was from road transport), followed by combustion in energy and transformation industries (22.7%) and combustion in manufacturing industry (18.0%).



Over the period 1990-2005, monitoring fulfilment of the targets set for national emission ceilings (Directive 2001/81/EC) for NO_x and NMVOCs reveals a fall of 7.1% in NMVOC emissions along with the aforementioned increase of 19.5% in NO_x emissions. The upward trend in the latter over the period, despite the slight reduction in 2005 compared with 2004 emission levels (0.6%), takes us further away from fulfilment of the target. For NMVOCs, the slight reduction seen over the period appears inadequate to meet the emissions targets set for 2010, although the reduction between 2004 and 2005 (2.3%), may be seen as a positive sign provided that this reduction increases over coming years.

As in the case of acidifying and eutrophying gases, if Spain is to achieve the targets set by the Directive on National Emission Ceilings, percentage reductions in these emissions will need to increase in the near future.

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- [See note for the previous indicator].

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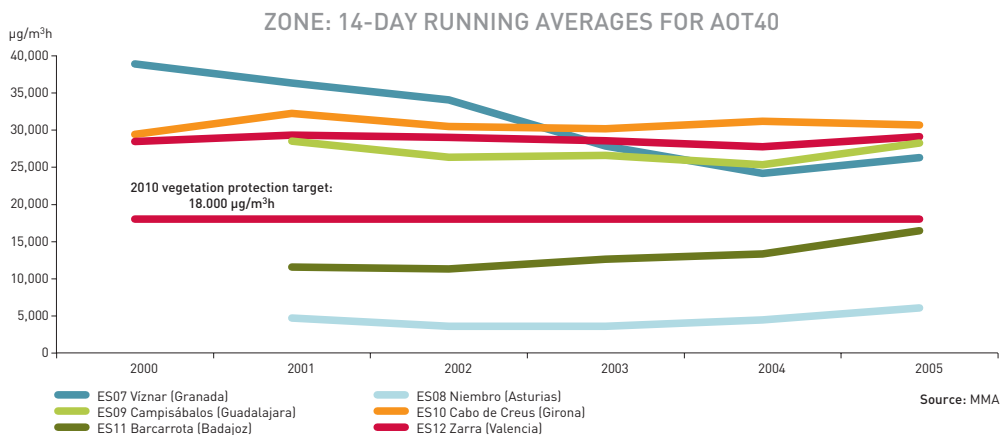
- Spanish National Atmospheric Emissions Inventory. Sub-Directorate General for Air Quality and Risk Prevention. Spanish Ministry of the Environment.

FURTHER INFORMATION

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Regional background air quality (vegetation protection): ozone

Spain does not have background pollution problems with SO₂ and NO_x, although ozone levels are higher than the established target figure



Ozone concentration levels (measured as AOT40) at almost all of the stations on the Spanish EMEP-CAMP network exceeded the vegetation protection target set for 2010 of a 5-year average of 18,000 µg/m³ (Royal Decree 1796/2003 of 26 December, relating to ozone in ambient air (*Real Decreto 1796/2003, relativo al ozono en el aire ambiente*), which transposed Council Directive 2002/3/EC, of 12 February 2002, relating to ozone in ambient air, into domestic law).

Only two of the stations (Niembro in Asturias and Barcarrota in Badajoz), had AOT40 figures below the target level. However, the upward trend seen in concentration levels at both these stations over the last four years suggests that the target will soon be exceeded.

For the remaining stations, concentration levels showed a clear tendency to stabilise: the only exception was the Viznar station in Granada, which had seen a sharp fall up until 2003, followed by an upturn in 2004. This suggests a far from favourable position in terms of achieving the targets.

NOTES

- This indicator does not include information on SO₂ and NO₂ concentrations, as from 2002 onwards the levels measured for these pollutants at the stations on the EMEP-CAMP network were far below the established limits (20 µg/m³ for SO₂ and 30 µg/m³ for NO_x) and therefore vegetation was not affected. However, this information was included in the last two editions of this report (2004 and 2005).
- The abbreviation AOT40 stands for Accumulation Over Threshold. This index is defined as the sum of the difference between concentrations of more than 80 µg/m³ per hour (= 40 parts per billion, or ppb) over a given period (which in the case of protection of vegetation covers the months of May, June and July), with only the hourly figures measured each day between 08.00 and 20.00 CET used for the calculation (Royal Decree 1796/2003, which transposes Directive 2002/3/EC into Spanish law).
- In order to obtain the AOT40 figure from the hourly ozone concentrations at each of the stations covered, figures are taken for those years in which 90% or more of the available data is valid, corrected to standardise all at 100% of possible data. Averages are calculated over five years (running averages) or, in the absence of a complete, consecutive series of annual AOT40 figures, a minimum three-year average (Annex I of Royal Decree 1796/2003, which transposes Directive 2002/3/EC into Spanish law).
- The EMEP-CAMP stations are distributed geographically as shown below:

**SOURCES**

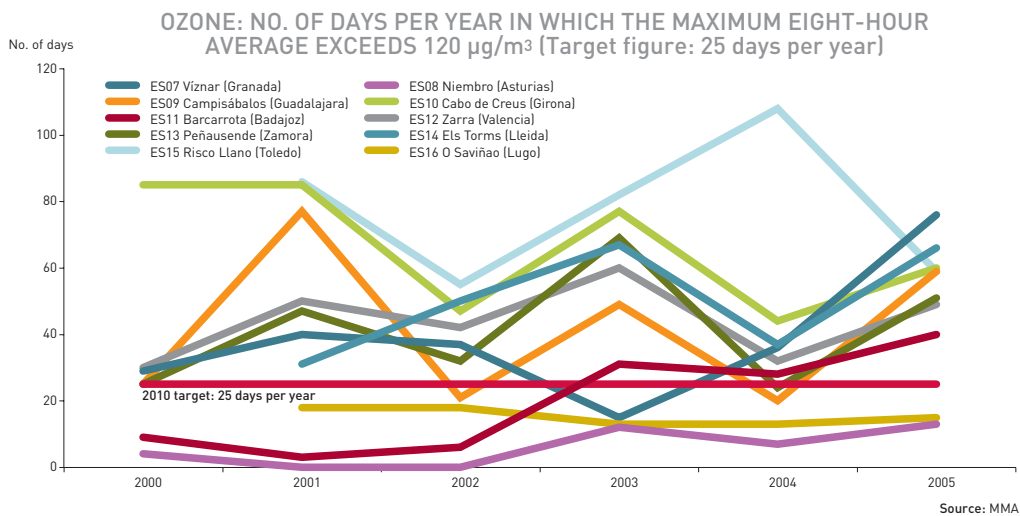
- Air Quality Database (*Base de datos de Calidad del Aire*). Sub-Directorate General for Air Quality and Risk Prevention. Spanish Ministry of the Environment.

FURTHER INFORMATION

- www.mma.es
- www.eea.europa.eu/

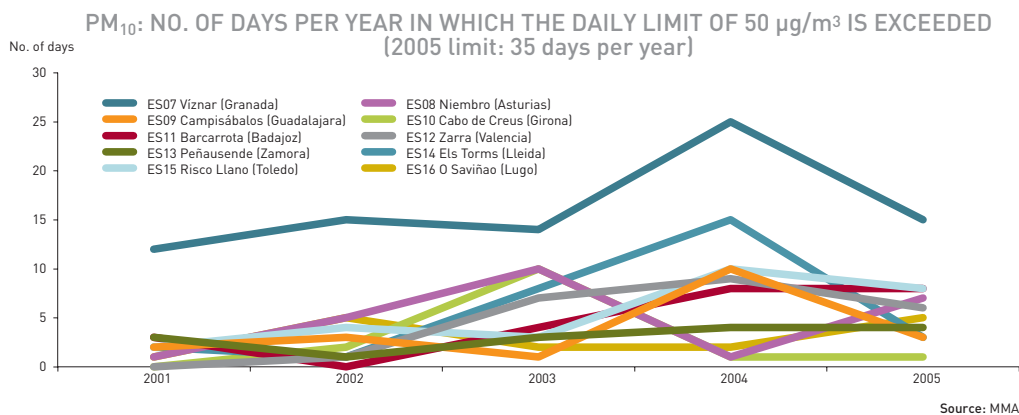
Regional background air quality (health protection): ozone and PM₁₀

The 2010 ozone targets are met at two of the stations and the PM₁₀ limits established are not exceeded at any location

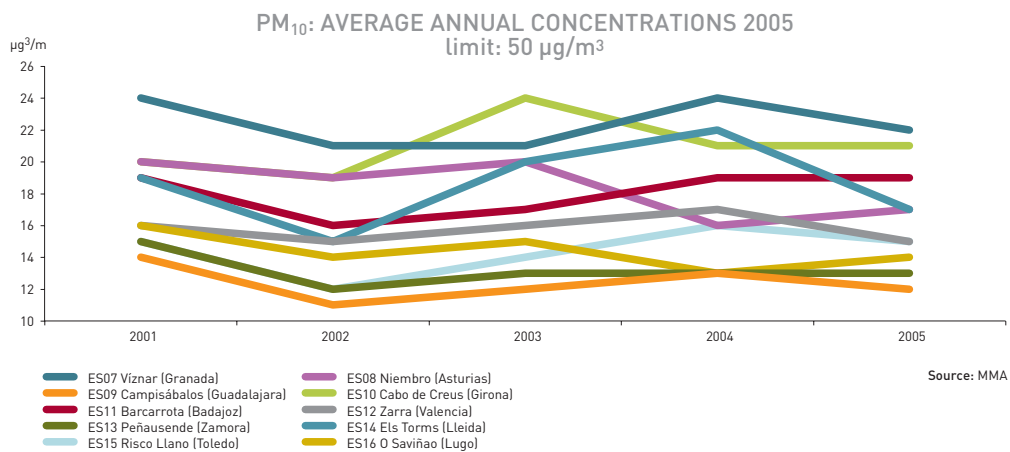


Analysis of the background pollution present in Spain, in terms of protecting human health and as measured at the EMEP-CAMP network stations, highlights worrying concentrations of ozone, while neither particles nor the remaining pollutants, in principle, represent a problem.

With respect to ozone, the target set for 2010 was exceeded at most stations and there is no clear downward trend in the figures for recent years. Only two stations met the target in 2005 (Niembro, in Asturias, and O Saviñao, in Lugo).



In terms of particle concentrations, unlike the situation in inner cities, where they are an increasing concern, the values recorded are well below the limits set for 2005: both the number of times the daily limit is exceeded and the average annual concentration fall within the range established.



NOTES

- Information has not been included for SO₂ or NO₂, as the levels measured for these pollutants (hourly, daily or annual) at the stations on the EMEP-CAMP network are well below the established limits, and they are therefore not considered to have an impact on health.
- The 2010 ozone target for the protection of human health has been set at no more than 25 days per year above the concentration of 120 µg/m³, measured as a maximum of the eight-hour averages. In terms of particle concentrations (PM₁₀), there are two variables of interest giving rise to the corresponding limit values:
 - Daily values: the target for the protection of human health from 2005 onwards (effective from 1 January 2006) is to achieve no more than 35 days/year above the concentration of 50 µg/m³.
 - Average annual value: the target for the protection of human health from 2005 onwards (effective from 1 January 2006) is to achieve average annual concentration of no more than 50 µg/m³.

SOURCES

- Air Quality Database. Sub-Directorate General for Air Quality and Risk Prevention. Spanish Ministry of the Environment.

FURTHER INFORMATION

- ww.mma.es
- www.eea.europa.eu/