2.1 AIR

Air quality and protection of the atmosphere are two of the main priorities of environmental policy. In spite of measures adopted in recent years in line with European policy, pollution levels with an extremely significant negative impact on human health and the environment still exist, above all in cities. Deterioration of the quality of the air we breathe, together with global atmospheric problems, are two of the subjects that most concern the scientific community and society in general. For this reason, they have an increasing presence on the Spanish political agenda.

Act 34/2007 (Ley 34/2007), of 15 November, regarding air quality and protection of the atmosphere is conceived as a new form of managing air quality. It replaces the previous obsolete regulations whose main reference was Act 38/1972 (Ley 38/1972), of 22 December, regarding protection of the atmospheric environment, and its enabling regulation, represented by Royal Decree 833/1975 (Real Decreto 833/1975), of 6 February. Renewal of these regulations obeys the need to adapt them to Spain's social and democratic model which, as is prescribed by the Spanish Constitution of 1978 (Art.1.1), is that of a devolved state consisting of autonomous regions (Communities).

The new Act aims to prevent, monitor and reduce atmospheric pollutionin order to avoid or decrease the damage that could result from it to people, the environment and other assets. The Act has many new aspects, including for example, that municipalities with more than 100,000 inhabitants should operate assessment facilities and networks, inform the public about air quality and pollution levels and draw up plans and programmes to meet the established air quality targets. In this sense, it urges the Government together with Regional Governments, to establish quality targets and emission limits for pollutants and activities. It also determines when and how Regional Governments

INDICATOR	GOAL	TREND
Atmospheric emissions of Greenhouse Gases (GHGs)	Reduce GHG emissions to meet Kyoto targets (115% of the 1990 level) by 2012	In 2006, GHG emissions fell against 2005 figures to stand 34.5% below the target
Atmospheric emissions of acidifying and eutrophying gases	Achieve Directive targets for national emission ceilings by 2010	Only SO_2 shows a downward trend towards the 2010 target, which will not be easy to meet
Emissions of tropospheric ozone precursor gases	Achieve Directive targets for national emission ceilings by 2010	Only NMVOCs show a downward trend towards the 2010 target, which will not be easy to meet
Regional background air quality (health and vegetation protection)	Achieve Framework Directive (96/62/EC) background air quality targets	Ozone is the only pollutant to exceed the established targets for 2010. The remaining pollutants have concentration levels below the established limits

and local authorities should assess air quality. It is worth noting that the Act requires the Public Administration to include considerations regarding atmospheric protection in the planning of sectoral policies, as well as to establish indicators to improve knowledge of the state of pollution and assess the efficacy of the adopted measures.

In September 2005, the European Commission approved the Thematic Strategy on Air Pollution. This strategy has been produced to attain "levels of air quality that do not give rise to significant negative impacts on, and risks to human health and the environment", an objective established in the 6th Environment Action Programme of the European Community.

In spite of the current regulatory framework, the EU estimates for 2020 forecast the existence of atmospheric pollution problems due to pollution by particulate matter, ozone and nitrogen compounds. The targets that would therefore achieve the required emission reductions by 2020 compared with the 2000 level are as follows: 82% for SO_2, 60% for NO_X, 51% for NMVOC, 27% for NH_3 and 59% for primary $PM_{2.5}$.

The EU Spring Council of 2007 agreed to reduce CO_2 emissions by 20% by 2020. A 20% increase in energy efficiency and a 10% rise in bio-fuel use was also agreed, as well as that 20% of energy should be provided by renewable sources.

Based on data available for the last few years, the main variables contemplated in this chapter reveal the following:

- Greenhouse Gas Emissions (GHG): fell in 2006 by 1.7% compared with 2005, the first decrease since signing the Kyoto Protocol.

- Emissions of acidifying and eutrophying gases: reduction in SO_2 emissions and an increase in the rest, although NO_X emissions between 2005 and 2006 also fell.

- Emissions of tropospheric ozone precursors: fall in NMVOCs and CO emissions (the latter increased slightly in 2006). NOx emissions fell during 2006, although they increased over the period 1990-2006.

- Regional background air quality: in terms of both health and vegetation protection, only ozone problems have been detected (the established targets have been exceeded at all the stations except for Niembro, in Asturias), as currently neither particulate matter nor the remaining pollutants are a problem in these non-urban areas.

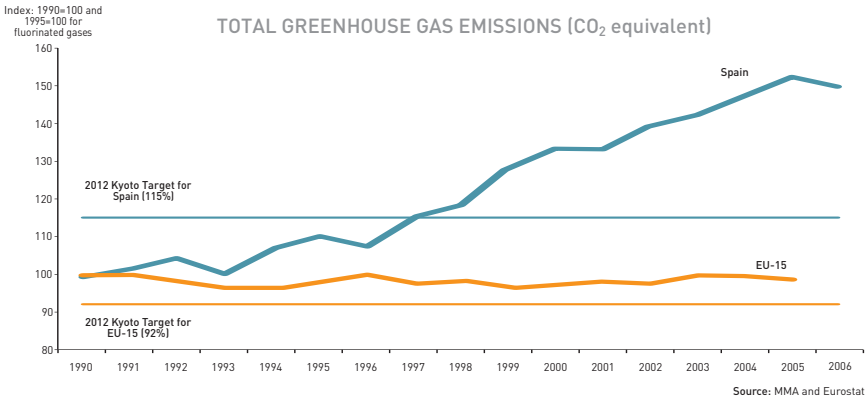
It is worth noting that in 2006 the "Four-year Scientific Assessment of Ozone Depletion" ("Evaluación científica cuatrienal del agotamiento de ozono") was carried out. This assessment confirmed that the levels of ozone-depleting substances present in the atmosphere had reached a record level by the beginning of 1990 and that they were decreasing according to plan with the reduction in production of substances that deplete it, thereby demonstrating the success of the Montreal Protocol. Apparent consumption of ozone-depleting substances in Spain is steadily falling and is relegated to use in activities in which they are permitted. Approval in 2006 of European Regulation 842/2006 regarding certain fluorinated greenhouse gases is also worth mentioning. This is an initiative that contributes to limiting the use of alternative coolants that have a high global warming potential.

The Montreal Protocol regarding Substances that Deplete the Ozone Layer is the international treaty that aims to protect the ozone layer through control of production of ozone-depleting substances. It was signed on 16 September 1987 and came into force on 1 January 1989. Spain signed on 21 July 1988 and ratified it on 16 December 1988. It is the main instrument of the Vienna Convention for the Protection of the Ozone Layer, adopted in 1985 and signed by Spain on 25 July 1988, which constitutes an important legal basis for action by the international community as regards protection of the stratospheric ozone layer.

Lastly, it is worth mentioning that at the Bali Conference of December 2007, the future international strategy to combat climate change was discussed with the aim of establishing guidelines following the end of the Kyoto Protocol in 2012. Prior to this, the European Parliament approved a Resolution that proposed a long-term objective of limiting the increase in world average temperature to 2°C compared to the pre-industrial period, which means reducing total greenhouse gas emissions to 1990 levels by at least 50% between now and 2050. Amongst other measures, for example, it proposes including emissions from aviation and maritime transport in international commitments to reduce greenhouse gases after 2012.

Atmospheric emissions of Greenhouse Gases (GHGs)

Greenhouse gas emissions in 2006 were 1.7% lower than in 2005



Source: MMA and Eurostat

Total GHG emissions in 2006 stood at 433,339 kilotonnes of CO_2 equivalent, 49.5% above the amount assigned to Spain for the Kyoto Protocol's baseline year (289,773 kilotonnes of CO_2-eq). Nevertheless, total emissions fell by 1.7% on 2005, dropping for the first time since the signing of the Protocol.

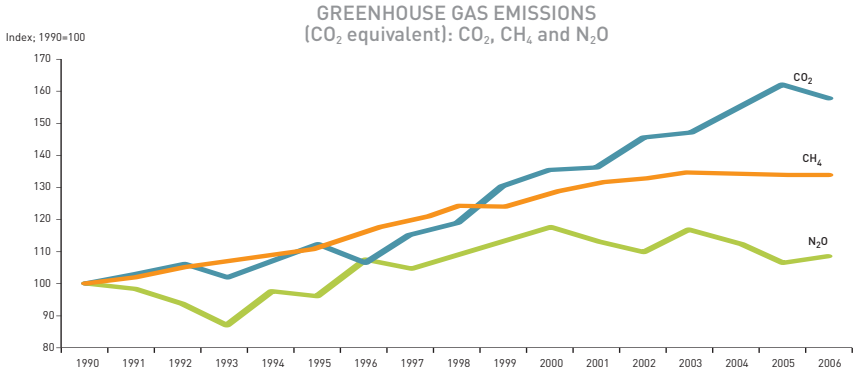
In relation to total emissions, in 2006 the contribution of "Energy transformation" (including transport), which has increased in recent years, was 78.1%, although between 2005 and 2006 it did fall by 0.7%. In 2006, "Industrial processes" and "Agriculture" contributed 8.1% and 10.7%, having decreased during the period by 1.1% and 3.4%, respectively. Lastly, "Waste treatment and disposal" contributed 2.8% to total emissions, whilst "Solvent use" fell slightly from 0.5% in 1990 to 0.4% in 2005.

By pollutant gas, CO_2 was the only one for which emissions were reduced in 2006 compared to 2005 (2.3%). Its contribution to total emissions is enormous (83%) and is mainly generated by "Energy transformation" and "Industrial processes". The other pollutants increased slightly on 2005, except for SF6 and HFCs, which increased 19.1% and 10.9%, respectively. Over the period 1990-2006, CO_2 increased by 57.4%, CH4 by 33.8% and N2O by 8.2%.

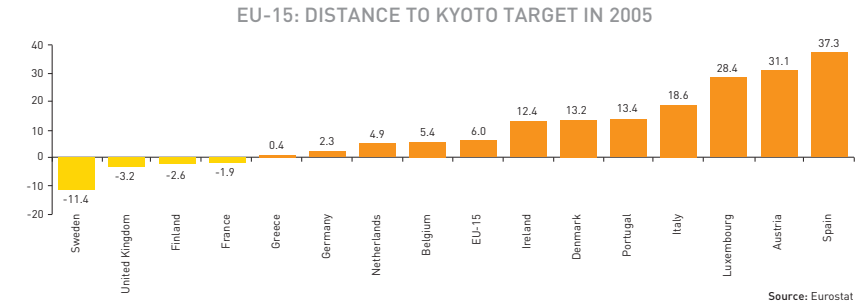
Among the fluorinated gases originating from industry (non-combustion production processes and solvent and other product use), the large increase in SF6 of 198.7%, the moderate growth in HFCs of only 19.5%, and the 30.3% fall in PFCs (compared to 1995, the baseline year for these pollutants) are particularly significant. However, it is worth noting that fluorinated gases represent only 1.41% of total GHG emissions.

In relation to the EU-15, in 2005 Spain was the country furthest off the target established in the Kyoto Protocol (37.3%). In that year, only four countries met their projected 2012 targets, whilst the remaining countries, and the EU as a whole, still need to make efforts to achieve them. However, data for 2006 confirms that Spain's distance from this target has fallen to 34.5%.

Spain has one of the lowest GHG emission rates per inhabitant of the EU-15 and was ranked in fifth position in 2005 in the EU-15 with 10.2 t CO_2-eq/inhab, even less than the EU average (10.9 in the EU-15, and 10.5 in the EU-27). However, it is one of the six countries in which this rate has increased in comparison with 1990.



Source: MMA



Source: Eurostat

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 to reduce 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 framework, the EU has undertaken to reduce its greenhouse gas emissions by 8% from 1990 levels within the period 2008-2012. Each EU member state has different obligations in relation to the overall EU commitment to reduce emissions. 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 polluting emissions generated throughout Spain. It includes anthropogenic and natural activities that generate any of the following pollutants: acidifying gases, ozone precursors and greenhouse gases, heavy metals, particulate matter and persistent organic compounds. Since 1990, SNAP (Selected Nomenclature for sources of Air Pollution), which is coherent with the IPCC categories (Intergovernmental Panel on Climate Change), has been used.

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 (MMA – *Ministerio de Medio Ambiente*).
- European Union figures: Eurostat. Query conducted on the website http://epp.eurostat.ec.europa.eu/ (Environment/Air Pollution and Climate Change data)

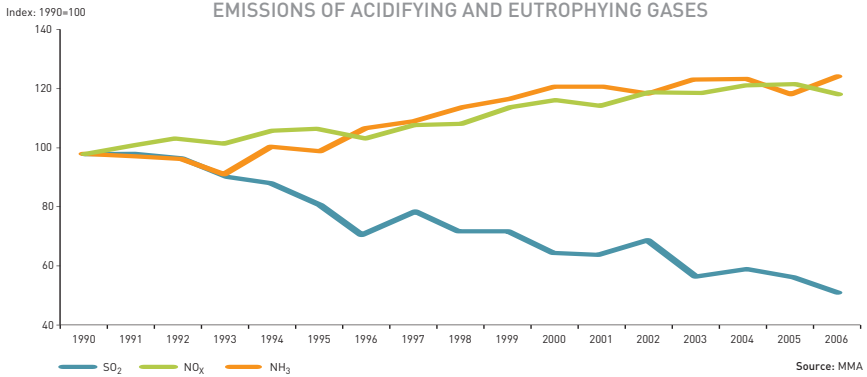
FURTHER INFORMATION

- http://www.mma.es
- http://www.eea.europa.eu/
- http://cdr.eionet.eu.int/es/eu
- EEA, 2007. Greenhouse gas emission trends and projections in Europe. Tracking progress towards Kyoto targets. EEA Report no 5/2007. EEA.

Atmospheric emissions of acidifying and eutrophying gases

Only SO_2 emissions fell, while emissions of the other acidifying gases continued to rise

EMISSIONS OF ACIDIFYING AND EUTROPHYING GASES



The overall balance for the period 1990-2006 shows a gradual reduction of sulphur oxide emissions, which fell by 45.9%, and sustained growth of nitrogen oxide emissions (19.1%). Meanwhile, ammonia emissions increased by 24.8%.

The main contribution to overall SO_2 emissions in 2006 was by combustion in energy production and transformation industries (77.9% of the total), followed by combustion in manufacturing industry (10.1% of total emissions). In absolute figures, road transport witnessed the greatest reduction in these emissions, dropping by 96.5% compared to 1990. At the same time, emissions of SO_2 by combustion in manufacturing industry and combustion in energy production and transformation industries decreased by 64.1% and by 43.4%, respectively, between 1990 and 2006.

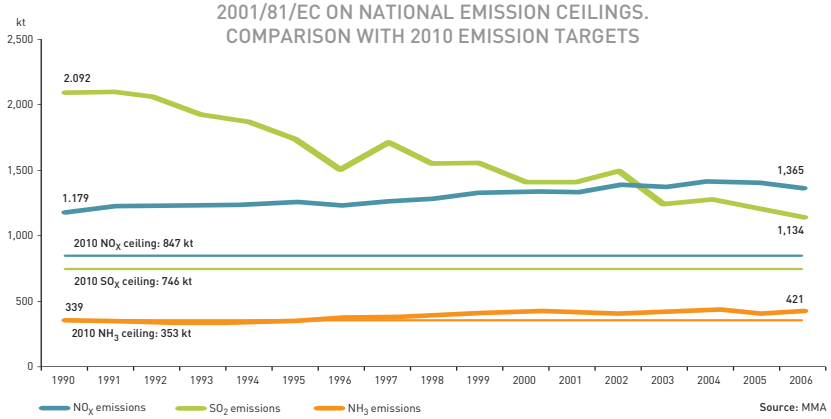
Agriculture is the largest emitter of NH_3, with almost 393,599 t, representing 91.2% of total emissions. Its growth by 22% during the period 1990-2006 has had the most influence, although sectors such as road transport and waste management have shown far larger increases in production of this pollutant.

In 2006, 50.4% of NO_X emitted into the atmosphere was produced by transport (31.7% by road transport and 18.7% by other modes). The second-largest source was combustion inenergy production and transformation industries (21.5%). Apart from road transport, which saw emissions fall during the 1990-2006 period by 4.9%, all of the other sectors have increased by between 21% and 29%.

In terms of the national emission ceilings established for 2010 (Directive 2001/81/EC of the European Parliament and of the Council, of 23 October), a downward trend has been observed throughout the 1990-2006 period in SO_2 emissions, while there has been a slight increase in NH_3 and NO_X emissions. In 2006, NO_X emissions broke this trend, falling by 3.1% on 2005.

SO_2 emissions and, above all NO_X emissions, must be reduced by a larger proportion than achieved last year, and the trend in NH_3 emissions must be reversed and their volume reduced. Should the trend of the last few years continue, it is unlikely that the established targets will be met.

CHANGES IN SO_2, NO_X AND NH_3 EMISSIONS UNDER DIRECTIVE 2001/81/EC ON NATIONAL EMISSION CEILINGS. COMPARISON WITH 2010 EMISSION TARGETS



NOTES

- The graph for the indicator shows the changes in total annual emissions of SO_2, NO_X and NH_3.
- 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, establishes that Member States must limit their annual national emissions of sulphur dioxide (SO_2), nitrogen oxides (NO_X), volatile organic compounds (VOCs) and ammonia (NH_3) 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.
- The scope of application of this Directive is very specific and does not include emissions of all activities. Additionally, for Spain, its territorial scope excludes emissions from the Canary Islands. It should not be confused with total emissions estimated by the Inventory, which includes all sectors and all of Spain's national territory.

SOURCES

- Spanish National Atmospheric Emissions Inventory. Sub-directorate General for Air Quality and Risk Prevention. Spanish Ministry of the Environment (MMA).

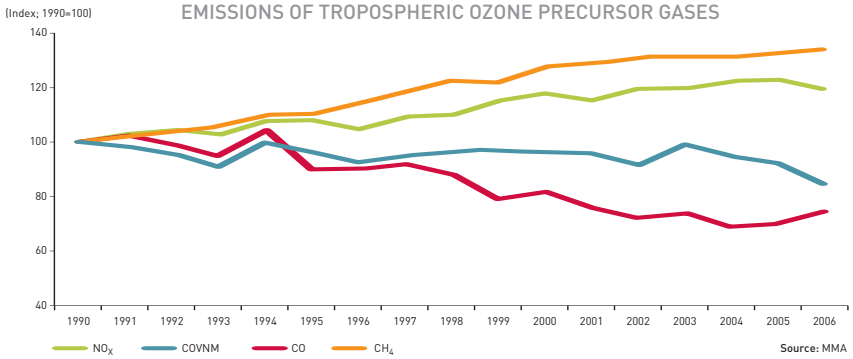
FURTHER INFORMATION

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

Emissions of tropospheric ozone precursor gases

NMVOCs are the only ozone precursor gases whose emissions have fallen. Of the others, only NO_X emissions decreased in 2006

EMISSIONS OF TROPOSPHERIC OZONE PRECURSOR GASES



Over the period 1990-2006, tropospheric ozone precursor gas emissions were characterised by falls of 26.4% in total CO emissions and 15.4% in those of NMVOCs. At the same tine, CH4 and NO_X emissions increased by 33.8% and 19.1%, respectively. However, compared with the previous year, CO emissions rose by 5.7% and CH_4 emissions by just 1.2%, whilst NMVOCs fell by 7.9% and emissions of NO_X by 2.4%.

As mentioned in the previous indicator, 50.4% of atmospheric emissions of NO_X in 2006 were produced by transport, followed by combustion in energy production and transformation industries (21.5%). Throughout the 1990-2006 period, only road transport showed a fall in emissions (4.9%), whilst the other sectors experienced increases of between 21% and 29%.

The majority of NMVOC emissions in 2006 were produced by the sector denominated “Other sources and sinks” (56.1%), which includes those from natural sources. Transport was the second most influential sector, contributing 9.4% of total emissions.

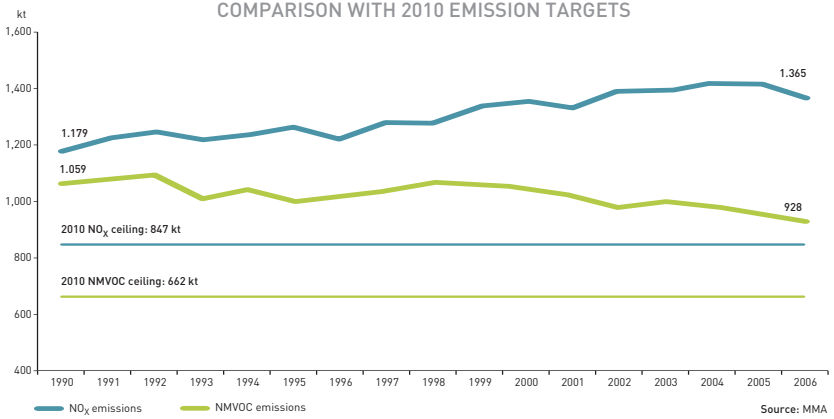
Once again, transport was the sector that emitted most CO into the atmosphere in 2006, beingresponsible for 33.1% (30.5% of the total came from road transport) followed byother sources and sinks (20.3%) and non-combustion production processes (13.5%). These last two are the sectors with the highest increase in emissions for the period 1990-2006; the first by 131.6% and the second by 36.8%. On the other hand, road transport emissions were notably reduced by 60.1% for said period.

The majority of methane emitted into the atmosphere in 2006 was produced by agriculture and waste treatment and disposal, contributing 59.6% and 27.7%, respectively. The latter sector has increased emissions the most since 1990, reaching 93.7%. At the same time, emissions by agriculture have risen by 27.1%.

In terms of the emission ceilings established for 2010 by Directive 2001/81/EEC, of 23 October, analysis of ozone precursor gas emissions during the period 1990-2006 suggests the need for significant efforts over the next few years. Specifically, to meet the established 2010 targets, NO_X emissions should be reduced by 38% (with regard to 2006), whilst those of NMVOCs should be reduced by 28.7%, figures which, according to the current trend, will require enormous efforts to be made.

Detailed analysis shows the clear downward trend in NMVOCs, which fell by 12.4% between 1990 and 2006 and by 2.16% in the last year (2005-2006). NO_X, however, progressively increased until 2004 (19.8%), although in the last two years emissions have dropped by 3.3%.

CHANGES IN NO_X AND NMVOC EMISSIONS UNDER DIRECTIVE 2001/81/EC ON NATIONAL EMISSION CEILINGS. COMPARISON WITH 2010 EMISSION TARGETS



NOTES

- The graph for the indicator shows the changes in total annual emissions of NO_X, NMVOCs, CO and CH_4.
- 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 note under previous indicator), establishes that Member States must limit their annual national emissions of sulphur dioxide (SO_2), nitrogen oxides (NO_X), volatile organic compounds (VOCs) and ammonia (NH_3) 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

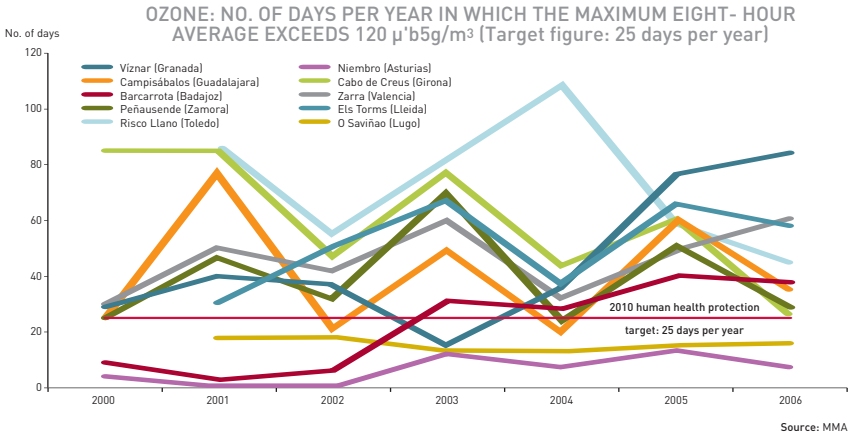
- Spanish National Atmospheric Emissions Inventory. Sub-directorate General for Air Quality and Risk Prevention. Spanish Ministry of the Environment (MMA).

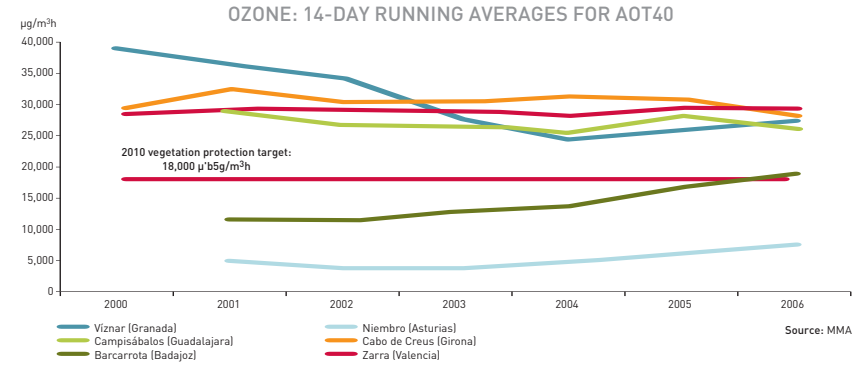
FURTHER INFORMATION

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

Regional background air quality (health and vegetation protection)

Only ozone background pollution can be considered a threat to population and vegetation health





Analysis of the background pollution present in Spain (EMEP/VAG/CAMP network) in terms of **protecting human health** only reveals the concentration of ozone to be of concern. Neither particulate matter nor the remaining pollutants currently represent a risk.

The 2010 target for ozone is exceeded in the majority of the EMEP stations, which have also recorded significant annual fluctuations. Only the Niembro and O Saviñao stations (Asturias and Lugo, respectively) have met the target since 2005.

The figures observed for particulate matter are well below the limits established for 2005 and therefore, unlike the situation in inner cities, they pose no background pollution risk.

In relation to **vegetation protection**, ozone concentration levels, expressed as AOT40, exceed the target figure of a 5-year average of 18,000 µg/m^3 established for 2010 in all the EMEP stations. Only at the Niembro (Asturias) station is this value still below this target, although since 2003 an upward trend has been recorded.

NOTES

- **Population health protection:**

  No information regarding SO_2, NO_2 or particulate matter has been included as the measured concentration and excess levels for these pollutants (hourly, daily and annual) at the stations on the EMEP/VAG/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/m^3, measured as the maximum of the 8-hour averages.

- **Vegetation protection:**

  No information regarding SO_2 and NO_2 concentrations has been included as, since 2002, the measured levels for these pollutants at the stations on the EMEP/VAG/CAMP network are well below the established limits, and therefore do not affect vegetation.

  AOT40 stands for Accumulation Over Threshold. This index is defined as the sum of the differences between hourly concentrations above 80 µg/m^3 (= 40 parts per thousand million) and 80 µg/m^3 over a given period (which, in the case of vegetation protection, is that comprising the months of May, June and July), using only 1-hour values measured between 8:00 and 20:00 each day, Central European Time. (Royal Decree 1796/2003, which transposes Directive 2002/3/EC into Spanish law).

  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 3-year average is used (Annex I of Royal Decree 1796/2003, which transposes Directive 2002/3/EC into Spanish law).

  The location of the EMEP stations is shown on the following map:

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 (MMA).

FURTHER INFORMATION

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