





2. Indicators: themes and sectors

- 2.1 Air
- 2.2 Water
- 2.3 Land
- 2.4 Nature
and biodiversity
- 2.5 Coasts and marine environment
- 2.6 Green economy
- 2.7 Waste
- 2.8 Agriculture
- 2.9 Energy
- 2.10 Industry
- 2.11 Fishing
- 2.12 Tourism
- 2.13 Transport
- 2.14 Households
- 2.15 Urban environment
- 2.16 Natural and technological
disasters

2.1 AIR



In December 2008, the EU adopted an integrated climate change and energy policy that includes several ambitious targets for 2020. Its intention is to set Europe on the path to a sustainable future based on an economy characterised by low carbon emissions and a reduction in energy consumption. To achieve this objective, it proposes:

1. Reducing greenhouse gas emissions by 20%.
2. Reducing energy consumption by 20% by improving energy efficiency.
3. Meeting 20% of our energy needs with renewable energy.

Decision 406/2009/EC of the European Parliament and of the Council of 23 April 2009 establishes the minimum contribution of each Member State towards fulfilling the Community commitment to reduce emissions of the greenhouse gases regulated by the Decision over the period 2013–2020, and sets forth the regulations governing implementation of these contributions and evaluation of the same. Moreover, Annex II establishes limits for greenhouse gas emissions by Member States by 2020 in relation to their 2005 greenhouse gas emission levels. In Spain's case, this limit is set at -10%.



The outcome of the Copenhagen Conference on Climate Change, held in December 2009, fell short of the EU's expectations and ambitions. Nevertheless, and although it is not binding, the agreement incorporates commitments to reduce emissions by the majority of countries, including the major greenhouse gas emitters and, in particular, by the emerging economies that had not adopted the Kyoto Protocol commitments.

INDICATOR	GOAL	TREND
Emissions of greenhouse gases	Reduce GHG emissions to meet Kyoto Protocol targets	In 2008, GHG emissions were 7.5% below the 2007 level. By implementing appropriate measures, it will be possible to comply with the Kyoto Protocol commitments
Emissions of acidifying and eutrophying gases and tropospheric ozone precursors	Achieve the objectives of the National Emission Ceilings Directive by 2010	The decrease in emissions in 2008 has made a significant contribution to achieving the objectives established
Emissions of particulate matter	Achieve the objectives of the National Emission Ceilings Directive for PM precursors by 2010	The fall in emissions of particulate matter in 2008 resulted in an overall fall for the entire 2000-2008 period
Regional background air quality for the protection of health and vegetation	Achieve the objectives for ambient air quality set down in the legislation (recast by Directive 2008/50/EC of 21 May)	Ozone is the only pollutant whose mean concentration still exceeds the target values established for 2010

New features include the aim to restrict the maximum temperature rise to less than 2 °C and the commitment by developed and developing countries to include their greenhouse gas emission reductions and national mitigation actions in a list. The agreement also includes specific financing figures, new proposals for governance, and mechanisms to support technology transfer and forest development. Equally, it establishes a transparent system of measuring, reporting and verifying the actions of developing countries.

In Spain, noteworthy progress has been made in implementing the law transposing the Directives on carbon capture and geological storage, and in modification of the emissions trading scheme (from 2012, the aviation sector will be included in the Community emissions trading scheme and the corresponding draft laws have been submitted for public consultation).

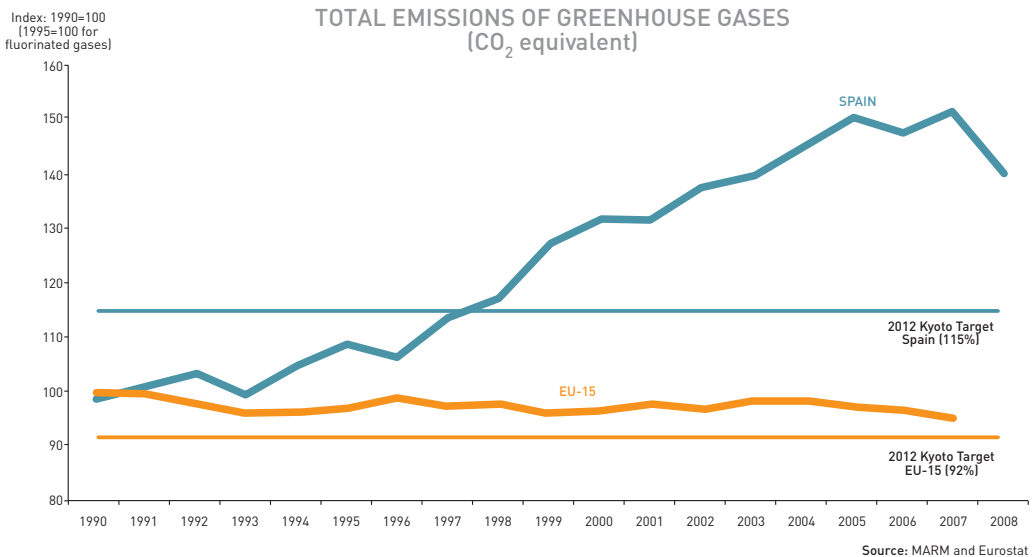
As regards air quality, on 11 June 2008, Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008, on ambient air quality and cleaner air for Europe, which was required to be incorporated into national law by Member States by 11 June 2010, came into force.

This Directive summarises four Directives and a Decision of the Council and, among other aspects, specifically regulates concentration of fine particulate matter (under 2.5 µm), which has been identified as one of the pollutants most hazardous to human health.

One of the Directive's annexes is devoted exclusively to the issue of public information and makes it mandatory for Member States to inform the public on a regular basis of recorded or predicted exceedances of information and alert thresholds.

Emissions of greenhouse gases

In 2008, GHG emissions decreased by 7.5%, the greatest reduction since adoption of the Kyoto Protocol



In 2008, greenhouse gas emissions fell to 405,740 kilotonnes of CO₂ equivalent, 7.5% below the 2007 level. This drop meant that total emissions over the period 1990–2008 rose by 40.0%, while the Kyoto Protocol establishes a limit of 15% above base year (1990).

CO₂ was the predominant pollutant, accounting for 83.2% of the total in 2008, and, by category, was largely generated by Energy and Industrial Processes. It was followed by CH₄ (which contributed 8.9%), N₂O (6.2%) and fluorinated gases (1.7%).

By sector, Energy contributed 78.5% of total emissions. In 2008, Industrial Processes and Agriculture contributed 7.7% and 9.6%, respectively, while Waste accounted for 3.8% by the end of the period. Finally, Solvent and Other Product Use only produced marginal emissions (less than 0.4% of total emissions).

In 2007, Spain was responsible for 8.8% of the EU-27's total GHG emissions and contributed just 9.95 tonnes of CO₂-eq/inhabitant and 0.42 kg of CO₂-eq/unit of

GDP. In both cases, 15 other EU-27 countries had higher emissions per inhabitant and per unit of GDP.

In Spain, since adopting the 2nd Emission Rights Allocation Plan (PAE) for 2008–2012 in 2006, the Government expects to meet its Kyoto Protocol targets (total greenhouse gas emissions no more than 37% above the base year figure). This total is reached by combining the target 15% increase established by the Kyoto Protocol with an additional 2% attributable to removal by sinks, and acquisition of the equivalent of the remaining 20% in carbon credits via the Kyoto Protocol's flexibility mechanisms.

The national emissions projections estimated for Spain under three possible scenarios — baseline (without measures), base (with measures) and target (with additional measures) — based on the 1990–2007 inventory data and produced whilst taking into consideration updates to sectoral planning and the macroeconomic situation associated with the same, indicate that under the base scenario mean GHG emissions over 2008–2012 will be 34.45% above the Kyoto Protocol's base year level.

GREENHOUSE GAS EMISSIONS PROJECTIONS
2008–2012 MEAN

SCENARIOS	Baseline (without measures)	Base (with measures)	Target (with additional measures)
GHG (kt CO ₂ -eq)	494,761	389,595	390,295
GHG (% compared to base year)	70.74	34.45	34.69

Source: MARM

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 Kyoto Protocol of the United Nations Framework Convention on Climate Change (1992) sets out developed countries' commitments to reduce emissions of these gases, regulates emissions trading among countries and establishes 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% in relation to 1990 levels within the period 2008–2012. Each EU Member State has different obligations in relation to the Community's overall commitment to reduce emissions (Spain has to stabilise GHG emissions at 115% of 1990 levels).

- The emissions figures only include gross emissions and exclude the net sink (capture minus emissions) for Group 5 – “Land use and changes in land and forest use”.
- The 2010 edition of the greenhouse gas emissions inventory, which covers the period 1990–2008, includes several differences in the estimation methodology to that applied in previous years (methodological revision, updating of baseline information and error correction).

SOURCES

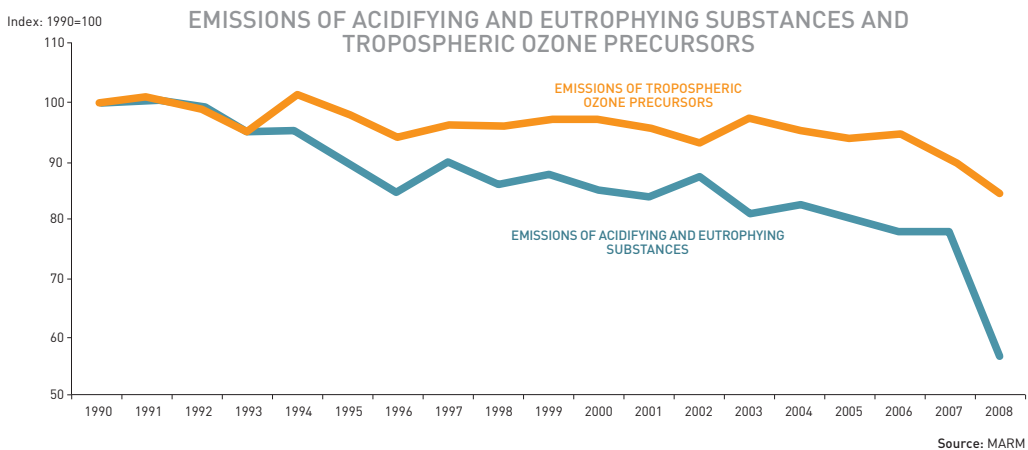
- MARM, 2010. Spanish Greenhouse Gas Emissions Inventory. 2010 edition (1990–2008 series). Summary of results. Directorate-General for Environmental Quality and Assessment.
- MARM, 2009. Proyección de emisiones de contaminantes atmosféricos en España. Summary. Directorate-General for Environmental Quality and Assessment. December 2009.
- EEA greenhouse gas data viewer.
- Eurostat website (Eurostat/Statistic/Environment/Data: Database/Air pollution/climate change/Indicators for air pollution and climate change/Select data

FURTHER INFORMATION

- <http://www.marm.es>
- http://www.mma.es/portal/secciones/calidad_contaminacion/atmosfera/emisiones/inventario.htm
- <http://www.eea.europa.eu/>
- <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>

Emissions of acidifying and eutrophying gases and tropospheric ozone precursors

In 2008, there was a sharp decrease in emissions of acidifying and eutrophying gases and ozone precursors



In 2008, there was a significant drop in aggregate emissions of acidifying and eutrophying substances and tropospheric ozone precursors. In fact, it was the greatest reduction since the emissions inventory began.

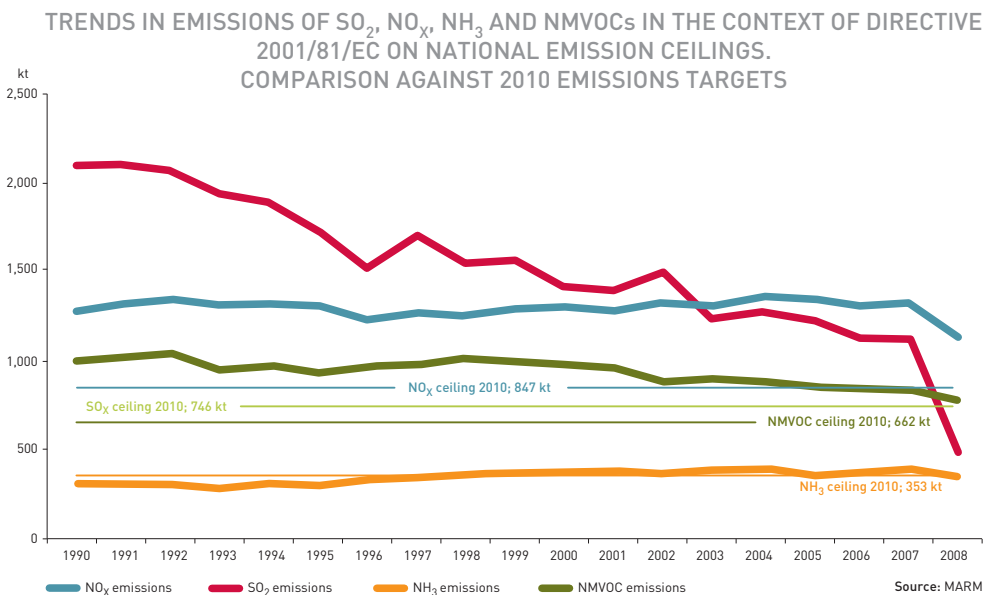
Specifically, emissions of acidifying and eutrophying substances (SO_2 , NO_x and NH_3 , expressed as acid equivalent) decreased by 28.0% between 2007 and 2008, while tropospheric ozone precursors (NO_x , NMVOCs, CO and CH_4 , expressed as NMVOC equivalent) fell by 6.4%.

These decreases have greatly changed the prevailing situation. Thus, over the period 1990–2008, aggregate emissions of acidifying and eutrophying gases fell by 43.8%, while those of tropospheric ozone precursors dropped by 15.9%.

By pollutant, the greatest reduction over the period occurred in SO_2 emissions (75.6%). It was followed in order of magnitude by CO (47.2%), NMVOCs (16.4%) and NO_x (7.7%). The only atmospheric emissions to increase were those of CH_4 and NH_3 (34.3% and 12.3%, respectively).

Nevertheless, in 2008, emissions of all pollutants fell in comparison with 2007. Thus, SO₂ decreased by 54.6%, NO_x by 12.2%, NH₃ by 7.6%, CO by 4.2%, NMVOCs by 1.9%, and CH₄ by 1.3%.

The figures for pollutant gas emissions over the past year have modified expectations as regards compliance with the targets established for 2010 by Directive 2001/81/EC of 23 October 2001, on national emission ceilings for certain atmospheric pollutants. As the graph shows, the falls experienced in 2008 have enabled Spain to meet its targets for SO₂ and NH₃ and, if this decrease continues in 2009, it will bring the country closer to complying with its targets for NO_x and NMVOCs.



NOTES

- The graph for the indicator shows the changes in aggregate total annual emissions of acidifying and eutrophying substances (SO₂, NO_x and NH₃) and tropospheric ozone precursors (NO_x, NMVOCs, CO and CH₄) in relation to the base year 1990 (1990=100).
- Emissions of acidifying and eutrophying gases are presented as acid equivalent (hydrogen ion-generating potential) and are aggregated using the following weighting factors: 31.25 acid equivalent/kg for SO₂ (2/64 acid equivalent/g), 21.74 acid equivalent/kg for NO_x, expressed as NO₂, (1/46 acid equivalent/g) and 58.82 acid equivalent/kg for NH₃ (1/17 acid equivalent/g). Emissions of tropospheric ozone precursors were estimated using the tropospheric ozone depleting potential (expressed as NMVOC equivalent). The following weighting factors were employed: 1.22 for NO_x, 1.00 for NMVOCs, 0.11 for CO, and 0.014 for CH₄.
- The objective of Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001, on national emission ceilings for certain atmospheric pollutants, is to limit emissions of acidifying and eutrophying pollutants and ozone precursors in order to protect human health and the environment.

SOURCES

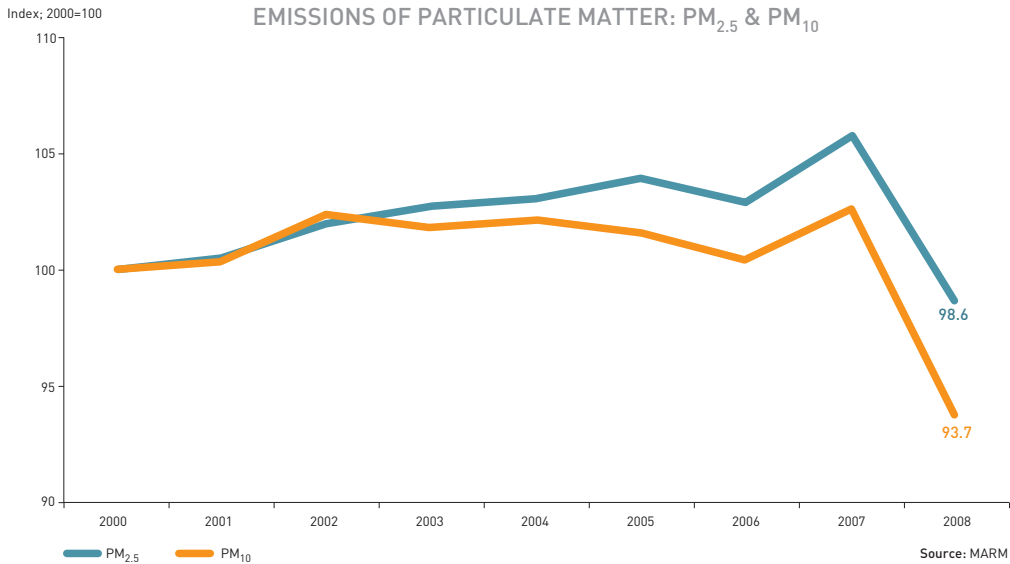
- MARM, 2010. Spanish Greenhouse Gas Emissions Inventory. 2010 edition (1990–2008 series). Summary of results. Directorate-General for Environmental Quality and Assessment.
- MARM, 2009. Proyección de emisiones de contaminantes atmosféricos en España. Summary. Directorate-General for Environmental Quality and Assessment. December 2009.

FURTHER INFORMATION

- <http://www.marm.es>
- <http://www.eea.europa.eu/>

Emissions of particulate matter

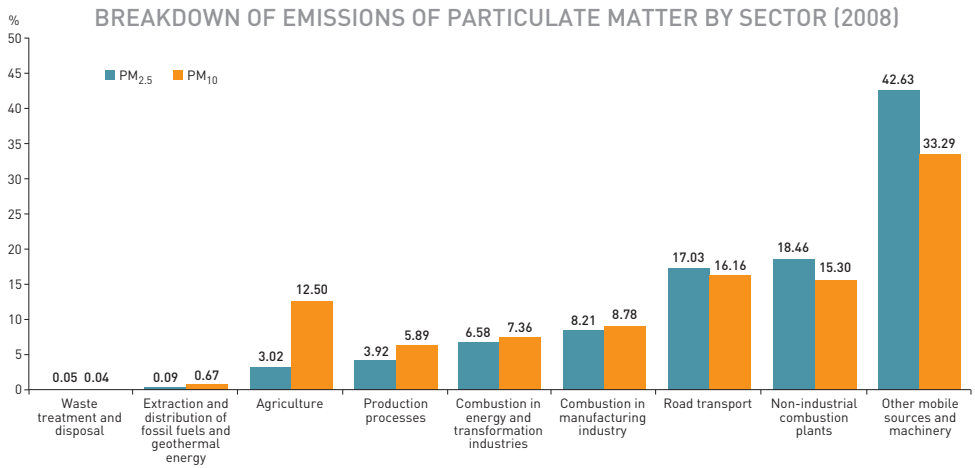
In 2008, emissions of particulate matter were lower than in 2000



In 2008, there was a sharp decrease in emissions of particulate matter, with PM₁₀ falling by 8.7% and PM_{2.5} falling by 6.8%. Thus, over the period 2000–2008, total emissions of PM₁₀ dropped by 6.3%, while those of PM_{2.5} fell by 1.4%.

In relation to 2007, there was a noteworthy decrease in 2008 in emissions originating from combustion in the energy and transformation industries and, to a limited extent, in those generated by road transport. The 2008 emissions breakdown shows the significant contributions made by other mobile sources and machinery, non-industrial combustion plants and road transport.

Over 1990–2007, total emissions of primary particles (PM₁₀) and precursors of secondary particles (NO_x, SO₂ and NH₃) fell by 44% overall in the 32 EEA member countries. Of this reduction, 43% occurred in energy industries, the sector that recorded the greatest reduction (as was also the case in Spain in the last year of the period). Among the root causes of this decrease were the shift from coal to natural gas in electricity generation, and technological improvements in industrial facilities to enhance equipment efficiency and performance and reduce pollution.



Source: MARM

NOTES

- The indicator covers emissions of primary particulate matter smaller than 10 and 2.5 µm (PM₁₀ and PM_{2.5}).
- The EU has not established specific limits for primary emissions of particulate matter, but it did put limits in place in 2010 for their precursors (NO_x, SO_x and NH₃) under the National Emission Ceilings Directive (Directive 2001/81/EC) and the Gothenburg Protocol to the Convention on Long-Range Transboundary Air Pollution (Council Decision 81/462/EEC of 11 June 1981).

SOURCES

- MARM, 2010. Spanish Greenhouse Gas Emissions Inventory. 2010 edition (1990–2008 series). Summary of results. Directorate-General for Environmental Quality and Assessment.

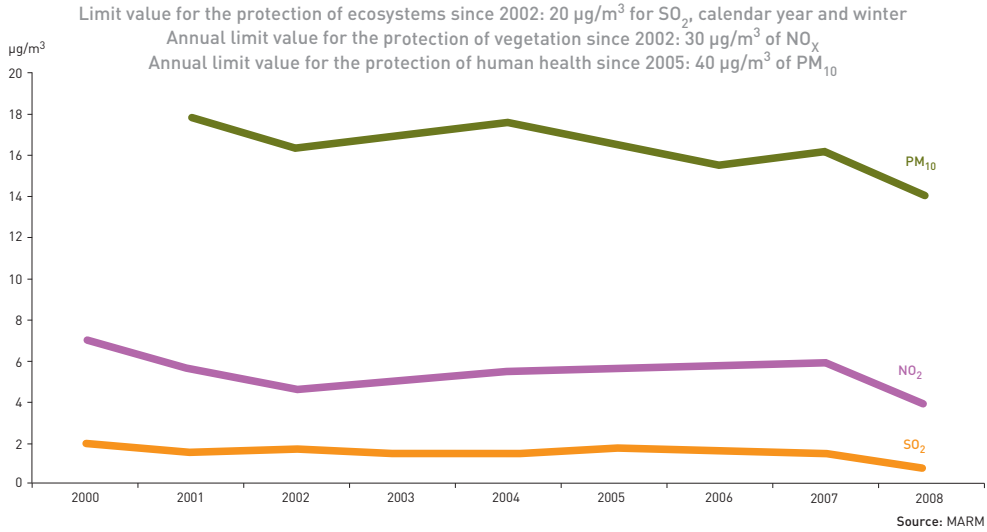
FURTHER INFORMATION

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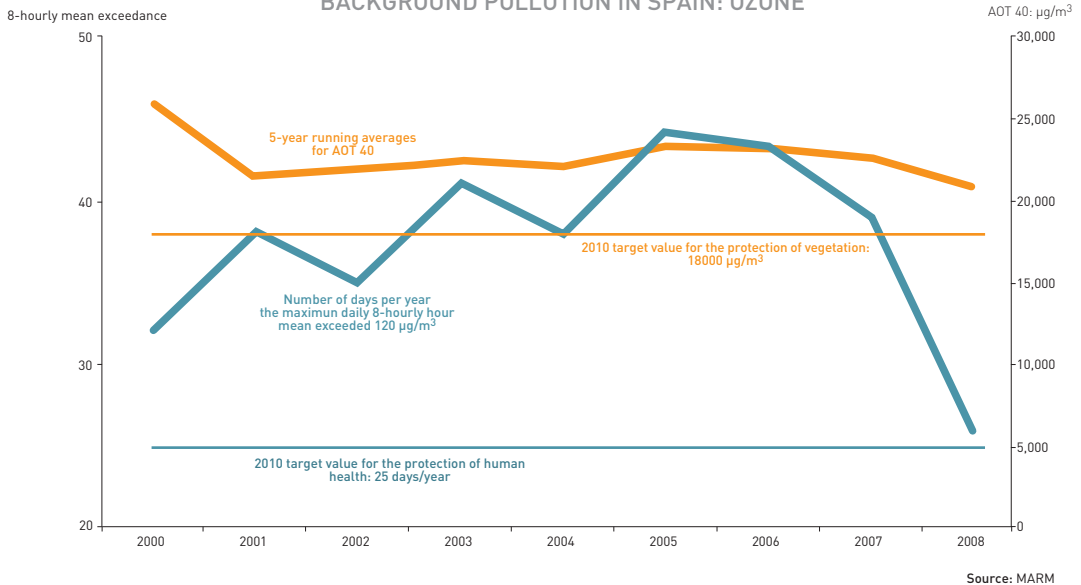
Regional background air quality for the protection of health and vegetation

In 2008, only ozone presented mean background pollution values above the 2010 target

BACKGROUND POLLUTION IN SPAIN: MEAN CONCENTRATION OF ANNUAL MEANS



BACKGROUND POLLUTION IN SPAIN: OZONE



The EMEP/GAW/CAMP network monitors Spain's background air pollution via stations located far from the sources of pollutant emissions.

The mean values presented in the indicator (mean annual means) show a pronounced decrease in the last year in the period.

The mean of the mean concentrations of SO₂, NO₂ and PM₁₀ is lower than the limit values set for each of these pollutants by the currently applicable legislation. The highest mean values do not exceed the limit values and, therefore, for these pollutants (excluding specific individual situations) background pollution does not present a significant hazard.

The situation as regards ozone is different, since although there were significant decreases in 2008 in the mean values covered by legislation (AOT40 and daily exceedances of the maximum 8-hour average), they were still above the target value due to come into force in 2010. As the graph shows, there has been a decrease in exceedances of the daily maximum 8-hour average since 2005, the year in which the highest value was recorded and from which point the upward trend was reversed. The AOT40 figure shows much more moderate growth and also began to fall in 2005.

NOTES

- The indicator assesses general background pollution in Spain. This is presented for each pollutant and year as the mean of the mean concentrations recorded at all of the stations on the European Monitoring and Evaluation Programme (EMEP) network.
- AOT40 stands for Accumulation Over Threshold. This index is defined as the sum of the differences between hourly concentrations above $80 \mu\text{g}/\text{m}^3$ (=40 parts per billion, or ppb) and $80 \mu\text{g}/\text{m}^3$ over a given period (which, in the case of the protection of vegetation, 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).
- In order to obtain the AOT40 figure from the 1-hour 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 EMEP, established under the framework of the Geneva Convention, measures background air pollution. The Global Atmospheric Watch (GAW) is a project implemented by the World Meteorological Organization (WMO). The Comprehensive Atmospheric Monitoring Programme (CAMP) is fruit of the OSPAR Convention and is designed to identify the atmospheric inputs in the North-East Atlantic region and examine their impact on the marine environment. The EMEP/GAW/CAMP network, which meets the aims of the aforementioned programmes, monitors tropospheric levels of background air pollution and sedimentation on the Earth's surface in order to protect the environment. The locations of the EMEP stations used to create the index are shown on the following map:



With the entry into force of the new Air Quality Directive (Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008), on ambient air quality and cleaner air for Europe, current limit values for the protection of ecosystems against SO_2 and of vegetation against NO_x are now known as "critical levels for the protection of vegetation".

SOURCES

- MARM, 2010. Air Quality Database. Directorate-General for Environmental Quality and Assessment.

FURTHER INFORMATION

- <http://www.marm.es>
- <http://www.aemet.es/>
- <http://www.eea.europa.eu/>