AIR POLLUTION BY OZONE IN EUROPE IN SUMMER 2003

Overview of exceedances of EC ozone threshold values during the summer season April–August 2003 and comparisons with previous years

Summary report

20 October 2003

Summary of a draft report to the Commission by the European Environment Agency, European Topic Centre on Air and Climate Change, authored by Jaroslav Fiala, Libor Cernikovsky, Frank de Leeuw and Pavel Kurfuerst and based on data provided in the framework of Council Directive 92/72/EEC on air pollution by ozone by 15 September 2003.

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Summary

Ground-level photochemical ozone is one of the air pollutants of most concern in Europe in 2003 since concentrations in the lower atmosphere continue to exceed thresholds established in EU legislation to protect human health and prevent damage to ecosystems, agricultural crops and materials.

According to Council Directive 92/72/EEC on air pollution by ozone, EU Member States have to inform the public when hourly average ozone concentrations exceed the information threshold of 180 μg/m^3 and the warning threshold of 360 μg/m^3 to enable the population concerned to take all appropriate preventive protective action. Member States also have to provide information on airborne ozone concentrations in their territory on an annual basis to the European Commission before 1 July of the following year. Additionally, exceedances of the threshold values for population information and warning, as set in the Directive, must be reported to the Commission within one month after an occurrence. Directive 92/72/EC has been repealed and a new ozone Directive 2002/3/EC is in force as of 9 September 2003. In this Directive, the information threshold is the same as in the old Directive; the hourly average concentration of 240 μg/m3, measured over three consecutive hours is set as an alert threshold.

This summary presents a first evaluation of the observed exceedances of the population information and warning threshold values for ozone during summer 2003 (April–August). Information is based on data from national monitoring networks which have not yet been validated due to the tight reporting schedule and hence the conclusions drawn need to be considered as preliminary. The agreed deadline for transmitting data for this report was 15 September 2003.

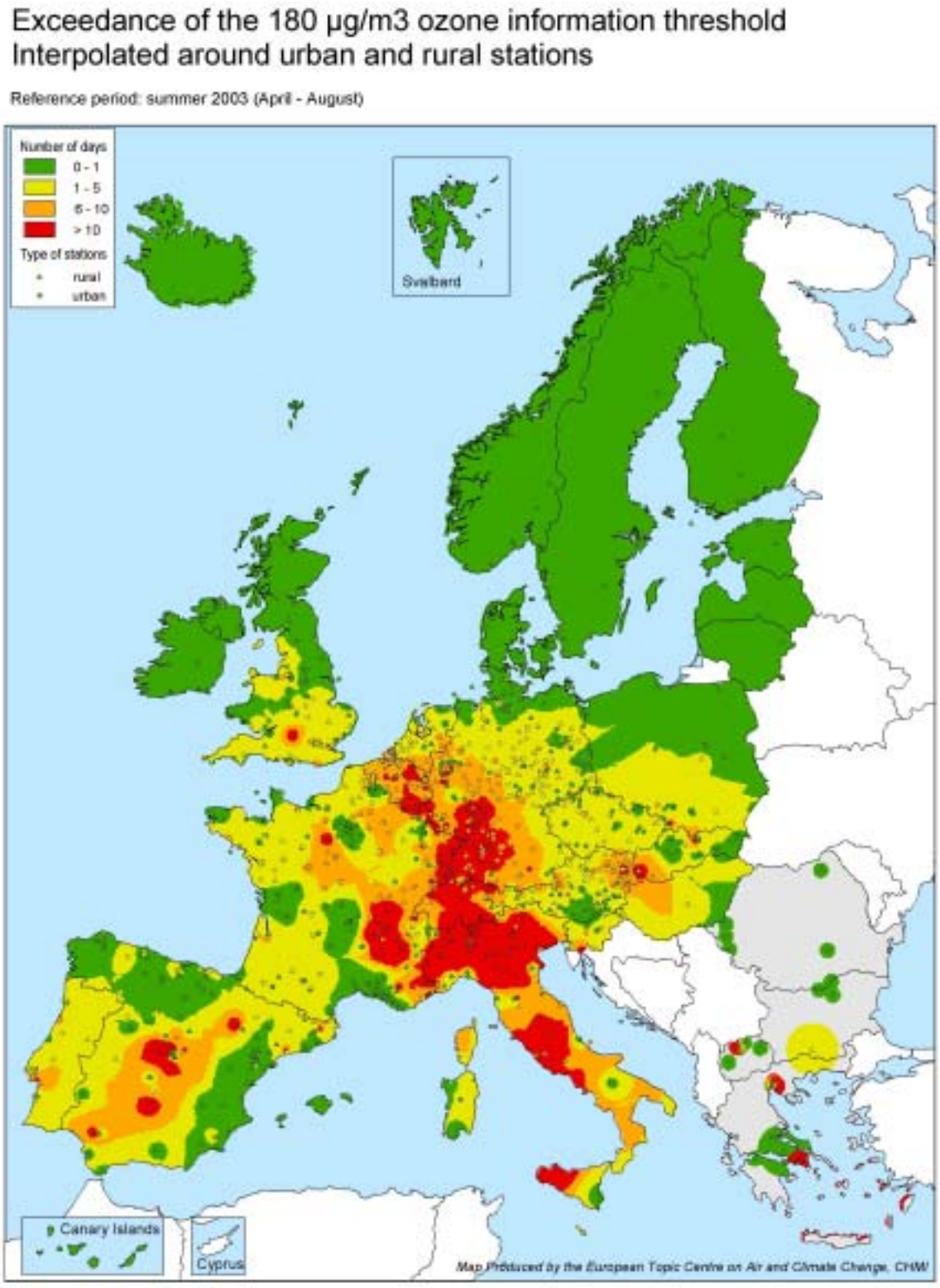
All of the EU Member States provided information on observed exceedances in time, or indicated that no exceedances had been observed In addition, 9 acceding countries (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovak Republic, Slovenia), 2 accession countries (Bulgaria, Romania) and 5 non-EU countries (FYROM, Iceland, Lichtenstein, Norway, Switzerland) provided information on observed exceedances upon request of the European Environment Agency.

Data from a total of 1805 ozone monitoring sites were reported to the Agency in summer 2003. From these stations 1624 stations are located within EU Member States, 497 stations are situated in rural areas, 857 stations in urban environment, 312 stations are classified as street stations and 139 stations were characterised as industrial stations or the monitoring environment was not specified.

In order to provide information as soon as possible, summaries of the data as provided monthly by the countries have been made available on the website of the European Topic Centre for air and climate change on reception: http://etc-acc.eionet.eu.int/databases/o3excess.

From an evaluation of the exceedances, the following initial conclusions are drawn for the situation during summer 2003:

- Exceptionally long lasting and spatially extensive episodes of high ozone concentrations occurred, mainly in the first half of August. These episodes appear to be associated with the extraordinarily hot temperatures over wide areas of Europe.



Map S.1 Number of exceedances of the threshold value for information of the public (1-hour ozone concentration > 180 µg/m^3) observed at rural and urban background stations, summer 2003 data (April–August), interpolated using inverse distance weighting.

Exceedance of the warning threshold

- Exceedance of the warning threshold (hourly average concentrations of 360 μg/m3) occurred in France for two hours at one station during August and in Italy and Romania in June for one hour at one station in each country. The maximum hourly ozone concentration reported in 2003 was 417 μg/m³ at a monitoring station in France. For comparison, during the summer of 2002 when temperatures did not reach as high as in 2003, the threshold value for warning the population was exceeded a similar number of times, namely once in France and five times in other countries across the EU and the highest hourly ozone concentration reported was 391μg/m³ at a monitoring station in Spain. Similar small numbers of exceedance of the warning threshold value occurred in earlier years. Hence these exceedances are rare and are not strongly correlated with temperature.

Exceedance of new alert threshold

- Ozone concentrations reported in 2003 have been compared with the alert threshold value as defined in the new Ozone Directive (hourly average concentration of 240 μg/m3, measured over three consecutive hours). Single hourly average ozone concentrations higher than 240 μg/m³ were reported from monitoring sites of 15 countries (Austria, Belgium, Switzerland, Germany, Spain, France, United Kingdom, Greece, Italy, Luxembourg, Netherlands, Portugal, Romania, Slovenia and Slovak Republic). On average, an exceedance of the new 240 $\mu g/m^3$ alert threshold was observed in summer 2003 at 27 % of the stations, which reported an exceedance of the 180 $\mu g/m^3$ information threshold.

Exceedance of information threshold

- Exceedance of the information threshold (hourly average concentrations of 180 $\mu g/m^3$) occurred in 23 out of the 31 countries reporting, 11 of them EU Member States (Map S.1). About 68 % of all stations (1220 stations) reported one or more exceedance. On average 5.4 exceedances per operational station were reported.

- The spatial distribution of exceedances of this threshold observed in summer 2003 was much more extended than in previous summers. With the exception of the northern part of Europe at least one day with exceedance of this threshold was recorded in most of the countries reporting in summer 2003. The area with more than 10 exceedance days in 2003 covered mainly south-western Germany, Switzerland, northern and south-eastern France, Belgium, northern and central Italy and central Spain

Trends in ozone statistics and precursor emissions.

- Analysis of trends over the past 12 years indicates that in the European Union the average number of hours per station when ozone concentration exceeded the information threshold of 180 $\mu g/m^3$ was higher in summer 2003 than in all previous years (See Fig S.1). In France this average number of exceedance hours was one third higher than in 1994, another year with frequent exceedances and a warm summer.

- The variation in the numbers of exceedance over the years cannot be explained by the variation in the emissions of ozone precursors since these emissions decreased gradually by ca. 30 % between 1990 and 2000. The more close correlation of exceedance numbers with temperature suggests that if climate change would result in warmer summers in Europe, more frequent exceedances of the ozone information thresholds are to be expected at the current emission levels.

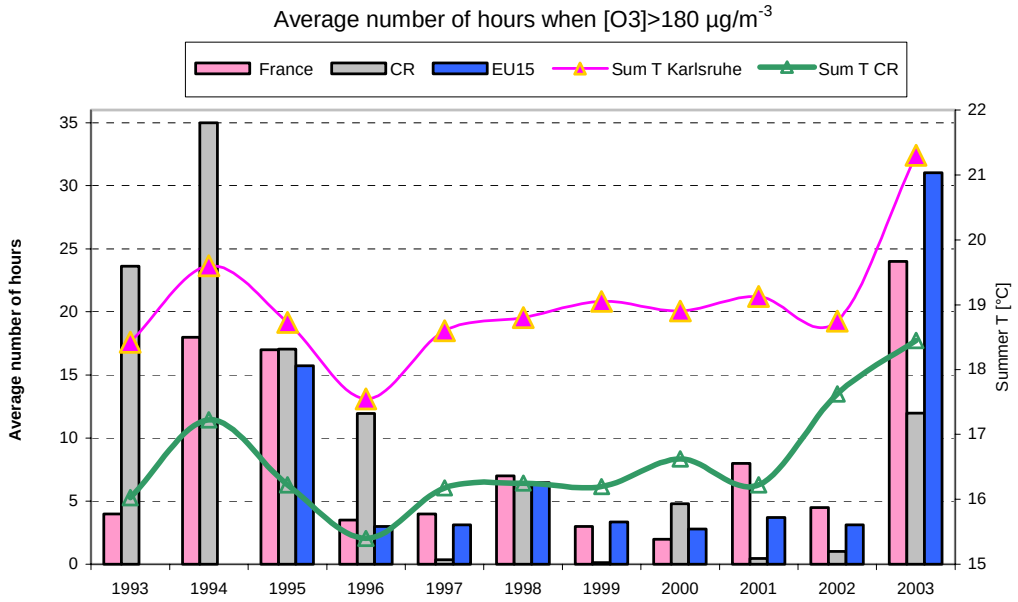


Figure S.1 Total number of hours with ozone concentration higher than 180 µg/m^3 divided by the number of operational stations for France, Czech Republic (CR) and the European Union. Average temperature for the period May–August for Czech Republic and western Europe.

The following main policy relevant conclusions can be drawn from the analyses presented in this report. However, these conclusions are tentative, due to the uncertainties caused by year-to-year meteorological variations and the changes in the monitoring station configuration.

In the period 1995-2003 of reporting under the old ozone Directive there has been little or no change in the reported exceedances of threshold values. This is not unexpected as reductions in the EU emissions of nitrogen oxides and non-methane volatile organic compounds, the main ozone precursors have so far been limited, about 30 % between 1990 and 2000.

The threshold for warning the population continues to be exceeded on a few occasions each year, while the threshold for informing the population is exceeded at most stations in most countries (outside northern Europe and Ireland) each year, generally more so in warm summers.

These exceedances are likely to recur in years with temperatures above the long-term average until there is a substantially larger decrease in precursor emissions. A further reduction of about 30% is foreseen towards 2010 under the National Emission Ceilings Directive.

While peak ozone concentrations seem to go down, ozone concentration statistics relevant to the target values set in the new ozone Directive show little or no reduction in the period 1996-2000. Very few stations actually show a significant downward trend for these statistics.

Under current legislation and with the rate of turnover of the vehicle fleet, further reductions will gradually occur towards 2010, and further reductions may be necessary to achieve the target values of the new ozone Directive .