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Overview of air quality reports by Member States under the European air quality directives

– Part 1: Main report –

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Abstract

EU Member States have submitted annual reports on air quality in 2001-2003 to the European Commission under the Air Quality Framework Directive (96/62/EC). The reports were provided in the form of a predefined questionnaire. The present report gives an overview and analysis of the submitted information, with a focus on 2003.

In the last few years the reporting requirements from the Member States have evolved, following the successive entering into force of the first three daughter directives 1999/30/EC, 2000/69/EC and 2002/3/EC and following the accession of ten new Member States to the EU. The EU15 Member States have sent reports on SO_2, NO_2, NO_x, PM_{10}, $PM_{2.5}$ and Pb for the reference years 2001-2003 and on benzene and CO for 2003. Five of the new Member States reported voluntarily on 2003. In addition, many Member States sent reports on ozone in 2003, although this was not yet mandatory.

The specific topics for analysis have been selected in deliberation with the Commission representatives to provide a comprehensive, though by no means exhaustive overview of air quality information provided under the air quality directives reporting obligation.

Further details to this main report are given in *Overview of air quality reports by Member States under the European air quality directives – Part 2: Annexes.* Lists of the exceedance status of the individual zones in the Member States have been published separately at http://europa.eu.int/comm/environment/air/index.htm.

Main findings of the present analysis are[1]:

– *Zone designation*
  Member States have taken similar approaches in designating their air quality zones, but there are also significant differences. The total number of zones reported ranged between 377 and 560, and depended in most Member States to some extent on the pollutant and protection target. Numbers of zones per Member State and zone sizes vary widely, often reflecting country size, pollution levels, population densities and geographical conditions. For some Member States, the reported zones that were related to health protection did not, as required, cover their entire territory.

[1] These findings do not include ozone, because not all Member States sent a (voluntary) report on ozone.

– *Exceedances*
The number of zones in which the limit values plus margins of tolerance (LV+MOT) for the protection of health were exceeded was largest for PM_{10} and NO_2; benzene and SO_2 were third and fourth In 38% of all zones at least one LV+MOT was exceeded, while 45% of the zones had no exceedance of any limit value. Large agglomerations tended to have slightly more exceedances than smaller ones. In the three years of reporting, the number of zones in exceedance of the LV+MOT tended to increase for most of the threshold; for PM_{10} this was also seen for the limit values.

For NO_2, most exceedances related to traffic. For PM_{10} about half the exceedances related directly to traffic and the others were due to a variety of causes. This was also reflected in the station types where exceedances occurred.

Of the limit values for ecosystems or vegetation, the NO_x limit value was exceeded more widely (20% of the EU15 zones designated for this limit value) than the limit value for SO_2 (1%).

Most Member States reported only exceedance for zones as a whole, without voluntary information on the surface area in exceedance; it should be noted that the percentages of zones with exceedance are not a good measure for the surface area or population exposed to levels exceeding thresholds.

In view of the differences between Member States in the methodology for air quality assessment (see below), significant differences in the extent to which exceedances are identified may be expected.

– *Air quality assessment*
In 2003, more than 3000 monitoring stations were in use for measuring air quality under the air quality directives. In EU15, 2111 stations were used for NO_2, 1679 stations for SO_2, 1494 for PM_{10} and less than 1000 stations for each of the other pollutants. There were still considerable differences between Member States in the structure of their networks; the ratio of the number of urban background and traffic stations in a country varied between 1:5 and 5:1. It was also found that the information on the classification of stations needs to be improved. There were important differences between Member States in the correction of PM_{10} concentration measured with non-reference methods.

The reporting of certain data needed for judging the fulfilment of assessment requirements is voluntary and several Member States did not send such data. Compliance with the minimum number of stations required by the directives could only be checked for the zones on which sufficient information was received. It was found that the number of stations for benzene and PM_{10} –

pollutants not regulated before – was in a substantial number of zones (about 40% and 23% respectively) below the minimum.

There were large differences in the use of models between Member States. The percentage of zones for which the compliance status was based on modelling varied between 6 and 24%, depending on the limit value.

– *Reporting process and implication for this overview*
  The simple Excel tool has been a useful tool for reporting, but processing was very cumbersome and time consuming because the tool did not protect against errors. As not all errors could be resolved, this technical overview report cannot be used for legal compliance checking.

This report has been prepared as part of European Commission service contract B4-3040/2003/359424/MAR/C1.

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1. Introduction

This document gives a technical overview of the annual reports by Member States to the European Commission on the results of the assessment of their air quality. These reports have been submitted under the Air Quality Framework Directive[2], following Commission Decision 2004/461/EC[3], which specifies the information to be sent in detail and provides a set of forms to be filled in, hereafter called 'the AQ questionnaire'.

In addition to this main report (Part 1), a document composed of annexes (Part 2) is available at http://europa.eu.int/comm/environment/air/index.htm. It has the same structure as the current report and gives additional details, such as data per Member State. Lists of the exceedance status of the individual zones in the Member States have been published separately at the same website.

Reports addressed in this document
This document focuses on the reports by the EU15 Member States on the year 2003 submitted under the First Daughter Directive[4] and the Second Daughter Directive[5]. Also information on 2001 and 2002 is taken into account, where useful. For new Member States, 2004 is the first year of mandatory reporting in which only a period after 1 May 2004 must be covered, but five of these countries have voluntarily sent already a report on 2003 data. These reports are included in the overviews, but because they do not give a complete picture of all new Member States they will not be discussed as a group. For all Member States, 2004 is the first year of mandatory reporting under the Third Daughter Directive[6]; the voluntary reports on 2003 received (eleven from EU15 and five from the new Member States) are also discussed here, but they do not give a complete picture.

Table 1 summarises the number of reports received.

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2 Council Directive 96/62/EC on ambient air quality assessment and management.

3 Commission Decision 2004/461/EC laying down a AQ questionnaire to be used for annual reporting on ambient air quality assessment under Council Directives 96/62/EC and 1999/30/EC and under Directives 2000/69/EC and 2002/3/EC of the European Parliament and of the Council.

4 Council Directive 1999/30/EC relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air (amended by Commission Decision 2001/744/EC).

5 Directive 2000/69/EC relating to limit values of benzene and carbon monoxide in ambient air.

6 Directive 2002/3/EC relating to ozone in ambient air.

Table 1 Number of AQ questionnaire reports received.

		EU15 Member States	New Member States
2001	First Daughter Directive	14 [1]	-
2002	First Daughter Directive	15	-
	First Daughter Directive	15	5
2003	Second Daughter Directive	15	5
	Third Daughter Directive	11	5

[1] The report for Italy was received too late to be included in the evaluation.

Reporting under the Exchange of Information Decision
In parallel to the reporting under the Framework Directive, which mainly focuses on compliance checking with obligations under the air quality directives, such as limit values, Member States are sending detailed information from their monitoring networks each year under the Exchange of Information Decision (EoI)[7]. These extensive reports contain to a large extent individual 'raw' data (e.g. all hourly concentrations) and include extensive complementary information about the monitoring stations (metadata). The European Topic Centre on Air and Climate Change of the European Environment Agency publishes annually an assessment of these reports. To avoid duplicate reporting by Member States, some of the data that are needed for evaluating the reports under the Framework Directive (particularly the metadata of stations) are only sent under EoI, and hence the current overview necessarily is partly based on EoI data.

Quality of the data received and implications for this overview
To facilitate the submission of the data, the Commission has made the AQ questionnaire available to the Member States in Excel format. This format does not reject erroneous data, and during the processing numerous small errors, e.g. spurious spaces, had to be removed before all reports could be joined in a database. There were also errors that required more insight for correction, such as inconsistent use of zone codes or use of codes that were not allowed. Another difficult type of error was not using the same codes for stations in the AQ questionnaire and EoI reports. As far as reasonable, it was attempted to resolve these errors by expert judgement, and many remaining problems could be solved in bilateral contacts with the Member States. However, the contact persons, especially those of large Member States with regionally managed monitoring networks, were not able to solve all problems, and hence it is likely that there are remaining errors, which may be reflected in the overviews given here.

In view of the corrections that had to be made to make statistical processing possible, this technical report can not be used for legal compliance checking. For

[7] Council Decision 97/101/EC establishing a reciprocal exchange of information and data from network and individual stations measuring ambient air pollution within the Member States (amended by Commission Decision 2001/752/EC).

that purpose the original AQ questionnaires as submitted by Member States have to be used.

Improving the reporting

Along with the proposal for revision of the Air Quality Framework Directive and Daughter Directives[8], the Commission is currently preparing the implementing provisions for reporting to accompany the new Directive, with the aim of modernising and streamlining the reporting. Reporting under the new air quality directive may in future years be merged with the reporting under the Exchange of Information Decision and the contents of the reports could evolve to more territory covering information on the air quality. It is anticipated that proposals for improving the reporting will be issued in the course of 2006.

Abbreviations used

Member States: Austria: AT; Belgium: BE; Cyprus: CY; Czech Republic: CZ; Denmark: DK; Estonia: EE; Finland: FI; France: FR; Germany: DE; Greece: EL; Hungary: HU; Ireland: IE; Italy: IT; Latvia: LV; Lithuania: LT; Luxembourg: LU; Malta: MT; Netherlands: NL; Poland: PL; Portugal: PT; Slovakia: SK; Slovenia: SI; Spain: ES; Sweden: SE; United Kingdom: UK.

AQ questionnaire	Questionnaire on air quality set out by Commission Decision 2004/461/EC
CO	Carbon monoxide
EoI	Exchange of Information Decision: Council Decision 97/101/EC, amended by Commission Decision 2001/752/EC
EU15	The 15 EU Member States before the accession of new Member States in 2004
LV	Limit value
MOT	Margin of Tolerance (see the legend to Tables 3 and 4)
MS	Member State
New MSs (or EU10)	The 10 new Member States that acceded the EU in 2004
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
Pb	Lead
PM_{10}	Particulate matter composed of particles smaller than 10 micrometer in aerodynamic diameter
O_3	Ozone
SO_2	Sulphur dioxide
TV	Target value

8 http://europa.eu.int/comm/environment/air/cafe/pdf/com_2005_447_en.pdf

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2. How the Member States have designated their zones

All Member States had to divide their territories into zones and agglomerations (a specific kind of zones as defined in the Air Quality Framework Directive). Many Member States made the division of their territory in zones to some extent dependent on the pollutant. They then usually reduced the number of zones for pollutants with levels clearly below the limit values by merging several zones into one single zone. Several countries even introduced special zones for ecosystem and vegetation protection. However, the extremely different approaches that were initially considered by some Member States, such as designating the country's entire network of motorways as one zone, were not taken. In 2002 and 2003 several countries made some adjustments, often related to the introduction of new zones for the pollutants under the Second and Third Daughter Directive.

Table 2 shows the number of zones that Member States designated. Not surprisingly, larger Member States have generally more zones than smaller ones, but this is not always true. The sizes of zones vary widely: from 0.8 km^2 to 338 145 km^2 and from about 3000 to 9 833 408 inhabitants. Figure 1 and Figure 2 show that there are also substantial differences between Member States.

The limit values for the protection of human health apply throughout the territories of the Member States, so areas that do not belong to any zone related to health protection should not exist. For most Member States the total surface area of health related zones indeed added up to the total surface area of the country, but for four Member States (France, Italy, Luxembourg and Estonia) this was not the case – this is at least partly due to errors or incomplete data[9].

Figure 3 shows the number of zones per Member State. One-third (231) of the total of 654 zones in EU15 have been given the status of agglomeration zone, which has certain implications for the number of monitoring stations and the application of alert thresholds. Also about 40-50% of the population was found to live in agglomeration zones; these zones comprise only 4-5% of the total area. A substantial number of agglomeration zones (27%), had less than 250 000 inhabitants; these were mainly in Italy, Spain and France.

Most Member States that reported have also sent maps of their zone borders, but it was not feasible to combine these into a single European map. Currently work is being done to make this possible. The maps of individual Member States have been reported separately at http://europa.eu.int/comm/environment/air/index.htm.

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[9] The discrepancies are at least partly due to the incorrect allocation of zones to protection targets and incomplete filling in of the zone sizes, possibly also due to incorrect use of the decimal symbol.

Table 2 Number of zones per Member State, including the designation of the zones for individual pollutants or types of protection targets.

Member State	All zones	SO_2		NO_2	NO_x	PM_{10}	Lead	Benzene	CO	O_3
		Health	Eco-systems	Health	Vege-tation					
AT	19	11	11	11	7	11	11	11	11	11
BE	17	12	12	11	11	9	12	11	10	12
DE	125	76	86	80	92	81	68	78	78	-
DK	10	3	3	9	9	9	2	4	9	9
EL	4	4	4	4	4	4	4	0	4	3
ES	143	143	143	143	143	143	143	143	143	143
FI	18	14	1	14	1	14	14	3	14	2
FR [1)]	88	80	76	85	81	80	28	23	16	35
IE	4	4	4 [2)]	4	4 [2)]	4	4	4	4	4
IT [1)]	139	93	55	114	81	81	37	51	69	65
LU	3	2	1	2	1	2	2	0	0	-
NL	9	9	9	9	9	9	4	0	0	-
PT	26	25	25	25	25	25	1	0 [3)]	0 [3)]	- [3)]
SE	6	6	6	6	6	6	2	6	3	6
UK	43	43	43	43	43	43	43	43	43	43
EU15	*654*	*525*	*479*	*560*	*521*	*521*	*375*	*377*	*404*	*342*
CZ	14	14	13	14	13	14	14	5	12	13
EE [1)]	16	5	5	5	5	2	-	-	3	5
LT	3	3	3	3	3	3	3	3	3	3
SI	9	9	9	6	6	6	6	6	6	6
SK	10	10	10	10	10	10	7	7	7	7

1) The pollutants were not indicated by EE for 11 zones, by FR for 1 zone and by IT for 17 zones.

2) IE has recently indicated that the above information, based on the zone designation form in the AQ questionnaire, is not entirely correct: IE has only one zone for SO_2 ecosystem protection and for NO_x vegetation protection. This information has not been taken into account in the analysis of this report.

3) PT has recently indicated that the AQ questionnaire by mistake did not include information on the zone designation for some pollutants: it has 25 zones for benzene, CO and ozone. This information has not been taken into account in the analysis of this report.

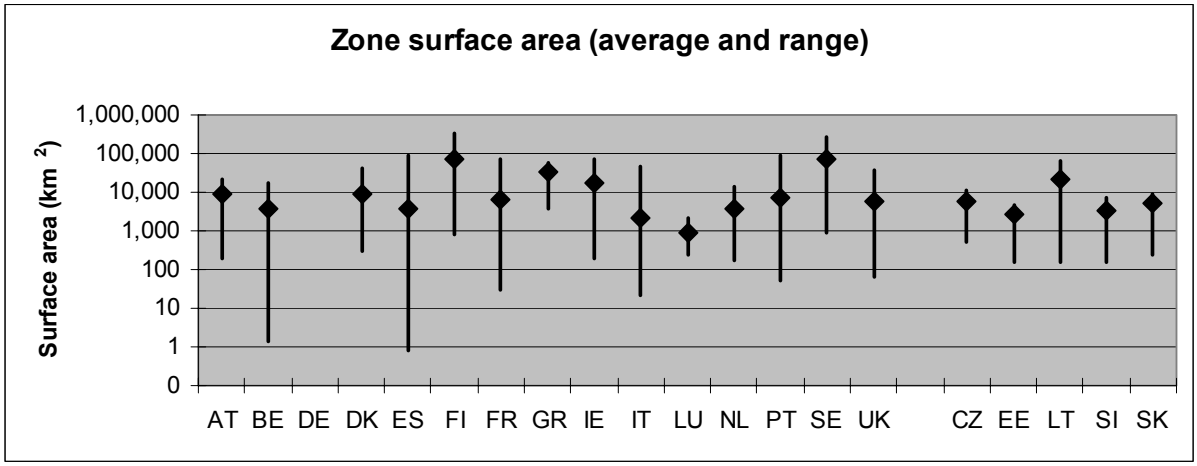

Figure 1 *Surface areas of zones per Member State. The dots indicate the average area, the lines the ranges.*

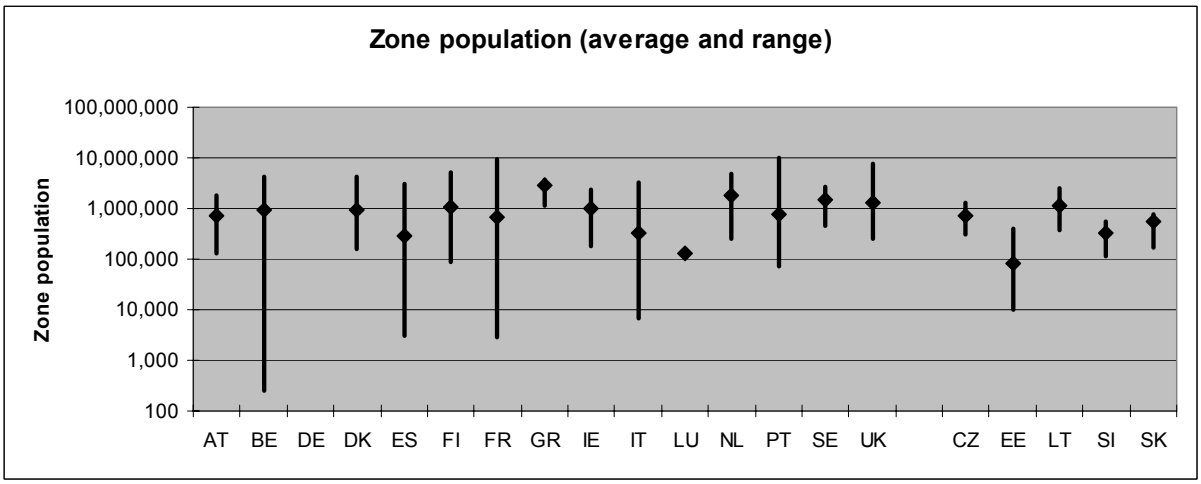

Figure 2 *Population of zones per Member State. The dots indicate the average area, the lines the ranges. Numbers below 3000 inhabitants reported by Italy are probably in error and have not been included. The submission of one member State was clearly given in the wrong units and has been corrected.*

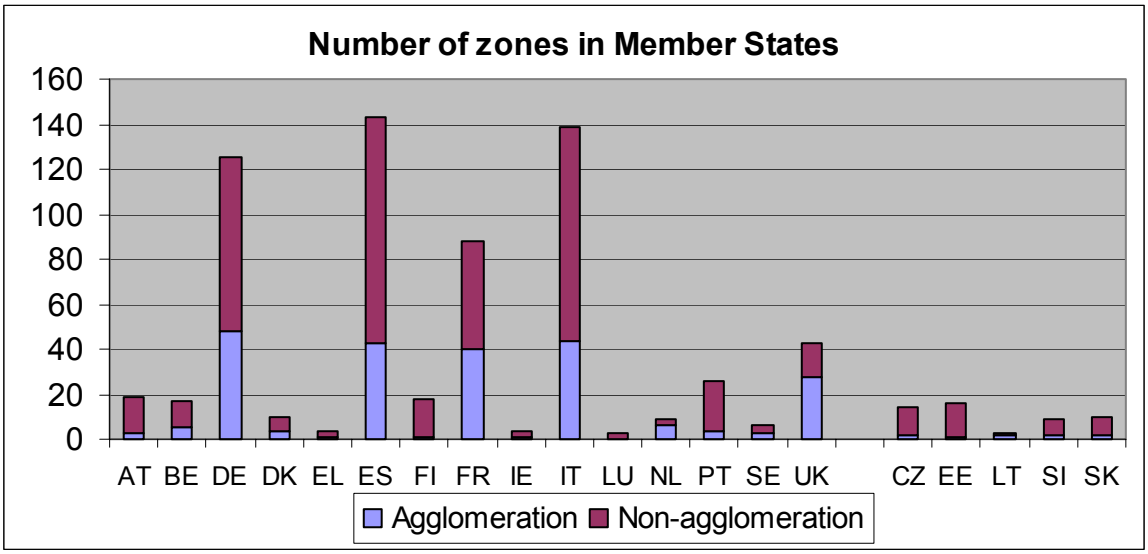

Figure 3 Designation of agglomeration and non-agglomeration zones per Member State.

3. Zones where air quality thresholds were exceeded

Air quality thresholds

Member States report in the AQ questionnaire exceedances of the following types of thresholds for the ambient concentration:

- Limit value (LV); this is a threshold that must be met from a certain year on.
- Limit value plus margin of tolerance (LV+MOT); the MOT is a decreasing increment set for most limit values, applying before the year in which the limit value must be met. If exceeded, a plan or programme has to be prepared or implemented and sent to the Commission ensuring that the limit value will be met in time.
- Target value (TV), a threshold for ozone to be met where possible from a certain year on;
- Long-term objective (LTO), a threshold for ozone to be attained in the long-term, save where not achievable through proportionate measures.

This concerns the following thresholds:

Threshold				First year for threshold to be met	Has the threshold a margin of tolerance?
Type	**Pollutant**	**Protection target**	**Averaging time or parameter**		
LV	SO_2	Health	Hour	2005	Yes
LV	SO_2	Health	Day	2005	No
LV	SO_2	Ecosystems	Year	2002	No
LV	SO_2	Ecosystems	Winter	2002	No
LV	NO_2	Health	Hour	2010	Yes
LV	NO_2	Health	Year	2010	Yes
LV	NO_x	Vegetation	Year	2002	No
LV	PM_{10}	Health	Day	2005	Yes
LV	PM_{10}	Health	Year	2005	Yes
LV	Lead	Health	Year	2005 (or 2010)	Yes
LV	Benzene	Health	Year	2010	Yes
LV	CO	Health	8 hours	2005	Yes
TV	Ozone	Health	Max. daily 8-hr mean	2010	No
LTO	Ozone	Health	AOT40 [1]	N.a.	No
TV	Ozone	Vegetation	Max. daily 8-hr mean	2010	No
LTO	Ozone	Vegetation	AOT40 [1]	N.a.	No

[1] Sum of the differences between hourly concentrations greater than 40 ppb and 40 ppb over a given time period between 8 and 20h.

3.1 Numbers of zones in exceedance and comparisons of limit values

Pollutants of the First and Second Daughter Directive

If measurements or model calculations show that a limit value or limit value plus margin of tolerance is exceeded somewhere in the zone, the zone is designated as

being in exceedance of this threshold. Table 3 and Table 4 summarise the exceedance status of zones per limit value and per Member State. This list has also been published separately at (http://europa.eu.int/comm/environment/air/index.htm), where also the overviews for 2001 and 2002 are listed. Those reports include also a long list of the exceedances status per limit value (and margin of tolerance) for each individual zone. Figure 4 and Figure 5 show per Member State the percentage of zones with exceedance of the limit value (plus the margin of tolerance)[10]. NO_2 and PM_{10}, the pollutants with the highest exceedance rates, have been brought together in the first graph and the other pollutants in the second one.

Table 3 Summary of exceedance status of zones in EU Member States in 2003 with respect to the limit values and limit values plus margin tolerances for sulphur dioxide, nitrogen dioxide and nitrogen oxides (see legend below)[1].

MS	SO_2 health Hr			SO_2 health Day		SO_2 eco Yr		SO_2 eco Wntr		NO_2 Hr			NO_2 Yr			NO_x	
	↑mot	lv-mot	↓lv	↑lv	↓lv	↑lv	↓lv	↑lv	↓lv	↑mot	lv-mot	↓lv	↑mot	lv-mot	↓lv	↑lv	↓lv
AT	0	0	11	0	11	0	8	0	8	0	0	11	6	2	3	1	7
BE	0	0	12	0	12	0	0	0	0	0	0	11	1	3	7	0	0
DE	0	0	76	0	76	0	19	0	14	0	5	75	16	25	39	0	15
DK	0	0	3	0	3	0	3	0	3	0	0	9	1	1	7	0	5
EL	0	0	4	0	4	0	0	0	0	0	1	3	2	1	1	0	0
ES	2	4	119	3	122	0	20	0	20	0	3	121	2	13	109	0	21
FI	0	0	14	0	14	0	1	0	1	0	0	14	0	1	13	0	1
FR	5	1	69	7	68	1	30	1	26	0	7	72	11	15	53	6	16
IE	0	0	4	0	0	1	0	0	0	1	0	3	0	0	4	0	1
IT	2	0	95	2	96	0	44	0	38	8	18	91	33	27	57	20	15
LU	0	0	3	0	3	0	0	0	1	0	0	3	1	0	2	0	1
NL	0	0	9	0	9	0	1	0	1	0	3	6	9	0	0	0	1
PT	0	0	15	0	15	0	9	0	3	0	0	14	1	1	17	0	5
SE	0	0	6	0	6	0	6	0	6	0	0	6	0	2	4	0	6
UK	1	0	42	1	42	0	15	0	15	1	2	36	35	7	1	0	15
EU15	***10***	***5***	***482***	***13***	***481***	***2***	***156***	***1***	***136***	***10***	***39***	***475***	***118***	***98***	***317***	***27***	***109***
CZ	0	0	14	0	14	4	10	3	11	0	0	14	0	3	11	7	7
EE	0	0	5	0	5	0	5	0	5	0	0	5	0	0	5	1	4
LT	0	0	3	0	3	0	1	0	1	0	0	3	0	2	0	0	0
SI	3	0	6	3	6	3	6	3	6	0	0	6	0	0	6	4	2
SK	0	0	9	0	9	0	3	0	3	0	0	9	0	1	8	0	3

1 Ireland has informed the Commission of errors in its report on 2003: for *SO_2 health Day* 4 zones are ↓lv; for *SO_2 eco Yr* 0 zones are ↑lv and 1 zone ↓lv ; for *NO_2 Hr* 0 zones are ↑lv and 4 zones ↓lv.

[10] It should be noted that the total area or population of zones with exceedance is not a useful parameter because in many zones only a limited area, e.g. near a number of streets, may be in exceedance.

Table 4 Summary of exceedance status of zones in EU Member States in 2003 with respect to the limit values and limit values plus margin tolerances for particulate matter[1)], lead, benzene and carbon monoxide (see legend below).

MS	PM_{10} Day			PM_{10} Yr			Lead Yr			Benzene Yr			CO Yr		
	↑mot	lv-mot	↓lv	↑mot	lv-mot	↓lv	↑mot	lv-mot	↓lv	↑mot	lv-mot	↓lv	↑mot	lv-mot	↓lv
AT	10	1	0	1	2	8	0	0	8	0	0	11	0	0	11
BE	10	0	0	9	0	1	0	0	12	0	0	11	0	0	7
DE	20	29	29	8	5	65	0	1	67	1	2	75	0	0	78
DK	0	2	4	0	1	5	0	0	2	0	0	1	0	0	4
EL	4	0	0	4	0	0	0	0	4	0	0	0	0	1	3
ES	24	14	78	14	7	95	0	0	84	0	2	58	0	0	109
FI	0	1	13	0	0	14	0	0	14	0	0	3	0	0	14
FR	5	7	63	4	1	70	0	0	28	0	6	43	0	0	53
IE	0	1	2	0	0	3	0	0	3	0	0	3	0	0	3
IT	46	17	29	35	5	52	0	0	35	3	5	60	2	0	88
LU	0	0	2	0	0	2	0	0	2	0	0	1	0	0	2
NL	6	3	0	1	2	6	0	0	9	0	0	9	0	0	9
PT	6	2	4	3	3	6	0	0	1	0	0	22	0	0	14
SE	0	1	5	0	1	5	0	0	6	0	0	6	0	0	6
UK	18	15	10	10	5	28	0	0	43	0	1	42	0	0	43
EU15	***149***	***93***	***239***	***89***	***32***	***360***	***0***	***1***	***318***	***4***	***16***	***345***	***2***	***1***	***444***
CZ	12	2	0	6	1	7	0	0	14	0	1	13	0	0	14
EE	1	0	4	0	0	5	0	0	1	0	0	0	0	0	5
LT	3	0	0	1	0	2	0	0	3	0	0	2	0	0	3
SI	4	1	0	3	1	1	0	0	4	0	0	1	0	0	6
SK	9	0	0	9	0	0	0	0	9	0	2	2	0	0	8

[1)] The results for particulate matter are not fully comparable between the Member States, because some countries have reported results from non-reference measurement methods without ensuring equivalence with the results that would have been obtained with the reference method. For more details see Section 4.4.

Legend

↓lv	Concentrations are everywhere below (or equal to) the *limit value*. This indication refers to all limit values (irrespective of whether they had to be met in 2003).
↑lv	Concentrations are at one or more locations above the *limit value*. This indication refers to limit values that did not yet had to be met in 2003. A plan or programme had to be prepared or implemented and sent to the Commission to ensure that this limit value will be attained in time.
↑lv	Concentrations are at one or more locations above the *limit value*. This indication refers to limit values that had to be met in 2003.
lv-mot	Concentrations are at one or more locations between the *limit value* and the *limit value plus the margin of tolerance*, but everywhere below *the limit value plus the margin of tolerance*. This indicator refers to limit values that did not yet had to be met in 2003.
↑mot	Concentrations are at one or more locations above the *limit value plus the margin of tolerance*. This indicator refers to limit values that did not yet had to be met in 2003. A plan or programme had to be prepared or implemented and sent to the Commission to ensure that this limit value will be attained in time.

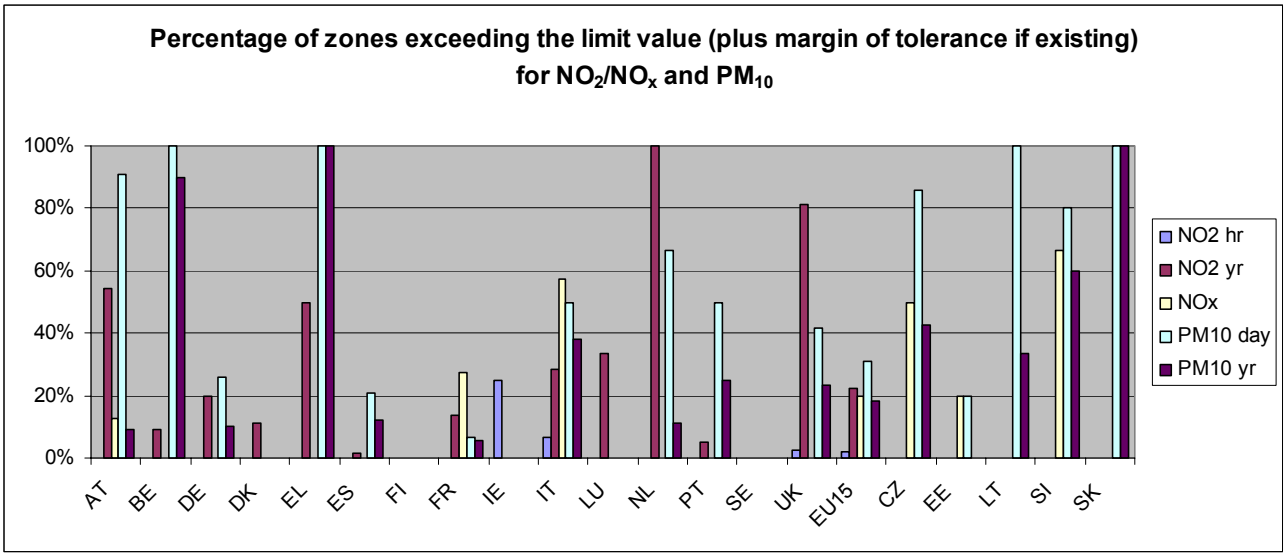

Figure 4 *Percentage of zones exceeding the limit value (plus margin of tolerance if existing) for NO_2, NO_x and PM_{10} in 2003. Note: Ireland has recently indicated that the exceedance for NO_2 indicated in the AQ questionnaire should be 0%; this information has not been included in the analysis in this report.*

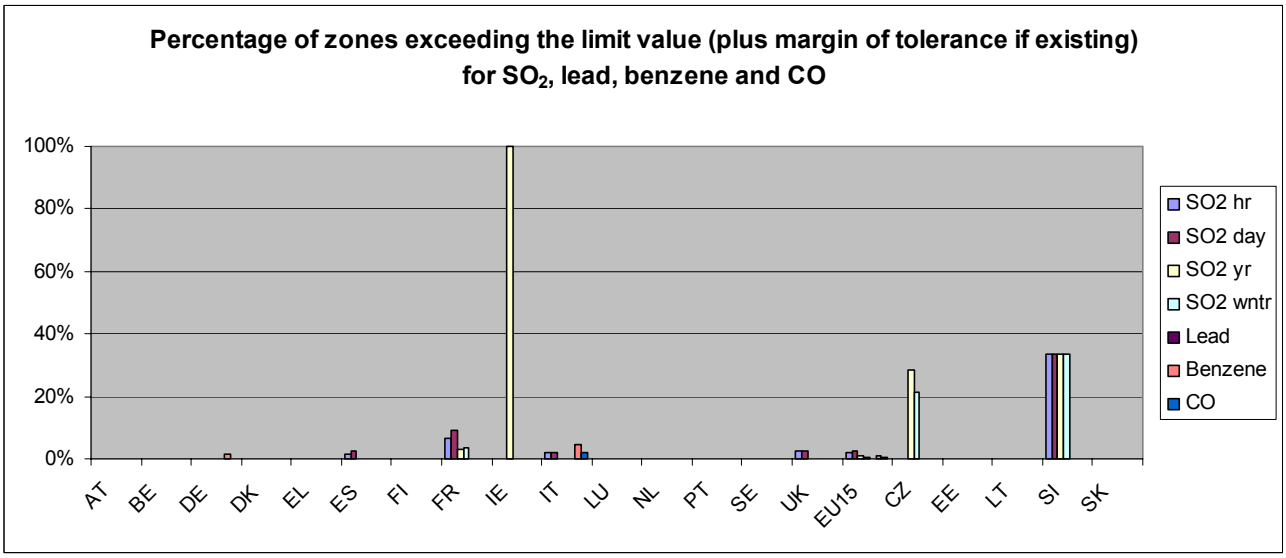

Figure 5 *Percentage of zones exceeding the limit value (plus margin of tolerance if existing) for SO_2, lead, benzene and CO in 2003. Note: Ireland has recently indicated that the exceedance for SO_2 indicated in the AQ questionnaire should be 0%; this information has not been included in the analysis in this report.*

Figure 6 gives for several limit values and limit values plus margins of tolerance how the prevalence of zones in exceedance is distributed over the EU. The pattern is dependent on the pollutant. Large differences occur between some neighbouring countries, which are probably due to differences not only in air quality, but also in zone designation and in assessment methodologies, e.g. application of correction factors for PM_{10} (causing a concentration jump of 47% at the border of Belgium with France and Luxembourg), station siting practice and the use of models.

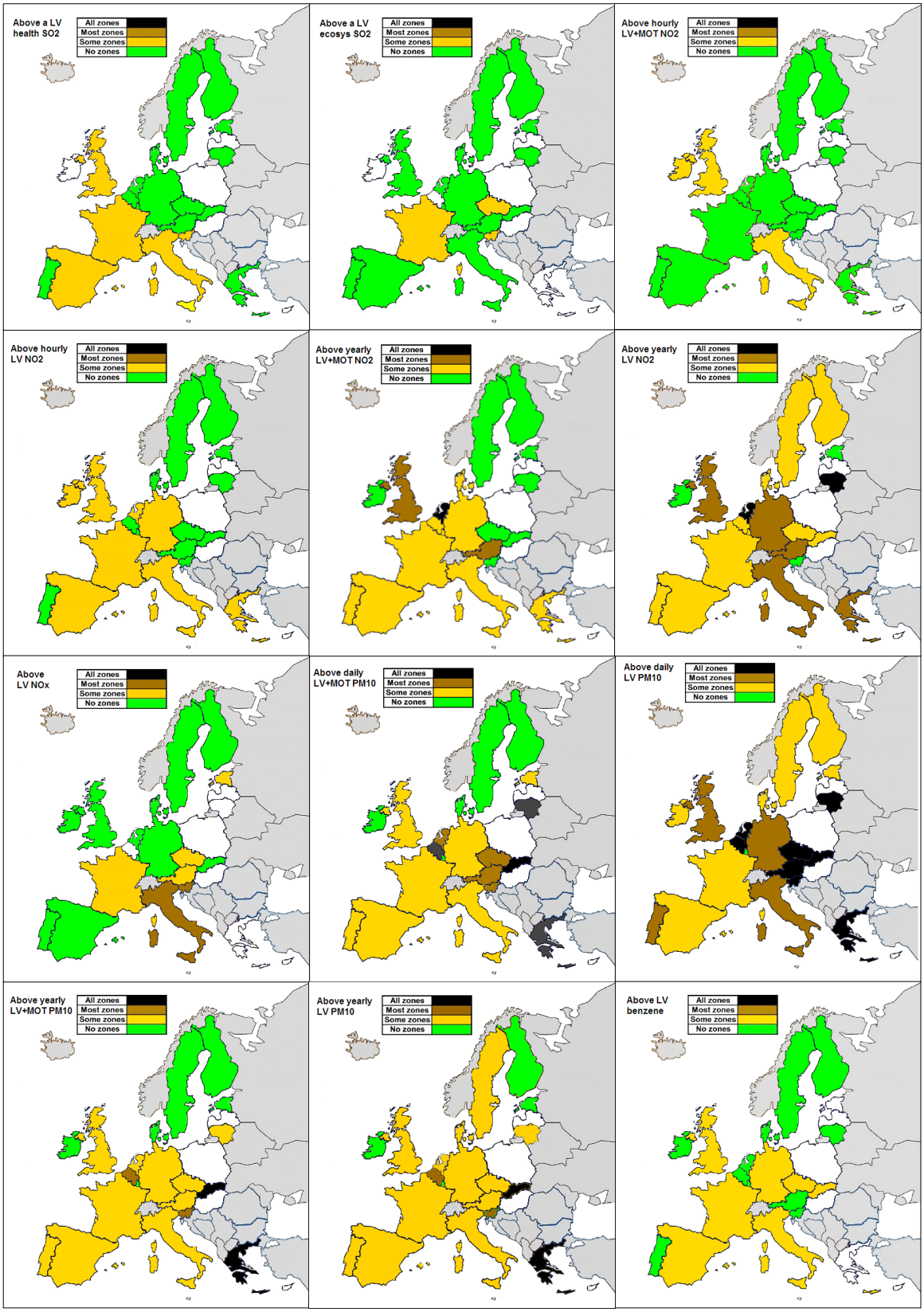

Figure 6 *Overview of the prevalence of zones in exceedance. "Some": > 0% and ≤ 50%; "Most": > 50% and < 100%. For Member States coloured white no information is available.*

Figure 7 shows for all limit values the percentage of EU15 zones in exceedance, with the percentages in decreasing order, thus indicating the stringency of the limit value.

- ***It should be noted that the number or percentage of zones in exceedance is only a crude indicator for the area in exceedance. In the first place, the exceedance area can be the entire zone area or just a few hundred square metres at a hotspot. In the second place, some Member States have made very large zones, so very few zones, for pollutants that are everywhere substantially below the air quality thresholds. Hence, the number or percentage of zones cannot be used to estimate the area in exceedance or to compare actual population exposure to air pollution between different Member States or even between regions within a Member State.***

The PM_{10} daily limit value seems the most difficult to attain, with 50% of the zones in exceedance of the limit value. The yearly limit value of NO_2 appears to be somewhat less stringent (40% in exceedance) and the PM_{10} yearly limit value follows as third (25%). These limit values did however not have to be met in 2003.

The limit values for ecosystems and vegetation had already to be met as from the entrance into force of the First Daughter Directive, i.e. from 2001 on. In 2003 a substantial number of zones exceeded these limit values: of the 164 zones for which the exceedance status for the NO_x limit value was reported[11], 20% were in exceedance. For SO_2 the corresponding percentages were 1.3% for the yearly limit value and 0.7 % for the winter limit value.

In 62% of the zones, all levels reported were in 2003 below all limit values plus margins of tolerance[12]. Stated conversely, in the other 38% of all zones, a plan or programme had, according to Article 8.3 of the First Daughter Directive, to be developed for at least one pollutant. Considering only exceedances of the limit values, without taking the margins of tolerance into account, the reported levels of all pollutants were not reported to exceed any limit values in 45% of the zones[13].

Figure 8 for the daily PM_{10} limit value illustrates that agglomeration zones are, not surprisingly, relatively more in exceedance of health limit values than non-agglomeration zone. However, exceedances occur also extensively in non-agglomeration zones, indicating that PM_{10} is not only a problem for major cities.

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11 Many zones, including all agglomerations, do not have areas where the siting criteria of stations for the protection of ecosystems and vegetation apply.

12 For some of these zones the exceedance status was not reported for all relevant thresholds.

13 This includes the zones on which no information on the exceedance status was reported. It should also be noted here that some zones do not pertain to all pollutants.

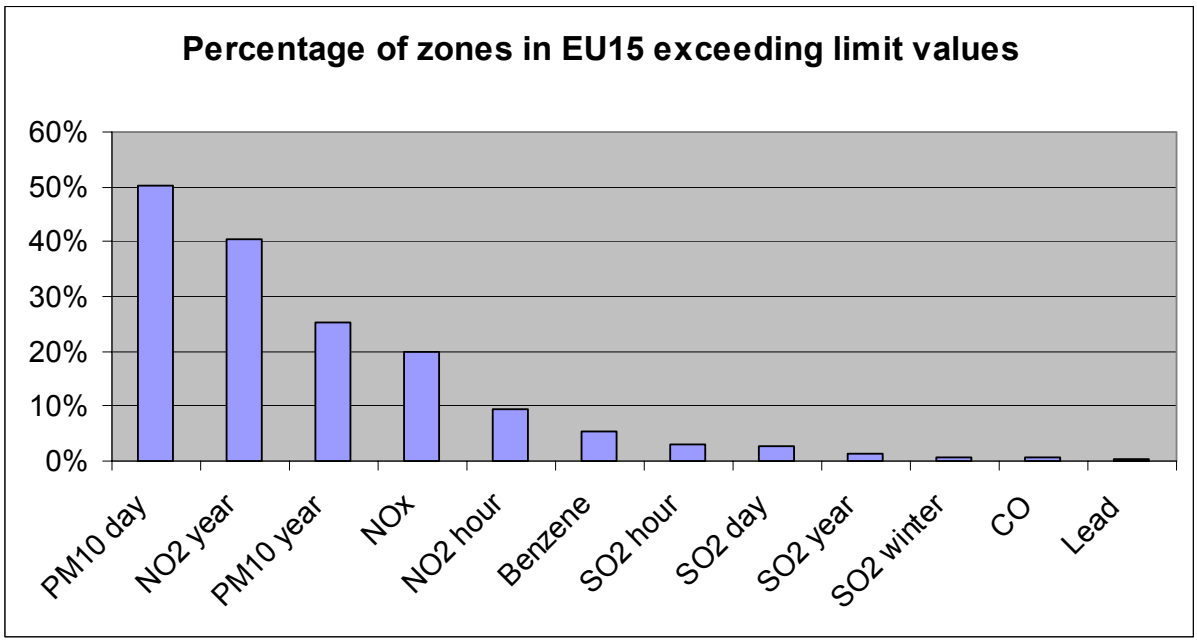


Figure 7 *Percentage of zones in EU15 exceeding limit values in 2003, arranged in decreasing order. Note: in contrast to Figure 4 en Figure 5 above, this graph does not refer to margins of tolerance.*

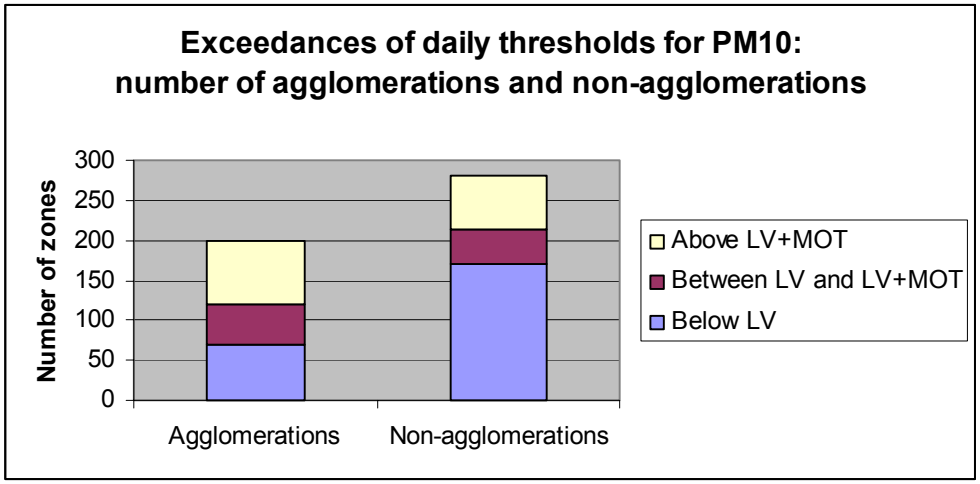


Figure 8 *Comparison of exceedances in agglomeration and non-agglomeration zones for the limit value and the limit value plus margin of tolerance of PM_{10}.*

Table 5 shows for a selection of pairs of limit values how the exceedances correlate. It shows that exceedances of the SO_2 yearly limit value for ecosystems and those of the NO_x limit value for ecosystems nowhere occur in the same zone (this is consistent with the differences in the reasons of exceedance reported, see Section 3.4 below). There are hardly zones (though not zero) with exceedance of the yearly PM_{10} limit value that do not exceed PM_{10} daily limit value as well. Similarly, exceedance of the NO_2 hourly limit value implies for most zones (though not all) that the yearly NO_2 limit value is also exceeded.

Table 5 Correlation of exceedances of pairs of limit values (and margins of tolerance if existing), for a selection of pairs.

Threshold 1	Percentage of zones ...			Threshold 2
	... only above Threshold 1	... above both thresholds	... only above Threshold 2	
SO_2 hour	0.8%	2.2%	0.4%	SO_2 day
NO_x vegetation	17%	0.0%	1.9%	SO_2 year eco
NO_2 year	22%	10%	12%	NO_x year
NO_2 year	33%	8%	1.3%	NO_2 hour
NO_2 year	24%	19%	6.7%	PM_{10} year
PM_{10} day	17%	33%	10%	NO_2 year
PM_{10} day	25%	25%	0.2%	PM_{10} year

Ozone

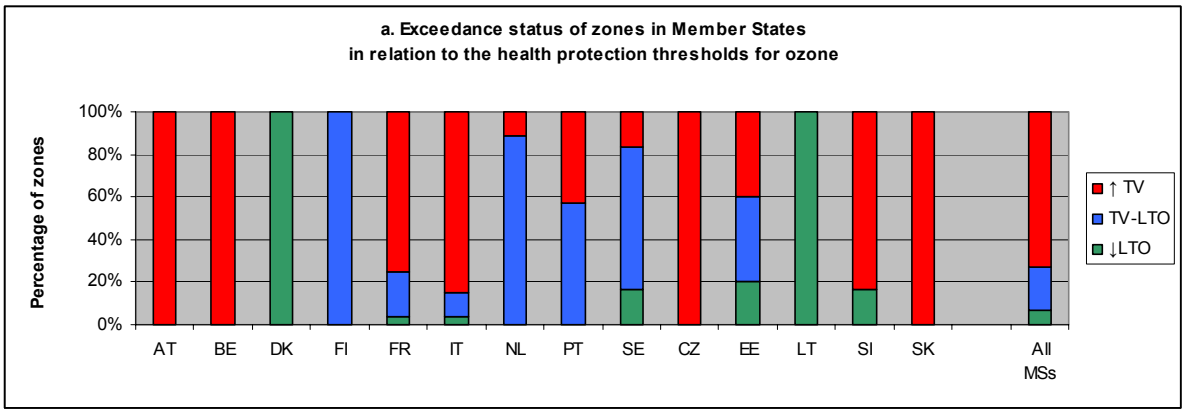
Nine EU15 Member States and five new Member States have voluntarily reported on ozone in 2003[14]. Some of these reports were not complete, e.g. covering not the entire country. The overview below is therefore incomplete.

Table 6 and Figure 9 show the exceedances status in relation to the health and vegetation protection thresholds of ozone in 2003, and Figure 10 gives an impression of the spatial distribution for the target value for health. There are too many countries for which no data are available to allow drawing conclusions on tendencies in EU regions in general. The target value for vegetation was exceeded in about half the zones and the target value for health in two-thirds of the zones reported. The long-term objectives for health and vegetations were only met in respectively 8% and 6% of the zones.

[14] The Third Daughter Directive requires Member States to report on ozone levels from 2004 on in the AQ questionnaire. In parallel, monthly and seasonal reporting is also required under the old ozone directive 92/72/EC as well under the Third Daughter Directive. This data flow is not considered here; the European Topic Centre on Air and Climate Change publishes each autumn an overview on these data, see *e.g.* the report on 2003 http://reports.eea.eu.int/topic_report_2003_3/en.

Table 6 Summary of exceedance status of zones in EU Member States in 2003 with respect to the target values and long term objectives for ozone.

MS	Health			Vegetation		
	↑ TV	TV-LTO	↓LTO	↑ TV	TV-LTO	↓LTO
AT	11	0	0	8	0	0
BE	9	0	0	0	9	0
DE	-	-	-	-	-	-
DK	0	0	4	0	2	2
EL	-	-	-	-	-	-
ES	-	-	-	-	-	-
FI	0	2	0	0	2	0
FR	60	17	3	30	31	5
IE	-	-	-	-	-	-
IT	44	6	2	39	2	0
LU	-	-	-	-	-	-
NL	1	8	0	0	6	3
PT	3	4	0	0	6	0
SE	1	4	1	0	5	1
UK	-	-	-	-	-	-
CZ	14	0	0	13	1	0
EE	2	2	1	-	-	-
LT	0	0	3	-	-	-
SI	5	0	1	5	1	0
SK	8	0	0	4	4	0
All MSs	158	43	15	99	69	11



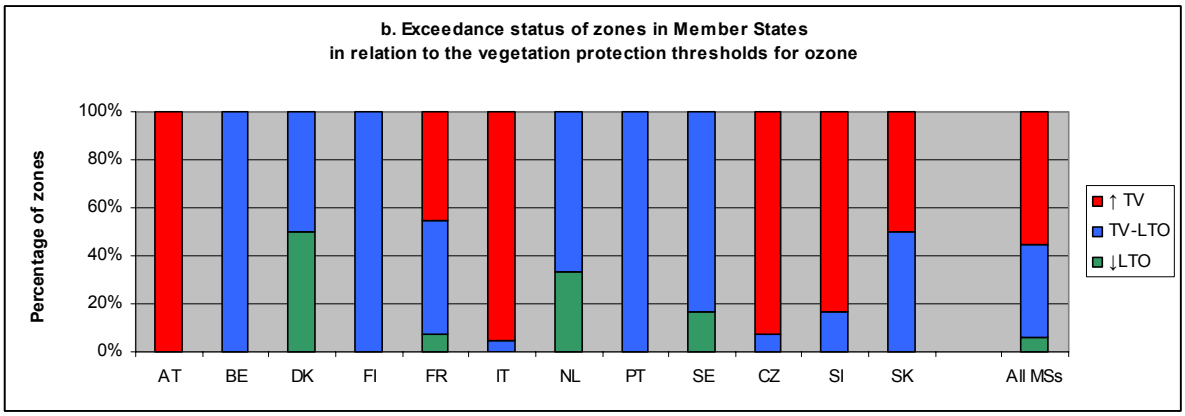


Figure 9 Exceedances status of zones in relation to the health and vegetation protection thresholds of ozone in 2003 for Member States that voluntarily reported. Zones where the highest levels were between the target value (TV) and the long-term objective (LTO) are indicated by TV-LTO.

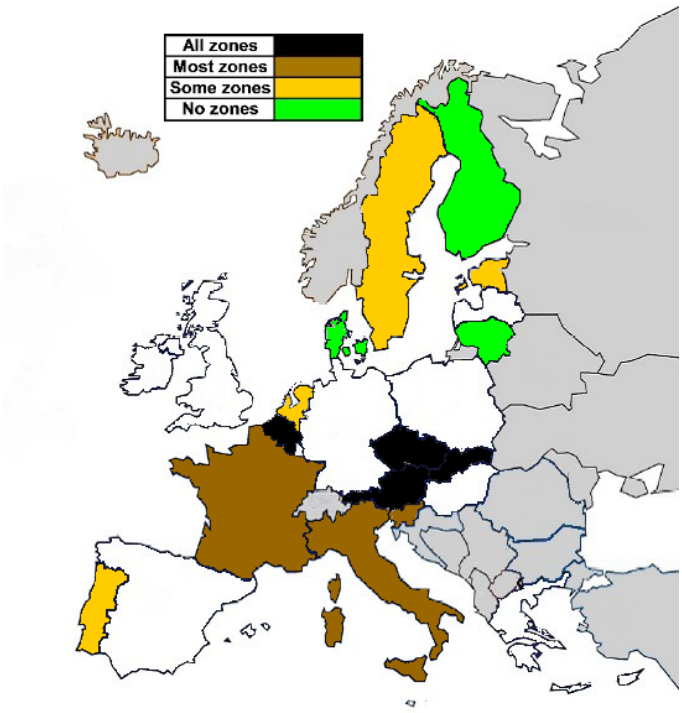


Figure 10 Overview of exceedances of the ozone target value for the protection of health. "Some": > 0% and ≤ 50%; "Most": > 50% and < 100%. For Member States coloured white no information is available.

3.2 Changes in exceedances over time

For the pollutants of the First Daughter Directive the three years of data could be compared for the EU15 Member States. Because the report of Italy on 2001 was not received in time to be included in the evaluation, also the reports of 2002 and 2003 were not included in the comparison. Figure 11 shows that the percentage of zones exceeding the LV+MOTs for PM_{10} and also NO_2 increased substantially from 2001-2003 (note the logarithmic scale, which levels off the trend visually). For NO_x a clear downward trend is visible (but inclusion of Italy would have reversed the NO_x trend for EU15 in 2002-2003 altogether).

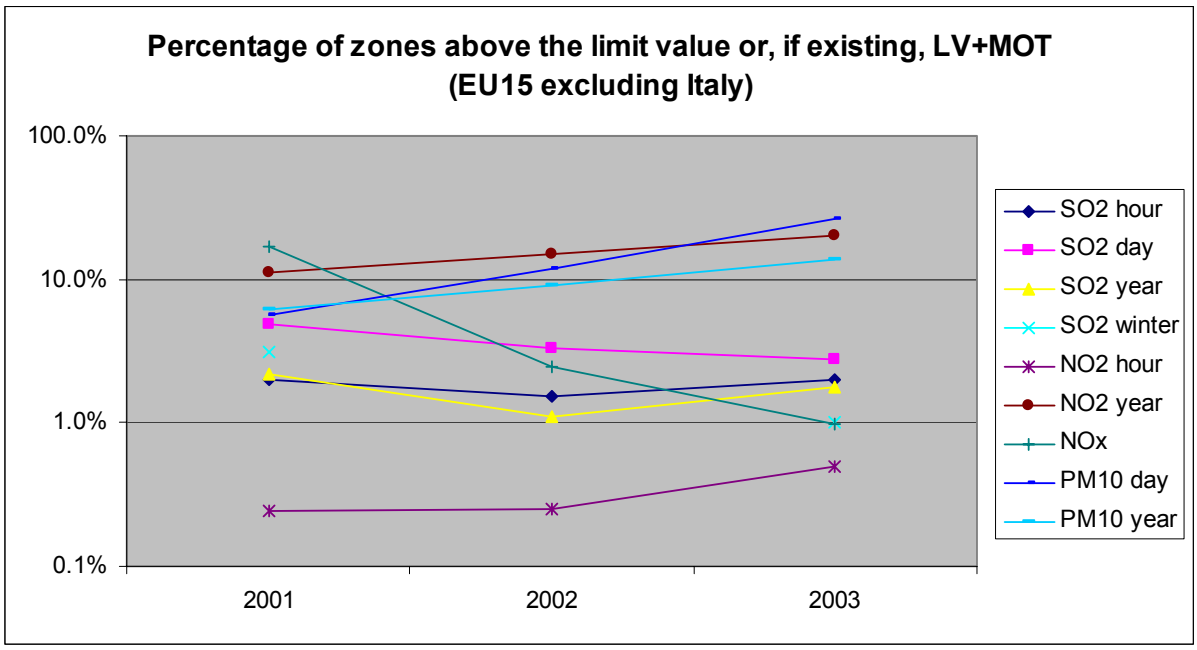


Figure 11 *Change from 2001-2003 in the percentage of zones exceeding the limit values plus if existing margins of tolerance. Italy has not been included because the report for 2001 was not received in time.*

An important reason for the exceedance percentage to increase is that the LV+MOT decreases over time, generally faster than the trend in concentrations. Limit values on the other hand do not change value over time and thus Figure 12 presenting exceedances of the limit value (repeating the previous figure for limit values without margin of tolerance), may give more insight. For the two PM_{10} limit values and the hourly NO_2 limit value also here a rather clear increase of the percentage of zones exceeding the limit values is visible. This may partly be due to the gradual improvement of the coverage of Member States' territories by monitoring stations, for PM_{10} possibly also to changes in application of correction factors. Also the relatively high concentrations in 2003 as compared with 2002 and 2004 undoubtedly play a role. Due to the incomplete information on the spatial extent of the exceedances (see also Section 3.1) not possible to estimate trends in surface area or population in exceedance.

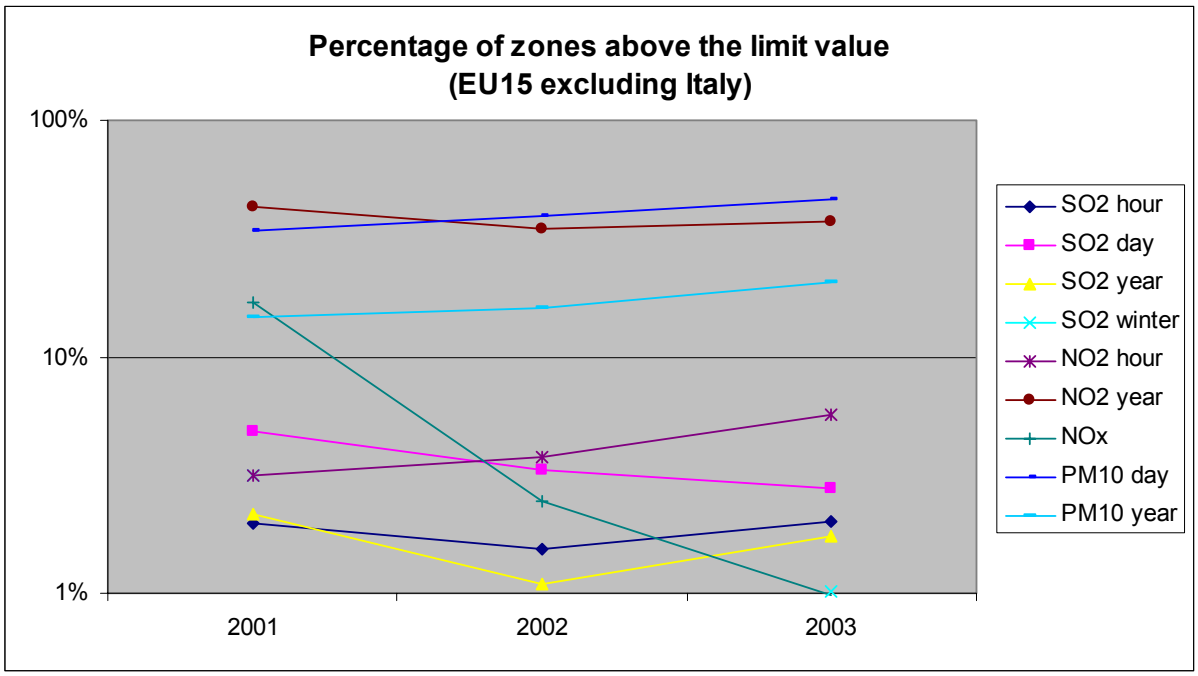


Figure 12 *Change from 2001-2003 in the percentage of zones exceeding the limit values. Italy has not been included because the report for 2001 was not received in time.*

3.3 Station classes where exceedances occurred

Member States have to report the classification of the monitoring stations, i.e. the types of area around the station (urban, suburban, rural) and the station types in relation to dominant emission sources (traffic, industrial, background) under the Exchange of Information Decision. Although the classification of stations has shortcomings (see also Section 4.3), it can be used to obtain a picture of the causes of exceedance, in addition to the reports on the reasons of exceedance (see Section 3.4). Figure 13 and Figure 14 show for 2003 at which station classes exceedances of the limit value plus, if existing, margin of tolerance occurred. SO_2 exceedances were found mainly at industrial sites, with exceedances in all area types (it should be noted that there were only a few stations with exceedance of the threshold for year and winter). NO_2 exceedances occurred mainly at traffic sites in urban areas; the NO_x threshold for vegetation tended to be somewhat more exceeded at background stations in suburban areas compared with the health thresholds, but almost half the stations were traffic stations, which should not be used for checking compliance with the limit value for vegetation. For PM_{10}, exceedances were mainly found at traffic and background sites in suburban and urban areas.

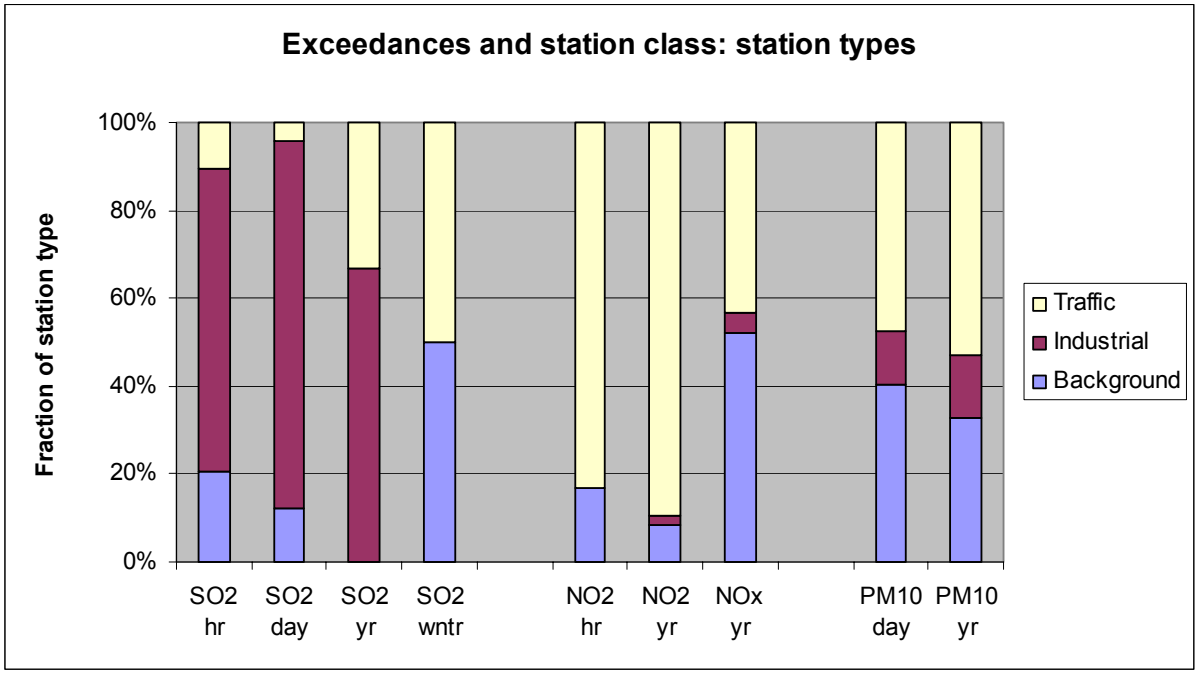


Figure 13 *Station types where exceedances of the limit values plus, if existing, margins of tolerance were measured (2003).*

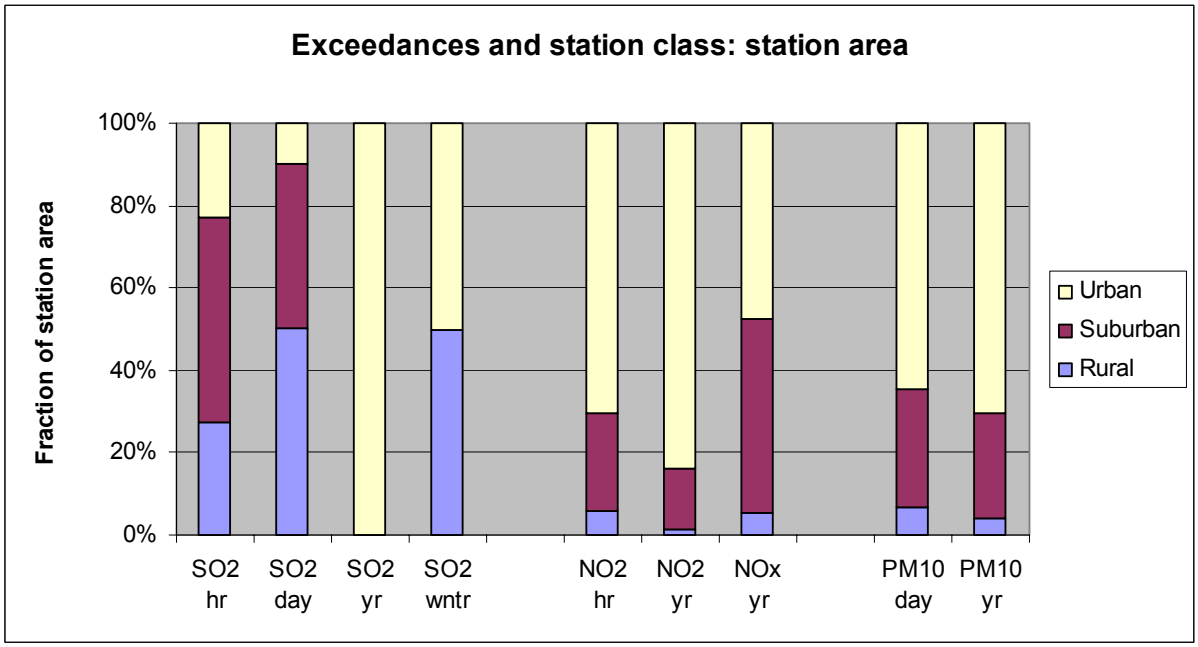


Figure 14 *Area classes of the stations at which exceedances of the limit values plus, if existing, margins of tolerances were measured (2003).*

3.4 Reasons of exceedance

Figure 15 gives an overview of the reasons of exceedance that Member States reported for each measured exceedance of the limit value plus, if existing, the margin of tolerance. The very few exceedances for benzene and CO have not been included in the figure.

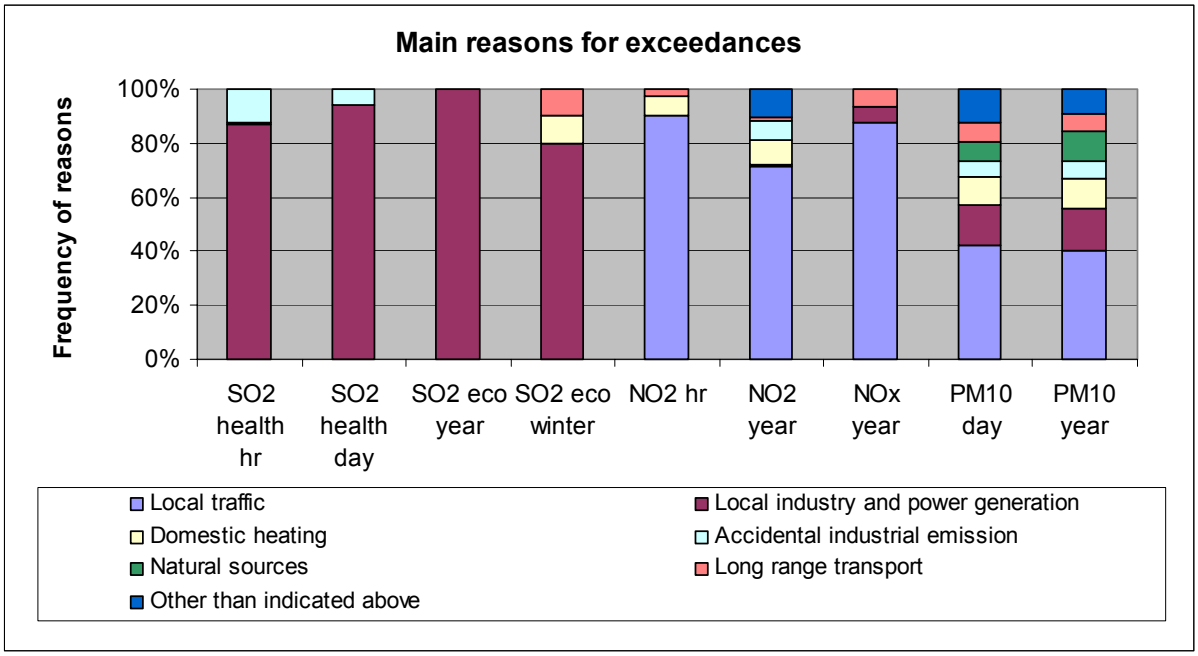


Figure 15 Frequency that a reason for exceedance was indicated (2003). The detailed set of reasons reported by the Member States have been grouped into seven reasons.

The profiles are quite different per pollutant. For SO_2 the vast majority of the exceedances is due to local industry and power generation. The few other cases are mainly caused by accidental industrial emissions. For NO_2 and also NO_x, local traffic is the major cause of exceedances. For understanding the other causes for NO_2, it should be noted that Member States could indicate more than one reasons for exceedance. The cause “domestic heating” was for NO_2 only mentioned in combination with “local traffic”, and “accidental industrial emission” was always mentioned together with both “domestic heating” and “local traffic”. The “accidental industrial emission” for SO_2 are from four stations in a single zone.

For PM_{10}, local traffic was indicated to be a less dominant cause for exceedance, with slightly less than half the cases ascribed to it. Also here local traffic was sometimes mentioned together with another reason, but a substantial number of exceedances were not related to local traffic. Of these, “local industry and power generation” was the most important, but also “domestic heating”, “natural sources” and accidental industrial emission had a noticeable share. Interestingly, only few exceedances were (partially or entirely) ascribed to long range transport of air

pollution, in spite of the fact that in many parts of Europe the large scale background is substantial. For all limit value exceedances together, the reasons pertaining to local sources comprised over 80% of all reasons mentioned; this suggests that very many exceedances can, at least partly, be addressed by local measures.

4. Measurements and calculations of the air quality

Depending on the level of air quality, Member States can use measurement stations, mathematical models and other methods for the assessment of their air quality. Currently, monitoring networks are clearly the backbone of the assessment system.

4.1 Stations used for the assessment of air quality

The information on the type and surroundings of the stations described below was not reported in the AQ questionnaire, but under the EoI Decision. To retrieve this, the "EoI station code" was needed to link the station data in the two reports. However, this code was lacking for a large number of stations reported under the first two daughter directives; in spite of a substantial effort by the European Topic Centre for Air and Climate Change the link could not be made for a considerable number of stations (547, which is 17% of all), and hence information on the station type or the surroundings was not available for these stations.

Figure 16 shows that the number of stations is very different per pollutant. This is obviously related to the station density requirements, which reflect the likelihood of exceedance of limit values. On top of this, there also seems to be a historic lag, causing 'old' pollutants (SO_2, NO_2/NO_x, lead, CO) to be measured more extensively than the newer ones (PM_{10} and benzene). This is particularly true for $PM_{2.5}$. See also Section 4.5, discussing the compliance with the station density requirements.
Many stations are used for more than one pollutant, e.g. about half the stations measure both NO_2 and PM_{10}; at 3% of the stations, the pollutants of the First and Second Daughter Directive are all measured together.

Table 7 lists the number of stations per pollutant per Member State, and Figure 17 pictures the table.

Table 7 Number of stations per pollutant per Member State in 2003.

	SO_2	NO_2	NO_x	PM_{10}	$PM_{2.5}$	Lead [1)]	Benzene	CO	All stations
AT	125	144	17	95	1	14	20	45	163
BE	79	58	0	36	10	46 (10)	35	18	162
DE	263	404	21	376	20	156	174	213	457
DK	5	13	11	11	2	7	1	6	14
EL	25	30	0	17	0	0	0	16	30
ES	304	298	25	235	44	63	32	146	352
FI	1	12	0	24	3	0	0	1	26
FR	459	519	235	340	43	34 (5)	85	99	707
IE	7	10	10	13	3	9	5	6	20
IT	233	391	63	203	7	16	95	275	483
LU	6	3	3	2	1	3	1	3	6
NL	38	41	41	28	0	9	10	18	67
PT	21	24	2	20	3	1	4	17	32
SE	35	58	5	23	5	0	9	4	71
UK	78	106	13	71	0	16	38	80	167
EU15	***1679***	***2111***	***446***	***1494***	***142***	***374 (15)***	***509***	***947***	***2757***
CZ	333	200	43	156	22	93	21	56	386
EE	7	7	7	4	0	1	0	7	7
LT	16	16	13	12	0	5	5	7	16
SI	19	11	11	9	0	5	8	4	19
SK	31	26	5	26	6	22	4	11	32

[1)] For lead the number of stations in the immediate vicinity of a special source as referred to in Annex IV or the First Daughter Directive is given in brackets.

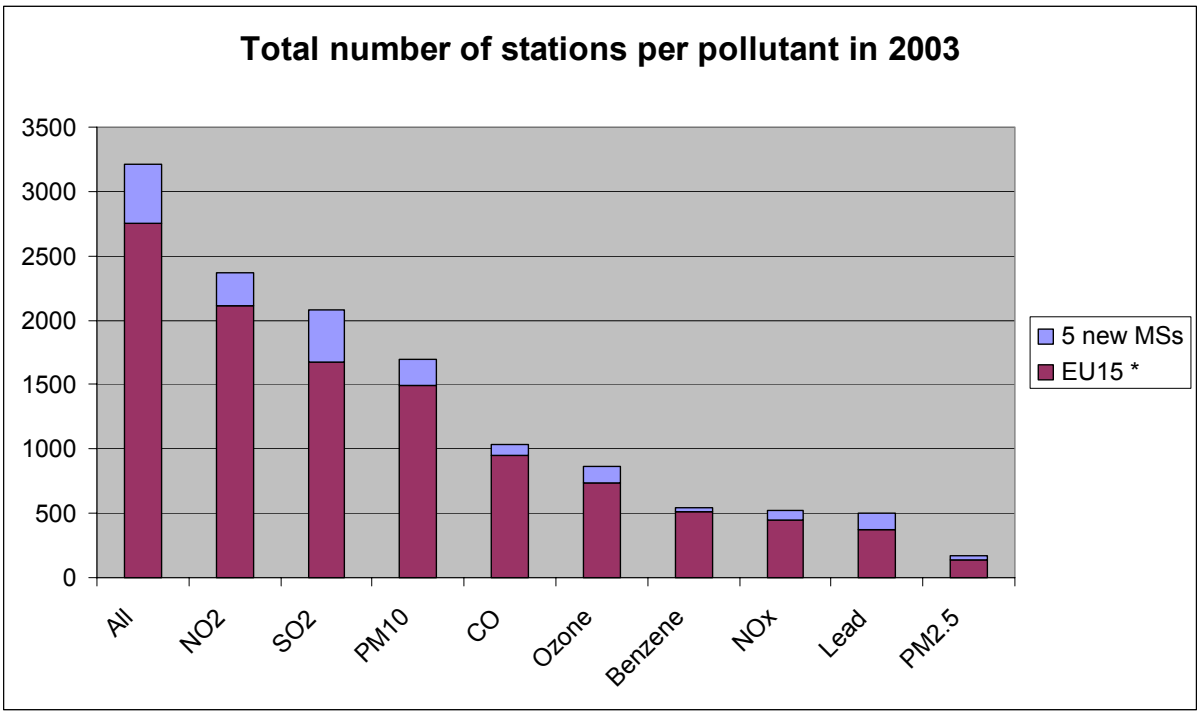


*Figure 16 Total number of stations per pollutant in 2003 for EU15 and the five new Member States that reported. * For ozone only 11 of the EU15 Member States are included.*

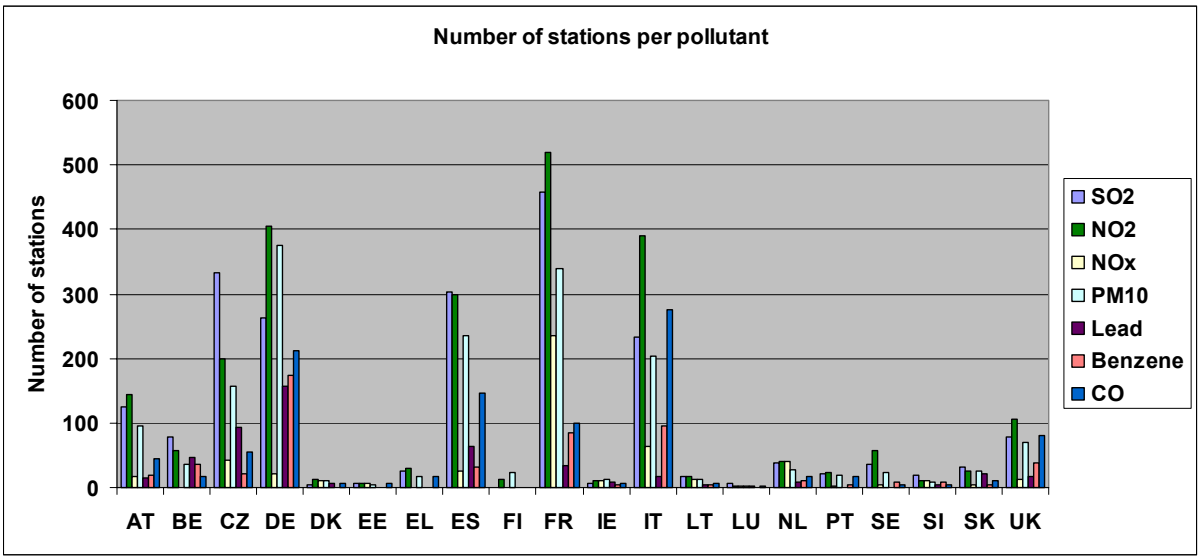


Figure 17 *Number of stations per pollutant per Member State in 2003. Note: an alternative version of this figure, displaying the smaller numbers more clearly, is given in the annex report.*

Before the air quality daughter directives came into force, Member States had different approaches in siting their stations. Since then, some convergence has taken place, but differences have remained. Figure 18 illustrates this for the ratio of urban background and traffic stations, which varies from almost 1:5 to 5:1. The proposal for the new air quality directive reduces this to a variation between 2:1 and 1:2.

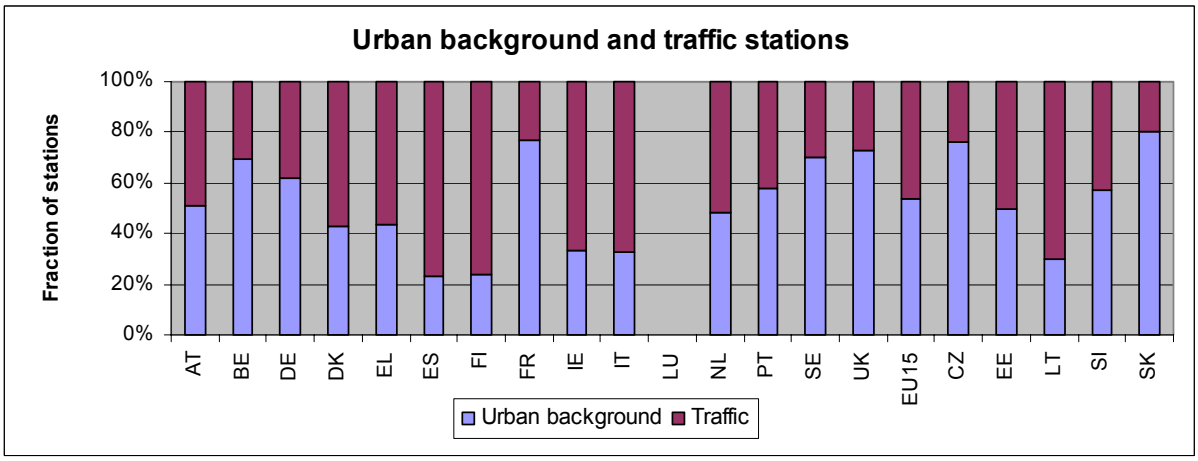


Figure 18 *Ratio of urban background stations and traffic stations per Member States in 2003 (for the 83% of the stations for which the link with EoI metadata could be made).*

4.2 Purposes of stations

All stations should be used for the assessment of the air quality in relation to the limit values for health protection, but for the assessment in relation to the limit values for ecosystems (SO_2) and vegetation (NO_x), only stations should be used at sufficient distance from sources and representative of an area of at least 1000 km^2. As this excludes urban, industrial and traffic stations, the number is substantially lower: 4% is used for ecosystem protection (SO_2) and 5% for vegetation (NO_x). It seems that several Member States were not very careful in filling this in, because the total number of stations in EU15 designated for checking compliance with the limit value of NO_x (clearly only to be used for vegetation protection) is more than twice the number of stations designated elsewhere in the AQ questionnaire form for vegetation protection. Furthermore, about one-third of the stations designated for ecosystem and/or vegetation protection were according to their classification sited in the neighbourhood of sources.

4.3 Ozone stations

Most Member States have voluntarily submitted information on stations used under the Third Daughter Directive relating to target values for ozone[15]. Table 8 and Figure 19 give an overview of numbers and station types per Member State. Half the stations are urban. Two-third is either urban or suburban, and the remaining third is rural or rural background.

[15] The Third Daughter Directive defines station types for ozone that slightly deviate from the classification under the Exchange of Information Decision. Hence Member States report these in the AQ questionnaire. In the current report, an overview of stations is only given for ozone, because for the other pollutants overviews of the stations are regularly reported under the Exchange of Information Decision.

Table 8 Number of stations per Member State per station type in 2003.

	Urban	Suburban	Rural	Rural background	Other	Not indicated	Total
AT	28	32	38	16	0	0	114
BE	14	9	11	3	0	0	37
DE	-	-	-	-	-	-	-
DK	5	0	1	1	0	0	7
EL	13	9	1	0	0	0	23
ES	-	-	-	-	-	-	-
FI	2	3	5	6	0	0	16
FR	224	122	42	6	18	1	413
IE	0	0	2	0	0	0	2
IT	6	17	5	0	0	19	47
LU	-	-	-	-	-	-	-
NL	19	3	21	0	0	0	43
PT	7	7	3	0	0	0	17
SE	10	0	8	0	0	0	18
UK	-	-	-	-	-	-	-
EU15 (partly)	*328*	*202*	*137*	*32*	*18*	*20*	*737*
CZ	35	12	0	24	0	0	71
EE	4	0	3	0	0	0	7
LT	9	0	0	3	0	0	12
SI	5	2	1	2	0	0	10
SK	13	1	5	4	0	0	23

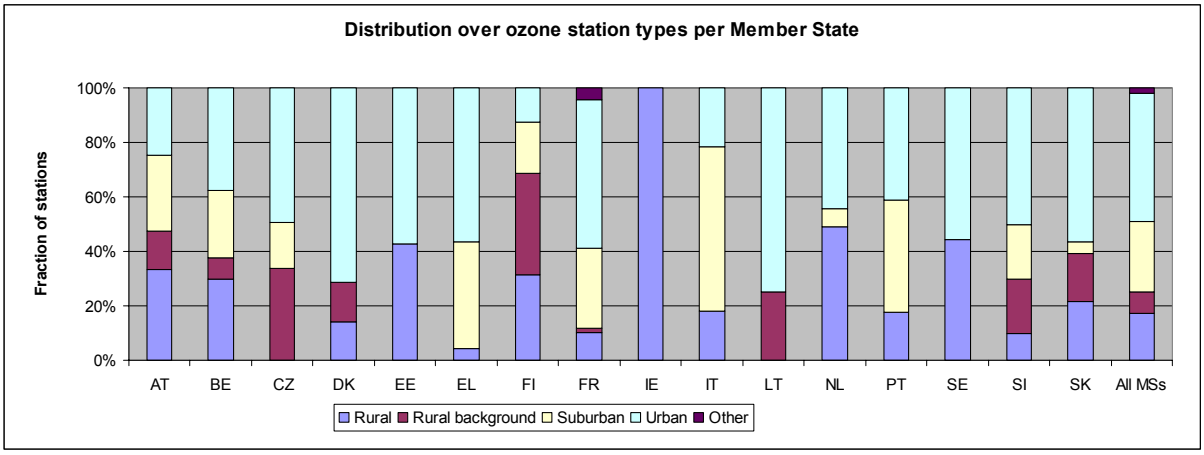


Figure 19 Comparison of the way Member States have distributed their ozone stations over different types of locations. Stations for which the type was not reported have not been included.

In contrast to the first two daughter directives, the third one requires Member States to report the station type. As the station type is also reported under the EoI Decision (with a slightly different typology), a consistency check could be made. This revealed that there are serious problems with the representativeness of the stations. The classification of only 49% of the stations was reported in a correct and consistent way. For the other stations, either the station types in the EoI report

and the AQ questionnaire were conflicting (18%), or the station type was incompletely reported (24%) or the stations were not, as required for ozone, background stations (9%).

4.4 Measurement methods for particulate matter

Several measurement methods are in use for PM_{10} and $PM_{2.5}$. The First Daughter Directive specifies the gravimetric method (collection on a filter and gravimetric mass determination) as the reference method and it allows other methods to be used, provided that equivalence with the reference method can be demonstrated. To achieve this equivalence, Member States may apply a correction factor (or equation). Figure 20 shows that, in terms of the number of monitoring sites, for PM_{10} the beta-absorption method is slightly more common than the oscillating microbalance method (TEOM), while in the newer and much smaller $PM_{2.5}$ network oscillating microbalance method is used at considerably more sites than beta-absorption. Gravimetry, the reference method, has a larger share for $PM_{2.5}$ than for PM_{10}. In a few cases a less commonly used method (TSP-measurement with correction, optical techniques) was used.

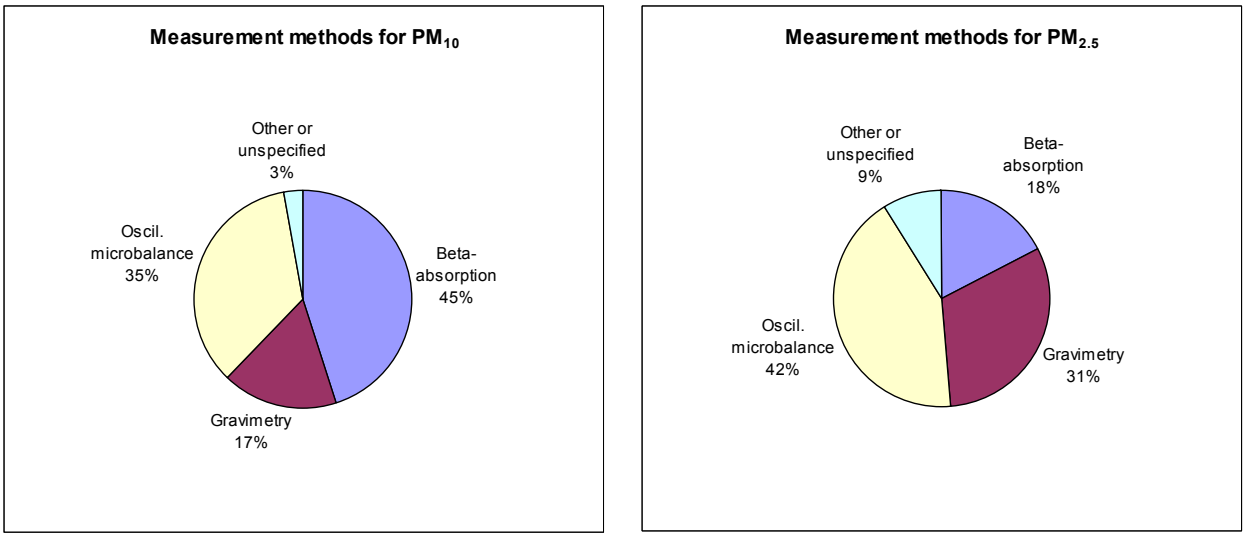


Figure 20 Measurement methods for PM_{10} (at 1701 sites) and $PM_{2.5}$ (at 170 sites) (2003).

Table 9 Correction Factors for PM_{10} reported in the AQ questionnaire (2003). The table gives the percentage of PM_{10} stations using a non-reference method.

Member State[1)]	CF>1	CF = 1[2)]	CF<1	CF not reported
AT	96%	4%	0%	0%
BE	100%	0%	0%	0%
CZ[3)]	0%	0%	0%	100%
DE	98%	0%	0%	2%
DK[4)]	10%	90%	0%	0%
EE	100%	0%	0%	0%
EL[2)]	0%	100%	0%	0%
ES[5)]	57%	23%	15%[1)]	4%
FI[2)]	0%	100%	0%	0%
FR[2)]	0%	19%	0%	81%
IT[3)]	3%	5%	0%	92%
LT	0%	0%	0%	100%
LU	100%	0%	0%	0%
NL	100%	0%	0%	0%
PT	95%	0%	0%	5%
SE[6)]	59%	0%	0%	41%
SI	100%	0%	0%	0%
SK	100%	0%	0%	0%
UK	98%	2%	0%	0%
All Member States	42%	2%		45%

1) IE used the reference method at all stations.

The clarification in the following footnotes is based on information received by the Commission in parallel to the AQ questionnaire:

2) There were differences between the Member States that apply the value 1 for the Correction Factor for non-reference methods in terms of the justification (demonstration of equivalence) that has been communicated to the Commission. Such justification was sent by FI, but not by FR and EL.

3) CZ and IT have clarified that the correction, if any was necessary, was applied already at calibration stage, so the results are equivalent with the reference method.

4) DK has informed the Commission that, contrary to their AQ Questionnaire report, it used the reference method at all but one of their stations.

5) ES has clarified that the various correction factors, including those below 1, have been substantiated by comparisons with the reference method.

6) SE has informed the Commission that for the stations with non-reference methods for which the correction factor was not filled in, the value should have been 1.0.

In a parallel report by ETC/ACC[16] an extensive analysis of Correction Factors for PM_{10} is given. In addition to the information on Correction Factors reported in the AQ questionnaire, the ETC used results in AirBase and information acquired in bilateral contacts with data providers. The report notes differences between neighbouring countries that seem difficult to explain. This, taken together with the fact that for 45% of the stations using a non-reference method the Correction Factor is not reported at all, suggests that the Correction Factor may not have been

16 Frank de Leeuw, December 2005. PM_{10} measurement methods and correction factors in AirBase. 2004 status report. ATC/ACC Technical paper 2005/6.

applied in a significant number of cases. Hence, caution should be taken when comparing PM_{10} levels of different Member States; one should also be aware that the occurrence of exceedances of the LV(+MOT) of PM_{10} may be affected by the way the Correction Factor has been dealt with.

For $PM_{2.5}$ a Correction Factor was applied for only 6 stations of the 118 stations that reported to use a non-reference method: the Correction Factor was not specified for 82 stations, for 30 stations it was given the value 1, for 1 station it was 0.815, for 3 stations 1.25 and for 2 stations 1.3.

4.5 Zones where the number of stations was too low

Stations related to health protection
The first two daughter directives list the minimum number of stations per zone for air quality assessment in relation to diffuse sources and in relation to health protection limit values. This minimum number depends on exceedance of the upper or lower assessment threshold (the assessment regime) specified in the directives, the population of the zone and the agglomeration status. These requirements apply only for zones in which no supplementary assessment was carried out and hence a straightforward check could only be made for these zones. Member States must also assess the air quality in the vicinity of point sources, but the directives do not specify the number of stations. Member States are responsible for having an adequate air quality assessment system in all of their zones; it is important to note that this may require more stations than the minimum that was checked here.

For the zones where no supplementary assessment had been carried out and on which Member States had, voluntarily, reported sufficient data, it could be checked whether the number of stations complied with the minimum number[17]. Figure 21 shows the result, considering only the zones that could be checked and for which measurement was mandatory. Clearly the non-compliance is considerably less for the “oldest” regulated pollutants SO_2, NO_2 and lead, with networks existing already for years, while the number of zones with too few stations is considerable for benzene (24 of 64 zones) and PM_{10} (65 of 264 zones). The analysis also showed that in many zones the number of stations was considerably higher than the minimum used here.

For $PM_{2.5}$ (not in the figure), each Member States must carry out measurements, choosing the number of stations “as representative of concentrations of $PM_{2.5}$ within that Member State”, with no minimum number prescribed. Three EU15 Member States (Greece, the Netherlands and the United Kingdom) did not report on any $PM_{2.5}$ station.

[17] Such a check might also be done for ozone, but this is left to the evaluation of the more complete set of reports on 2004.

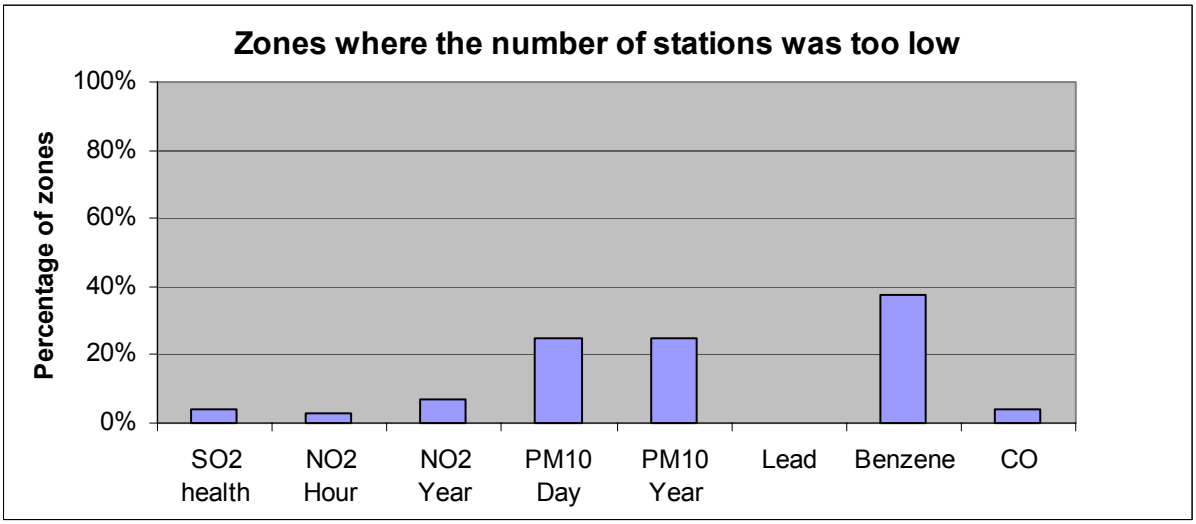


Figure 21 *Compliance with the minimum number of stations required. Only zones were considered for which the compliance could be checked and in which measurement was mandatory. If the number of stations was less than the minimum number required, the zone was counted as "not enough stations".*

Stations related to ecosystem and vegetation protection
For zones exceeding the assessment thresholds for ecosystems and vegetation it is difficult to do a precise check, because the assessment thresholds are defined per zone, while the minimum number of stations is defined as one station per 20000 or 40000 km^2 when respectively the upper or lower assessment threshold is exceeded. Most zones are smaller than these sizes. One large zone was found to have not enough stations (two instead of the required three stations. Several Member States with a large territory did not report having any stations for ecosystems or vegetation.

4.6 Inconsistencies between zones with exceedance and stations with exceedance

Inconsistencies in lists of zones exceeding the limit value plus the MOT and the lists of individual measurements in exceedance could be noticed; this concerned 119 zones in 14 Member States. Many of those could be ascribed to incorrect reporting of the measurements (e.g. reporting exceedances of the limit value instead of the LV+MOT), but there were also unexplained inconsistencies.

4.7 Modelling and Supplementary Assessment

The Daughter Directive encourages Member States to assess their air quality not only with measurements, which gives the concentrations only at the locations of the monitoring stations, but also with other methods *e.g.* model calculations. The

Commission is currently discussing with Member States the possibilities for reporting territory covering maps of the air quality, and hence this type of assessment is expected to become more important.

Table 10 and Figure 22 show for how many zones the reports indicated that the exceedance status had been determined by modelling (instead of measuring). Clearly this was the case in a minority of zones, with the highest percentage for lead (with levels in many zones far below the limit value) and benzene (for which a relatively large number of zones had too few stations, see above).

Member States could also report whether Supplementary Assessment, i.e. assessment based on information from sources other than measurement, such as emission inventories, indicative measurement methods and air quality modelling, was applied. The number of zones for which this was done, is for some limit values lower than the number of zones for which the exceedance status was determined by modelling. This unexpected result – modelling implies Supplementary Assessment – may be point at lack of clarity in the concept of Supplementary Assessment.

Table 10 Number of EU zones where the exceedance status was determined by modelling or where Supplementary Assessment (SA) was carried out. The percentage of zones is given in brackets.

Number of zones ...	**SO_2**				**NO_2**		**NO_x**	**PM_{10}**		**Lead**	**Benzene**	**CO**
	Health		**Eco**		**Health**		**Vegetation**	**Day**	**Yr**	**Yr**	**Yr**	**Yr**
	Hr	**Day**	**Yr**	**Winter**	**Hr**	**Yr**	**Yr**					
.. in total	537	534	190	169	561	569	164	517	517	350	386	483
.. with exceedance status based on modelling	46 (9%)	46 (9%)	24 (13%)	25 (15%)	35 (6%)	75 (13%)	18 (11%)	63 (12%)	52 (10%)	83 (24%)	69 (18%)	56 (12%)
... reported in Form 8 [1)]	334				351			335		255	269	310
... where SA was applied [2)]	31 (9%)				37 (11%)			37 (11%)		20 (8%)	23 (9%)	26 (8%)

1) In Form 8 of the AQ questionnaire, Member States indicated whether the exceedance status had been established by measurement or modelling.

2) Form 10 of the AQ questionnaire, a voluntary reporting table, included a column on SA. It was not filled in by all Member States.

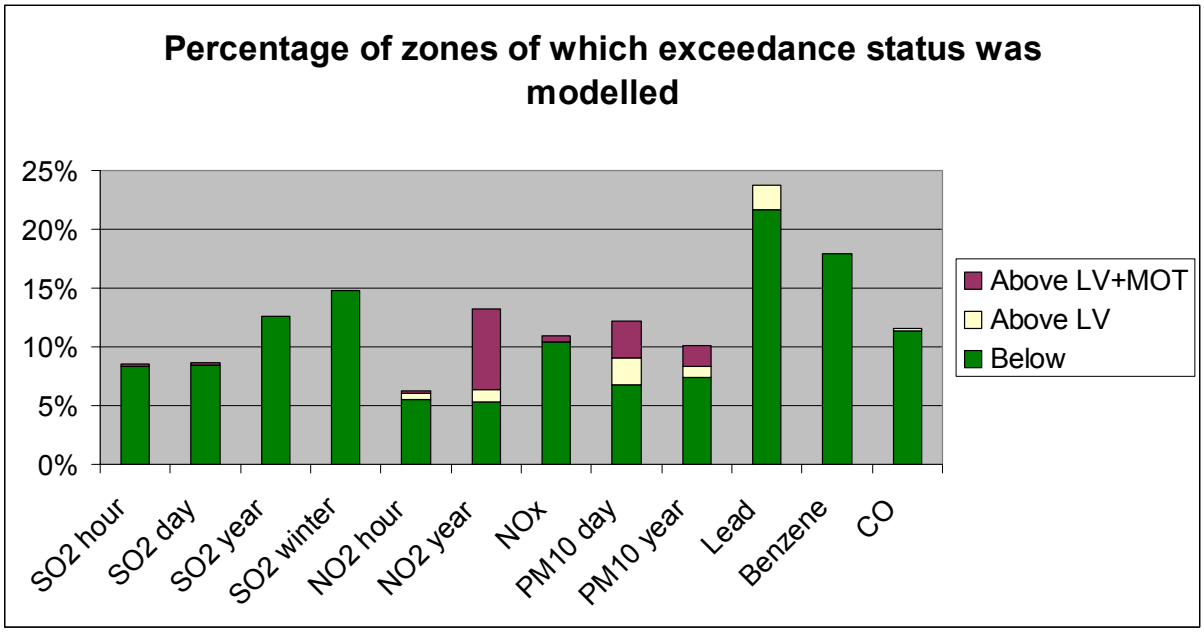


Figure 22 *Percentage of zones in which the exceedance status was determined on the basis of modelling, per limit value. The figure makes a distinction with respect to the exceedance status that was determined by the model assessment.*

5. Miscellaneous elements of the reports

5.1 Exceedances of the 'old' limit values

In 2001-2003 the limit values of the 'old' Directives 80/779/EEC (sulphur dioxide and suspended particulates), 82/884/EC (lead) and 85/203/EEC (nitrogen dioxide) were still in force, and exceedances had to be reported in the AQ questionnaire.

For 2001 only Spain reported exceedances: one for SO_2, two for Black Smoke and one for Total Suspended Particles (TSP). For 2002 three exceedances for TSP were reported: two by Italy, one by Spain. For 2003 the United Kingdom reported an exceedance for the NO_2 hourly limit value.

5.2 Statistics of $PM_{2.5}$ measurements

In order to gather data for evaluating a possible $PM_{2.5}$ threshold, the First Daughter Directive requires that "each Member State shall choose the number and the siting of the stations at which $PM_{2,5}$ is to be measured as representative of concentrations of $PM_{2,5}$" and to report the results of those measurements. Two EU15 Member States (Greece and the Netherlands) did not report such data. The other Member States sent $PM_{2.5}$ data for in total 137 stations[18]; almost all of these stations were also reported for PM_{10}.

Figure 23 illustrates the range of $PM_{2.5}$ concentrations, distinguishing traffic stations, industrial stations and background stations (based on the classification reported under the Exchange of Information Decision). The levels are not clearly different; the main difference, the smaller range in levels at industrial stations, can be ascribed to the small number of stations. It should be noted that this overlap of ranges does not imply that levels are not increased near traffic; it is more likely that the variability in background levels dominates the ranges.

[18] This number is lower than the number of stations reported to be designated for $PM_{2.5}$ given in Table 7, because several Member States did not report $PM_{2.5}$ data for all designated stations.

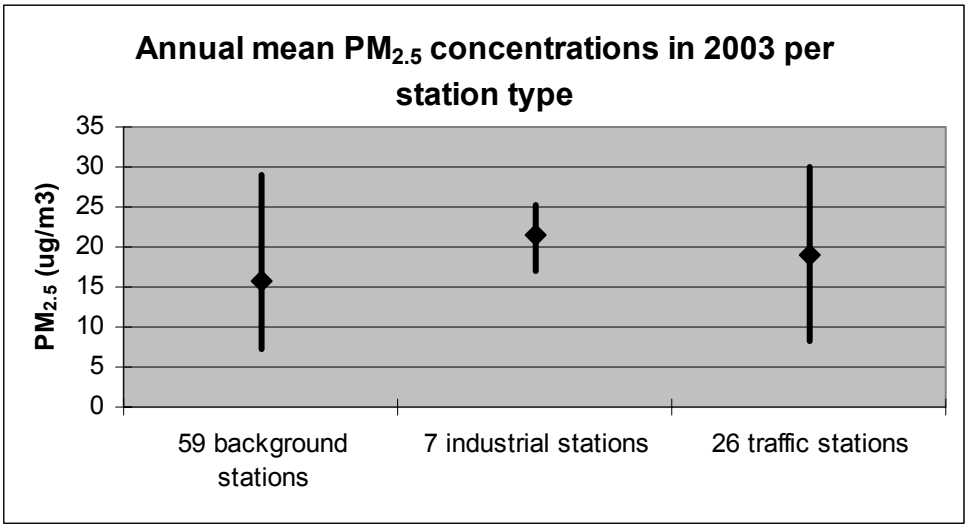


Figure 23 Annual mean $PM_{2.5}$ concentrations in 2003 per station type.

5.3 Concentrations of SO_2 averaged over 10 minutes

In order to prepare for a possible new air quality threshold for SO_2 concentrations averaged over 10 minutes, Member States had to record these data where practicable and report the results to the Commission. Five EU15 Member States (DE, and one new Member State reported such data, covering 77 stations. Results are presented in Part II of this report.

5.4 Information related to derogation situations

Specific sources of lead
None of the Member States indicated exceedances due to 'specific sources' of lead, i.e. sources in an area in the immediate vicinity of specific sources designated according to Annex IV of the First Daughter Directive. Table 7 shows that Belgium and France had in 2003 stations in the immediate vicinity of such 'specific sources'.

Correction for natural sources for SO_2
None of the Member States indicated exceedances due to natural SO_2 sources.

Correction for natural events for PM_{10}
The First Daughter Directive gives Member States in Article 5(4) the possibility of subtracting the contribution from natural events from the PM_{10} concentrations before comparing these with the limit values. This has been done for some stations by Spain and France. For most Spanish stations the natural events were described as 'Transport of natural particles from dry regions outside the Member State'. For

the other Spanish stations as well as all French stations the natural event was not specified.

Table 11 shows for Spain the effect of the correction on the number of stations with exceedance. The corrections brought roughly half the number of stations below the daily limit value, but for the annual limit value the compliance status of only 10% of the stations in exceedance was changed.

Table 11 Influence of the correction for natural events on the number of stations exceeding the limit values for PM_{10} in 2003. The numbers indicate the number of stations to which the correction was applied, not the total number of stations with exceedance in Spain or France.

Member State	Number of stations with exceedance of:			
	Daily limit value		Annual limit value	
	Before correction	After correction	Before correction	After correction
Spain	58	25	41	37
France	14	6	-	-

Correction for winter sanding for PM_{10}
The First Daughter Directive also gives Member States the possibility of subtracting the contribution due to winter sanding of roads before comparing PM_{10} concentrations with the limit values. For one station, in Finland, a correction was reported for 2003, only for the number of daily exceedances. The correction brought the number of exceedances at this stations from 41 to 16, so it brought the station below the limit value.

5.5 Consultations on transboundary pollution

There were only two mentions of consultations in 2003 under Article 8(6) of the Framework Directive with other Member States on significant air pollution originating in other Member States. Both France and the Czech Republic indicated consultations with Germany (this was however not reflected in the German report).

6. Authentication

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