Reporting on ambient air quality assessment in the EU Member States, 2009

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Benno Jimmink, Frank de Leeuw, Jana Ostatnická, Markéta Schreiberová, Mar Viana

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Cover page: Examples of traffic-related measures to reduce air pollution at the local scale:

- *low emission zones*
- *improve bikeability by a better bicycle infrastructure*
- *car sharing: reserved parking place*
- *car sharing: pick-up point at the station*

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Author affiliation

Frank de Leeuw, Benno Jimmink National Institute for Public Health and the Environment (RIVM), Bilthoven, The Netherlands
Jana Ostatnická, Markéta Schreiberová, Czech Hydrometeorological Institute (CHMI), Praha, Czech Republic
Mar Viana Institute for Environmental Assessment and Water Research (IDAEA-CSIC), Barcelona, Spain

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ETC/ACM Technical Paper 2011/7
European Topic Centre on Air and Climate Change
PO Box 1
3720 BA Bilthoven
The Netherlands
Phone +31 30 2748562
Fax +31 30 2744433
Email: etcacm@rivm.nl
Website http://acm.eionet.europa.eu/

Summary

The number of designated zones in 2009 in the EU-27 (925) was slightly lower than in 2008 (930). The zones designated for pollutants having a health related limit or target value is nearly complete for SO_2, NO_2 and PM as the zones cover 90% or more of the population. For lead, benzene, CO and ozone population coverage is still less: in a number of Member States less than 80%. The situation with respect to the Fourth Daughter Directive reporting has further improved in 2009. However, one Member State has not yet defined zones for BaP and in three other Member States the defined zones cover less than 60% of the population. In three Member States, zones for the other pollutants were not covering more than 90% of the entire population.

In 2009 the percentage of zones in Member States where the limit (LV) or target value (TV) was exceeded, was highest for the daily limit value of PM_{10} (34%) and the health-related target value of O_3 (38%). For the NO_2 annual limit value this percentage was 29%. Compared to 2008, the number of exceedances of the O_3 TV in 2009 was lower in northern, central and eastern Europe but equal or higher in northwestern Europe and the Mediterranean area. The percentage of zones in exceedance of both the PM_{10} daily limit value and PM_{10} annual limit value had decreased in 2009 compared to previous years. The former decreased by 2% to 34% (PM_{10} daily limit value), the latter by 3% to 10% (PM_{10} annual limit value).

The number of $PM_{2.5}$ monitoring stations had still increased in 2009; nearly all stations also reported data under the Exchange of Information Decision. The designation of stations used for the calculation of the averaged exposure indicator (AEI) is far from complete. The number of (sub)urban background stations is in line with the requirements for determining the AEI. However, at present, the representativeness of the stations for estimating population exposure cannot be judged. Concentrations above 25 $\mu g/m^3$ are observed at about 9% of the stations in 11 Member States. Estimates of the exposure concentration obligation (based on all available operational (sub)urban background stations in AirBase) results in levels of more than 20 $\mu g/m^3$ in 7 Member States.

Air Quality Legislation Principles

European Air Quality legislation is built on the principle that the Member States divide their territory into a number of air quality management zones and agglomerations. In these zones and agglomerations, the Member States should assess the air quality using measurements, modelling or other empirical techniques. Delimitations of zones may differ between different pollutants in order to optimize management of air quality due to differences in sources and abatement strategies. Where limit levels are exceeded, the Member States should prepare an air quality plan or programme to ensure compliance with the limit value before the date when the limit value formally enters into force. In addition, information on air quality has to be disseminated to the public.

EU Member States have submitted annual reports on air quality in 2009 to the European Commission under the Air Quality Framework Directive (96/62/EC). The reports were provided in the form of a predefined questionnaire (http://ec.europa.eu/environment/air/quality/legislation/reporting.htm). The present report gives an overview and analysis of the submitted information for the year 2009. It is an update of the previous reporting cycle from 2001-2008; reports over these years are available from above website.
To enable reporting on the 4th DD pollutants, in 2007 relevant forms were introduced to the questionnaire covering monitoring of arsenic (As), nickel (Ni), cadmium (Cd), mercury (Hg), benzo(a)pyrene (BaP) and related polycyclic aromatic hydrocarbons (PAH) in ambient air and deposition. Last year forms are included to inform on the attainment of $PM_{2.5}$ target value and on time extensions. In total 29 countries report as Norway and Iceland submit voluntary reports. Switzerland provides information on exceedance of ozone target values on a voluntary basis.

Designation of zones

Compared to the previous year there was a small decrease in the number of designated zones. Germany, Luxembourg, Italy and Portugal have made an adjustement in their total number of zones. France and Spain adjusted the zones for specific pollutants. In the other Member States, the number of zones was not changed. Zones, for which limit values set for the protection of human health apply, should cover the whole population and the whole territory of a Member State. This requirement is not met in all Member States; compared to 2008, the situation has not improved.

The total number of zones differs for each pollutant. In the EU27 the highest number of zones is designated for PM_{10} (820) and NO_2 (817) the lowest number is designated for ecosystem protection (NO_x 403 and SO_2 404).

The designation of zones differs widely between the Member States. By comparing the information on zones, various different approaches are seen.

- at least two or more zones are defined;
- the same set of zones is designated for all the pollutants; these sets are also stable over the years;
- the designation of zones is not stable and is changed from year to year;
- zone boundaries coincide with administrative boundaries;
- a zone forms a continuous area.

Exceedances

The pollutants that show most exceedances of limit and target values in 2009 are PM_{10} daily and O_3. In 34% of all EU27 zones PM_{10} daily limit value is exceeded (44% of the agglomerations); for O_3 these percentages are 38% and 28%, respectively. In terms of potentially esxposed population, the annual limit value of NO_2 shows most exceedances: 49% of the population, living in 29% of the zones, is potentially exposed to level above the LV. The similarities between the exceedance maps of 2008 and 2009 indicate that exceedances are rather persistent.

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1. Introduction

This document provides an overview of the annual reports from Member States to the European Commission on the results of the assessment of air quality in those states in 2009. These national reports have been submitted under the Air Quality Framework Directive[1], following Commission Decision 2004/461/EC[2], which specifies the information to be sent in detail and provides a set of forms to be filled in. In the document presented here this Decision will be referred to as 'the questionnaire' or, when the context is not directly clear, 'the AQ questionnaire'.
In 2009, a modification of the questionnaire and related guidance was prepared to enable reporting under the 4th Daughter Directive (4th DD)[3]. For the year 2007 reporting on the 4th DD pollutants was on a voluntary basis, for the year 2008 and onwards, reporting has been mandatory. The changes introduced in the questionnaire in 2007 relate to the inclusion of relevant forms covering monitoring of arsenic (As), nickel (Ni), cadmium (Cd), mercury (Hg), benzo(a)pyrene (BaP) and other polycyclic aromatic hydrocarbons (PAH) in ambient air and deposition. The questionnaire consists of 28 forms (see Annex I) with in total 86 sub-forms.
In 2010 further changes were introduced in the questionnaire to enable the communication of information on the application of Articles 15 (on $PM_{2.5}$) and 22 (on time extension) of Air Quality Directive 2008/50/EC. Forms are included to inform on the attainment of the $PM_{2.5}$ target value (on a voluntary basis in 2009; target value in force in 2010). The updated questionnaire and guidance documents have been made available on the website of DG Environment[4].
Assessments of the air quality in zones in the EU Member States based on the questionnaire for the years 2001-2008 are also available on DG Environment's website[4].

The European Environment Agency was requested by DG Environment to compile this report. The document was prepared by the European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM).

1.1. Member State reports addressed

This document primarily deals with the reports by the EU Member States on the year 2009 submitted under the Air Quality Directive[5], and the Fourth Daughter Directive[4]. The assessments in this report are based on the information received by ETC/ACM before 13 May 2011 (the official deadline for submission was 30 September 2010). All Member States have delivered their reports before 13 May 2011. On a voluntary basis Norway and Iceland submitted a questionnaire; Switzerland provided information on the ozone air quality.
All questionnaires have been uploaded by the Member States (MS) on Reportnet CDR (http://cdr.eionet.europa.eu/). Over the period 19-21 October 2010 the ETC/ACM sent out a mailing request to all contact persons in the MS informing on the outcome of a first review of the submitted questionnaires. In this request several tables summarizing the information received from the Member States had been included. In March 2011 a second mailing request was sent to the MS,

1 Council Directive 96/62/EC on ambient air quality assessment and management.
2 Commission Decision 2004/461/EC laying down an 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.
3 EC(2004) Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air, Official Journal L23, 26/01/2005, pp 3-16.
4 http://ec.europa.eu/environment/air/quality/legislation/reporting.htm
5 EC (2008) Directive 2008/50/EC of the European Parliament and of the Council on ambient air quality and cleaner air for Europe. Official Journal, L 152 11.6.2008, pp 1-44.

which focused on possible inconsistencies within the questionnaire itself and within the meta-information as provided under the Exchange of Information decision (see below 1.2).
In both mailing requests the MS were invited to check the summaries which had been provided by the ETC/ACM. A number of Member States submitted a revised questionnaire or separate form(s) that had been revised. All updates received before May 2011 have been included in the analysis provided in this document.

1.2. Reporting under the Exchange of Information Decision

The Framework Directive focuses mainly on compliance checking against obligations (air quality standards and objectives) set under the air quality directives (see Annex II[6]). In parallel, Member States submit detailed information from their monitoring networks under the Exchange of Information Decision (EoI)[7] every year. These reports contain monitoring data for a range of pollutants and measured on different temporal scales. Furthermore, they include extensive complementary information about the monitoring stations (metadata). The ETC/ACM publishes an assessment of these reports (see, for the assessment of the 2009-data: Mol et al., 2011) annually. To avoid double reporting by Member States, some of the data necessary for evaluating the reports under the air quality directives are only sent under the EoI Decision. This is particularly true for the meta-information on monitoring stations. All monitoring stations used for compliance checking under the AQ Directive have to be included in the set of monitoring stations submitting data under the EoI. The deadline for submitting the EoI information was 1 October 2010. In the assessment of those parts of the questionnaire related to monitoring stations, the information extracted from the EoI has been included.

1.3. Common technical errors in data submission

To facilitate the submission of the required data and information, the European 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. A second form of common errors was the use of other symbols than prescribed in the questionnaire or its guidelines, for example, ticking an “x” or “+” in stead of the prescribed “y”; using a comma as separator while the semi-colon is prescribed. Although in general the information was unambiguous, a time consuming correction of this type of errors was necessary before the data could automatically be processed.
There were also errors in the 2009 data that required more insight in order to correct them. Examples are inconsistent use of zone codes and pollutant codes or use of codes that were not allowed. Another type of error is that MS do not use the same codes for stations in the AQ questionnaire and EoI reports. Member States have always reacted actively on the feedback reports of the ETC/ACM. As a result the quality of the data has been improved over the years.

Disclaimer
This report contains summary information based on data delivered before 13 May 2011. Revisions prepared by Member States after this date have not been included. In order to enable an automatic processing of the national reports, the ETC/ACM has made a number of (in general editorial) changes in the submitted questionnaires. It cannot be excluded that mistakes or misinterpretations have

[6] For more details see http://ec.europa.eu/environment/air/quality/standards.htm
[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).

emerged during this process. Hence, this report presents an overview of the air quality in the Member States of the European Union but it cannot be used for legal compliance checking.

Abbreviations used

Member States have been abbreviated following the ISO3166-1 country alpha-2 code[1]:

Austria: AT; Belgium: BE; Bulgaria: BG; Cyprus: CY; Czech Republic: CZ; Denmark: DK; Estonia: EE; Finland: FI; France: FR; Germany: DE; Greece: GR; Hungary: HU; Ireland: IE; Italy: IT; Latvia: LV; Lithuania: LT; Luxembourg: LU; Malta: MT; Netherlands: NL; Poland: PL; Portugal: PT; Romania: RO; Slovakia: SK; Slovenia: SI; Spain: ES; Sweden: SE; United Kingdom: GB[2], and Switzerland: CH, Iceland: IS and Norway: NO.

AEI	Average Exposure Indicator ($PM_{2.5}$)
AQ questionnaire	Questionnaire on air quality set out by Commission Decision 2004/461/EC
As	Arsenic
B(a)P *or* BaP	Benzo(a)pyrene
Cd	Cadmium
CDR	Central Data Repository
CO	Carbon monoxide
DD	Daughter Directive
EoI	Exchange of Information Decision: Council Decision 97/101/EC, amended by Commission Decision 2001/752/EC
EU27	The 27 EU Member States
LAT	Lower assessment threshold
LTO	Long Term Objective (O_3)
LV	Limit value
MOT	Margin of Tolerance
MS	Member State(s)
Ni	Nickel
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
O_3	Ozone
PAH	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PM_{10}	Particulate matter composed of particles smaller than 10 micrometer in aerodynamic diameter
$PM_{2.5}$	Particulate matter composed of particles smaller than 2.5 micrometer in aerodynamic diameter
SO_2	Sulphur dioxide
TEOM	Tapered Element Oscillating Microbalance
TEOM-FDMS	Tapered Element Oscillating Microbalance- Filter Dynamics Measurement System
TV	Target value
UAT	Upper Assessment Threshold

Notes

1: see http://www.iso.ch/iso/en/prods-services/iso3166ma/02iso-3166-code-lists/index.html

2. Including Gibraltar.

2. Designation of zones

The number of designated zones in 2009 in the EU-27 (925) was slightly lower than in 2008 (930). The 2009 zoning adjustments compared to 2008 are:

- Portugal reduced the number of zones from 34 to 29 zones
- Luxemburg increased the number of zones from 3 to 4 zones
- Italy reduced the number of zones from 145 to 142 zones
- Germany increased the number of zones from 111 to 113 zones

The zones designated for pollutants having a health related limit or target value is nearly complete for SO_2, NO_2 and PM: the zones cover 90% or more of the population. For lead, benzene, CO and ozone the coverage of the population is less: in a number of Member States less than 80%. The situation with respect to the Fourth Daughter Directive has further improved this year. However, Romania has not yet defined zones for BaP and in three other Member States the defined zones cover less than 60% of the population. In three Member States, zones for the other pollutants were not covering more than 90% of the entire population.

The Member States have designated zones to assess and manage air quality in order to comply with EU-regulations. To optimize management of air quality due to differences in sources and abatement strategies, the delimitations of zones may differ between pollutants.

As the Member States are free in defining their own zone structure and characteristics (population and area), the designated zones vary widely dependant on the chosen variable(s): size, population, measured individual pollutant and/or types of protection targets. This complicates mutual comparison of final results between countries.

Table 1 gives an overview of the total number of zones defined for 2009 (Form 2). Compared to 2008 (Jimmink et al., 2010) there are four small changes in the number of zones. 10 Member States have indicated (Form 0) a change in the zone definition for one or more pollutants. For the first time, this year all Member States have designated zones for one or more of the 4th DD pollutants. Romania has no zones designated for BaP; zones, designated for the protection of ecosystems and vegetation, have not been defined by Belgium, Hungary and Lithuania.
The lowest number of zones is found for the two objectives related to the protection of ecosystems and/or vegetation. In relation to the protection of health, the number of zones defined for SO_2, NO_2 and PM_{10} tends to be higher (over 800) than for the other pollutants (600-800). The number of zones defined for the 4th DD-pollutants is relatively low, 506-538

Table 1. Number of zones per Member State in 2009, including the designation of the zones for individual pollutants or types of protection targets (data extracted from form 2).

Member State	Total (a)	SO_2		NO_2	NO_x	PM_{10}	Lead	benzene	CO	Ozone	As	Cd	Ni	BaP
		health	eco											
AT	19	11	8	11	8	11	11	11	11	11	11	11	11	11
BE	22	12	0	11	0	11	11	7	7	6	10	10	10	6
BG	6	6	1	6	1	6	6	5	6	6	4	4	5	6
CY	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CZ	15	15	15	15	15	15	15	15	15	15	15	15	15	15
DE	113	80	15	86	15	83	73	85	85	65	68	68	68	70
DK	3	3	3	3	1	3	3	3	3	3	3	3	3	3
EE	4	4	4	4	4	4	2	2	4	4	2	2	2	2
ES	153	135	33	137	33	138	81	125	134	136	76	76	76	76
FI	18	14	1	14	1	14	14	3	14	2	2	2	2	2
FR	81	75	65	79	68	79	50	59	55	80	44	44	44	36
GB	44	44	44	44	44	44	44	44	44	44	44	44	44	44
GR	4	4	4	4	4	4	4	4	4	4	4	4	4	4
HU	11	11	0	11	0	11	11	11	11	11	11	11	11	11
IE	4	4	1	4	1	4	4	4	4	4	4	4	4	4
IT	142	130	47	136	52	135	83	115	126	86	12	12	12	12
LT	3	3	1	3	0	3	3	3	3	3	3	3	3	3
LU	4	3	1	3	1	3	3	1	1	3	3	3	3	3
LV	2	2	1	2	1	2	2	2	2	2	2	2	2	2
MT	2	2	1	2	1	2	2	2	2	2	2	2	2	1
NL	9	9	1	9	1	9	9	9	9	9	9	9	9	9
PL	186	170	125	170	125	170	170	170	170	28	170	170	170	170
PT	29	20	7	20	6	25	1	1	1	19	1	1	2	1
RO	21	21	2	20	2	21	21	20	20	15	20	21	20	0
SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6
SI	12	9	7	6	4	6	7	6	6	6	7	7	7	6
SK	11	10	1	10	1	10	5	10	10	2	2	2	2	2
EU27	**925**	**804**	**395**	**817**	**396**	**820**	**642**	**724**	**754**	**573**	**536**	**537**	**538**	**506**
IS	3	2	2	3	0	3	2	2	2	2	0	0	0	0
NO	7	7	7	7	7	7	0	7	7	7	7	7	7	7
CH	4	0	0	0	0	0	0	0	0	4	0	0	0	0
all	**939**	**813**	**404**	**827**	**403**	**830**	**644**	**733**	**763**	**586**	**543**	**544**	**545**	**513**

For all compounds, the designated zones are more or less the same as in 2008, except for a few countries. Changes can be observed in Italy, France, Portugal and Spain. In 2009, the number of zones designated for lead is reduced by 11 for Italy and 6 for Spain, whereas they increased by 13 for France. In Portugal the number of zones for the 4th DD-pollutants was reduced by 7 (Ni) and 8 (As, Cd and BaP). Only 1 for As, Cd and BaP and 2 for Ni remain. The total number of zones in the EU-27 countries showed a slight decrease to 925 in 2009 after a slight increase to 930 in 2008 (Table 2).

Table 2. Total number of zones per Member State in 2004-2009 (data extracted from form 2); highlighted boxes indicate that the number of zones designated was different then in previous year(s).

Member State	Total zones 2004	Total zones 2005	Total zones 2006	Total zones 2007	Total zones 2008	Total zones 2009
AT	19	19	19	19	19	19
BE	17	17	17	18	22	22
BG			6	6	6	6
CY	1	1	1	1	1	1
CZ	15	15	15	15	15	15
DE	145	118	120	120	111	113
DK	10	10	10	3	3	3
EE	16	4	4	4	4	4
ES	140	140	138	138	153	153
FI	18	18	18	18	18	18
FR	85	87	88	81	81	81
GB	43	43	44	44	44	44
GR	4	4	4	4	4	4
HU	11	11	11	11	11	11
IE	4	4	4	4	4	4
IT*	137	144	121	143	145	142
LT	3	3	3	3	3	3
LU			3	3	3	4
LV	2	2	2	2	2	2
MT	3	2	2	2	2	2
NL	9	9	9	9	9	9
PL	362	362	362	186	186	186
PT	26	26	26	27	34	29
RO*			4	21	21	21
SE	6	6	6	6	6	6
SI	9	9	9	10	12	12
SK	10	10	10	11	11	11
EU25	**1,095**	**1,064**	**1,046**	**882**	**903**	**898**
EU27			**1,056**	**909**	**930**	**925**

Information on population and area of the zones, provided on voluntary basis, is almost completely available for all MS. This provides an insight in the key parameters for defining zones and their differences between MS.

The limit values for the protection of human health apply throughout the whole territory of the Member States. Therefore, areas that do not belong to any zone related to health protection targets should not exist. Consequently, the population living in zones related to those targets should add up to the national total population number. National totals on area and population, provided by Eurostat[8] or the FAO[9], have been used here as a reference. However, small deviations are to be expected in view of the different information sources and deviating census base years.

[8] Eurostat, demographic balance and crude rates, population on 1. January 2009, downloaded on 2 September 2011.
[9] FAO statistical data, total country area in 2009, downloaded on 5 September 2011

Within a deviation of 5%, the total surface area of the health-related zones indeed added up to the national surface area for most of the Member States. For SO_2, NO_2, PM_{10} and ozone, the designated zones are in good agreement throughout the entire EU-27 with only deviations up to 8% in Germany, 12% in France and up to 35% in Italy. For the other components the national area is less well covered, although 19 Member States are in good agreement. In Estonia, France and Italy the coverage is less than 80% for six or more components and in Bulgaria for five.

In addition to a complete coverage of the area, it is more important to have a full coverage of the total population. Compared to previous years, the situation has slightly improved but a full EU-coverage is not yet met. Figure 2 compares the national population with the total population in zones designated for each of the health related objectives. Again, a nearly complete coverage is in general found for SO_2, NO_2, PM_{10} and ozone. Lower coverages are found in the case of benzene and CO. Lead and the 4th DD pollutants have the least coverage.

Excluding the 4th DD pollutants, population-based zone agreement within a 5% deviation has been attained by 22 Member States. Notable exceptions are France, Italy and Estonia, where for several major health protection components less than 80% of the population appears to be residing in designated zones.

For the 4th DD pollutants, the population coverage is also close to 100% in 19 Member States. However, for Estonia, France and Italy the designated zones for all 4th DD pollutants cover less than 60% of the total population. An apparent covering of less than 70% for one or two 4th DD pollutants still exists in Bulgaria, Romania, Latvia and Malta.

Summarizing, 19 of the EU-27 Member States have designated zones which apparently meet the EU criteria of a full coverage of the population. Five Member States still have a lack of agreement, and agreement is very poor in five Member States for the 4th DD pollutants.

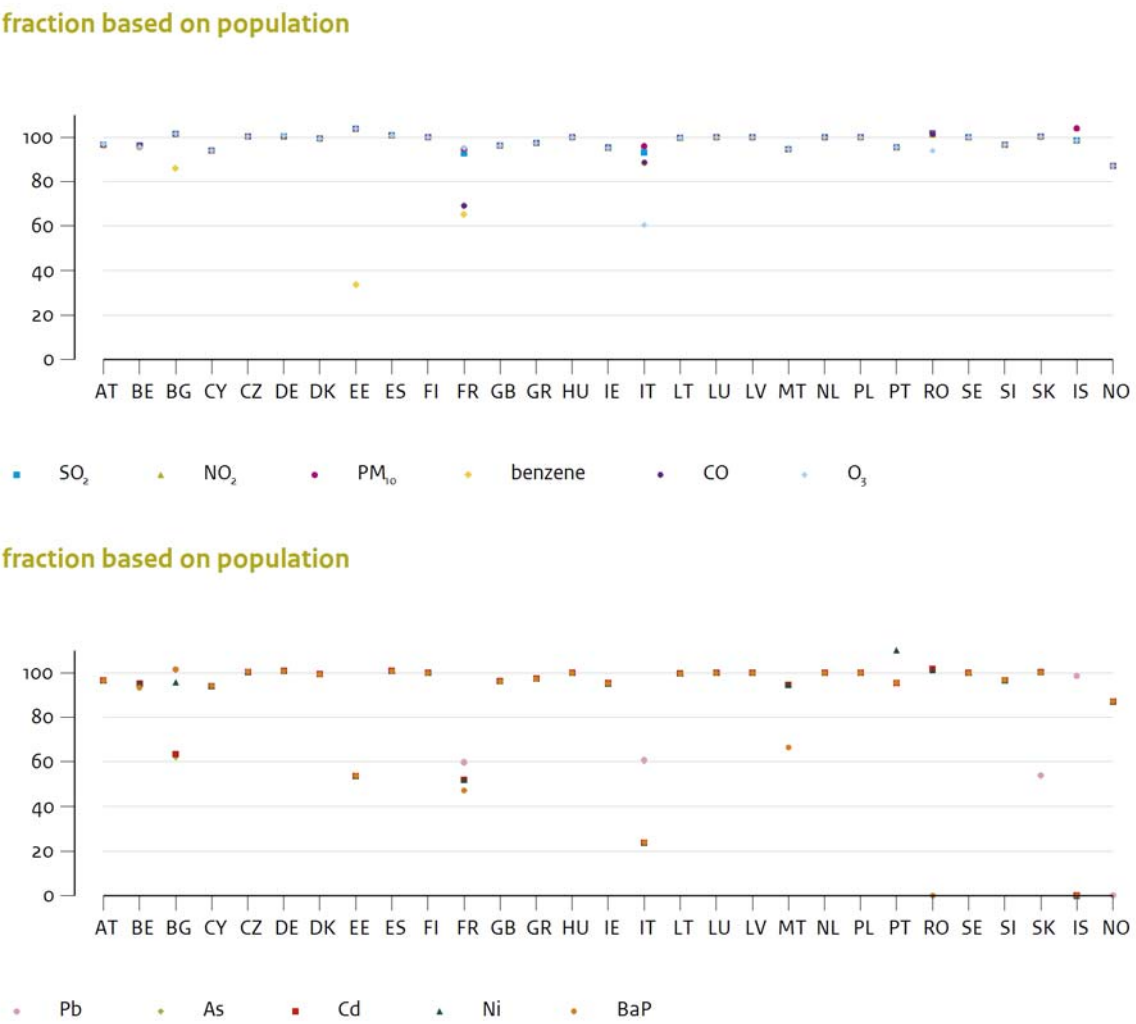
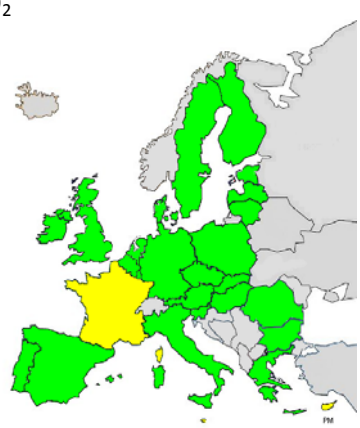


Figure 2a. Total population living in zones designated in relation to health protection targets as fraction of the national population. Note that Switzerland has designated zones for ozone only and is not included in this graph.

SO_2

NO_2

As



PM_{10}

Pb

Cd

benzene

CO

Ni

Ozone

BaP

Figure 2b. Indication of the fraction of population living in zones designated in relation to health protection targets (EU Member States). In the green shaded countries the coverage is more than 95%, in yellow shaded countries the coverage is between 80-95%, in red shaded countries the coverage is less than 80%.

The designation of zones differs widely between the Member States. In the questionnaire the MS do not provide background information on the procedures followed in the designation. An overview of the applied methodologies can therefore not be given; however, by comparing the information on zones, various different approaches can be listed:

- At least two or more zones are defined, also for the smaller MS like Malta or Luxembourg. An exception is Cyprus: one zone designated for all pollutants covers the entire country.
- A number of countries designate the same set of zones for all the pollutants (for example Czech Republic, United Kingdom, the Netherlands, Sweden); this set of zones is generally not changed from year to year (see Table 2).
- Other countries (for example Austria) have defined two or more sets of zones for specific pollutants; these sets are also stable over the years.
- In some Members States (for example Germany and Italy) the designation of zones is not stable and is changed from year to year.
- Frequently, but not in all cases the zone boundaries coincide with administrative boundaries (for example, zone designated for the protection of ecosystems or vegetation may coincide with natural parks)
- Frequently but not in all cases a zone forms a continuous area. Examples of a zone consisting of various scattered areas can be found in Belgium where the medium-sized cities are grouped into one zone BEFS05, similar examples are found in various German Bundesländer (counties).

Using the PM-zone designation as an example, the differences between MS in defining zones is illustrated in Table 3. On average one third of the EU-27 population reside in agglomerations (Table 3) whereas the agglomerations cover only 4% of the total land area. Excluding Cyprus and Luxembourg, which have not defined any agglomeration, and Bulgaria which has designated all zones as agglomerations, the percentage of the population living in agglomerations varies between 12% (Slovakia) to 67% (Malta). Other countries where more than 40% of the population is living in agglomerations are Spain, Portugal and the United Kingdom.

Figure 3 further shows that there are substantial differences between Member States in the population and area size of zones.

Table 3. The percentage of the total population living in agglomerations as defined for PM and the total population per Member State; averaged, maximum and minimum area and population in a PM-zone (data extracted from form 2; population (per 1/1/2009) taken from Eurostat).

	Total population	% population in agglomerations defined for PM	Area in a PM-zone			Population in a PM-zone		
			minimum	average	maximum	minimum	average	maximum
AT	8,355,260	25	198	7,625	19,185	255,000	733,545	1,563,000
BE	10,753,080	23	45	2,710	15,545	14,460	940,933	4,401,250
BG	7,606,551	102[a]	504	18,506	48,063	341,278	1,286,958	2,562,901
CY	796,875	0[b]	9,251	9,251	9,251	750,000	750,000	750,000
CZ	10,467,542	27	230	5,260	11,025	307,700	700,560	1,248,900
DE	82,002,356	34	65	4,132	27,737	58,294	992,315	8,174,148
DK	5,511,451	23	470	14,594	42,682	298,538	1,825,264	4,222,641
EE	1,340,415	34	42	10,884	32,176	46,032	347,900	623,106
ES	45,828,172	52	2	3,666	93,500	3,224	334,710	3,321,265
FI	5,326,314	19	791	24,061	98,984	82,634	380,264	1,033,933
FR	64,369,147	39	25	7,822	82,849	3,069	802,481	9,667,332
GB	61,595,091	41	7	5,516	38,269	27,928	1346,356	8,278,251
GR	11,260,402	39	129	33,007	69,747	800,764	2741,005	3,606,734
HU	10,030,975	25	228	8,457	84,004	49,881	911,907	5,082,969
IE	4,450,030	24	185	17,573	68,482	190,384	1059,962	2,359,940
IT	60,045,068	37	10	2,210	23,093	3,687	446,465	4,711,804
LT	3,349,872	27	157	21,767	64,742	350,452	1,113,152	2,429,824
LU	493,500	0[b]	238	862	2,105	143,697	164,500	201,098
LV	2,261,294	32	307	32,294	64,282	713,016	1130,647	1,548,278
MT	413,609	66	39	158	276	116,933	1,95,707	274,482
NL	16,485,787	31	174	4,616	17,222	234,146	1,831,754	4,907,925
PL	38,135,876	23	28	1,839	7,184	38,737	224,408	1969,479
PT	10,627,250	41	51	3,668	21,903	72,169	406,222	1,740,288
RO	21,498,616	27	112	11,406	36,842	69,816	1,040,406	3,345,119
SE	9,256,347	32	927	75,039	292,645	485,075	1,542,725	2,796,198
SI	2,032,362	19	147	3,379	7,092	114,890	327,339	550,496
SK	5,412,254	12	245	4,904	9,455	193,314	542,393	807,011
EU27	499,705,496	37	2	12415	292645	3069	893,329	9,667,332
IS	319,368	0[b]	26	34342	102000	17563	110,719	200,657
NO	4,799,252	28	465	46258	109474	168601	597,179	1167648

[a] small deviations can be expected in view of the different information sources and deviating census base years.

[b] countries have not defined any agglomeration.

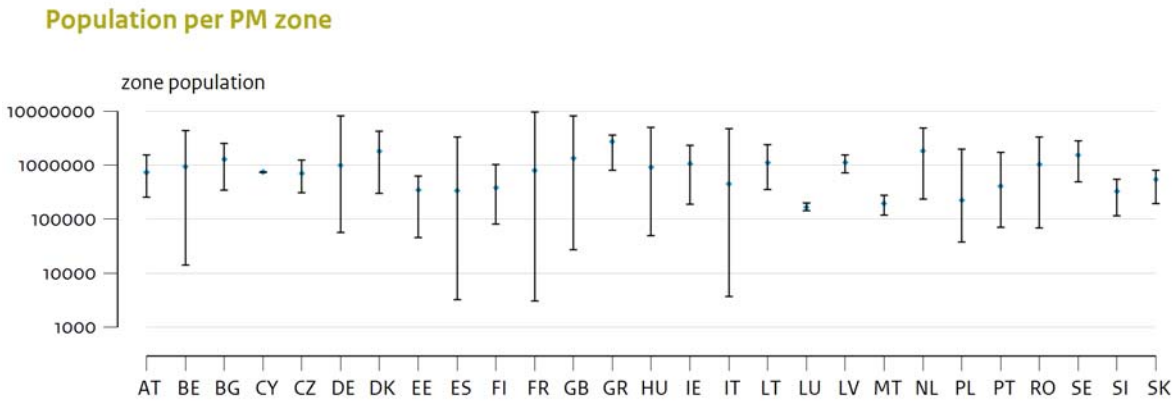


Figure 3a. Number of inhabitants in zones per Member State, data for 2009; the dots indicate the averaged population; the lines indicate the minimum and maximum number of inhabitants per zone. Note: scale is logarithmic.

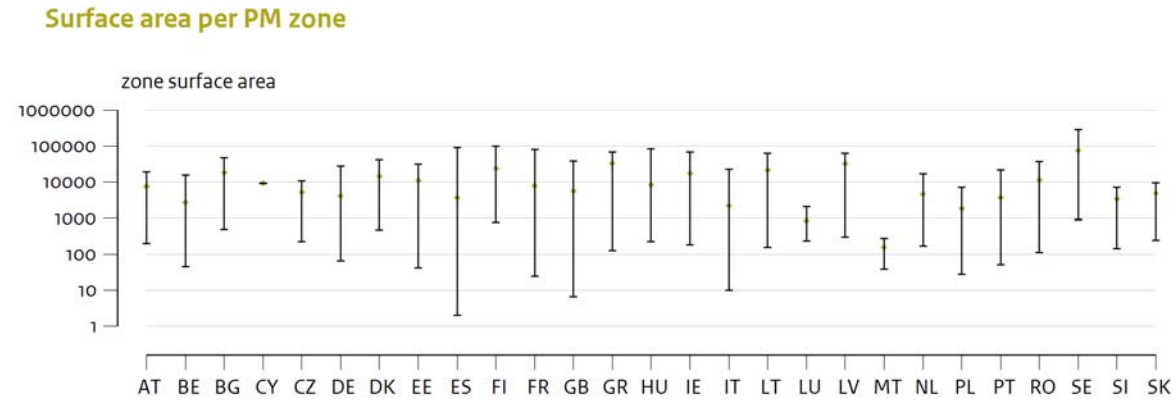


Figure 3b. Surface area of zones per Member State, data for 2009; the dots indicate the averaged area; the lines indicate the minimum and maximum area per zone. Note: scale is logarithmic.

3. Overview of reported Air Quality assessments

If measurements or model calculations indicate that a limit value or limit value plus margin of tolerance is exceeded somewhere in a zone, the whole zone is designated as being in exceedance concerning this threshold. The focus is on pollutants/protection targets, where compliance poses problems. The information presented in this chapter is mainly extracted from forms 2, 8 and 9 of the AQ questionnaire. An overview of the limit and target values is given in Annex II.

- *Please note: The number or percentage of zones in exceedance is a limited indicator for the actual area in exceedance. First of all, the area in exceedance might be the entire zone or just a few hundred square metres at a hotspot. In addition, some Member States have designated a few very large zones for pollutants known to have concentration levels substantially below air quality thresholds in the country. 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.*

In 2009, the percentage of zones in all Member States where the limit value or target value was exceeded, was highest for the daily limit value of PM_{10} and the health-related target value of O_3. The percentages were 34% and 38%, respectively. For the NO_2 annual limit value this percentage was 29% (also above NO_2 margin of tolerance: 24%).

For other pollutants, Annex V gives summaries of the exceedance status of zones per pollutant/protection targets and Member State; more detailed information for each of the zones is listed in Annex V. The final list of zones is available via the following web-link: http://www.eea.europa.eu/data-and-maps/data/zones-in-relation-to-eu-air-quality-thresholds-2/zones-attribute-description/zones-attribute-description/at_download/file

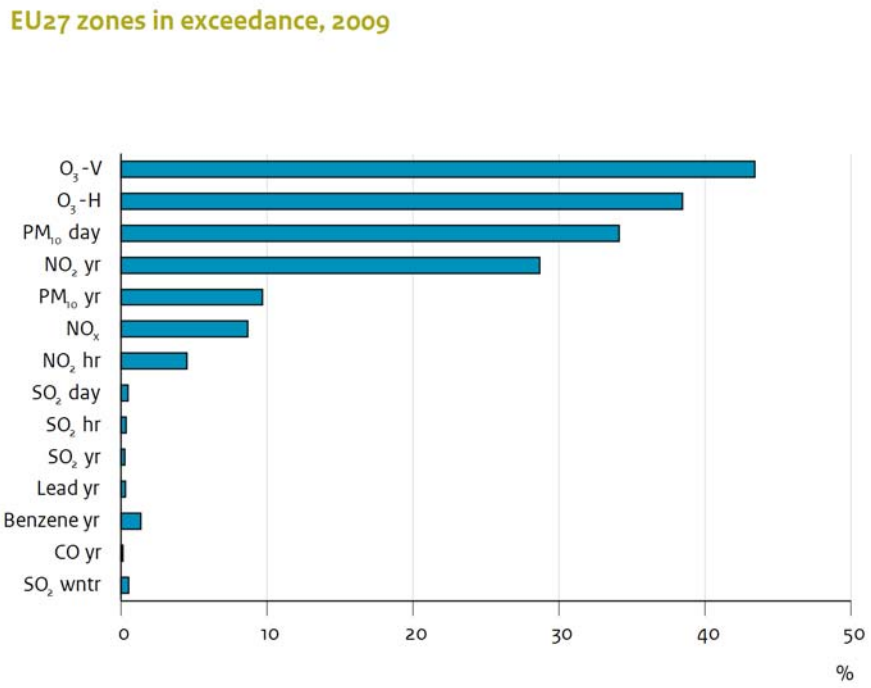


Figure 4a. Fraction of EU-27 zones in exceedance per limit or target value, 2009.

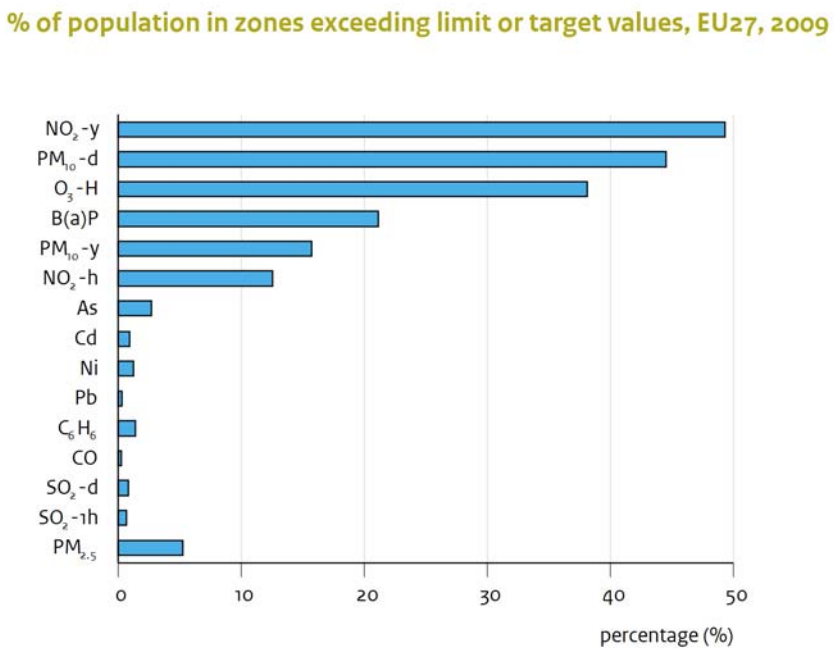


Figure 4b. Fraction of population potentially exposed to concentrations above limit or target values.

3.1. Zones in exceedance maps for PM_{10}, O_3 and NO_2

Figures 5a, 5b and 5c show the EU-27 zone in exceedance maps for the PM_{10} daily limit value the O_3 health-related target value and the NO_2 annual limit value (see also Annex II). White areas in the maps represent areas in Member States, where no zones had been designated. Territories marked yellow are areas where zones had been designated, but no information on the air quality status was reported. In both cases those MS are not fulfilling the criteria of the Directive, as zoning and reporting is mandatory for all health-related pollutants. Red, violet and purple territories are areas where an exceedance occurred:

- exceedance of just the limit value (red);
- exceedance of the limit value but not of the margin of tolerance (violet);
- exceedance of both the limit value and the margin of tolerance (purple).

Marked green are areas for which no exceedances had been reported.

Figure 5a shows exceedances of the PM_{10} daily limit value in a number of urban agglomerations and regions where high PM_{10} levels are well documented by measurements. Examples are the Po Valley in Italy, parts of Central Europe, the German Ruhr area, parts of the Netherlands, northern Belgium and the London area (see for example the monitoring based maps presented in de Smet et al. (2010). However, zones in exceedances can also be found in southern Sweden, Latvia, Greece and the Balkans. Here exceedance has been reported at one or two hot-spot stations resulting in a whole zone in non-compliance.

In EU-27 the O_3 health-related target value was exceeded in a total of 235 zones, see Figure 5b. Similar to the 2008 situation, there are only some remote zones in Europe which do not exceed the long-term objective of 120 $\mu g/m^3$.

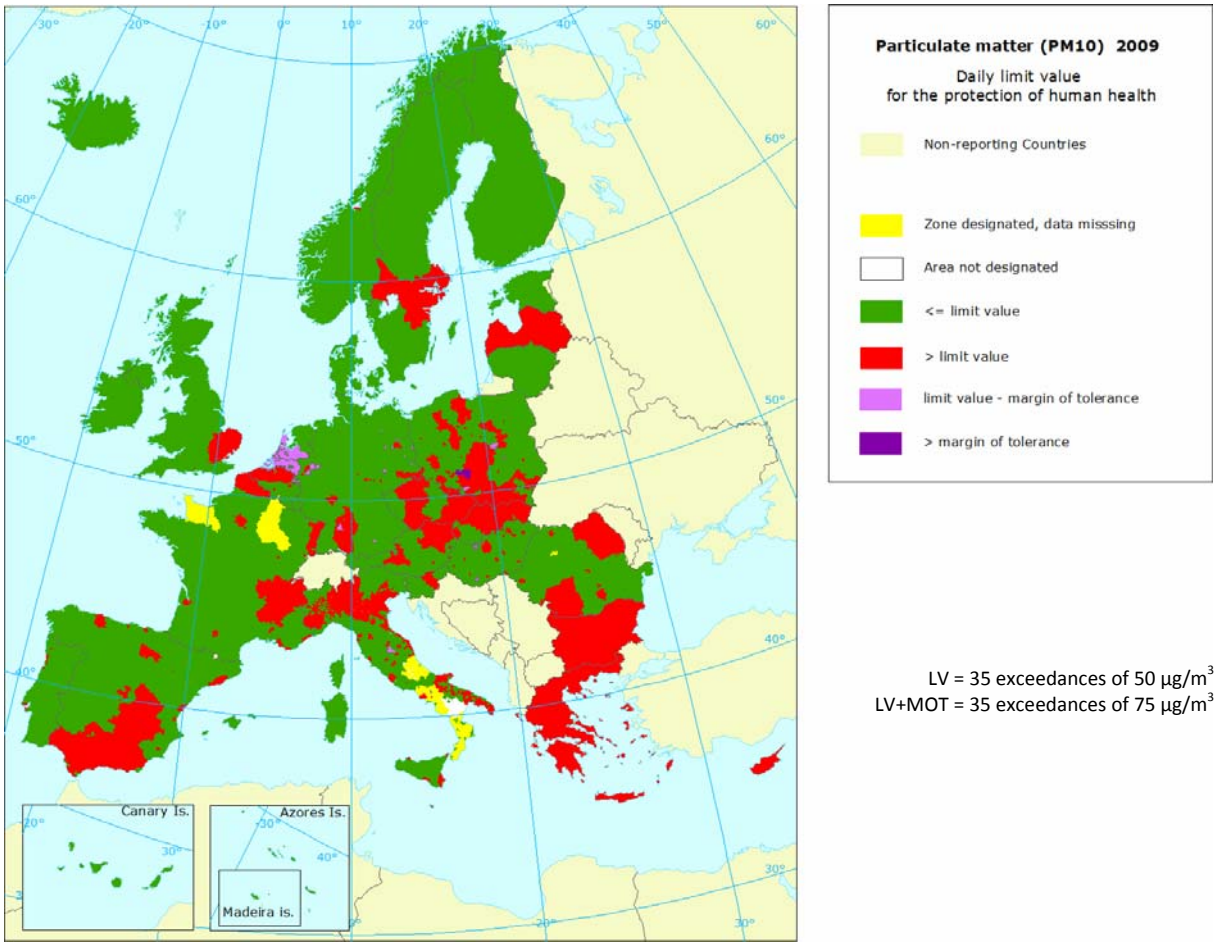


Figure 5a. Zones in exceedance of the daily PM_{10} limit value in 2009.

To help identifying the air pollutant sources of greatest risk to human health, modelling tools can be applied to estimate air quality, as well as population exposure. In Form 19, MS may voluntarily provide modelling information and supplementary assessments. Compared to Form 8 or 9 where the whole zone is declared to be above or below the LV or TV, this Form refines the fraction (and the area) of the population potentially exposed to levels in excess of the limit or target value. For a particular pollutant, air concentrations may vary significantly within an urban area both in time and space. Human activities will also vary in space and time, and also depending on age, gender, and other demographic characteristics. Thus, the information in Form 19 usually improves the estimation of population actually exposed to bad air quality. However, uncertainties remain, as the information is provided on a voluntary basis only and is far from complete, even with respect to single MS.

Form 19 was filled in by several countries. The Czech Republic, France, United Kingdom and the Netherlands provided data addressing all LV/TV. Slovakia (PM_{10} and ozone), Italy (NO_x/NO_2, PM_{10}) and Belgium (As) only provided information on the LV/TV for the pollutant(s) given in parentheses.

By comparing 2009-data with historical data from form 19, an attempt was made to analyse the development in exceedance areas. Since 2005/2006 there is a general tendency towards a reduction in area, road length and population exposed to concentrations above the LV or TV; especially in the Czech Republic the exceedance of the PM_{10} daily limit value was much lower in 2009 compared to previous years. However, since reporting in Form 19 is voluntary, it is not certain whether countries reported exposure data for all zones in exceedance. By comparing the information in the forms 8 and 9 it becomes clear that France and Italy only reported supplementary assessments in relation to

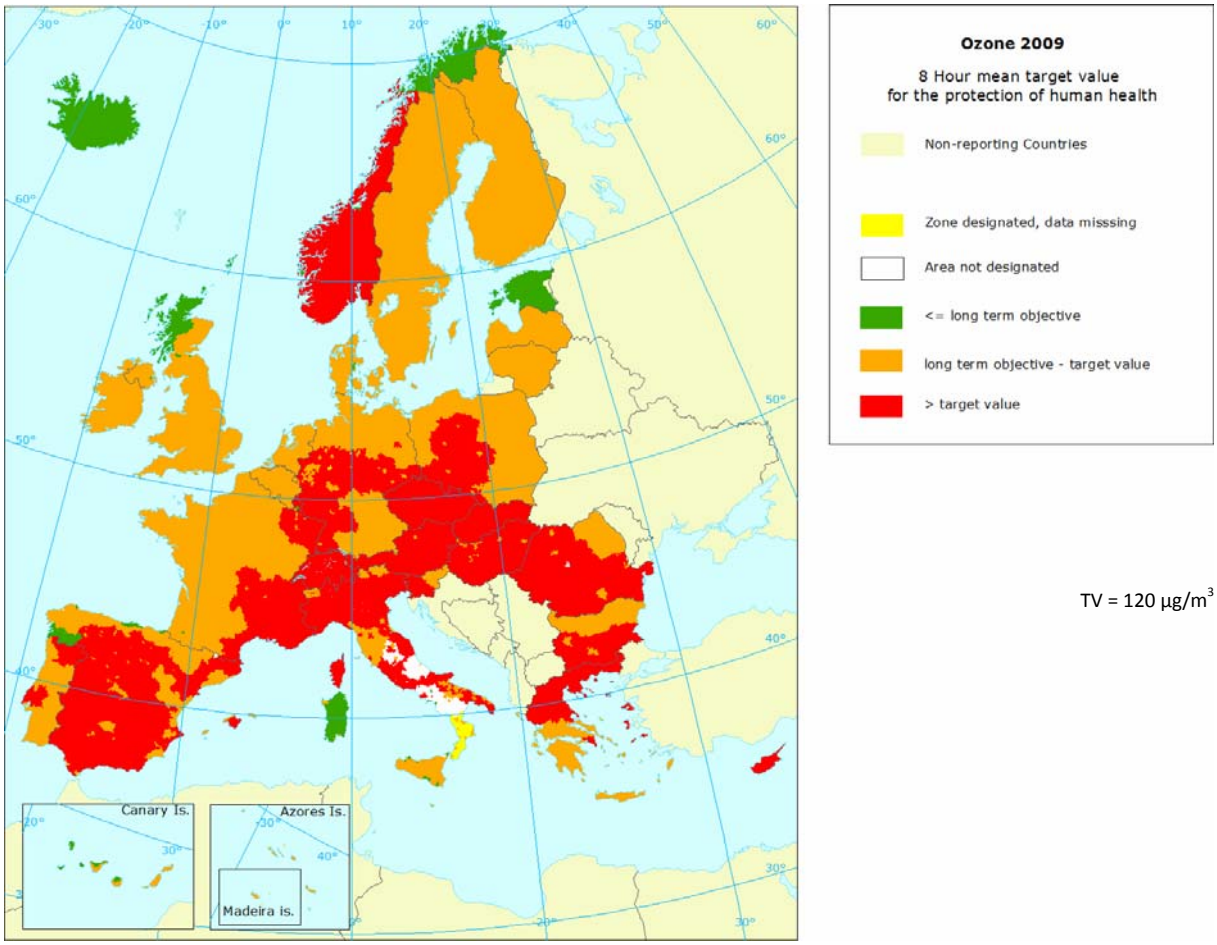


Figure 5b. Zones in exceedance of the health-related target value for ozone.

some exceedances in 2009. The introduction of a PM_{10} equivalence correction method in France in 2007 might be the reason for the strong increase of area in exceedance.

The zones for which the O_3 health target was exceeded are shown in Figure 5b. Of all zones for which the ozone target value was exceeded in 2009 and reporting is based on modelled results, 12 zones are located in Italy and 3 in the Czech Republic. Similar to the 2008 situation, there are only some remote zones in Europe which do not exceed the long term objective.

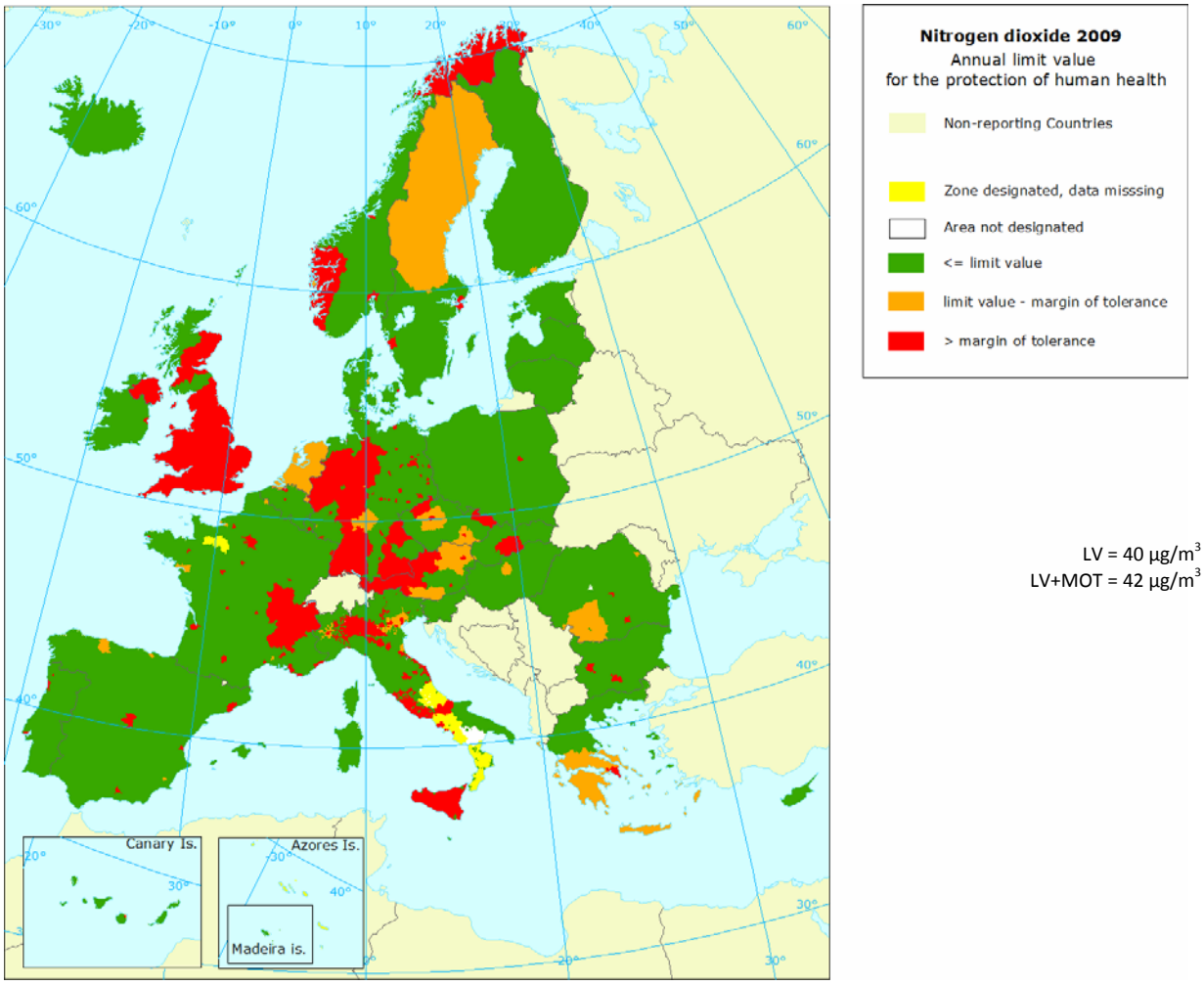


Figure 5c: Zones in exceedance of the annual limit value for NO_2 in 2009.

The most frequently mentioned cause named for exceedance of the annual limit value of NO_2 is local traffic (72%). In 2009, most exceedances of the limit value plus the margin of tolerance in agglomerations occured in Germany (28), the United Kingdom (27) and Italy (25). In Austria, the Czech Republic and Ireland all designated agglomerations exceeded the margin of tolerance in 2009.

3.2. Derogation situations

In three situations a (temporally) exceedance of the limit value is permitted, according to the AQ Directive 2008/50/EC:

(i) Art. 22 allows under specific conditions a temporally exceedance of the limit value;

(ii) when exceedances are attributable to natural sources (Art. 20); and

(iii) when exceedances are attributable to winter-sanding or –salting of roads (Art. 21).

Following Art. 22 in the AQ Directive, Member States having particular difficulties in achieving compliance with the limit values for particulate matter (PM_{10}), nitrogen dioxide or benzene, may request the Commission for a postponement of attainment by a maximum of five years. During the

postponement period the limit values continue to apply plus a margin of tolerance. Derogation is given for individual zones; in all other zones compliance with limit values is required.

A table with all air quality zones in the EU for which exceedances of the PM_{10} limit values have been reported can be found on the European Commission's website[10]. The table covers the years 2005-2007 and informs also whether a notification for time extension has been submitted.

For the daily PM_{10} limit value, time extensions have been granted for 55 zones in the EU Member States. Not in all cases the zone codes given in the derogation requests could be traced in the 2009 questionnaires. Zones in the Czech Republic and Poland were re-numbered in 2008 but a match with the derogation request could be made. Germany provided a separate sheet with information on zones for which exemption has been granted. For the situation in 2008, a few zones in Germany could not be unambiguously matched. From the 55 zones retrieved in the 2009 questionnaires, 21 zones have reported that PM_{10} levels are in compliance with the daily limit value, see Table 4. Time extension has been granted for 10 zones for the annual PM_{10} limit value. In 6 German zones concentrations were reported to be below the annual limit value already in 2008. Once a limit value has been met, air quality should be maintained; this implies that for half of the zones, the granted time extensions for PM_{10} might be withdrawn.

[10] http://ec.europa.eu/environment/air/quality/legislation/time_extensions.htm

Table 4. *Status in zones for which time extension has been granted for annual and daily limit values of PM_{10} (nr=AQ status not retrievable).*

		PM_{10} ALV			PM_{10} DLV	
Zone code	**zone name**	**2008**	**2009**		**2008**	**2009**
AT_02	Kärnten				<lv	<lv
AT_03	Niederösterreich				<lv	>lv
AT_06	Steiermark ohne AG Graz				>lv	<lv
AT_07	Tirol				<lv	<lv
AT_09	Wien				>lv	>lv
AT_40	AG Linz				>lv	<lv
AT_60	Graz				>lv	>lv
CY001A	CYPRUS	>lv	>lv			
CZ031	Jihočeský kraj				>lv	>lv
CZ0640	Jihomoravský kraj				>lv	>lv
DEZAXX0006S	Orte erhöhter verkehrsbedingter Schadstoffbelastung im Land Brandenburg ab 2005				>lv	lv-mot
DEZCXX0007A	Ballungsraum Stuttgart	>lv	lv-mot			
DEZCXX0070S	Gebiet (ohne Ballungsräume) mit PM10-Werten > GW				nr	lv-mot
DEZDXX0001A	Ballungsraum München				>lv	lv-mot
DEZDXX0002A	Ballungsraum Augsburg				>lv	<lv
DEZEIX0107A	Ballungsraum Niedersachsen-Bremen				>lv	<lv
DEZJXX0004A	Köln				<lv	<lv
DEZJXX0005A	Hagen				<lv	<lv
DEZJXX0006A	Essen				<lv	lv-mot
DEZJXX0008A	Dortmund				<lv	lv-mot
DEZJXX0009A	Düsseldorf				>lv	lv-mot
DEZJXX0011A	Aachen				<lv	lv-mot
DEZJXX0014S	Warstein				nr	<lv
DEZJXX0015A	Grevenbroich (Ballungsraum Rheinisches Braunkohlerevier)				nr	<lv
DEZNXX0001A	Leipzig				>lv	lv-mot
DEZOXX0005S	Harz				<lv	<lv
DEZPXX0008S	Gebiet Thüringen 1				>lv	lv-mot
ES0705	COMARCA DE PUERTOLLANO				>lv	<lv
FR16A00001	Strasbourg				>lv	>lv
HU0001	Budapest region	<lv	<lv			
HU0002	Győr-Mosonmagyaróvár				<lv	<lv
HU0003	Komárom-Tatabánya-Esztergom				<lv	lv-mot
HU0006	Pécs region				<lv	lv-mot
HU0008	Sajó valley	lv-mot	<lv			
HU0009	Debrecen region				<lv	<lv
HU0011	Allotted cities	lv-mot	<lv			
IT0201	Zona di risanamento				<lv	<lv
IT1001	Area metropolitana di Perugia				>lv	lv-mot
IT1101	Zona A	<lv	lv-mot		>lv	>lv
IT1203	Z2				<lv	<lv
IT1504	Zona di risanamento – area beneventana				>lv	lv-mot
NL0100	Noord				<lv	<lv
NL0200	Midden	<lv	<lv		>lv	lv-mot
NL0210	Amsterdam/Haarlem	<lv	<lv		>lv	lv-mot
NL0220	Utrecht	<lv	<lv		>lv	lv-mot
NL0230	Den Haag/ Leiden				>lv	lv-mot

NL0240	Rotterdam/ Dordrecht	<lv	<lv		>lv	lv-mot
NL0300	Zuid				>lv	lv-mot
NL0310	Eindhoven				>lv	<lv
NL0320	Heerlen/ Kerkrade				<lv	<lv
PL.14.15.z.03	strefa pruszkowsko-żyrardowska				>lv	lv-mot
PL.14.04.m.01	miasto Radom				>lv	lv-mot
PL.16.05.z.03	strefa namysłowsko-oleska				>lv	>lv
PL.16.01.p.01	powiat kędzierzyńsko-kozielski				>lv	lv-mot
PL.30.12.z.03	strefa ostrowsko-kępińska				<lv	<lv
UK0001	Greater London Urban Area				>lv	>lv
SKKO02	Košický kraj				>lv	>lv
SKPR01	Prešovský kraj				>lv	>lv
SKTN01	Trnavský kraj				>lv	<lv
SKTR01	Trenčiansky kraj				>lv	>lv

Reporting by the MS of exceedances of the PM_{10} limit values attributable to natural sources

Correction of exceedances attributable to natural sources is possible for PM_{10} and SO_2. None of the Member States informed on SO_2 events. Norway listed one zone in Form 21 (correction of SO_2 limit value for ecosystems, winter mean) but did not report the estimated concentration after subtraction of the natural contribution.

Correction of the daily and annual limit value for PM_{10} is applied by a number of Member States; contributions by desert dust and/or sea salt were the major natural sources. The highest number of PM_{10} exceedances per station due to natural sources was reported by Mediterranean Member States (Cyprus, Spain and Greece). Table 5 lists the zones where after subtraction of the natural contributions the air quality assessments changed from “above limit value “to “below limit value”. Note that the French zone of Réunion (FR38N00001) is part of France d’outre-mer.

Table 5. *Influenced exceedances of PM_{10} limit values by correction of the natural contribution.*

daily limit value					
MS	Zone code	Zone	MS	Zone code	Zone
CY	CY001A	CYPRUS	ES	ES1016	L'HORTA
ES	ES0103	ZONA INDUSTRIAL DE HUELVA	ES	ES1705	LA RIOJA
ES	ES0109	ANDALUCIA-NÚCLEOS DE 50.000 A 250.000 HABITANTES	FR	FR38N00001	Reunion
ES	ES0115	ANDALUCIA-ZONAS RURALES	GB	UK(GIB)	Gibraltar
ES	ES0602	COMARCA DE TORRELAVEGA	GB	UK0029	Eastern
ES	ES0713	RESTO DE CASTILLA-LA MANCHA 4	GB	UK0019	Southampton Urban Area
ES	ES0902	VALLÈS-BAIX LLOBREGAT	GR	EL0001	Βόρεια Ελλάδα
ES	ES0903	PENEDÈS - GARRAF	GR	EL0002	Νότια Ελλάδα
ES	ES1003	MIJARES-PEÑAGOLOSA . ÁREA COSTERA	MT	MT0001	Maltese Agglomeration
ES	ES1602	BAJO NERVION	PT	PT2003	Zona de Influência de Estarreja

annual limit value					
MS	Zone code	Zone	MS	Zone code	Zone
CY	CY001A	CYPRUS	FR	FR38N00001	réunion
ES	ES0118	GRANADA Y ÁREA METROPOLITANA	GR	EL0002	Νότια Ελλάδα
ES	ES0205	ZARAGOZA	GR	EL0003	Οικισμός Αθήνα
ES	ES0902	VALLÈS-BAIX LLOBREGAT	GR	EL0004	Οικισμός Θεσσαλονίκη
ES	ES0903	PENEDÈS - GARRAF	MT	MT0001	Maltese Agglomeration
ES	ES1308	MADRID-CORREDOR DEL HENARES			

Contribution of winter-sanding and -salting

Latvia and Romania reported on corrections due to winter sanding on PM_{10} exceedances in Form 24 However, after the correction the exceedances remained.
No requests were made for correcting PM_{10} exceedances due to contributions by winter-salting.

Exceedances of previous limit values

Previous limit values (Directive 85/203/EEC) remain in force until the new ones set in the first Daughter Directive (now included in the AQ Directive) take over. Until 1 January 2010 this applied only to the previous NO_2 limit value. This old limit value for the 98-percentile NO_2 of 200 µg/m^3 was exceeded in 8 zones in 2009 (extracted from form 26); 6 of these zones were situated in Bulgaria and 2 in Germany. For all the zones air quality plans have been compiled.

4. Overview of available information on $PM_{2.5}$

Summary

- The number of $PM_{2.5}$ monitoring stations still increased in 2009; nearly all stations also report data under the EoI.
- Designation of stations used for the determination of the averaged exposure indicator (AEI) is far from complete. The number of (sub)urban background stations is in line with the requirements for determining the AEI but the representativeness of the stations for estimating population exposure can not yet be judged.
- Concentrations above 25 µg/m^3 (target value to be met in 2010, limit value to be met in 2015) are observed at about 9% of the stations in 11 Member States.
- Estimates of the exposure concentration obligation (based on all available (sub)urban background stations) are in 7 Member States above 20 µg/m^3, the level legally binding in 2015.

This chapter gives a preliminary overview of the $PM_{2.5}$ information reported by the Member States in their annual questionnaire and EoI submission. $PM_{2.5}$ reporting is still not mandatory for 2009 data. An overview of the $PM_{2.5}$ monitoring networks in the MS is presented in Table 6 (extracted from Form 3).

Table 6. *Number of $PM_{2.5}$ stations in EU Member States as reported in the questionnaire, number of stations labelled as being used to determine the AEI, number of stations as reported to AirBase having data for 2009 (number of (sub)-urban background stations in parentheses), population living in agglomerations and a summary of the applied measurement method[(a)].*

MS	Number of stations	Used for AEI	Number of stations in AirBase(c)	Urban population [(b)]	Measurement method				
					Beta ab-sorption	Gravi-metric	TEOM	TEOM-FDMS	Other, un-specified
AT	13		13 (6)	2.1 - 5.6	0	11	0	2	0
BE	32		34 (11)	2.4 - 10.2	3	5	0	10	14
BG	9		7 (5)	7.7 - 5.4	5	4	0	0	0
CY	5		5 (4)	0 - 0.6	0	0	0	0	0
CZ	31		33 (19)	2.8 - 7.5	23	8	0	0	0
DE	109		112 (52)	28.1 - 60.8	49	43	9	0	13
DK	8	3	10 (4)	1.3 - 4.7	8	0	3	0	0
EE	3		6 (3)	0.5 - 0.9	3	0	0	0	0
ES	130	25	150 (53)	23.4 - 34.4	37	68	13	0	12
FI	9	1	10 (4)	1 - 3.3	5	0	5	0	1
FR	85	33	81 (60)	25.6 - 47.9	0	0	2	83	0
GB	68	51	72 (46)	25.5 - 54.9	1	5	5	62	0
GR	4		4 (2)	4.3 - 6.8	4	0	0	0	0
HU	3		3 (1)	2.5 - 6.8	3	0	0	0	0
IE	5	2	5 (2)	1 - 2.7	0	3	0	2	0
IT	81		107 (43)	24.6 - 40.1	64	15	2	0	0
LT	7	3	7 (3)	0.9 - 2.3	3	4	0	0	0
LU	3		3	0 - 0.4	0	0	3	0	0
LV	7	2	7 (2)	0.7 - 1.5	7	0	0	0	0
MT	3		3 (1)	0.3 - 0.4	2	0	0	1	0
NL	29	13	29 (14)	5.1 - 13.5	0	29	0	0	0
PL	46	32	31 (28)	9 - 23.3	6	37	3	0	0
PT	24	6	23 (8)	4.4 - 6.3	23	1	0	0	0
RO	24	24	24 (23)	5.7 - 11.6	0	24	0	0	0
SE	16		15 (6)	2.9 - 7.7	0	7	6	3	0
SI	4		4 (2)	0.4 - 1	0	4	0	0	0
SK	3		4 (3)	0.7 - 3	0	0	0	3	0
IS	6		6 (3)		6	0	0	0	0
NO	18		15 (3)		0	0	0	0	18
Total	785	195	696 (127)		252	268	51	166	58

(a) note that due to parallel measurements the total number of instruments exceeds the total number of stations; information on measuring method is extracted from form 3 of the questionnaire.

(b) range in urban population; number on the left is the total urban population in agglomerations, number on the right is extracted from the UN-World Urbanisation Prospect (data for 2008).

(c) The stations in AirBase are not necessarily the same as in the questionnaire, see Chapter 6.

All Member States, Iceland and Norway reported in From 18 for 2009 on the $PM_{2.5}$ levels at 689 stations (456 stations for 2008). For nearly all stations listed in the questionnaire are monitoring data also reported under the EoI. Notable exceptions emerged for France: for more than 20 stations listed in the questionnaire monitoring data has not been submitted to AirBase. Figure 6 summarises the reported concentrations: the target value of 25 µg/m^3, to be met in 2010, is exceeded at about 9% of the monitoring stations in 11 Member States in 2009.

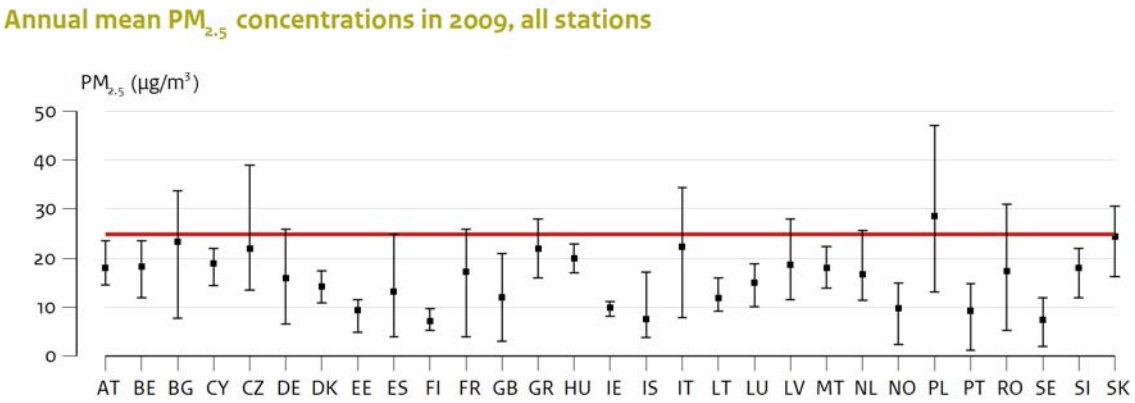


Figure 6. Annual mean (and maximum/minimum value) of $PM_{2.5}$ in 2009 per country. The red line corresponds to the target value of 25 µg/m^3 to be met in 2010 (data extracted from Form 18).

An overview of the measurement methods is given in Figure 7 and Table 6. 12 Member States have identified stations used for the determination of the Average Exposure Indicator (AEI). These stations should be representative for the exposure of the population and in AirBase a classification as "(sub)urban background" is expected. Surprisingly, eight stations are classified as "urban industrial" or have an unknown classification. This issue will have to be followed up. At 26 stations identified as AEI-station 2009 $PM_{2.5}$ data was not reported in AirBase.

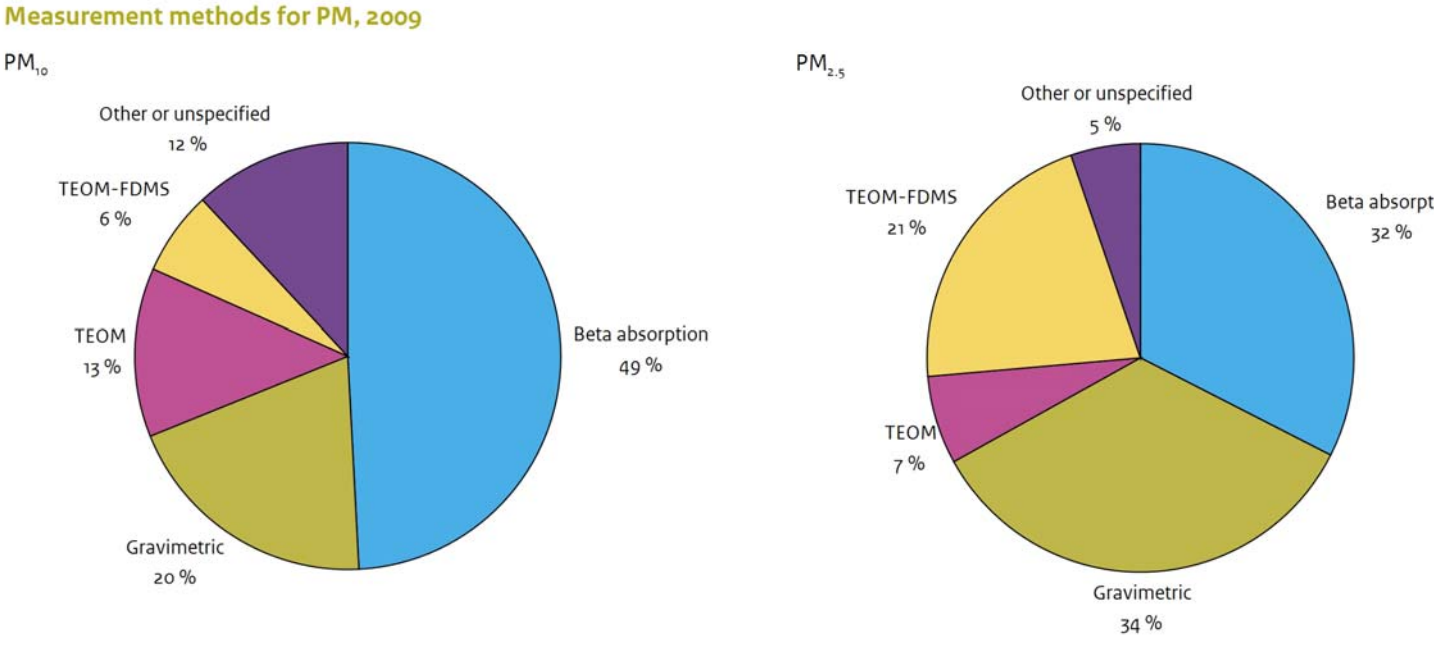


Figure 7. Measurement methods used for PM sampling (data extracted from Form 3).

The Air Quality Directive sets requirements for the number of stations for the assessment of the AEI: a minimum of one sampling point per million inhabitants summed over agglomerations and additional urban areas with more than 100,000 inhabitants should be operational. To estimate the required number of AEI stations, information on the population living in agglomerations can be used. However, as some larger cities with more than 100,000 inhabitants might not be part of an

agglomeration.Thus, this estimate gives only indications for a minimum number of stations required. An upper estimate might be based on the total urban population within a Member State. This information (data for 2008) was taken from the World Population Prospect (UN, 2009).
For most of the Member States the number of (sub)urban background stations operational in 2009 (Table 6; extracted from AirBase) falls in general in the range of AEI stations required according to the two estimates of urban population mentioned above. However, from this limited analysis it can not be concluded whether the stations are representative for the population exposure throughout the territory of the Member State.

4.1. First estimate of the exposure concentration obligation

As not all Member States have yet provided information on the selected set of AEI- stations, a first estimate of the exposure concentration obligation has been made on basis of data available in AirBase. The three-year running mean (2007-2009) has been calculated as the mean of the annual averaged concentration over all operational (sub)urban background stations in each individual year. Please note that the approximated levels (Figure 8) are not based on a stable set of stations. For a number of countries results are based on data for two or one year only. Figure 9 indicates that in 7 Member States current urban concentrations are above the levels of 20 µg/m^3, legally binding in 2015.

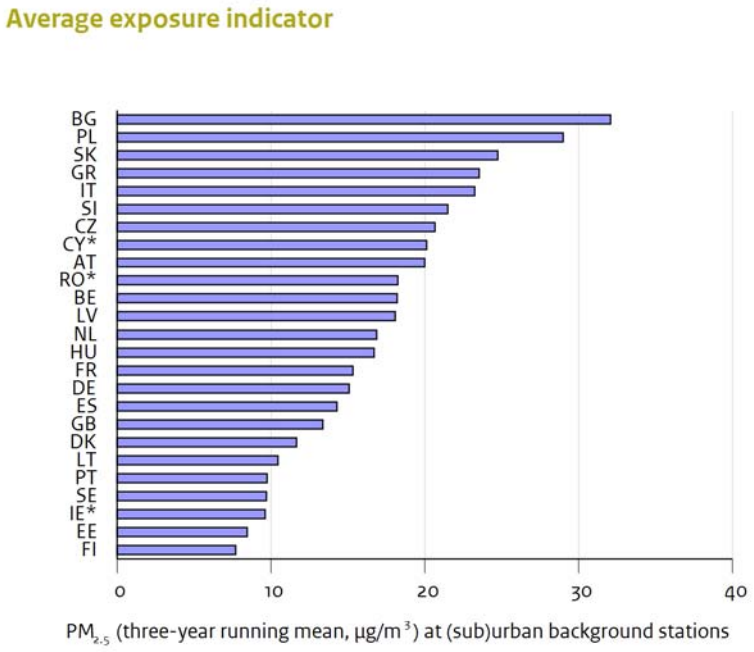


Figure 8. Average exposure indicator. Three-year running mean (2007-2009) over all operational (sub)urban background stations. Results for countries marked with an asterisk are based on 2009 data only.

5. Monitoring networks

5.1. Stations related to health protection targets

The Air Quality Directive and the 4th Daughter Directive list criteria for determining the minimum number of monitoring stations per zone. The minimum number of stations per zone depends on:

(1) the exceedance of the upper or lower assessment threshold (the assessment regime) specified in the directives;
(2) the population density of the zone;
(3) the agglomeration status and
(4) on whether the information from the fixed station is supplemented by information from modelling and/or indicative measurements.

Further, Member States have to assess the air quality in the vicinity of point sources, but the directives do not specify the number of stations needed for such an assessment.
The information in the questionnaire and Exchange of Information Decision is insufficient to fully assess the four criteria given above. Information on the assessment regime (given in Form 10) is voluntary; additional information is available from AirBase but not for all zones. The population data (form 2) is, although also voluntary, nearly complete for all zones. Whether supplementary information and whether the conditions set out in Art 7 or 10 of the AQ Directive are met, cannot be monitored sufficiently for each zone. Therefore, a check on compliance with the obliged minimum number of stations in zones cannot be made without collecting additional information from the Member States. In the previous report a preliminary assessment was presented (Jimmink et al., 2010). As this assessment was based on a (possibly) incomplete set of information, the presented conclusion might be erroneous.

6. Comparison with EoI information

The Exchange of Information Decision requires that for all stations used for compliance checking (that is, all stations listed in the questionnaire) meta-information and concentration data have to be submitted. A comparison of the information in the questionnaire and in AirBase shows that for the stations listed in Form 3 almost 99 % can be retrieved from AirBase. The agreement for ozone stations (Form 4) is nearly complete (more than 99.8%).
When matching at the level of a measurement configuration (that is, checking whether the 2009 concentration data of a station/pollutant combination listed in Form 3 or 4 is available from AirBase) larger differences are found, see Figure 9. For the classical pollutants (SO_2, NO_2, PM_{10}, CO, O_3) for nearly all measurement configurations the concentrations data are also included in the national EoI submissions (more than 95%). For $PM_{2.5}$, benzene and the pollutants in the 4th Daughter Directive a positive match between the two data flows could be found in 69 to 92% of the cases.

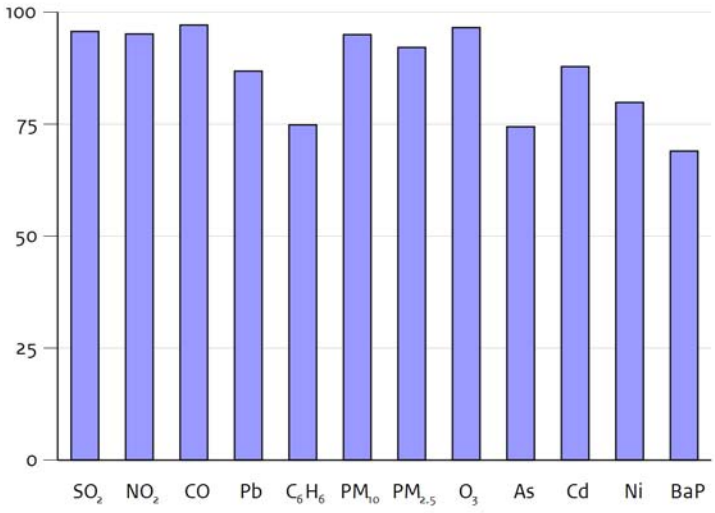


Figure 9. Fraction of measurement configurations listed in Form 3 and 4 for which 2009 monitoring data is available in AirBase.

The AQ Directive prescribes a reference method for each of the pollutants. In Form 3, the measurement method for PM_{10} and $PM_{2.5}$ is requested (see Chapter 4, Figure 6). For the other pollutants information on the measurement methods is available from AirBase. Table 7 lists the reported method for those stations which are reported in the questionnaire and which are traceable in AirBase. At the majority of the stations the reference method is applied. When a non-reference method is used, the questionnaire does not provide any further information on how equivalence with the reference method has been demonstrated.

Table 7. *Fraction (in %) of the reference method used at stations reporting under the questionnaire*.

	SO_2	NO_2	CO	benzene	ozone
reference	88	89	87	79	94
others	7	6	4	9	2
unknown/not reported	5	5	9	12	4

With respect to the heavy metals (HM) and BaP, the reference methods are mostly used for the analytical part. The AQ Directive prescribes that these pollutants should be measured as constituent parts of particulate matter (PM_{10}). By matching the information given in the questionnaire with the one in AirBase it is shown that PM_{10} sampling is used at 33 – 80% of the stations[11]. For the other situations the size fraction is unknown; it could be larger or smaller than 10 micron.

To test the agreement between the questionnaire and the AirBase data flows the reported exceedances of the annual limit value of PM_{10} was selected as an example (as given in Form 11j; this form in principle only lists exceedances of ALV). In total there were 162 data sets and Figure 10

[11] For lead, arsenic, cadmium, nickel and B(a)P the fraction of station with PM_{10}- sampling is 33, 47, 51, 52 and 80%, respectively.

shows that agreement between the two data flows is excellent. Most data points are located on the 1:1 line. Small variations are found resulting from rounding; in the questionnaire the reported numbers are usually rounded towards the nearest integer value, in Airbase data is not rounded. The format of the questionnaire is an unprotected excel spreadsheet; mistakes while filling in the data cannot be excluded.
For three stations that report an exceedance in the questionnaire a match with AirBase is possible but for these stations no PM_{10} data is reported to AirBase. Further, for about one third of the stations (48 out of 162) the data coverage is less than the required 90%.

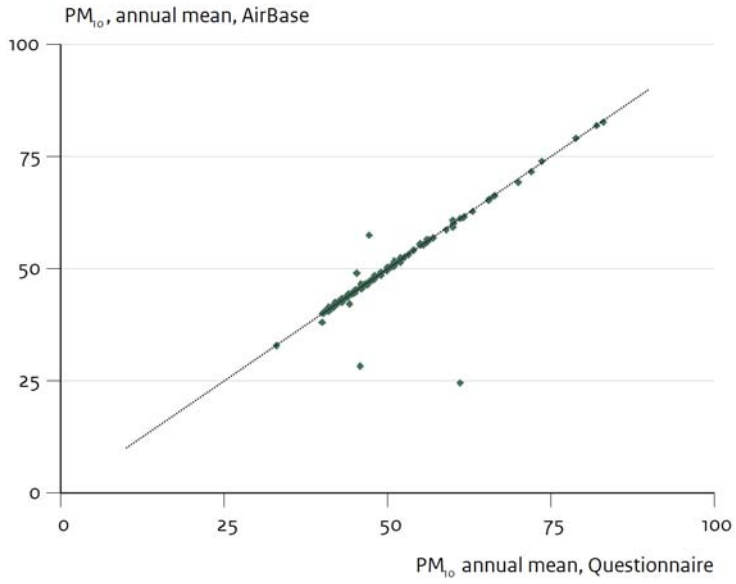


Figure 10. Comparison between the PM_{10} annual mean concentrations as reported in the questionnaire and AirBase, reference year 2009. The 1:1- line is given.

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Mol W.J.A., P.R. van Hooydonk and F.A.A.M. de Leeuw (2011). The state of the air quality in 2009 and the European exchange of monitoring information in 2010. ETC/ACM Technical paper 2011/1. http://acm.eionet.europa.eu/reports/ETCACM_TP_2011_1_EoI_AQ_meta_info2009

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Annex I: List of forms in AQ questionnaire

Form 0	General information, update history
Form 1	Contact body and address
Form 2	Delimitation of zones and agglomerations
Form 3	Stations and measuring methods used for assessment under first, second and fourth DD
Form 4	Stations used for assessment of ozone, including nitrogen dioxide and nitrogen oxides in relation to ozone
Form 5	Stations and measuring methods used for the assessment of recommended volatile organic compounds (3rd DD) and other relevant PAH and metals in ambient air and deposition (4th DD)
Form 6	Stations and measurement methods used for the assessment of other ozone precursor substances
Form 7	Methods used to sample and measure PM_{10} and $PM_{2.5}$, ozone precursor substances, arsenic, cadmium, nickel, mercury, PAH: optional additional codes to be defined by the Member State
Form 8	List of zones and agglomerations where levels exceed or do not exceed limit values or limit values plus margin of tolerance for pollutants listed in first and second DD
Form 9	List of zones and agglomerations where levels exceed or do not exceed target values or long term objectives for ozone and arsenic, cadmium, nickel, B(a)P and $PM_{2.5}$
Form 10	List of zones and agglomerations where levels exceed or do not exceed upper assessment thresholds or lower assessment thresholds, including information on the application of supplementary assessment methods
Form 11	Individual exceedances of limit values and limit values plus the margin of tolerance of pollutants listed in first and second DD
Form 12	Reasons for individual exceedances: optional additional codes to be defined by the Member State
Form 13	Individual exceedances of ozone thresholds
Form 14	Exceedance of target values of ozone, arsenic, cadmium, nickel, benzo(a)pyrene and $PM_{2.5}$
Form 15	Annual statistics of ozone, arsenic, cadmium, nickel, and benzo(a)pyrene
Form 16	Annual average concentrations of ozone precursor substances of mercury and other relevant PAH and deposition rates of mercury and other relevant PAH
Form 17	Monitoring data on 10 minutes mean SO_2 levels
Form 18	Monitoring data on 24hr mean $PM_{2.5}$ levels
Form 19	Tabular results of and methods used for supplementary assessment
Form 20	List of references to supplementary assessment methods referred to in Form 19
Form 21	Exceedance of limit values for SO_2 due to natural sources
Form 22	Natural SO_2 sources: optional additional codes to be defined by Member State
Form 23	Exceedance of limit values of PM_{10} due to natural events
Form 24	Exceedance of limit values of PM_{10} due to winter sanding
Form 25	Consultations with other MS on transboundary pollution
Form 26	Exceedances of limit values laid down in Directives 85/203/EEC
Form 27	Reasons for exceedances of limit values laid down in Directives 85/203/EEC: optional additional codes to be defined by the Member State

Annex II. Air Quality Standards

Under EU law a limit value is legally binding from the date it enters into force subject to any exceedances permitted by the legislation. A target value is to be attained as far as possible by the attainment date. The table below shows the EU air quality standards.

Pollutant	Concentration	Averaging period	Legal nature	Permitted exceedances each year
Fine particles ($PM_{2.5}$)	25 µg/m^3 25 µg/m^3	1 year	Target value entered into force 1.1.2010 Limit value enters into force 1.1.2015	n/a
Sulphur dioxide (SO_2)	350 µg/m^3	1 hour	In force	24
	125 µg/m^3	24 hours	In force	3
Nitrogen dioxide (NO_2)	200 µg/m^3	1 hour	Limit value entered into force 1.1.2010	18
	40 µg/m^3	1 year	Limit value entered into force 1.1.2010*	n/a
PM_{10}	50 µg/m^3	24 hours	In force**	35
	40 µg/m^3	1 year	In force**	n/a
Lead (Pb)	0.5 µg/ m^3	1 year	In force	n/a
Carbon monoxide (CO)	10 mg/ m^3	Maximum daily 8 hour mean	In force	n/a
Benzene	5 µg/ m^3	1 year	Limit value enters into force 1.1.2010**	n/a
Ozone	120 µg/ m^3	Maximum daily 8 hour mean	Target value enters into force 1.1.2010	25 days averaged over 3 years
Arsenic (As)	6 ng/ m^3	1 year	Target value enters into force 31.12.2012	n/a
Cadmium (Cd)	5 ng/ m^3	1 year	Target value enters into force 31.12.2012	n/a
Nickel (Ni)	20 ng/ m^3	1 year	Target value enters into force 31.12.2012	n/a
Polycyclic Aromatic Hydrocarbons	1 ng/ m^3 (expressed as concentration of Benzo(a)pyrene)	1 year	Target value enters into force 31.12.2012	n/a

**Under the Directive 2008/50/EC the Member State can apply for an extension of up to five years (i.e. maximum up to 2015) in a specific zone. Request is subject to assessment by the European Commission. In such cases within the time extension period the limit value applies at the level of the limit value plus maximum margin of tolerance (48 µg/m^3 for annual NO_2 limit value).*

***Under the Directive 2008/50/EC the Member State can apply for an extension until three years after the date of entry into force of the Directive (i.e. June 2011) in a specific zone. Request is subject to assessment by the European Commission. In such cases within the time extension period the limit value applies at the level of the limit value + maximum margin of tolerance (35 days at 75µg/m^3 for the daily PM_{10} limit value, 48 µg/m^3 for the annual PM_{10} limit value).*

For NO_2 and benzene the following limit values plus margin of tolerance apply in 2009:

NO_2	hourly limit value	LV+MoT = 210 µg/m^3
NO_2	annual limit value	LV+MoT = 42 µg/m^3
Benzene	annual limit value	LV+MoT = 6 µg/m^3

The Air Quality Directive is introducing additional $PM_{2.5}$ objectives targeting the **exposure** of the population to fine particles. These objectives are set at the national level and are based on the average exposure indicator (AEI).

AEI is determined as a 3-year running annual mean $PM_{2.5}$ concentration averaged over the selected monitoring stations in agglomerations and larger urban areas, set in urban background locations to best assess the $PM_{2.5}$ exposure to the general population.

Title	Metric	Averaging period	Legal nature	Permitted exceedances each year
$PM_{2.5}$ Exposure concentration obligation	**20 µg/m^3 (AEI)**	**Based on 3 year average**	**Legally binding in 2015 (years 2013,2014,2015)**	**n/a**
$PM_{2.5}$ Exposure reduction target	**Percentage reduction* + all measures to reach 18 µg/m^3 (AEI)**	**Based on 3 year average**	**Reduction to be attained where possible in 2020, determined on the basis of the value of exposure indicator in 2010**	**n/a**

Depending on the value of AEI in 2010, a percentage reduction requirement (0, 10, 15, or 20%) is set in the Directive. If AEI in 2010 is assessed to be over 22 µg/m^3, all appropriate measures need to be taken to achieve 18 µg/m^3 by 2020

Critical levels set for the protection of ecosystems and vegetation:

Title	Metric	Averaging period	Legal nature	Permitted exceedances each year
SO2	**20 µg/m^3**	**Calendar year and winter (1 October to 31 March)**	**In force**	**n/a**
NOx	**30 µg NOx/m^3**	**Calendar year**	**In force**	**n/a**
O3	**AOT40 18000 (µg/m^3).h**	**Period May to July averaged over 5 years**	**Target value to be met by 1-1-2010**	**n/a**
	AOT40 6000 (µg/m^3).h	**Period May to July**	**Long term objective, Date by which the LTO should be met is not defined**	**n/a**

Annex III. Exceedance maps

This section shows exceedance maps for all targets, except for the PM_{10} daily and O_3 health targets which have been included in Figures 4 and 5 in Chapter 3.
The white areas in the maps represent areas in Member States that were not designated into zones. The yellow areas were designated into zones, but air quality status was not reported on. For health related problems in both cases Member States did not comply with the Directive as zoning and reporting is mandatory.

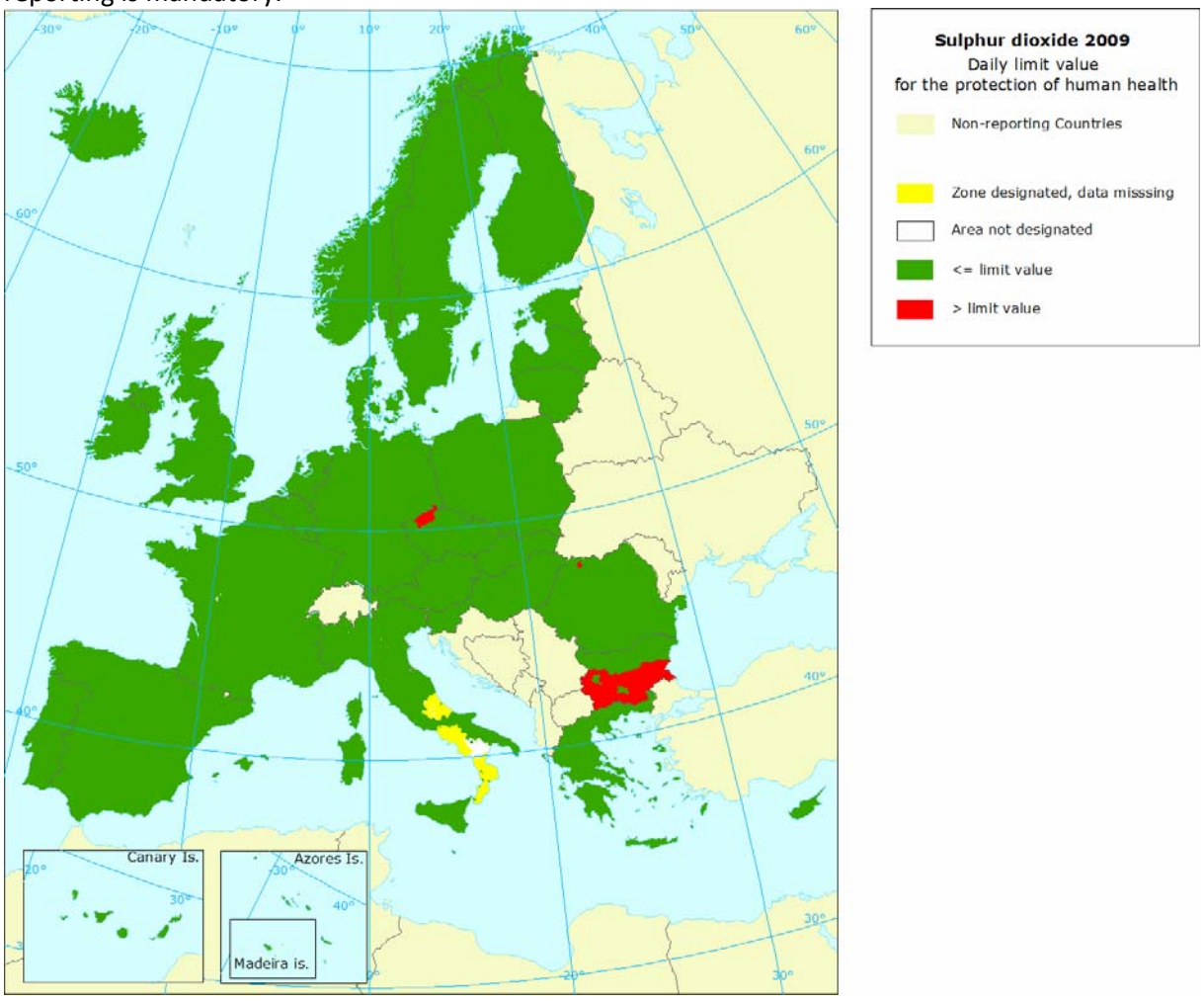

Figure III.1. Zones in exceedance for the daily limit value for SO_2 in 2009.
Occurrence of zone exceedances for the daily limit value for SO_2 is highest in Romania, Czech Republic and Bulgaria in 2009. In comparison to 2008, a new exceedance appeared in the Czech Republic, whereas in 2009 no excdeedances occurred in France, Spain or Portugal anymore.

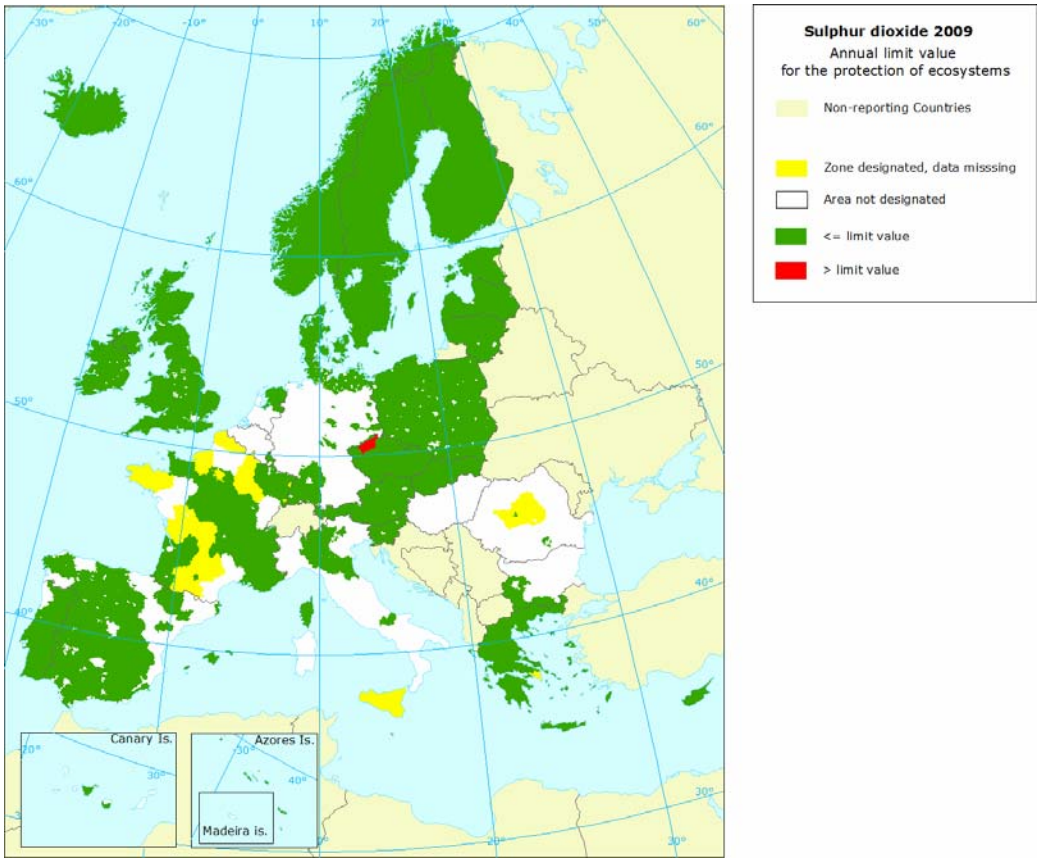

Figure III.2. Zones in exceedance for the annual limit value for SO_2 set for the protection of ecosystems in 2009.

Zone exceedance for the annual limit value for SO_2 for protection of ecosystems occurred in the Czech Republic in 2009.

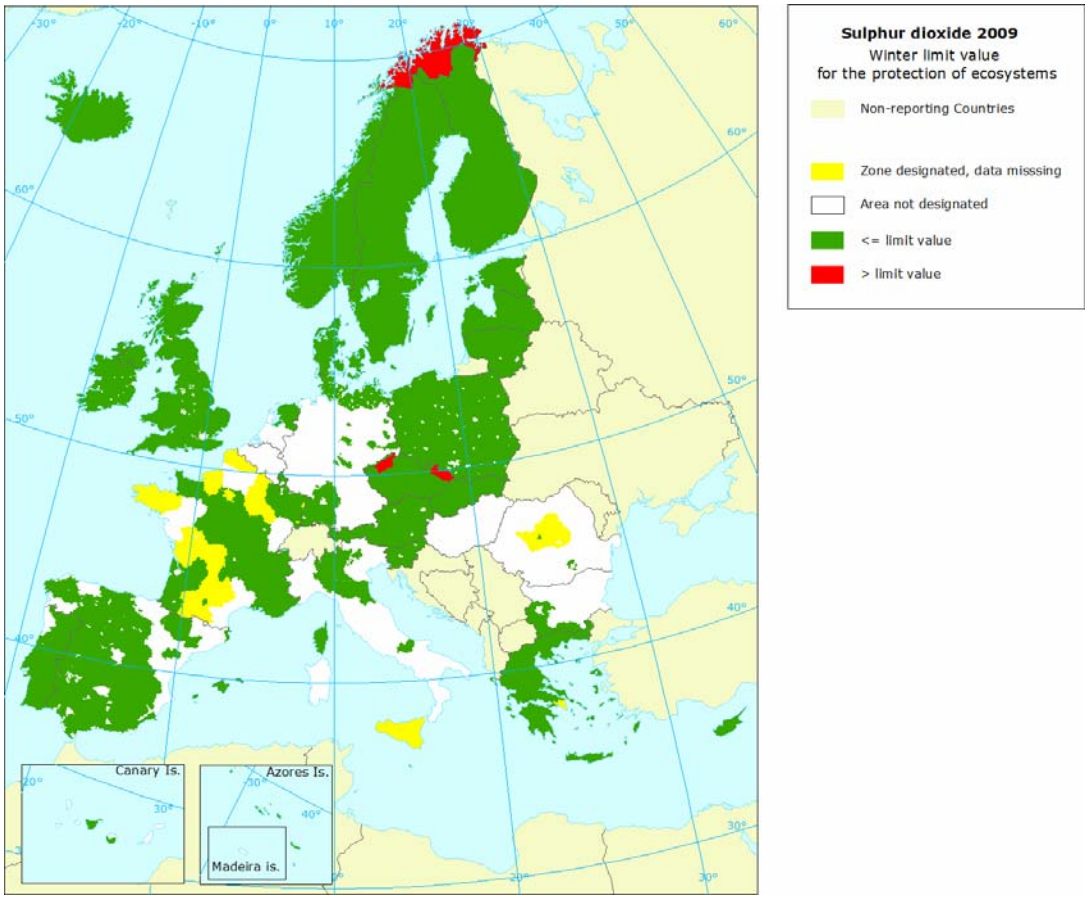

Figure III.3. Zones in exceedance for the winter limit value for SO_2 set for the protection of ecosystems in 2009.

Zone exceedances for the annual limit value for SO_2 for protection of ecosystems occurred in the Czech Republic and Norway in 2009.

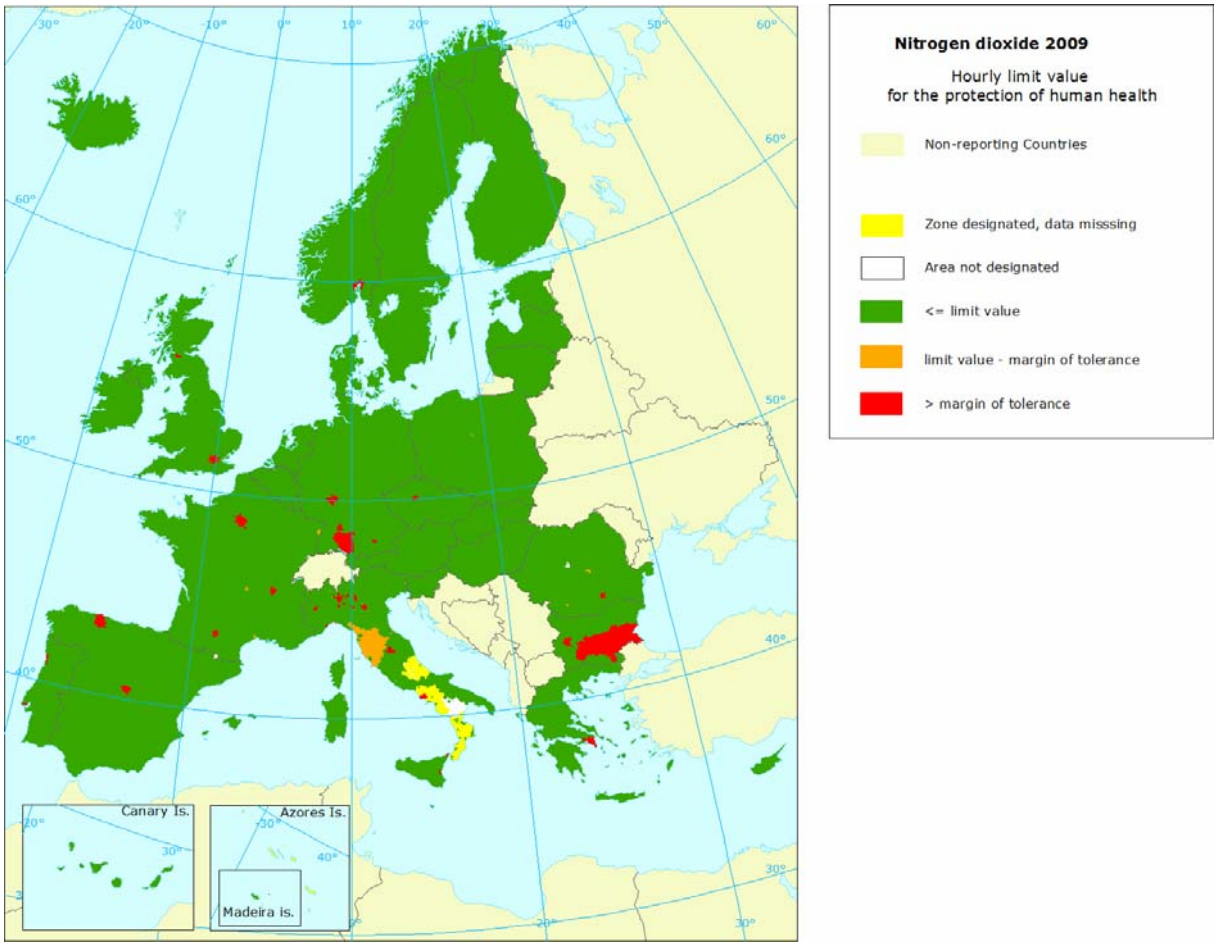

Figure III.4. Zones in exceedance for the daily limit value and margin of tolerance for NO_2 in 2009. Italy has 9 exceedances of the limit value plus margin of tolerance. For 9 designated zones data are missing. For France, data are missing for 5 designated zones and 3 zones are in exceedance of the limit value plus margin of tolerance. Further exceedances of the limit value plus margin of tolerance are observed in Germany (4), Spain and Bulgaria (both 3), United Kingdom and Portugal (both 2), Romania, Czech Republic and Greece (all 1).

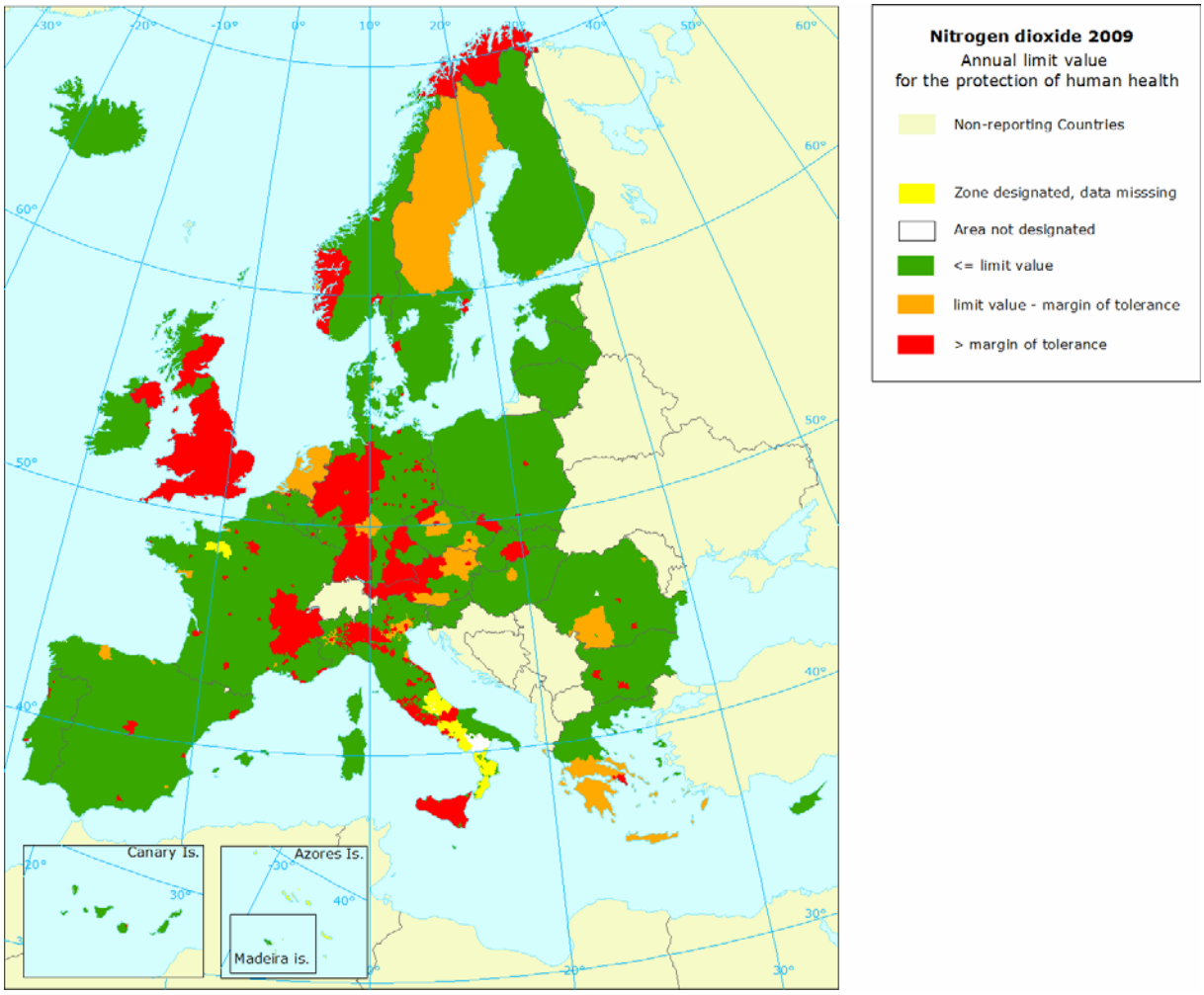

Figure III.5. Zones in exceedance for the annual limit value for NO_2 in 2009.

Germany, the United Kingdom and Italy have the highest number of zones in exceedance of LV+MOT. The most agglomeration exceedances of the MOT also occur in Germany (28), UK (27) and Italy (25). In Austria, the Czech Republic and Ireland all designated agglomerations exceed the LV+MOT. The most mentioned cause mentioned for exceedance of the annual limit value of NO2 is local traffic (85%). For 31 zones in the United Kingdom the reported exceedances are based on modelled results.

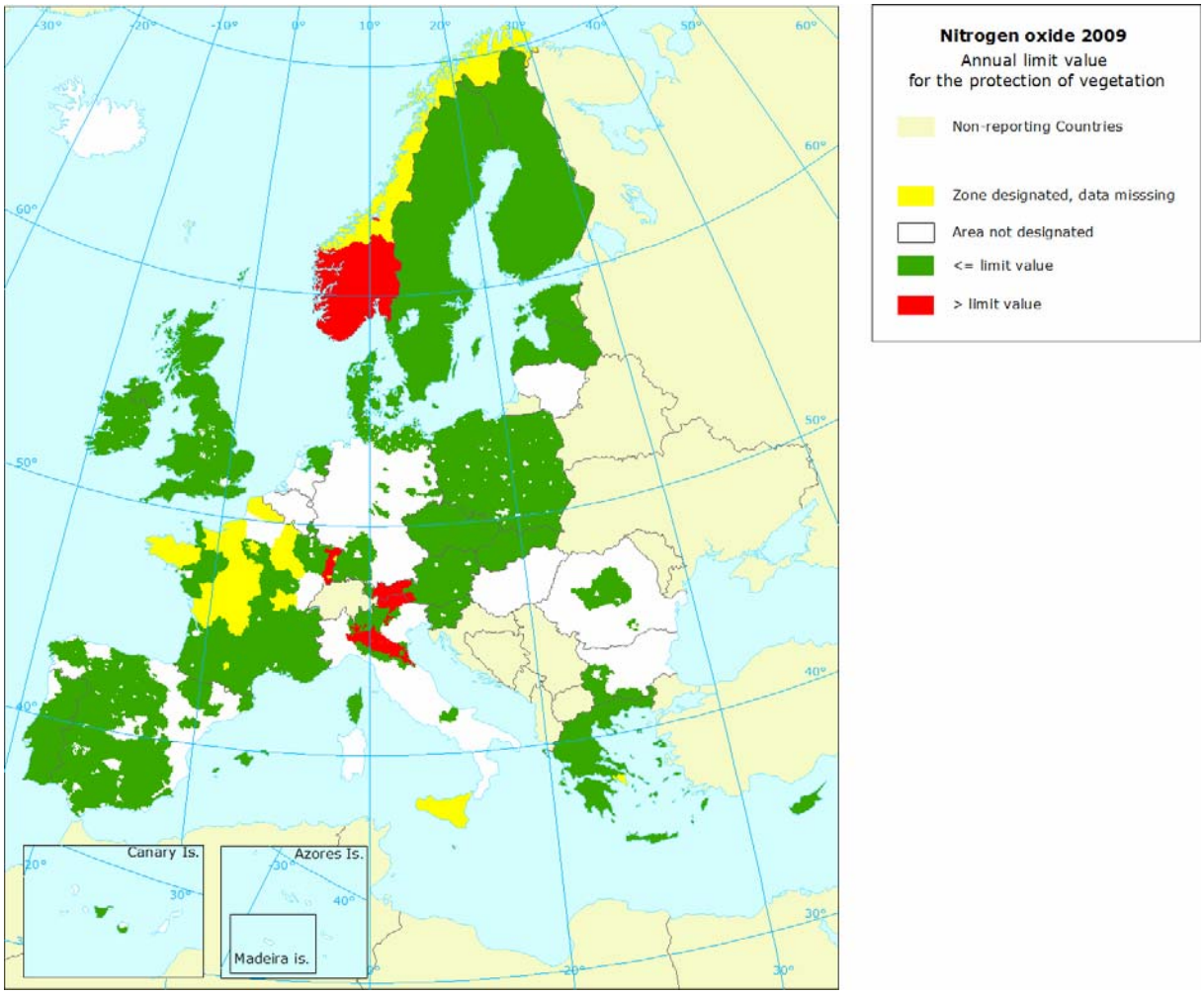

Figure III.6. Zones in exceedance for the annual limit value for NO_x set for the protection of ecosystems in 2009.

Italy reported 26 zone exceedances of the limit value of NO_x set for the protection of vegetation in 2008; 14 of these zones are urban agglomerations.

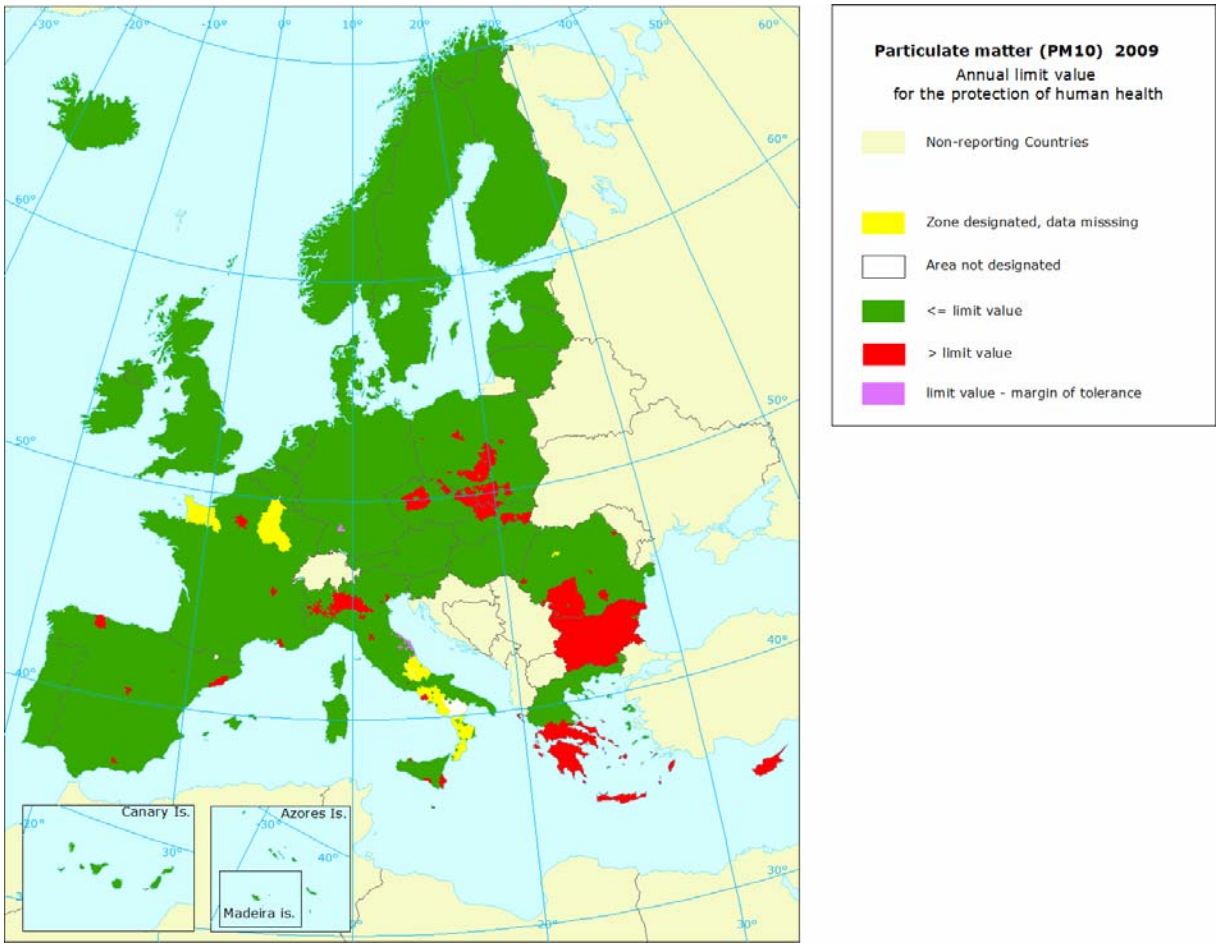

Figure III.7. Zones in exceedance for the annual limit value for PM_{10} in 2009.

Most zones in exceedances of yearly LV of PM_{10} occur in Italy (24), Poland (20), Spain (18) and Romania (15). Romania, Bulgaria, Greece and Cyprus have all or nearly all designated zones exceeding the LV.

For the annual limit value of PM_{10} the most mentioned single reason mentioned exceedance cause is local traffic (35%). From all the yearly PM_{10} limit value exceedances, 12 zones in Romania are reported exceedances based on modelled results.

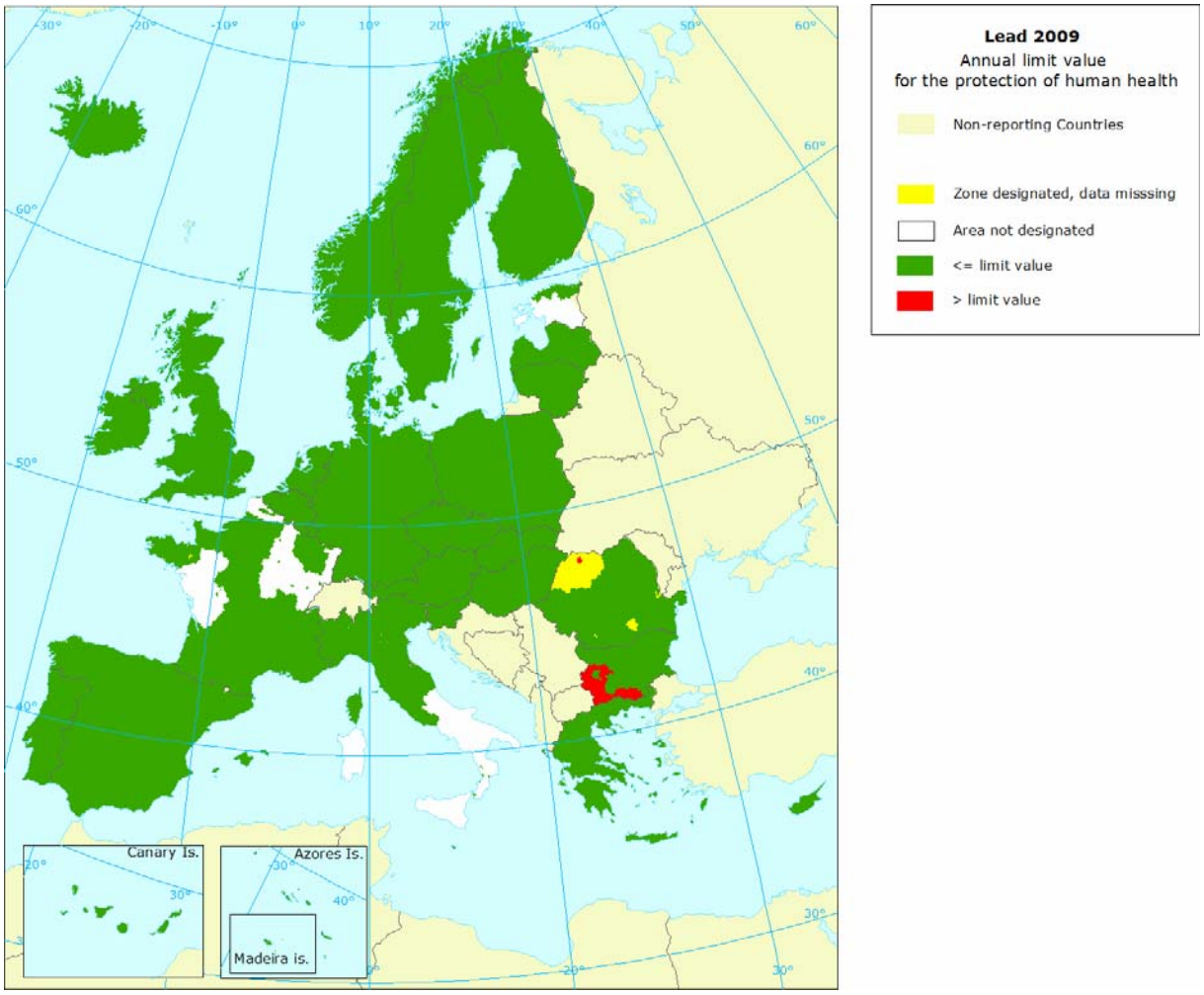

Figure III.8: Zones in exceedance for the annual limit value for lead in 2009.

Only in two EU27 zones (< 1%) an exceedance of the lead LV is reported. These zones are located in Bulgaria and Romania. Montenegro also reported exceedance in one zone.

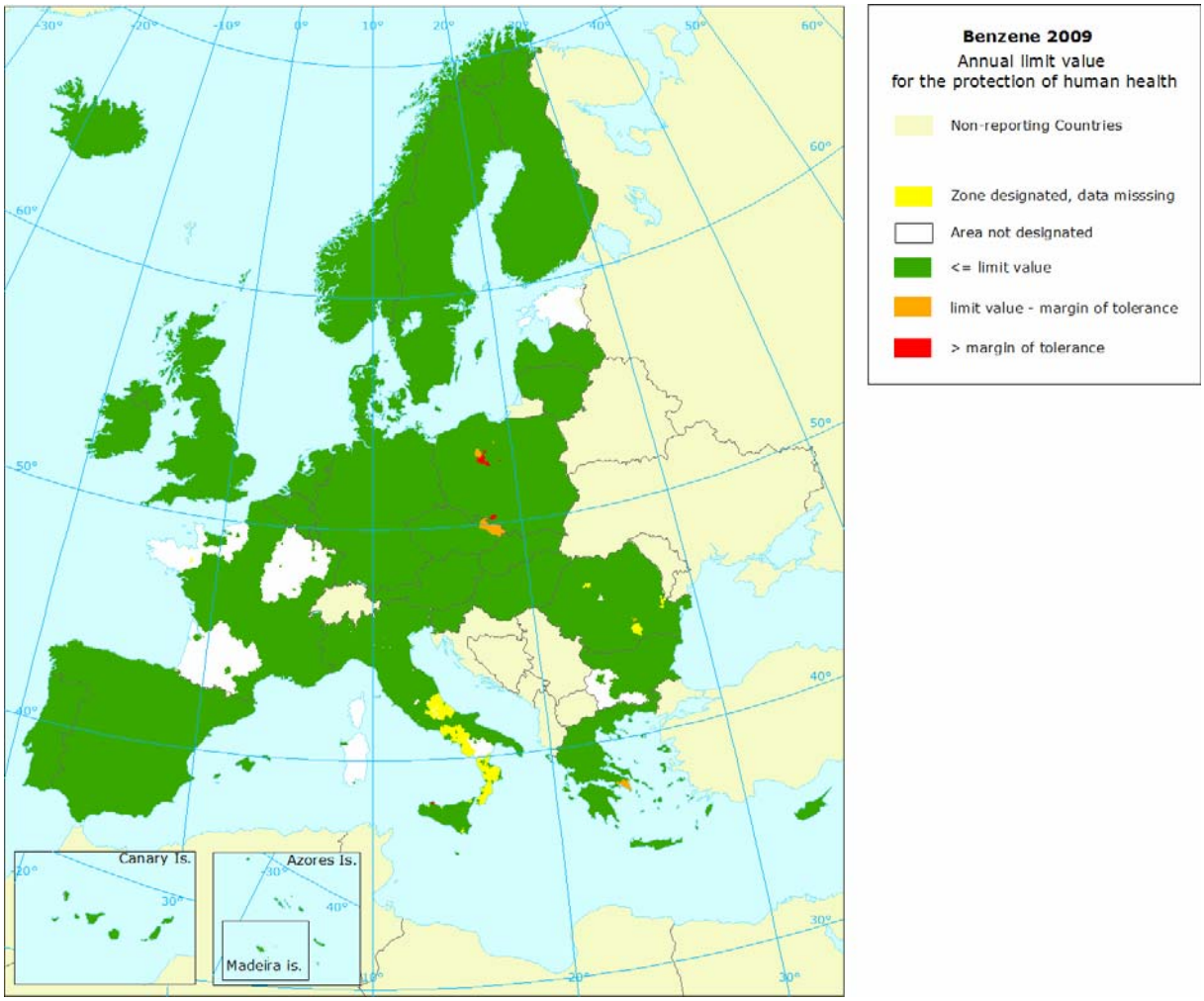

Figure III.9: Zones in exceedance for the annual limit value for benzene in 2009.
In 10 EU27 zones concentrations are above the limit value of 5 µg/m^3 to be met in 2010; this concerns less than 1.5% of the population in the EU27 (less than 0.3% of the area).

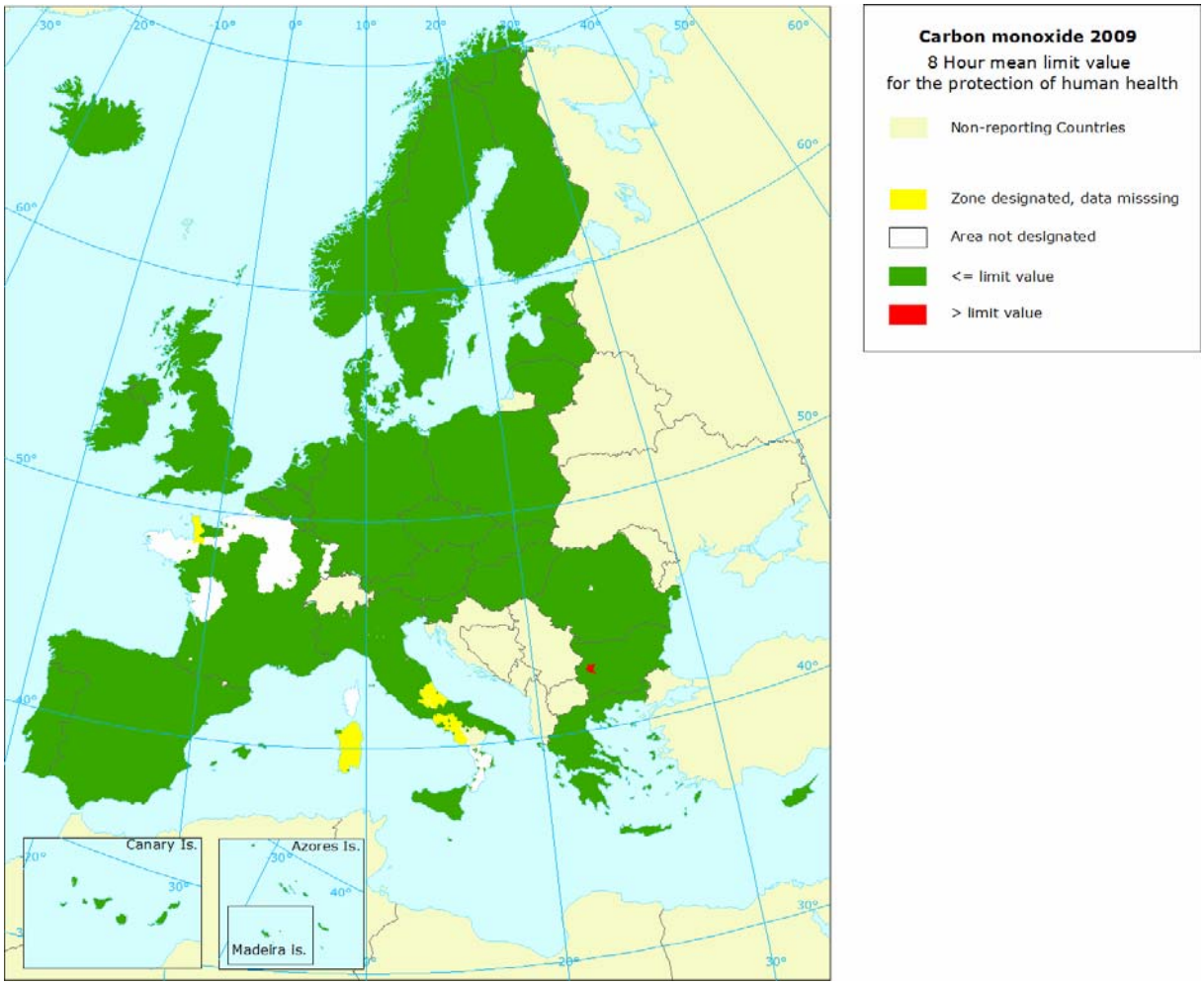

Figure III.10: Zones in exceedance for the annual limit value for CO in 2009.
Information on the situation with respect to CO is incomplete in France and Italy. Exceedance has been reported for one zone in Bulgaria.

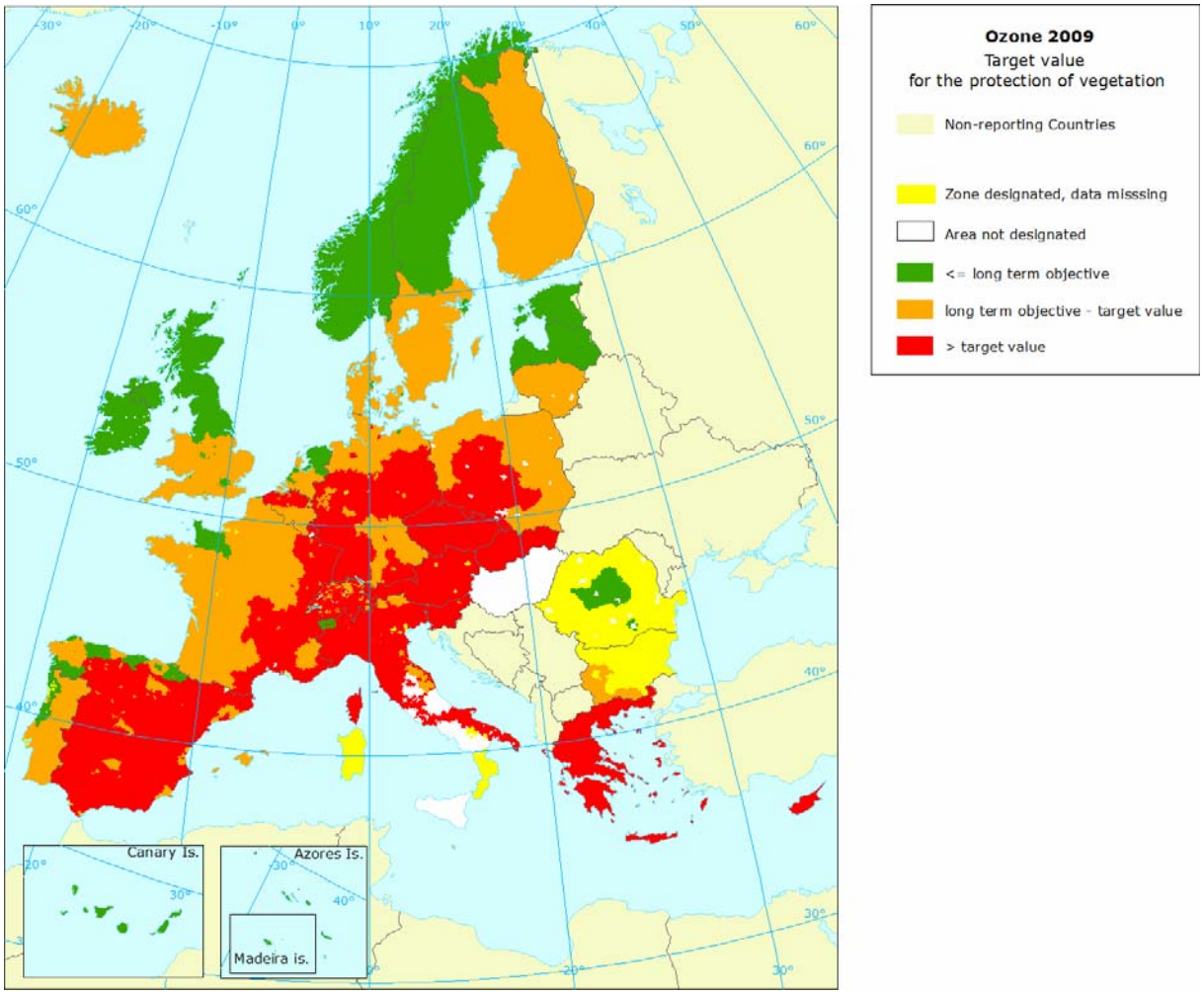

Figure III.11: Zones in exceedance for the vegetation target value for O_3 in 2009.

Most zones in exceedances of TV occur in Spain (52), Italy (82), Germany (37) and France (23). Czech Republic, Austria and Slovakia have all or nearly all designated zones exceeding the TV.

From all the ozone vegetation target value exceedances, 21 zones in Italy, 2 zones in the Czech Republic and 1 zone in Slovenia are reported exceedances based on modelled results.

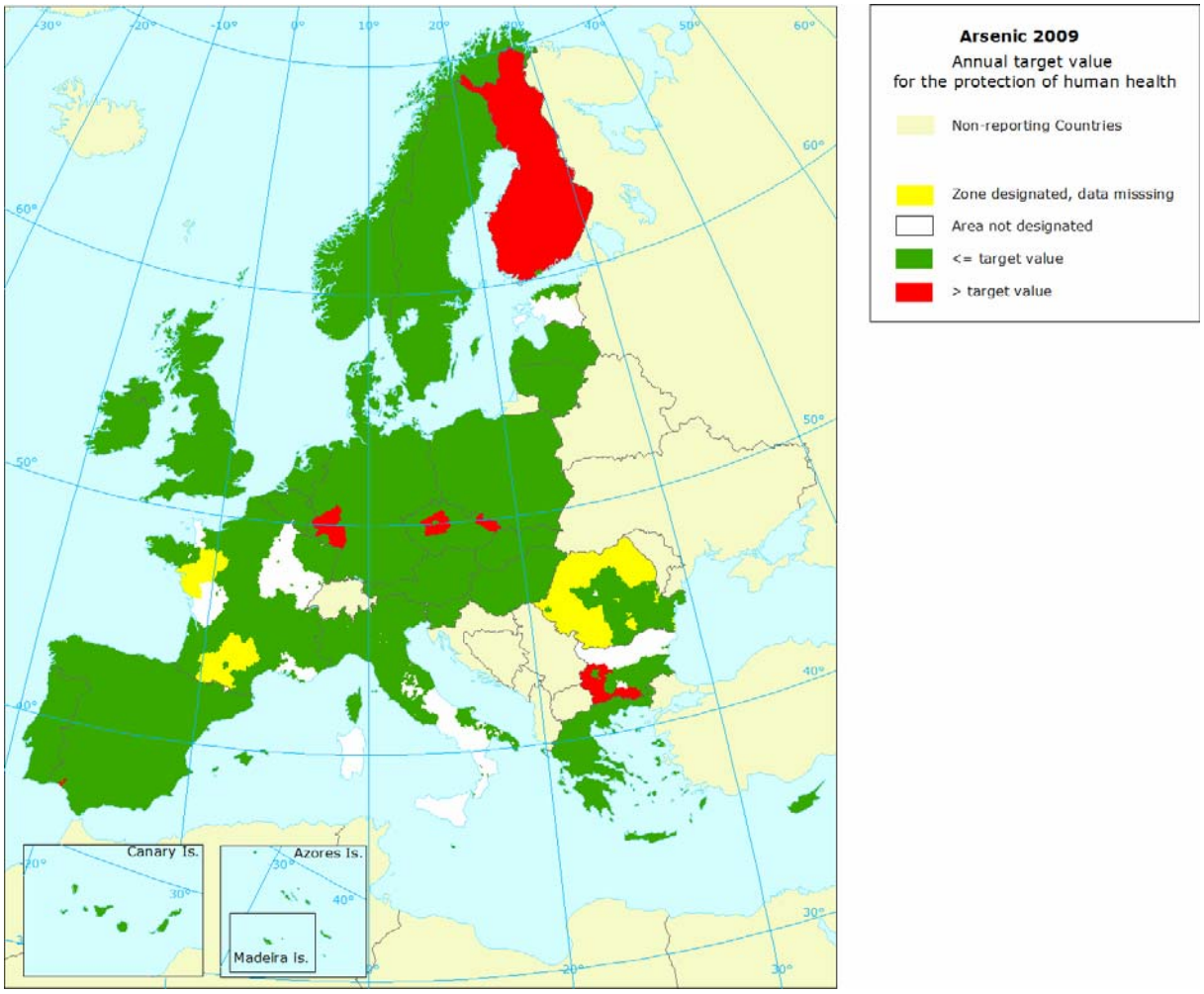

Figure III.12: Zones in exceedance for the target value for arsenic in 2009.

In 8 zones the target value of arsenic has been exceeded in 2009. Still most remarkable is the situation in Finland, where two zones have been designated for arsenic: (1) the Helsinki metropolitan area where no exceedance is observed and (2) the remaining part of Finland where an exceedance is observed at one station reported to be caused by *local industry including power production*. Unfortunately, this station could not be traced in AirBase and no more information can be given.

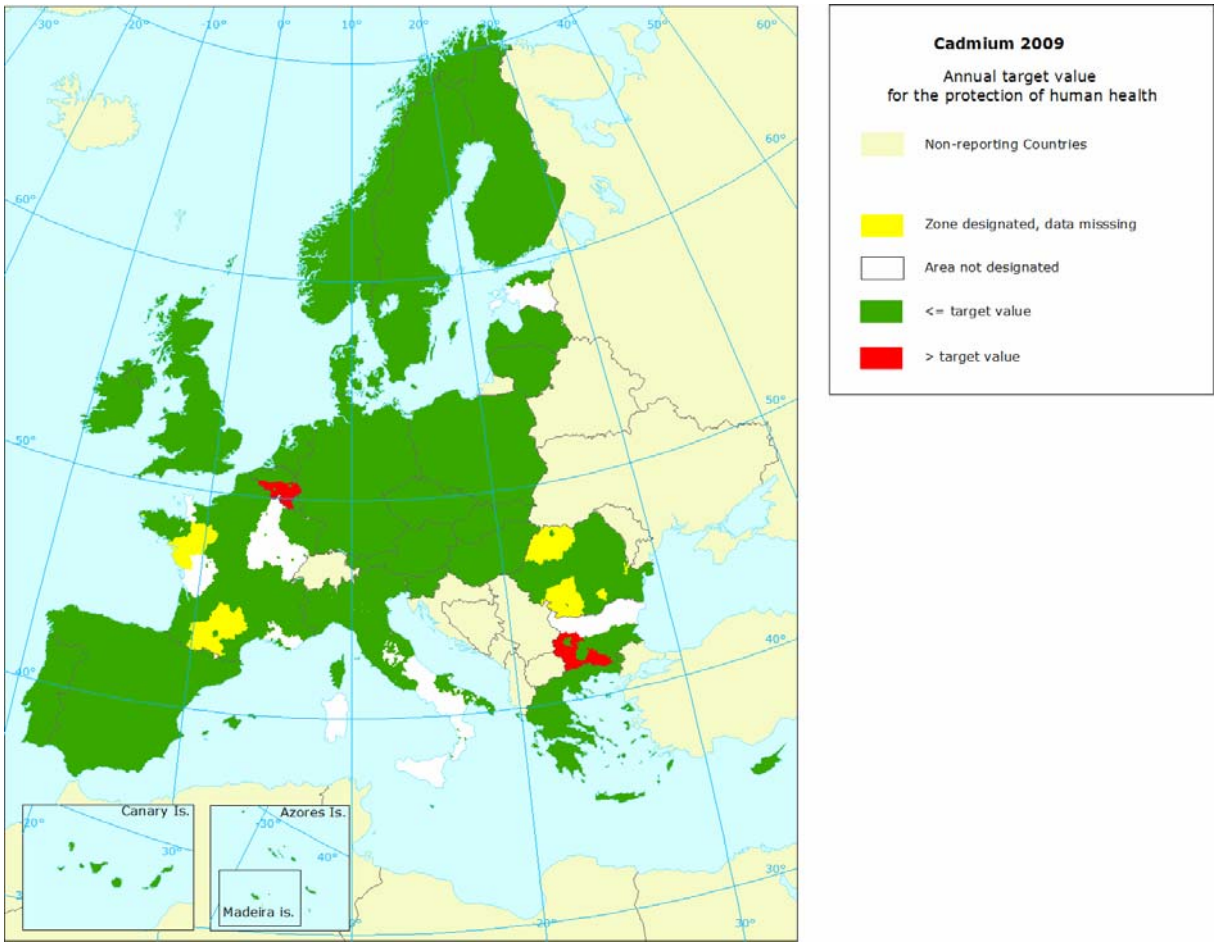

Figure III.13: Zones in exceedance for the target value for cadmium in 2009.

In 4 zones the target value of cadmium has been exceeded in 2009. Zones in exceedance in 2008 in the Czech Republic, Slovenia and Finland reported no exceedances in 2009.

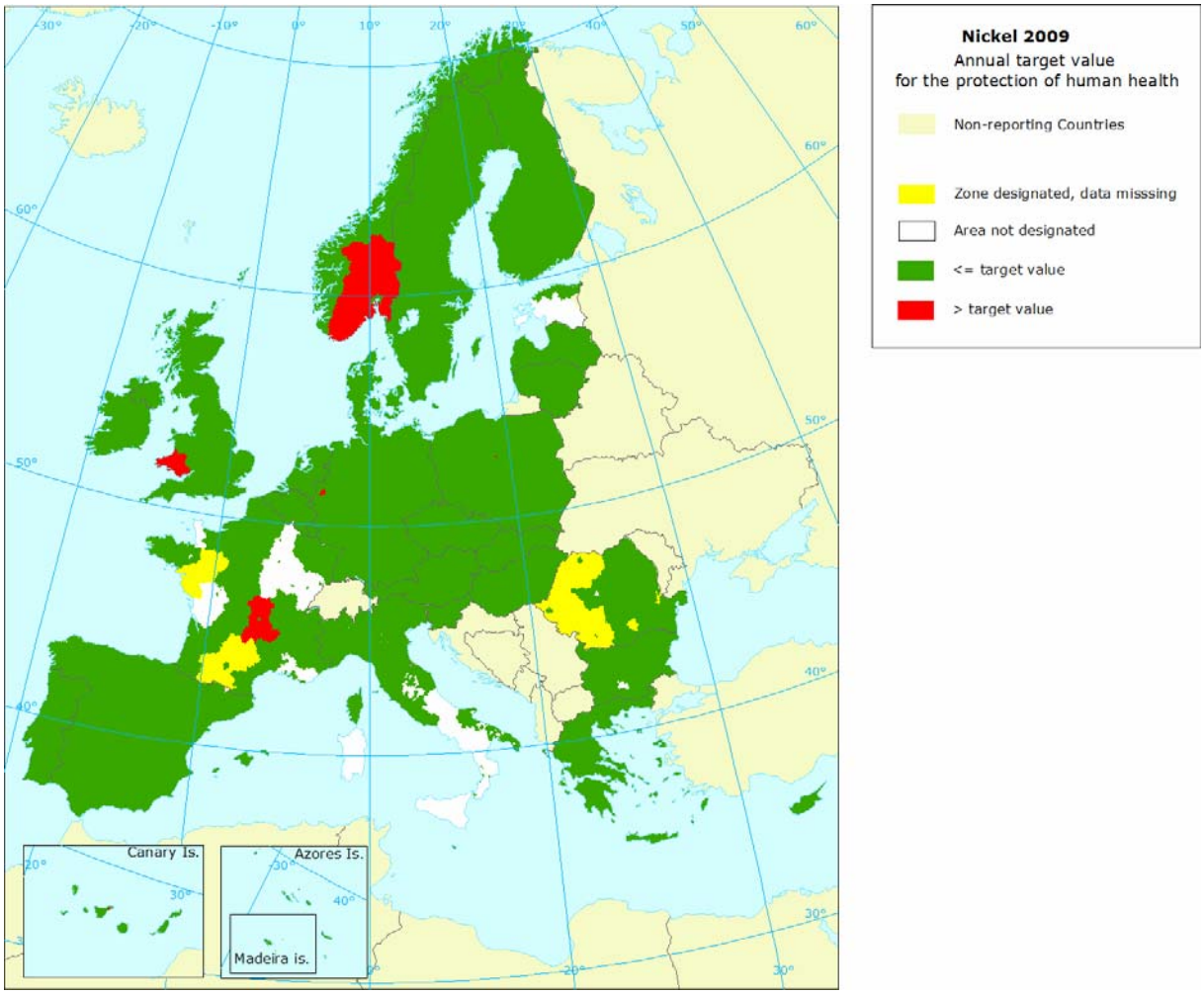

Figure III.14: Zones in exceedance for the target value for nickel in 2009.

In 8 EU27 zones the target value of nickel has been exceeded in 2009. The exceedances are observed in France, Norway, Poland, Belgium, Portugal, Spain, Germany (all 1 zone) and Wales (2 zones).

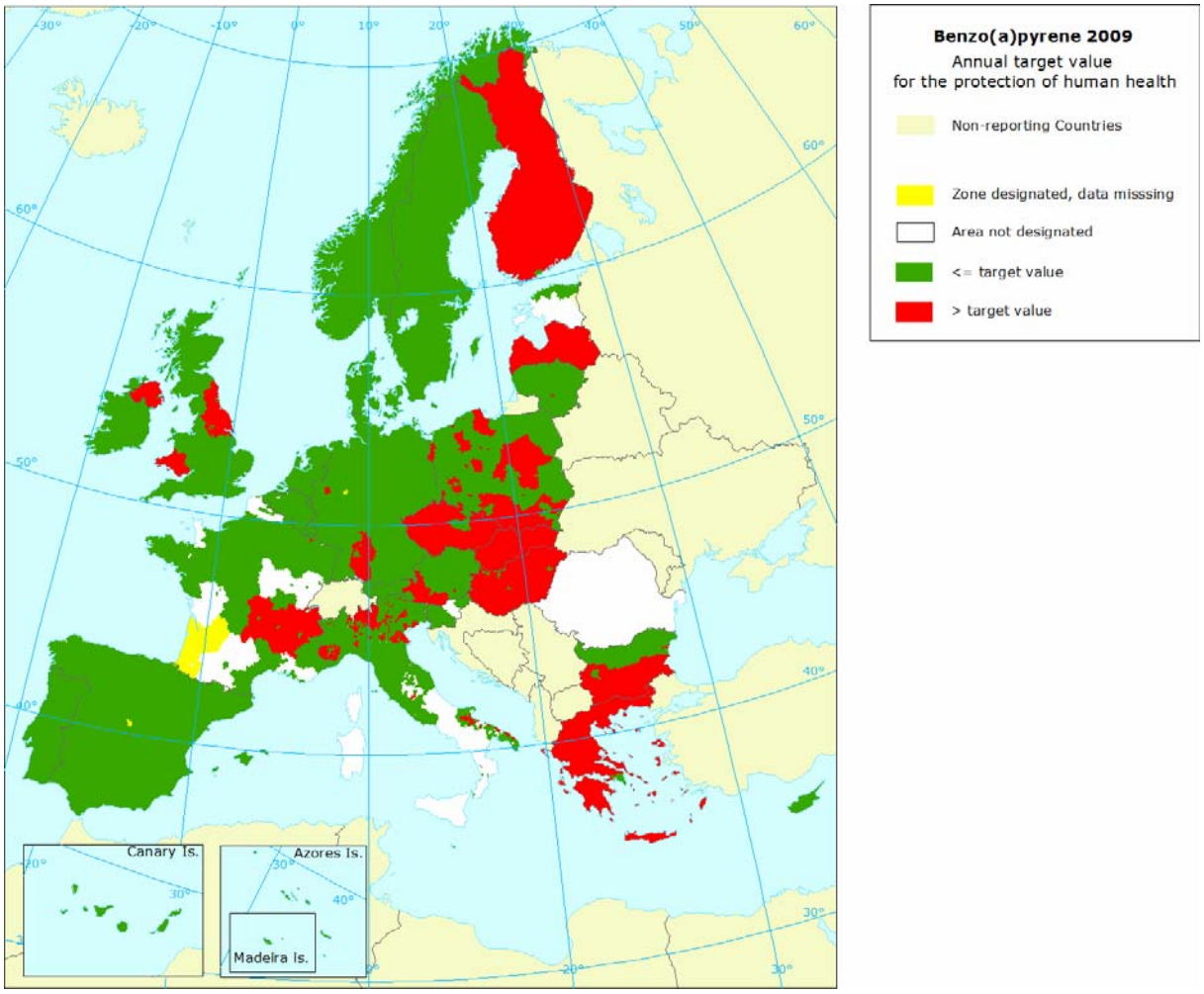

Figure III.14: EU27 Zones in exceedance for the annual target value for benzo(a)pyrene in 2009.
Finland and Slovakia have just one designated zone for B(a)P which exceeds the health target value. Greece have 4 zones for B(a)P, Athens is below TV and rest of Greece is above TV. The Czech Republic have 15 designated zones, all but one exceeding the TV.

Annex IV. Statistics per Member State

Summary of air quality status for each pollutant-pollution target combination. Information extracted from form 8 and 9.

MS	SO2 health Hr		SO2 health Day		SO2 eco Yr		SO2 eco Wntr		NO2 Hr			NO2 Yr			NOx	
	↑lv	↓lv	↑lv	↓lv	↑lv	↓lv	↑lv	↓lv	↑mot	lv-mot	↓lv	↑mot	lv-mot	↓lv	↑lv	↓lv
AT	0	11	0	11	0	8	0	8	0	0	11	7	2	2	1	7
BE	0	12	0	12	0	0	0	0	0	0	11	3	0	8	0	0
BG	2	4	2	4	0	1	0	1	3	0	3	2	0	4	0	1
CY	0	1	0	1	0	1	0	1	0	0	1	0	0	1	0	1
CZ	0	15	1	14	1	14	2	13	1	0	14	4	2	9	0	15
DE	0	80	0	80	0	15	0	15	4	0	82	52	4	30	0	15
DK	0	3	0	3	0	3	0	3	0	0	3	1	1	1	0	1
EE	0	4	0	4	0	4	0	4	0	0	4	0	0	4	0	4
ES	0	135	0	135	0	33	0	33	3	0	134	8	4	125	0	33
FI	0	14	0	14	0	1	0	1	0	0	14	0	1	13	0	1
FR	0	75	0	75	0	33	0	33	3	3	70	21	4	50	1	27
GB	0	44	0	44	0	15	0	15	2	0	42	41	0	3	0	15
GR	0	4	0	4	0	2	0	2	1	0	3	1	1	2	0	2
HU	0	11	0	11	0	0	0	0	0	0	11	0	1	10	0	0
IE	0	4	0	4	0	1	0	1	0	0	4	1	0	3	0	1
IT	0	122	0	122	0	38	0	38	9	2	116	46	4	77	26	15
LT	0	3	0	3	0	1	0	1	0	0	3	0	0	3	0	0
LU	0	3	0	3	0	1	0	1	0	0	3	1	0	2	0	1
LV	0	2	0	2	0	1	0	1	0	0	2	0	0	2	0	1
MT	0	2	0	2	0	1	0	1	0	0	2	0	0	2	0	1
NL	0	9	0	9	0	1	0	1	0	0	9	0	9	0	0	1
PL	0	170	0	170	0	125	0	125	0	1	169	2	0	168	0	125
PT	0	20	0	20	0	7	0	7	2	0	17	3	0	16	0	6
RO	1	20	1	20	0	2	0	2	1	2	17	2	2	16	0	2
SE	0	6	0	6	0	6	0	6	0	0	6	2	1	3	0	6
SI	0	9	0	9	0	7	0	7	0	0	6	0	0	6	0	4
SK	0	10	0	10	0	10	0	10	0	0	10	1	1	8	0	10
EU27	3	793	4	792	1	331	2	330	29	8	767	198	37	568	28	295
CH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IS	0	2	0	2	0	2	0	2	0	0	3	0	0	3	0	0
ME	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	2
NO	0	7	0	7	0	7	1	6	1	0	6	4	1	2	5	0
ALL	3	802	4	801	1	340	3	338	30	9	777	202	38	575	33	297

Table IV.1.a: Zone exceedance per Member State and pollutant (SO_2, NO_2 and NO_x) in 2009

MS	SO_2 health 1h	SO_2 health day	SO_2 year	SO_2 wntr	NO_2-h	NO_2-y	NO_x-y
FR	5	5	23	23	5	6	30
GR			2	2			2
IT	14	14	8	8	9	9	9
PT					1	1	
RO			1	1			
EU27	19	19	34	34	15	16	41
ME	1	1	1	1	1	1	1
total	**20**	**20**	**35**	**35**	**16**	**17**	**42**

Table IV.1.b: Defined zones missing AQ assessment in 2009 per MS and pollutant (SO_2, NO_2 and NO_x)

MS	PM10 Day		PM10 Yr		PM25		Lead Yr		Benzene Yr			CO Yr	
	↑lv	↓lv	↑lv	↓lv	↑lv	↓lv	↑lv	↓lv	↑mot	lv-mot	↓lv	↑lv	↓lv
AT	4	7	0	11	0	11	0	11	0	0	11	0	11
BE	8	3	0	11	0	11	0	11	0	0	7	0	7
BG	6	0	5	1	5	1	1	5	0	0	5	1	5
CY	1	0	1	0	0	1	0	1	0	0	1	0	1
CZ	10	5	2	13	3	12	0	15	0	1	14	0	15
DE	17	66	1	82	0	0	0	73	0	0	85	0	85
DK	0	3	0	3	0	3	0	3	0	0	3	0	3
EE	0	4	0	4	0	3	0	2	0	0	2	0	4
ES	22	116	7	131	0	131	0	81	0	0	125	0	134
FI	0	14	0	14	0	14	0	14	0	0	3	0	14
FR	21	50	4	67	1	51	0	59	0	0	60	0	59
GB	4	40	0	44	0	44	0	44	0	0	44	0	44
GR	4	0	3	1	0	0	0	4	0	1	3	0	4
HU	5	6	0	11	0	3	0	11	0	0	11	0	11
IE	0	4	0	4	0	3	0	4	0	0	4	0	4
IT	59	68	17	110	9	44	0	100	1	0	121	0	124
LT	0	3	0	3	0	3	0	3	0	0	3	0	3
LU	0	3	0	3	0	3	0	3	0	0	1	0	1
LV	2	0	0	2	1	1	0	2	0	0	2	0	2
MT	1	1	1	1	0	2	0	2	0	0	2	0	2
NL	6	3	0	9	0	9	0	9	0	0	9	0	9
PL	79	91	29	141	0	0	0	170	4	2	164	0	170
PT	5	20	0	25	0	17	0	1	0	0	1	0	1
RO	10	10	6	14	2	16	1	14	0	1	14	0	20
SE	2	4	0	6	0	6	0	6	0	0	6	0	6
SI	1	5	0	6	0	6	0	7	0	0	6	0	6
SK	7	3	2	8	0	0	0	10	0	0	10	0	10
EU27	274	529	78	725	21	395	2	665	5	5	717	1	755
CH	0	0	0	0	0	0	0	0	0	0	0	0	0
IS	0	3	0	3	0	2	0	2	0	0	2	0	2
ME	2	0	2	0	0	0	1	0	1	0	1	0	0
NO	1	6	0	7	0	7	0	7	0	0	7	0	7
ALL	277	538	80	735	21	404	3	674	6	5	727	1	764

Table IV.2.a: Zone exceedance per Member State and pollutant (PM_{10}, $PM_{2.5}$, Pb, benzene and CO) in 2009

MS	PM_{10}-d	PM_{10}-y	Lead	Benz	CO
FR	10	10	5	6	6
IT	9	9		10	10
RO	1	1	6	5	
EU27	20	20	11	21	16
ME					2
total	**20**	**20**	**11**	**21**	**18**

Table IV.2.b: Defined zones missing AQ assessment in 2009 per MS and pollutant (PM_{10}, $PM_{2.5}$, Pb, benzene and CO)

MS	Ozone Health			Ozone Vegetation			As		Cd		Ni		B(a)P	
	↑tv	lto-tv	↓lto	↑tv	lto-tv	↓lto	↑lv	↓lv	↑lv	↓lv	↑lv	↓lv	↑lv	↓lv
AT	10	1	0	8	0	0	0	11	0	11	0	11	3	8
BE	0	6	0	1	5	0	2	8	2	8	1	9	0	6
BG	2	4	0	0	1	0	1	3	2	2	0	5	4	2
CY	1	0	0	1	0	0	0	1	0	1	0	1	0	1
CZ	15	0	0	15	0	0	2	13	0	15	0	15	14	1
DE	18	46	0	37	25	2	1	67	0	68	1	67	3	66
DK	0	2	1	0	1	2	0	3	0	3	0	3	0	3
EE	0	0	4	0	0	4	0	2	0	2	0	2	0	2
ES	43	82	11	52	55	29	1	75	0	76	1	75	0	75
FI	0	2	0	0	2	0	1	1	0	2	0	2	1	1
FR	24	46	3	23	34	5	0	57	0	57	1	56	4	50
GB	0	40	4	0	11	33	0	44	0	44	2	42	6	38
GR	3	1	0	4	0	0	0	4	0	4	0	4	3	1
HU	6	5	0	0	0	0	0	11	0	11	0	11	7	4
IE	0	4	0	0	0	1	0	4	0	4	0	4	0	4
IT	86	22	8	82	4	1	0	101	0	101	0	101	12	89
LT	0	3	0	0	1	0	0	3	0	3	0	3	1	2
LU	1	1	1	1	0	0	0	3	0	3	0	3	0	3
LV	0	2	0	0	0	1	0	2	0	2	0	2	2	0
MT	0	2	0	0	1	0	0	2	0	2	0	2	0	1
NL	0	9	0	0	5	4	0	9	0	9	0	9	0	9
PL	6	22	0	7	9	0	0	170	0	170	1	169	73	97
PT	2	17	0	0	6	4	0	1	0	1	1	1	0	1
RO	13	7	0	0	0	2	0	5	0	14	0	12	0	0
SE	0	6	0	0	4	2	0	6	0	6	0	6	0	6
SI	3	3	0	5	1	0	0	7	0	7	0	7	0	6
SK	2	0	0	2	0	0	0	2	0	2	0	2	1	1
EU27	**235**	**333**	**32**	**238**	**165**	**90**	**8**	**615**	**4**	**628**	**8**	**624**	**134**	**477**
CH	4	0	0	3	1	0	0	0	0	0	0	0	0	0
IS	0	0	2	0	1	1	0	0	0	0	0	0	0	0
ME	0	1	0	0	1	0	0	0	0	0	0	0	0	0
NO	4	0	3	0	0	7	0	7	0	7	1	6	0	7
ALL	**243**	**334**	**37**	**241**	**168**	**98**	**8**	**622**	**4**	**635**	**9**	**630**	**134**	**484**

Table IV.3.a: Zone exceedance per Member State and pollutant (O_3, As, Cd, Ni and B(a)P) in 2009

MS	O_3 health	O_3 vegetation	As	Cd	Ni	B(a)P
AT		3				
BG		5				
DE	1	1				1
ES						1
FR	7	15	9	9	9	7
IT	3	16				
PT		9				
RO		6	15	7	8	
EU27	11	55	24	16	17	9
ME	1	1		1	1	
total	**12**	**56**	**24**	**17**	**18**	**9**

Table IV.3.b: Defined zones missing AQ assessment in 2009 per MS and pollutant (O_3, As, Cd, Ni and B(a)P)

Annex V. List of zones in relation to AQ standards

The list of zones in EU Member States in relation to the air quality standards as set in the air quality Directive is available as electronic annex List_of_zones_2009.xls from the EEA website: http://www.eea.europa.eu/data-and-maps/data/zones-in-relation-to-eu-air-quality-thresholds-2/zones-attribute-description/zones-attribute-description/at_download/file