Reporting on ambient air quality assessment in the EU Member States and other EEA member countries, 2011

ETC/ACM Technical Paper 2013/14
November 2013

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

European Topic Centre
on Air Pollution and
Climate Change Mitigation

The European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM)
is a consortium of European institutes under contract of the European Environment Agency
RIVM UBA-V Öko Öko-Recherche Aether UAB Emisia Vito 4Sfera CHMI NILU INERIS PBL CSIC

Cover page picture:
Entrance to the Europoort harbour of Rotterdam, from image collection of RIVM ©.

Author affiliation
Benno Jimmink, Frank de Leeuw: National Institute for Public Health and the Environment (RIVM), Bilthoven, The Netherlands
Jana Ostatnická, Markéta Coňková: Czech Hydrometeorological Institute (CHMI), Praha, Czech Republic

DISCLAIMER

ETC/ACM Technical Paper 2013/14
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 2011 in the EU-27 (811) was higher than in 2010 (784). The designation of zones for pollutants having a health related limit or target value is completed for SO_2, NO_2, PM_{10}, CO and ozone. For these compounds, the zones cover 90% or more of the population; exceptions are found in Romania where the population coverage may drop below 50%. For $PM_{2.5}$ an incomplete zoning is found in Greece, Hungary and Romania. For lead and benzene, the coverage is lower: in a number of Member States the zones cover less than 80% of the population. Germany, France, Greece, Hungary, Italy, Portugal, Romania, and Slovakia have different zone designations for PM_{10} and $PM_{2.5}$.

In 2011, the percentage of zones in all reporting countries exceeding the limit or target values set for the protection of human health was highest for the daily limit value of PM_{10} and for the health-related target value of O_3. The percentages were 42% and 33%, respectively. For the NO_2 annual limit value this percentage was 33%. Compared to 2010 the fraction of zones in exceedance of PM10 LV is this year higher.
Looking at the population, the highest fraction potentially exposed to levels above the LV or TV is found for the daily LV of PM_{10} (49%), next the annual LV of NO_2 (48%), followed by the O_3 TV (31%).

The number of $PM_{2.5}$ monitoring stations had still increased in 2011; 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) has been completed in nearly all Member States. 24 Member States reported on the AEI (period 2009-2011); six MS reported an AEI above 20 µg/m^3, the legally binding value for 2015.

Table of contents

1. Introduction

This document provides an overview of the annual reports from reporting countries (both Member and non-Member States) to the European Commission on the results of the assessment of their air quality in 2011. These national reports have been submitted under the Air Quality Framework Directives[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. This Decision will further be referred to as 'the questionnaire' or, when the context is not directly clear, 'the AQ questionnaire'.

Following the 4th Daughter Directive (4th DD)[3], in 2007 the questionnaire was changed to include 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. 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 have been added, enabling reporting countries to report on the attainment of the $PM_{2.5}$ target value.

The questionnaire consists of 28 forms (see Annex I) with in total 90 sub-forms. 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 previous years is available on DG Environment's website[4] and on the European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM) website[5].

Not all (sub)forms of the questionnaire will be discussed in this report; focus will be on those forms containing information directly related to the attainment status of the zones. In some of the other forms voluntary information is requested; although very valuable (for example, Form 19 providing information on the area and population exposed to concentrations above LV or TV) the reported information is generally too scattered to prepare an EU-wide assessment.

Information from the questionnaire has been, frequently after gap filling the missing data using the information from AirBase (EoI data flow, see below), discussed in various EEA or ETC/ACM reports. Typical recently published examples are (i) the evaluation of assessment regime (Form 10) and the related monitoring requirements (see EEA, 2013a), (ii) a detailed analysis of availability and trend of ozone precursors (Form 5 and 16; see De Leeuw 2012), (iii) a discussion on the measuring methods of PM and the 4th DD pollutants (Forms 3, 5; see Alastuey et al 2011; Mol et al 2013).

DG Environment requested the European Environment Agency to compile this report. The ETC/ACM prepared the document.
On the incoming questionnaires the ETC/ACM performed a number of quality checks. These checks mainly relate to completeness and consistency (both within the Questionnaire as with the information submitted under the Exchange of Information Decision). Based on the checks country

1 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 replaced the former Air Quality Framework Directive 96/62/EC.

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 http://acm.eionet.europa.eu/reports, under "ETC/ACM Technical Papers"

specific feedback reports have been prepared. The reporting countries have been asked to react on these reports. A summary of the quality procedure is given in section 1.1; a more extensive description has been given in an ETC/ACM Working Paper[6].

1.1. Member State reports addressed

This document primarily deals with the reports by the EU Member States on the year 2011 submitted under the Air Quality Framework Directives, and the 4th DD. On a voluntary basis Norway and Iceland submitted a questionnaire.

All questionnaires have been uploaded by the reporting countries on Reportnet CDR (http://cdr.eionet.europa.eu/). In October 2012 the ETC/ACM sent out a mailing request to all contact persons in the reporting countries informing on the outcome of a first review of the submitted questionnaires. In this request, several tables summarizing the reporting from the countries were included. In March/April 2013 a second mailing request was sent to the countries, 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 countries were invited to check the summaries which had been provided by the ETC/ACM. A number of countries submitted a revised questionnaire or separate form(s) that had been revised.

1.2. Reporting under the Exchange of Information Decision

The Air Quality Directives focus mainly on compliance checking against the obligations (air quality standards and objectives) they set (see Annex II[7]). In parallel, reporting countries submit detailed information from their monitoring networks under the Exchange of Information Decision (EoI)[8] 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 annually publishes an assessment of these reports (see, for the assessment of the 2011 data; Mol et al., 2013). To avoid double reporting by countries, some of the data necessary for evaluating the reports under the air quality directives are only required under the EoI Decision. This is particularly the case for the meta-information on monitoring stations. All monitoring stations used for compliance checking under the AQ Directives 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 2012. 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 by the countries, the European Commission prepared an AQ questionnaire template in Excel format. This format does not reject erroneous data, and during the processing numerous small errors, e.g. spurious spaces, have to be removed before all reports can 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 “+” instead of the prescribed “y”; or using a comma as separator while the semi-colon is prescribed.

[6] Available from http://acm.eionet.europa.eu/databases/aq-questionnaire/other_info_aqq.html
[7] For more details see http://ec.europa.eu/environment/air/quality/standards.htm
[8] 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).

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 2011 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 reporting countries do not use the same codes for stations in the AQ questionnaire and EoI reports. Reporting countries 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 15 May 2013. Revisions prepared by reporting countries 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 emerged during this process. Hence, this report presents an overview of the air quality in the Member States of the European Union and the other reporting countries but it cannot be used for legal compliance checking.

Abbreviations used

Reporting countries 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];, 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 after accession of 12 new Member States in 2004 and 2007
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
RC	Reporting Countries
SO_2	Sulphur dioxide
TV	Target value

Notes

1: see http://www.iso.org/iso/home/standards/country_codes/iso-3166-1_decoding_table.htm

2. Including Gibraltar.

2. Designation of zones

The number of designated zones in 2011 in the EU-27 (811) was higher than in 2010 (784). The 2011 zoning adjustments compared to 2010 are:

- Italy increased the number of zones from 142 to 151 zones
- Romania increased the number of zones from 21 to 50 zones
- Germany decreased the number of zones from 115 to 110 zones
- Portugal reduced the number of zones from 28 to 26 zones
- Slovenia reduced the number of zones from 12 to 8 zones

The designation of zones for pollutants having a health related limit or target value is completed for SO_2, NO_2, PM_{10}, CO and ozone. For these compounds, the zones cover 90% or more of the population; exceptions are found in Romania where the population coverage may drop below 50%. For $PM_{2.5}$ an incomplete zoning is found in Greece, Hungary and Romania. For lead and benzene, the coverage is lower: in a number of Member States the zones cover less than 80% of the population. Germany, France, Greece, Hungary, Italy, Portugal, Romania, and Slovakia have different zone designations for PM_{10} and $PM_{2.5}$.

The situation with respect to the Fourth Daughter Directive has slightly improved this year. However, Romania and Malta have not yet defined zones for B(a)P; in France and Italy the defined zones for B(a)P cover less than 60% of the population. In Bulgaria, France, Italy, Malta and Romania zones for As, Cd and/or Ni, cover less than 90% of the entire population.

The countries 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 countries are free in defining their own zone structure and characteristics (population and area), the designated zones vary widely, depending 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 2011 (information extracted from Form 2). Compared to reporting year 2010 (Jimmink et al., 2012) there are various changes in the designation of zones (See also Table 2). 6 Member States have indicated a change in the zone definition for one or more pollutants (Form 0). Malta did not designate zones for any of the heavy metals (Pb, As, Cd, Ni); this might be caused by an omission in the reporting as zones have been designated for these pollutants in 2010. Romania and Malta did not designate zones for B(a)P. Belgium and Hungary did not designate zones for the protection of vegetation for both SO_2 and NO_x, Latvia and Lithuania did not designate zones for the protection of vegetation for NO_x. The other reporting countries (Norway and Iceland) have also changed the zone definition; Iceland did not designate zones for the protection of vegetation for NO_x nor for the pollutants regulated in the 4th DD (As, Cd, Ni and BaP).
The lowest number of zones is found for the two objectives related to the protection of vegetation. In relation to the protection of health, the number of zones defined in the EU Member States for NO_2 and PM_{10} – the pollutants showing the largest number of exceedances - tends to be higher (about 690) than for the other pollutants (400-650). The number of zones defined for the 4th DD-pollutants is relatively low, 435-454.

Table 1. Number of zones per reporting country in 2011, including the designation of the zones for individual pollutants or types of protection targets (data extracted from form 2).

Reporting Country	Total (a)	SO_2		NO_2	NO_x	PM_{10}	Lead	benzene	CO	Ozone	As	Cd	Ni	BaP	$PM_{2.5}$
		health	veg												
AT	19	11	8	11	8	11	11	11	11	11	11	11	11	11	11
BE	22	12	0	11	0	11	11	7	7	6	10	10	10	7	11
BG	6	6	1	6	1	6	4	6	6	6	4	4	5	6	6
CY	1	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	15
DE	110	75	15	83	15	81	70	80	80	66	67	67	67	71	74
DK	3	3	1	3	1	3	3	3	3	3	3	3	3	3	3
EE	4	4	4	4	4	4	4	2	4	4	4	4	4	4	4
ES	157	132	38	134	38	135	81	122	131	135	76	76	76	76	135
FI	18	14	1	14	1	14	14	3	14	2	2	2	2	2	14
FR	76	76	6	75	13	74	65	61	76	73	55	55	54	57	59
GB	44	44	43	44	43	44	44	44	44	44	44	44	44	44	44
GR	4	4	2	4	2	4	4	4	4	4	4	4	4	4	2
HU	10	10	0	10	0	10	10	10	10	10	10	10	10	10	5
IE	4	4	1	4	1	4	4	4	4	4	4	4	4	4	4
IT	151	96	22	137	31	137	69	98	105	97	43	43	43	42	114
LT	3	3	1	3	0	3	3	3	3	3	3	3	3	3	3
LU	4	3	1	3	1	3	3	1	1	3	3	3	3	3	3
LV	2	2	1	2	0	2	2	2	2	2	2	2	2	2	2
MT	2	2	1	2	1	2	0	2	2	2	0	0	0	0	2
NL	9	9	1	9	1	9	9	9	9	9	9	9	9	9	9
PL	46	46	16	46	16	46	46	46	46	46	46	46	46	46	46
PT	26	20	7	20	7	23	1	1	1	19	1	1	1	1	1
RO (a)	50	40	3	29	3	28	23	24	43	41	11	22	19	0	18
SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
SI	8	6	4	6	4	6	7	6	6	6	7	7	7	6	6
SK	11	9	1	10	1	10	2	10	9	2	2	2	2	2	8
EU27	**811**	**653**	**200**	**692**	**214**	**692**	**512**	**581**	**643**	**620**	**443**	**454**	**451**	**435**	**606**
IS	4	3	1	3	0	3	2	2	2	2	0	0	0	0	3
NO	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
all	**822**	**663**	**208**	**702**	**221**	**702**	**521**	**590**	**652**	**629**	**450**	**461**	**458**	**442**	**616**

(a) In the zone information provided by Romania an inconsistency has been noted between the spatial data (GIS information) and the zone definition as given in Form 2 of the Questionnaire. The spatial data contains boundaries of four more zones which are not included in definition in Form 2 (no reference to these four zones has been made in any other form of the Questionnaire). Any further meta-information on these zones is not available. In all the maps presented in this report, these zones are coloured yellow ("missing information").

For all compounds, the designated zones for 2011 are more or less the same as in 2010, except for a few countries. Although the total number of designated zones remains unchanged changes in the zoning for one or more pollutants can be observed in Bulgaria, Estonia, Spain, France, Greece, Latvia and Malta. As indicated above the total number of zones has been changed in Germany, Italy, Portugal, Slovenia and Romania. Iceland defined one more zone.

Latvia designated zones for one pollutant/protection target more than last year. As indicated above, Malta designated zones for 5 pollutant/protection targets less than last year. Iceland and Norway designated zones for one more pollutant/protection target combination.

In 2011, the number of zones designated for lead has increased for France and Italy. The total number of zones in the EU-27 countries showed an increase from 784 in 2010 to 811 in 2011. Since 2004 the number of zones has been reduced by 26% (Annex V). This reduction is mainly caused by a

stepwise reconstruction of the zoning in Poland in 2007 and 2010 which resulted in a net reduction of 316 zones. Germany has realized a net reduction of 35 zones. The largest increase (+17) in zones is seen in Spain. In other countries the number of designated zones remains relatively stable.
2010 was the first year that reporting on $PM_{2.5}$ was mandatory. Compared to 2010 differences in the number of $PM_{2.5}$ zones are seen for Germany, France, Italy, Slovakia and Norway. When comparing zone designation for PM_{10} with zone designation for $PM_{2.5}$ it is seen that in general (in 19 Member States plus Iceland) they are exactly the same. Similar to last year, eight MS have defined a lower number of zones for $PM_{2.5}$ than for PM_{10}: Germany (81 and 74 zones for PM_{10} and $PM_{2.5}$ respectively), France (74 and 59 zones), Greece (4 and 2), Hungary (10 and 5), Italy (137 and 114), Portugal (23 and 1), Romania (28 and 18) and Slovakia (10 and 8). In contrast to last year Norway this year has the same zone designation for both PM_{10} and $PM_{2.5}$.

As discussed in earlier reports (De Leeuw et al. 2011; Jimmink et al. 2012), the designation of zones differs widely between the reporting countries. In the Questionnaire the reporting countries 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.
- 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; exceptions are found for zones designated for the protection of ecosystems or vegetation for which boundaries 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 Federal States.

In De Leeuw et al. (2011) PM_{10} zoning was shown as an example for the different approaches. This year we take a closer look at O_3 zoning designation between reporting countries, the results are presented in Table 2. Like the case for PM_{10}, the size and population of a zone may differ several orders of magnitude within a country. Compared to PM_{10} the ozone zone tends to be slightly larger; the total population living in ozone agglomerations is slight less than living in PM_{10} agglomerations. This might reflect the behaviour of both pollutants: PM_{10} is generally higher in urban areas whereas ozone is higher in the more rural areas.

The limit values for the protection of human health apply throughout the whole territory of the Member States. Therefore, all areas should belong to a zone related to health protection targets. 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[9] or the FAO[10], 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.

[9] Eurostat, demographic balance and crude rates, population on 1 January 2011, downloaded on 2 September 2013.
[10] FAO statistical data, total country area in 2009, downloaded on 5 September 2011.

Table 2. The percentage of the total population living in agglomerations as defined for O_3 and the total population per reporting country; averaged, maximum and minimum area and population in an ozone-zone (data extracted from form 2; population (per 1/1/2012) taken from Eurostat).

Reporting Country	Total population	% population in agglomerations defined for O_3	Area in an O_3-zone			Population in an O_3-zone		
			minimum	average	maximum	minimum	average	maximum
AT	8,404,252	27	198	7626	21677	130634	749060	1754244
BE	10,951,266	18	136	5099	13281	255997	1839325	5495609
BG	7,504,868	98	504	18485	48023	363375	1221204	2288659
CY	804,435	0[a]	9251	9251	9251	840407	840407	840407
CZ	10,532,770	27	230	5260	11025	308600	702220	1253800
DE	81,751,602	34	94	5418	29623	37512	1242768	8309633
DK	5,560,628	24	313	14488	42682	311000	1854667	4252000
EE	1,340,194	34	42	10884	32176	46032	347900	623106
ES	46,152,926	53	6	3746	77160	5122	346404	3237937
FI	5,375,276	19	791	168430	336069	1033933	2661847	4289760
FR	65,048,412	40	57	7558	43502	61610	872937	10400677
GB	62,498,612	36	7	5767	43203	27928	1335406	7807696
GR	11,309,885	39	129	33007	69747	800764	2741005	3606734
HU	9,985,722	25	228	9303	84320	61085	998572	5041072
IE	4,480,858	23	185	17573	68482	190384	1059962	2359940
IT	60,626,442	20	39	2518	23093	5243	466888	3593025
LT	3,244,601	27	157	21767	64742	336912	1081534	2353629
LU	511,840	0[a]	238	862	2105	151001	170613	208198
LV	2,229,641	30	307	32448	64589	658640	1035186	1411731
MT	417,617	52	39	158	276	175537	195708	215878
NL	16,655,799	31	174	4616	17222	234146	1831754	4907925
PL	38,200,037	23	56	6797	34841	103892	830593	3173956
PT	10,636,979	40	51	4826	30643	72169	534503	1740288
RO	21,413,815	18	41	4280	8567	114925	365242	1677985
SE	9,415,570	33	927	75039	292645	509167	1580476	2829548
SI	2,050,189	18	147	3379	7092	108202	340345	598140
SK	5,435,273	8	368	24518	48667	413192	2702161	4991130
EU27	502,539,509	34	6	6806	336069	5122	766087	10400677
IS	319,368	0[a]	1000	51500	102000	102494	150447	198399
NO	4,799,252	28	465	46258	109474	188793	710433	1770437

[a] countries have not defined any agglomeration.

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 reporting countries. For SO_2, NO_2, PM_{10}, and ozone, the designated zones are in good agreement throughout the entire EU-27 with deviations in Romania; with respect to $PM_{2.5}$, the spatial coverage of zones is low (less than 80%) in France, Greece, Hungary and Romania. For the other components the national area is less well covered, although 19 countries are in good agreement. In Romania, Italy, Malta, France and Bulgaria, the coverage is less than 80% for twelve, six, five, four and three components, respectively.

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 1 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. The population coverage for $PM_{2.5}$ is less than 80% in Greece, Hungary and Romania.

Within the 5% deviation range full population coverage has been attained by 19 reporting countries for all pollutants. In general, a population coverage of less than 90% is found for those pollutants for which exceedances of the limit or target values are rarely observed (for a number of these pollutants, concentrations are even below the lower assessment threshold, for example, lead, benzene, CO). An exception is formed by $PM_{2.5}$; population coverage of 30-85% is found in France, Greece, Hungary, Italy and Romania. For Italy, Malta and Romania the designated zones for all 4th DD pollutants cover less than 60% of the total population. In addition, an apparent covering of less than 70% or less for one or more 4th DD pollutants still exists in Bulgaria and France.

Summarizing, 19 out of 27 Member States and Norway have designated zones for all health related pollutants which apparently meet the EU criteria of a full coverage of the population (i.e. 95% or more). Three Member States (Estonia, Greece and Hungary) still have a lack of agreement for one pollutant, and agreement is very poor in five Member States (Bulgaria, France, Italy, Malta and Romania) and Iceland for two or more of the health-related pollutants.

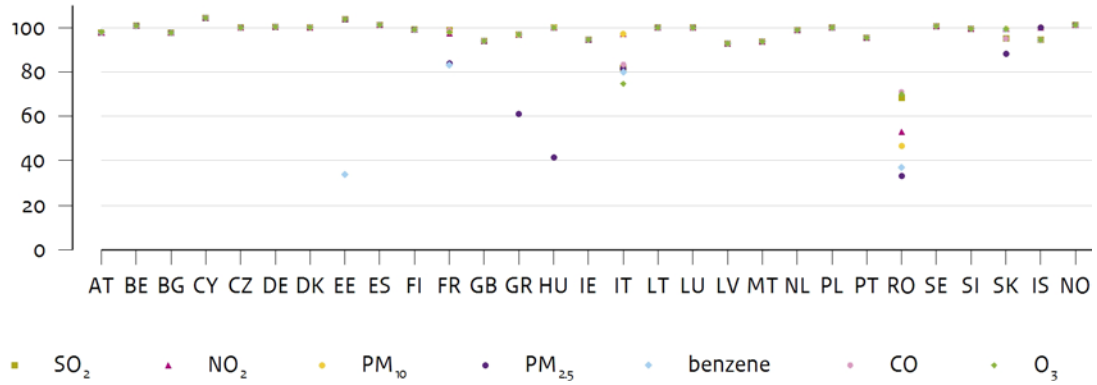

Figure 1a. Total population living in zones designated in relation to health protection targets as fraction of the national population.

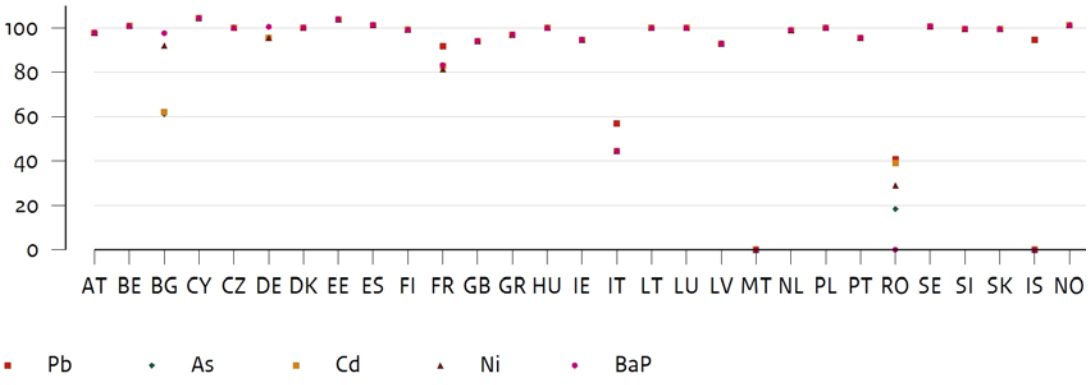

Figure 1b. Total population living in zones designated in relation to health protection targets as fraction of the national population.

3. Air Quality assessments

If measurements or model calculations indicate that a limit value (or limit value plus margin of tolerance) or a target value is exceeded somewhere in a zone, the whole zone is designated as being in exceedance concerning this threshold. The information presented in this chapter is mainly extracted from forms 2, 8 and 9 of the AQ questionnaire. It focuses on pollutants/protection targets, where compliance poses problems. 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 where air quality exceeds the limit or target value. 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 reporting countries 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 reporting countries or even between regions within a country.*

In 2011, the percentage of zones in all reporting countries exceeding the limit or target values set for the protection of human health was highest for the daily limit value of PM_{10} and for the health-related target value of O_3. The percentages were 42% and 33%, respectively. For the NO_2 annual limit value this percentage was 33%. Compared to 2010 the fraction of zones in exceedance of PM10 LV is this year higher.
Looking at the population, the highest fraction potentially exposed to levels above the LV or TV is found for the daily LV of PM_{10} (49%), next the annual LV of NO_2 (48%), followed by the O_3 TV (31%).
In Annex IV there is the link to the list of zones per reporting country and their status in relation to the air quality objectives.

3.1. Main exceedances related to human health

Figures 3-6 show the reporting countries zones in exceedance maps for the PM_{10} daily limit value, the O_3 health-related target value, the NO_2 annual limit value and the B(a)P annual target value (see also Annex II). White areas in the maps represent areas in countries 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 of the abovementioned cases those reporting countries are not fulfilling the criteria of the Directive, as zoning and reporting is mandatory for all health-related pollutants. For PM_{10} and NO_2, red, violet and purple territories are areas where an exceedance occurred:
For zones without time extension (time extension has not been requested or granted, see section 3.2.1):

- no exceedance of the limit value (green);
- exceedance of the limit value (red);

For zones with time extension granted:

- no exceedance of the limit value (green);
- 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).

For O_3 and B(a)P, a red zone indicates an exceedance of the target value and for ozone, orange means an exceedance of the long term objective but not of the target value.

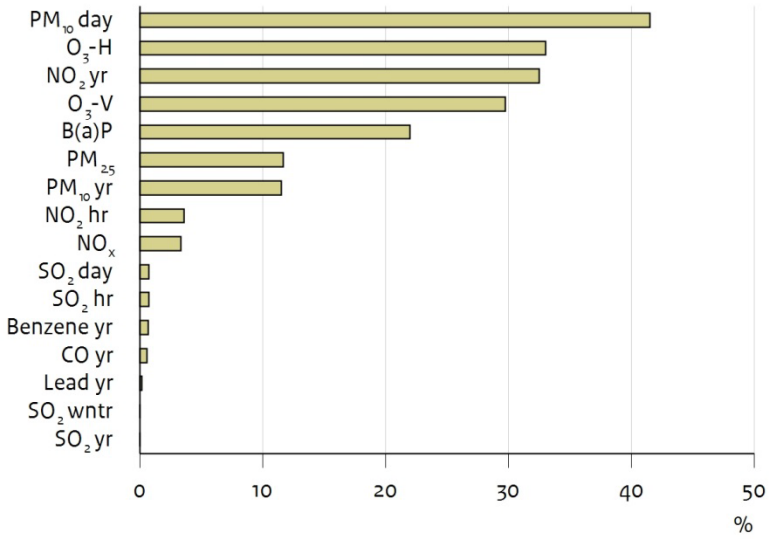

Figure 2a. Fraction of EU-27 zones in exceedance per limit or target value, 2011.

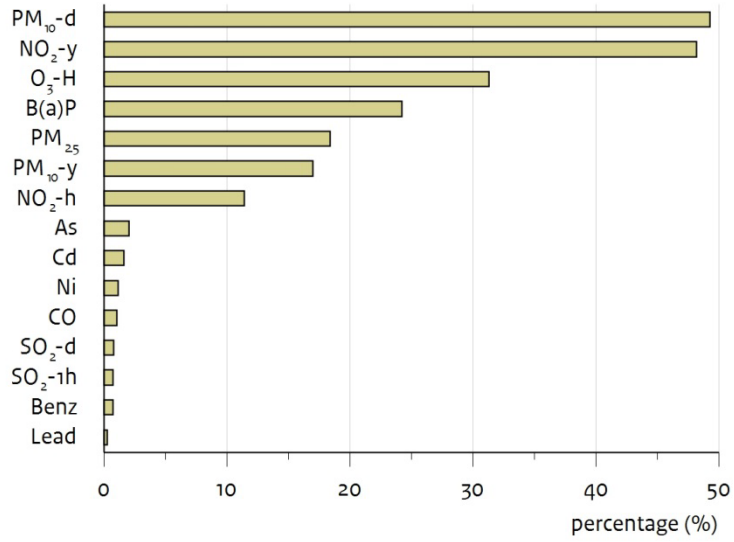

Figure 2b. Fraction of population potentially exposed to concentrations above limit or target values in 2011, EU-27 Member States.

Figure 3 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, northern Belgium, the Ruhr area, Central and Eastern Europe. However, zones in exceedance can also be found in Sweden, Latvia, south Spain and the Balkans. Here, exceedance might have been reported at one or two hot-spot stations resulting in a whole zone in non-compliance.

Note that the map does not account for substractions of natural contributions and/or of contributions of winter-sanding and salting (see sections 3.2.2 and 3.2.3)

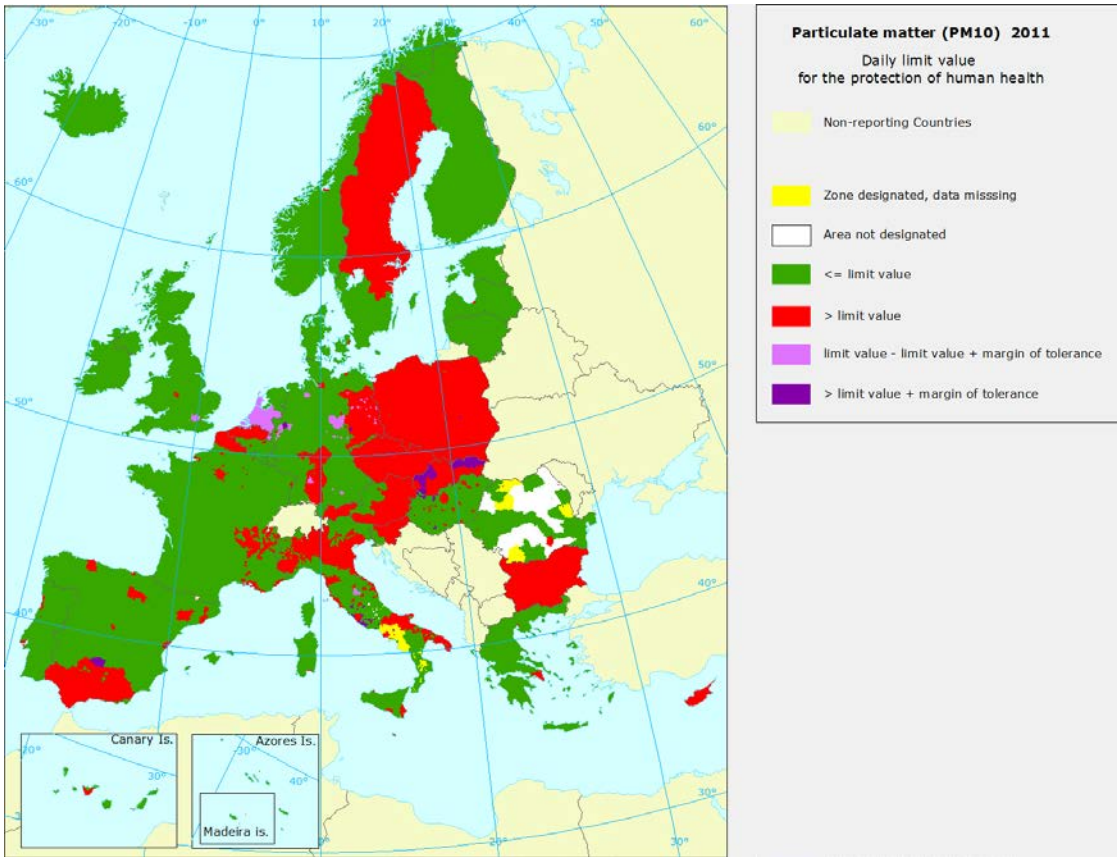

Figure 3. Zones in exceedance of the daily PM_{10} limit value in 2011 (not accounting for subtractions of natural contributions and/or of contributions of winter-sanding and salting).

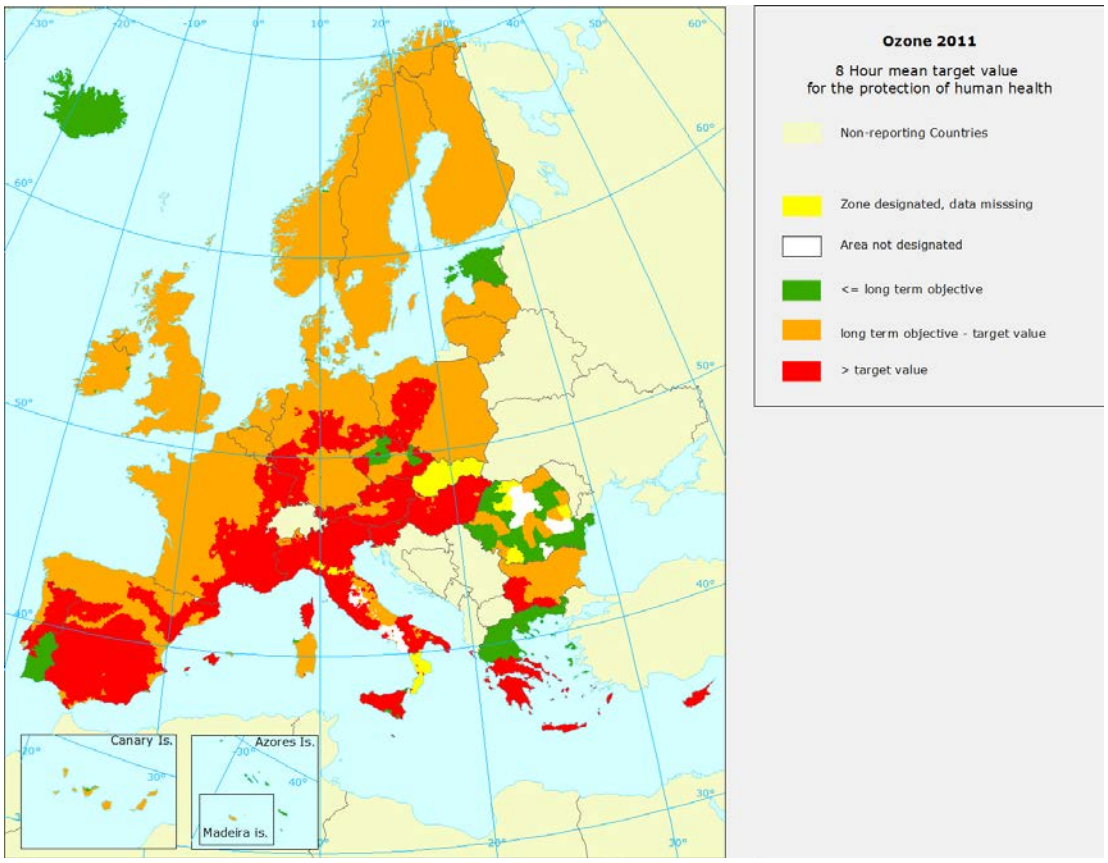

Figure 4. Zones in exceedance of the health-related target value for ozone in 2011.

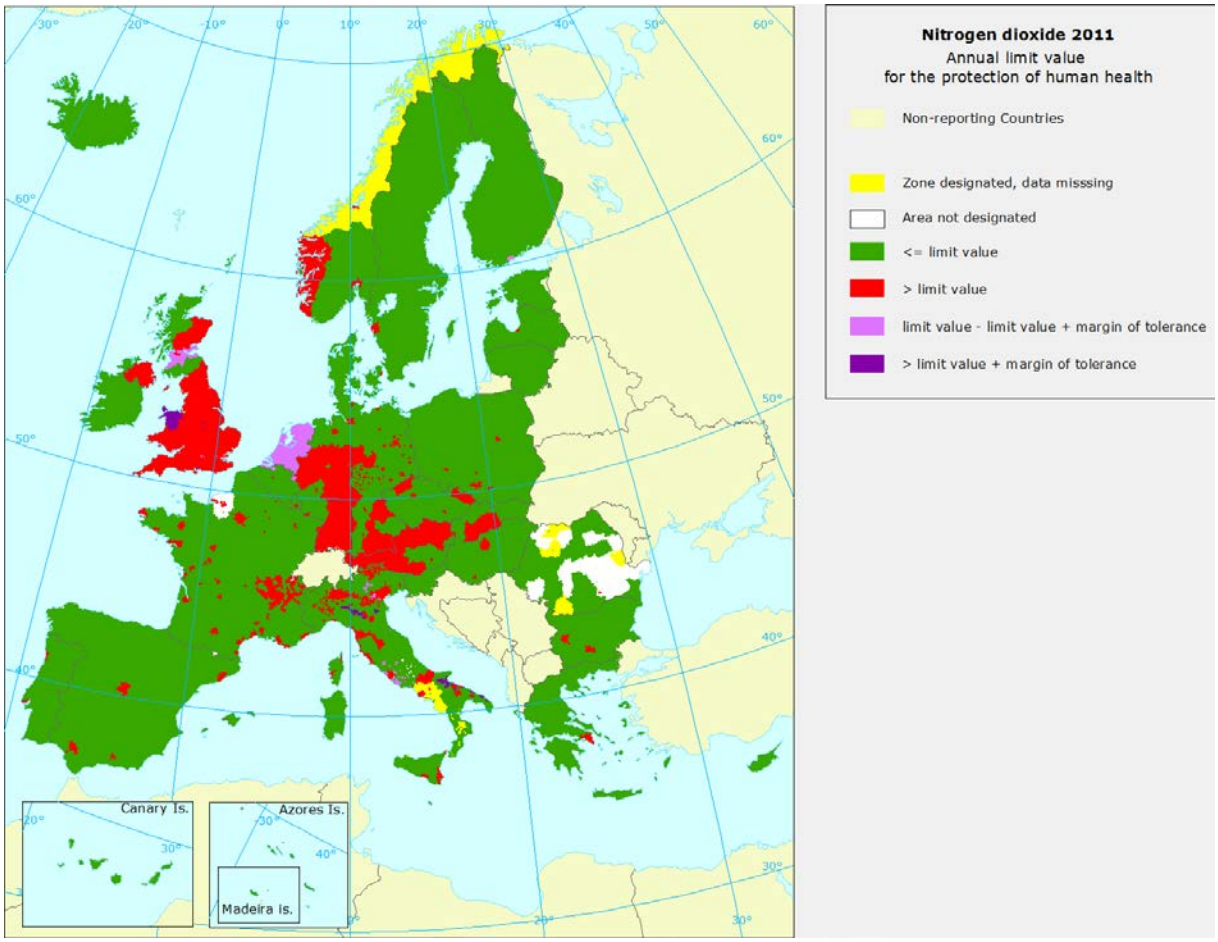

Figure 5: Zones in exceedance of the annual limit value for NO_2 in 2011.

In EU-27 the O_3 health-related target value was exceeded in a total of 212 zones, see Figure 4. In two of those zones reporting was based on modelled results, one zone is located in Italy and the other zone in Spain. Similar to previous years, there are few zones in Europe not exceeding the long-term objective of 120 µg ozone/m^3. In previous years these zones were mainly located in Northern Europe; however, this year a few zones in the Mediterranean and Balkan regions report levels below the LTO. This is rather surprisingly as European air quality maps either based on modelling or on interpolated monitoring data (see e.g. EMEP,2012; Horalek et al, 2013) tend to show the highest levels here, in particular in the more eastern parts of the Mediterranean. Ozone 2011 monitoring data available in AirBase (Mol et al, 2013) shows levels exceeding the LTO value of 120 ug/m^3 both in South Portugal as well as in Northern Greece. Not all of these stations have been assigned as stations reporting under the AQ Directive (e.g. because the data quality objectives have not been met).

For NO_2 the map looks very similar to last year's. The most agglomeration exceedances of the ALV occur in Germany (57), Italy (46), UK (41) and France (26). For 23 zones in the United Kingdom the reported exceedances are based on modelled results. In the Netherlands all designated zones reported exceedance to the LV, but not the MOT. As the Netherlands were granted time extensions for the annual limit value of NO_2 for all zones, they still attain the AQD objectives.

The health target value for B(a)P was exceeded in 111 zones (see Figure 6). In Finland and Lithuania all designated zones exceeded the TV. In addition, Bulgaria, the Czech Republic, Greece, Hungary, Poland and Slovenia have nearly all their designated zones for B(a)P exceeding the TV.

B(a)P is found in fine PM and originates from incomplete combustion. With the increase use of biomass (wood) burning for domestic heating and power generation the B(a)P emissions have shown an increase over the last decade. The fraction of the population potentially exposed to levels exceeding the B(a)P target value is 25%. When focussing on the urban population 22-30% of the urban population is exposed to levels above target value of 1 ng/m^3 (EEA, 2013b). As B(a)P is known to be carcinogenic there will be no safe level below which no further health impacts are to be expected. Therefore, no Air Quality Guideline has been recommended by the WHO (2000). However, based on epidemiological data the WHO estimates the unit risk[11] for B(a)P to be 8.7 x 10^{-5} per ng/m^3. If we except a lifetime risk of 10^{-5} a reference concentration for B(a)P would be 0.12 ng/m^3. The fraction of the urban population potentially exposed to concentrations above this level is estimated as 75-95% (EEA, 2013b). The uncertainty in the population exposure estimates is large. With a lower assessment threshold of 0.4 ng/m^3 routine monitoring of B(a)P is not mandatory in large part of EU27: in more than 50% of the zones the concentrations are below the LAT. The health risks associated with B(a)P exposure might be underestimated.

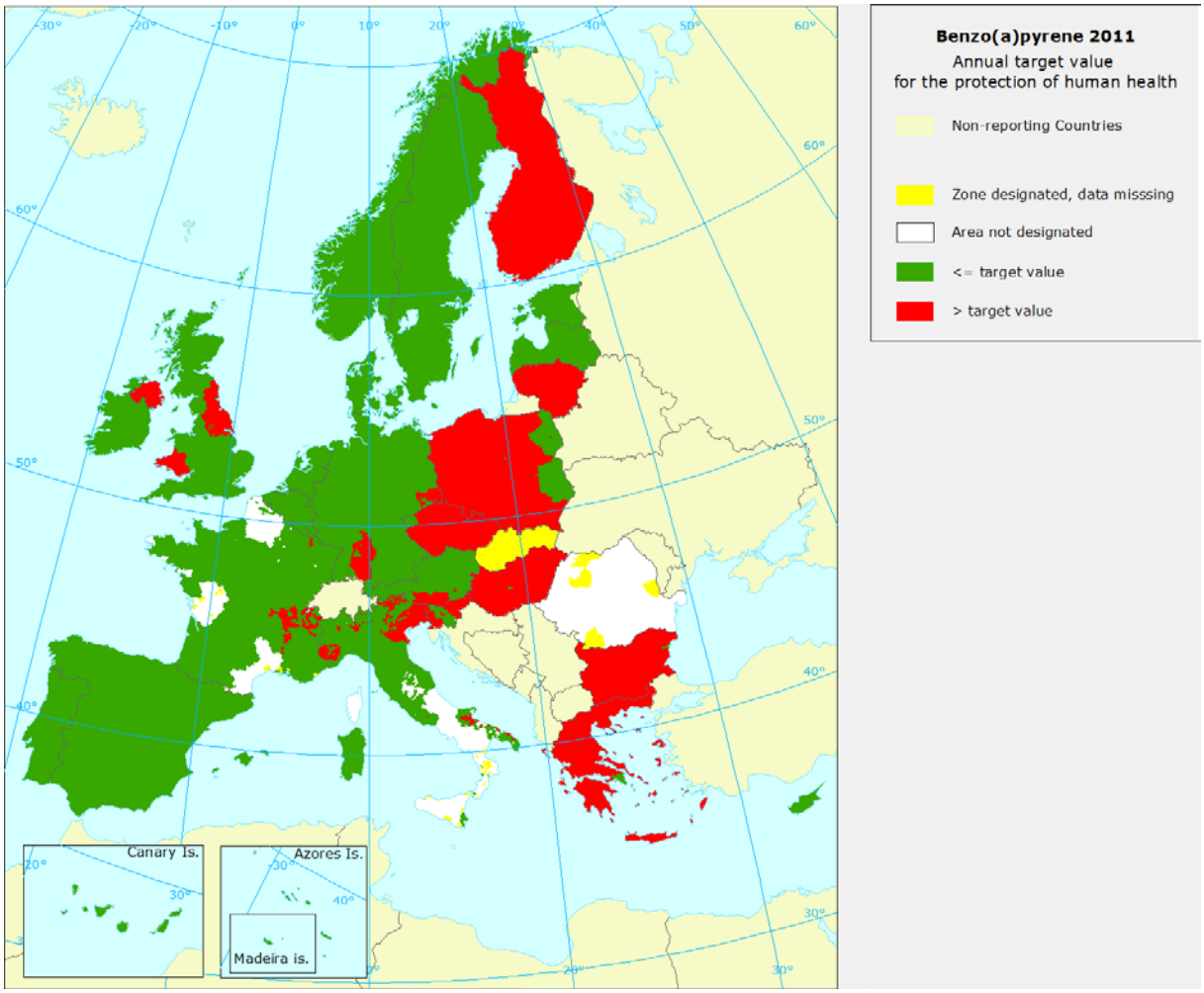

Figure 6: Zones in exceedance of the annual target value for benzo(a)pyrene in 2011.

In reporting on the individual exceedances of limit or target values (form 11 and form 13) the countries may indicate a reason for the exceedance. For 8-9% of the individual exceedances of the PM_{10} annual or daily limit value and the ozone health-TV it has been indicated that transport of air

[11] The unit risk is defined as "the additional lifetime cancer risk occurring in a hypothetical population in which all individuals are exposed continuously from birth throughout their lifetime to a concentration of 1 ng/m^3 of the carcinogen in the air they breathe".

pollution originating from sources outside the reporting country causing the exceedance. Consultation with other MS on transboundary pollution is, however, limited: four MS consulted one or more other MS on this topic (Form 25). Further information on agenda or minutes of these meetings has not been included in the questionnaire.

Air pollutants are mainly emitted in the same industrialized and densely populated areas. Their concentrations are therefore highly correlated, in particular for primary (directly emitted) pollutants. For secondary pollutants (formed in the atmosphere) correlation tends to be lower. As a result of this exceedance of two or more limit or target value might be co-located. Tentatively an overlay of all the zones where a LV/TV of the five most important pollutants (from a health point of view) has been exceeded, has been prepared. The final map (Figure 7) shows the well-known polluted areas in Europe (urban areas, Po Valley, eastern Europe) where the population is exposed to air pollution exceeding three to five LV/TV. The green/orange coloured Romanian areas could be due to the lack of data from these parts of Europe (see Figure 3- 6), automatically resulting in 0-1 components above the LV/TV. Improvement in designation of zones could result in more components above the LV/TV there, similar to neighbouring countries.

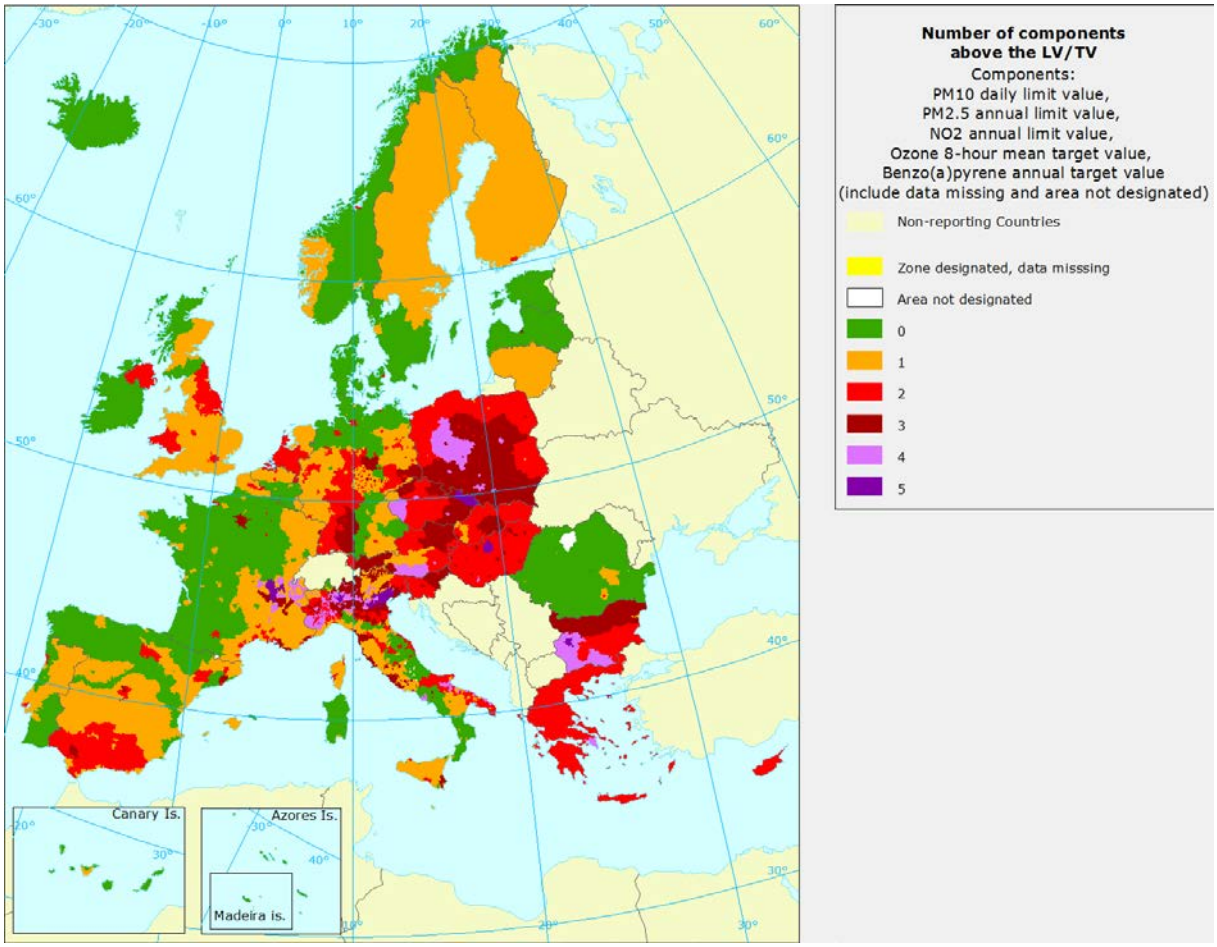

Figure 7: Indicative air quality map showing the number of components exceeding LV/TV in different areas as reported by countries for 2011.

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 values of PM_{10}, NO_2 and benzene;
(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).

3.2.1. Time extensions

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 (until 1 January 2015, NO_2 and benzene) or an exemption of the obligation of appliance up to three years (until June 2011, PM_{10}). During those periods 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.

Information on the notifications for time extension submitted by the Member States and the decisions of the Commission in reply to these requests are available on the European Commission's website[12].

In a number of cases the designation of the zones included in the notifications of the MS have been changed over the years. In general a match could be made between the original zone and the current (2011) zone on the basis of additional information submitted by the Member States. A table, covering the period 2008-2011 for zones for which time extension has been granted is presented in Table 3. In this table the zone code and zone as defined in 2011 have been given.

For the daily PM_{10} limit value, time extensions have been granted for 56 zones in the EU Member States. From the 56 zones, 6 zones have reported that PM_{10} levels are below the daily limit value which is substantially less than the previous year. In 2010, 16 time-extension zones reported values below the limit value, so in 10 of them air quality has been worsened.
Time extension has been granted for 10 zones for the annual PM_{10} limit value. In 8 zones concentrations were reported to be below the annual limit value; in 7 of them attainment of the annual limit value was achieved already in 2010 or even earlier. In one zone the limit value has been met in 2009 and 2010 but an exceedance has been reported in 2011. And finally in another zone PM_{10} annual levels are above the LV during the whole period 2008-2011

Postponement for both the annual and hourly limit value of NO_2 has been granted for two zones in Bulgaria. In addition, in 80 zones time extension is granted for the annual limit value, and in 4 zones for the hourly limit value. In six zones the 2011 annual mean concentrations were below the limit value; in two zones the reported concentrations dropped below the HLV. This is an improvement compared to 2010, when none of the time-extension zones was below the limit values.

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

Table 3a-d. *Status in zones for which time extension has been granted for a) annual (ALV) or b) daily limit values (DLV) for PM_{10} (nr=AQ status not retrievable); c) both ALV and DLV for PM_{10}; and d) NO_2 annual and hourly limit value. The grey shaded cells indicate no time extension was granted in the zone for this particular limit value.*

a) PM_{10} ALV

Zone code	zone name	2008	2009	2010	2011
CY001A	CYPRUS	>lv	>lv	>lv	>lv
DEZCXX0007A	Ballungsraum Stuttgart	>lv	lv-mot	lv-mot	<lv
HU0001	Budapest region	<lv	<lv	<lv	<lv
HU0008	Sajó valley	lv-mot	<lv	<lv	>lv
HU0011	Allotted cities	lv-mot	<lv	<lv	<lv
IT1102	Zona B	<lv	<lv	<lv	<lv

b) PM_{10} DLV

Zone code	zone name	2008	2009	2010	2011
AT_02	Kärnten	<lv	<lv	>lv	>lv
AT_03	Niederösterreich	<lv	>lv	>lv	>lv
AT_06	Steiermark ohne AG Graz	>lv	<lv	>lv	>lv
AT_07	Tirol	<lv	<lv	>lv	>lv
AT_09	Wien	>lv	>lv	>lv	>lv
AT_40	AG Linz	>lv	<lv	>lv	>lv
AT_60	Graz	>lv	>lv	>lv	>lv
CZ031	Jihočeský kraj	>lv	>lv	>lv	>lv
CZ0640	Jihomoravský kraj	>lv	>lv	>lv	>lv
DEZAXX0006S	Orte erhöhter verkehrsbedingter Schadstoffbelastung im Land Brandenburg ab 2005	>lv	lv-mot	lv-mot	>lv
DEZCXX0070S	Gebiet (ohne Ballungsräume) mit PM10-Werten > GW	nr	lv-mot	lv-mot	lv-mot
DEZDXX0001A	Ballungsraum München	>lv	lv-mot	lv-mot	lv-mot
DEZDXX0002A	Ballungsraum Augsburg	>lv	<lv	lv-mot	lv-mot
DEZEIX0107A	Ballungsraum Niedersachsen-Bremen	>lv	<lv	<lv	lv-mot
DEZJXX0004A	Köln	<lv	<lv	<lv	<lv
DEZJXX0005A	Hagen	<lv	<lv	<lv	lv-mot
DEZJXX0006A	Essen	<lv	lv-mot	<lv	>lv
DEZJXX0008A	Dortmund	<lv	lv-mot	<lv	lv-mot
DEZJXX0009A	Düsseldorf	>lv	lv-mot	lv-mot	lv-mot
DEZJXX0011A	Aachen	<lv	lv-mot	<lv	<lv
DEZJXX0014S	Warstein	nr	<lv	<lv	<lv
DEZJXX0015A	Grevenbroich (Ballungsraum Rheinisches Braunkohlerevier)	nr	<lv	lv-mot	lv-mot
DEZJXX0017A	Duisburg	>lv	>lv	lv-mot	lv-mot
DEZJXX0018S	Krefeld	lv-mot	lv-mot	lv-mot	lv-mot
DEZNXX0001A	Leipzig	>lv	lv-mot	lv-mot	>lv
DEZOXX0017S	LSA West	<lv	<lv	lv-mot	lv-mot
DEZPXX0010S	Gebiet Thüringen 1	>lv	lv-mot	lv-mot	lv-mot
ES0705	COMARCA DE PUERTOLLANO	>lv	<lv	<lv	>lv
FR16A02	Strasbourg	>lv	>lv	>lv	>lv
HU0002	Győr-Mosonmagyaróvár	<lv	<lv	lv-mot	>lv
HU0003	Komárom-Tatabánya-Esztergom	<lv	lv-mot	lv-mot	>lv
HU0006	Pécs region	<lv	lv-mot	>lv	>lv
HU0009	Debrecen region	<lv	<lv	<lv	<lv
IT0201	Zona di risanamento	<lv	<lv	<lv	<lv

Zone code	zone name	2008	2009	2010	2011
IT1001	Area metropolitana di Perugia	>lv	lv-mot	<lv	lv-mot
IT1203	Z2	<lv	<lv	<lv	>lv
IT1504	Zona di risanamento – area beneventana	>lv	lv-mot	<lv	>lv
NL0100	Noord	<lv	<lv	<lv	<lv
NL0230	Den Haag/ Leiden	>lv	lv-mot	<lv	lv-mot
NL0300	Zuid	>lv	lv-mot	lv-mot	lv-mot
NL0310	Eindhoven	>lv	<lv	lv-mot	lv-mot
NL0320	Heerlen/ Kerkrade	<lv	<lv	lv-mot	lv-mot
PL1404	strefa pruszkowsko-żyrardowska	>lv	lv-mot	>lv	>lv
PL1403	miasto Radom	>lv	lv-mot	>lv	>lv
PL1602	strefa namysłowsko-oleska	>lv	>lv	>lv	>lv
PL1602	powiat kędzierzyńsko-kozielski	>lv	lv-mot	>lv	>lv
PL3003	strefa ostrowsko-kępińska	<lv	<lv	>lv	>lv
UK0001	Greater London Urban Area	>lv	>lv	lv-mot	lv-mot
SKKO02	Košický kraj	>lv	>lv	>lv	>lv
SKPR01	Prešovský kraj	>lv	>lv	lv-mot	>lv
SKTN01	Trnavský kraj	>lv	<lv	lv-mot	>lv
SKTR01	Trenčiansky kraj	>lv	>lv	lv-mot	>lv

c) both PM_{10} ALV and PM_{10} DLV

Zone code	zone name	2008	2009	2010	2011	2008	2009	2010	2011
NL0200	Midden	<lv	<lv	<lv	<lv	>lv	lv-mot	lv-mot	lv-mot
NL0210	Amsterdam/Haarlem	<lv	<lv	<lv	<lv	>lv	lv-mot	lv-mot	lv-mot
NL0220	Utrecht	<lv	<lv	<lv	<lv	>lv	lv-mot	<lv	lv-mot
NL0240	Rotterdam/ Dordrecht	<lv	<lv	<lv	<lv	>lv	lv-mot	lv-mot	lv-mot

d) NO_2 ALV, HLV

		ALV		HLV	
Zone code	zone name	2010	2011	2010	2011
AT_02	Kärnten	>lv	>lv		
AT_03	Niederösterreich	>lv	>lv		
AT_40	AG Linz	>lv	>lv		
BEF01S	PORT OF ANTWERP	>lv	lv-mot		
BEF02A	ANTWERP	>lv	lv-mot		
BG0001	Sofia	>lv	>lv	>lv	>lv
BG0002	Plovdiv	>lv	>lv	>lv	>lv
CZ010	Praha			>lv	>lv
CZ0642	Brno	>lv	>lv		
DEZAXX0006S	Orte erhöhter verkehrsbedingter Schadstoffbelastung im Land Brandenburg ab 2005	>lv	>lv		
DEZCXX0005A	Ballungsraum Karlsruhe	>lv	>lv		
DEZCXX0042S	Regierungsbezirk Freiburg (ohne Ballungsraum)	>lv	>lv		
DEZCXX0043S	Regierungsbezirk Tübingen			>lv	>lv
DEZDXX0025S	Oberpfalz	>lv	>lv		
DEZDXX0026S	Unterfranken	>lv	>lv		
DEZEXX0101S	Bremen (Bremerhaven)	>lv	>lv		
DEZFXX0003S	Gebiet I (Südhessen)	>lv	>lv		
DEZFXX0004S	Gebiet II (Lahn-Dill-Gebiet)	>lv	>lv		
DEZGLX0001A	Ballungsraum Hamburg			>lv	<lv

		ALV		HLV	
Zone code	**zone name**	**2010**	**2011**	**2010**	**2011**
DEZHXX0003A	Ballungsraum Rostock	>lv	>lv		
DEZIXX0103S	Niedersachsen-Sued	>lv	>lv		
DEZIXX0104A	Ballungsraum Hannover-Braunschweig	>lv	>lv		
DEZIXX0105A	Ballungsraum Osnabrueck	>lv	>lv		
DEZIXX0106A	Ballungsraum Goettingen	>lv	<lv		
DEZJXX0018S	Krefeld	>lv	>lv		
DEZLXX0001A	Ballungsraum Kiel	>lv	>lv		
DEZLXX0005S	Itzehoe	>lv	>lv		
DEZLXX0006S	Ratzeburg	>lv	>lv		
DEZMXX0001A	Ballungsraum Saarbrücken (BSB)	>lv	>lv		
DEZNXX0001A	Leipzig	>lv	>lv		
DEZNXX0002A	Dresden	>lv	>lv		
DEZNXX0015A	Ballungsraum Chemnitz	>lv	>lv		
DEZOXX0002A	Halle	>lv	>lv		
DEZOXX0015A	Landeshauptstadt Magdeburg	>lv	>lv		
DEZPXX0011S	Gebiet Thüringen 2	>lv	>lv		
ES0118	GRANADA Y ÁREA METROPOLITANA	>lv	>lv		
ES1308	CORREDOR DEL HENARES	>lv	>lv		
ES1309	URBANA SUR	>lv	>lv		
FI0014	Pääkaupunkiseutu (HSY-alue)	>lv	lv-mot		
UK(GIB)	Gibraltar	>lv	lv-mot		
UK0008	Nottingham Urban Area	>lv	>lv		
UK0011	Leicester Urban Area	>lv	>lv		
UK0012	Portsmouth Urban Area	>lv	>lv		
UK0015	Bournemouth Urban Area	>lv	>lv		
UK0016	Reading/Wokingham Urban Area	>lv	lv-mot		
UK0017	Coventry/Bedworth	>lv	>lv		
UK0021	Southend Urban Area	>lv	lv-mot		
UK0025	Edinburgh Urban Area	>lv	lv-mot		
UK0026	Cardiff Urban Area	>lv	lv-mot		
UK0037	Central Scotland	>lv	lv-mot		
UK0042	North Wales	>lv	>lv		
UK0043	Northern Ireland	>lv	>lv		
IT0104	Vercelli 01	>lv	>lv		
IT0110	Asti 01	>lv	>lv		
IT0112	Alessandria 01	>lv	>lv		
IT0114	Biella 01	>lv	<lv		
IT0309	Pianura ad elevata urbanizzazione (A)	>lv	>lv		
IT0310	Pianura (B)	>lv	<lv		
IT0401	Zona A	>lv	lv-mot		
IT0501	Zona 1 Agglomerato: Agglomerato Venezia-Treviso	>lv	>lv		
IT0502	Zona 1 Agglomerato: Agglomerato Padova	>lv	lv-mot		
IT0503	Zona 1 Agglomerato: Agglomerato Vicenza	>lv	lv-mot		
IT0703	Aree urbane con fonti emittenti miste -La Spezia -	>lv	lv-mot		

		ALV		HLV	
Zone code	**zone name**	**2010**	**2011**	**2010**	**2011**
IT0705	Aree urbane in cui prevale la fonte produttiva-Bormida-	>lv	>lv		
IT0706	Aree urbane in cui prevale la fonte produttiva-Busalla-	>lv	lv-mot		
IT0802	Agglomerato R1 Piacenza	>lv	>lv		
IT0812	Agglomerato R2 Parma	>lv	>lv		
IT0822	Agglomerato R3 Reggio Emilia	>lv	>lv		
IT0833	Agglomerato R5 Fiorano Modenese	>lv	>lv		
IT0852	Agglomerato R8 Ferrara	>lv	>lv		
IT0882	Agglomerato R13 Rimini	>lv	<lv		
IT1203	Z2	>lv	lv-mot		
IT1502	ZONA DI RISANAMENTO - AREA SALERNITANA	>lv	<lv		
IT1503	ZONA DI RISANAMENTO - AREA AVELLINESE	>lv	<lv		
IT1603	C (aree urbano-industriali)	>lv	>lv		
LV0001	Riga	>lv	>lv		
NL0100	Noord	lv-mot	lv-mot		
NL0200	Midden	lv-mot	lv-mot		
NL0210	Amsterdam/Haarlem	lv-mot	lv-mot		
NL0220	Utrecht	lv-mot	lv-mot		
NL0230	Den Haag/ Leiden	lv-mot	lv-mot		
NL0240	Rotterdam/ Dordrecht	lv-mot	lv-mot		
NL0300	Zuid	lv-mot	lv-mot		
NL0310	Eindhoven	lv-mot	lv-mot		
NL0320	Heerlen/ Kerkrade	lv-mot	lv-mot		
PT3001	Área Metropolitana de Lisboa Norte			>lv	<lv

3.2.2. Reporting of exceedances of the PM_{10} limit values attributable to natural sources

Subtraction of exceedances attributable to natural sources is possible for PM_{10} and SO_2. None of the reporting countries informed on SO_2 events.

Subtractions for PM_{10} are applied by a number of reporting countries. In addition to contributions from sea salt, the natural events affecting measured concentrations were mainly described as: "*wild-land fire inside the Member State*", "*high wind events inside the Member State*" and "*transport of natural particles from dry regions outside the Member State*". The latter contribution is particularly important in the Mediterranean Member States. Volcanic eruptions only play a role in Iceland. Not in all cases a justification for the subtraction for natural events has been given; see Viana et al (2011) for a further discussion on the reporting on natural events.
Subtractions regarding exceedances of the PM_{10} daily limit value have been claimed at 134 stations in 62 zones. On averaged 5.7 exceedance days are subtracted per station. In 16 zones the subtraction resulted in a change in the attainment status in relation to the daily limit value; for the other zones the number of exceedance days at one or more monitoring stations after subtraction was still above the allowable 35 days. In Copenhagen (DK0001) the combined subtraction for sea salt and winter sanding resulted in a change in attainment status. Also 3 zones changed their attainment status in relation to the annual limit value. Table 4 lists the zones where after subtraction of the natural contributions the air quality assessments changed from "above limit value" to "below limit value".

Table 4. *Subtraction of natural contributions to the annual mean concentrations or to concentrations during exceedances days may result in concentrations which are below the annual or daily limit value. The air quality assessment in the following zones changes from "above limit value" to "below limit value" by subtraction of the natural contribution.*

daily limit value			annual limit value		
reporting country	Zone code	Zone	reporting country	Zone code	Zone
CY	CY001A	CYPRUS	CY	CY001A	CYPRUS
DK	DK0001	København	ES	ES00118	GRANADA Y ÁREA METROPOLITANA
ES	ES0104	ZONA INDUSTRIAL DE BAHÍA DE ALGECIRAS	MT	MT0001	MALTESE AGGLOMERATION
ES	ES0111	CÓRDOBA			
ES	ES0119	MÁLAGA Y COSTA DEL SOL			
ES	ES0121	NUEVA ZONA INDUSTRIAL DE HUELVA			
ES	ES0124	NUEVA ZONA DE LA BAHÍA DE CÁDIZ			
ES	ES0513	SUR DE TENERIFE			
ES	ES0705	COMARCA DE PUERTOLLANO			
ES	ES1003	MIJARES-PEÑAGOLOSA . ÁREA COSTERA			
ES	ES1301	MADRID			
FR	FR38N10	REUNION-ZUR			
GB	UK(GIB)	GIBRALTAR			
GB	UK0002	WEST MIDLANDS URBAN AREA			
MT	MT0001	MALTESE AGGLOMERATION			
SI	SI3	ALPSKO - DINARSKO			

3.2.3. Contribution of winter-sanding and -salting

Four countries (Austria, Denmark, Latvia and Romania) reported on subtractions due to winter sanding on PM_{10} exceedances in Form 24. However, after the subtraction the number of exceedances dropped below the allowed number only in Latvia and Romania, and also in Denmark when the combined effects of sea salt and winter sanding are accounted for (see above). Table 5 lists the zones where after subtraction of contributions of winter sanding and salting the air quality assessments changed from "above limit value" to "below limit value".

Table 5. *Subtraction of the contributions of winter sanding and salting to the annual mean concentrations or to concentrations during exceedances days may result in concentrations which are below the annual or daily limit value. The air quality assessment in the following zones changes from "above limit value" to "below limit value" by subtraction of winter sanding and salting*

daily limit value		
reporting country	Zone code	Zone
LV	LV0001	RIGA
RO	RO021301	IASI_A

4. Overview of available information on PM monitoring and AEI/$PM_{2.5}$

An overview of the PM monitoring networks in the reporting countries is presented in Table 7 (extracted from Form 3). Some countries defined stations which are not equipped with a $PM_{2.5}$ monitoring device, as being used for the calculation of the AEI; these stations have not been included in the counting in Table 7.

Table 7. *Number of PM_{10} and $PM_{2.5}$ stations in reporting countries as reported in the questionnaire, number of stations labelled as being used to determine the AEI, number of PM_{10} and $PM_{2.5}$ stations as reported to AirBase having data for 2011 and the number of (sub)-urban background $PM_{2.5}$ stations.*

country	AQ Questionnaire (form 3)			AirBase		
	PM_{10}	$PM_{2..5}$	Defined as AEI-station	PM_{10}	$PM_{2..5}$	$PM_{2..5}$ UB
AT	137	20		133	21	12
BE	59	38	8	65	42	18
BG	40	9		40	9	6
CY	3	5		3	5	4
CZ	126	43		120	44	23
DE	401	133		430	147	77
DK	7	8	3	6	8	3
EE	7	7		7	7	3
ES	440	207	30	453	202	74
FI	34	13	1	42	20	6
FR	364	108	53	379	102	74
GB	69	78	45	64	73	47
GR	18	4		18	4	3
HU	26	8	4	25	8	6
IE	17	6	2	17	7	3
IT	430	126		509	142	66
LT	14	7	3	14	7	1
LU	6	3		6	3	1
LV	9	5	1	9	5	2
MT	4	3		4	3	1
NL	48	28	11	48	29	13
PL	198	68	32	200	69	60
PT	55	21	5	59	23	9
RO	44	18	16	44	18	17
SE	39	15	3	41	18	6
SI	14	4		14	4	2
SK	31	27		31	26	18
IS	8	5		8	6	3
NO	30	18	3	31	21	5
Total	2678	1035	224	2820	1073	563

There is a very good agreement in the number of PM sampling points reported in the AQQ and to AirBase. There is a tendency for a slightly larger number of stations in AirBase. Clearly, not all stations are used for compliance checking; this might be related to parallel measurements (e.g. by using different sampling methods) at one station.

Large differences are found in the PM-networks in the reporting countries. Only in Cyprus, Denmark and the United Kingdom the number of $PM_{2.5}$ stations exceeded the number of PM_{10} stations. The criteria set in the directive that the total number of $PM_{2.5}$ and PM_{10} sampling points shall not differ more than by a factor of 2 is fulfilled in 13 reporting countries (according to form 3 in the questionnaires). The majority of MS (15 out of 27; and also Norway) have reported on the set of $PM_{2.5}$ stations used for the assessment of the Averaged Exposure Index (AEI). Compared to the 2010-reporting (Jimmink et al, 2012) it means one country more, but there are fewer stations, mainly due to a significant reduction in the number of stations used for the AEI in France, United Kingdom and Romania. The minimal required density of the AEI-stations of one station per million city dwellers, as set in the Directive, appears to be in agreement if the total urban population is estimated either by summing the population in the agglomerations or by taking the data from the World Population Prospect (UN, 2009).

The design of the $PM_{2.5}$ network is more directed towards estimation of population exposure than towards assessment of hotspot situations: 52% of the stations is classified as (sub)urban background while 33% is labelled as traffic or industrial station. The corresponding percentages for the PM_{10} network are both 43%.

For $PM_{2.5}$, statistical parameters (mean, median, 98-percentile and maximum) have been reported by all reporting countries using Form 18. Information is given for 981 stations, about 50 less than the number of stations defined in Form 3. The reported data is summarized in Figure 8. The level of 25 µg/m^3, target value in 2010, limit value in 2015, has been exceeded at one or more stations (in total 117 stations) in 11 reporting countries. (Only 10 MS reported exceedance of the $PM_{2.5}$ TV in form 18).

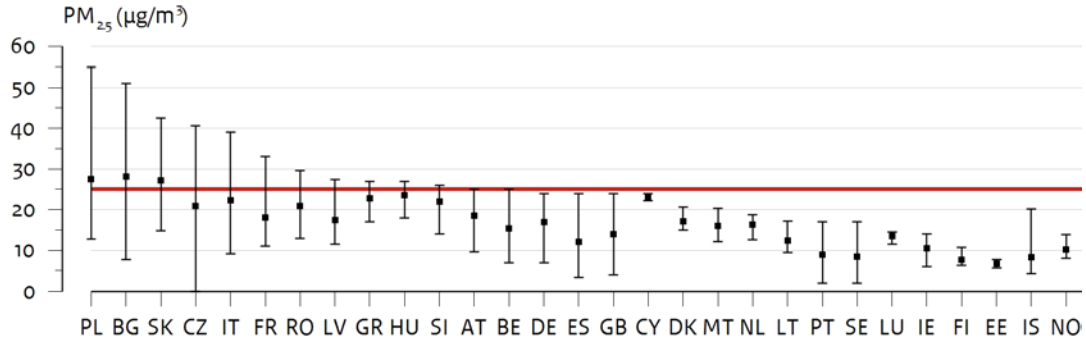

Figure 8. Annual mean (and maximum/minimum value) $PM_{2.5}$ concentrations in 2011 averaged over all stations reported per country. The red line corresponds to the 2010 target value and 2015 limit value.

The AEI reflects the $PM_{2.5}$-exposure of the general (urban) population. 15 reporting countries provided information on stations and measurement configurations selected for determination of the AEI in the AQQ (Form 3). Not all stations selected for AEI determination had a measuring series in 2011 (UK, FR and RO). 24 countries have reported an AEI for 2011 (calculated using years 2009-2011), see Figure 9 (Form 28). In six of them the AEI for 2011 is above 20 µg/m^3, the exposure concentration obligation, legally binding AEI in 2015.

As an alternative estimate of the AEI we have calculated here the three-year running mean (2009-2011) as the mean of the annual averaged concentration over all operational (sub)urban background stations in each individual year (data available from AirBase). The approximated AEI (Figure 9) is not based on a stable set of stations. In general, the official reported AEI, based on a dedicated set of (sub)urban station agrees well with the AEI estimated here on the basis of all operational (sub)urban background stations. Figure 9 indicates that in 8 countries the current estimated exposure indicator is above 20 µg/m^3, the exposure concentration obligation, legally binding AEI in 2015.

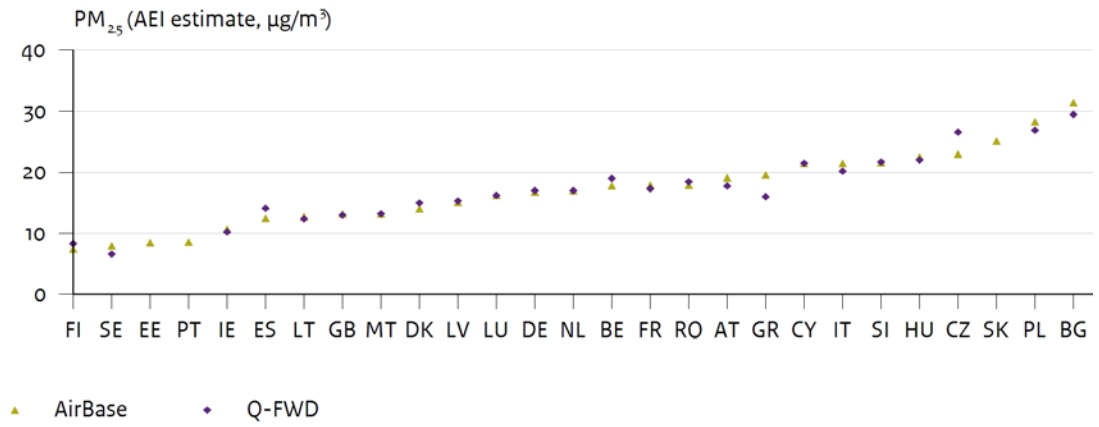

Figure 9. Average Exposure Indicator (AEI): estimated AEI, three-year running mean (2009-2011; data for Poland based on 2010-2011) over all operational (sub)urban background stations (green triangles). AEI as reported in the AQQ (purple diamonds; form 28).

5. 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 AQQ) meta-information and concentration data has to be submitted. A comparison of the information in the AQQ 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 2011 concentration data of a station/pollutant combination listed in Form 3 or 4 is available from AirBase) larger differences are found. For the classical pollutants (SO_2, NO_2, PM_{10}, $PM_{2.5}$, CO, O_3) for nearly all measurement configurations the 2011 concentration data are also included in the national EoI submissions (ranging from 96.2 ($PM_{2.5}$) to 98.6% (SO_2)). For lead, benzene and the 4th DD pollutants a positive match between the two data flows could be found in 82-97% of the cases. This is an improvement compared to the previous reporting year but especially the reporting on 4th DD pollutants needs further attention.

6. Conclusions

The number of designated zones in 2011 in the EU-27 (811) was higher than in 2010 (784). The designation of zones for pollutants having a health related limit or target value is completed for SO_2, NO_2, PM_{10}, CO and ozone. For these compounds, the zones cover 90% or more of the population; exceptions are found in Romania where the population coverage may drop below 50%. For $PM_{2.5}$ an incomplete zoning is found in Greece, Hungary and Romania. For lead and benzene, the coverage is lower: in a number of Member States the zones cover less than 80% of the population. Germany, France, Greece, Hungary, Italy, Portugal, Romania, and Slovakia have different zone designations for PM_{10} and $PM_{2.5}$.

In 2011, the percentage of zones in all reporting countries exceeding the limit or target values set for the protection of human health was highest for the daily limit value of PM_{10} and for the health-related target value of O_3. The percentages were 42% and 33%, respectively. For the NO_2 annual limit

value this percentage was 33%. Compared to 2010 the fraction of zones in exceedance of PM10 LV is this year higher.
Looking at the population, the highest fraction potentially exposed to levels above the LV or TV is found for the daily LV of PM_{10} (49%), next the annual LV of NO_2 (48%), followed by the O_3 TV (31%).

The number of $PM_{2.5}$ monitoring stations had still increased in 2011; 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) has been completed in nearly all Member States. 24 Member States reported on the AEI (period 2009-2011); in six MS the reported AEI was above 20 $\mu g/m^3$, the value legally binding for 2015. The 2010 target value and 2015 limit value of 25 $\mu g/m^3$ is exceeded at hot-spot locations in eleven MS.

References

Andrés Alastuey, María Cruz Minguillón, Noemí Pérez, Xavier Querol, Mar Viana Frank de Leeuw (2011) PM10 measurement methods and correction factors: 2009 status report ETC/ACM Technical Paper 2011/21.

Beauchamp et al (2013) Sensitivity analysis of ammonia emission reductions on exceedances of PM air quality standards. ETC/ACM Technical paper 2013/12.

de Leeuw F., Jimmink B., Ostatnicka J., Schreiberova M., Viana M. (2011) Reporting on ambient air quality assessment in the EU Member States, 2009. ETC/ACM Technical Paper 2011/7

De Leeuw F (2012) AirBase: a valuable tool in air quality assessments at a European and local level. ETC/ACM Technical Paper 2012/4.

EEA (2013a) Air Implementation Pilot - Lessons learnt from the implementation of air quality legislation at urban level. EEA Report No 7/2013.

EEA (2013b) European annual air quality report 2013. EEA Report No 9/2013.

EMEP (2012) "Transboundary acidification, eutrophication and ground level ozone in Europe in 2010" Status Report 1/2012.

Horálek J., Corbet L, Kurfürst P., de Leeuw F. (2013) European air quality maps PM and ozone for 2010 and their uncertainty, ETC/ACM Technical Paper 2012/12.

Jimmink B., de Leeuw F., Ostatnicka J., Schreiberova M., Corbet L. (2012) Reporting on ambient air quality assessment in the EU Member States, 2010. ETC/ACM Technical Paper 2012/7

Mol W.J.A. , van Hooydonk P.R. (2013) The European exchange of information in 2012, ETC/ACM Technical Paper 2013/1.

United Nations, Department of Economic and Social Affairs, Population Division (2009). World Population Prospects: The 2008 Revision, Highlights, Working Paper No. ESA/P/WP.210

WHO (2000). Air Quality guidelines for Europe, 2nd edition: WHO Regional Office for Europe (WHO Regional Publications, European Series, No. 91)

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 5a-5c	Stations and measuring methods used for the assessment of recommended volatile organic compounds, other relevant PAH in ambient air and of concentration and deposition of arsenic, cadmium, mercury , nickel, B(a)P and other relevant PAH at background locations.
Form 6	Stations and measurement methods used for the assessment of other ozone precursor substances
Form 7	Methods used to sample, measure and analyse 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 8a-8g	List of zones and agglomerations where levels exceed or do not exceed limit values or limit values plus margin of tolerance for SO_2, NO_2, NO_x, PM_{10}, lead, benzene, CO and $PM_{2.5}$
Form 9a-9c	List of zones and agglomerations where levels exceed or do not exceed target values or long term objectives for ozone, target values for arsenic, cadmium, nickel and B(a)P and target values for $PM_{2.5}$
Form 10a-10l	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 11a-11m	Individual exceedances of limit values and limit values plus the margin of tolerance of SO_2, NO_2, NO_x, PM_{10}, lead, benzene, CO and $PM_{2.5}$
Form 12	Reasons for individual exceedances: optional additional codes to be defined by the Member State
Form 13a-13c	Individual exceedances of ozone information and alert thresholds and of the long term objective for health protection
Form 14a-14d	Exceedance of target values of ozone, arsenic, cadmium, nickel, benzo(a)pyrene and $PM_{2.5}$
Form 15a-15b	Annual statistics of ozone, arsenic, cadmium, nickel, and benzo(a)pyrene
Form 16a-16d	Annual average concentrations of ozone precursor substances, of mercury and relevant PAH compounds other than B(a)P, and total deposition of arsenic, cadmium, nickel, mercury and relevant PAH compounds other than B(a)P
Form 17	Monitoring data on 10 minutes mean SO_2 levels
Form 18	Monitoring data on 24hr mean $PM_{2.5}$ levels
Form 19a-19l	Tabular results of and methods used for supplementary assessment
Form 20	List of references to supplementary assessment methods referred to in Form 19
Form 21a-21d	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 23a-23b	Exceedance of limit values of PM_{10} due to natural events or contributions
Form 24a-24b	Exceedance of limit values of PM_{10} due to winter sanding or salting
Form 25	Consultations with other MS on transboundary pollution
Form 26	Exceedances of limit values laid down in Directive 85/203/EEC
Form 27	Reasons for exceedances of limit values laid down in Directive 85/203/EEC: optional additional codes to be defined by the Member State
Form 28	$PM_{2.5}$ Average Exposure Indicator

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 set for the protection of human health.

Pollutant	Concentration	Averaging period	Legal nature	Permitted exceedances each year
Fine particles ($PM_{2.5}$)	25 µg/m^3	1 year	Target value entered into force 1.1.2010 Limit value enters into force 1.1.2015*	n/a
	20 µg/m^3	1 year	Indicative limit value enters into force 1.1.2020 (to be confirmed)	
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 entered into force 1.1.2010**	n/a
Ozone	120 µg/ m^3	Maximum daily 8 hour mean	Target value entered into force 1.1.2010 Long term objective	25 days averaged over 3 years (2010 to 2012) n/a
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
Benzo(a)pyrene	1 ng/ m^3	1 year	Target value enters into force 31.12.2012	n/a

** Margin of tolerance: 20 % on 11 June 2008, decreasing on the next 1 January and every 12 months thereafter by equal annual percentages to reach 0 % by 1 January 2015*

***Under the Directive 2008/50/EC the Member State can apply for a postponement 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 (18 hours at 300 µg/m^3 for the hourly NO_2 limit value, 60 µg/m^3 for annual NO_2 limit value and 10 µg/m^3 for the benzene limit value).*

***Under the Directive 2008/50/EC the Member State can apply for an exemption of the obligation of appliance 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).*

The Air Quality Directive has introduced 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*

AQ objectives set for the protection of vegetation:

Title	Metric	Averaging period	Legal nature
SO_2	**20 µg/m^3**	**Calendar year and winter (1 October to 31 March)**	**Critical levels. In force**
NO_x	**30 µg NO_x/m^3**	**Calendar year**	**Critical level. In force**
O_3	**AOT40 18000 (µg/m^3).h**	**Period May to July averaged over 5 years**	**Target value to be met by 1-1-2010 (*2010 will be the first year in the five years row)***
	AOT40 6000 (µg/m^3).h	**Period May to July**	**Long term objective (Date by which the LTO should be met is not defined)**

Annex III. Exceedance maps

This section shows exceedance maps for all AQ objectives, except for the PM_{10} daily limit value, O_3 health target value, NO_2 annual limit value and B(a)P annual target value, which have been included in Figures 3 to 6 in Chapter 3.
The white areas in the maps represent areas in reporting countries that were not designated into zones. The yellow areas were designated into zones, but air quality status was not reported on. For health related objectives in both cases Member States did not comply with the Directives as zoning and reporting is mandatory.

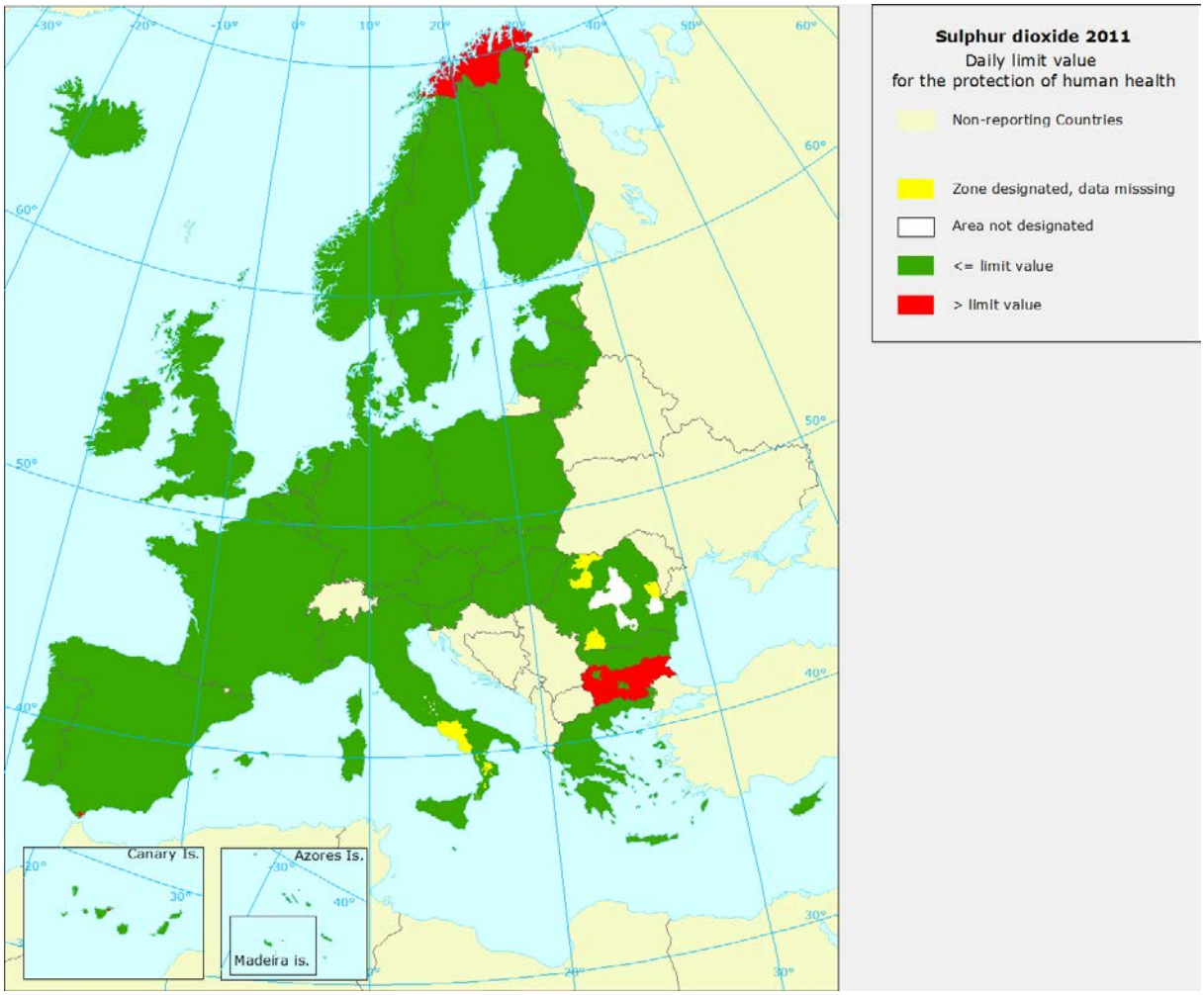

Figure III.1. Zones in exceedance for the daily limit value for SO_2 in 2011.
Like in 2010 zone exceedances for the daily limit value for SO_2 occurred sporadically in Bulgaria, Romania and Norway. The exceedances in Norway are likely caused by transport from the industrial region around Murmansk. In 2011, exceedances have also been reported in Spain. There has been no 2011 exceedance in the Polish zone reporting an exceedance in 2010.

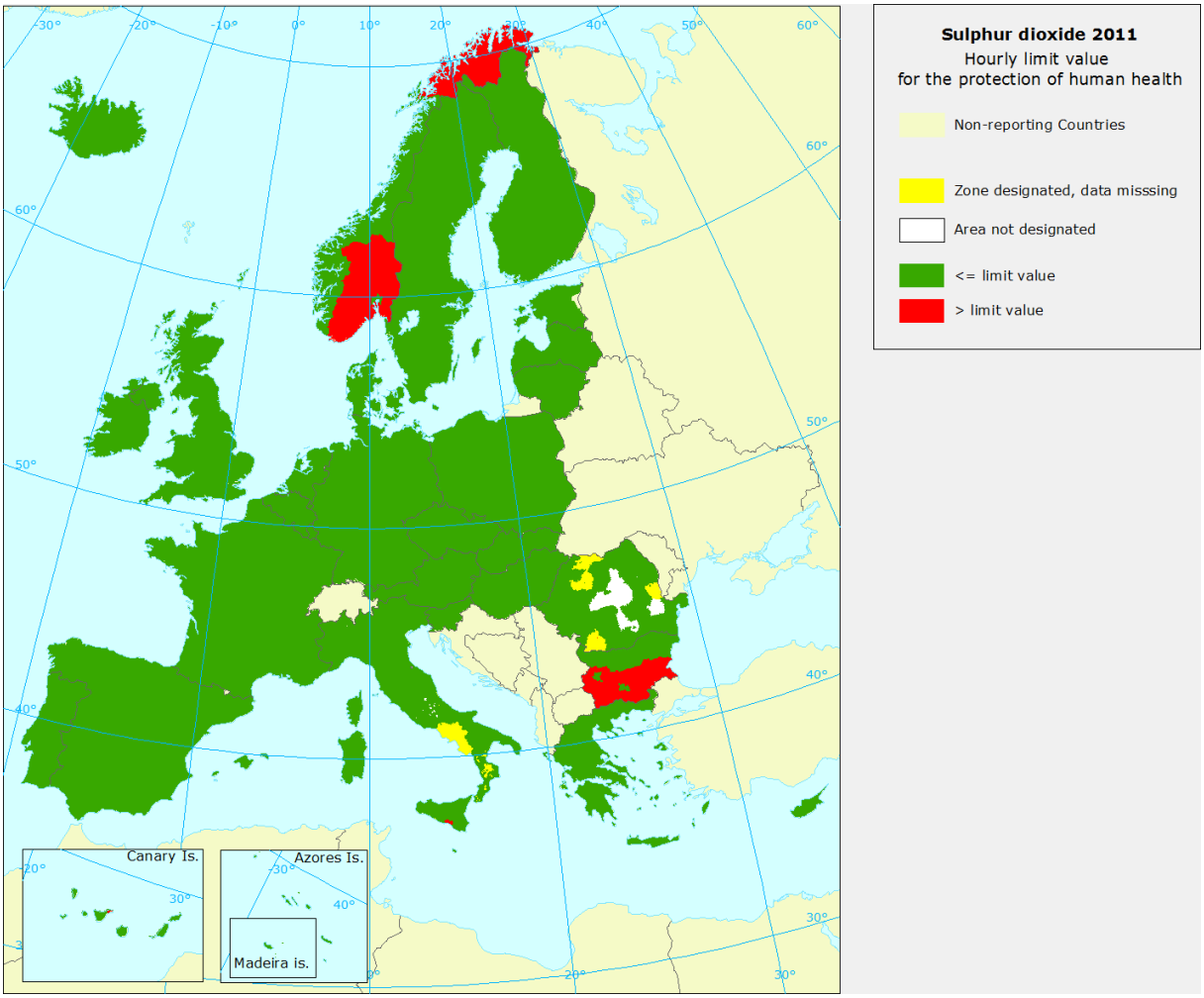

Figure III.2. Zones in exceedance for the hourly limit value for SO_2 in 2011

Compared to the situation with respect to the exceedances of the daily limit value, the map for the hourly limit value of SO_2 shows two additional exceedances in Italy and Norway.

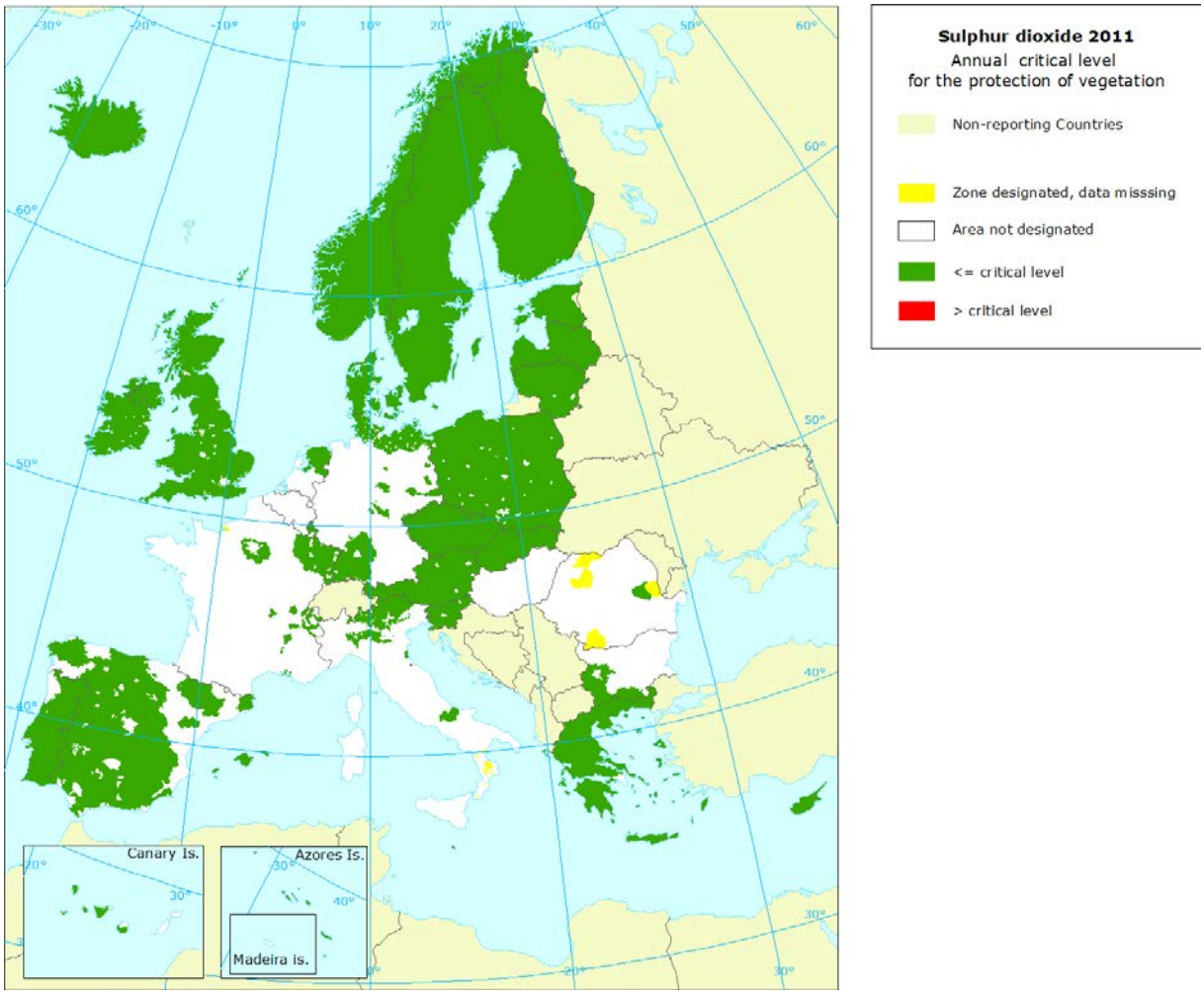

Figure III.3. Zones in exceedance for the annual critical level for SO_2 set for the protection of vegetation in 2011.

No zone exceedance for the annual critical level (CL) for SO_2 for protection of vegetation occurred in 2011. The exceedance of the SO_2 CL, observed in 2010 in Norway, does not appear in 2011 anymore.

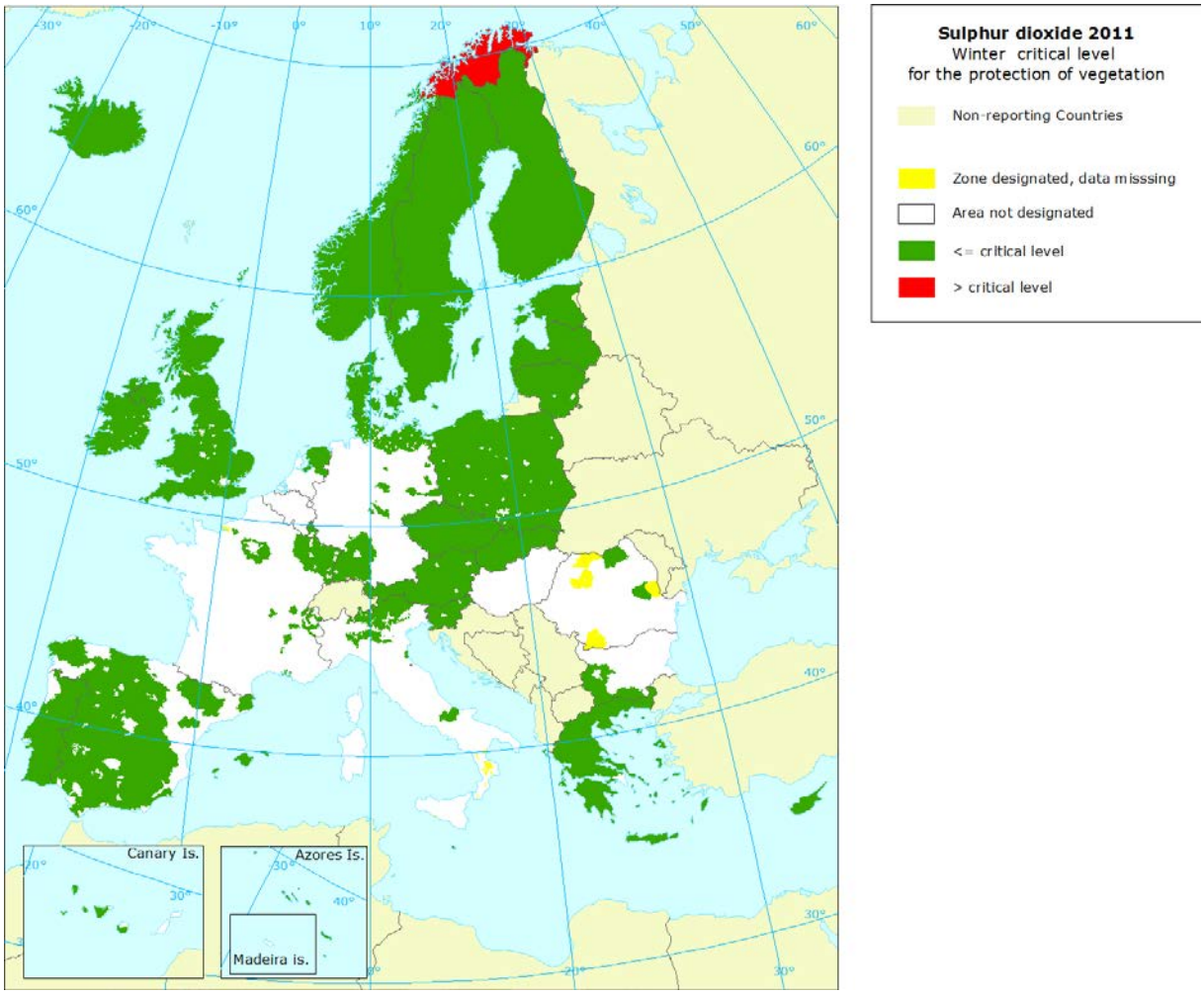

Figure III.4. Zones in exceedance for the winter critical level for SO_2 set for the protection of vegetation in 2011.

Zone exceedances for the winter critical level for SO_2 for protection of vegetation occurred in Norway in 2011. Whereas in 2010 an exceedance of the winter critical level for SO_2 for the protection of vegetation was observed in the Czech Republic, it does not occur anymore in 2011

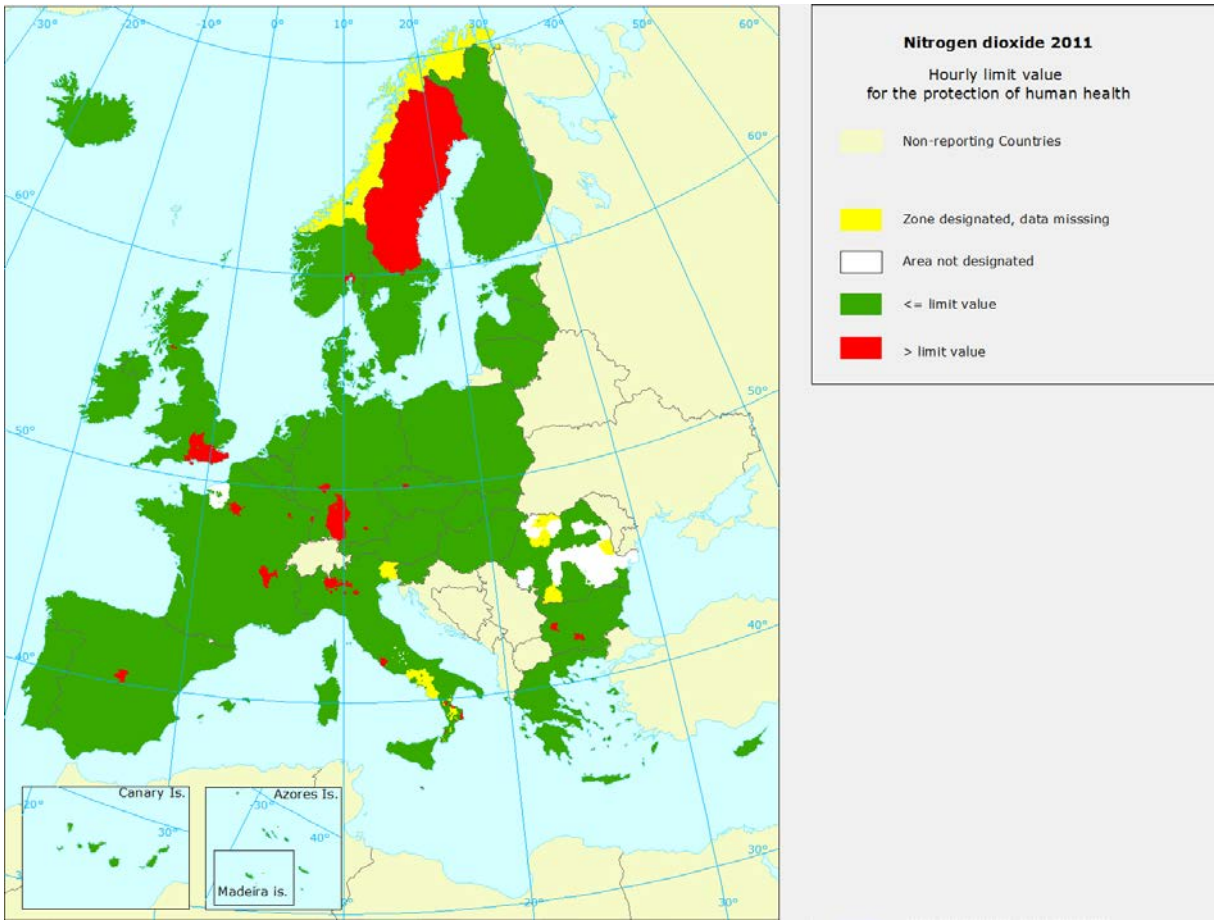

Figure III.5. Zones in exceedance for the hourly limit value for NO_2 in 2011.

Exceedance of the hourly limit value for NO_2 has been reported for 25 zones in EU27 (in 2010: 21 zones). Italy has 5 zones in exceedance of the limit value and for 12 designated zones data are missing. Further exceedances of the limit value are observed in Germany (5), France (4), Spain and United Kingdom (both 3), Bulgaria (2), Czech Republic, Malta and Sweden (all 1). Exceedances have not been reported for Romania but information is missing for part of the country.
Norway has 1 zone in exceedance and data are missing for 2 designated zones.

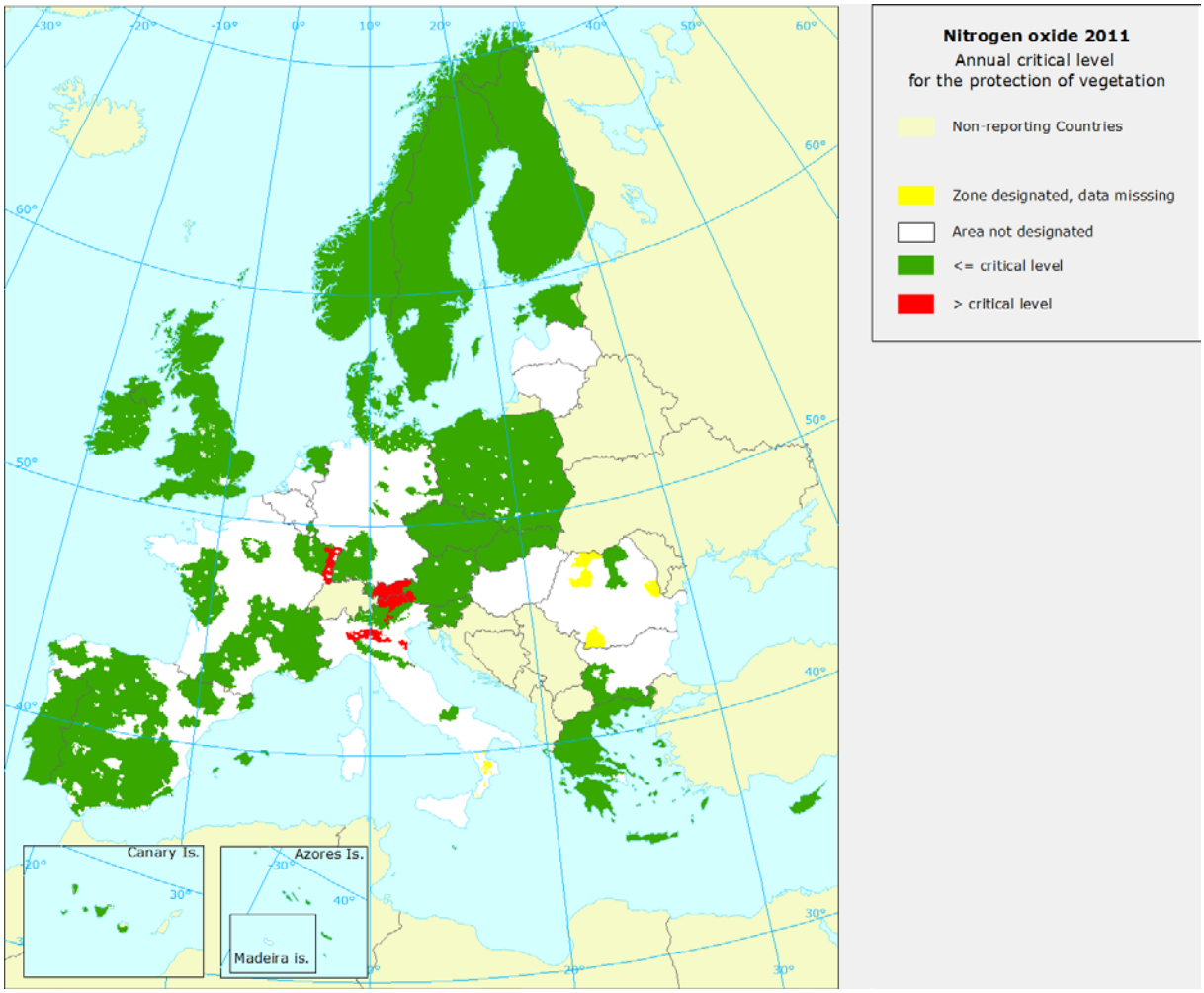

Figure III.6. Zones in exceedance for the critical level for NO_x set for the protection of vegetation in 2011.

Both in 2010 and in 2011, Austria and Italy reported in one and four zones, respectively, exceedances of the critical level of NO_x set for the protection of vegetation (30 µg/m^3/year). In addition, France reported in 2011 one zone in exceedance. The 5 zones in exceedance in 2010 in Norway are not in exceedance in 2011 anymore.

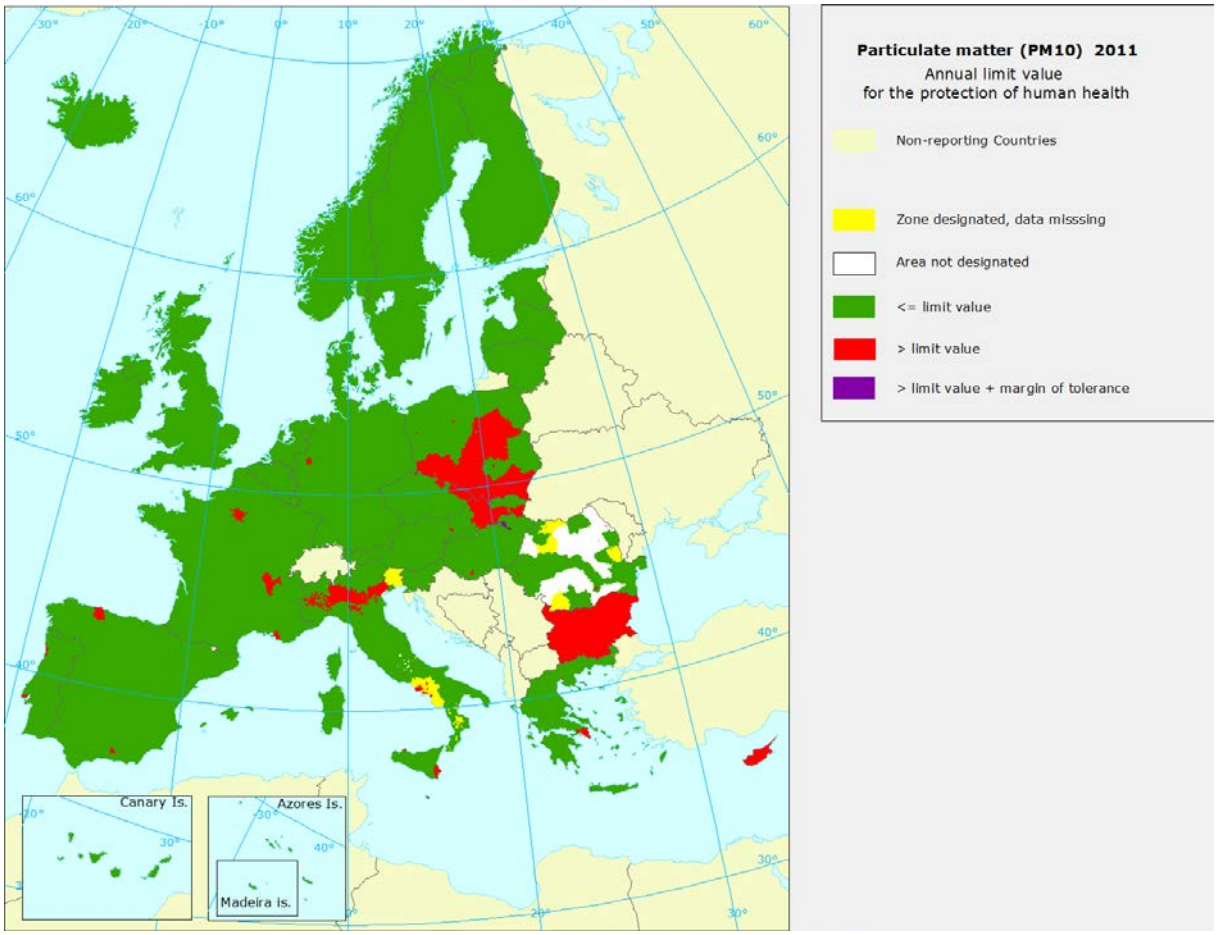

Figure III.7. Zones in exceedance for the annual limit value for PM_{10} in 2011.

Note that the map does not account for subtractions of natural contributions and/or of contributions of winter-sanding and salting, (see sections 3.2.2 and 3.2.3).

Most zones in exceedances of the annual LV of PM_{10} occur in Italy (25) and Poland (23). Bulgaria and Cyprus have all designated zones exceeding the LV.

For the annual limit value of PM_{10} the most mentioned single reason of exceedance is local traffic.

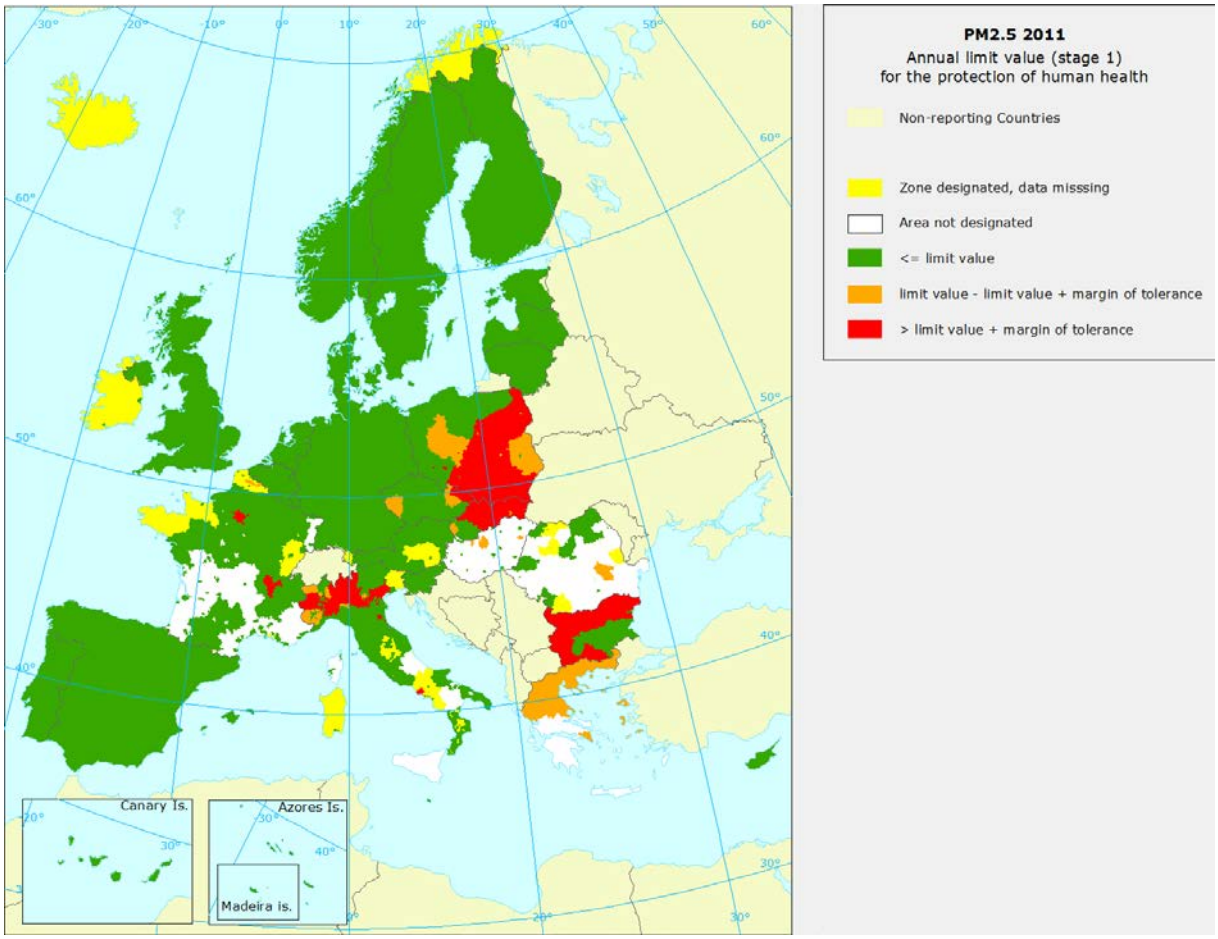

Figure III.8. Zones in exceedance for the annual limit value (to enter into force 1 January 2015) for $PM_{2.5}$ in 2011.

Most zones in exceedance of the annual LV and MOT of $PM_{2.5}$ occur in Italy (20) and Poland (21). Greece has all designated zones exceeding the LV (but not the LV + MOT).

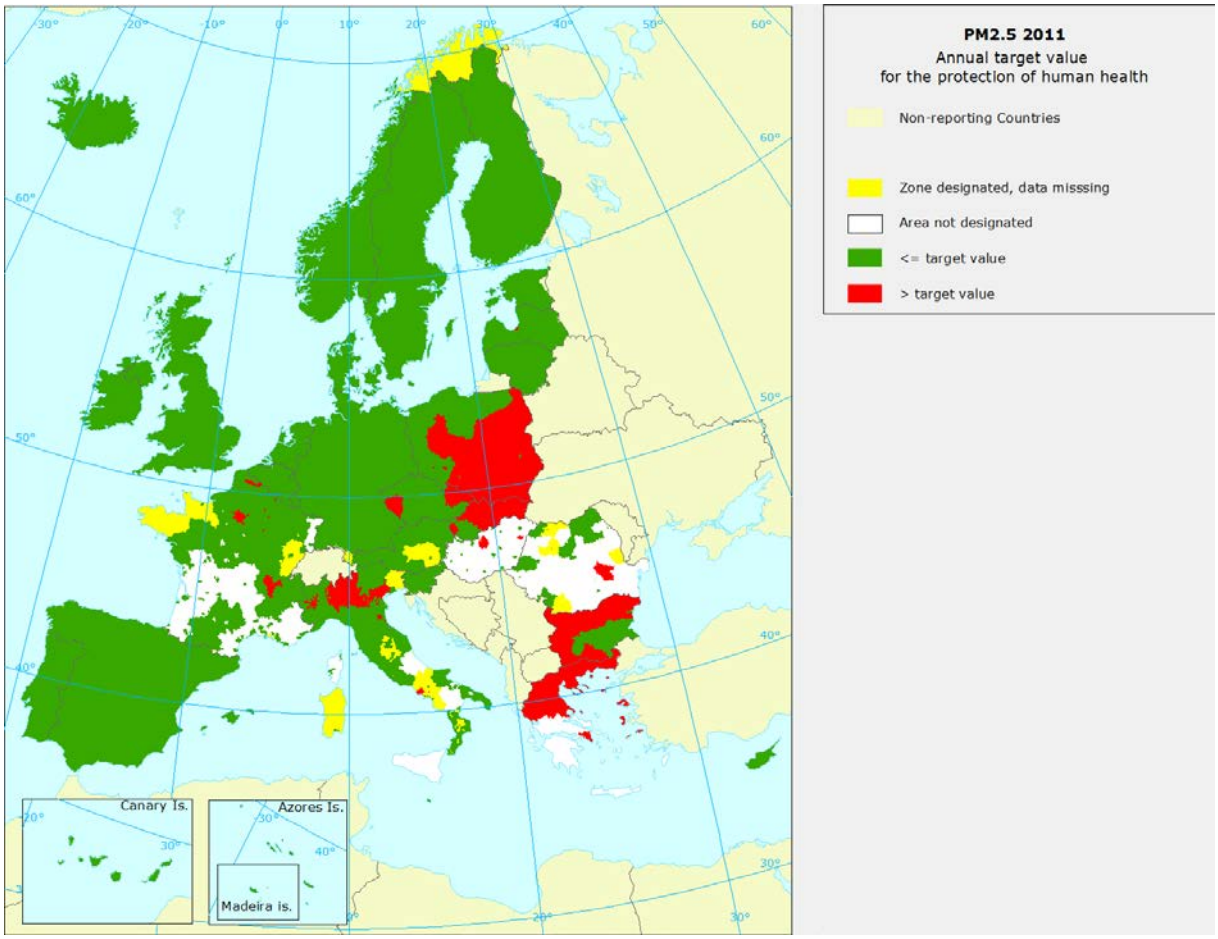

Figure III.9. Zones in exceedance for the annual target value for $PM_{2.5}$ in 2011.

Most zones in exceedance of the annual TV of $PM_{2.5}$ occur in Italy (19) and Poland (27). Slovakia has 8 out of 10 designated zones exceeding the TV, whereas Greece has all designated zones exceeding the TV.

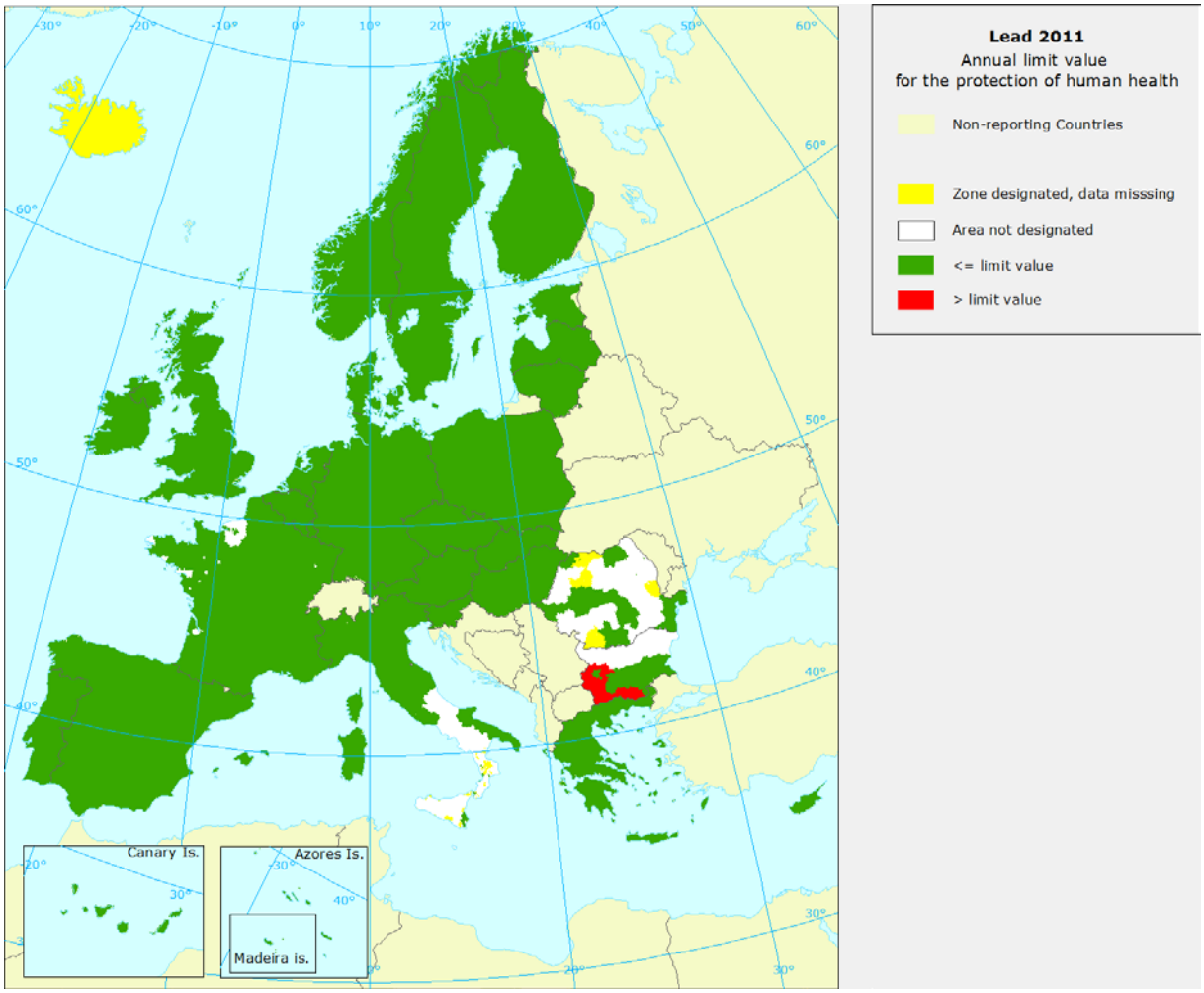

Figure III.10: Zone in exceedance for the annual limit value for lead in 2011.

There is only one zone in Bulgaria reporting an exceedance of the limit value for lead.

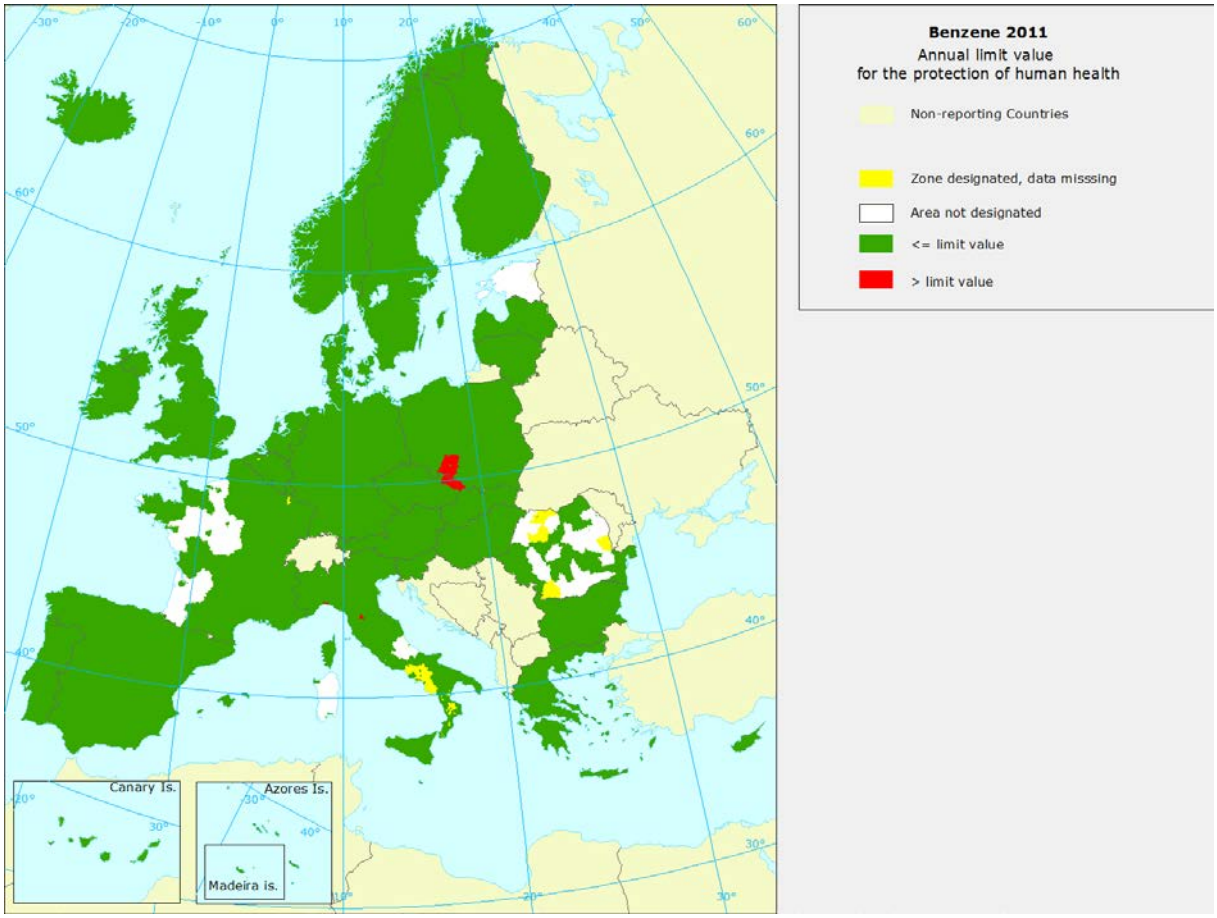

Figure III.11: Zones in exceedance for the annual limit value for benzene in 2011.

The Czech Republic (1), Italy (2) and Poland (1) reported in total 4 zones exceeding the limit value of 5 µg/m^3; this is half the number of zones in comparison with 2010 and it concerns less than 1% of the population in the EU27 (less than 0.5% of the area).

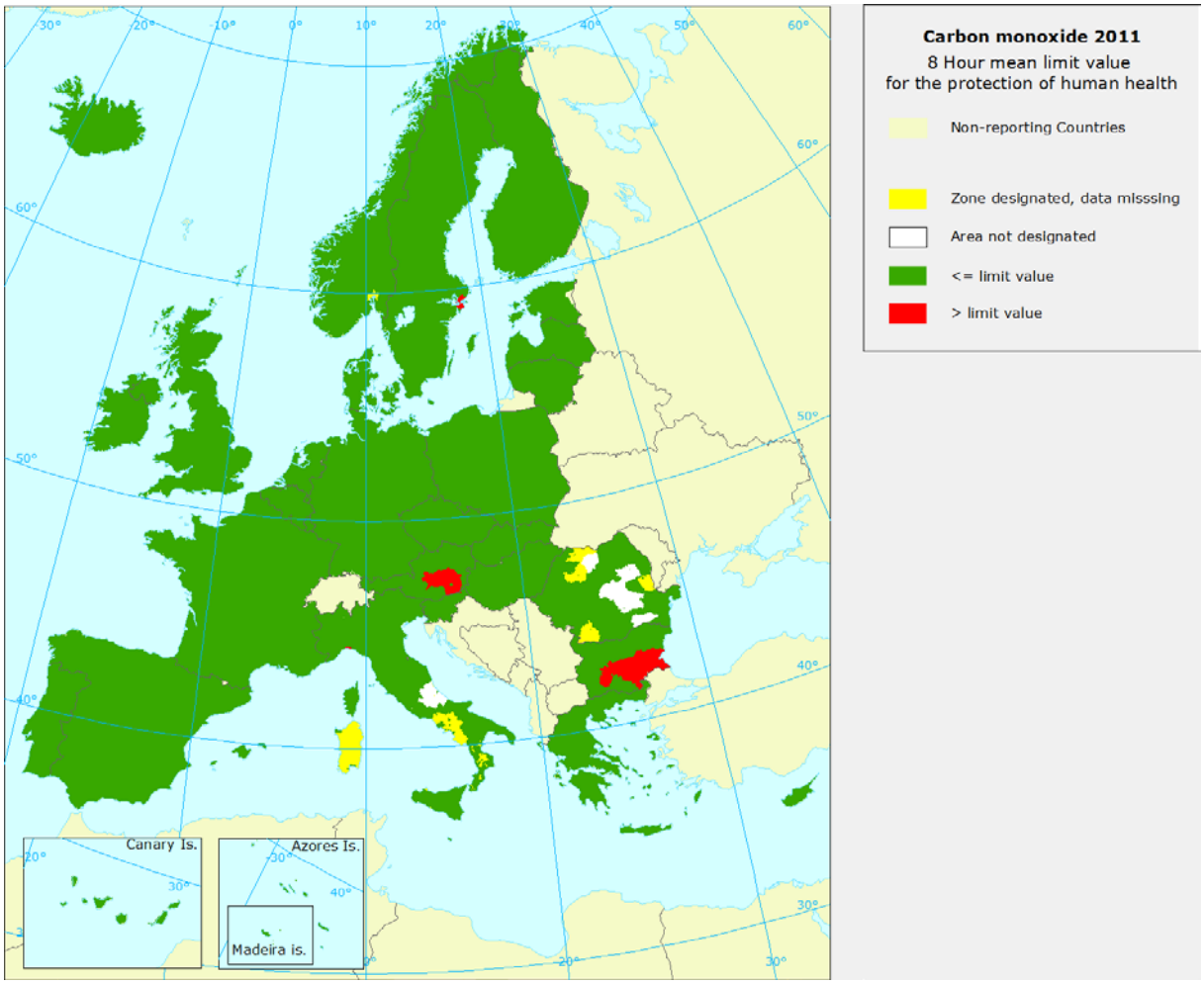

Figure III.12: Zones in exceedance for the annual limit value for CO in 2011.
Information on the situation with respect to CO is incomplete in Italy and Romania. Exceedance has been reported for zones in Austria, Bulgaria, Italy and Sweden (all 1 zone).

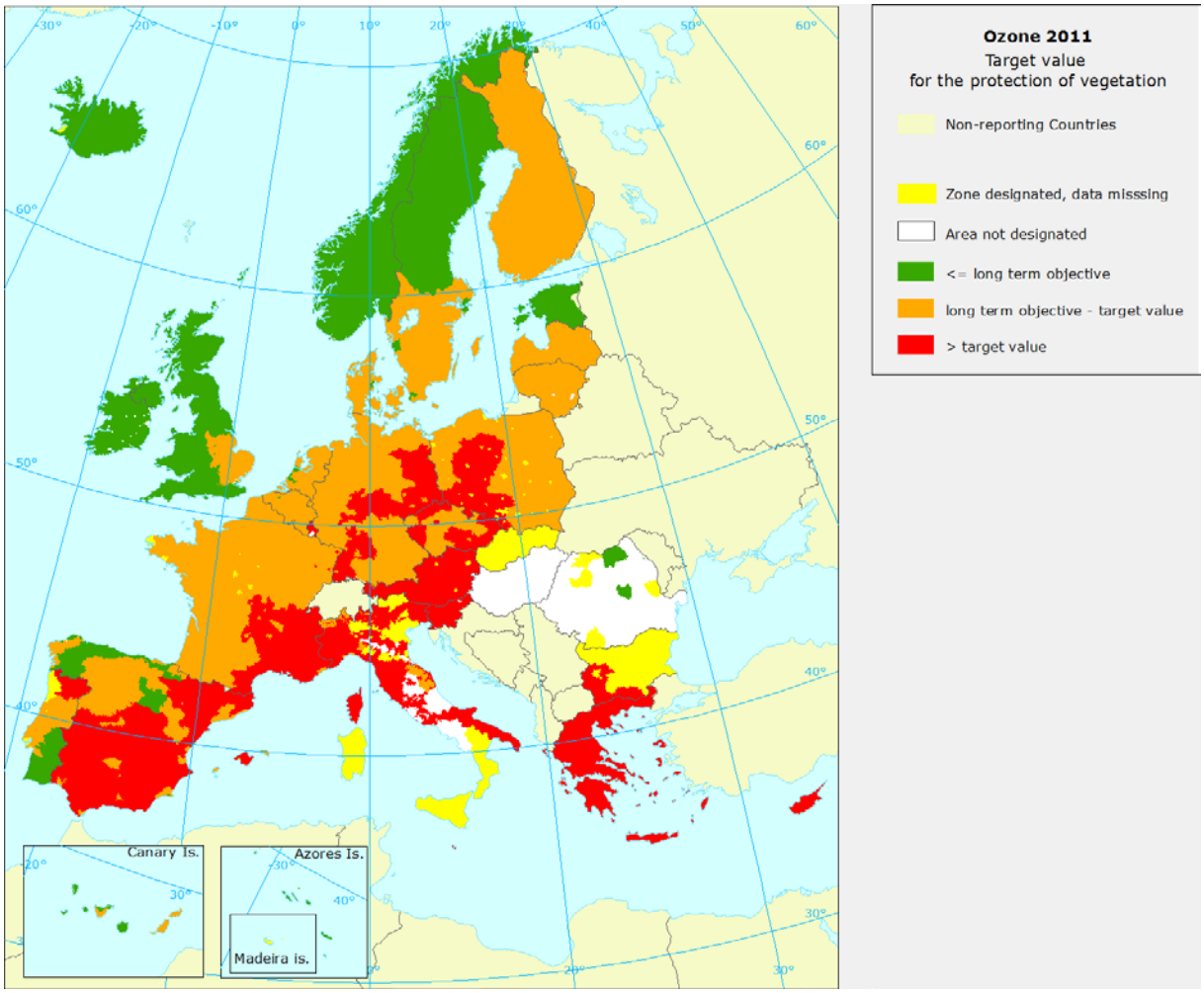

Figure III.13: Zones in exceedance for the vegetation target value for O_3 in 2011.

Most zones in exceedance of TV occur in Spain (53), Italy (52), France (18) and Germany (9). Austria, Bulgaria, Cyprus, Greece, Italy, Malta and Slovenia have all or nearly all of the reported zones exceeding the TV.

From all the ozone vegetation target value exceedances, 7 zones in Italy, 2 zones in Spain and 1 zone in Slovenia are reporting exceedances based on modelled results.

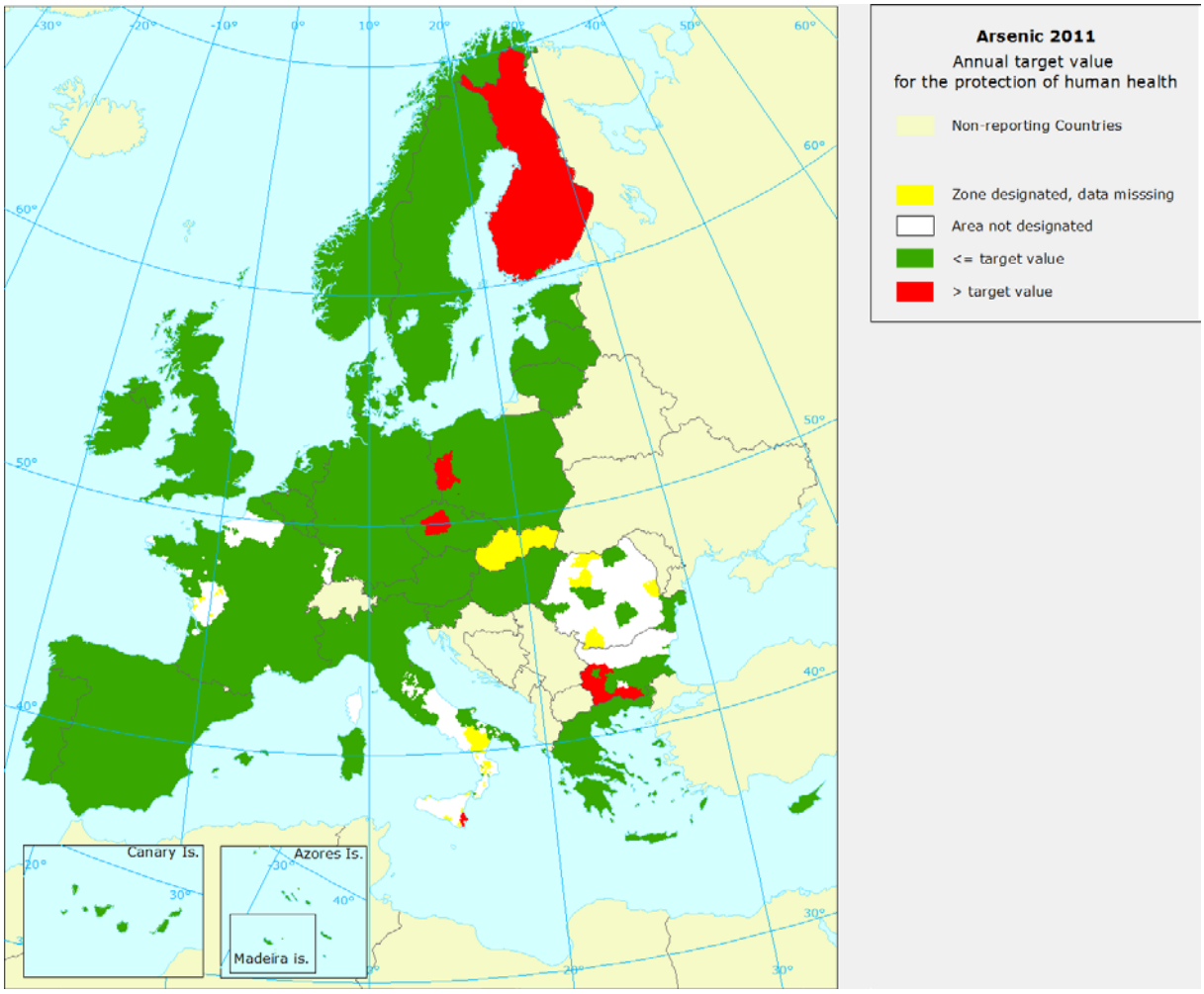

Figure III.14: Zones in exceedance for the target value for arsenic in 2011.
In 10 zones in Belgium (2), Bulgaria (1), the Czech Republic (2), Germany (1), Finland (1), Italy (1) and Poland (2) the target value of arsenic has been exceeded in 2011.

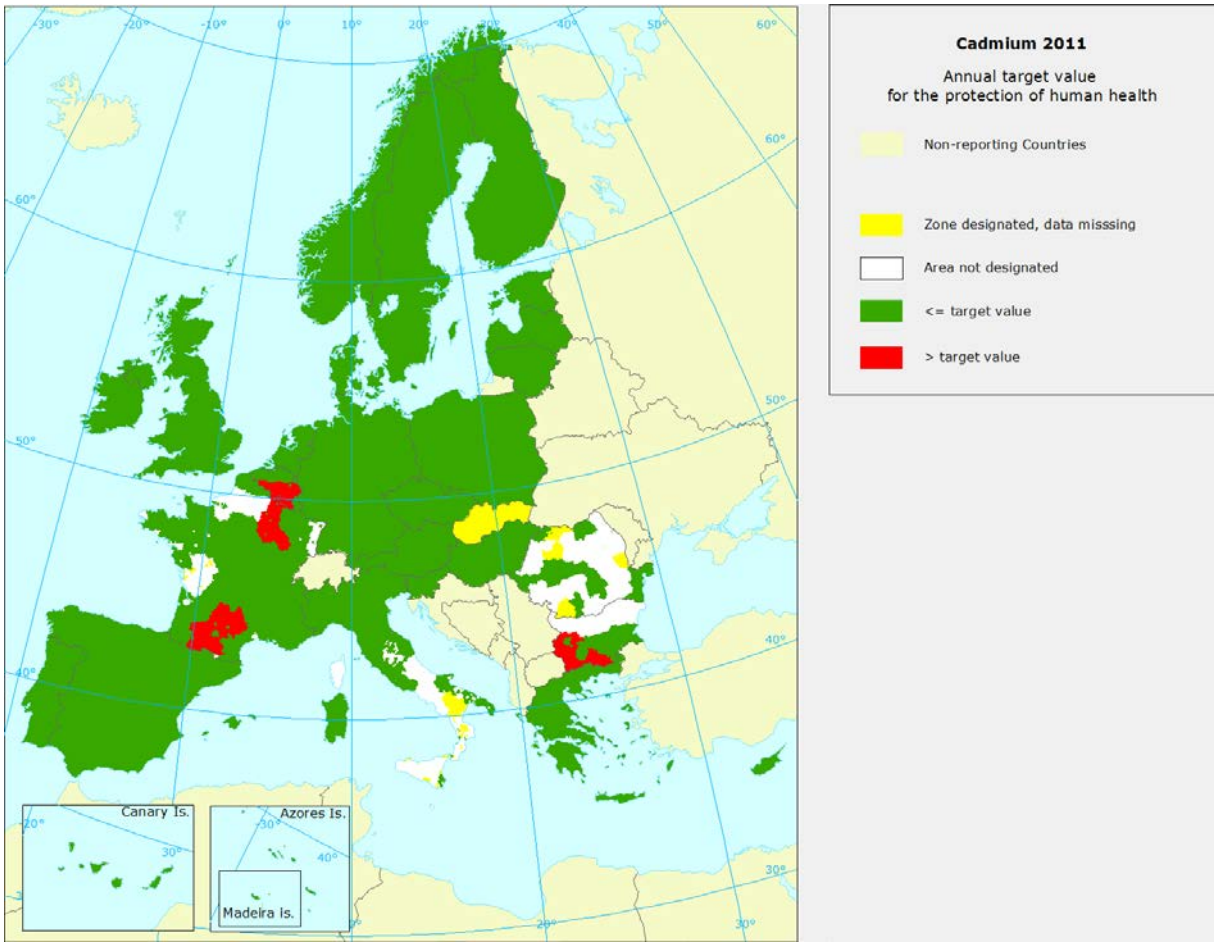

Figure III.15: Zones in exceedance for the target value for cadmium in 2011.

In 7 zones the target value of cadmium has been exceeded in 2011. Belgium (3), Bulgaria and France (both 2) reported exceedances of the TV.

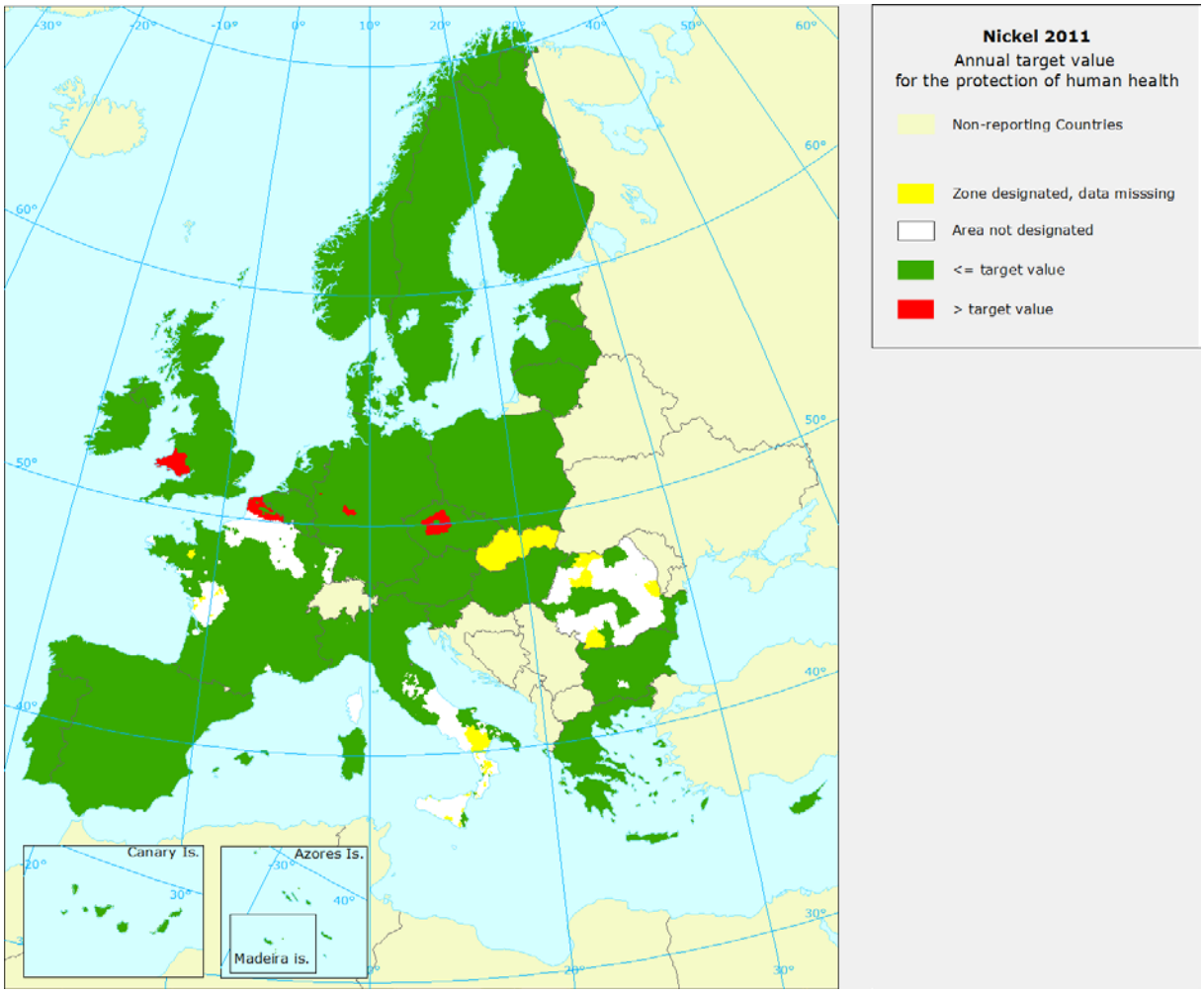

Figure III.16: Zones in exceedance for the target value for nickel in 2011.

In 7 EU27 zones the target value of nickel has been exceeded in 2011. The exceedances are observed in Belgium, the Czech Republic and France (all 1 zone), Germany and United Kingdom (both 2 zones).

Annex IV. List of zones in relation to AQ standards

This annex presents a summary of air quality status for each pollutant-pollution target combination at the national level.
A full list of zones in EU Member States and other reporting countries in relation to the air quality standards as set in the air quality Directive is available as electronic annex from the ETC/ACC website: http://acm.eionet.europa.eu/docs/AQQlist_of_Zones_2011_ETC_ACM_TP_2013_14.xlsxx . Information is extracted from forms 8 and 9.

	SO2 health 1h			SO2 health day			SO2 year			SO2 wntr			NO2-h				NO2-y				NOx-y		
RC	undef	<LV	>LV	undef	<LV	>LV	undef	<LV	>LV	undef	<LV	>LV	undef	<LV	LV - MOT	>MOT	undef	<LV	LV - MOT	>MOT	undef	<LV	>LV
AT	0	11	0	0	11	0	0	8	0	0	8	0	0	11	0	0	0	2	9	0	0	7	1
BE	0	12	0	0	12	0	0	0	0	0	0	0	0	11	0	0	0	8	3	0	0	0	0
BG	0	4	2	0	4	2	0	1	0	0	1	0	0	4	2	0	0	4	2	0	0	1	0
CY	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	1	0	0	0	1	0
CZ	0	15	0	0	15	0	0	15	0	0	15	0	0	14	1	0	0	11	4	0	0	15	0
DE	0	75	0	0	75	0	0	16	0	0	15	0	0	78	5	0	0	26	57	0	0	15	0
DK	0	3	0	0	3	0	0	1	0	0	3	0	0	3	0	0	0	2	1	0	0	1	0
EE	0	4	0	0	4	0	0	4	0	0	4	0	0	4	0	0	0	4	0	0	0	4	0
ES	0	131	1	0	130	2	0	38	0	0	33	0	0	131	3	0	0	126	8	0	0	37	0
FI	0	14	0	0	14	0	0	1	0	0	1	0	0	14	0	0	0	13	1	0	0	1	0
FR	0	76	0	0	76	0	4	5	0	6	14	0	1	70	4	0	0	49	26	0	0	12	1
GB	0	44	0	0	44	0	0	15	0	0	15	0	0	41	3	0	0	3	41	0	0	15	0
GR	0	4	0	0	4	0	0	2	0	0	2	0	0	4	0	0	0	3	1	0	0	2	0
HU	0	10	0	0	10	0	0	0	0	0	0	0	0	10	0	0	0	8	2	0	0	0	0
IE	0	4	0	0	4	0	0	1	0	0	1	0	0	4	0	0	0	3	0	0	0	1	0
IT	10	120	1	10	121	0	0	7	0	0	9	0	12	120	5	0	7	84	46	0	1	12	4
LT	0	3	0	0	3	0	0	1	0	0	1	0	0	3	0	0	0	3	0	0	0	0	0
LU	0	3	0	0	3	0	0	1	0	0	1	0	0	3	0	0	0	2	1	0	0	1	0
LV	0	2	0	0	2	0	0	1	0	0	0	0	0	2	0	0	0	1	1	0	0	0	0
MT	0	2	0	0	2	0	0	1	0	0	1	0	0	1	1	0	0	2	0	0	0	1	0
NL	0	9	0	0	9	0	0	1	0	0	1	0	0	9	0	0	0	0	9	0	0	1	0
PL	0	46	0	0	46	0	0	16	0	0	16	0	0	46	0	0	0	41	5	0	0	16	0
PT	0	20	0	0	20	0	0	7	0	0	7	0	0	20	0	0	0	18	2	0	0	7	0
RO	0	40	1	0	40	1	0	2	0	0	3	0	0	29	0	0	0	27	2	0	0	3	0
SE	0	6	0	0	6	0	0	6	0	0	6	0	0	5	1	0	0	5	1	0	0	6	0
SI	0	6	0	0	6	0	0	4	0	0	7	0	0	6	0	0	0	6	0	0	0	4	0
SK	0	10	0	0	10	0	0	10	0	0	10	0	0	10	0	0	0	7	3	0	0	10	0
EU27	10	675	5	10	675	5	4	165	0	6	176	0	13	654	25	0	7	460	225	0	1	173	6
IS	0	3	0	0	3	0	0	3	0	0	2	0	0	3	0	0	0	3	0	0	0	0	0
NO	0	5	2	0	6	1	0	7	0	0	6	1	2	4	1	0	2	2	3	0	0	7	0
total	10	683	7	10	684	6	4	175	0	6	182	1	15	661	26	0	9	465	228	0	1	180	6

	PM10-d			PM10-y			Lead			Benzene				CO		
RC	undef	<LV	>LV	undef	<LV	>LV	undef	<LV	>LV	undef	<LV	LV - MOT	>MOT	undef	<LV	>LV
AT	0	3	8	0	11	0	0	11	0	0	11	0	0	0	10	1
BE	0	1	10	0	11	0	0	11	0	1	6	0	0	0	7	0
BG	0	0	6	0	0	6	0	3	1	0	6	0	0	0	5	1
CY	0	0	1	0	0	1	0	1	0	0	1	0	0	0	1	0
CZ	0	0	15	0	14	1	0	15	0	0	14	1	0	0	15	0
DE	0	48	33	0	80	1	0	70	0	0	80	0	0	0	80	0
DK	0	2	1	0	3	0	0	3	0	0	3	0	0	0	3	0
EE	0	4	0	0	4	0	0	4	0	0	2	0	0	0	4	0
ES	0	114	21	0	133	2	0	81	0	0	122	0	0	0	131	0
FI	0	14	0	0	14	0	0	14	0	0	3	0	0	0	14	0
FR	1	53	20	1	69	4	0	65	0	1	60	0	0	0	76	0
GB	0	41	3	0	44	0	0	44	0	0	44	0	0	0	44	0
GR	0	2	2	0	2	2	0	4	0	0	4	0	0	0	4	0
HU	0	2	8	0	8	2	0	10	0	0	10	0	0	0	10	0
IE	0	4	0	0	4	0	0	4	0	0	4	0	0	0	4	0
IT	7	56	74	12	100	25	8	107	0	7	119	2	0	8	121	1
LT	0	3	0	0	3	0	0	3	0	0	3	0	0	0	3	0
LU	0	3	0	0	3	0	0	3	0	0	1	0	0	0	1	0
LV	0	1	1	0	2	0	0	2	0	0	2	0	0	0	2	0
MT	0	1	1	0	1	1	0	0	0	0	2	0	0	0	2	0
NL	0	1	8	0	9	0	0	9	0	0	9	0	0	0	9	0
PL	0	4	42	0	23	23	0	46	0	0	45	1	0	0	46	0
PT	0	17	6	0	20	3	0	1	0	0	1	0	0	0	1	0
RO	0	22	6	0	25	3	0	23	0	0	24	0	0	0	43	0
SE	0	3	3	0	6	0	0	6	0	0	6	0	0	0	5	1
SI	0	1	5	0	6	0	0	7	0	0	6	0	0	0	6	0
SK	0	0	10	0	6	4	0	2	0	0	10	0	0	0	10	0
EU27	6	400	284	13	601	78	8	549	1	9	598	4	0	8	657	4
IS	0	3	0	0	3	0	2	0	0	0	2	0	0	0	2	0
NO	0	6	1	0	7	0	0	7	0	0	7	0	0	1	6	0
total	6	409	285	13	611	78	10	556	1	9	607	4	0	9	665	4

	O3-H				O3-V				PM2.5 limit value				PM2.5 LV stage 2			PM2.5-target value		
RC	undef	<LTO	LTO - TV	>TV	undef	<LTO	LTO - TV	>TV	undef	<LV	LV -MOT	>MOT	undef	<LV	>LV	undef	<TV	>TV
AT	0	0	3	8	3	0	0	8	2	9	0	0	2	7	2	2	9	0
BE	0	0	6	0	0	1	5	0	0	11	0	0	0	9	2	0	11	0
BG	0	0	4	2	5	0	0	1	0	2	0	4	0	1	5	0	2	4
CY	0	0	0	1	0	0	0	1	0	1	0	0	0	0	1	0	1	0
CZ	0	3	5	7	0	0	7	8	0	12	2	1	0	3	12	0	12	3
DE	0	0	55	11	0	0	57	9	1	73	0	0	1	62	11	1	73	0
DK	0	0	3	0	0	1	2	0	0	3	0	0	0	3	0	0	3	0
EE	0	4	0	0	0	4	0	0	0	4	0	0	0	4	0	0	4	0
ES	0	2	82	51	0	30	51	53	0	135	0	0	0	135	0	0	135	0
FI	0	0	2	0	0	0	2	0	0	14	0	0	0	14	0	0	14	0
FR	0	5	42	26	3	4	48	18	11	46	1	2	11	35	14	10	46	4
GB	0	0	44	0	0	40	4	0	0	44	0	0	0	41	3	0	44	0
GR	0	1	0	3	0	0	0	4	0	0	2	0	0	0	2	0	0	2
HU	0	0	4	6	0	0	0	0	0	2	3	0	0	0	5	0	3	2
IE	0	2	2	0	0	1	0	0	2	2	0	0	2	2	0	0	4	0
IT	11	7	18	83	39	0	7	52	19	74	10	20	109	5	0	19	85	19
LT	0	0	3	0	0	0	1	0	0	3	0	0	0	3	0	0	3	0
LU	0	0	2	1	0	0	0	1	0	3	0	0	0	3	0	0	3	0
LV	0	1	1	0	0	0	1	0	0	1	1	0	0	0	2	0	1	1
MT	0	0	1	1	0	0	0	1	0	2	0	0	0	2	0	0	2	0
NL	0	0	9	0	0	3	6	0	0	9	0	0	0	9	0	0	9	0
PL	0	2	41	3	30	0	11	5	0	19	6	21	46	0	0	0	19	27
PT	0	2	13	4	12	2	4	1	0	1	0	0	1	0	0	0	1	0
RO	0	30	11	0	0	3	0	0	0	16	2	0	0	7	11	0	16	2
SE	0	0	6	0	0	4	2	0	0	6	0	0	0	6	0	0	6	0
SI	0	1	0	5	0	0	0	5	0	6	0	0	0	1	5	0	6	0
SK	2	0	0	0	2	0	0	0	0	2	3	5	8	0	0	0	2	8
EU27	13	60	357	212	94	93	208	167	35	500	30	53	180	352	75	32	514	72
IS	0	2	0	0	1	1	0	0	3	0	0	0	3	0	0	0	4	0
NO	1	1	5	0	0	7	0	0	1	6	0	0	1	6	0	1	6	0
total	14	63	362	212	95	101	208	167	39	506	30	53	184	358	75	33	524	72

	As			Cd			Ni			B(a)P		
RC	undef	<TV	>TV	undef	<TV	>TV	undef	<TV	>TV	undef	<TV	>TV
AT	0	11	0	0	11	0	0	11	0	0	9	2
BE	0	8	2	0	7	3	0	9	1	0	7	0
BG	0	3	1	0	2	2	0	5	0	0	1	5
CY	0	1	0	0	1	0	0	1	0	0	1	0
CZ	0	13	2	0	15	0	0	14	1	0	1	14
DE	0	66	1	0	67	0	0	65	2	0	68	3
DK	0	3	0	0	3	0	0	3	0	0	3	0
EE	0	4	0	0	4	0	0	4	0	0	4	0
ES	0	76	0	0	76	0	0	76	0	0	76	0
FI	0	1	1	0	2	0	0	2	0	0	0	2
FR	2	53	0	2	51	2	3	50	1	3	51	3
GB	0	44	0	0	44	0	0	42	2	0	37	7
GR	0	4	0	0	4	0	0	4	0	0	1	3
HU	0	10	0	0	10	0	0	10	0	0	1	9
IE	0	4	0	0	4	0	0	4	0	0	4	0
IT	10	103	1	10	104	0	10	104	0	8	91	13
LT	0	3	0	0	3	0	0	3	0	0	0	3
LU	0	3	0	0	3	0	0	3	0	0	3	0
LV	0	2	0	0	2	0	0	2	0	0	2	0
MT	0	0	0	0	0	0	0	0	0	0	0	0
NL	0	9	0	0	9	0	0	9	0	0	9	0
PL	0	44	2	0	46	0	0	46	0	0	4	42
PT	0	1	0	0	1	0	0	1	0	0	1	0
RO	0	11	0	0	22	0	0	19	0	0	0	0
SE	0	6	0	0	6	0	0	6	0	0	6	0
SI	0	7	0	0	7	0	0	7	0	0	1	5
SK	2	0	0	2	0	0	2	0	0	2	0	0
EU27	14	490	10	14	504	7	15	500	7	13	381	111
IS	0	0	0	0	0	0	0	0	0	0	0	0
NO	0	7	0	0	7	0	0	7	0	0	7	0
total	14	497	10	14	511	7	15	507	7	13	388	111

Annex V. Historical list of designated zones

Table V. Total number of zones per Member State in 2004-2011 (data extracted from form 2); highlighted boxes indicate that the number of zones designated in 2011 differs from the corresponding number in previous reporting year.

Member State	Total zones 2004	Total zones 2005	Total zones 2006	Total zones 2007	Total zones 2008	Total zones 2009	Total zones 2010	Total zones 2011
AT	19	19	19	19	19	19	19	19
BE	17	17	17	18	22	22	22	22
BG			6	6	6	6	6	6
CY	1	1	1	1	1	1	1	1
CZ	15	15	15	15	15	15	15	15
DE	145	118	120	120	111	113	115	110
DK	10	10	10	3	3	3	3	3
EE	16	4	4	4	4	4	4	4
ES	140	140	138	138	153	153	157	157
FI	18	18	18	18	18	18	18	18
FR	85	87	88	81	81	81	76	76
GB	43	43	44	44	44	44	44	44
GR	4	4	4	4	4	4	4	4
HU	11	11	11	11	11	11	10	10
IE	4	4	4	4	4	4	4	4
IT	137	144	121	143	145	142	142	151
LT	3	3	3	3	3	3	3	3
LU			3	3	3	4	4	4
LV	2	2	2	2	2	2	2	2
MT	3	2	2	2	2	2	2	2
NL	9	9	9	9	9	9	9	9
PL	362	362	362	186	186	186	46	46
PT	26	26	26	27	34	29	28	26
RO			4	21	21	21	21	50
SE	6	6	6	6	6	6	6	6
SI	9	9	9	10	12	12	12	8
SK	10	10	10	11	11	11	11	11
EU25	**1095**	**1064**	**1046**	**882**	**903**	**898**	**757**	**755**
EU27			**1056**	**909**	**930**	**925**	**784**	**811**