



The European exchange of information in 2011



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Front page picture:

Most westerly station in Europe, station Faial on the Azores (Portugal), station Eol code: PT07001

See: <http://www.qualar.org/index.php?page=4&subpage=3>, choose Faial

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SUMMARY

Every year the ETC/ACM prepares a technical paper on the meta information and air quality data that have been exchanged among the EU Member States (MS) and the Commission. Besides the EU Member States, other member and cooperating countries of the European Environment Agency, which include EU candidate countries, EU potential candidate countries and European Free Trade Association (EFTA) states, have agreed to follow this reporting procedure as well. The content of AirBase (version6) is available to the public via the European Environment Agency (EEA) website¹. More information on AirBase can be found on the ETC/ACM website². The results of the reporting cycle presented in this technical paper cover data for 2010.

A total of 38 countries, including the 27 EU MS, have provided air quality data for 2010. As in preceding years, a large number of time series have been transmitted, covering, for example, sulphur dioxide (SO₂), nitrogen dioxide (NO₂), nitrogen oxides (NO_x), particulate matter (PM₁₀, PM_{2.5}), ozone (O₃), carbon monoxide (CO) and benzene (C₆H₆). In an increasing degree also Volatile Organic Compounds (VOC), Heavy Metals (HM) and Polycyclic Aromatic Hydrocarbons (PAH) have been transmitted. A few countries have also delivered PM_{2.5} speciation concentrations (PM_{2.5_spec}). Nearly all the countries that have updated their meta information have used the Air Quality Data Exchange Module (AQ-DEM)³, made available for this purpose by the European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM).

This technical paper only describes the meta information and the quality of the measurement data of the provided air quality data for 2010. The state of the air quality for selected pollutants in 2010 will be described in the EEA Air quality report (EEA, 2012).

¹ <http://www.eea.europa.eu/themes/air/airbase>

² <http://acm.eionet.europa.eu/databases/airbase/>

³ http://acm.eionet.europa.eu/databases/country_tools/aq/aq-dem/index.html

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INTRODUCTION

The reciprocal exchange of information and data among countries and the European Commission is based on the Air Quality Directive (AQD) 2008/50/EC (EU, 2008)). This Exchange of Information (EoI) Decision ‘establishing a reciprocal exchange of information and data from networks and individual stations measuring ambient air pollution within the Member States’, was formerly established in the EoI Decision 97/101/EC and annexes (EU 1997, EU 2001a and EU 2001b).

Parallel to dataflow under the EoI, the Member States (MS) of the European Union (EU) provide information on air quality in the context of the former Air Quality (AQ) Framework Directives (FWD) and related daughter directives (DD). These Directives have been merged into the AQD 2008/50/EC (EU, 2008)) except for the fourth DD (4DD, EU 2004a). This information mainly focuses on compliance checking with obligations under the AQ directives, such as limit values. To avoid duplicate reporting by the MS, some of the meta data that is needed for evaluating the reports under the FWD (in particular the meta-information on stations and networks) is only sent under the EoI.

Rules for implementing the reporting system under the Directives 2008/50/EC and 2004/107/EC (Implementing Provisions, IPR) are established in the 2011/850/EU Decision of 12 December 2011 (EU, 2011a) and will apply from the end of a 2-year transitional period commencing at the date of their adoption on 31 December 2013. Until that date the EoI Decision 97/101/EC remains applicable (see Article 31.4 in the AQD 2008/50/EC (EU, 2008)). An accompanying Guidance document (EU, 2011b) is in development. For the time being the EoI data submission still follows the Guidance based on the revised Annexes of the Decision (Garber *et al.* 2001).

The EoI requires a large set of meta information and AQ data to be delivered to the Commission. Part of this information is mandatory and the other items are to be delivered to the Commission ‘to the extent possible’ and ‘as much information as feasible should be supplied’ (see Annex A).

The EEA prepares each year a technical paper on meta information and AQ data exchanged, and make the information available to EU MS. The decision states that the Commission will call on the European Environment Agency (EEA) with regard to the operation and practical implementation of the information system. The European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM), under contract to EEA, manages the database system, AirBase (see Mol and de Leeuw 2005). The information submitted under the EoI is stored in AirBase. Statistics based on the delivered information are calculated and also stored in AirBase (see Annex B). In AirBase also NO_x values have been derived for stations where NO and NO₂ values have been reported, but no NO_x values. The contents of AirBase are available to the public via the EEA website¹ and ETC/ACM website². On the ETC/ACM website also background information on AirBase can be found.

AirBase is the central database for the AQ meta information for the different AQ data flows: (EoI, FWD questionnaire (EU, 2004b), summer ozone reporting (SOR)), the Up To Date (UTD) Web site³.

¹ <http://www.eea.europa.eu/themes/air/airbase>

² <http://acm.eionet.europa.eu/databases/airbase/index.html>

³ <http://www.eea.europa.eu/maps/ozone/welcome>

This report shows information provided by the 27 EU Member States (EU-27). In addition it contains information from the other five EEA member countries and from the six EEA cooperating countries¹, which have agreed to follow the data exchange procedures in the framework of Euroairnet².

This report also refers to the QA/QC aspects of the data in AirBase. The procedures and the first QA/QC checks are described in some reports (see Mol, 2011). The standard checks on the delivered EoI-data are: outliers, strange statistics, missing data, missing essential meta data, potential overwriting of data already stored in AirBase, potential deletion of stations and measurement configurations with data. In addition to these standard checks also QA/QC checks are performed on questionable station coordinates.

This report only describes the more technical aspects of the data submission process. The state of the air quality for selected pollutants in 2010 will be described in the EEA Air quality report (EEA, 2012).

EoI Technical Papers of earlier years can be found on the ETC/ACM Website³

¹ EU27 Member States: Austria, Belgium, Bulgaria, Denmark, Finland, Germany, Greece, Spain, France, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Sweden, United Kingdom, Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia, Slovakia. In addition to the 27 EU Member States the four EFTA Countries (Iceland, Liechtenstein, Norway and Switzerland) and Turkey are EEA member countries (EEA 32 member countries). EEA cooperating countries are: Albania, Bosnia and Herzegovina, Croatia, Former Yugoslav Republic of Macedonia (FYROM), Serbia and Montenegro.

² http://acm.eionet.europa.eu/databases/databases/EuroAirnet/index_html

³ http://acm.eionet.europa.eu/databases/airbase/eoi_reports

1. EXCHANGE OF INFORMATION 2011 (DATA FOR 2010)

1.1. Data delivery

Thirty eight countries, including the EU-27 MS, provided AQ data for the reporting year 2010 (see the status table in

http://acm.eionet.europa.eu/country_tools/aq/eoi_to_airbase_status/index.html)

The delivery of data was facilitated by the AQ Data Exchange Module (AQ-DEM)¹. This tool was used by most of the countries. Some countries provided their data in files in the EoI specified formats (DEM and ISO-7168-1: 1999 (extended) format). All data delivered for the reporting year 2010 was loaded into AirBase (version 6). All statistics and exceedances relevant in the AQD 2008/50/EC and 4DD have been calculated and were also loaded into AirBase. Also NO_x values have been derived and loaded in AirBase for stations where NO and NO₂ values have been reported, but no NO_x values.

1.2. QA/QC feedback actions

Several quality checks have been performed on delivered data. The quality checks in all steps of the EoI delivery process are described in a working document (see Mol, 2011).

If the DEM is used, the first quality checks are performed in the DEM itself. The DEM is prefilled with all meta information of the last version of AirBase, and the data supplier can modify the available meta information in the DEM and/or can add new meta information into the DEM at first, and then can import the raw data into the DEM. If ISO- or DEM-files are delivered, ETC/ACM loads these data in the DEM itself. During the import of meta information and raw data automatically semantic and syntactic format checks are performed. Error messages and warnings are given for mandatory (see Annex A), essential and desired (important) parameters. Also checks are performed for the data values. Information is given on the unit value of the components. There is a map facility to check if a station is positioned within country borders. The station position can also be checked in Google Earth. After import of the data the data supplier can check the data in various ways:

- Check on outliers. For each component a default lower and upper value is defined, but it is also possible to change these values (per country) into a country dependent lower and upper value.
- Check on calculated statistics. Overviews with statistics calculated from the imported measurement data are generated. The imported data can be checked on: zero or negative statistics or statistics which are 3 times lower or higher than the year before.
- Check on missing imported data. The DEM gives information on data which were reported the year before but not now or data which have been reported now but not the year before (there is a gap in the timeseries for the current or previous reporting year).

The imported measurement data can also be checked by visual inspection (graphs, bar charts). The DEM can export the imported data in several formats: MS Excel, DEM format, XML Google Earth kml format. The data can also be checked by inspecting these exports.

After delivery the DEMs (including the generated DEMs for France and Germany) are uploaded into AirBase. ETC/ACM repeats the DEM checks on outliers, calculated statistics and missing data. Moreover ETC/ACM performs some extra checks:

- Check on missing essential meta information (station coordinates, altitude, type of station, type of area)
- Resubmission of data: measurement data, already available in AirBase, has been submitted again.

¹ http://acm.eionet.europa.eu/databases/country_tools/aq/aq-dem/dem_install.html

- Stations and/or measurement configurations which have to be removed from AirBase, but measurement data are attached to these stations and/or measurement configurations

ETC/ACM also performed not only checks on historical data in AirBase. These checks are part of an activity in the ETC/ACM Implementation Plan called “Improving air quality data capture including near real-time data flows”. For the EoI we have among others the following issues:

- No response on regular feedback after EoI delivery.
- Check on coordinates (stations in other country, in the sea etc.).
- Stations Questionnaire and/or NRT and/or SOR missing in AirBase.
- Double/multiple defined stations with the same coordinates
- NO_x or NO₂+NO measurement values delivered?
- Gaps in historical timeseries.

Intensive feedback took place with all reporting countries on these items. The country feedbacks sent to the MS resulted in one or more updates for 31 original EoI reports like:

- revalidation of suspicious data, originally reported as valid;
- resubmission of time series in which suspicious data were detected;
- updating (essential) meta information;
- submission of missing time series

More detailed information on the country feedbacks can be found in Annex C.

1.3. Reporting characteristics

Sulphur dioxide (SO₂), nitrogen dioxide (NO₂), nitrogen oxides (NO_x), ozone (O₃), carbon monoxide (CO), particulate matter (PM₁₀, PM_{2.5}), benzene (C₆H₆) and lead (Pb) were the most frequently reported pollutants. Fewer time series were submitted for the less commonly monitored components, i.e. Volatile Organic Compounds (VOC), Heavy Metals (HM) and Polycyclic Aromatic Hydrocarbons (PAH). Some countries have delivered PM_{2.5} speciation data (PM_{2.5_spec}). The latter is a new requirement in the AQD 2008/50/EC (Article 6(5)).

The number of reporting countries varied per component ranging from all 38 countries for PM₁₀ to nineteen for components for VOC- (VOC minus benzene, see Annex D).

The number of reporting stations in 2010 also varied accordingly (excluding the PM_{2.5_spec} stations), being 466 for one or more VOC- and 3278 for NO₂. Differences in the distribution and density of reporting stations are illustrated for selected pollutants (*Figures 1 through 8*)¹. The expected coverage of EoI stations in these figures is set out in Article 3 of the EoI decision (EU 1997). The EoI should cover at least the stations which are used in the FWD and the related DD. Only if the concentrations are below the lower assessment threshold (LAT) it is not necessary to deliver fixed measurement data (EU, 2008 (Annex II)).

Overviews of reporting in 2010 can be seen in *Tables 1 and 2* in this report. For completeness the tables also show the number of stations with NO_x data, or, if no NO_x data are available with NO₂ + NO data (symbol “NO_x/NO”) and the number of stations providing data for one or more O₃ precursors excluding benzene which is listed separately (VOC-) and the number of stations with data for one or more of the heavy metals in the 4th DD (HM4: As, Cd, Hg, Ni) and one or more PAH in the 4th DD (PAH4). Only *lead in aerosol* (Pb_aer) has been taken into account. Also the PM_{2.5} speciation stations are added. For a detailed definition of HM4, PAH4, Pb_aer and PM_{2.5_spec}, see Annex E).

¹ Note that a number of French stations (Reunion, Guadeloupe, ...) fall outside the maps; these station are however included in the Tables and other graphs.

The stations in AirBase have a station type: traffic, industrial, background or unknown and a type of area: urban, suburban, rural or unknown. The type of stations in *Table 1* has been defined as follows:

Station classification	Type of station in AirBase	Type of area in AirBase
Traffic	Traffic	Urban, suburban, rural, unknown
Urban background	Background	Urban, suburban
Industrial	Industrial	Urban, suburban, rural, unknown
Rural background	Background	Rural
Other	Background	Unknown
	Unknown	Urban, suburban, rural, unknown

More detailed information on the number and type of stations per pollutant and per country in 2010 can be found in table A “number of stations per pollutant and station type and country in 2010”

http://acm.eionet.europa.eu/databases/airbase/eoi_tables/eoi2011/index_html

All stations with data (stations with raw data with averaging times varying from hour to year and/or statistics) are taken into account in this chapter, regardless of the data coverage¹ at that station². For the gaseous components mostly hourly and daily concentration data have been delivered. The components from the 4th DD (HM4 and PAH4) and PM_{2.5}_spec components have different averaging times than hour and day: the averaging times can be weekly, 2-weekly, 4-weekly, monthly, 3-monthly and yearly. If the measurement periods of a component differ more than 25% from a constant averaging time, the averaging time has been defined as “var”.

The daily values in AirBase have been calculated by ETC/ACM from the hourly values if available. If a country reports both hourly and daily values, the delivered daily values have been overwritten by the calculated daily values. If 3-hourly data are delivered, these data are aggregated in daily values; in this case only the aggregated daily values are made available in AirBase. .

Most countries delivered data for more pollutants than the mandatory list of pollutants defined under the EoI. See table B “number of stations with HM4, VOC, PAH4 and other non-Directive components” in http://acm.eionet.europa.eu/databases/airbase/eoi_tables/eoi2011/index_html for a summary of these supplementary components.

For most pollutants the number of stations for which data have been reported in 2010 has increased in comparison with 2009 (see *Table 1*). Only SO₂, Pb_aer and CO slightly decreased. The highest increases are in the number of stations measuring PM_{2.5} (48%) and VOC- (38%). The difference between the number of stations for which NO₂ has been reported and the number of stations for which NO_x/NO has been reported is 847. This is a small improvement in comparison with 2009, where the difference was 914. For most of these stations the ETC/ACM was not able to calculate the NO_x concentration as data on NO was missing. As most automated monitors measure both pollutants simultaneously, this difference is surprisingly big. See table C “number of stations with NO₂, NO_x and NO” in http://acm.eionet.europa.eu/databases/airbase/eoi_tables/eoi2011/index_html for an overview per country.

¹ In the Air Quality Directives 2008/50/EC and 2004/170/EC the terms *data capture* and *time coverage* have been defined. The time coverage is the percentage of measurement time in a given period. The data capture is the percentage of valid measurement values in a given data set. For each yearly time series the so called *data coverage* has been calculated in AirBase. The *data coverage* is defined as follows: *Data coverage* = *data capture* * *time coverage*.

² More specific: stations with data are stations with calculated or defined statistics (annual means).

Table 1 Number of stations for which 2010 data have been delivered for AQD 2008/50/EC & 4DD components, specified per station type. For a detailed definition of Pb_aer, VOC-, PM_{2.5}_spec, HM4 and PAH4 see Annex D.

	AQ Directive												
	AQD 2008/50/EC											DD 2004/50/EC	
	SO2	NO2	NOx/NO	PM10	PM2.5	Pb_aer	CO	C6H6	O3	VOC-	PM2.5_s pec	HM4	PAH4
Reporting EU countries	27	27	26	27	27	23	27	27	27	17	5	24	23
Total number of stations	1897	3155	2333	2817	965	644	1265	841	2200	459	15	744	550
Of which													
Traffic	365	994	725	837	220	151	600	343	288	193	3	155	141
Urban background	745	1229	861	1159	506	259	410	299	1078	126		311	261
Industrial	510	494	402	449	96	134	189	137	277	100		144	64
Rural background	265	411	343	346	136	100	63	60	519	38	12	134	84
Other	12	27	2	26	7		3	2	38	2			
Reporting non-EU countries	10	10	9	11	4	1	9	6	10	2		2	2
Total number of stations	201	123	98	223	32	14	49	19	70	7		18	17
Of which													
Traffic	24	48	43	50	17	2	25	12	20	2		2	4
Urban background	144	43	29	140	11	5	11	5	24	4		5	7
Industrial	20	14	13	17			11	1	7			1	
Rural background	12	18	13	16	4	7	2	1	19	1		9	5
Other	1											1	1
Total reporting countries	37	37	35	38	31	24	36	33	37	19	5	26	25
Total number of stations 2010 data	2098	3278	2431	3040	997	658	1314	860	2270	466	15	762	567
Total number of stations 2009 data	2184	3268	2354	3015	826	675	1355	775	2246	408	8	745	545
Change nr. of stations 2009/2010 data	-86	10	77	25	171	-17	-41	85	24	58	7	17	22
Perc. Increase stations 2009/2010 data	-4%	0%	3%	1%	21%	-3%	-3%	11%	1%	14%	88%	2%	4%

Table 2 Number of stations for which 2010 data have been delivered for AQD 2008/50/EC & 4DD components, specified per country. For a detailed definition of Pb_aer, VOC-, PM_{2.5}_spec, HM4 and PAH4 see Annex D. The number of stations for individual components in VOC-, PM_{2.5}_spec, HM4 and PAH4 can be found in Table B “number of stations with HM4, VOC, PAH4 and other non_Directive components” on http://acm.eionet.europa.eu/databases/airbase/eoi_tables/eoi2011/index.html

	AQ Directive											DD 2004/50/EC	
	AQD 2008/50/EC												
	SO2	NO2	NOx/NO	PM10	PM2.5	Pb_aer	CO	C6H6	O3	VOC-	PM2.5_s pec	HM4	PAH4
EU-27 countries													
AUSTRIA	101	156	136	144	15	17	44	21	114			18	26
BELGIUM	62	85	85	61	38	42	22	40	41	40		47	23
BULGARIA	28	24	18	42	9	9	16	17	19	6		12	11
CYPRUS	2	2	2	3	5	3	1	1	2		1	3	2
CZECH REPUBLIC	73	88	88	126	35	62	27	30	61			62	33
DENMARK	2	13	8	8	9	7	8	3	10	3		7	2
ESTONIA	9	9	9	7	7	2	7	2	9			2	2
FINLAND	7	25	25	38	19		5	4	16	4			
FRANCE	260	476		373	88		74	24	427				
GERMANY	159	553	390	451	128	125	126	143	288	116	9	201	107
GREECE	13	25	18	19	4		14	2	23	2			
HUNGARY	24	24	23	25	7		21	12	17	12		7	20
IRELAND	12	14	14	17	5	5	6	3	12	1		8	5
ITALY	306	643	632	522	130	60	366	198	368	141		60	60
LATVIA	4	5	1	8	5	3	2	4	7	2	2	3	4
LITHUANIA	10	14	11	14	7	5	7	3	12	1		5	5
LUXEMBOURG	6	6	6	6	3	5	3	2	6			5	5
MALTA	4	3	3	4	3	3	4	3	5	3	1	3	2
NETHERLANDS	20	59	44	48	30	6	22	2	37	2		8	6
POLAND	130	139	125	206	67	91	71	54	64	1		91	107
PORTUGAL	53	61	61	59	23	1	38	13	49			2	1
ROMANIA	91	79	79	59	25	53	87	56	81			44	
SLOVAKIA	12	15	14	32	27	5	10	10	15			5	7
SLOVENIA	19	11	10	16	4	4	5	2	12	2		4	3
SPAIN	435	476	401	424	179	95	251	142	409	117		104	82
SWEDEN	10	32	12	39	16	4	4	7	16			4	4
UNITED KINGDOM	45	118	118	66	77	37	24	43	80	6	2	39	33
Total EU-27 countries	1897	3155	2333	2817	965	644	1265	841	2200	459	15	744	550
non-EU-27 countries													
ALBANIA	3	3		2			3	3	2				
BOSNIA - HERZEGOVINA	7	4	2	1	2		2		4				
CROATIA	8	8	8	7			8	2	2				
ICELAND	4	8	7	12	6		1	1	1	1			
LIECHTENSTEIN		1	1	1					1				
MACEDONIA, FYRO ¹⁾	21	15	15	15			13		12				
MONTENEGRO	3	4	4	4			4		2				
NORWAY	10	30	24	31	19		2	9	11			4	8
SERBIA	18	17	5	3			4	1	3				
SWITZERLAND	10	33	32	30	5	14	12	3	32	6		14	9
TURKEY	117			117									
Total non-EU-27 countries	201	123	98	223	32	14	49	19	70	7		18	17
Total all countries	2098	3278	2431	3040	997	658	1314	860	2270	466	15	762	567

¹⁾ FYRO = the Former Yugoslav Republic Of

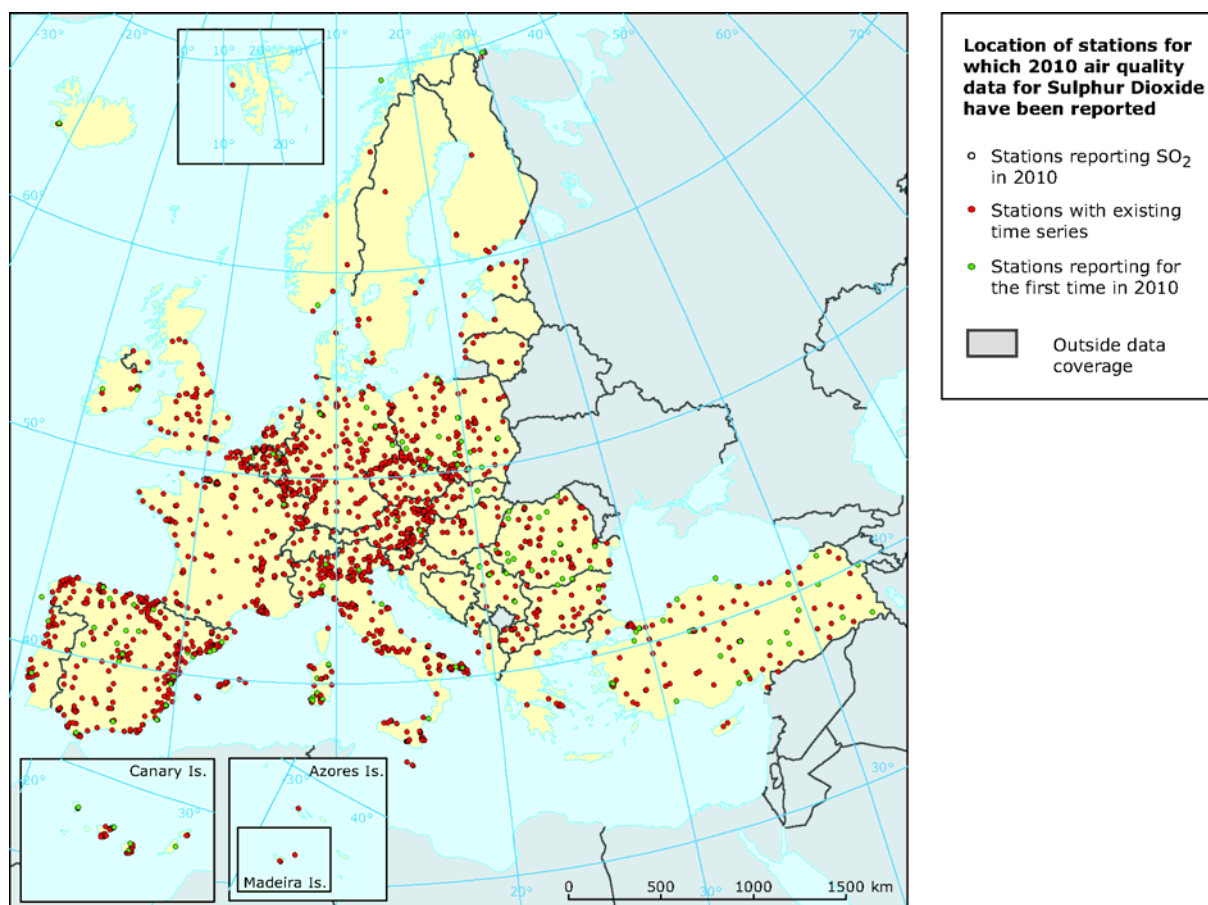


Figure 1 Location of stations for which 2010 air quality data for sulphur dioxide (SO₂) have been reported. The green stations report for the first time (new stations).

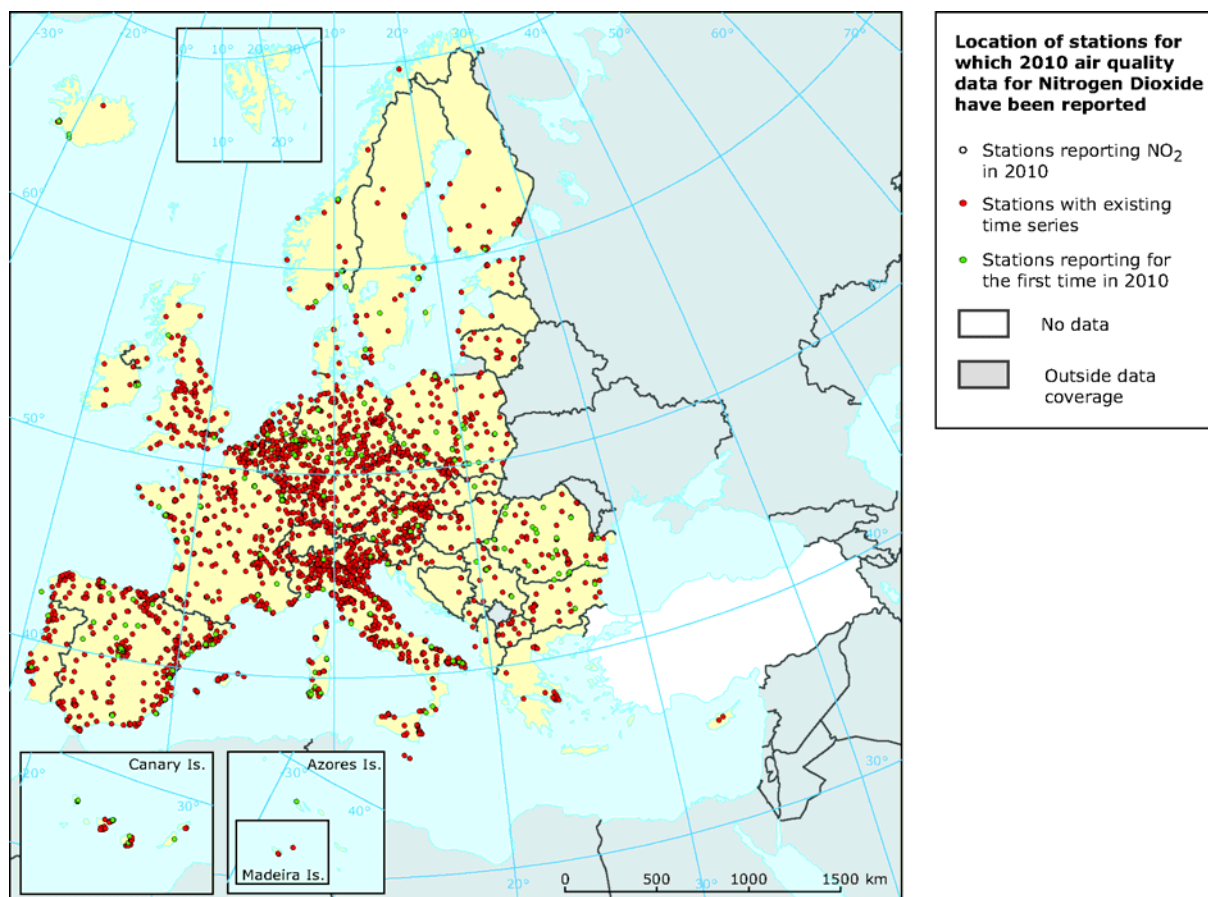


Figure 2 Location of stations for which 2010 air quality data for nitrogen dioxide (NO₂) have been reported. The green stations report for the first time (new stations).

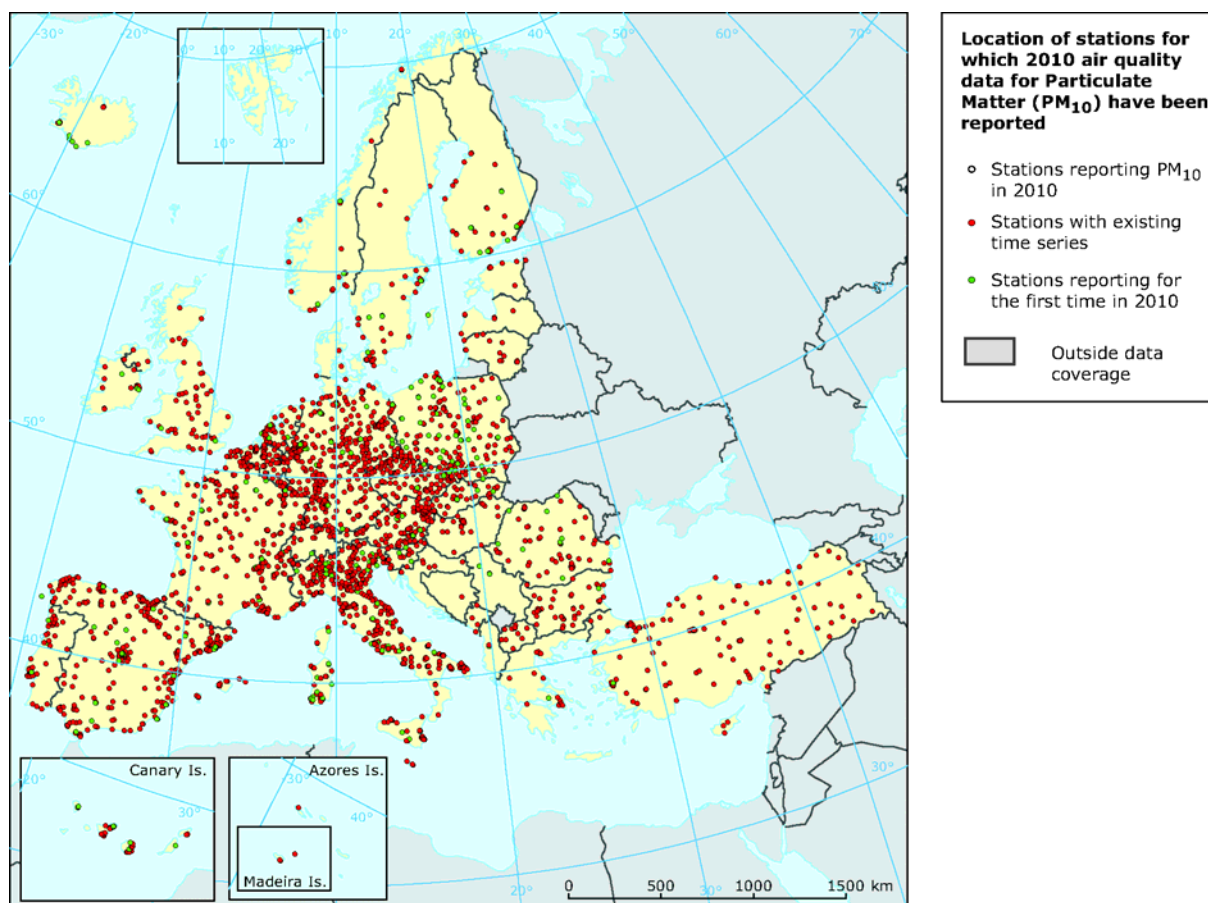


Figure 3 Location of stations for which 2010 air quality data for particulate matter (PM_{10}) have been reported. The green stations report for the first time (new stations).

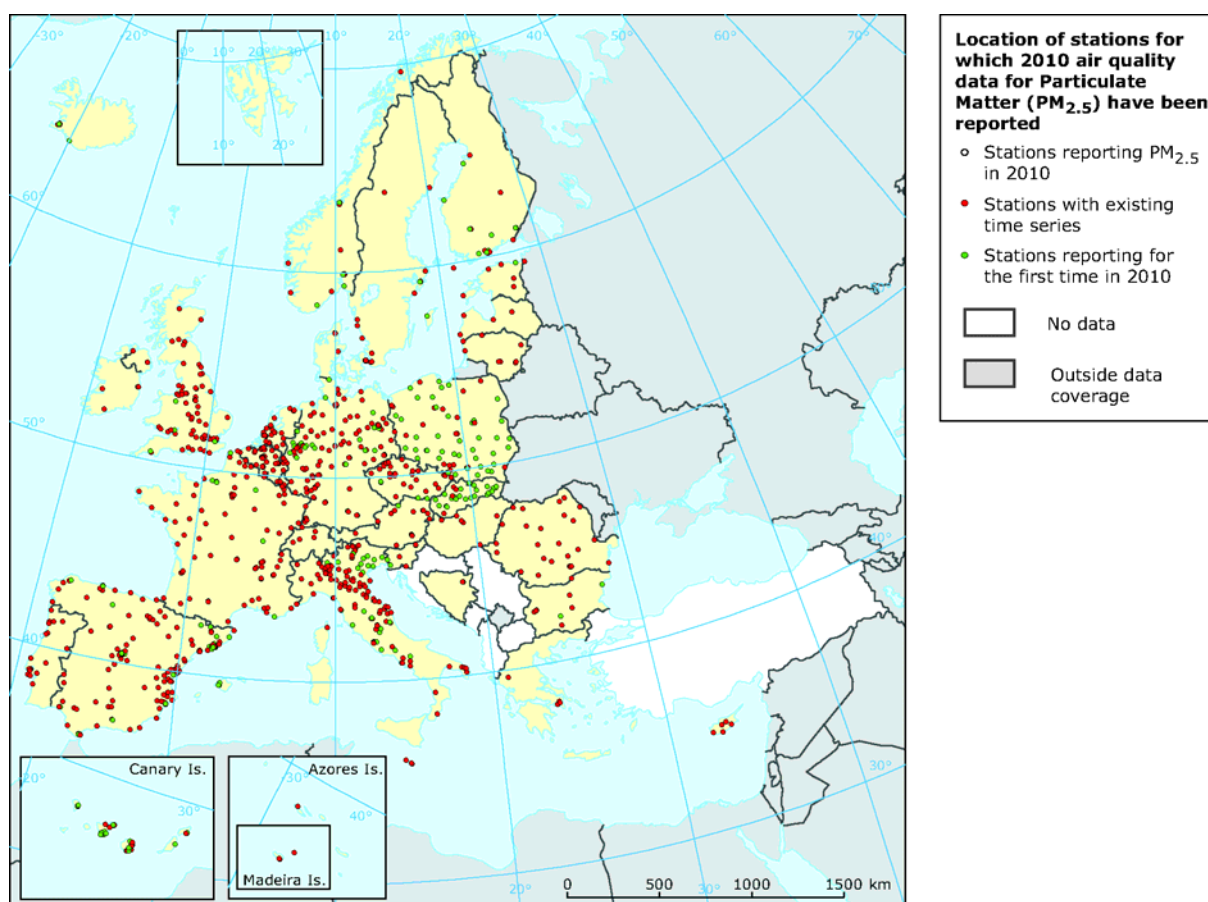


Figure 4 Location of stations for which 2010 air quality data for particulate matter ($PM_{2.5}$) have been reported. The green stations report for the first time (new stations).

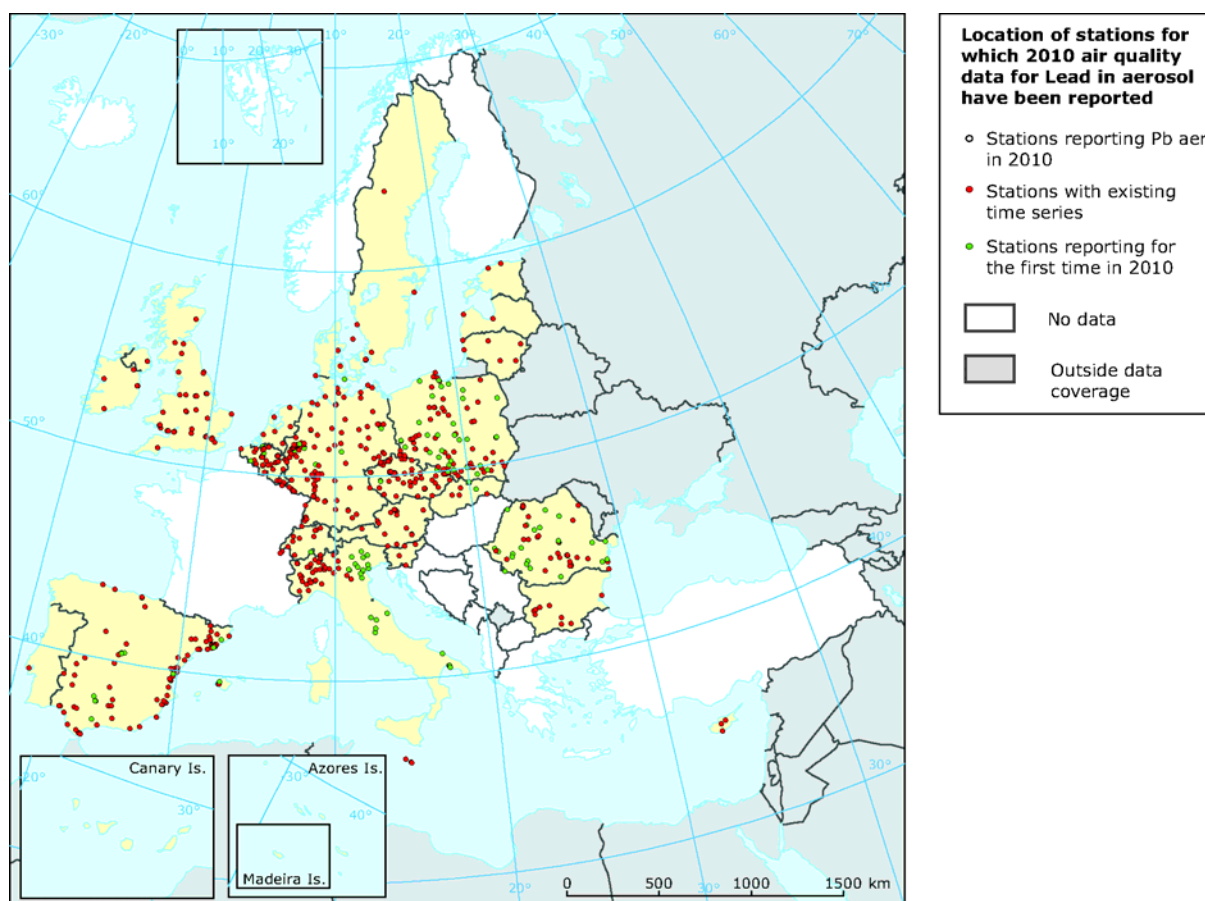


Figure 5 Location of stations for which 2010 air quality data for lead (Pb) have been reported. The green stations report for the first time (new stations).

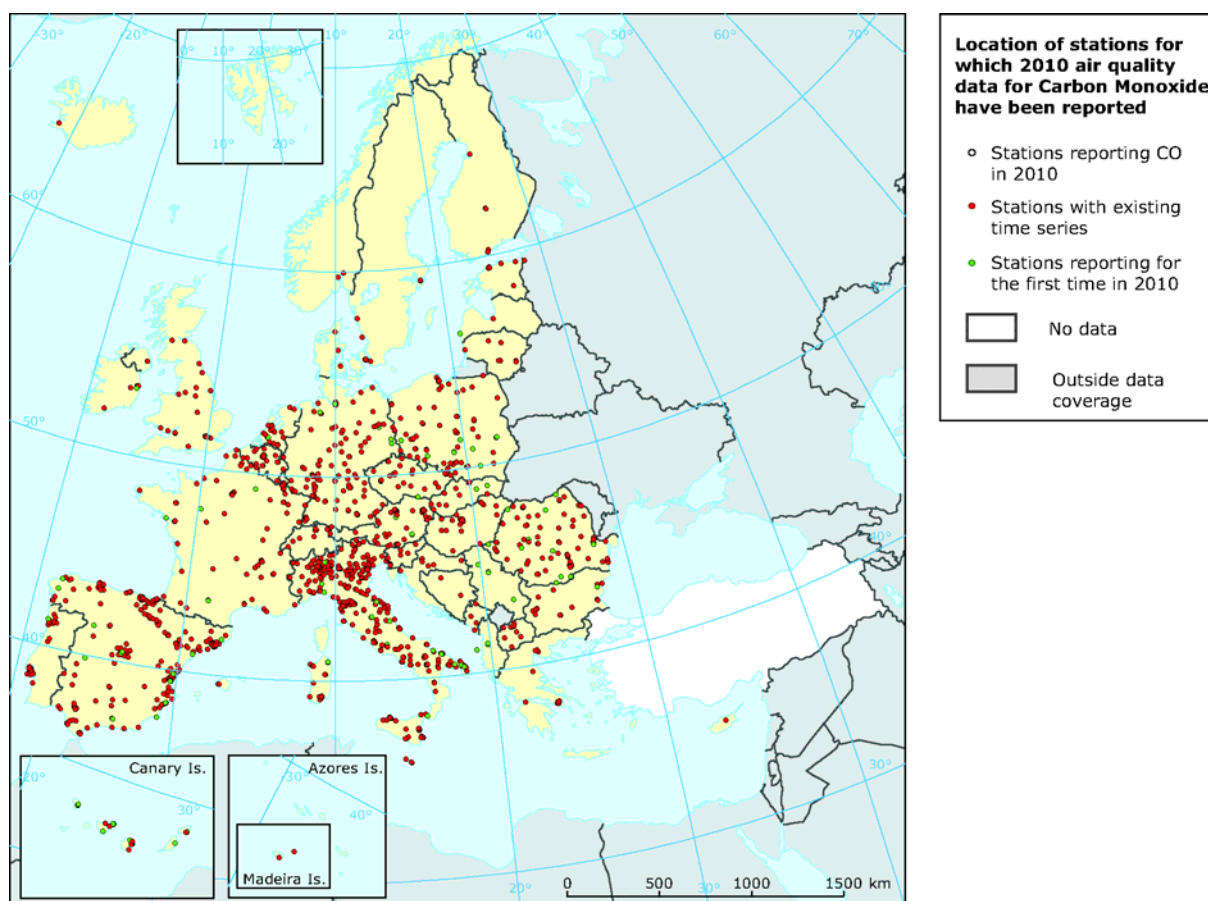


Figure 6 Location of stations for which 2010 air quality data for carbon monoxide (CO) have been reported. The green stations report for the first time (new stations).

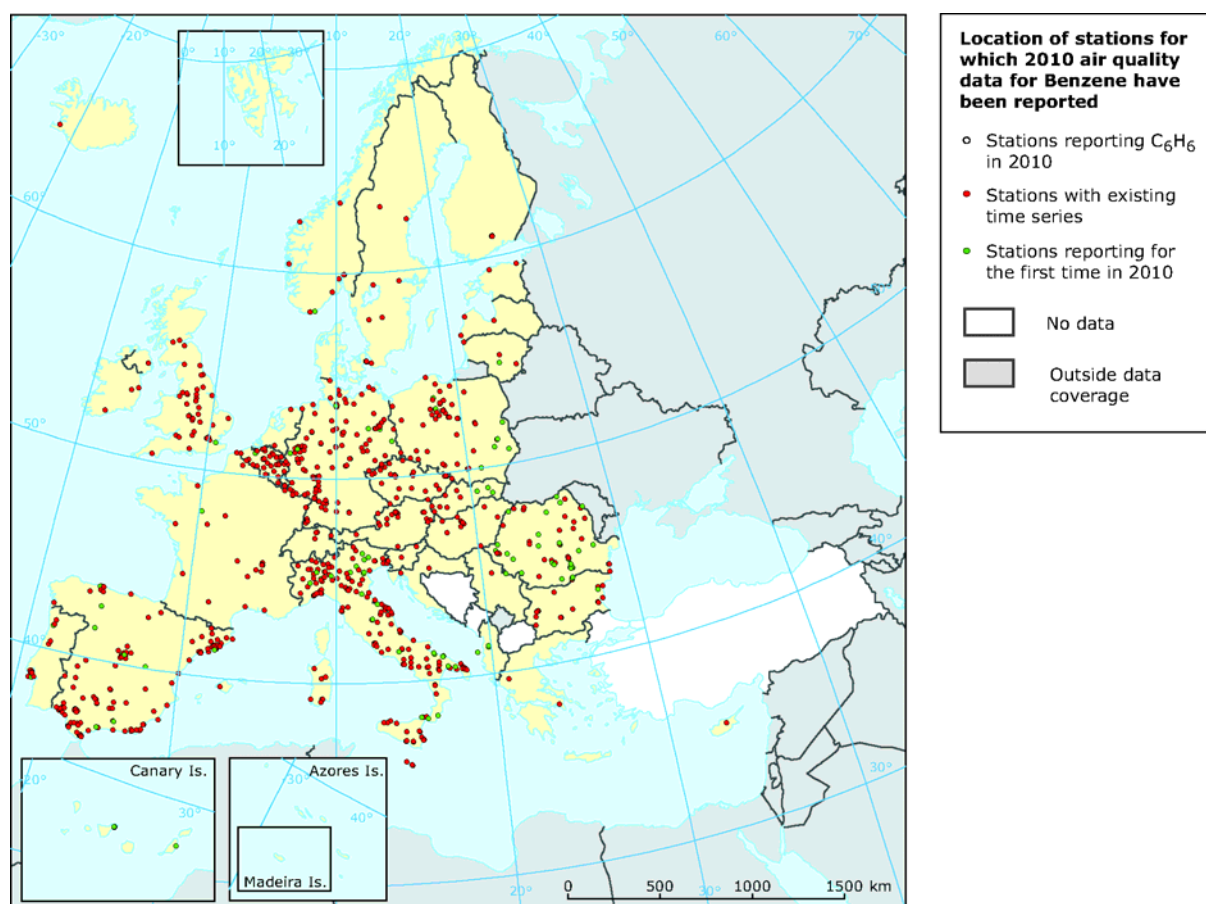


Figure 7 Location of stations for which 2010 air quality data for benzene (C_6H_6) have been reported. The green stations report for the first time (new stations).

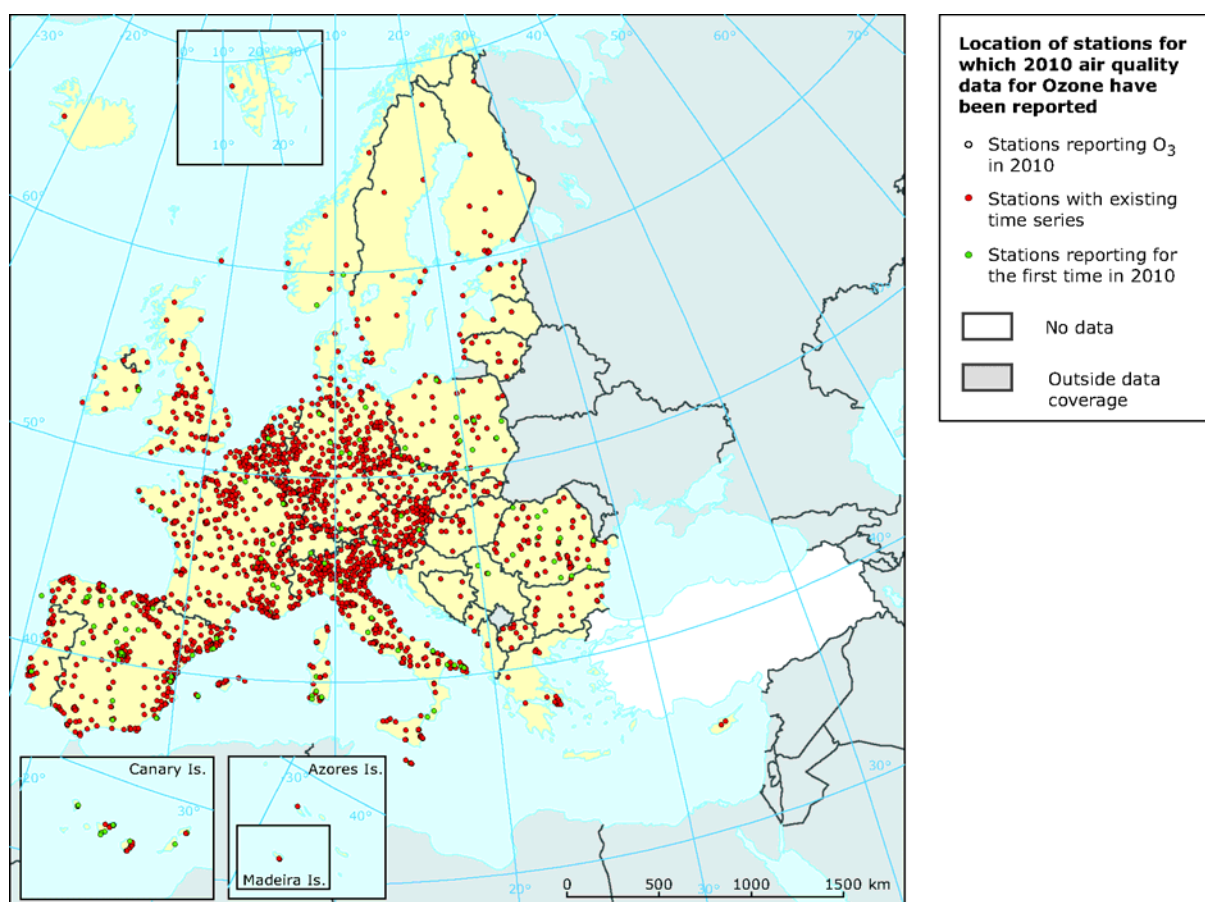


Figure 8 Location of stations for which 2010 air quality data for ozone (O₃) have been reported. The green stations report for the first time (new stations).

1.4. Measurement methods

Figure 9 shows the relative use of different measurement methods for the various components delivered for 2010. The figure shows that reference methods are used to a very large extent for the components ozone (UV absorption, 93%), NO₂ (chemiluminescence, 88%), SO₂ (UV fluorescence, 89%) and CO (infrared absorption, 86%).

For PM₁₀ and PM_{2.5}, gravimetry is the reference method. Gravimetric methods are used at 22% of the PM₁₀ and 33% of the PM_{2.5} stations. The commonly used automatic instrumental methods TEOM and Beta Absorption are used extensively, providing hourly data, while the gravimetric methods give typically only 24-hour averages. These methods should have been compared with the reference method at each measurement configuration and a correction factor should be applied to the data. Countries which deliver a DEM can also report the correction factor. Only a fraction of the PM₁₀ stations with Beta Absorption and TEOM method have delivered a correction factor, namely 15% and 20% respectively. For the PM_{2.5} stations with Beta Absorption and TEOM method these percentages are 19% and 12% respectively. Additional reporting of correction factors can be found in the Questionnaires (form 3).

For benzene 23% of the stations do not report the method used. 75% of the stations do report the method, but most of them incomplete (chromatography without further specification). 25% of the stations report gas chromatography followed by mass spectroscopy or flame ionisation for quantification.

For BaP in aerosol 27% of the stations do not report the method used. 69% of the stations do report the method, but most of them incomplete (chromatography without further specification). 22% of the stations report the reference method (gas chromatography followed by mass spectroscopy) for quantification.

For Pb in aerosol 19% of the stations do not report the method used. 75% of the stations do report the reference method (atomic absorption spectrometry or inductive coupled plasma mass spectrometry) for quantification.

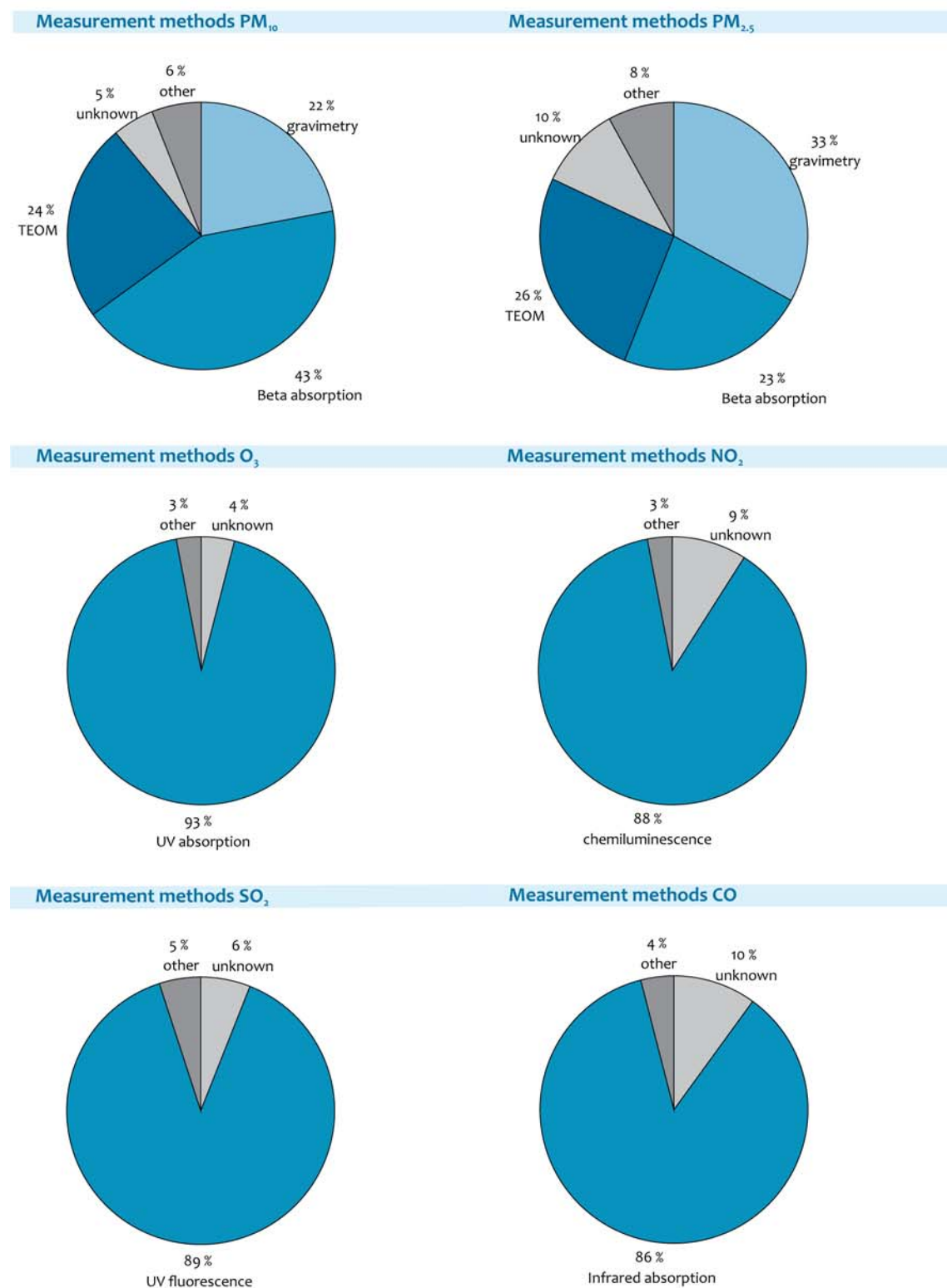


Figure 9 Measurement methods used for PM_{10} , $PM_{2.5}$, O_3 , NO_2 , SO_2 and CO reported for 2010.

1.5. Total number of stations in AirBase

The total number of stations in AirBase is 7968, from which 7380 stations have measurement data (raw data and statistics). 13 stations have only invalid raw data and have therefore no calculated statistics. 178 stations have only reported statistics; no raw data have been delivered. The 397 stations without data are for instance:

- stations for which meta information has been delivered under the EoI but no measurement data;
- stations for which measurement data will be delivered;
- stations reporting UTD ozone¹ to the EEA and stations reporting SOR (3rd FWD/DD)² data which have not yet delivered for the EoI

Table 3 gives an overview of the number of station in AirBase 6 (with data until 2010); for comparison also the numbers for AirBase 5 (with data until 2009) have been given.

Table 3. Overview number of stations in AirBase 5 and 6

Overview nmbr of stations in AirBase (status:13-02-2012)

Selection of stations	Nr. of stations in AirBase 5	Nr. of stations in AirBase 6
Stations with raw data and statistics	7091	7380
Stations with only statistics	178	178
Stations with only invalid raw data	19	13
Stations without data	446	397
Total stations in AirBase	7734	7968

The EoI should cover at least the stations which are included in the FWD/Questionnaire (EU 2004b). MS are notified when stations and measurement configurations have been reported in UTD, SOR and the FWD/Questionnaire, but are not present in AirBase. They are requested to deliver the meta information of these stations and measurement configurations and the raw data.

In Annex E overviews can be found on the share of statistics in AirBase per country and per component.

¹ <http://www.eea.europa.eu/maps/ozone/welcome>

² <http://www.eea.europa.eu/maps/ozone/compare/summer-reporting-under-directive-2002-3-ec>

1.6. Historical data, data coverage and time series

The total number of stations with data which are operational in 2010 is 4664 (see *Table 4*). This is a decrease of 47 stations in comparison with the EoI2010. One of the reasons is the reorganisation of the networks for the United Kingdom in AirBase. The UK networks were pollutant oriented, so the same physical station could be defined by different station codes in two or more networks. Now the stations are uniquely defined. The reduction in Poland can be declared partly from the closure of about 200 stations.

In the EoI2011 also historical data (2008 or earlier years) have been delivered, see *Table 5*.

Figure 10 gives information on the data coverage of the 2010 stations. The number of stations with data coverage >0% (all operational 2010 stations) have been compared with the number of stations with >=75% and >=90% data coverage¹. In table D you can also find information on data coverage for selected pollutants, see “Information on time series in AirBase” http://acm.eionet.europa.eu/databases/airbase/eoi_tables/eoi2011/index_html .

Long-term measurement series provide valuable information for determining, for example, the effect of abatement measures and trend analysis. Keeping in mind that AirBase became operational in 1997, the average length of the time series in AirBase can also be found in table D. Note that the length of the time series in years in table D is calculated regardless of the data coverage in a year. The calculation is also based on any averaging time. If there is a gap of one or more years, the maximum length of time series is taken. For the average length of time series all stations available in AirBase have been included.

The number of stations with continuous time series is visualized in *Figure 11* for several components.

¹ The data quality objectives as laid down in the Directives 2008/50/EC and 2004/170/EC require, in general, a data coverage of 90%. For continuous measurements in the assessments presented here (chapter 2) a criterion of 75% data coverage is applied.

Table 4 Summary of periods and number of stations for which data have been delivered.

Country	Air quality reporting Start/end year ¹⁾	Number of stations for which data have been delivered for at least one year in the whole period ¹⁾	Number of stations for which 2009 data have been delivered in the EoI2010 ¹⁾	Number of stations for which 2010 data have been delivered in the EoI2011 ¹⁾
EU-27 countries				
AUSTRIA	1981-2010	262	193	195
BELGIUM	1985-2010	380	226	243
BULGARIA	1998-2010	42	41	42
CYPRUS	1993-2010	9	6	6
CZECH REPUBLIC	1992-2010	192	174	172
DENMARK	1976-2010	42	14	15
ESTONIA	1997-2010	11	9	9
FINLAND	1990-2010	102	56	59
FRANCE	1976-2010	1084	700	678
GERMANY	1976-2010	1235	545	660
GREECE	1983-2010	37	29	28
HUNGARY	1996-2010	49	32	36
IRELAND	1973-2010	106	29	28
ITALY	1976-2010	1103	707	705
LATVIA	1997-2010	20	12	11
LITHUANIA	1997-2010	25	18	18
LUXEMBOURG	1976-2010	14	8	8
MALTA	2002-2010	8	4	5
NETHERLANDS	1976-2010	98	78	80
POLAND	1997-2010	521	389	274
PORTUGAL	1986-2010	105	67	72
ROMANIA	1999-2010	176	107	132
SLOVAKIA	1995-2010	59	37	38
SLOVENIA	1996-2010	34	30	30
SPAIN	1986-2010	831	601	600
SWEDEN	1985-2010	83	55	57
UNITED KINGDOM	1969-2010	573	270	183
<i>Total</i>		<i>7201</i>	<i>4437</i>	<i>4384</i>
Non-EU-27 countries				
ALBANIA	2008-2010	3	3	3
BOSNIA - HERZEGOVINA	1985-2010	21	8	8
CROATIA	2004-2010	8	8	8
ICELAND	1993-2010	18	9	13
LIECHTENSTEIN	2004-2010	2	1	1
MACEDONIA, FYRO ²⁾	1997-2010	46	30	24
MONTENEGRO	2008-2010	4	4	4
NORWAY	1994-2010	62	46	49
SERBIA	2002-2010	29	20	20
SWITZERLAND	1991-2010	47	32	33
TURKEY	2007-2010	117	113	117
<i>Total</i>		<i>357</i>	<i>274</i>	<i>280</i>
<i>Total EU-27 + non-EU-27 countries</i>		<i>7558</i>	<i>4711</i>	<i>4664</i>

1) Irrespective of the component(s) measured

2) FYRO= Former Yugoslavian Republic Of

Table 5 Number of stations delivering historical data (2009 or earlier years) in the EoI 2011

Country	Number of stations for which 2009 data have been delivered in the EoI2011 ¹⁾	Number of stations for which <2009 data have been delivered in the EoI2011 ¹⁾
EU-27 countries		
AUSTRIA	6	16
CZECH REPUBLIC	2	44
DENMARK	12	0
FINLAND	1	0
GERMANY	66	0
GREECE	1	1
HUNGARY	4	12
LATVIA	2	2
LITHUANIA	6	0
NETHERLANDS	28	1
PORTUGAL	8	0
SLOVENIA	2	2
SWEDEN	1	8
UNITED KINGDOM	40	0
<i>Total</i>	<i>179</i>	<i>86</i>
Non-EU-27 countries		
NORWAY	2	0
SWITZERLAND	3	15
<i>Total</i>	<i>5</i>	<i>15</i>
<i>Total EU-27 + non-EU-27 countries</i>	<i>184</i>	<i>101</i>

1) Irrespective of the component(s) measured

Data coverage

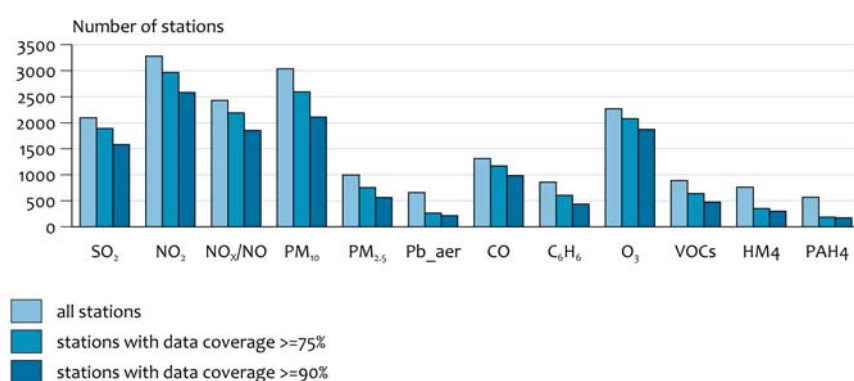


Figure 10 Number of stations with 2010 data coverage >0% (with data), >=75% and >=90%. Data coverage is based on daily averages for SO₂, NO₂, NO_x/NO, PM₁₀, PM_{2.5}, Pb_{aer}, benzene, VOC, HM₄ and PAH₄ and based on daily running 8h maximum for CO and O₃

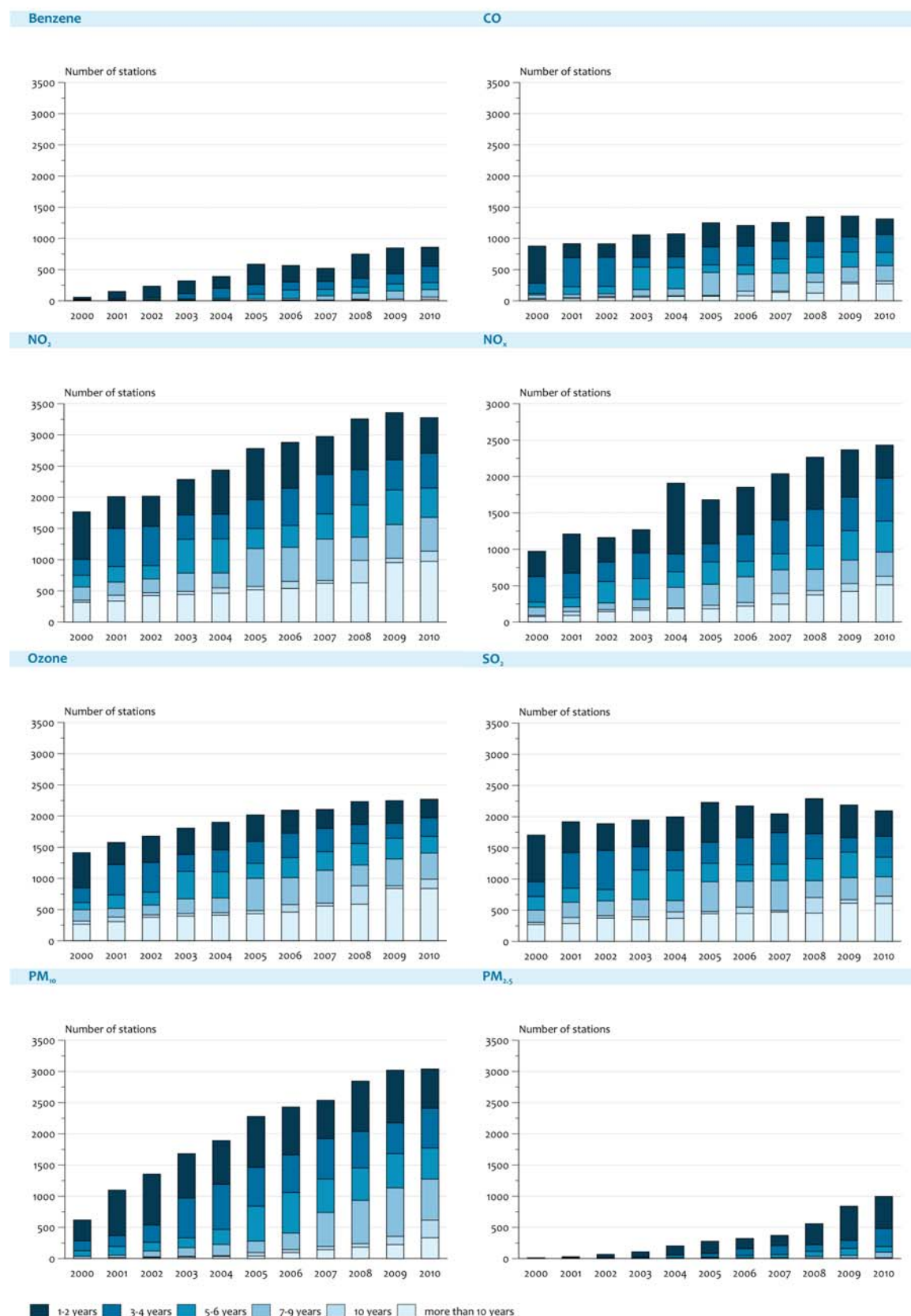


Figure 11 Number of stations with time series of 1-2, 3-4, 5-6, 7-9, 10 and more than 10 year ending in the year on the x-axis for several components.

2. CONCLUSIONS

A total of 38 countries, including all 27 EU Member States, have provided air quality data for 2010. Measurement data from a total of 4664 stations have been delivered in the EoI2011. This is a small decrease in comparison with the EoI2010. One of the reasons is that UK has reorganized their networks in AirBase, so that many multiple defined stations have been removed.

Small increases are seen in the number of stations reporting PM_{2.5} and VOC (21% and 14% respectively). Some countries started to deliver PM_{2.5} speciation concentrations.

In the EoI2011 letter (accompanying the request sent to the Member States in 2011 for submitting 2010 air quality data) mailed to all the data suppliers, the Member States were requested to submit at least two of the three oxidised nitrogen components (NO₂, NO, NO_x). In spite of this request there is still a difference of almost 800 stations (from which about 500 stations of France) between the number of stations for which NO₂ has been reported and the number of stations for which NO (or NO_x) has been reported. In AirBase NO_x values have been derived for stations where NO and NO₂ values have been reported, but no NO_x values.

The number of stations for the 4DD components has increased slightly: the number of stations where one or more heavy metals listed in the 4DD have been reported, has increased by 2% while the number of stations where benzo(a)pyrene or one of the other PAH have been reported has increased by 4%.

Nearly all countries delivered the data in time (before 1st of October 2011). ETC/ACM has produced QA/QC country feedback reports (Mol, 2011). The response on these reports was very good; almost all countries replied to this response within the deadline.

The quality of the meta information, measurement data but also the derived information (statistics, exceedances) in AirBase has been further improved.

3. LIST OF ABBREVIATIONS

AOT40	ozone concentrations <u>A</u> ccumulated dose <u>O</u> ver a <u>T</u> hreshold of <u>40</u> ppb
AQ	<u>A</u> ir <u>Q</u> uality
AQD	<u>A</u> ir <u>Q</u> uality <u>D</u> irective
CDR	<u>C</u> entral <u>D</u> ata <u>R</u> epository
DD	<u>D</u> aughter <u>D</u> irectives
4DD	<u>F</u> ourth <u>D</u> aughter <u>D</u> irective 2004/107/EC
DEM	<u>D</u> ata <u>E</u> xchange <u>M</u> odule
DG ENV	<u>D</u> irector <u>a</u> te- <u>G</u> eneral <u>E</u> nvironment
EEA	<u>E</u> uropean <u>E</u> nvironment <u>A</u> gency
EFTA	<u>E</u> uropean <u>F</u> ree <u>T</u> rade <u>A</u> ssociation
EOI	<u>E</u> xchange of <u>I</u> nformation
ETC/ACM	<u>E</u> uropean <u>T</u> opic <u>C</u> entre on <u>A</u> ir <u>P</u> ollution and <u>C</u> limate <u>C</u> hange <u>M</u> itigation
EU	<u>E</u> uropean <u>U</u> nion
EU-27	The <u>27</u> <u>EU</u> Member States
FWD	<u>A</u> ir <u>Q</u> uality <u>F</u> ramework <u>D</u> irective on ambient air quality assessment and Management Directive 96/62/EC
IPR	<u>I</u> mplementing <u>P</u> rovisions of the Air Quality Directive 2008/50/EC
LAT	<u>L</u> ower <u>A</u> ssessment <u>T</u> hreshold
MS	<u>M</u> ember <u>S</u> tate(s)
NUTS	<u>N</u> omenclature des <u>U</u> nités <u>T</u> erritoriales <u>S</u> tatistiques
QA/QC	<u>Q</u> uality <u>A</u> ssurance & <u>Q</u> uality <u>C</u> ontrol
SOR	<u>S</u> ummer <u>O</u> zone <u>R</u> eporting
SOMO35	<u>S</u> um of <u>O</u> zone <u>M</u> eans <u>O</u> ver <u>35</u> ppb
UTD	<u>U</u> p <u>T</u> o <u>D</u> ate

List of components and component groups

As	Arsenic
B(a)P	benzo(a)pyrene
C ₆ H ₆	benzene
Cd	Cadmium
CO	carbon monoxide
Hg	Mercury
HM	Heavy Metals
HM4	Heavy Metals in the 4 th DD (see list in Annex D)
Ni	Nickel
NO ₂	nitrogen dioxide
NO _x	nitrogen oxides
NO _x /NO	Delivered NO _x and, if no NO _x data available, NO ₂ + NO
O ₃	ozone
PAH	Polycyclic Aromatic Hydrocarbons
PAH4	Polycyclic Aromatic Hydrocarbons in the 4 th DD (see list in Annex D)
Pb	Lead
Pb_aer	Lead in aerosol (see list in Annex D)
PM _{2.5}	particulate matter with particle diameter 2.5 µm or less
PM _{2.5} _spec	PM _{2.5} speciation concentrations (see list in Annex D)
PM ₁₀	particulate matter with particle diameter 10 µm or less
SO ₂	sulphur dioxide
VOC	Volatile Organic Compounds (see list in Annex D)
VOC-	Volatile Organic Compounds minus benzene

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Annex A Exchange of Information requirements

The MS of the EU should, according to Annex II of the Council Decision on the reciprocal exchange of information, report certain types of meta information (EU, 2001a). Part of the information, as mentioned in Annex II, is mandatory (*Table A1*). The other information should be delivered ‘to the extent possible’ and ‘as much as feasible’ (*Table A2*).

Table A.1 Overview of mandatory meta information to be delivered under the EoI

Item ^a	Description
I.1.	Name of the network
I.4.1.	Name of the body responsible for network management
I.4.2.	Name of person responsible
I.4.3.	Address
I.4.4.	Telephone and fax numbers
I.5.	Time reference basis
II.1.1.	Name of the station
II.1.4.	Station code given under the present decision and to be provided by the Commission
II.1.8.	Geographical co-ordinates
II.1.10.	Pollutants measured
II.1.11.	Meteorological parameters measured
II.2.1.	Type of area

(a) Numbers according to Annex II of the EoI (EU, 2001a)

Table A.2. Overview of non-mandatory meta information to be delivered under the EoI

Item ^a	Description
I.2.	Abbreviation (of the network)
I.3.	Type of networks
I.4.5.	E-mail (of the body responsible for the network)
I.4.6.	Website address
II.1.2.	Name of the town/city of location (of the station)
II.1.3.	National and/or local reference number or code
II.1.5.	Name of technical body responsible for the station
II.1.6.	Bodies or programmes to which data are reported
II.1.7.	Monitoring objectives
II.1.9.	NUTS level IV
II.1.12	Other relevant information
II.2.2.	Type of station in relation to dominant emission sources
II.2.3.	Additional information about the station
III.1.1.	Name (of measurement equipment)
III.1.2.	Analytical principle or measurement method
III.2.1.	Location of sampling point
III.2.2	Height of sampling point
III.2.3	Result-integrating time
III.2.4	Sampling time

(a) Numbers according to the Annex II of the EoI (EU, 2001a).

Table A.3 Overview of mandatory pollutants to be delivered under the EoI

EoI nr.	Formula	Name of pollutant	Units of measurement	Average over
1	SO ₂	Sulphur dioxide	µg/m ³	1 h
2	NO ₂	Nitrogen dioxide	µg/m ³	1 h
3	PM ₁₀	Particulate matter < 10 µm	µg/m ³	24 h
4	PM _{2.5}	Particulate matter < 2.5 µm	µg/m ³	24 h
5	SPM	Total suspended particulates	µg/m ³	24 h
6	Pb	Lead	µg/m ³	24 h
7	O ₃	Ozone	µg/m ³	1 h
8	C ₆ H ₆	Benzene	µg/m ³	24 h
9	CO	Carbon monoxide	mg/m ³	1 h
10	Cd	Cadmium	ng/m ³	24 h
11	As	Arsenic	ng/m ³	24 h
12	Ni	Nickel	ng/m ³	24 h
13	Hg	Mercury	ng/m ³	24 h
14	BS	Black smoke	µg/m ³	24 h
15	NO _x	Nitrogen oxides	µg NO ₂ /m ³	1 h

Table A.4 Overview of other pollutants to be delivered under the EoI if available

Eol nr.	Formula	Name of pollutant	Units of measurement	Average over
16	C ₂ H ₆	Ethane	µg/m ³	24 h
17	H ₂ C=CH ₂	Ethene (Ethylene)	µg/m ³	24 h
18	HC=CH	Ethyne (Acetylene)	µg/m ³	24 h
19	H ₃ C-CH ₂ -CH ₃	Propane	µg/m ³	24 h
20	CH ₂ =CH-CH ₃	Propene	µg/m ³	24 h
21	H ₃ C-CH ₂ -CH ₂ -CH ₃	n-Butane	µg/m ³	24 h
22	H ₃ C-CH(CH ₃) ₂	i-Butane	µg/m ³	24 h
23	H ₂ C=CH-CH ₂ -CH ₃	1-Butene	µg/m ³	24 h
24	H ₃ C-CH=CH-CH ₃	trans-2-Butene	µg/m ³	24 h
25	H ₃ C-CH=CH-CH ₃	cis-2-Butene	µg/m ³	24 h
26	CH ₂ =CH-CH=CH ₂	1.3 Butadiene	µg/m ³	24 h
27	H ₃ C-(CH ₂) ₃ -CH ₃	n-Pentane	µg/m ³	24 h
28	H ₃ C-CH ₂ -CH(CH ₃) ₂	i-Pentane	µg/m ³	24 h
29	H ₂ C=CH-CH ₂ -CH ₂ -CH ₃	1-Pentene	µg/m ³	24 h
30	H ₃ C-HC=CH-CH ₂ -CH ₃	2-Pentenenes	µg/m ³	24 h
31	CH ₂ =CH-C(CH ₃)=CH ₂	Isoprene	µg/m ³	24 h
32	C ₃₆ H ₁₄	n-Hexane	µg/m ³	24 h
33	(CH ₃) ₂ -CH-CH ₂ -CH ₂ -CH ₃	i-Hexane	µg/m ³	24 h
34	C ₇ H ₁₆	n-Heptane	µg/m ³	24 h
35	C ₈ H ₁₈	n-Octane	µg/m ³	24 h
36	(CH ₃) ₃ -C-CH ₂ -CH-(CH ₃) ₂	i-Octane	µg/m ³	24 h
37	C ₆ H ₅ -CH ₃	Toluene	µg/m ³	24 h
38	C ₆ H ₅ -C ₂ H ₅	Ethyl benzene	µg/m ³	24 h
39	m,p-C ₆ H ₄ (CH ₃) ₂	m,p-Xylene	µg/m ³	24 h
40	o-C ₆ H ₄ -(CH ₃) ₂	o-Xylene	µg/m ³	24 h
41	C ₆ H ₃ -(CH ₃) ₃	1,2,4-Trimethylbenzene	µg/m ³	24 h
42	C ₆ H ₃ (CH ₃) ₃	1,2,3-Trimethylbenzene	µg/m ³	24 h
43	C ₆ H ₃ (CH ₃) ₃	1,3,5-Trimethylbenzene	µg/m ³	24 h
44	HCHO	Formaldehyde	µg/m ³	1 h
45	THC (NM)	Total non-methane hydrocarbons	µg C/m ³	24 h
46	SA	Strong acidity	µg SO ₂ /m ³	24 h
47	PM1	Particulate matter < 1 µm	µg/m ³	24 h
48	CH ₄	Methane	µg/m ³	24 h
49	Cr	Chromium	ng/m ³	24 h
50	Mn	Manganese	ng/m ³	24 h
51	H ₂ S	Hydrogen sulphide	µg/m ³	24 h
52	CS ₂	Carbon disulphide	µg/m ³	1 h
53	C ₆ H ₅ -CH=CH ₂	Styrene	µg/m ³	24 h
54	CH ₂ =CH-CN	Acrylonitrile	µg/m ³	24 h
55	CHCl=CCl ₂	Trichloroethylene	µg/m ³	24 h
56	C ₂ Cl ₄	Tetrachloroethylene	µg/m ³	24 h
57	CH ₂ Cl ₂	Dichloromethane	µg/m ³	24 h
58	BaP	Benzo(a)pyrene	µg/m ³	24 h
59	VC	Vinyl chloride	µg/m ³	24 h
60	PAN	Peroxyacetyl nitrate	µg/m ³	1 h
61	NH ₃	Ammonia	µg/m ³	24 h
62	N-DEP	Wet nitrogen deposition	mg N/(m ² *month)	1 month
63	S-DEP	Wet sulphur deposition	mg S/(m ² *month)	1 month

Annex B Aggregation of data and calculation of statistics and NO_x values in AIRBASE

1. Hourly and daily values

Aggregation of data

The air quality statistics in AirBase are based on *hourly values*, *daily (24-hour) average values*, and *daily 8-hour maximum values*. However, most of the reported measurement data are in hourly time episodes. To obtain the daily and 8-hour based statistical parameters the hourly values (if available) are aggregated to derive daily and 8-hourly values. If a country reports both hourly and daily values, the reported daily values will be ignored. The calculated daily values will be used instead for calculating the statistics. If 3-hourly data are delivered, these data are aggregated in daily values.

For the aggregation of hourly data to longer averaging periods (8 hourly, daily) a minimum data capture of 75% is required to calculate a valid aggregated value:

- a *daily averaged* (24-hourly) concentration is calculated when at least 18 valid hourly values are available
- a *8-hourly averaged* concentration is calculated when at least 6 valid hourly values are available
- a *maximum daily 8-hour mean* is calculated when at least 18 valid running 8-hour averages per day are available

For the aggregation of 3hourly data to daily values we have also the 75% data capture rule:

- a *daily averaged* concentration is calculated when at least 6 valid 3-hourly values are available

Statistics calculation on annual basis

The following types of annual statistics are calculated depending on the component:

- *General* concentration statistic: annual mean, 50, 95, 98 percentiles and maximum (only SO₂ also 99.9 percentile based on hourly values).
- *Exceedances*: hours/days with concentration > y µg/m³ (with y = limit or threshold value) and the kth highest value
- *AOT40*: ozone concentrations accumulated dose over a threshold of 40 ppb (AOT40 definition see below)
- *SOMO35*: ozone concentrations accumulated dose over a threshold of 35 ppb (SOMO35 definition see below)

The annual statistical parameters of the table are routinely calculated and stored in AirBase. The statistical parameters are calculated irrespective of the proportion of valid data (data capture) with one exception: all hourly and daily statistics which are based on one day or less are excluded. So statistics with a data coverage lower than 0.275% aren't calculated.

Component	Parameter based on		
	1 hour values	daily values	Maximum daily 8-hour mean
Sulphur dioxide (SO ₂)	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • 99.9 percentile • maximum • hours with c > 350 µg/m³ • 25th highest value 	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum • days with c > 125 µg/m³ • 4th highest value 	
Nitrogen dioxide (NO ₂)	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum • hours c > 200 µg/m³ • 19th highest value 	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum 	
Nitrogen monoxide (NO)	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum 	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum 	
Nitrogen oxides (NO _x) ^b	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum 	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum 	
Ozone (O ₃)	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum • AOT40 	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum 	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum • days with c > 120 µg/m³, • 26th highest value • SOMO35
Carbon monoxide (CO)	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum 	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum 	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum
Particulate matter (PM ₁₀)	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum 	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum • days with c > 50 µg/m³, • 8th highest value • 36th highest value 	
other	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum 	<ul style="list-style-type: none"> • annual mean • 50 percentile • 95 percentile • 98 percentile • maximum 	

Table B1. Calculated statistics in AIRBASE

For each statistic the data coverage¹ percentage is calculated. This is done as follows:

$$\text{Data coverage} = N_{\text{valid}} / N_{\text{year}} * 100 \%$$

where N_{valid} is the number of valid hourly/daily values and N_{year} is the number of hours/days in the year

Calculation of aggregations and statistics

1. All components

- **Annual mean**

The annual mean is calculated as follows:

$$\text{Annual mean} = \sum_i C_i / N_{\text{valid}}$$

where C_i is the valid hourly/daily/day8hmax concentration and the summation is over all valid hourly/daily values measured in the year. N_{valid} is the total number of valid hourly/daily values in the year.

- **Percentiles**

The y^{th} percentile should be selected from the measurement values (valid hourly/daily/day8hmax concentrations). All the values should be listed in increasing order:

$$X_1 \leq X_2 \leq X_3 \leq \dots \leq X_k \leq \dots \leq X_{N-1} \leq X_N$$

The y^{th} percentile is the concentration X_k , where the value of k is calculated as follows:

$$k = (q \cdot N)$$

with q being equal to $y/100$ and N the number of valid values. The value of $(q \cdot N)$ should be rounded off to the nearest whole number (values $< 0.499999\dots$ are rounded to 0, values $= 0.5$ are rounded to 1).

- **Maximum**

The (annual) maximum is calculated as follows:

$$\text{Maximum} = \max(C_i)$$

where C_i are the valid hourly/daily/day8hmax concentrations and i is running over all valid hourly/daily/day8hmax values measured in the year.

2. Only SO₂, NO₂, PM₁₀, O₃

- **k^{th} highest value**

The k^{th} highest value should be selected from the valid measurement values. All the values should be listed in decreasing order:

$$X_1 \geq X_2 \geq X_3 \geq \dots \geq X_k \geq \dots \geq X_{N-1} \geq X_N$$

The k^{th} highest value is the concentration X_k .

¹ In the Air Quality Daughter Directives 2008/50/EC and 2004/170/EC the terms *data capture* and *time coverage* have been defined. The time coverage is the percentage of measurement time in a given period. The data capture is the percentage of valid measurement values in a given data set. For each yearly time series the so called *data coverage* has been calculated in AirBase. The *data coverage* is defined as follows: *Data coverage* = *data capture* * *time coverage*.

Example: the limit value for the protection of human health for PM₁₀ is that the daily average of 50 µg/m³ will not be exceeded on more than 35 days per year. If the 36th highest value is more than 50 µg/m³, the limit value for PM₁₀ has been exceeded.

- **Number of hours/days with concentration > y µg/m³**
The n number of hours/days with concentration > y µg/m³ (with y = limit or threshold value) can be calculated from the valid measurement values:

$$X_1, X_2, X_3, \dots, X_k, \dots, X_{N-1}, X_N$$

N is the number of X_k -values for which $X_k > y$ µg/m³. If $n > 35$ in the example on PM₁₀ at the previous bullet, the limit value for PM₁₀ has been exceeded.

3. Only O₃, CO

- **8-hour running averages**
The 8-hour running averaged value for each hour is calculated as the average of the values for that hour and the 7 foregoing hours (averaging period). So, the averaging period of hour₁ of day_n is hour₁₇ of day_{n-1} until hour₁ of day_n. The averaging period of hour₂₄ of day_n is hour₁₆ of day_n until hour₂₄ of day_n.
- **Maximum daily 8-hour mean**
The maximum daily 8-hour mean for a day is the maximum of the 8-hours running averages for that day

4. Only O₃

- **AOT40 (crops)**
(Accumulated dose of ozone Over a Threshold of 40 ppb)
AOT40 means the sum of the differences between hourly concentrations greater than 80 µg/m³ (= 40 parts per billion) and 80 µg/m³:

$$AOT40_{measured} = \sum_i \max(0, (C_i - 80))$$

where C_i is the hourly mean ozone concentration in µg/m³ and the summation is over all hourly values measured between 8.00 – 20.00 Central European Time¹ each day and for days in the 3 month growing season crops from 1 May to 31 July.

AOT40 has a dimension of (µg/m³)-hours. AOT40 is sensitive to missing values and a correction to full time coverage has been applied:

$$AOT40_{estimate} = (AOT40_{measured} \cdot N_{period}) / N_{valid}$$

where N_{valid} is the number of valid hourly values and N_{period} is the number of hours in the period.

- **SOMO35**
(Sum of Ozone Means Over 35 ppb)
For quantification of the health impacts the World Health Organisation recommends the use of the SOMO35 indicator. SOMO35 means the sum of the differences between maximum daily 8-hour concentrations greater than 70 µg/m³ (= 35 parts per billion) and 70 µg/m³:

$$SOMO35_{measured} = \sum_i \max(0, (C_i - 70))$$

¹ In AirBase the time zone was disregarded. So the values between 8.00 – 12.00 in the reported time have been taken.

where C_i is the maximum daily 8-hour ozone concentration in $\mu\text{g}/\text{m}^3$ and the summation is over all days per calendar year.

SOMO35 has a dimension of $(\mu\text{g}/\text{m}^3)\cdot\text{days}$. SOMO35 is sensitive to missing values and a correction to full time coverage has been applied:

$$SOMO35_{\text{estimate}} = (SOMO35_{\text{measured}} \cdot N_{\text{period}}) / N_{\text{valid}}$$

where N_{valid} is the number of valid daily values and N_{period} is the number of days per year.

2. Other than hourly and daily values: n-day ($n>1$), n-week, n-month, year and var¹

Non automatic measured components (e.g. the components from the 4th DD (Heavy Metals and PAHs) have also other averaging times than hour and day: week, 2-week, 4-week, month, 3-month, year etc.). These measurements consist of samples with a start date/time and an end date/time. The averaging time is the period of the sample (end date/time minus start date/time). If the sample periods of a component differ 25% or more from a constant averaging time, the averaging time has been defined as “var”. Example: if all periods of 4week samples are within 21 and 35 days, the averaging time is still 4week. The 100% period for a nmonth sample has been defined as the period starting from the start date/time of the sample and ending on the same day number and time n months later. Example: the sample starts at 5 March at 00:00, the 100% 1-month period is until 5 April at 00:00. Other example: the sample starts at 30 January at 00:00, the 100% 1-month period is until “virtual” 30 February, that is actually 2 March at 00:00 (no leap year). So if the end date/time is between 27 March 18:00 and 22 April 18:00 the sample period has still 1month averaging time.

The only statistics calculated for these averaging times are:

- annual mean
- 50 percentile
- 95 percentile
- 98 percentile
- maximum

All statistics calculations are done in analogy to the hourly/daily statistics calculations except for the annual mean and the data coverage. These quantities are calculated on base of the number of hours in the sample periods.

So the data coverage is calculated as follows:

$$\text{Data coverage} = \sum_i N_{\text{valid},i} / N_{\text{year}} * 100 \%$$

where $N_{\text{valid},i}$ is the number of hours in the valid sample i and N_{year} is the number of hours in the year

The annual means are calculated according to the formula:

$$\text{Annual mean} = \sum_i N_i C_i / \sum_i N_i \quad i=1, \quad n$$

where

¹ n-hour values are aggregated into daily values. The statistics are based on these daily values.

N_i = the number of hours of the sampling period i within the calendar year
 N'_i = the number of hours in the total sampling period i
 C_i = corrected concentration for sampling period i
 $\quad = C'_i * (N_i / N'_i)$
 C'_i = Valid concentration reported for sampling period i

3. Calculation of NO_x values

To obtain a better coverage of NO_x-measurements in AirBase, there are in AirBase version 5 also NO_x-values available which are derived from reported NO- and NO₂-results following the formula :

$$C_{NOx} = C_{NO2} + ((M_{NO2} / M_{NO}) * C_{NO})$$

where

C_{NOx} = NO_x concentration in $\mu\text{g NO}_2/\text{m}^3$

C_{NO2} = NO₂ concentration in $\mu\text{g}/\text{m}^3$

C_{NO} = NO concentration in $\mu\text{g}/\text{m}^3$

M_{NO} = MolecularMass of NO = 30

M_{NO2} = MolecularMass of NO₂ = 46

For defining the measurement configuration of the derived NO_x measurements, the information is used of the measurement configuration of NO.

In case NO, NO₂ and NO_x are all reported, the reported NO_x-values will have priority over the derived NO_x-values.

Annex C. EoI2011 QA/QC timetable

Overview of the QA/QC activities undertaken by the data suppliers and ETC/ACM during the EoI2011 reporting cycle is given in *Table B1*. The QA/QC checks are described in “Quality checks on air quality data in AirBase and the EoI data in 2011” (see Mol 2011).

<i>Table C1. QA/QC actions on EoI2010 data in 2011 and 2012</i>		
Date	Processes by data supplier	Processes by ETC/ACM
12 May 2011		Release of the DEMv14
	Modifying meta data in the DEM Checking meta data in the DEM Import raw data into the DEM Checking raw data in the DEM Submit EoI to Central Data Repository (CDR)	Help desk
1 Oct 2011 to 15 Dec 2011		Upload DEM into AirBase Checks on outliers, missing essential meta data, missing data, resubmission old data, deletion stations/measurement configurations with data. Send feedback reports to the data suppliers
	Replies on the feedback reports, submitting missing data	
		Processing of the replies
15 December 2011 to 22 December 2011		Delivery of interim version of AirBase to EEA Checks by EEA Release of interim version of AirBase on EEA Data Service
15 Dec 2011 to 1 Feb 2011	Replies on the feedback reports, submitting missing data	
		Upload data received in this period (MT, DE, IT)
		Processing of the (non) replies
1 Feb to 8 Febr 2011		Calculation of statistics and exceedances
8 February 2011		Delivery first version AirBase to EEA
8 Febr to 10 Febr 2011		Checks by EEA
21 February 2011		Delivery final AirBase to EEA
23 February 2011		Release of AirBase on EEA Data Service (see airbase history page)

Most feedback is on the outliers. With the outlier checks also errors in units can be detected. There was no feedback on lack of component reporting on NO/NO_x/NO₂ (only one of this three components has been reported), but this will be included in the feedback of EoI2011.

38 countries have delivered EoI2010 data (see status table http://acm.eionet.europa.eu/databases/country_tools/eq/eoi_to_airbase_status/index.html)

All countries have given response on the feedback.

The feedback has been placed on CDR:


http://cdr.eionet.europa.eu/resultsfeedbacks?obligation=http%3A%2F%2Frod.eionet.eu.int%2Fobligations%2F131&startdate%3Adate%3Aignore_empty=&enddate%3Adate%3Aignore_empty=&country=&sort_on=reportingdate&sort_order=reverse Most countries have placed their responses also on CDR. The responses of AT, BA, BG, DE, DK, GR, IT, MK, PT, RO, SK and TR have been placed on Circa: http://eea.eionet.europa.eu/Members/irc/eionet-circle/airclimate/library?l=/qaqc_country_feedback/eoi_2011_2010_data&vm=detailed&sb=Title. One can also use the status table to find very easily all feedback information.

Information on Circa is not public. For access to this information an Eionet user account and password is needed.

Table C2. Status overview of QA/QC feedback actions on the EoI-2011 reporting cycle

Country feedback		EoI2011							
Country		outliers detected	outliers statistics detected	missing data	missing essential data	resubm. data	deleted meta with data stored	deleted meta without data stored	EMEP data reported **
AL	Albania								
AT	Austria								
BA	Bosnia-Herzegovina								
BE	Belgium								
BG	Bulgaria								
CH	Switzerland								
CY	Cyprus								
CZ	Czech Republic								
DE	Germany								
DK	Denmark								
EE	Estonia								
ES	Spain								
FI	Finland								
FR	France								
GB	United Kingdom								
GR	Greece								
HR	Croatia								
HU	Hungary								
IE	Ireland								
IS	Iceland								
IT	Italy								
LI	Liechtenstein								
LT	Lithuania								
LU	Luxembourg								
LV	Latvia								
ME	Montenegro								
MK	FYR of Macedonia								
MT	Malta								
NL	Netherlands								
NO	Norway								
PL	Poland								
PT	Portugal								
RO	Romania								
RS	Serbia								
SE	Sweden								
SI	Slovenia								
SK	Slovak Republic								
TR	Turkey								

Legend:

 detected in country-report not detected in country-report

** : Only BG (only ozone),
CY and GR have asked to
forward the EMEP data to
NILU

Annex D Component groups VOC, Pb_aer, Heavy Metals 4DD (HM4) and PAHs 4DD (PAH4)

Component group Volatile Organic Compounds (VOC) (VOC- = VOC – Benzene)

CompNmbr	CompShortName	CompName	Matrix
20	C6H6	Benzene	air
21	C6H5-CH3	Toluene	air
24	CH2=CH-CH=CH2	1,3 Butadiene	air
25	HCHO	Formaldehyde	air
32	THC (NM)	Total non-methane hydrocarbons	air
316	(CH3)2-CH-CH2-CH2-CH3	i-Hexane (2-methylpentane)	air
394	H3C-CH2-CH2-CH3	n-Butane	air
428	C2H6	Ethane	air
430	H2C=CH2	Ethene (Ethylene)	air
431	C6H5-C2H5	Ethyl benzene	air
432	HC=CH	Ethyne (Acetylene)	air
441	C7H16	n-Heptane	air
443	C6H14	n-Hexane	air
447	H3C-CH(CH3)2	i-Butane (2-methylpropane)	air
449	(CH3)3-C-CH2-CH-(CH3)2	i-Octane (2,2,4-trimethylpentane)	air
450	H3C-CH2-CH(CH3)2	i-Pentane (2-methylbutane)	air
451	CH2=CH-C(CH3)=CH2	Isoprene (2-methyl-1,3-butadiene)	air
464	m,p-C6H4(CH3)2	m,p-Xylene	air
475	C8H18	n-Octane	air
482	o-C6H4-(CH3)2	o-Xylene	air
486	H3C-(CH2)3-CH3	n-Pentane	air
503	H3C-CH2-CH3	Propane	air
505	CH2=CH-CH3	Propene	air
6005	H2C=CH-CH2-CH3	1-Butene	air
6006	trans-H3C-CH=CH-CH3	trans-2-Butene	air
6007	cis-H3C-CH=CH-CH3	cis-2-Butene	air
6008	H2C=CH-CH2-CH2-CH3	1-Pentene	air
6009	H3C-HC=CH-CH2-CH3	2-Pentenenes	air
6011	1,2,4-C6H3(CH3)3	1,2,4-Trimethylbenzene	air
6012	1,2,3-C6H3(CH3)3	1,2,3-Trimethylbenzene	air
6013	1,3,5-C6H3(CH3)3	1,3,5-Trimethylbenzene	air

Component group Lead in aerosol (Pb_aer)

CompNmbr	CompShortName	CompName	Matrix
12	Pb	Lead	aerosol
1012	Pb in PM2.5	Lead in PM2.5	aerosol
3012	Pb in TSP	Lead in TSP	aerosol
5012	Pb in PM10	Lead in PM10	aerosol

Component group BaP in aerosol (BaP_aer)

CompNmbr	CompShortName	CompName	Matrix
6015	BaP	Benzo(a)pyrene	air+aerosol
5029	BaP in PM10	Benzo(a)pyrene in PM10	aerosol
5129	BaP in PM10	Benzo(a)pyrene in PM10	air + aerosol
1029	BaP in PM2.5	Benzo(a)pyrene in PM2.5	aerosol

Component group Heavy Metals in 4DD (HM4)

CompNmbr	CompShortName	CompName	Matrix
13	Hg	Mercury	aerosol
14	Cd	Cadmium	aerosol
15	Ni	Nickel	aerosol
18	As	Arsenic	aerosol
653	Hg-reactive	reactive_mercury	air+aerosol
2013	Hg	Mercury	precip
2014	Cd	Cadmium	precip
2015	Ni	Nickel	precip
2018	As	Arsenic	precip
3013	Hg in TSP	Mercury in TSP	aerosol
3014	Cd in TSP	Cadmium in TSP	aerosol
4013	Hg	Mercury	air+aerosol
4813	Hg0 + Hg-reactive	Total gaseous mercury	air + aerosol
5013	Hg in PM10	Mercury in PM10	aerosol
5014	Cd in PM10	Cadmium in PM10	aerosol
5015	Ni in PM10	Nickel in PM10	aerosol
5018	As in PM10	Arsenic in PM10	aerosol
7013	Hg	Mercury	precip+dry_dep
7014	Cd	Cadmium	precip+dry_dep
7015	Ni	Nickel	precip+dry_dep
7018	As	Arsenic	precip+dry_dep

Component group Polycyclic Aromatic Hydrocarbons in 4DD (PAH4)

29	BaP	Benzo(a)pyrene	precip
6015	BaP	Benzo(a)pyrene	air+aerosol
7029	BaP	Benzo(a)pyrene	precip+dry_dep
5029	BaP in PM10	Benzo(a)pyrene in PM10	aerosol
5129	BaP in PM10	Benzo(a)pyrene in PM10	air + aerosol
1029	BaP in PM2.5	Benzo(a)pyrene in PM2.5	aerosol
609	Benzo(a)anthracene	Benzo(a)anthracene	air+aerosol
610	Benzo(a)anthracene	Benzo(a)anthracene	precip
611	Benzo(a)anthracene	Benzo(a)anthracene	precip+dry_dep
5609	Benzo(a)anthracene in PM10	Benzo(a)anthracene in PM10	air+aerosol
5610	Benzo(a)anthracene in PM10	Benzo(a)anthracene in PM10	aerosol
616	Benzo(b)fluoranthene	Benzo(b)fluoranthene	air+aerosol
617	Benzo(b)fluoranthene	Benzo(b)fluoranthene	precip
618	Benzo(b)fluoranthene	Benzo(b)fluoranthene	precip+dry_dep
5616	Benzo(b)fluoranthene in PM10	Benzo(b)fluoranthene in PM10	air+aerosol
5617	Benzo(b)fluoranthene in PM10	Benzo(b)fluoranthene in PM10	aerosol
759	Benzo(j)fluoranthene	Benzo(j)fluoranthene	precip
760	Benzo(j)fluoranthene	Benzo(j)fluoranthene	precip+dry_dep
762	Benzo(j)fluoranthene	Benzo(j)fluoranthene	air+aerosol
5759	Benzo(j)fluoranthene in PM10	Benzo(j)fluoranthene in PM10	aerosol
5762	Benzo(j)fluoranthene in PM10	Benzo(j)fluoranthene in PM10	air+aerosol
625	Benzo(k)fluoranthene	Benzo(k)fluoranthene	air+aerosol
626	Benzo(k)fluoranthene	Benzo(k)fluoranthene	precip
627	Benzo(k)fluoranthene	Benzo(k)fluoranthene	precip+dry_dep
5625	Benzo(k)fluoranthene in PM10	Benzo(k)fluoranthene in PM10	air+aerosol
5626	Benzo(k)fluoranthene in PM10	Benzo(k)fluoranthene in PM10	aerosol
419	Dibenzo(ah)anthracene	Dibenzo(ah)anthracene	precip
763	Dibenzo(ah)anthracene	Dibenzo(ah)anthracene	air+aerosol
7419	Dibenzo(ah)anthracene	Dibenzo(ah)anthracene	precip+dry_dep
5419	Dibenzo(ah)anthracene in PM10	Dibenzo(ah)anthracene in PM10	aerosol
5763	Dibenzo(ah)anthracene in PM10	Dibenzo(ah)anthracene in PM10	air+aerosol
654	Indeno-(1,2,3-cd)pyrene	indeno_123cd_pyrene	air+aerosol
655	Indeno-(1,2,3-cd)pyrene	indeno_123cd_pyrene	precip
656	Indeno-(1,2,3-cd)pyrene	indeno_123cd_pyrene	precip+dry_dep
5654	Indeno-(1,2,3-cd)pyrene in PM	indeno_123cd_pyrene in PM10	air+aerosol
5655	Indeno-(1,2,3-cd)pyrene in PM	indeno_123cd_pyrene in PM10	aerosol
5655	Indeno-(1,2,3-cd)pyrene in PM	indeno_123cd_pyrene in PM10	aerosol

Component group PM2.5 speciation in AQDD (PM2.5_spec)

CompNmbr	CompShortName	CompName	Matrix
1771	EC in PM _{2.5}	Elemental carbon in PM2.5	aerosol
1772	OC in PM _{2.5}	Organic carbon in PM2.5	aerosol
1045	NH ₄ ⁺ in PM _{2.5}	Ammonium in PM2.5	aerosol
1046	NO ₃ ⁻ in PM _{2.5}	Nitrate in PM2.5	aerosol
1047	SO ₄ ²⁻ in PM _{2.5}	sulphate in PM2.5	aerosol
1629	Ca ²⁺ in PM _{2.5}	calcium in PM2.5	aerosol
1631	Cl ⁻ in PM _{2.5}	chloride in PM2.5	aerosol
1657	K ⁺ in PM _{2.5}	potassium in PM2.5	aerosol
1659	Mg ²⁺ in PM _{2.5}	magnesium in PM2.5	aerosol
1668	Na ⁺ in PM _{2.5}	sodium in PM2.5	aerosol

Annex E Overviews share statistics in AirBase per country and per component

Table E.1. Overview share of statistics and number of components in AirBase v6 per country.

Country	share of statistics in AirBase (0.0 means less than 0.05%)	number of components
EU-27 countries		
AUSTRIA	7.52%	32
BELGIUM	3.80%	67
BULGARIA	0.54%	19
CYPRUS	0.09%	40
CZECH REPUBLIC	3.45%	15
DENMARK	0.76%	42
ESTONIA	0.24%	14
FINLAND	0.85%	48
FRANCE	10.74%	17
GERMANY	23.33%	55
GREECE	0.91%	15
HUNGARY	0.54%	40
IRELAND	0.42%	41
ITALY	11.06%	35
LATVIA	0.22%	42
LITHUANIA	0.40%	57
LUXEMBOURG	0.18%	16
MALTA	0.13%	34
NETHERLANDS	3.09%	85
POLAND	2.93%	60
PORTUGAL	1.87%	21
ROMANIA	1.12%	22
SLOVAKIA	0.76%	15
SLOVENIA	0.36%	31
SPAIN	13.93%	67
SWEDEN	0.56%	24
UNITED KINGDOM	6.59%	105
Non-EU-27 countries		
ALBANIA	0.01%	7
BOSNIA - HERZEGOVINA	0.07%	8
CROATIA	0.08%	9
ICELAND	0.14%	16
LIECHTENSTEIN	0.02%	5
MACEDONIA, FYRO ¹⁾	0.46%	9
MONTENEGRO	0.02%	7
NORWAY	0.50%	19
SERBIA	0.14%	9
SWITZERLAND	1.89%	19
TURKEY	0.28%	2

1) FYRO= Former Yugoslavian Republic Of

Table E.2. Overview share of statistics and number of countries in AirBase per component; AQD/4DD: component specified in the AQD 2008/50/EC or in 4DD; LV/TV: component with limit value or target value set in AQD 2008/50/EC and the 4DD

AirBase component code	Short name component	Component name	Matrix	Measurement unit	AQD/4 DD	LV/TV	share of statistics in AirBase (0.0 means less than 0.05%)	nr. of countries reporting this component
1	SO ₂	Sulphur dioxide	air	µg/m ³	yes	yes	16.99%	37
3	SA	Strong acidity	air	µg SO ₂ /m ³	no	no	0.46%	7
4	SPM	Total suspended particulates	aerosol	µg/m ³	no	no	1.80%	20
5	PM ₁₀	Particulate matter < 10 µm	aerosol	µg/m ³	yes	yes	9.33%	38
6	BS	Black smoke	air	µg/m ³	no	no	0.78%	16
7	O ₃	Ozone	air	µg/m ³	yes	yes	19.88%	37
8	NO ₂	Nitrogen dioxide	air	µg/m ³	yes	yes	16.45%	37
9	NO _x	Nitrogen oxides	air	µg NO ₂ /m ³	yes	no	8.36%	36
10	CO	Carbon monoxide	air	mg/m ³	yes	yes	8.23%	36
11	H ₂ S	Hydrogen sulphide	air	µg/m ³	no	no	0.05%	7
12	Pb	Lead	aerosol	µg/m ³	no	no	0.60%	23
13	Hg	Mercury	aerosol	ng/m ³	no	no	0.05%	5
14	Cd	Cadmium	aerosol	ng/m ³	no	no	0.43%	23
15	Ni	Nickel	aerosol	ng/m ³	no	no	0.35%	22
16	Cr	Chromium	aerosol	ng/m ³	no	no	0.02%	3
17	Mn	Manganese	aerosol	ng/m ³	no	no	0.02%	3
18	As	Arsenic	aerosol	ng/m ³	no	no	0.32%	21
19	CS ₂	Carbon disulphide	air	µg/m ³	no	no	0.00%	1
20	C ₆ H ₆	Benzene	air	µg/m ³	yes	yes	1.44%	34
21	C ₆ H ₅ -CH ₃	Toluene	air	µg/m ³	yes	no	0.55%	21
22	C ₆ H ₅ -CH=CH ₂	Styrene	air	µg/m ³	no	no	0.01%	2
24	CH ₂ =CH-CH=CH ₂	1.3 Butadiene	air	µg/m ³	yes	no	0.06%	6
25	HCHO	Formaldehyde	air	µg/m ³	yes	no	0.00%	2
26	CHCl=CCl ₂	Trichloroethylene	air	µg/m ³	no	no	0.01%	1
27	C ₂ Cl ₄	Tetrachloroethylene	air	µg/m ³	no	no	0.01%	1
30	PAH	Polyaromatic hydrocarbons	air+aerosol	ng/m ³	no	no	0.00%	1
32	THC (NM)	Total non-methane hydrocarbons	air	µg C/m ³	no	no	0.13%	6
33	T-VOC	Total volatile organic compounds	air	µg/m ³	no	no	0.07%	4
34	PAN	Peroxyacetyl nitrate	air	µg/m ³	no	no	0.00%	1
35	NH ₃	Ammonia	air	µg/m ³	no	no	0.08%	6
36	N-DEP	Wet nitrogen deposition	flux	mg N/m ² .m	no	no	0.03%	1
37	S-DEP	Wet sulphur deposition	flux	mg S/m ² .m	no	no	0.03%	2
38	NO	Nitrogen monoxide	air	µg/m ³	yes	no	7.67%	28
39	HCl	Hydrogen chloride	air	µg/m ³	no	no	0.00%	1
40	HF	Hydrogen fluoride	air	µg/m ³	no	no	0.00%	1
41	CH ₄	Methane	air	µg/m ³	no	no	0.12%	4
45	NH ₄	Particulate ammonium	aerosol	µg/m ³	no	no	0.01%	2
46	NO ₃	Particulate nitrate	aerosol	µg/m ³	no	no	0.01%	2
47	SO ₄ (H ₂ SO ₄ aerosols) (SO ₄ ²⁻)	Particulate sulphate	aerosol	µg/m ³	no	no	0.06%	8
48	Se	Selenium	aerosol	ng/m ³	no	no	0.02%	1
49	Vanadium	Vanadium	aerosol	ng/m ³	no	no	0.02%	2
51	HC C2-C6(excl. AROM. & CHLH)	HC C2-C6(excl. AROM. & CHLH)	air+aerosol	µg/m ³	no	no	0.00%	1
63	Zn	Zinc	aerosol	ng/m ³	no	no	0.01%	3
65	Fe	Iron	aerosol	ng/m ³	no	no	0.00%	2
67	HNO ₃ +NO ₃	Total nitrate	air+aerosol	µg N/m ³	no	no	0.02%	2
68	NH ₃ +NH ₄	Total ammonium	air+aerosol	µg N/m ³	no	no	0.01%	2
69	Radioactivity	Radioactivity			no	no	0.00%	1
73	Cu	Copper	aerosol	ng/m ³	no	no	0.00%	2

AirBase component code	Short name component	Component name	Matrix	Measurement unit	AQD/4 DD	LV/TV	share of statistics in AirBase (0.0 means less than 0.05%)	nr. of countries reporting this component
316	(CH ₃) ₂ -CH-CH ₂ -CH ₂ -CH ₃	i-Hexane (2-methylpentane)	air	µg/m3	yes	no	0.03%	8
323	3-methylpentane	N3methylpentane	air	pptv	no	no	0.00%	1
351	Acenaphthene	acenaphthene	air+aerosol	ng/m3	no	no	0.04%	4
352	Acenaphthylene	acenaphthylene	air+aerosol	ng/m3	no	no	0.01%	3
380	Benzo(b+j+k)fluoranthenes	Benzo(b+j+k)fluoranthenes	air+aerosol	ng/m3	no	no	0.02%	1
381	Benzo(e)pyrene	Benzo(e)pyrene	air+aerosol	ng/m3	no	no	0.00%	1
394	H ₃ C-CH ₂ -CH ₂ -CH ₃	n-Butane	air	µg/m3	yes	no	0.06%	8
412	k	conductivity	precip	uS/cm	no	no	0.00%	1
416	Cyclo-hexane	cyclohexane	air	pptv	no	no	0.00%	1
428	C ₂ H ₆	Ethane	air	µg/m3	yes	no	0.05%	7
430	C ₂ H ₄	Ethene (Ethylene)	air	µg/m3	yes	no	0.05%	6
431	C ₆ H ₅ -C ₂ H ₅	Ethyl benzene	air	µg/m3	yes	no	0.17%	15
432	HC=CH	Ethyne (Acetylene)	air	µg/m3	yes	no	0.04%	5
435	Fluorene	fluorene	air+aerosol	ng/m3	no	no	0.04%	4
441	C ₇ H ₁₆	n-Heptane	air	µg/m3	yes	no	0.08%	9
443	C ₆ H ₁₄	n-Hexane	air	µg/m3	yes	no	0.08%	9
447	H ₃ C-CH(CH ₃) ₂	i-Butane (2-methylpropane)	air	µg/m3	yes	no	0.05%	7
449	(CH ₃) ₃ -C-CH ₂ -CH-(CH ₃) ₂	i-Octane (2,2,4-trimethylpentane)	air	µg/m3	yes	no	0.03%	7
450	H ₃ C-CH ₂ -CH(CH ₃) ₂	i-Pentane (2-methylbutane)	air	µg/m3	yes	no	0.06%	9
451	CH ₂ =CH-C(CH ₃)=CH ₂	Isoprene (2-methyl-1,3-butadiene)	air	µg/m3	yes	no	0.06%	7
464	m,p-C ₆ H ₄ (CH ₃) ₂	m,p-Xylene	air	µg/m3	yes	no	0.18%	16
465	Naphtalene	naphtalene	air+aerosol	ng/m3	no	no	0.01%	3
475	C ₈ H ₁₈	n-Octane	air	µg/m3	yes	no	0.04%	8
482	o-C ₆ H ₄ -(CH ₃) ₂	o-Xylene	air	µg/m3	yes	no	0.20%	16
486	H ₃ C-(CH ₂) ₃ -CH ₃	n-Pentane	air	µg/m3	yes	no	0.07%	10
503	H ₃ C-CH ₂ -CH ₃	Propane	air	µg/m3	yes	no	0.05%	7
505	CH ₂ =CH-CH ₃	Propene	air	µg/m3	yes	no	0.05%	6
520	SO ₂ + SO ₄ --	sum_sulph_diox_sulphate	air+aerosol	µg S/m3	no	no	0.00%	1
604	Al	aluminium	aerosol	ng/m3	no	no	0.00%	1
606	Anthracene	anthracene	air+aerosol	ng/m3	no	no	0.04%	4
608	Anthracene	anthracene	precip+dry_dep	µg/m2/day	no	no	0.00%	1
609	Benz(a)anthracene	Benzo(a)anthracene	air+aerosol	ng/m3	no	no	0.03%	2
611	Benz(a)anthracene	Benzo(a)anthracene	precip+dry_dep	µg/m2/day	yes	no	0.01%	6
616	Benzo(b)fluoranthene	Benzo(b)fluoranthene	air+aerosol	ng/m3	no	no	0.03%	1
618	Benzo(b)fluoranthene	Benzo(b)fluoranthene	precip+dry_dep	µg/m2/day	yes	no	0.00%	2
622	Benzo(ghi)perylene	Benzo(ghi)perylene	air+aerosol	ng/m3	no	no	0.04%	5
624	Benzo(ghi)perylene	Benzo(ghi)perylene	precip+dry_dep	µg/m2/day	no	no	0.00%	1
625	Benzo(k)fluoranthene	Benzo(k)fluoranthene	air+aerosol	ng/m3	no	no	0.02%	1
627	Benzo(k)fluoranthene	Benzo(k)fluoranthene	precip+dry_dep	µg/m2/day	yes	no	0.00%	3
629	Ca++	calcium	aerosol	µg/m3	no	no	0.01%	1
630	Ca++	calcium	precip	mg/l	no	no	0.00%	1
631	Cl-	chloride	aerosol	µg/m3	no	no	0.01%	1
632	Cl-	chloride	precip	mg/l	no	no	0.00%	1
643	Fluoranthene	fluoranthene	air+aerosol	ng/m3	no	no	0.06%	5
645	Fluoranthene	fluoranthene	precip+dry_dep	µg/m2/day	no	no	0.00%	1
648	H+	acidity(H+)	precip	ue H/l	no	no	0.00%	1
653	Hg-reactive	reactive_mercury	air+aerosol	pg/m3	yes	no	0.00%	1
654	Indeno-(1,2,3-cd)pyrene	indeno_123cd_pyrene	air+aerosol	ng/m3	no	no	0.02%	1
656	Indeno-(1,2,3-cd)pyrene	indeno_123cd_pyrene	precip+dry_dep	µg/m2/day	yes	no	0.01%	6

AirBase component code	Short name component	Component name	Matrix	Measurement unit	AQD/4 DD	LV/TV	share of statistics in AirBase (0.0 means less than 0.05%)	nr. of countries reporting this component
658	K+	potassium	precip	mg/l	no	no	0.00%	1
660	Mg++	magnesium	precip	mg/l	no	no	0.00%	1
664	NH ₄ ⁺	ammonium	precip	mg N/l	no	no	0.00%	1
666	NO ₃ ⁻	nitrate	precip	mg N/l	no	no	0.00%	1
669	Na+	sodium	precip	mg/l	no	no	0.00%	1
673	PCB-114	PCB_114	air+aerosol	pg/m3	no	no	0.01%	1
674	PCB-118	PCB_118	air+aerosol	pg/m3	no	no	0.01%	1
677	PCB-138	PCB_138	air+aerosol	pg/m3	no	no	0.01%	1
679	PCB-141	PCB_141	air+aerosol	pg/m3	no	no	0.01%	1
680	PCB-153	PCB_153	air+aerosol	pg/m3	no	no	0.00%	1
683	PCB-157	PCB_157	air+aerosol	pg/m3	no	no	0.01%	1
684	PCB-167	PCB_167	air+aerosol	pg/m3	no	no	0.01%	1
685	PCB-170	PCB_170	air+aerosol	pg/m3	no	no	0.01%	1
686	PCB-180	PCB_180	air+aerosol	pg/m3	no	no	0.01%	1
689	PCB-183	PCB_183	air+aerosol	pg/m3	no	no	0.01%	1
690	PCB-187	PCB_187	air+aerosol	pg/m3	no	no	0.01%	1
691	PCB-189	PCB_189	air+aerosol	pg/m3	no	no	0.01%	1
692	PCB-194	PCB_194	air+aerosol	pg/m3	no	no	0.01%	1
695	PCB-28	PCB_28	air+aerosol	pg/m3	no	no	0.00%	1
701	PCB-52	PCB_52	air+aerosol	pg/m3	no	no	0.01%	1
706	PCB-74	PCB_74	air+aerosol	pg/m3	no	no	0.01%	1
707	PCB-99	PCB_99	air+aerosol	pg/m3	no	no	0.01%	1
709	PCB_123	PCB_123	air+aerosol	pg/m3	no	no	0.01%	1
712	Phenanthrene	phenanthrene	air+aerosol	ng/m3	no	no	0.04%	4
714	Phenanthrene	phenanthrene	precip+dry_dep	ug/m2/day	no	no	0.00%	1
715	Pyrene	pyrene	air+aerosol	ng/m3	no	no	0.05%	4
717	Pyrene	pyrene	precip+dry_dep	ug/m2/day	no	no	0.00%	1
719	SO ₄ --	sulphate	precip	mg S/l	no	no	0.00%	1
753	precip_amount	precipitation_amount	precip	mm	no	no	0.01%	1
754	precip_amount_off	precipitation_amount_off	precip	mm	no	no	0.00%	1
760	Benzo(j)fluoranthene	Benzo(j)fluoranthene	precip+dry_dep	ug/m2/day	yes	no	0.00%	2
762	Benzo(j)fluoranthene	Benzo(j)fluoranthene	air+aerosol	ng/m3	no	no	0.00%	1
1029	BaP in PM _{2.5}	Benzo(a)pyrene in PM2.5	aerosol	ng/m3	no	no	0.00%	1
1045	NH ₄ ⁺ in PM _{2.5}	Ammonium in PM2.5	aerosol	ug/m3	yes	no	0.00%	5
1046	NO ₃ ⁻ in PM _{2.5}	Nitrate in PM2.5	aerosol	ug/m3	yes	no	0.00%	4
1047	SO ₄ ²⁻ in PM _{2.5}	sulphate in PM2.5	aerosol	ug/m3	yes	no	0.00%	5
1629	Ca ²⁺ in PM _{2.5}	calcium in PM2.5	aerosol	ug/m3	yes	no	0.00%	5
1631	Cl ⁻ in PM _{2.5}	chloride in PM2.5	aerosol	ug/m3	yes	no	0.00%	5
1657	K ⁺ in PM _{2.5}	potassium in PM2.5	aerosol	ug/m3	yes	no	0.00%	5
1659	Mg ²⁺ in PM _{2.5}	magnesium in PM2.5	aerosol	ug/m3	yes	no	0.00%	5
1668	Na ⁺ in PM _{2.5}	sodium in PM2.5	aerosol	ug/m3	yes	no	0.00%	4
1771	EC in PM _{2.5}	Elemental carbon in PM2.5	aerosol	ug/m3	yes	no	0.00%	2
1772	OC in PM _{2.5}	Organic carbon in PM2.5	aerosol	ug/m3	yes	no	0.00%	2
2012	Pb	Lead	precip	ug/l	no	no	0.00%	1
2013	Hg	Mercury	precip	ng/l	no	no	0.00%	3
2014	Cd	Cadmium	precip	ug/l	no	no	0.00%	3
2015	Ni	Nickel	precip	ug/l	no	no	0.00%	3
2018	As	Arsenic	precip	ug/l	no	no	0.00%	2
2063	Zn	Zinc	precip	ug/l	no	no	0.00%	1
2065	Fe	Iron	precip	ug/l	no	no	0.00%	1
2073	Cu	Copper	precip	ug/l	no	no	0.00%	1

AirBase component code	Short name component	Component name	Matrix	Measurement unit	AQD/4 DD	LV/TV	share of statistics in AirBase (0.0 means less than 0.05%)	nr. of countries reporting this component
2076	pH	acidity(pH)		pH units	no	no	0.00%	3
4013	Hg ⁰	Mercury	air+aerosol	ng/m3	yes	no	0.00%	4
4330	PCB-105	PCB_105	air+aerosol	pg/m3	no	no	0.01%	1
4336	PCB-149	PCB_149	air+aerosol	pg/m3	no	no	0.01%	1
4339	PCB-156	PCB_156	air+aerosol	pg/m3	no	no	0.01%	1
4341	PCB-18	PCB_18	air+aerosol	pg/m3	no	no	0.01%	1
4347	PCB-31	PCB_31	air+aerosol	pg/m3	no	no	0.00%	1
4406	Chrysene	chrysene	air+aerosol	ng/m3	no	no	0.05%	5
4813	Hg ⁰ + Hg-reactive	Total gaseous mercury	air + aerosol	ng/m3	yes	no	0.01%	6
5012	Pb in PM ₁₀	Lead in PM10	aerosol	µg/m3	yes	no	0.25%	9
5013	Hg in PM ₁₀	Mercury in PM10	aerosol	ng/m3	yes	yes	0.00%	1
5014	Cd in PM ₁₀	Cadmium in PM10	aerosol	ng/m3	yes	yes	0.27%	11
5015	Ni in PM ₁₀	Nickel in PM10	aerosol	ng/m3	yes	yes	0.22%	11
5018	As in PM ₁₀	Arsenic in PM10	aerosol	ng/m3	yes	yes	0.22%	11
5029	BaP in PM ₁₀	Benzo(a)pyrene in PM10	aerosol	ng/m3	yes	yes	0.28%	21
5129	BaP in PM ₁₀	Benzo(a)pyrene in PM10	air + aerosol	ng/m3	no	no	0.01%	2
5380	Benzo(b,j,k)fluoranthene in PM ₁₀	Benzo(b,j,k)fluoranthene in PM10	aerosol	ng/m3	no	no	0.01%	5
5419	Dibenzo(ah)anthracene in PM ₁₀	Dibenzo(ah)anthracene in PM10	aerosol	ng/m3	yes	no	0.08%	14
5609	Benzo(a)anthracene in PM ₁₀	Benzo(a)anthracene in PM10	air+aerosol	ng/m3	no	no	0.01%	2
5610	Benzo(a)anthracene in PM ₁₀	Benzo(a)anthracene in PM10	aerosol	ng/m3	yes	no	0.09%	16
5616	Benzo(b)fluoranthene in PM ₁₀	Benzo(b)fluoranthene in PM10	air+aerosol	ng/m3	no	no	0.01%	1
5617	Benzo(b)fluoranthene in PM ₁₀	Benzo(b)fluoranthene in PM10	aerosol	ng/m3	yes	no	0.06%	9
5625	Benzo(k)fluoranthene in PM ₁₀	Benzo(k)fluoranthene in PM10	air+aerosol	ng/m3	no	no	0.01%	2
5626	Benzo(k)fluoranthene in PM ₁₀	Benzo(k)fluoranthene in PM10	aerosol	ng/m3	yes	no	0.08%	12
5654	Indeno-(1,2,3-cd)pyrene in PM ₁₀	indeno_123cd_pyrene in PM10	air+aerosol	ng/m3	no	no	0.01%	3
5655	Indeno-(1,2,3-cd)pyrene in PM ₁₀	indeno_123cd_pyrene in PM10	aerosol	ng/m3	yes	no	0.09%	15
5759	Mg ²⁺ in PM ₁₀	Benzo(j)fluoranthene in PM10	aerosol	ng/m3	yes	no	0.03%	4
5762	Benzo(j)fluoranthene in PM ₁₀	Benzo(j)fluoranthene in PM10	air+aerosol	ng/m3	no	no	0.00%	2
5763	Dibenzo(ah)anthracene in PM10	Dibenzo(ah)anthracene in PM10	air+aerosol	ng/m3	no	no	0.01%	2
6001	PM _{2.5}	Particulate matter < 2.5 µm	aerosol	µg/m3	yes	yes	1.00%	31
6002	PM ₁	Particulate matter < 1 µm	aerosol	µg/m3	no	no	0.02%	3
6005	H ₂ C=CH-CH ₂ -CH ₃	1-Butene	air	µg/m3	yes	no	0.06%	8
6006	H ₃ C-CH=CH-CH ₃	trans-2-Butene	air	µg/m3	yes	no	0.06%	6
6007	H ₃ C-CH=CH-CH ₃	cis-2-Butene	air	µg/m3	yes	no	0.06%	6
6008	H ₂ C=CH-CH ₂ -CH ₂ -CH ₃	1-Pentene	air	µg/m3	yes	no	0.02%	8
6009	H ₃ C-HC=CH-CH ₂ -CH ₃	2-Pentenenes	air	µg/m3	yes	no	0.06%	7
6011	C ₆ H ₃ -(CH ₃) ₃	1,2,4-Trimethylbenzene	air	µg/m3	yes	no	0.04%	9
6012	C ₆ H ₃ (CH ₃) ₃	1,2,3-Trimethylbenzene	air	µg/m3	yes	no	0.03%	8
6013	C ₆ H ₃ (CH ₃) ₃	1,3,5-Trimethylbenzene	air	µg/m3	yes	no	0.04%	9
6015	BaP	Benzo(a)pyrene	air+aerosol	ng/m3	no	no	0.11%	10

AirBase component code	Short name component	Component name	Matrix	Measurement unit	AQD/4 DD	LV/TV	share of statistics in AirBase (0.0 means less than 0.05%)	nr. of countries reporting this component
6380	Benzo(b,j,k)fluoranthene in PM ₁₀	Benzo(b,j,k)fluoranthene in PM ₁₀	air+aerosol	ng/m ³	no	no	0.01%	1
7012	Pb	Lead	precip+dry_dep	µg/m ² /day	yes	no	0.00%	1
7013	Hg	Mercury	precip+dry_dep	µg/m ² /day	yes	no	0.01%	4
7014	Cd	Cadmium	precip+dry_dep	µg/m ² /day	yes	no	0.05%	9
7015	Ni	Nickel	precip+dry_dep	µg/m ² /day	yes	no	0.04%	9
7018	As	Arsenic	precip+dry_dep	µg/m ² /day	yes	no	0.04%	9
7029	BaP	Benzo(a)pyrene	precip+dry_dep	ng/m ² /day	yes	no	0.01%	7
7380	Benzo(b,j,k)fluoranthene	Benzo(b,j,k)fluoranthene	precip+dry_dep	µg/m ² /day	no	no	0.00%	3
7419	Dibenzo(ah)anthracene	Dibenzo(ah)anthracene	precip+dry_dep	ng/m ² /day	yes	no	0.01%	4