

EUROPEAN EXCHANGE OF AIR QUALITY MONITORING META INFORMATION IN 2002



**ETC/ACC Technical paper 2004/1
June 2004**

E Buijsman, PR van Hooydonk, WJA Mol, L Cernikovsky

The European Topic Centre on Air and Climate Change (ETC/ACC) is a consortium
of European institutes under contract of the European Environmental Agency
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See also: <http://www.airparif.asso.fr/english/reseau/default.htm>.

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See <http://www.provincia.cagliari.it/ambiente/qa/fotolocalizza/34-35.html>

Pictures in figure 3 have been taken from the website of Land Oberösterreich, Austria.

See http://www.ooe.gv.at/umwelt/luft/MN_Stationen/

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ETC/ACC Technical paper 2004/1

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SUMMARY

Current air quality legislation of the European Union, Council Decision (97/101/EC), requires the Commission to prepare a technical report on a yearly basis, combining the meta information and air quality data flows that have been exchanged among the European Union Member States) and shared with the Commission. Member States of the European Environment Agency, which includes EU Accession Candidate Countries, EU Acceding Countries, EFTA states, and Albania, Bosnia and Herzegovina, and FYROM (Former Yugoslavian Republic of Macedonia), have agreed to follow this reporting procedure as well. All this information is to be made available in a database. The results of the reporting cycle presented in this particular technical report cover data for 2002.

Nearly all the countries that have updated their meta information used the Air Quality Data Exchange Module (DEM), made available for this purpose by the European Topic Centre on Air and Climate Change (ETC/ACC). A total of 30 countries, including 14 EU Member States, provided air quality data for 2002. As in preceding years, a large number of time series were transmitted, covering, for example, sulphur dioxide (SO₂), nitrogen dioxide (NO₂), particulate matter (PM₁₀), ozone (O₃), carbon monoxide (CO) and benzene (C₆H₆).

Although most countries provided 2002 data only, several did provide data from previous years. These were loaded into AIRBASE as well. AIRBASE contents are overviewed elsewhere in this report to help other Member States to identify and fill historical data gaps, as requested in Article 5(4) of the European Council Decision on Exchange of Information.

A number of points for necessary improvements in AIRBASE have been identified. In improving the substantive quality of AIRBASE, we should focus on elements which, from a user's perspective, are most beneficial. The most important actions are:

- Continuing the ongoing dialogue between the national data suppliers and the ETC/ACC as the most important tool for improving the quality of AIRBASE, communicating on (apparent) faults, possible outliers, incomplete measurement data and the like.
- Completing meta information, which is essential from the user's perspective. Meta information concerned are the station name, the station characteristics in terms of type of station and area, the geographical co-ordinates and the altitude. Improvements in this respect could be achieved by several countries.
- Establishing an ongoing critical review of information in AIRBASE as a necessary item. The priority here is given to the information originating from APIS and GIRAFE. In general, one should be firm in getting the information in AIRBASE thoroughly examined and, if necessary, removed or supplemented.
- Further extending past measurement series.
- Incorporating information on potential correction factors applied for particulate matter measurements as being of the utmost importance.

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1. INTRODUCTION

Countries of the European Union have a long tradition of exchanging data on air quality data. The reciprocal exchange among countries and the Commission is based on a series of Council Decisions. The latest Decision (97/101/EC) 'establishing a reciprocal exchange of information and data from networks and individual stations measuring ambient air pollution within the Member States', the so-called Exchange of Information (EoI), was adopted by the European Council in 1997 (EU, 1997). The annexes to the Decision have been amended to adapt the list of pollutants covered to changes and requirements on additional information, validation and aggregation (EU 2001a). Data submission followed the revised Annex II of the Decision (EU, 2001) for 2002.

According to the EoI Decision, the Commission will, each year, prepare a technical report on meta information and air quality data exchanged, and make the information available to EU Member States in a database. The decision also 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 and Climate Change (ETC/ACC), under contract to EEA, manages the database system, AIRBASE. The information submitted under the EoI is stored in AIRBASE and made available to the public on Internet via the ETC/ACC website¹. Data delivered under the EoI include information on measurement networks, measurement stations, measurement techniques and data quality (Table 1).

The technical reports, both on transmitted meta information and transmitted air quality data flows, have been combined into this one report, European Exchange of Air Quality Monitoring Meta Information in 2002. As agreed with the Commission and the EEA, the ETC/ACC has prepared the report and loaded the information into the AIRBASE database. This report contains information from the EEA Member States (EU Member States, EU Accession Candidate Countries, EU Acceding Countries, EFTA states, and several other countries²), who have agreed to follow the data exchange procedures.

Table 1 A summary of meta information to be delivered under the Exchange of Information (EoI) (EU, 1997)

Type of information	Examples
Networks	
Organisation	Name of the network, geographical coverage, responsible authorities, organisational information, quality class
Stations	
General	Name and location of measurement site, type of station
Local surroundings	Type of surroundings
Emission sources	Sources which might influence local air quality
Traffic characterisation	For traffic stations only: traffic density
Measurement configurations	
Measurement technique	Analytical method, sampling characteristics, time resolution, calibration
Validation procedure	Procedures, criteria, data quality, data coverage

¹ <http://etc-acc.eionet.eu.int/databases/airbase.html>

² **Situation in 2002.** EU Member States: Austria, Belgium, Denmark, Finland, Germany, Greece, Spain, France, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Sweden, United Kingdom. EU Accession Countries: Bulgaria, Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia, Slovak Republic, Turkey. EFTA Countries: Iceland, Liechtenstein, Norway, Switzerland. Some other countries are Albania, Bosnia and Herzegovina, and FYROM (Former Yugoslavian Republic of Macedonia).

2. META INFORMATION FOR 2002

2.1. Exchange of Information

The Exchange of Information (EoI) of the European Union requires a large set of meta information to be delivered to the Commission (EU, 1997; 2002). The non-EU Member States, who are members of the European Environment Agency (EEA), have also been asked to deliver data in the framework of the EUROAIRNET programme. Part of this information is mandatory (*Table 2*) and the other items are to be delivered to the Commission 'to the extent possible' and 'as much information as feasible should be supplied' ¹.

Table 2 Mandatory meta information to be delivered under the Exchange of Information (EoI)

Item ¹⁾	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 of the body responsible
I.4.4.	Telephone and fax numbers of the body responsible
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

1) Item numbers according to Annex II of the EoI (EU, 2002).

The EoI Decision defines a system aimed at classifying measurement stations in general terms. The classification is based on the type of area in which the station is located and on the type of sources that dominate the air quality at the station. The EoI classifies area types into (Garber *et al.*, 2002):

- *Urban*: station located in a city.
- *Suburban*: station located on the outskirts (fringe) of a city, or in small residential areas outside a main city.
- *Rural*: station located outside a city.

The type of station - which is non-mandatory meta information - is classified as:

- *Traffic station* –located such that its pollution level can be determined predominantly by the emissions from nearby traffic (roads, motorways)[see *Figure 1*].
- *Industrial* - located such that its pollution level is influenced predominantly by emissions from nearby single industrial sources or industrial areas with many sources (see *Figure 2*).
- *Background* - located such that its pollution level is not influenced significantly by any single source or street, but by the integrated contribution from all sources upwind of the station. These stations can be located both inside (*urban background*) and outside (*regional background*, see *Figure 3*) cities.

¹ See Annex A for overview.

These schemes are qualitative. Nevertheless, they are very helpful in classifying stations on a general level. In this way they serve as an aid in further improving air quality information systems on the pan-European level.



Figure 1 Example of a traffic station. The measurement station Boulevard Périphérique Auteuil of the Airparif monitoring network in Paris, France. Photo and map © Airparif, Paris, France.



Figure 2 Example of an industrial station. The measurement station Portoscuso – Rio su Cannoni (35) of the monitoring network of the Province of Cagliari, Italy. Photo © Provincia di Cagliari, Italy.



Figure 3 Example of a regional background station. The measurement station Schöneben of the monitoring network of the province of Oberösterreich, Österreich. Photo and map © Land Oberösterreich, Austria.

2.2. Results

Thirty countries, including all EU Member States except Luxembourg, provided air quality data for the reporting year, 2002. The delivery of data was facilitated by a tool called the Data Exchange Module (DEM), developed by the ETC/ACC. This tool was used by most of the countries. Some countries provided (part of) their data in separate files. All data delivered for the reporting year 2002 was loaded into AIRBASE.

Transmitted data cover substances including mainly 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). Fewer time series were submitted for less commonly monitored components. Although this report includes the available information up to April 2004, data processing is an ongoing process, so please refer to the AIRBASE website ¹ for the most recent overview of the progress in processing the data.

ETC/ACC has introduced quality control procedures for incoming meta data (De Leeuw *et al.*, 2003). In this way, stations have been detected for which one or more essential piece of data was missing. Some countries have indicated deletion of stations and/or measurement configurations for which no measurement data are stored in AIRBASE. Furthermore, a new module in the DEM has been introduced which enables the check on outliers in the imported measurement data. The results of these checks were reported to the countries, which, for the most part, responded in return.

Upon request of the ETC/ACC, several countries provided 2002 data, as well as data from previous years. A limited number of countries provided corrections on data submitted in previous years. As standard procedure, every replacement has to be confirmed by the data supplier before implementation in AIRBASE.

The number of reporting countries varied per component (*Table 3*). This ranged from 6 for lead to 29 for sulphur dioxide. The number of stations varied accordingly, being 42 for PM_{2.5} and 2046 for nitrogen dioxide ². Consequently, the distribution and density of stations throughout Europe shows differences (*Figures 4 through 9*). This holds as well for the number of stations for which hourly and/or daily concentration data are available (*Tables 4 and 5*). All stations with data are taken into account, regardless of the data coverage. This evaluation focus on components defined under the Framework Directive (and the three Daughter Directives). Most countries delivered more data than defined under the EoI. See Annex D for a summary of these supplementary components.

In comparison with 2001, the number of countries delivering data and the number of stations for which data are reported has again increased. With Malta delivering data, the total number of reporting countries is now 30.

¹ <http://etc-acc.eionet.eu.int/databases/airview.html>.

² Information on the type of stations per country is given in Annex B.

Table 3 Number of stations per pollutant and station type, 2002

	Daughter directive							
	1	.	.	.	.	2	.	3
	Sulphur dioxide	Nitrogen dioxide	Particulate matter (<10 µm)	Particulate matter (< 2.5 µm)	Lead	Carbon monoxide	Benzene	Ozone
Reporting EU countries	14	14	14	5	4	13	8	14
Total number of stations	1678	1815	1164	37	85	834	179	1524
<i>Of which</i>								
Traffic	394	527	363	8	49	419	97	312
Urban background	598	679	457	20	16	303	58	610
Industrial	333	233	140	0	11	48	7	129
Regional background	256	263	127	1	6	35	7	342
Other ¹⁾	98	113	77	8	3	29	10	131
Reporting non-EU countries	15	14	11	2	2	9	2	13
Total number of stations	249	231	142	5	27	80	5	147
<i>Of which</i>								
Traffic	35	35	26	2		20	2	20
Urban background	151	136	82	2	23	44	2	60
Industrial	15	12	7	1	3	6	0	9
Regional background	48	48	27	0	1	10	1	58
Other ¹⁾	0	0	0	0	0	0	0	0
All countries	29	28	25	7	6	22	10	27
Total number of stations	1927	2046	1306	42	112	914	184	1671

1) Primarily unknown.

Sulphur Dioxide

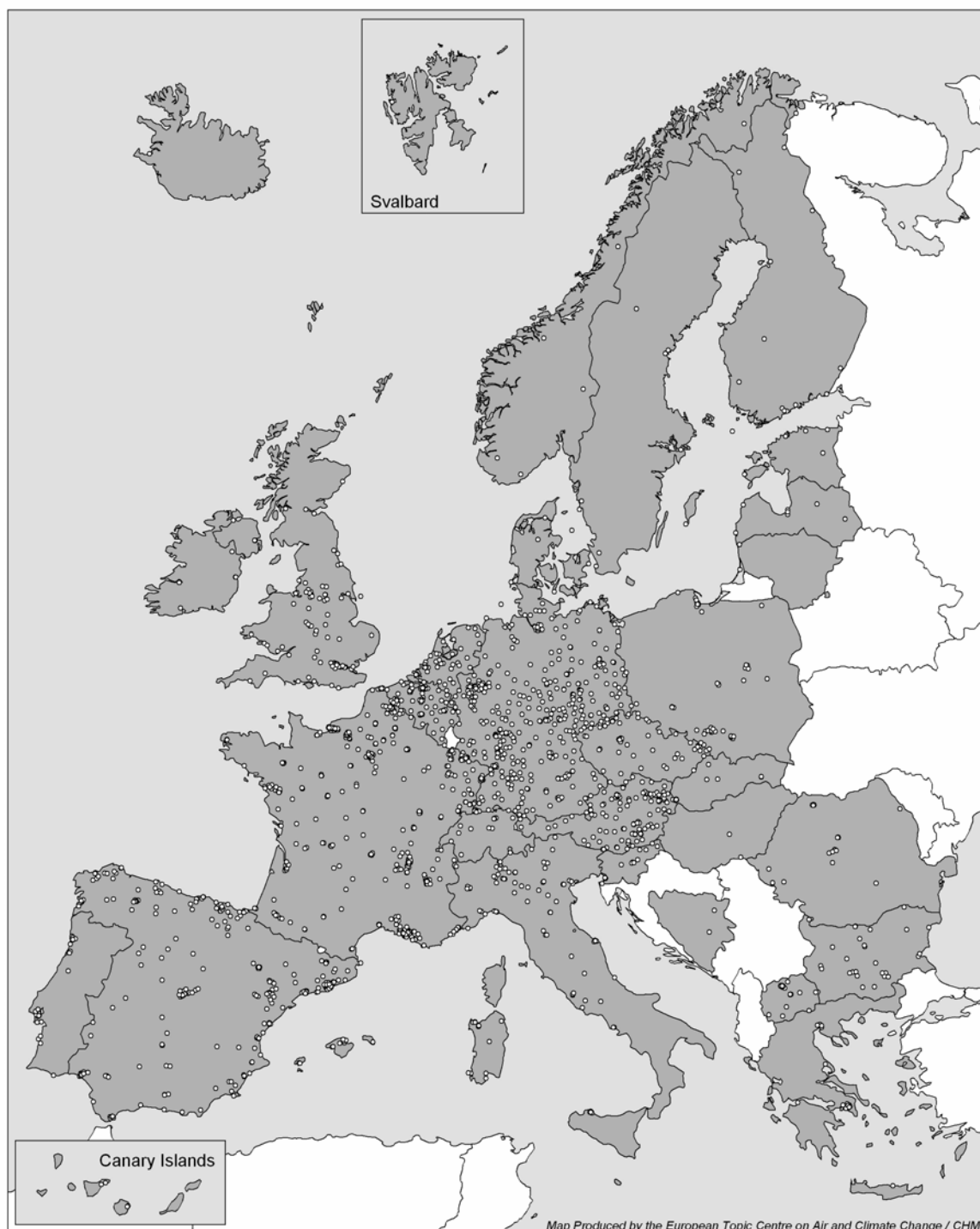


Figure 4 Location of stations for which 2002 air quality data for sulphur dioxide (SO₂) have been reported.

Nitrogen Dioxide

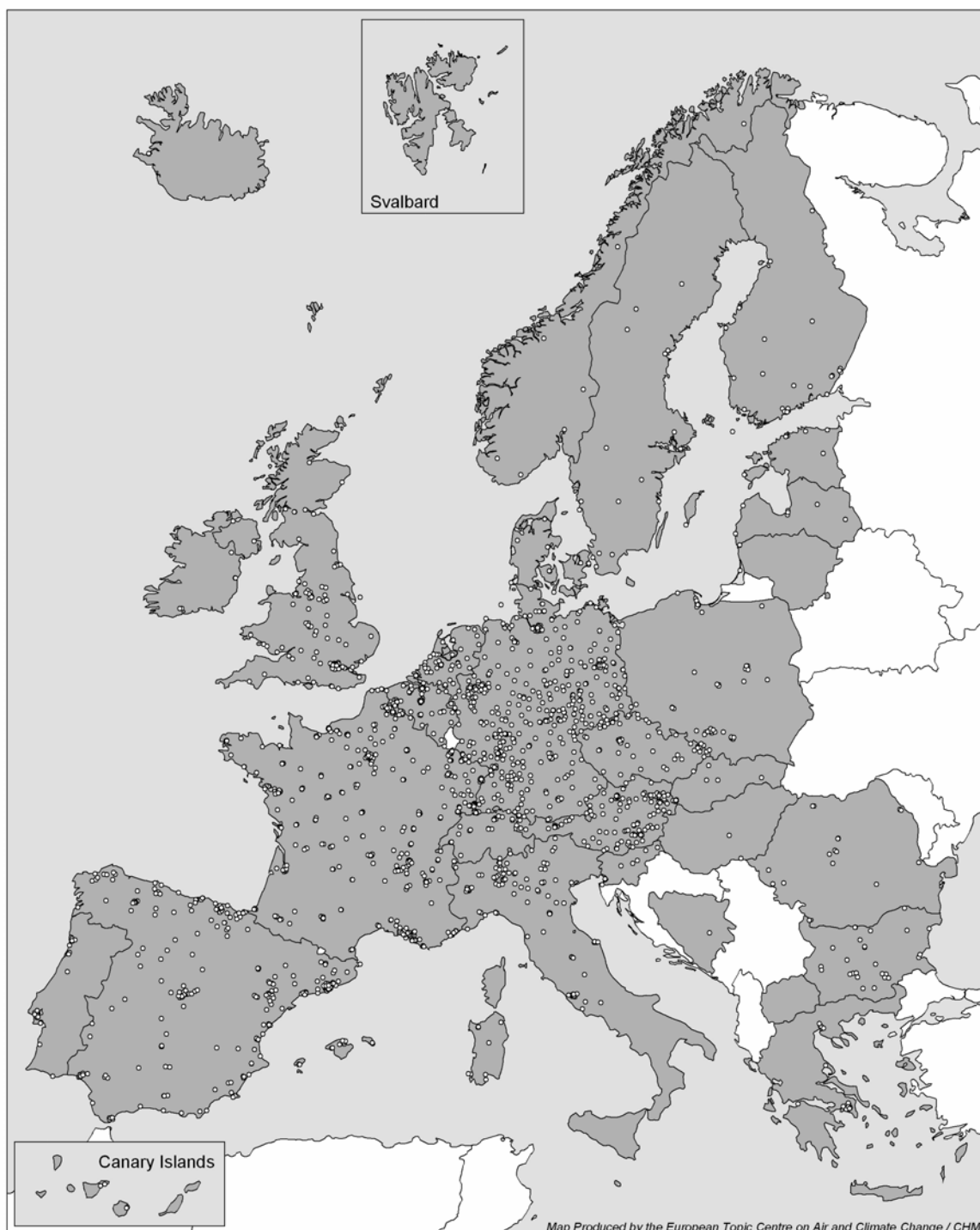


Figure 5 Location of stations for which 2002 air quality data for nitrogen dioxide (NO₂) have been reported.

Particulate Matter

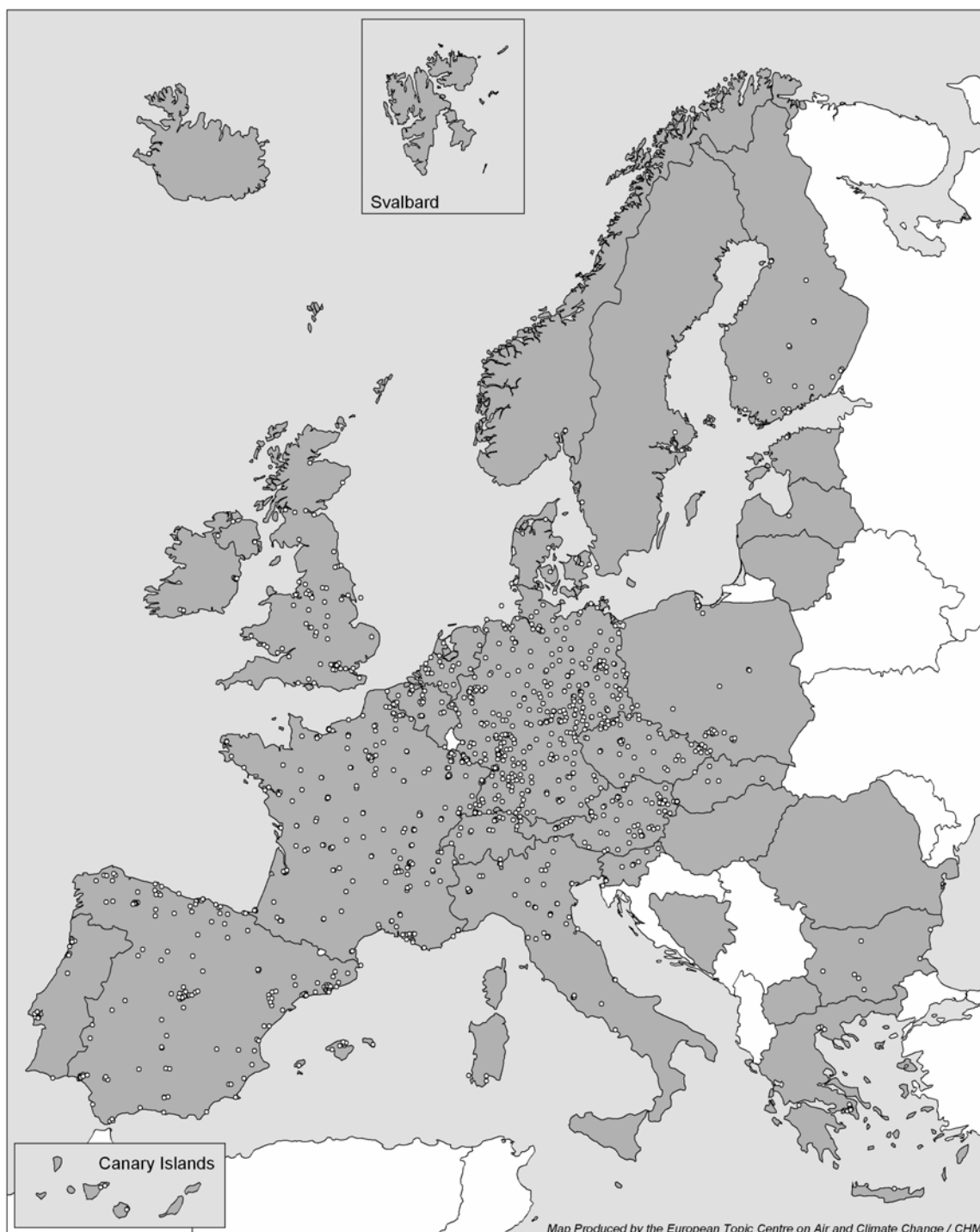


Figure 6 Location of stations for which 2002 air quality data for particulate matter (PM₁₀) have been reported.

Carbon Monoxide

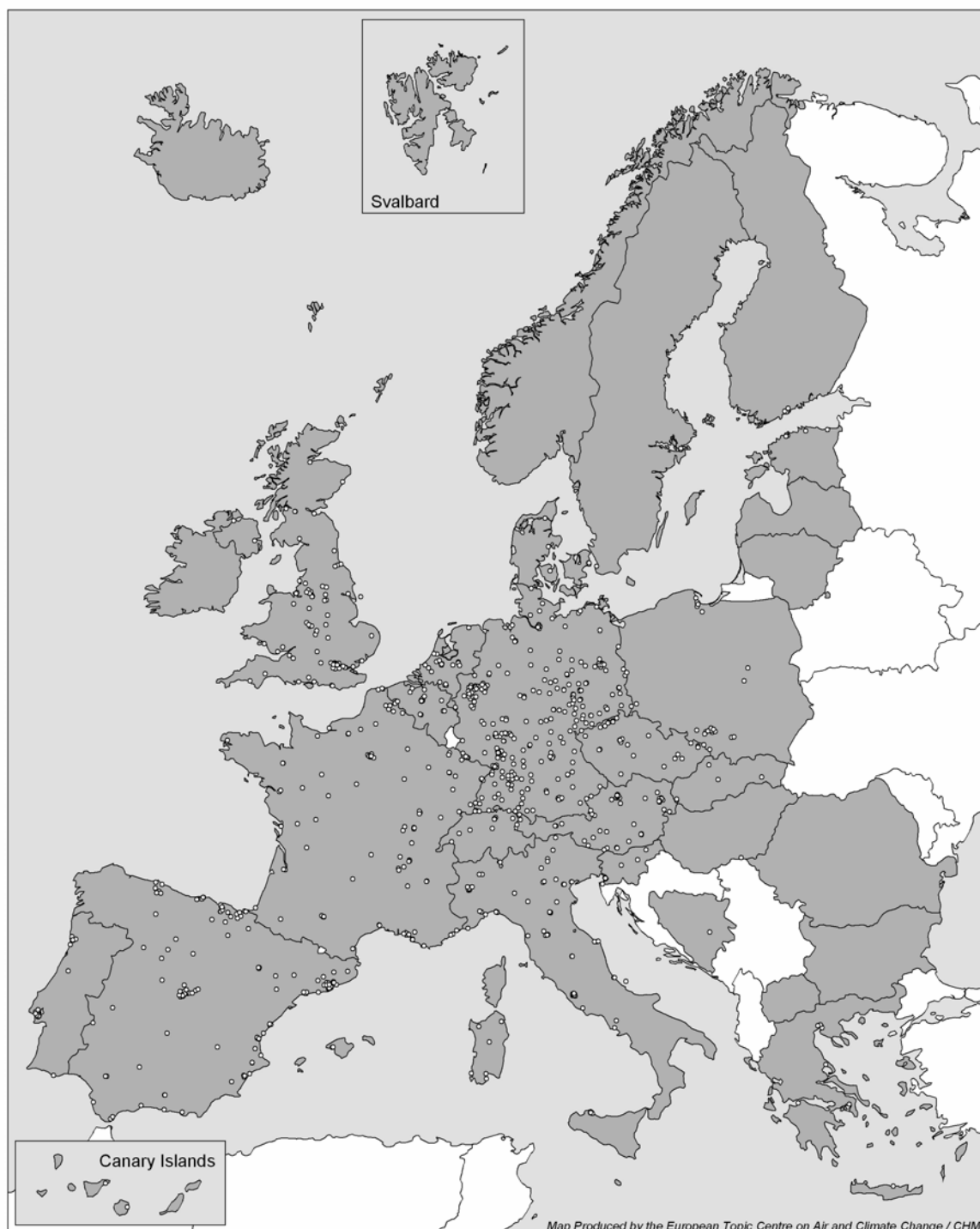


Figure 7 Location of stations for which 2002 air quality data for carbon monoxide (CO) have been reported.

Benzene

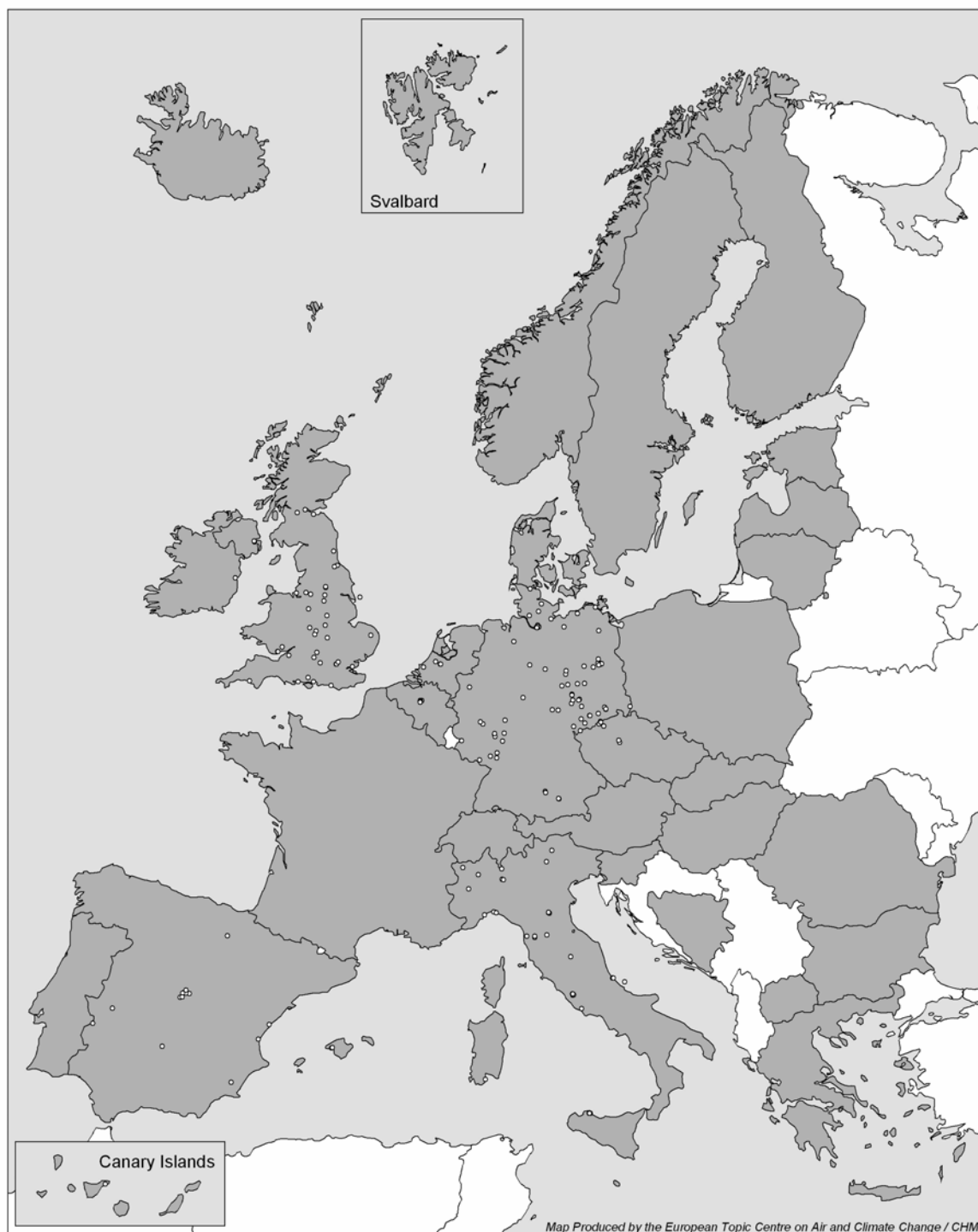


Figure 8 Location of stations for which 2002 air quality data for benzene (C₆H₆) have been reported.

Ozone

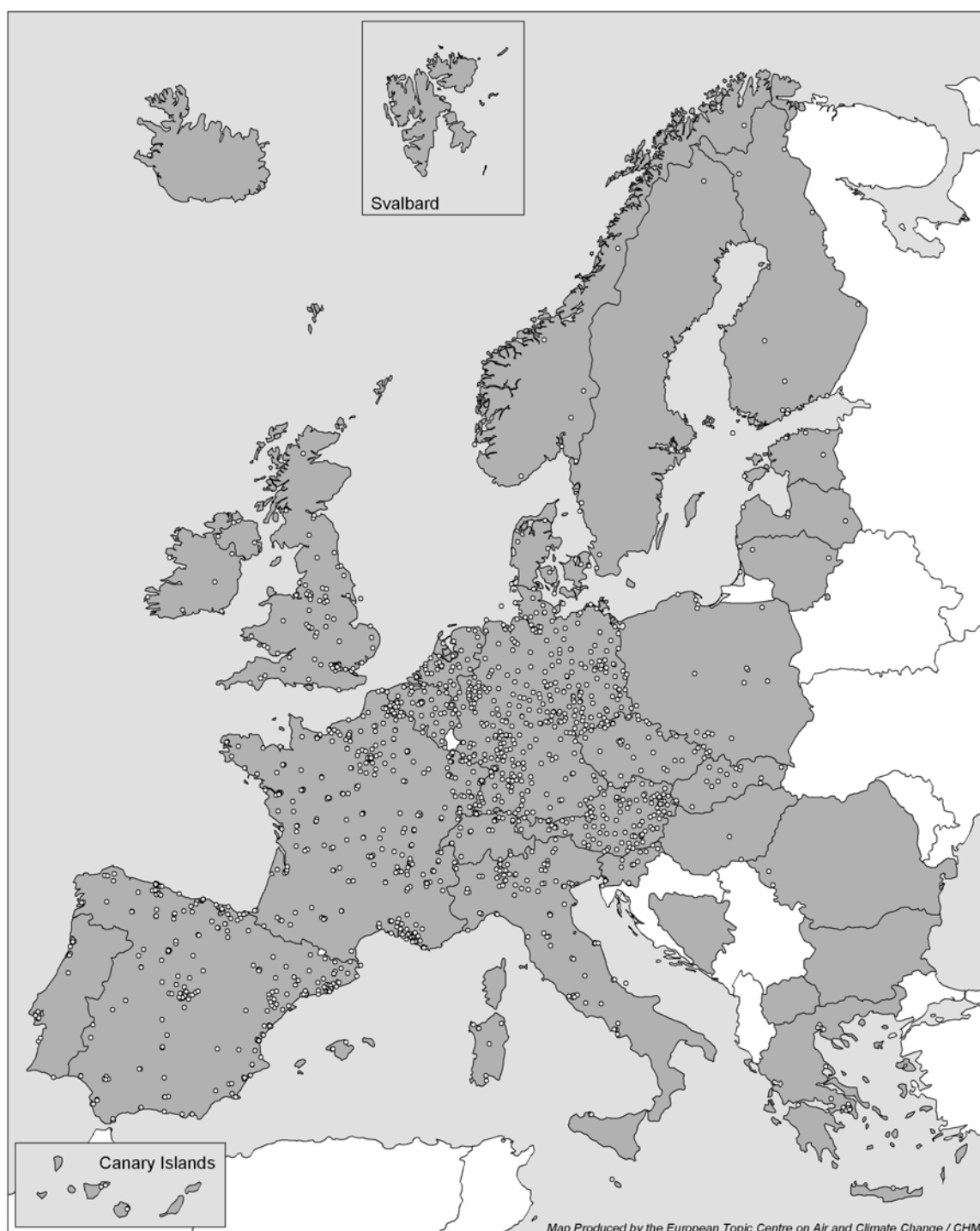


Figure 9 Location of stations for which 2002 air quality data for ozone (O₃) have been reported.

Table 4 Number of stations in the EU countries for which data for components of the daughter directives were available in AirBase, 2002

	Daughter directive												
	1	.	.	.	.	.	.	.	2	.	.	3	
	Sulphur dioxide		Nitrogen dioxide 1)		Particulate matter (<10 µm)		Particulate matter (<2.5 µm)		Lead	Carbon monoxide	Benzene		Ozone
Formula (or abbreviation)	SO ₂		NO ₂		PM ₁₀		PM _{2.5}		Pb	CO	C ₆ H ₆		O ₃
EoI code	1		2		3		4		6	9	8		7
Time resolution ¹⁾	H	D	H	D	H	D	H	D	D	H	H	D	H
Austria	138		144		74	1				47			113
Belgium	67		47		23	3			28	18		5	33
Denmark	2	3	12		8					6	1		8
Finland	9	4	24		26		3			4			12
France	477		491		269	28				103			399
Germany	417		476		264	116				297	77		377
Greece	23		26		15					15			26
Ireland	6		6		8						1		7
Italy	94		117		46	4				84	32		99
Luxembourg ²⁾													
Netherlands	38		45		20				4	22		4	38
Portugal	30		32		21	1	2		1	26			26
Spain	272	10	272		140	55			52	130	18		299
Sweden	4	5	7	14	4					3			8
United Kingdom	79		102		65	5				79	6	35	79
All countries	1656	22	1801	14	601	563	37	0	85	834	135	44	1524

1) H: hour; D: day.

2) No information received.

Table 5 Number of stations in non- EU countries for which data for components of daughter directives were available in AirBase, 2002

	Daughter directive											
	1	.	.	.	.	.	.	.	.	2	.	3
	Sulphur dioxide		Nitrogen dioxide		Particulate matter (<10 µm)		Particulate matter (<2.5 µm)		Lead	Carbon monoxide	Benzene	Ozone
Formula (or abbreviation)	SO ₂		NO ₂		PM ₁₀		PM _{2.5}		Pb	CO	C ₆ H ₆	O ₃
EoI code	1		2		3		4		6	9	8	7
Time resolution ¹⁾	H	D	H	D	H	D	H	D	D	H	H	D
Albania ²⁾												
Bosnia and Herzegovina	1		1							1		
Bulgaria	38		38		7				19			
Cyprus ²⁾												
Czech Republic	55		55		53					27	4	35
Estonia	7		7		4					5		7
F.Y.R.O.M.		25										
Hungary	1	1	1	1	1					1		2
Iceland	1		2		2		2			1	1	3
Latvia	6	2	6	2	1							6
Liechtenstein ²⁾												
Lithuania		1		1								3
Malta												1
Norway	1	7	1	6	3							10
Poland	17	31	28	20	33	3				24		21
Romania		23		18					8			2
Slovak Republic	8		8		8					5		17
Slovenia	8		6		7					4		10
Switzerland	16		30		23					12		30
Turkey ²⁾												
All countries	159	90	183	48	74	68	5	0	27	80	5	147

1) H: hour; D: day.

2) No information received.

3. META INFORMATION IN AIRBASE

3.1. Database perspective

The EoI Decision requests the Member States to transmit meta information on networks, stations and measurement configurations according to Annex II of the Decision (EU, 1997). The non-EU Member States, which are members of the European Environment Agency (EEA), are also asked to deliver data in the framework of the EuroAirnet programme. The meta information is stored in AirBase; information there refers to networks and stations that have delivered data.

Meta information, originating from the former EU databases, APIS ¹ and GIRAFE ², is also incorporated into AirBase, creating the beginnings of a long-term record of air quality data and of meta information on monitoring networks, measurement configurations, measurement techniques and the like (Tables 6 and 7). However, it should be kept in mind that measurement configurations have changed throughout the years, and that these changes have not always been reported. Consequently, the length of the time series is limited at the moment. This limitation can be partly overcome if countries are willing to deliver (more of) their older data as well, thereby expanding the existing time series. Long-term air quality time series are most welcome from the perspective of a proper long-term evaluation of air quality and of the influence of abatement measures to improve air quality. Another limitation arising from the incorporation of old database information is that AirBase may contain information on stations that is obsolete and should be updated.

Table 6 Average length of time series for components of the air quality daughter directives ¹⁾

Component	Length of time series	Component	Length of time series
	<i>Year</i>		<i>Year</i>
Sulphur dioxide	4.8	Lead	4.3
Nitrogen dioxide	4.6	Ozone	3.9
Particulate matter (<10 µm)	2.7	Carbon monoxide	4.6
Particulate matter (<2.5 µm)	1.7	Benzene	1.9

¹⁾ All (primary) AIRBASE data have been taking account in calculating the average length of time series regardless of the starting year.

AIRBASE holds different types of meta information that may be of help in making a proper evaluation of measurement data. The following information is available:

- Geographical information e.g. address, co-ordinates and altitude.
- Station information in terms of location of stations and characteristics of the surroundings.
- Period of measurement per component.
- Measurement techniques.

¹ APIS (Air Pollution Information System) used to be the EU database containing air quality data.

² GIRAFE (Guide d'Information sur les Réseaux de surveillance de la qualité de l'Air Fonctionnant en Europe) used to be the EU database containing meta information on air quality networks and stations.

Table 7 Summary of periods and number of stations for which data are available in AIRBASE

Country	Air quality reporting Start/end	Number of operational stations in 2002 ¹⁾
EU countries		
Austria	1990-2002	183
Belgium	1975-2002	134
Denmark	1976-2002	15
Finland	1990-2002	48
France	1968-2002	699
Germany	1976-2002	519
Greece	1983-2002	29
Ireland	1973-2002	15
Italy	1976-2002	175
Luxembourg	1976-1993	
Netherlands	1976-2002	48
Portugal	1986-2002	38
Spain	1986-2002	406
Sweden	1993-2002	24
United Kingdom	1969-2002	329
Non-EU countries		
Albania	²⁾	.
Bosnia Herzegovina	2002-2002	1
Bulgaria	1998-2002	38
Cyprus	²⁾	.
Czech Republic	1992-2002	55
Estonia	1997-2002	7
FYROM	1997-2002	28
Hungary	1997-2002	2
Iceland	1997-2002	3
Latvia	1997-2002	8
Liechtenstein	²⁾	.
Lithuania	1997-2002	3
Malta	2002-2002	1
Norway	1994-2002	15
Poland	1997-2002	50
Romania	2001-2002	26
Slovak Republic	1995-2002	22
Slovenia	1997-2002	10
Switzerland	1992-2002	31
Turkey	²⁾	.
1) Irrespective of the component(s) measured		
2) No information in AirBase		

Long-term measurement series provide valuable information for determining, for example, the effect of abatement measures and trend analysis. Since AirBase became operational in 1996, the average length of the time series in AirBase is relatively short (*Figure 10*). However, as one of the long-term objectives is to expand the time series in AirBase, further improvement can be expected. For the moment, the most extended time series are available for sulphur dioxide, black smoke and strong acidity.

Strictly speaking, the air quality daughter directives define criteria for minimum data capture, *i.e.* 90% (EU, 1999 and EU, 2000) or, in a single case, a differentiated set of criteria (EU, 2002). Indeed, data capture is a general measure for the performance of a complete monitoring system but not necessarily a sufficient indicator for the quality of the data set. The relation between the quality of aggregated data and data capture is often not straightforward and, judging the quality of the time series on the basis of the data capture alone is not recommended ¹.

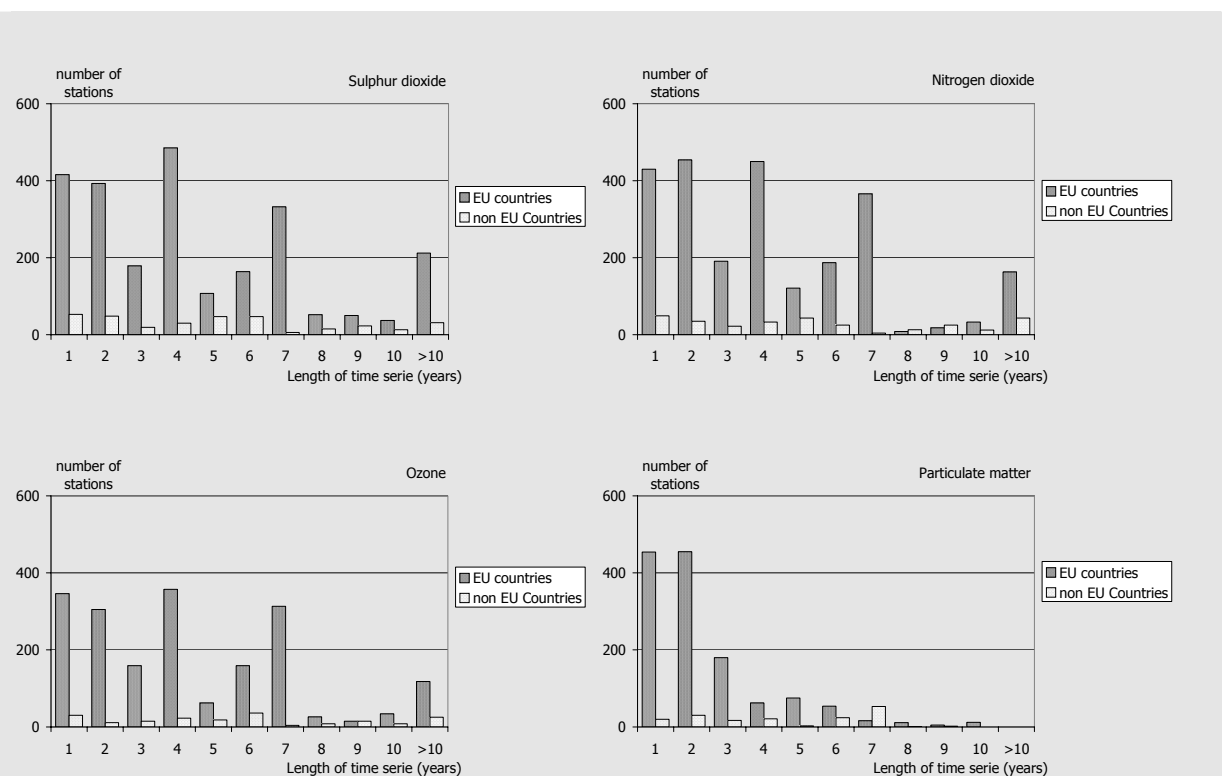


Figure 10 Length of time series (in years) in AirBase for sulphur dioxide (top left), nitrogen dioxide (top right), ozone (bottom left) and particulate matter (<10 μm) (bottom right).

¹ For instance, a low data capture could result in an annual average with an acceptable quality, whereas the estimation of higher percentiles based on the same low data capture could lead to values with higher uncertainty.

3.2. User perspective

Problems can arise if the (meta) information delivered is incomplete. Moreover, the lack of certain types of meta information makes the proper use of measurement results questionable or diminishes the value of measurement results. For this reason we define the *effective* percentage of stations, *i.e.* the percentage of the stations for which essential meta information has been delivered. Essential meta information is defined from a user perspective. In other words, what is the kind of meta information needed by a user for adequate application and analysis of data considered:

- Station characteristics in terms of type of station and area.
- Geographical co-ordinates and altitude.
- Station name.

In this perspective, if one of these items is missing, the station is considered as having incomplete meta information (*Table 8*). Note that one of these items, the type of station, is not mandatory under the current Exchange of Information. In reference to this, an additional column in *Table 8* shows the mandatory part of the information.

For certain assessments, information on the type of station is essential for selecting the appropriate set of stations. However, the criteria used to define the different type of stations leaves - necessarily - room for different interpretations. There is also the possibility that certain stations will be influenced by these sources. The type of station should then be defined on the basis of the predominant sources influencing the station. Recent research has shown the presence of possibilities to define the type of station using the measurement data themselves (Snel, 2004). Although further research is certainly needed the method looks promising. The method requires, for example, nitrogen monoxide (NO) data as input. Unfortunately, only few countries deliver these data. Most networks perform measurements on an hourly basis. Current technology allows that in these cases, measurement results for nitrogen dioxide (NO₂), as well as for nitrogen monoxide and nitrogen oxides (NO_x), can easily be made available. From the point of view of quality control the suggestion has been made to include nitrogen oxide in the regular data delivery.

Table 8 Number of stations with mandatory and effective information, 2002

Country	Total number of stations	Stations with mandatory information 1)	Effective percentage of stations 2)	Country	Total number of stations	Stations with mandatory information 1)	Effective percentage of stations 2)
EU countries				Non-EU countries			
		%	%			%	%
Austria	183	100	100	Albania	4)	.	.
Belgium	134	100	100	Bosnia Herzegovina	1	100	100
Denmark	15	100	100	Bulgaria	38	100	100
Finland	48	100	100	Cyprus	4)	.	.
France	699	75 ³⁾	75 ³⁾	Czech Republic	55	100	100
Germany	519	95	94	Estonia	7	100	100
Greece	29	93	93	FYROM	28	100	100
Ireland	15	100	100	Hungary	2	100	100
Italy	175	100	100	Iceland	3	100	100
Luxembourg	4)	.	.	Latvia	8	100	100
Netherlands	48	100	100	Liechtenstein	4)	.	.
Portugal	38	100	100	Lithuania	3	100	100
Spain	406	93	93	Malta	1	100	100
Sweden	24	100	100	Norway	15	100	100
United Kingdom	329	100	100	Poland	50	100	100
				Romania	26	100	100
				Slovak Republic	22	100	100
				Slovenia	10	100	100
				Switzerland	31	100	100
				Turkey	4)	.	.

1) Percentage of the total number of stations for which the following information is available: type of area, geographical co-ordinates, altitude and station name.

2) Percentage of the total number of stations for which the following information is available: type of station, type of area, geographical co-ordinates, altitude and station name.

3) A possible explanation for these low figures is that France did not use the Data Exchange Module (DEM) to deliver data. The DEM prompts the data supplier when mandatory information is not loaded into DEM.

4) No information received.

4. DISCUSSION

Since its introduction in 1996, AIRBASE has become a comprehensive source of information on air quality in Europe. AIRBASE includes not only air quality measurement data, but also information on monitoring networks, their stations and measurement configurations obtained from over 30 European countries and covering almost 40 air quality parameters. Nevertheless, substantial improvements can still be achieved. Systematic analysis of the contents of AIRBASE, its performance and user experiences have made clear that AIRBASE is not always able to deliver the desired information. For instance, if information on the type of station is missing, the use of measurement results for this station is, in most cases, very restricted. This emphasises the urgent need to deliver complete (meta) information to AIRBASE.

At first, a major focus of AIRBASE was to facilitate the Member States of the European Union in the process of delivering mandatory information under the Exchange of Information (EoI), thereby stimulating the reciprocal exchange of information among the countries. Gradually the facilities of AIRBASE have been developed to become a tool for analysing and evaluating air quality as well. Therefore and in the light of these demands, the user friendliness of AIRBASE will be further improved. For instance with the introduction of a new version of AirView, the entrance software for AIRBASE, accessibility will be enhanced. Even more essential is the maintenance of the validity of AIRBASE data. Ensuring or improving the quality of data in AIRBASE, both measurement data and meta information, is an ongoing activity of high priority. The increasing use of AIRBASE data for analysing and evaluating air quality makes this even more important. According to the EoI Decision, the Member States are responsible for the validation of the data. The ETC/ACC should, as technical manager of AIRBASE, help to improve the overall quality of the data. The ETC/ACC has used quality control procedures as an additional check on incoming data to detect:

- The occurrence of extreme values;
- Stations for which one or more essential pieces of data are missing;
- Submitted results for measurements already stored in AIRBASE;
- Stations that have been deleted, but that still have data stored in AIRBASE.

Nearly all countries have reacted in response to the results of the quality checks by ETC/ACC. In the end, an ongoing and active dialogue between the national data suppliers and the ETC/ACC – i.e. communication on (apparent) faults, incomplete measurement data and the like – forms the most important tool for improving the quality of AIRBASE. Further expansion of historical time series will improve the usability of AIRBASE too.

AIRBASE incorporates meta information originating from the former EU databases, APIS and GIRAFE. The aim here was to create a link to the beginnings of a long-term record of air quality data and meta information on monitoring networks, measurement configurations, measurement techniques and the like. However, data deliveries under APIS and GIRAFE turned out to be subject to less stringent quality protocols than are now considered appropriate. As a consequence, AIRBASE in this respect still contains some inadequate, incomplete or sometimes even erroneous information. Removing this faulty or inadequate information and either removing or supplementing incomplete data sets will probably substantially improve the quality of the contents of AIRBASE contents.

The EoI Decision does not call for information on how particulate-matter monitoring (PM₁₀, PM_{2.5}) data have been processed. Recent reviews show that countries respond differently with respect to the use of a correction factor when reporting data which have not been measured using the reference method (Anonymous, 1997; Anonymous, 2004). AIRBASE contains data as such: i.e. (raw) data are stored in formats in which they have been delivered. The measurement data of particulate matter is not accompanied by information on whether data have been subject to a correction or not. This poses a risk to potential users of these data, as they are not necessarily aware of possible inconsistencies between data from different networks. Information on the use of the correction factors for particulate matter is necessary

for the appropriate use of particulate matter data. Action is in progress at the ETC/ACC to incorporate this information in AIRBASE in due time.

5. RECOMMENDATIONS

From the previous chapters, it has become clear that several improvements can be realised in AIRBASE. Certain types of information are lacking or incomplete. Quality improvement of AIRBASE should focus on actions, which, from a user's perspective, are the most beneficial:

- Continuing the ongoing dialogue between the national data suppliers and the ETC/ACC as the most important tool for improving the quality of AIRBASE, communicating on (apparent) faults, incomplete measurement data and the like.
- Completing meta information: essential from the user perspective are the station name, the station characteristics in terms of type of station and area, the geographical co-ordinates and altitude.
- Clearing AIRBASE of 'phantom' stations and measurement configurations, i.e. those for which no measurement data are available¹.
- Ongoing critically reviewing of information in AIRBASE as a necessary item. The priority in this respect lies in the information originating from APIS and GIRAFE. In general, one should be firm about having the (meta) information in AIRBASE thoroughly examined and, if necessary, removed or supplemented ⁹.
- Further extending historic measurement series.
- Encouraging Member States to deliver non mandatory meta information.
- Incorporating information on correction factors for particulate matter measurements as being of the utmost importance ⁹.

¹ Work in progress, will be finished this year.

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Annex A Exchange of Information

The Member States of the European Union should, according to Annex II of the Council Decision on the reciprocal exchange of information, report certain types of meta information (EU, 2002). 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 A1 Overview of non-mandatory meta information to be delivered under the Exchange of Information (EoI)

Item ¹⁾	Description
I.2.	Abbreviation (of name 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 (of the body responsible for the network)
II.1.2.	Name of the town/city of location (of the station)
II.1.3.	National and/or local reference number or code (of the station)
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 of integrating time
III.2.4.	Sampling time

¹⁾ Numbers according to Annex II of the Exchange of Information (EU, 2002)

Annex B Number and type of stations per pollutant, 2002

Table B1 Sulphur dioxide (SO₂)

Country	Total number of stations	Traffic	Urban back-ground	Industrial	Regional back-ground	Unknown
EU countries						
Austria	138	26	46	20	46	0
Belgium	67	14	29	11	13	0
Denmark	5	2	0	0	3	0
Finland	13	2	0	4	7	0
France	478	44	186	139	36	74
Germany	417	102	198	17	84	16
Greece	23	11	7	4	0	1
Ireland	6	4	0	1	1	0
Italy	94	40	26	17	11	0
Netherlands	38	5	9	0	24	0
Portugal	30	9	15	4	2	0
Spain	282	126	17	112	19	8
Sweden	9	0	5	0	4	0
United Kingdom	79	9	60	4	6	0
Non-EU countries						
Bosnia Herzegovina	1	0	1	0	0	0
Bulgaria	38	0	38	0	0	0
Czech Republic	55	6	29	1	19	0
Estonia	7	1	1	2	3	0
FYROM	25	9	12	4	0	0
Hungary	1	1	0	0	0	0
Iceland	1	1	0	0	0	0
Latvia	8	4	2	0	2	0
Lithuania	1	0	0	0	1	0
Norway	8	0	0	0	8	0
Poland	48	2	34	3	9	0
Romania	23	2	16	4	1	0
Slovak Republic	8	3	5	0	0	0
Slovenia	8	2	6	0	0	0
Switzerland	16	4	7	1	4	0

Table B2 Nitrogen dioxide (NO₂)

Country	Total number of stations	Traffic	Urban back- ground	Industrial	Regional back- ground	Unknown
EU countries						
Austria	144	35	55	14	40	0
Belgium	47	10	18	11	8	0
Denmark	12	5	4	0	3	0
Finland	24	13	3	3	5	0
France	491	80	224	63	40	84
Germany	476	140	208	19	89	20
Greece	26	12	10	3	0	1
Ireland	6	4	0	0	2	0
Italy	117	53	32	12	20	0
Netherlands	45	13	8	0	24	0
Portugal	32	12	17	2	1	0
Spain	272	123	20	101	20	8
Sweden	21	3	14	0	4	0
United Kingdom	102	24	66	5	7	0
Non-EU countries						
Bosnia Herzegovina	1	0	1	0	0	0
Bulgaria	38	0	38	0	0	0
Czech Republic	55	6	29	1	19	0
Estonia	7	1	1	2	3	0
Hungary	2	1	0	0	1	0
Iceland	2	1	1	0	0	0
Latvia	8	4	2	0	2	0
Lithuania	1	0	0	0	1	0
Norway	7	1	0	0	6	0
Poland	48	2	35	3	8	0
Romania	18	4	10	3	1	0
Slovak Republic	8	3	5	0	0	0
Slovenia	6	2	4	0	0	0
Switzerland	30	10	10	3	7	0

Table B3 Particulate matter (<10 µm)

Country	Total number of stations	Traffic	Urban back- ground	Industrial	Regional back- ground	Unknown
EU countries						
Austria	74	24	26	11	13	0
Belgium	23	5	13	4	1	0
Denmark	8	3	3	0	2	0
Finland	26	18	6	1	1	0
France	269	42	129	36	10	52
Germany	380	116	170	15	67	12
Greece	15	7	4	2	0	2
Ireland	8	5	3	0	0	0
Italy	50	26	17	5	2	0
Netherlands	20	5	5	0	10	0
Portugal	22	9	10	2	1	0
Spain	195	90	17	60	17	11
Sweden	4	2	2	0	0	0
United Kingdom	70	11	52	4	3	0
Non-EU countries						
Bulgaria	7	0	7	0	0	0
Czech Republic	53	6	29	1	17	0
Estonia	4	1	1	2	0	0
Hungary	1	1	0	0	0	0
Iceland	2	1	1	0	0	0
Latvia	1	1	0	0	0	0
Norway	3	1	2	0	0	0
Poland	33	2	24	3	4	0
Slovak Republic	8	3	5	0	0	0
Slovenia	7	2	5	0	0	0
Switzerland	23	8	8	1	6	0

Table B4 Particulate matter (<2.5 µm)

Country	Total number of stations	Traffic	Urban back-ground	Industrial	Regional back-ground	Unknown
EU countries						
Austria	1	0	0	0	1	0
Belgium	3	0	3	0	0	0
Finland	3	2	1	0	0	0
France	28	5	15	0	0	8
Portugal	2	1	1	0	0	0
Non-EU countries						
Iceland	2	1	1	0	0	0
Poland	3	1	1	1	0	0

Table B5 Lead

Country	Total number of stations	Traffic	Urban back-ground	Industrial	Regional back-ground	Unknown
EU countries						
Belgium	28	8	10	6	4	0
Netherlands	4	1	1	0	2	0
Portugal	1	1	0	0	0	0
Spain	52	40	4	5	0	3
Non-EU countries						
Bulgaria	19	0	19	0	0	0
Romania	8	0	4	3	1	0

Table B6 Carbon monoxide (CO)

Country	Total number of stations	Traffic	Urban back- ground	Industrial	Regional back- ground	Unknown
EU countries						
Austria	47	23	15	5	4	0
Belgium	18	8	9	1	0	0
Denmark	6	5	1	0	0	0
Finland	4	4	0	0	0	0
France	103	61	25	4	4	9
Germany	297	117	141	13	15	11
Greece	15	8	2	3	0	2
Italy	84	53	22	6	3	0
Netherlands	22	12	5	0	5	0
Portugal	26	14	11	1	0	0
Spain	130	92	16	12	3	7
Sweden	3	2	1	0	0	0
United Kingdom	79	20	55	3	1	0
Non-EU countries						
Bosnia Herzegovina	1	0	1	0	0	0
Czech Republic	27	3	20	1	3	0
Estonia	5	1	1	2	1	0
Hungary	1	1	0	0	0	0
Iceland	1	1	0	0	0	0
Poland	24	2	15	3	4	0
Slovak Republic	5	3	2	0	0	0
Slovenia	4	1	3	0	0	0
Switzerland	12	8	2	0	2	0

Table B7 Benzene (C₆H₆)

Country	Total number of stations	Traffic	Urban back- ground	Industrial	Regional back- ground	Unknown
EU countries						
Belgium	5	3	2	0	0	0
Denmark	1	1	0	0	0	0
Germany	77	50	14	1	5	7
Ireland	1	1	0	0	0	0
Italy	32	20	7	5	0	0
Netherlands	4	1	2	0	1	0
Spain	17	11	3	1	0	3
United Kingdom	41	10	30	0	1	0
Non-EU countries						
Czech Republic	4	1	2	0	1	0
Iceland	1	1	0	0	0	0

Table B8 Ozone (O₃)

Country	Total number of stations	Traffic	Urban back- ground	Industrial	Regional back- ground	Unknown
EU countries						
Austria	113	11	40	8	54	0
Belgium	33	4	15	2	12	0
Denmark	8	2	3	0	3	0
Finland	12	1	2	0	9	0
France	399	9	204	24	60	102
Germany	377	68	186	15	99	9
Greece	26	9	10	4	1	2
Ireland	7	1	0	0	6	0
Italy	99	30	40	8	21	0
Netherlands	38	8	6	0	24	0
Portugal	26	8	14	2	2	0
Spain	299	158	30	64	29	18
Sweden	8	0	4	0	4	0
United Kingdom	79	3	56	2	18	0
Non-EU countries						
Czech Republic	35	2	18	1	14	0
Estonia	7	1	1	2	3	0
Hungary	2	1	0	0	1	0
Iceland	3	2	1	0	0	0
Latvia	6	3	2	0	1	0
Lithuania	3	0	0	0	3	0
Malta	1	0	0	0	1	0
Norway	10	0	0	0	10	0
Poland	21	0	11	1	9	0
Romania	2	0	2	0	0	0
Slovak Republic	17	0	9	1	7	0
Slovenia	10	2	6	0	2	0
Switzerland	30	9	10	4	7	0

Table B9 Black smoke

Country	Total number of stations	Traffic	Urban back- ground	Industrial	Regional back- ground	Unknown
EU countries						
Belgium	30	4	20	5	1	0
Greece	4	2	2	0	0	0
Netherlands	14	3	2	0	9	0
Spain	28	11	0	17	0	0
Sweden	6	0	4	0	2	0
United Kingdom	166	0	165	1	0	2
Non-EU countries						
FYROM	28	9	15	4	0	0
Poland	7	0	7	0	0	0

Annex C Supplementary information on data series

C1 Years and length of data series

Table C1.1 Sulphur dioxide (SO₂)

Country	Years	Average length of time series
<i>Years</i>		
EU countries		
Austria	1990-2002	9.5
Belgium	1985-2002	10.9
Denmark	1976-2002	4.7
Finland	1990-2002	6.5
France	1981-2002	3.5
Germany	1976-2002	5.1
Greece	1983-2002	3.0
Ireland	2000-2002	1.4
Italy	1976-2002	1.5
Netherlands	1976-2002	9.7
Portugal	1986-2002	3.6
Spain	1986-2002	3.5
Sweden	1993-2002	5.7
United Kingdom	1985-2002	6.2
Non-EU countries		
Bosnia Herzegovina	2002-2003	1.0
Bulgaria	1998-2002	4.4
Czech Republic	1992-2002	9.6
Estonia	1997-2002	4.3
FYROM	1997-2002	5.6
Hungary	1997-2002	1.6
Iceland	1993-2002	4.0
Latvia	1997-2002	2.9
Lithuania	1997-2002	2.5
Norway	1998-2002	5.0
Poland	1997-2002	3.8
Romania	2001-2002	1.7
Slovak Republic	1995-2002	2.7
Slovenia	1997-2002	2.9
Switzerland	1992-2002	7.3

Table C1.2 Nitrogen dioxide (NO₂)

Country	Years	Average length of time series
<i>Years</i>		
EU countries		
Austria	1990-2002	9.3
Belgium	1980-2002	8.5
Denmark	1982-2002	5.3
Finland	1990-2002	5.0
France	1982-2002	3.2
Germany	1984-2002	5.2
Greece	1983-2002	4.4
Ireland	1999-2002	2.1
Italy	1999-2002	1.2
Netherlands	1981-2002	9.1
Portugal	1986-2002	3.2
Spain	1987-2002	3.5
Sweden	1993-2002	5.3
United Kingdom	1980-2002	6.3
Non-EU countries		
Bosnia Herzegovina	2002-2003	1.0
Bulgaria	1998-2002	4.3
Czech Republic	1992-2002	9.6
Estonia	1997-2002	3.9
Hungary	1997-2002	1.6
Iceland	1994-2002	5.0
Latvia	1997-2002	2.9
Lithuania	1997-2002	2.5
Norway	1994-2002	5.1
Poland	1997-2002	4.2
Romania	2001-2002	1.7
Slovak Republic	1995-2002	2.7
Slovenia	1997-2002	2.7
Switzerland	1992-2002	9.3

Table C1.3 Particulate matter (<10 µm)

Country	Years	Average length of time series
<i>Years</i>		
EU countries		
Austria	2000-2002	1.8
Belgium	1995-2002	5.5
Denmark	2001-2002	1.4
Finland	1991-2002	3.1
France	2001-2003	1.7
Germany	1998-2002	2.6
Greece	2001-2002	1.9
Ireland	1999-2002	2.0
Italy	1999-2002	1.2
Netherlands	1997-2002	5.5
Portugal	1997-2002	2.2
Spain	1997-2002	2.3
Sweden	1998-2002	3.0
United Kingdom	1992-2002	5.9
Non-EU countries		
Bulgaria	1998-2002	2.1
Czech Republic	1996-2002	6.8
Estonia	2001-2002	1.7
Hungary	2000-2002	3.0
Iceland	1994-2002	3.8
Latvia	2001-2002	2.0
Lithuania	1999-1999	1.0
Norway	1994-2002	4.9
Poland	1997-2002	3.7
Slovak Republic	1999-2002	2.6
Slovenia	2001-2002	1.4
Switzerland	1992-2002	4.3

Table C1.4 Particulate matter (<2.5 µm)

Country	Years	Average length of time series
<i>Years</i>		
EU countries		
Austria	2001-2002	2.0
Belgium	2000-2002	2.7
Finland	2001-2002	1.7
France	2001-2003	1.5
Portugal	2002-2002	1.0
Non-EU countries		
Iceland	1995-2002	3.0
Poland	2001-2002	2.0
Netherlands	2001-2002	2.0
Portugal	2002-2002	1.0
Spain	1993-2002	1.2

Table C1.5 Lead

Country	Years	Average length of time series
<i>Years</i>		
EU countries		
Belgium	1982-2002	7.5
Denmark	1982-2001	4.0
Finland	1993-1994	2.0
Germany	1988-1989	2.0
Ireland	1982-1988	7.0
Netherlands	2001-2002	2.0
Portugal	2002-2002	1.0
Spain	1993-2002	1.2
Non-EU countries		
Bulgaria	1998-2002	4.1
Romania	2001-2002	1.7

Table C1.6 Carbon monoxide (CO)

Country	Years	Average length of time series
<i>Years</i>		
EU countries		
Austria	1990-2002	7.3
Belgium	1994-2002	2.8
Denmark	1998-2002	4.0
Finland	1990-2002	8.5
France	1982-2002	3.1
Germany	1985-2002	3.5
Greece	1983-2002	3.9
Ireland	1999-2000	1.5
Italy	1999-2002	1.2
Netherlands	1981-2002	7.9
Portugal	1997-2002	3.2
Spain	1987-2002	4.2
Sweden	1998-2002	3.0
United Kingdom	1982-2002	6.0
Non-EU countries		
Bosnia Herzegovina	2002-2003	1.0
Bulgaria	1998-2001	3.6
Czech Republic	1992-2002	8.8
Estonia	1997-2002	2.6
Hungary	1997-2002	1.3
Iceland	1994-2002	9.0
Lithuania	1997-1999	2.3
Poland	1997-2002	3.3
Slovak Republic	1995-2002	4.7
Slovenia	2002-2002	1.0
Switzerland	1992-2002	7.8

Table C1.7 Benzene (C₆H₆)

Country	Years	Average length of time series
<i>Years</i>		
EU countries		
Belgium	1994-2002	3.7
Denmark	2002-2002	1.0
Germany	1999-2002	2.4
Ireland	2002-2002	1.0
Italy	1999-2002	1.2
Netherlands	1997-2002	6.0
Spain	2002-2002	1.0
United Kingdom	1993-2002	1.0
Non-EU countries		
Czech Republic	2002-2002	1.0
Iceland	2002-2002	1.0
Switzerland	1994-1997	1.7

Table C1.8 Ozone (O_3)

Country	Years	Average length of time series
		<i>Years</i>
EU countries		
Austria	1990-2002	9.7
Belgium	1985-2002	7.9
Denmark	1997-2002	4.2
Finland	1990-2002	7.3
France	1982-2002	3.2
Germany	1984-2002	5.5
Greece	1983-2002	4.2
Ireland	1999-2002	2.8
Italy	1999-2002	1.1
Netherlands	1981-2002	8.9
Portugal	1986-2002	3.2
Spain	1987-2002	3.3
Sweden	1998-2002	3.3
United Kingdom	1982-2002	7.2
Non-EU countries		
Bulgaria	1998-2001	3.8
Czech Republic	1992-2002	7.8
Estonia	1997-2002	4.4
Hungary	1997-2002	2.3
Iceland	1994-2002	4.0
Latvia	1997-2002	2.5
Lithuania	1997-2002	3.0
Malta	2002-2002	1.0
Norway	1998-2002	5.0
Poland	1997-2002	4.3
Romania	2002-2002	1.0
Slovak Republic	1997-2002	3.4
Slovenia	1997-2002	3.5
Switzerland	1992-2002	9.0

Table C1.9 Black smoke

Country	Years	Average length of time series
<i>Years</i>		
EU countries		
Belgium	1975-2002	8.5
Denmark	1976-1982	6.5
France	1968-1990	7.0
Greece	1984-2002	2.1
Ireland	1973-2000	4.7
Luxembourg	1976-1993	14.6
Netherlands	1990-2002	8.8
Portugal	1986-1991	3.8
Spain	1986-2002	2.7
Sweden	1997-2002	4.1
United Kingdom	1969-2002	6.1
Non-EU countries		
FYROM	1997-2002	5.6
Poland	1997-2002	5.1

C2 Total number of stations and number of stations with essential information, 1997-2002

The Exchange of Information was introduced in 1997 (Anonymous, 1997). Since that year, EU Member States were obliged to deliver information on station characteristics.

Table C 2.1 Number of stations and stations with essential information ¹⁾, EU countries, 1997-2002

Country		1997	1998	1999	2000	2001	2002
Austria	number of stations	187	189	190	189	186	183
	Of which with essential information (%)	100	100	100	100	100	100
Belgium	number of stations	187	158	162	141	140	134
	Of which with essential information (%)	99	100	100	100	100	100
Denmark	number of stations	5	10	10	10	16	15
	Of which with essential information (%)	100	100	100	100	100	100
Finland	number of stations	21	29	30	29	48	48
	Of which with essential information (%)	100	100	100	100	100	100
France	number of stations	1	1	507	504	533	522
	Of which with essential information (%)	100	100	81	80	76	75
Germany	number of stations	478	474	444	496	486	490
	Of which with essential information (%)	96	96	96	95	96	94
Greece	number of stations	9	9	9	9	26	27
	Of which with essential information (%)	100	100	100	90	96	93
Ireland	number of stations	3	0	43	43	15	15
	Of which with essential information (%)	75	0	98	98	100	100
Italy	number of stations	2	2	185	181	326	175
	Of which with essential information (%)	100	100	89	99	95	100
Netherlands	number of stations	50	50	48	49	48	48
	Of which with essential information (%)	100	100	100	100	100	100
Portugal	number of stations	20	21	26	31	30	38
	Of which with essential information (%)	100	100	100	100	100	100
Spain	number of stations	110	118	162	160	310	379
	Of which with essential information (%)	99	99	99	99	97	93
Sweden	number of stations	16	17	22	28	25	24
	Of which with essential information (%)	100	100	100	100	100	100
United Kingdom	number of stations	311	328	314	299	301	329
	Of which with essential information (%)	97	96	99	99	100	100

1) Stations for which the following information is available: type of area, geographical co-ordinates, altitude and station name.

Table C 2.2 Number of stations and stations with essential information ¹⁾, non EU countries, 1997-2002

Country		1997	1998	1999	2000	2001	2002
Bosnia Herzegovina	number of stations	0	0	0	0	0	1
	Of which with essential information (%)	0	0	0	0	0	100
Bulgaria	number of stations	0	50	50	50	50	38
	Of which with essential information (%)	0	100	100	100	100	100
Czech Republic	number of stations	57	57	58	57	55	55
	Of which with essential information (%)	100	100	100	100	100	100
Estonia	number of stations	6	6	6	5	6	7
	Of which with essential information (%)	100	100	100	100	100	100
FYROM	number of stations	12	1	2	2	2	2
	Of which with essential information (%)	100	100	100	100	100	100
Hungary	number of stations	2	2	2	2	3	3
	Of which with essential information (%)	100	100	100	100	100	100
Iceland	number of stations	2	2	7	14	12	8
	Of which with essential information (%)	100	100	100	100	100	100
Latvia	number of stations	5	6	6	3	3	3
	Of which with essential information (%)	100	100	100	100	100	100
Lithuania	number of stations	27	27	27	27	27	28
	Of which with essential information (%)	100	100	100	100	100	100
Norway	number of stations	0	0	0	0	0	1
	Of which with essential information (%)	0	0	0	0	0	100
Poland	number of stations	5	17	17	16	15	15
	Of which with essential information (%)	100	100	100	100	100	100
Romania	number of stations	27	30	43	51	50	50
	stations with essential information	100	100	100	100	100	100
Slovak Republic	number of stations	0	0	0	0	24	26
	Of which with essential information (%)	0	0	0	0	100	100
Slovenia	number of stations	36	21	20	27	22	22
	Of which with essential information (%)	100	100	100	100	100	100
Switzerland	number of stations	5	5	5	5	5	10
	Of which with essential information (%)	100	100	100	100	100	100

1) Stations for which the following information is available: type of area, geographical co-ordinates, altitude and station name.

Annex D Non-directive components

Table D1 EU countries which have delivered measurement data of non-directive components, 2002 ¹⁾

Country	Time resolution ²⁾	Formula	EoI code ³⁾	Component	Number of stations
Austria	H	TSP	5	Total Suspended Particulates	81
Belgium	D	Cd	10	Cadmium	19
	D	As	11	Arsenic	11
	D	Hg	13	Mercury	1
	D	Ni	12	Nickel	16
	D	TSP	5	Total Suspended Particulates	1
Denmark	H	C ₆ H ₅ CH ₃	37	Toluene	1
	H	TSP	5	Total Suspended Particulates	63
Germany	D	TSP	5	Total Suspended Particulates	11
Finland	D	TSP	5	Total Suspended Particulates	2
France	H	T-VOC	.	Volatile organic components	7
Italy	H	TSP	5	Total Suspended Particulates	16
	D	TSP	5	Total Suspended Particulates	6
	H	CH ₄	48	Methane	2
	H	C ₆ H ₅ CH ₃	37	Toluene	19
	H	THC (NM)	45	Non-methane hydrocarbons	20
	H	H ₂ S	51	Hydrogen sulphide	3
	H	NH ₃	61	Ammonia	2
	D	NH ₄	.	Ammonium aerosol	7
	D	NO ₃	.	Nitrate aerosol	7
	D	SO ₄	.	Sulphate aerosol	7
	D	Cd	10	Cadmium	4
	D	As	11	Arsenic	4
	H	CH ₄	48	Methane	1
	D	C ₆ H ₅ CH ₃	37	Toluene	4
	H	NH ₃	61	Ammonia	8
Netherlands	D	VOC ⁴⁾	.	Volatile Organic Components	
	H	TSP	5	Total Suspended Particulates	93
	D	TSP	5	Total Suspended Particulates	27
	H	CH ₄	48	Methane	14
Spain	D	SA	46	Strong acidity	166
United Kingdom	D	SA	46	Strong acidity	166

1) Nitrogen monoxide (NO) and nitrogen oxides (NO_x) are not shown. Most networks perform nitrogen dioxide (NO₂) measurements on an hourly basis. Current technology allows that in these cases measurement results for nitrogen dioxide (NO₂), as well as for nitrogen monoxide (NO) and nitrogen oxides (NO_x), can be made available.

2) H: hour; D: day.

3) . : not reported.

4) VOC includes about 30 organic components.

Table D2 Non-EU countries which have delivered measurement data of non-directive components, 2002 ¹⁾

Country	Time resolution ²⁾	Formula	EoI Code ³⁾	Component	Number of stations
Bulgaria	H	HCl	.	Hydrogen chloride	1
	D	TSP	5	Total Suspended Particulates	34
	D	Cd	10	Cadmium	6
	H	H ₂ S	51	Hydrogen sulphide	27
	H	NH ₃	61	Ammonia	5
Estonia	D	TSP	5	Total Suspended Particulates	1
Iceland	H	C ₆ H ₅ CH ₃	37	Toluene	1
	H	THC (NM)	45	Non-methane hydrocarbons	1
	H	CH ₄	48	Methane	1
Lithuania	D	NH ₃ /NH ₄	.	Totale ammonium	1
	D	HNO ₃ /NO ₃	.	Total nitrate	1
	D	SO ₂ /SO ₄	.	Total sulphate	1
Norway	D	SO ₄	.	Sulphate aerosol	7
Poland	D	TSP	5	Total Suspended Particulates	2
Romania	D	SO ₄	.	Sulphate aerosol	2
	D	TSP	5	Total Suspended Particulates	15
	D	Cd	10	Cadmium	7
	D	HCHO	44	Formaldehyde	2
	D	NH ₃	61	Ammonia	14
Switzerland	H	THC (NM)	45	Non-methane hydrocarbons	4
<p>1) Nitrogen monoxide (NO) and nitrogen oxides (NO_x) are not shown. Most networks perform nitrogen dioxide (NO₂) measurements on an hourly basis. Current technology allows that in these cases measurement results for nitrogen dioxide (NO₂), as well as for nitrogen monoxide (NO) and nitrogen oxides (NO_x), can be made available.</p> <p>2) H: hour; D: day.</p> <p>3) . : not reported</p>					

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