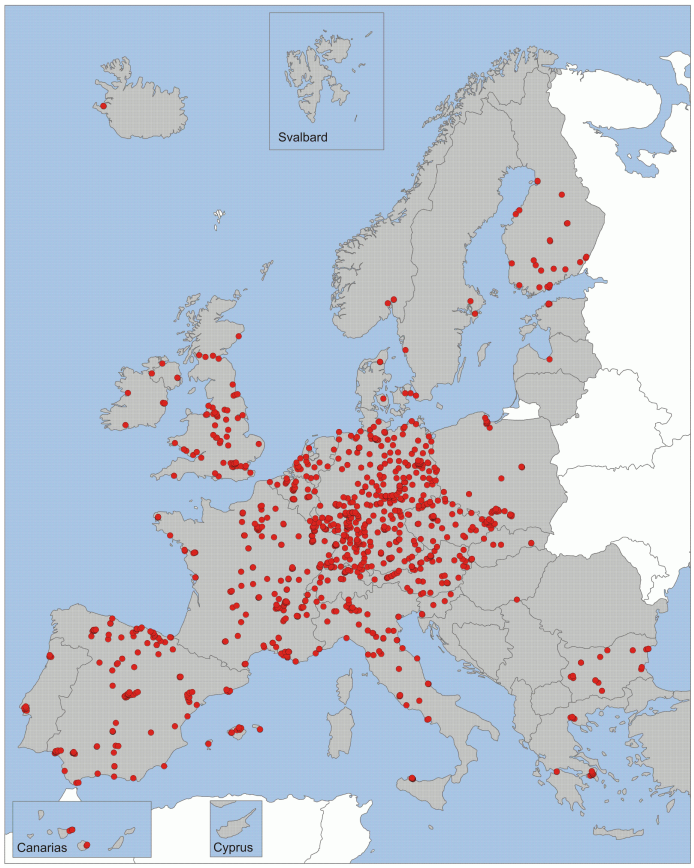
EUROPEAN EXCHANGE OF AIR QUALITY MONITORING META INFORMATION IN 2001



ETC/ACC Technical paper 2003/1
June 2003

E Buijsman, PR van Hooydonk, W Mol, J Fiala, FAAM de Leeuw

European Topic Centre
on Air and Climate Change

The European Topic Centre on Air and Climate Change (ETC/ACC) is a consortium of European institutes under contract of the European Environmental Agency
RIVM UBA-B UBA-V IIASA NILU AEAT AUTh CHMI DNMI NTUA ÖKO SHMU TNO

EUROPEAN EXCHANGE OF AIR QUALITY MONITORING META INFORMATION IN 2001

E Buijsman, PR van Hooydonk, W Mol, J Fiala, FAAM de Leeuw

ETC/ACC Technical paper 2003/1
June 2003

The European Topic Centre on Air and Climate Change (ETC/ACC) is a consortium of European institutes under contract of the European Environmental Agency
RIVM UBA-B UBA-V IIASA NILU AEAT AUTh CHMI DNMI NTUA ÖKO SHMU TNO

Front page: Stations reporting data on particulate matter (PM_{10}) in 2001; see also Figure 4.

Author affiliation:
E Buijsman, PR van Hooydonk, W Mol, and FAAM de Leeuw: National Institute for Public Health and the Environment, Bilthoven, The Netherlands.
J Fiala: Czech Hydrometeorological Institute, Prague, Czech Republic.

Figures in this report have been produced by the Czech Hydrometeorological Institute (Český hydrometeorologický ústav).

ETC/ACC Technical paper 2003/1
European Topic Centre on Air and Climate Change
PO Box 1
3720 BA Bilthoven
The Netherlands
Phone +31 30 2743550
Fax +31 30 2744433
Email etcacc@rivm.nl
Website http://etc-acc.eionet.eu.int/

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 dataflows that have been exchanged among the Member States, EFTA states, Accession Countries, some other countries and the Commission. The information is to be made available to Member States in a database.

The results of the reporting cycle presented in this particular technical report cover data for 2001. This report contains information delivered by EU Member and EFTA states, and Switzerland and the Accession Countries, who have agreed to follow the data exchange procedures.

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). Twenty-eight countries in total, including 14 EU Member States, provided air quality data for 2001. As in preceding years a large number of time series were transmitted, covering such substances as sulphur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM_{10}), ozone (O_3), carbon monoxide (CO), benzene (C_6H_6) and black smoke.

Most countries provided 2001 data only. However, several countries provided data from previous years, which were loaded into AIRBASE as well. An overview of the AIRBASE contents is included 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. Certain types of information are lacking or incomplete. 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 to be taken 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, 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. Major improvements in this respect could be achieved by a number of countries.
- Establishing an ongoing critical review 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 in having the information in AIRBASE thoroughly examined and, if necessary, removed or supplemented.
- Further extending past measurement series.
- Incorporating information on correction factors for particulate matter measurements as being of the utmost importance.

CONTENTS

1. INTRODUCTION

Countries of the European Union have a long tradition of exchanging 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 recently amended to adapt the list of pollutants covered as well as requirements on additional information, validation and aggregation (Decision 2001/752/EC; see EU 2001). Data submission followed the revised Annex II of the Decision (EU, 2001) for 2001.

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 Member States in a database. The decision also states that the Commission will call upon the European Environment Agency (EEA) with regard to the operation and practical implementation of the information system. The European Topic Centre on Air Quality 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 the Internet via the ETC-ACC website [1]. Data to be delivered under the EoI include information on measurement stations, measurement techniques and data quality (*Table 1*).

The technical reports on both transmitted meta information and transmitted air quality dataflows have been combined into this report. 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 EU Member States and other European countries that have agreed to follow the data exchange procedures.

Table 1 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
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. META INFORMATION FOR 2001

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, 2001). 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' [2].

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
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

[1)] Numbers according to Annex II of the EoI (EU, 2001)

The EoI Decision defines a system aiming to classify 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*. The station is located such that its pollution level is determined predominantly by the emissions from nearby traffic (roads, motorways).
- *Industrial*. The station is located such that its pollution level is influenced predominantly by emissions from nearby single industrial sources or industrial areas with many sources.
- *Background*. The station is 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*) cities.

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

[2] See Annex A for overview.

2.2. Results

Twenty-eight countries, including 14 EU Member States, have provided air quality data for the reporting year 2001 [3]. The delivery of data is facilitated by a tool, the Data Exchange Module (DEM), which has been developed by the ETC/ACC. This tool was used by most countries. Some countries provided (part of) their data in separate files. All data delivered for the reporting year 2001 has been loaded into AIRBASE.

Transmitted data cover mainly sulphur dioxide (SO_2), nitrogen dioxide (NO_2), nitrogen monoxide (NO), nitrogen oxides (NO_x), ozone (O_3), total suspended particulates (TSP), carbon monoxide (CO), black smoke, particulate matter (PM_{10}, $PM_{2.5}$), benzene (C_6H_6), lead and strong acidity. A relatively small number of time series was submitted for less commonly monitored components. Although this report overviews the available information up to April 2003, data processing is an ongoing process, so please refer to the AIRBASE website [4] for the most recent overview of the progress in processing the data.

Most countries provided 2001 data only. Upon request of the ETC/ACC, several countries provided data from previous years as well. 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 3 for lead to 26 for sulphur dioxide. The number of stations varied accordingly, being 21 for $PM_{2.5}$ and 1876 for nitrogen dioxide [5]. Consequently, the distribution and density of stations throughout Europe shows differences (*Figures 1 through 4)* [6]. 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. However, stations that only delivered statistics are not considered. Furthermore, these overviews cover only components under the EoI. Sometimes countries delivered more data than defined under the EoI. See Annex E for a summary of these supplementary components.

In comparison with previous years, the number of countries delivering data and the number of stations for which data are reported have increased.

[3] Almost all countries delivered basic data. Bosnia Herzegovina delivered only statistical data.
[4] http://etc-acc.eionet.eu.int/databases/airbase.html.
[5] Information on the type of stations per country is given in Annex B.
[6] Locations for a number of other components are given in Annex C.

Table 3 Number of stations per pollutant and station type, 2001

	Daughter directives								Other directives
	1					2		3	
	Sulphur dioxide	Nitrogen dioxide	Particulate matter (<10 µm)	Particulate matter (< 2.5 µm)	Lead	Carbon monoxide	Benzene	Ozone	Black smoke
Reporting EU countries	**14**	**14**	**14**	**4**	**3**	**13**	**4**	**14**	**5**
Total number of stations	**1711**	**1808**	**922**	**19**	**55**	**838**	**119**	**1427**	**258**
Of which									
Traffic	386	526	296	5	13	416	63	261	15
Urban background	604	668	400	10	17	295	28	625	207
Industrial	315	189	79	0	14	37	5	98	11
Regional background	270	267	85	1	11	34	2	316	23
Other [1)]	136	158	62	3	0	56	21	127	2
Reporting non-EU countries	**14**	**13**	**11**	**2**	**2**	**8**	**0**	**12**	**2**
Total number of stations	**248**	**226**	**145**	**4**	**29**	**83**	**0**	**142**	**34**
Of which									
Traffic	32	31	24	2	0	19	0	18	9
Urban background	154	135	86	1	26	49	0	63	22
Industrial	14	11	6	1	3	5	0	8	3
Regional background	48	49	29	0	0	10	0	53	0
Other [1)]	0	0	0	0	0	0	0	0	0
All countries	**28**	**27**	**25**	**6**	**5**	**21**	**4**	**26**	**7**
Total number of stations	**1959**	**2034**	**1067**	**23**	**84**	**921**	**119**	**1569**	**292**

[1)] Primarily unknown

Figure 1 Location of stations for which 2001 air quality data for sulphur dioxide (SO_2) have been reported.

Figure 2 Location of stations for which 2001 air quality data for ozone (O_3) have been reported.

Figure 3 Location of stations for which 2001 air quality data for nitrogen dioxide (NO_2) have been reported.

Figure 4 Location of stations for which 2001 air quality data for particulate matter (PM_{10}) have been reported.

Table 4 Number of stations in EU countries for which data for components of daughter and other directives are available in AIRBASE, 2001

	Time resolution [1]	Formula (or abbreviation)	EoI code	Austria	Belgium	Denmark	Finland	France	Germany	Greece	Ireland	Italy	Luxembourg [2]	Netherlands	Portugal	Spain	Sweden	United Kingdom	**All countries**
Gaseous inorganic components																			
Carbon monoxide	H	CO	9	49	9	6	4	93	300	14		114		21	18	138	4	68	**838**
Nitrogen dioxide	H	NO_2	2	147	42	10	22	459	464	27	6	168		44	23	276	8	98	**1794**
Nitrogen dioxide	D	NO_2	2														14		**14**
Ozone	H	O_3	7	113	32	9	12	396	372	23	6	109		37	18	215	9	76	**1427**
Sulphur dioxide	H	SO_2	1	146	64	2	9	483	421	21	3	124		37	21	283	6	76	**1696**
Sulphur dioxide	D	SO_2	1			3	4									1	7		**15**
Gaseous organic components																			
Benzene	H	C_6H_6	8						79			32							**111**
Benzene	D	C_6H_6	8		4									4					**8**
Particles and particle-bound components																			
Lead	D	Pb	12		42	9								4					**55**
Black smoke	D	BS	14		22									14		33	10	179	**258**
Particulate matter (<10 µm)	H	PM_{10}	3				25		303	14		54		19	11	134	4	63	**627**
Particulate matter (<10 µm)	D	PM_{10}	3	53	23	5		208			6								**295**
Particulate matter (<2.5 µm)	H	$PM_{2.5}$	4	1	3		2												**6**
Particulate matter (<2.5 µm)	D	$PM_{2.5}$	4					13											**13**

[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 and other directives are available in AirBase, 2001 [1)]

	Time resolution [2)]	Formula (or abbreviation)	EoI code	Bosnia and Herzegovina [3)]	Bulgaria	Czech Republic	Estonia	F.Y.R.O.M.	Hungary	Iceland	Latvia	Lithuania	Norway	Poland	Romania	Slovak Republic	Slovenia	Switzerland	**All non-EU countries**
Gaseous inorganic components																			
Carbon monoxide	H	CO	9		9	27	4		1	1				25		4		12	**83**
Nitrogen dioxide	H	NO_2	2		45	55	6		1	1	7		1	30		7	2	29	**184**
Nitrogen dioxide	D	NO_2	2						1		2	1	6	18	14				**42**
Ozone	H	O_3	7		9	35	6		2	2	8	2	10	21		13	5	29	**142**
Sulphur dioxide	H	SO_2	1		47	55	6		1	1	8		1	18		8	3	16	**164**
Sulphur dioxide	D	SO_2	1					24	1		2	1	7	30	19				**84**
Gaseous organic components																			
Benzene	H	C_6H_6	8																**0**
Particles and particle-bound components																			
Lead	D	Pb	6		22										7				**29**
Black smoke	D	BS	11					27						7					**34**
Particulate matter (<10 µm)	H	PM_{10}	3						1				3			6	3	1	**14**
Particulate matter (<10 µm)	D	PM_{10}	3		18	55	3			2	1			32				20	**131**
Particulate matter (<2.5 µm)	D	$PM_{2.5}$	4							1				3					**4**

[1)] No information recieved from Albania and Liechenstein

[2)] H: hour; D: day

[3)] Only statistical data received

3. LONG-TERM META INFORMATION

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). Also the non-EU Member States, which are members of the European Environment Agency (EEA), are 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, which originates in the former EU databases, APIS [7] and GIRAFE [8], 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 time series is at the moment limited. 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. From the perspective of a proper long-term evaluation of air quality and of the influence of abatement measures to improve air quality, long-term air quality time series are most welcome. Another problem arising from the incorporation of old database information is that AIRBASE may contain information on stations that is obsolete and that should be updated.

Table 6 Average length of time series for components of the daughter and other directives

Component	Length of time series	Component	Length of time series
	Year		*Year*
Sulphur dioxide	4.1	Lead	4.3
Nitrogen dioxide	3.8	Ozone	4.0
Particulate matter (<10 μm)	2.3	Benzene	1.5
Particulate matter (<2.5 μm)	1.0	Carbon monoxide	3.2
Suspended particulates	3.4	Black smoke	5.9

AIRBASE holds different types of meta information, which may be of help in making a proper evaluation of measurement data. Available information includes:
- 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.
- Statistical aggregated data.

[7] APIS (Air Pollution Information System) was the EU database with air quality data.
[8] GIRAFE (Guide d'Information sur les Réseaux de surveillance de la qualité de l'Air Fonctionnant en Europe) was the EU database with 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 stations [2] (2001)
EU countries		
Austria	1990-2001	186
Belgium	1975-2001	135
Denmark	1976-2001	16
Finland	1990-2001	48
France	1968-2001	684
Germany	1976-2001	507
Greece	1983-2001	27
Ireland	1973-2001	14
Italy	1976-2001	210
Luxembourg	1976-1993	0
Netherlands	1976-2001	48
Portugal	1986-2001	26
Spain	1986-2001	318
Sweden	1993-2001	25
United Kingdom	1969-2001	296
Non-EU countries		
Albania	[1]	0
Bosnia Herzegovina	1997-2001	27
Bulgaria	1998-2001	50
Czech Republic	1992-2001	55
Estonia	1997-2001	6
FYROM	1997-2001	27
Hungary	1997-2001	2
Iceland	1993-2001	3
Latvia	1997-2001	10
Liechtenstein	[1]	0
Lithuania	1997-2001	2
Norway	1994-2001	15
Poland	1997-2001	50
Romania	2001-2001	24
Slovak Republic	1995-2001	18
Slovenia	1997-2001	5
Switzerland	1992-2001	30

[1] No information in AIRBASE

[2] Irrespective of the component(s) measured

Long-term measurement series provide valuable information, for instance, for policy evaluation, for determining the effect of abatement measures and for trend analysis. Since AIRBASE became operational in 1996, the average length of the time series in AirBase is relatively short (*Figure 5*). 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 daughter directives define criteria for the minimal data capture, *i.e.* 90% (EU, 1999 and EU, 2000) or, in a single case, a differentiated set of criteria (EU, 2002). Thus, data capture can be used to investigate if countries are complying with the daughter directives. Indeed, data capture is a general measure for the performance of a complete monitoring system but not necessarily 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.

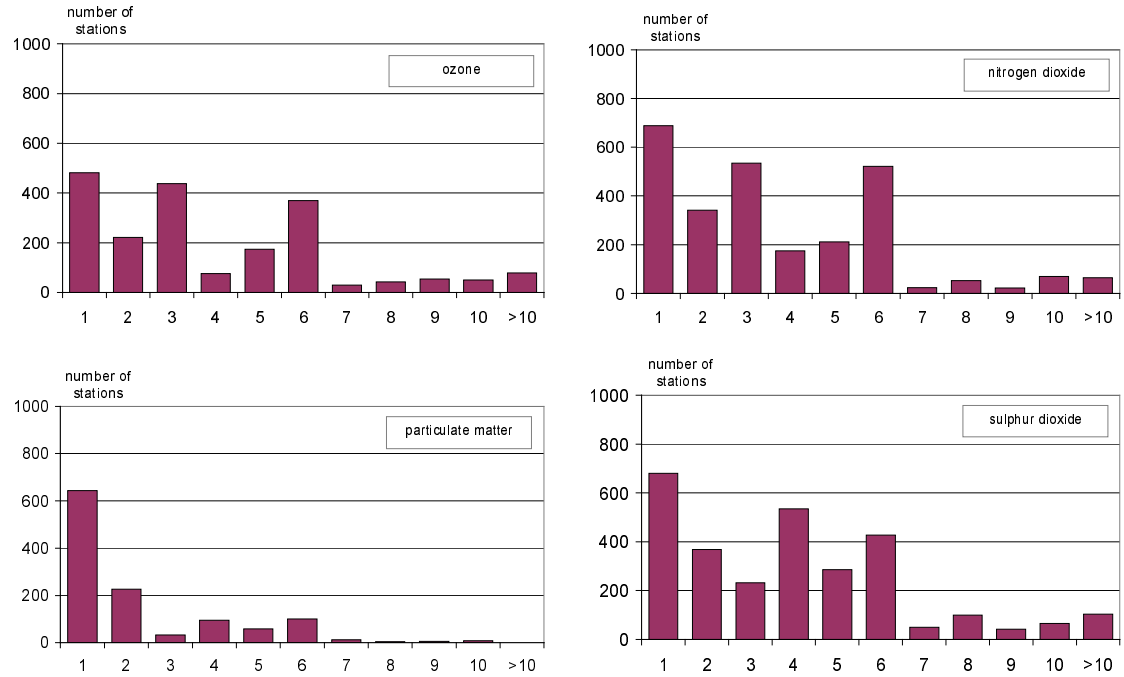


Figure 5 Length of time series (in years) in AIRBASE for ozone (top left), nitrogen dioxide (top right), particulate matter (<10 µm) (bottom left) and sulphur dioxide (bottom right).

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. To refer to this fact, an additional column in Table 8 shows the mandatory part of the information.

Table 8 Number of stations, 2001

Country	Total number of stations	With mandatory information [1]	Effective percentage of stations [2]	Country	Total number of stations	With mandatory information [1]	Effective percentage of stations [2]
EU countries				**Non-EU countries**			
			%				%
Austria	186	100	100	Albania	[3]	.	.
Belgium	135	100	100	Bosnia Herzegovina	27	100	100
Denmark	16	100	100	Bulgaria	50	100	100
Finland	48	100	100	Czech Republic	55	100	100
France	684	71	68	Estonia	6	100	100
Germany	507	84	82	FYROM	27	100	100
Greece	27	100	100	Hungary	2	100	100
Ireland	14	100	100	Iceland	3	100	100
Italy	210	92	92	Latvia	10	100	100
Luxembourg	[3]	.	.	Liechtenstein	[3]	.	.
Netherlands	48	100	100	Lithuania	2	100	100
Portugal	26	100	100	Norway	15	100	100
Spain	318	93	93	Poland	50	100	100
Sweden	25	100	100	Romania	24	100	100
United Kingdom	296	99	99	Slovak Republic	18	100	100
				Slovenia	5	100	100
				Switzerland	30	100	100

[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] 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. In some respects the absence or incompleteness of certain types of meta information hampers the performance of AirBase. For instance, if information on the type of station is missing, the measurement results for this station are, in most cases, very restricted. This emphasises the urgent need to deliver complete (meta) information to AIRBASE.

At first, AIRBASE was meant 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 (meta) information among the countries. Gradually, priorities have changed and nowadays AIRBASE IS more and more a tool for analysing and evaluating air quality. AIRBASE has developed from a database for storing information into a user-oriented database for retrieving information. In consequence, the user friendliness of AIRBASE should, in the light of these new demands, be improved. However, it is essential to maintain the validity of AIRBASE data.

The quality of data in AIRBASE, measurement data as well as meta information, is an item of ongoing concern. 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, being the technical manager of AIRBASE, should help in improving the overall quality of the data. As occasionally questionable data have been found to be present, the ETC/ACC decided to implement supplementary quality control procedures as an additional check on incoming data [9]. Nevertheless, an ongoing 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.

AIRBASE incorporates meta information originating from the former EU databases, APIS and GIRAFE. The aim here was to create 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 contains inadequate, incomplete or sometimes even erroneous information. Removing this faulty information and either removing or supplementing incomplete data 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 (PM_{10}, $PM_{2.5}$) data have been processed. Recent reviews show that countries act differently with respect to the use of a correction factor (Anonymus, 1997). 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 correction or not. This poses a risk to potential users of these data, as they are not aware of possible inconsistencies between data from different networks. Information on the use of correction factors for particulate matter is necessary for appropriate use of particulate matter data.

Recently, valuable air quality analyses have been performed on the basis of data from AIRBASE (EEA, 2003a, 2003b and De Leeuw, 2000), clearly showing the potential for analysis on a pan-European level. Further expansion of historical time series will strengthen the quality of assessments.

[9] Mainly tests for the occurrence of extreme values.

5. RECOMMENDATIONS

From the previous chapters, it has become clear that several improvements in AIRBASE can be realised. Certain types of information are lacking or incomplete. Quality improvement of AIRBASE should focus on actions which, from a user's perspective, are 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. Major improvements in this respect could be achieved by a number of countries.
- Establishing an ongoing critical review 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 in having the information in AIRBASE thoroughly examined and, if necessary, removed or supplemented.
- Further extending past measurement series.
- Incorporating information on correction factors for particulate matter measurements as being of the utmost importance.

REFERENCES

Anonymous. 1997. Ambient air pollution by particulate matter. Position paper. European Commission, Brussels.

De Leeuw FAAM. 2000. Trends in ground level ozone concentrations in the European Union. *Environmental Science & Policy* **3**, 189-199.

EEA. 2003a. Air quality in Europe: state and trends 1990-1999. EEA Topic Report 4/2002 10.

EEA. 2003b. Air Pollution in Europe. Developments 1990-2000. EEA Issue Report, in press.

EU. 1997. Council Decision of 27 January 1997 establishing a reciprocal exchange of information and data from networks and individual stations measuring ambient air pollution within the Member States (97/101/EC). Official Journal L 035, 05/02/1997, pp. 14-22.

EU. 1999. Council Directive 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air (99/30/EC). Official Journal L 163, 29/06/1999, pp. 41–60.

EU. 2001. Commission Decision of 17 October 2001 amending the Annexes to Council 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 (2001/752/EC). Official Journal L 282, 26/10/2001, pp. 69–76.

Garber W, Colosio J, Grittner S, Larssen S, Rasse D, Schneider J, Houssiau M. 2002. Guidance on the Annexes to Decision 97/101/EC on Exchange of Information as revised by Decision 2001/752/EC. European Commission, DG Environment, Brussels.

[10] See also http://reports.eea.eu.int/topic_report_2002_4/en.

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, 2001). Part of the information which is mentioned in the 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 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

[1)] Numbers according to the Annex II of the Exchange of Information (EU, 2001)

Annex B Number and type of stations per pollutant, 2001

Table B1 Sulphur dioxide (SO_2)

Country	**Total number of stations**	Traffic	Urban back-ground	Industrial	Regional back-ground	Unknown
EU countries						
Austria	**146**	26	48	22	50	0
Belgium	**64**	11	29	11	13	0
Denmark	**5**	2	0	0	3	0
Finland	**13**	2	0	4	7	0
France	**483**	43	185	145	35	75
Germany	**421**	98	200	14	69	40
Greece	**21**	9	7	4	1	0
Ireland	**3**	2	0	1	0	0
Italy	**124**	44	28	39	13	0
Luxembourg	**.**	.	.	.	.	.
Netherlands	**37**	5	10	0	22	0
Portugal	**21**	5	10	4	2	0
Spain	**284**	129	22	67	45	21
Sweden	**13**	2	7	0	4	0
United Kingdom	**76**	8	58	4	6	0
Non-EU countries						
Albania	**.**	.	.	.	.	.
Bosnia Herzegovina	**.**	.	.	.	.	.
Bulgaria	**47**	0	47	0	0	0
Czech Republic	**55**	6	29	1	19	0
Estonia	**6**	1	1	1	3	0
FYROM	**24**	9	12	3	0	0
Hungary	**2**	1	0	0	1	0
Iceland	**1**	1	0	0	0	0
Latvia	**10**	3	4	0	3	0
Liechtenstein	**.**	.	.	.	.	.
Lithuania	**1**	0	0	0	1	0
Norway	**8**	0	0	0	8	0
Poland	**48**	2	34	3	9	0
Romania	**19**	1	13	5	0	0
Slovak Republic	**8**	3	5	0	0	0
Slovenia	**3**	1	2	0	0	0
Switzerland	**16**	4	7	1	4	0

Table B2 Nitrogen dioxide (NO_2)

Country	**Total number of stations**	Traffic	Urban back-ground	Industrial	Regional back-ground	Unknown
EU countries						
Austria	**147**	36	53	16	42	0
Belgium	**42**	7	16	12	7	0
Denmark	**10**	4	4	0	2	0
Finland	**22**	11	3	3	5	0
France	**459**	73	210	56	36	84
Germany	**464**	109	217	13	72	53
Greece	**27**	12	10	4	1	0
Ireland	**6**	4	0	0	2	0
Italy	**168**	87	38	22	21	0
Luxembourg	**.**	.	.	.	.	.
Netherlands	**44**	13	9	0	22	0
Portugal	**23**	9	10	2	2	0
Spain	**276**	134	20	56	45	21
Sweden	**22**	4	14	0	4	0
United Kingdom	**98**	23	64	5	6	0
Non-EU countries						
Albania	**.**	.	.	.	.	.
Bosnia Herzegovina	**.**	.	.	.	.	.
Bulgaria	**45**	0	45	0	0	0
Czech Republic	**55**	6	29	1	19	0
Estonia	**6**	1	1	1	3	0
FYROM	**0**	0	0	0	0	0
Hungary	**2**	1	0	0	1	0
Iceland	**1**	1	0	0	0	0
Latvia	**9**	3	3	0	3	0
Liechtenstein	**.**	.	.	.	.	.
Lithuania	**1**	0	0	0	1	0
Norway	**7**	1	0	0	6	0
Poland	**48**	2	34	3	9	0
Romania	**14**	4	7	3	0	0
Slovak Republic	**7**	2	5	0	0	0
Slovenia	**2**	1	1	0	0	0
Switzerland	**29**	9	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	**53**	23	14	8	8	0
Belgium	**23**	4	13	5	1	0
Denmark	**5**	3	1	0	1	0
Finland	**25**	18	6	1	0	0
France	**208**	33	116	24	9	26
Germany	**303**	82	152	9	36	24
Greece	**14**	8	4	2	0	0
Ireland	**6**	4	2	0	0	0
Italy	**53**	34	16	2	2	0
Luxembourg	**.**	.	.	.	.	.
Netherlands	**19**	5	6	0	8	0
Portugal	**11**	3	7	1	0	0
Spain	**134**	69	13	23	17	12
Sweden	**4**	2	2	0	0	0
United Kingdom	**63**	8	48	4	3	0
Non-EU countries						
Albania	**.**	.	.	.	.	.
Bosnia Herzegovina	**.**	.	.	.	.	.
Bulgaria	**18**	0	18	0	0	0
Czech Republic	**55**	6	29	1	19	0
Estonia	**3**	1	1	1	0	0
FYROM	**0**	0	0	0	0	0
Hungary	**1**	1	0	0	0	0
Iceland	**2**	2	0	0	0	0
Latvia	**1**	1	0	0	0	0
Liechtenstein	**.**	.	.	.	.	.
Lithuania	**0**	0	0	0	0	0
Norway	**3**	1	2	0	0	0
Poland	**32**	2	23	3	4	0
Romania	**0**	0	0	0	0	0
Slovak Republic	**6**	2	4	0	0	0
Slovenia	**3**	1	2	0	0	0
Switzerland	**21**	7	7	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
Denmark	**0**	0	0	0	0	0
Finland	**2**	1	1	0	0	0
France	**13**	4	6	0	0	3
Germany	**0**	0	0	0	0	0
Greece	**0**	0	0	0	0	0
Ireland	**0**	0	0	0	0	0
Italy	**0**	0	0	0	0	0
Luxembourg	**.**	.	.	.	.	.
Netherlands	**0**	0	0	0	0	0
Portugal	**0**	0	0	0	0	0
Spain	**0**	0	0	0	0	0
Sweden	**0**	0	0	0	0	0
United Kingdom	**0**	0	0	0	0	0
Non-EU countries						
Albania	**.**	.	.	.	.	.
Bosnia Herzegovina	**.**	.	.	.	.	.
Bulgaria	**0**	0	0	0	0	0
Czech Republic	**0**	0	0	0	0	0
Estonia	**0**	0	0	0	0	0
FYROM	**0**	0	0	0	0	0
Hungary	**0**	0	0	0	0	0
Iceland	**1**	1	0	0	0	0
Latvia	**0**	0	0	0	0	0
Liechtenstein	**.**	.	.	.	.	.
Lithuania	**0**	0	0	0	0	0
Norway	**0**	0	0	0	0	0
Poland	**3**	1	1	1	0	0
Romania	**0**	0	0	0	0	0
Slovak Republic	**0**	0	0	0	0	0
Slovenia	**0**	0	0	0	0	0
Switzerland	**0**	0	0	0	0	0

Table B5 Lead

Country	**Total number of stations**	Traffic	Urban back-ground	Industrial	Regional back-ground	Unknown
EU countries						
Austria	**0**	0	0	0	0	0
Belgium	**42**	8	14	14	6	0
Denmark	**9**	4	1	0	4	0
Finland	**0**	0	0	0	0	0
France	**0**	0	0	0	0	0
Germany	**0**	0	0	0	0	0
Greece	**0**	0	0	0	0	0
Ireland	**0**	0	0	0	0	0
Italy	**0**	0	0	0	0	0
Luxembourg	**.**	.	.	.	.	.
Netherlands	**4**	1	2	0	1	0
Portugal	**0**	0	0	0	0	0
Spain	**0**	0	0	0	0	0
Sweden	**0**	0	0	0	0	0
United Kingdom	**0**	0	0	0	0	0
Non-EU countries						
Albania	**.**	.	.	.	.	.
Bosnia Herzegovina	**.**	.	.	.	.	.
Bulgaria	**22**	0	22	0	0	0
Czech Republic	**0**	0	0	0	0	0
Estonia	**0**	0	0	0	0	0
FYROM	**0**	0	0	0	0	0
Hungary	**0**	0	0	0	0	0
Iceland	**0**	0	0	0	0	0
Latvia	**0**	0	0	0	0	0
Liechtenstein	**.**	.	.	.	.	.
Lithuania	**0**	0	0	0	0	0
Norway	**0**	0	0	0	0	0
Poland	**0**	0	0	0	0	0
Romania	**7**	0	0	4	3	0
Slovak Republic	**0**	0	0	0	0	0
Slovenia	**0**	0	0	0	0	0
Switzerland	**0**	0	0	0	0	0

Table B6 Carbon monoxide (CO)

Country	**Total number of stations**	Traffic	Urban back-ground	Industrial	Regional back-ground	Unknown
EU countries						
Austria	**49**	23	14	7	5	0
Belgium	**9**	3	5	1	0	0
Denmark	**6**	5	1	0	0	0
Finland	**4**	4	0	0	0	0
France	**93**	56	24	1	4	8
Germany	**300**	101	148	7	11	33
Greece	**14**	9	2	3	0	0
Ireland	**0**	0	0	0	0	0
Italy	**114**	75	30	3	6	0
Luxembourg	**.**	.	.	.	.	.
Netherlands	**21**	12	4	0	5	0
Portugal	**18**	8	9	1	0	0
Spain	**138**	100	9	11	3	15
Sweden	**4**	2	2	0	0	0
United Kingdom	**68**	18	47	3	0	0
Non-EU countries						
Albania	**.**	.	.	.	.	.
Bosnia Herzegovina	**.**	.	.	.	.	.
Bulgaria	**9**	0	9	0	0	0
Czech Republic	**27**	3	20	1	3	0
Estonia	**4**	1	1	1	1	0
FYROM	**0**	0	0	0	0	0
Hungary	**1**	1	0	0	0	0
Iceland	**1**	1	0	0	0	0
Latvia	**0**	0	0	0	0	0
Liechtenstein	**.**	.	.	.	.	.
Lithuania	**0**	0	0	0	0	0
Norway	**0**	0	0	0	0	0
Poland	**25**	2	16	3	4	0
Romania	**0**	0	0	0	0	0
Slovak Republic	**4**	3	1	0	0	0
Slovenia	**0**	0	0	0	0	0
Switzerland	**12**	8	2	0	2	0

Table B7 Benzene (C_6H_6)

Country	**Total number of stations**	Traffic	Urban back-ground	Industrial	Regional back-ground	Unknown
EU countries						
Austria	**0**	0	0	0	0	0
Belgium	**4**	2	2	0	0	0
Denmark	**0**	0	0	0	0	0
Finland	**0**	0	0	0	0	0
France	**0**	0	0	0	0	0
Germany	**79**	38	18	1	1	21
Greece	**0**	0	0	0	0	0
Ireland	**0**	0	0	0	0	0
Italy	**32**	22	6	4	0	0
Luxembourg	**.**	.	.	.	.	.
Netherlands	**4**	1	2	0	1	0
Portugal	**0**	0	0	0	0	0
Spain	**0**	0	0	0	0	0
Sweden	**0**	0	0	0	0	0
United Kingdom	**0**	0	0	0	0	0
Non-EU countries						
Albania	**.**	.	.	.	.	.
Bosnia Herzegovina	**.**	.	.	.	.	.
Bulgaria	**0**	0	0	0	0	0
Czech Republic	**0**	0	0	0	0	0
Estonia	**0**	0	0	0	0	0
FYROM	**0**	0	0	0	0	0
Hungary	**0**	0	0	0	0	0
Iceland	**0**	0	0	0	0	0
Latvia	**0**	0	0	0	0	0
Liechtenstein	**.**	.	.	.	.	.
Lithuania	**0**	0	0	0	0	0
Norway	**0**	0	0	0	0	0
Poland	**0**	0	0	0	0	0
Romania	**0**	0	0	0	0	0
Slovak Republic	**0**	0	0	0	0	0
Slovenia	**0**	0	0	0	0	0
Switzerland	**0**	0	0	0	0	0

Table B8 Ozone (O_3)

Country	**Total number of stations**	Traffic	Urban back-ground	Industrial	Regional back-ground	Unknown
EU countries						
Austria	**113**	12	39	8	54	0
Belgium	**32**	3	14	3	12	0
Denmark	**9**	2	3	0	4	0
Finland	**12**	1	2	0	9	0
France	**396**	10	209	22	55	100
Germany	**372**	55	218	8	83	8
Greece	**23**	8	10	4	1	0
Ireland	**6**	0	0	1	5	0
Italy	**109**	38	40	11	20	0
Luxembourg	**.**	.	.	.	.	.
Netherlands	**37**	8	7	0	22	0
Portugal	**18**	5	8	3	2	0
Spain	**215**	114	18	36	28	19
Sweden	**9**	2	3	0	4	0
United Kingdom	**76**	3	54	2	17	0
Non-EU countries						
Albania	**.**	.	.	.	.	.
Bosnia Herzegovina	**.**	.	.	.	.	.
Bulgaria	**9**	0	9	0	0	0
Czech Republic	**35**	2	18	1	14	0
Estonia	**6**	1	1	1	3	0
FYROM	**0**	0	0	0	0	0
Hungary	**2**	1	0	0	1	0
Iceland	**2**	2	0	0	0	0
Latvia	**8**	3	3	0	2	0
Liechtenstein	**.**	.	.	.	.	.
Lithuania	**2**	0	0	0	2	0
Norway	**10**	0	0	0	10	0
Poland	**21**	0	11	1	9	0
Romania	**0**	0	0	0	0	0
Slovak Republic	**13**	0	9	1	3	0
Slovenia	**5**	1	2	0	2	0
Switzerland	**29**	8	10	4	7	0

Table B9 Black smoke

Country	**Total number of stations**	Traffic	Urban back-ground	Industrial	Regional back-ground	Unknown
EU countries						
Austria	**0**	0	0	0	0	0
Belgium	**22**	0	18	4	0	0
Denmark	**0**	0	0	0	0	0
Finland	**0**	0	0	0	0	0
France	**0**	0	0	0	0	0
Germany	**0**	0	0	0	0	0
Greece	**0**	0	0	0	0	0
Ireland	**0**	0	0	0	0	0
Italy	**0**	0	0	0	0	0
Luxembourg	**.**	.	.	.	.	.
Netherlands	**14**	3	3	0	8	0
Portugal	**0**	0	0	0	0	0
Spain	**33**	12	2	6	13	0
Sweden	**10**	0	8	0	2	0
United Kingdom	**179**	0	176	1	0	2
Non-EU countries						
Albania	**.**	.	.	.	.	.
Bosnia Herzegovina	**.**	.	.	.	.	.
Bulgaria	**0**	0	0	0	0	0
Czech Republic	**0**	0	0	0	0	0
Estonia	**0**	0	0	0	0	0
FYROM	**27**	9	15	3	0	0
Hungary	**0**	0	0	0	0	0
Iceland	**0**	0	0	0	0	0
Latvia	**0**	0	0	0	0	0
Liechtenstein	**.**	.	.	.	.	.
Lithuania	**0**	0	0	0	0	0
Norway	**0**	0	0	0	0	0
Poland	**7**	0	7	0	0	0
Romania	**0**	0	0	0	0	0
Slovak Republic	**0**	0	0	0	0	0
Slovenia	**0**	0	0	0	0	0
Switzerland						

Annex C Measuring sites for black smoke, carbon monoxide, lead and benzene, 2001

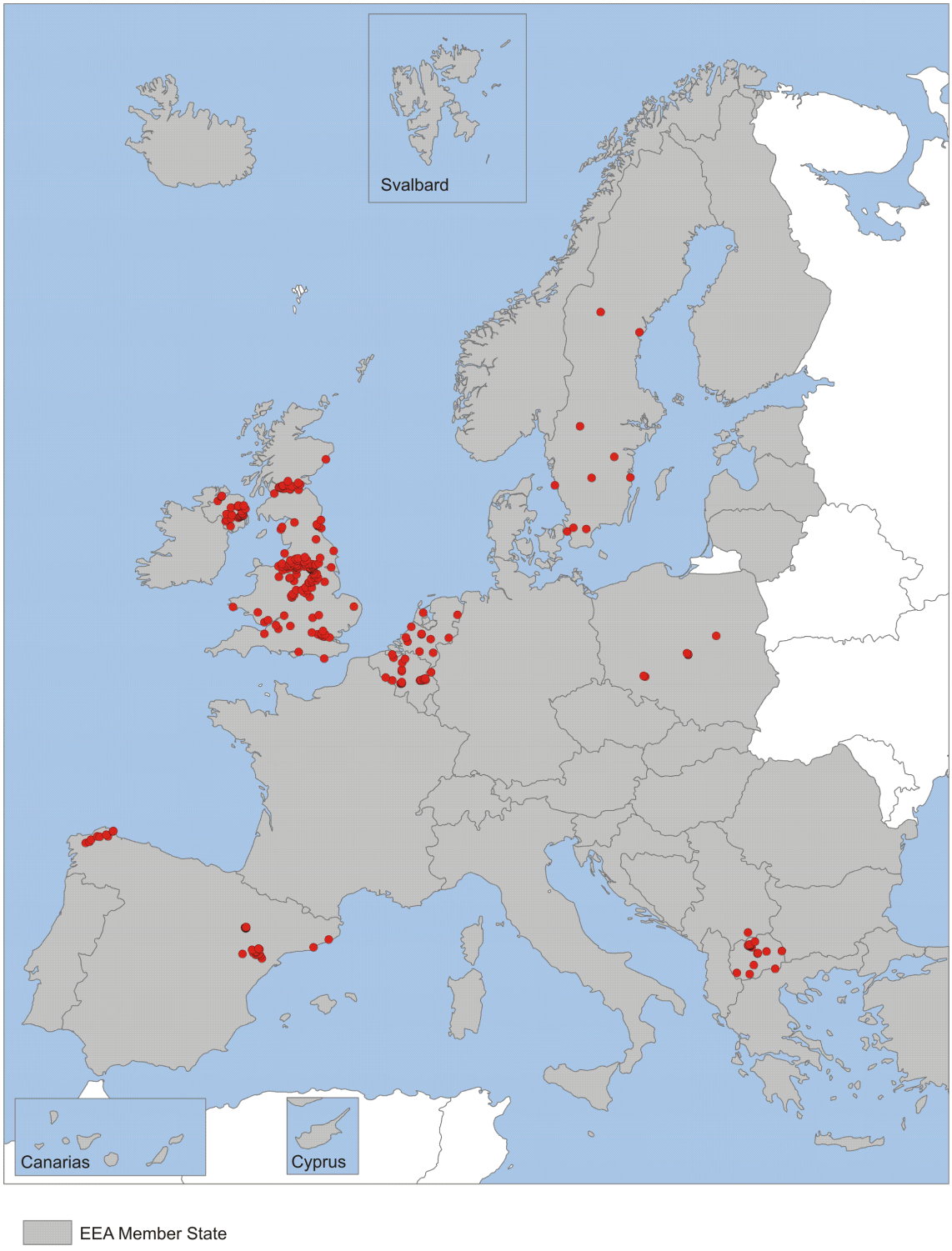


Figure C1 Location of stations for which 2001 air quality data for black smoke have been reported.

Figure C2 Location of stations for which 2001 air quality data for carbon monoxide (CO) have been reported.

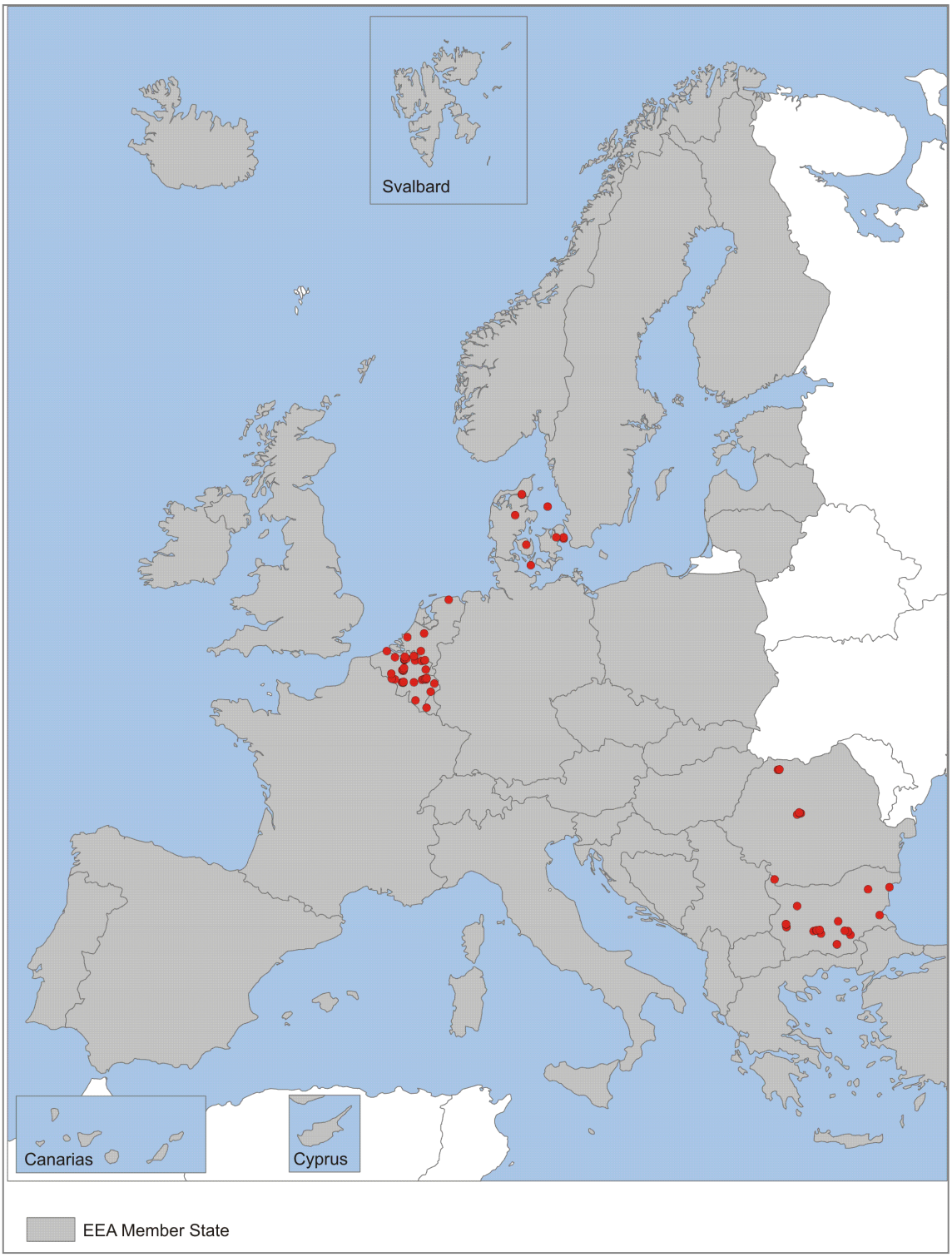


Figure C3 Location of stations for which 2001 air quality data for lead (Pb) have been reported

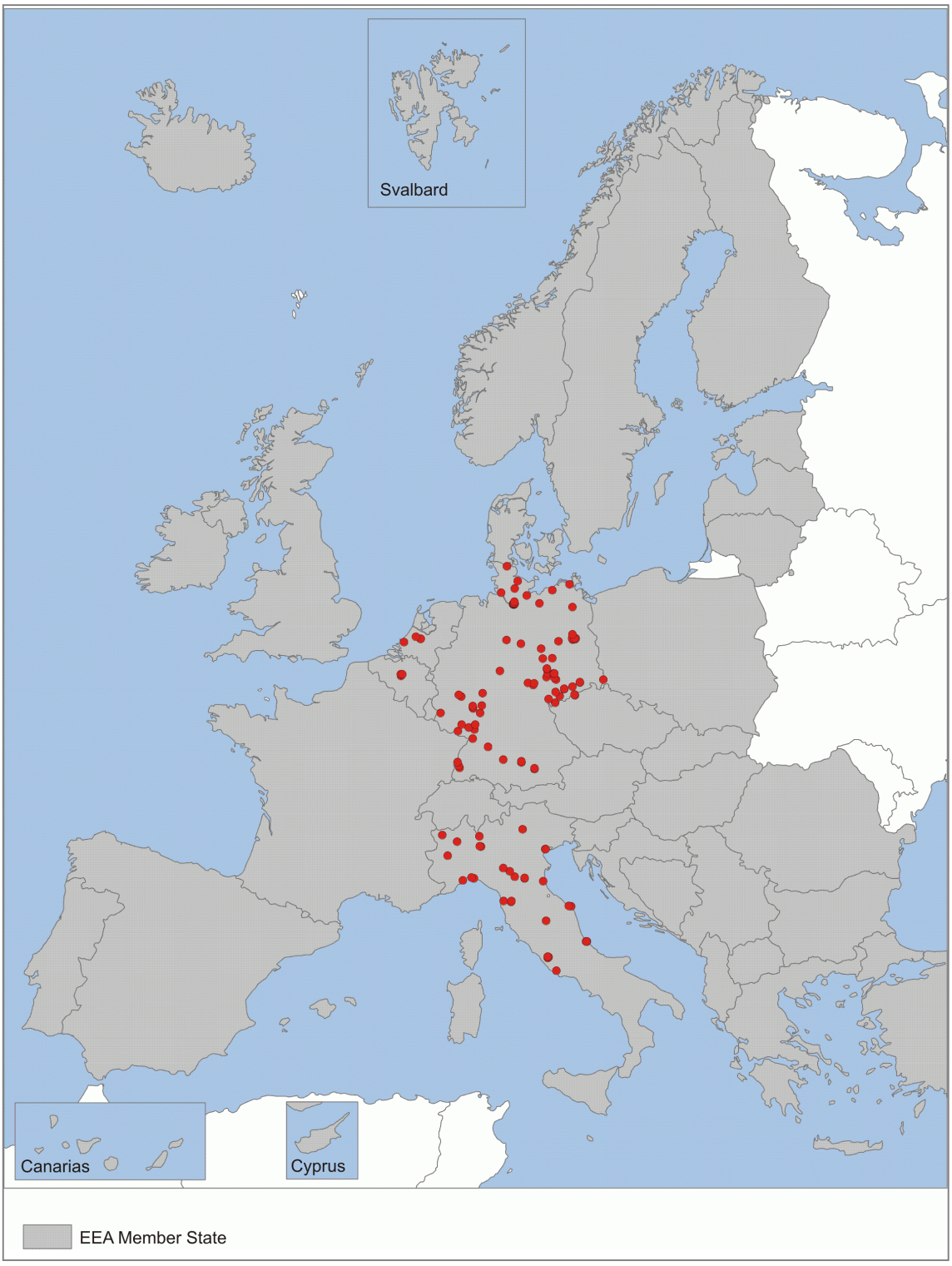


Figure C4 Location of stations for which 2001 air quality for benzene have been reported.

Annex D Supplementary information

Table D1 Sulphur dioxide (SO_2)

Country	Years	Data capture [1]	Stations with essential information [2]	Average length of time series
		%	%	*Years*
EU countries				
Austria	1990-2001	92	100	4.7
Belgium	1990-2001	84	100	10.3
Denmark	1976-2001	83	36	5.4
Finland	1990-2001	97	100	6.1
France	1981-2001	86	68	3.5
Germany	1976-2001	94	76	4.9
Greece	1983-2001	82	96	4.3
Ireland	2000-2001	88	100	1.4
Italy	1976-2001	71	78	1.7
Luxembourg				
Netherlands	1976-2001	90	55	9.0
Portugal	1986-2001	87	80	3.5
Spain	1986-2001	87	92	3.1
Sweden	1993-2001	83	100	6.3
United Kingdom	1993-2001	86	99	5.8
Non-EU countries				
Albania				
Bosnia Herzegovina				
Bulgaria	1998-2001	32	100	1.9
Czech Republic	1992-2001	91	100	8.7
Estonia	1997-2001	87	100	3.9
FYROM	1997-2001	83	100	5.6
Hungary	1997-2001	95	100	2.5
Iceland	1993-2001	75	33	1.7
Latvia	1997-2001	78	100	3.0
Liechtenstein				
Lithuania	1997-2001	97	100	2.5
Norway	1998-2001	98	100	4.0
Poland	1997-2001	92	100	3.0
Romania	2001-2001	98	100	2.6
Slovak Republic	1995-2001	88	100	3.3
Slovenia	1997-2001	88	100	6.0
Switzerland	1992-2001	94	100	7.1

1) Average value for the period given in the second column

2) The percentage of the stations for which the following meta information has been delivered: station name, type of station, type of area, geographical co-ordinates and altitude. Average value for the period given in the second column

Table D2 Nitrogen dioxide (NO_2)

Country	Years	Data capture [1]	Stations with essential information [2]	Average length of time series
		%	%	*Years*
EU countries				
Austria	1990-2001	91	100	5.3
Belgium	1980-2001	78	84	8.5
Denmark	1982-2001	80	65	5.6
Finland	1990-2001	93	100	4.7
France	1982-2001	86	69	2.6
Germany	1984-2001	93	79	4.6
Greece	1983-2001	80	97	3.9
Ireland	1999-2001	92	100	1.4
Italy	1999-2001	81	98	1.5
Luxembourg				
Netherlands	1981-2001	90	78	8.6
Portugal	1986-2001	86	88	3.4
Spain	1987-2001	87	91	3.0
Sweden	1993-2001	74	100	5.3
United Kingdom	1980-2001	84	96	5.8
Non-EU countries				
Albania				
Bosnia Herzegovina				
Bulgaria	1998-2001	29	100	1.9
Czech Republic	1992-2001	92	100	8.6
Estonia	1997-2001	76	100	3.4
FYROM				
Hungary	1997-2001	94	100	2.5
Iceland	1994-2001	98	100	1.0
Latvia	1997-2001	81	100	2.9
Liechtenstein				
Lithuania	1997-2001	98	100	2.5
Norway	1994-2002	55	100	4.5
Poland	1997-2001	88	100	3.6
Romania	2001-2001	95	100	2.5
Slovak Republic	1995-2001	81	100	3.2
Slovenia	1997-2001	68	100	6.0
Switzerland	1992-2001	96	100	

1) Average value for the period given in the second column

2) The percentage of the stations for which the following meta information has been delivered: station name, type of station, type of area, geographical co-ordinates and altitude. Average value for the period given in the second column

Table D3 Particulate matter (<10 μm)

Country	Years	Data capture [1]	Stations with essential information [2]	Average length of time series
		%	%	*Years*
EU countries				
Austria	2000-2001	83	100	1.1
Belgium	1995-2001	84	100	5.0
Denmark	2001-2001	72	100	1.8
Finland	1991-2001	87	100	2.4
France	2001-2001	79	76	1.0
Germany	1998-2001	82	85	1.8
Greece	2001-2001	90	100	1.0
Ireland	1999-2001	85	100	2.0
Italy	1999-2001	68	100	1.5
Luxembourg				
Netherlands	1997-2001	90	100	5.8
Portugal	1997-2001	84	100	2.4
Spain	1997-2001	78	92	2.1
Sweden	1998-2001	91	100	2.7
United Kingdom	1993-2001	88	100	5.8
Non-EU countries				
Albania				
Bosnia Herzegovina				
Bulgaria	1998-2001	59	100	1.6
Czech Republic	1996-2001	96	100	5.9
Estonia	2001-2001	83	100	1.0
FYROM				
Hungary	2000-2001	97	100	2.0
Iceland	1994-2001	38	50	1.3
Latvia	2001-2001	52	100	1.0
Liechtenstein				
Lithuania	1999-1999	94	100	2.0
Norway	1994-2002	39	100	4.8
Poland	1997-2001	87	100	3.2
Romania				
Slovak Republic	1999-2001	91	100	2.0
Slovenia	2001-2001	77	100	1.0
Switzerland	1992-2001	88	100	4.0

1) Average value for the period given in the second column

2) The percentage of the stations for which the following meta information has been delivered: station name, type of station, type of area, geographical co-ordinates and altitude. Average value for the period given in the second column

Table D4 Particulate matter (<.2.5 µm)

Country	Years	Data capture [1]	Stations with essential information [2]	Average length of time series
		%	%	*Years*
EU countries				
Austria	2001-2001	88	100	1.0
Belgium	2000-2001	100	100	1.0
Denmark				
Finland	2001-2001	63	100	1.0
France	2001-2001	73	62	1.0
Germany				
Greece				
Ireland				
Italy				
Luxembourg				
Netherlands				
Portugal				
Spain				
Sweden				
United Kingdom				
Non-EU countries				
Albania				
Bosnia Herzegovina				
Bulgaria				
Czech Republic				
Estonia				
FYROM				
Hungary				
Iceland	1995-2001	46	100	1.0
Latvia				
Liechtenstein				
Lithuania				
Norway				
Poland				
Romania				
Slovak Republic				
Slovenia				
Switzerland				

1) Average value for the period given in the second column

2) The percentage of the stations for which the following meta information has been delivered: station name, type of station, type of area, geographical co-ordinates and altitude. Average value for the period given in the second column

Table D5 Lead

Country	Years	Data capture [1]	Stations with essential information [2]	Average length of time series
		%	%	*Years*
EU countries				
Austria				
Belgium	1982-2001	87	100	7.1
Denmark	1982-2001	80	45	2.9
Finland	1993-1994	33	100	6.5
France				
Germany	1988-1989	26	77	2.0
Greece				
Ireland	1982-1988	85		2.6
Italy				
Luxembourg				
Netherlands	2001-2001	49	100	1.0
Portugal				
Spain	1993-1999	46	100	2.6
Sweden				
United Kingdom				
Non-EU countries				
Albania				
Bosnia Herzegovina				
Bulgaria	1998-2001	35	100	3.4
Czech Republic				
Estonia				
FYROM				
Hungary				
Iceland				
Latvia				
Liechtenstein				
Lithuania				
Norway				
Poland				
Romania	2001-2001	94	100	2.8
Slovak Republic				
Slovenia				
Switzerland				

1) Average value for the period given in the second column

2) The percentage of the stations for which the following meta information has been delivered: station name, type of station, type of area, geographical co-ordinates and altitude. Average value for the period given in the second column

Table D6 Ozone (O_3)

Country	Years	Data capture [1]	Stations with essential information [2]	Average length of time series
		%	%	*Years*
EU countries				
Austria	1990-2001	93	100	8.2
Belgium	1985-2001	74	90	7.3
Denmark	1997-2001	91	100	2.1
Finland	1990-2001	92	100	7.1
France	1982-2001	87	64	2.5
Germany	1984-2001	93	90	4.9
Greece	1983-2001	83	96	3.7
Ireland	1999-2001	91	100	2.4
Italy	1999-2001	82	100	1.3
Luxembourg				
Netherlands	1981-2001	91	86	8.6
Portugal	1986-2001	83	97	3.2
Spain	1987-2001	88	91	3.2
Sweden	1998-2001	92	100	3.4
United Kingdom	1982-2001	87	98	6.9
Non-EU countries				
Albania				
Bosnia Herzegovina				
Bulgaria	1998-2001	73	100	3.4
Czech Republic	1992-2001	90	100	6.9
Estonia	1997-2001	80	100	4.0
FYROM				
Hungary	1997-2001	93	100	2.8
Iceland	1994-2001	58	100	1.0
Latvia	1997-2001	65	100	2.2
Liechtenstein				
Lithuania	1997-2001	83	100	3.4
Norway	1998-2001	99	100	4.0
Poland	1997-2001	92	100	3.8
Romania				
Slovak Republic	1997-2001	83	100	3.9
Slovenia	1997-2001	86	100	6.0
Switzerland	1992-2001	94	100	8.4

1) Average value for the period given in the second column

2) The percentage of the stations for which the following meta information has been delivered: station name, type of station, type of area, geographical co-ordinates and altitude. Average value for the period given in the second column

Table D7 Benzene (C_6H_6)

Country	Years	Data capture [1]	Stations with essential information [2]	Average length of time series
		%	%	*Years*
EU countries				
Austria				
Belgium	1994-2001	37	100	3.2
Denmark				
Finland				
France				
Germany	1999-2001	80	60	1.0
Greece				
Ireland				
Italy	1999-2001	75	100	1.3
Luxembourg				
Netherlands	1997-2001	53	100	5.0
Portugal				
Spain				
Sweden				
United Kingdom				
Non-EU countries				
Albania				
Bosnia Herzegovina				
Bulgaria				
Czech Republic				
Estonia				
FYROM				
Hungary				
Iceland				
Latvia				
Liechtenstein				
Lithuania				
Norway				
Poland				
Romania				
Slovak Republic				
Slovenia				
Switzerland	1994-1997	30	100	1.8

1) Average value for the period given in the second column

2) The percentage of the stations for which the following meta information has been delivered: station name, type of station, type of area, geographical co-ordinates and altitude. Average value for the period given in the second column

Table D8 Carbon monoxide (CO)

Country	Years	Data capture [1]	Stations with essential information [2]	Average length of time series
		%	%	*Years*
EU countries				
Austria	1990-2001	87	100	5.4
Belgium	1994-2001	81	100	4.5
Denmark	1998-2001	94	100	3.5
Finland	1990-2001	95	100	8.5
France	1982-2001	84	72	2.6
Germany	1985-2001	92	80	2.7
Greece	1983-2001	84	94	5.6
Ireland			100	1.5
Italy	1999-2001	81	100	1.3
Luxembourg				
Netherlands	1981-2001	89	76	7.6
Portugal	1997-2001	89	100	3.1
Spain	1987-2001	86	89	3.7
Sweden	1998-2001	95	100	3.0
United Kingdom	1982-2001	83	95	6.1
Non-EU countries				
Albania				
Bosnia Herzegovina				
Bulgaria	1998-2001	72	100	3.6
Czech Republic	1992-2001	88	100	7.8
Estonia	1997-2001	93	100	2.0
FYROM				
Hungary	1997-2001	90	100	2.1
Iceland	1994-2001	98	100	8.0
Latvia				
Liechtenstein				
Lithuania	1997-1999	94	100	2.7
Norway				
Poland	1997-2001	89	100	2.3
Romania				
Slovak Republic	1995-2001	71	100	5.3
Slovenia				
Switzerland	1992-2001	93	100	7.3

1) Average value for the period given in the second column

2) The percentage of the stations for which the following meta information has been delivered: station name, type of station, type of area, geographical co-ordinates and altitude. Average value for the period given in the second column

Table D9 Black smoke

Country	Years	Data capture [1]	Stations with essential information [2]	Average length of time series
		%	%	*Years*
EU countries				
Austria				
Belgium	1975-2001	85	56	9.0
Denmark	1976-1982	88		6.5
Finland				
France	1968-1990	88	7	6.1
Germany				
Greece	1984-2000	86	86	8.9
Ireland	1973-2000	74	85	4.5
Italy				
Luxembourg	1976-1993	70		13.2
Netherlands	1990-2001	93	100	8.4
Portugal	1986-1991	79	33	3.3
Spain	1986-2001	78	98	2.3
Sweden	1997-2001	55	100	5.0
United Kingdom	1969-2001	79	74	5.4
Non-EU countries				
Albania				
Bosnia and Herzegovina				5.7
Bulgaria				
Czech Republic				
Estonia				
FYROM	1997-2001	84	100	5.8
Hungary				
Iceland				
Latvia				
Liechtenstein				
Lithuania				
Norway				
Poland	1997-2001	92	100	4.5
Romania				
Slovak Republic				
Slovenia				
Switzerland				

1) Average value for the period given in the second column

2) The percentage of the stations for which the following meta information has been delivered: station name, type of station, type of area, geographical co-ordinates and altitude. Average value for the period given in the second column

Annex E Non-directive components

Table E1 EU countries which have delivered measurement data of non-directive components, 2001

Country	Time resolution [1)]	Formula	EoI code [2)]	Component	Number of stations
Austria	H	TSP	5	Total Suspended Particulates	97
Belgium	D	As	11	Arsenic	26
	D	Cd	10	Cadmium	38
	D	Hg	13	Mercury	1
	D	Ni	15	Nickel	31
Germany	H	TSP	5	Total Suspended Particulates	144
Finland	D	TSP	5	Total Suspended Particulates	11
France	D	TSP	5	Total Suspended Particulates	73
Italy	H	NH_3	61	Ammonia	2
		H_2S	51	Hydrogen sulphide	3
	H	CH_4	16	Methane	2
	H	THC (NM)	45	Non-methane hydrocarbons	20
	H	PAN	60	Peroxyacetylnitrate	2
	H	$C_6H_5CH_3$	37	Toluene	14
	H	TSP	5	Total Suspended Particulates	63
	H	T-VOC	.	Volatile organic components	4
Netherlands	H	NH_3	61	Ammonia	8
	D	NH4	.	Ammonium aerosol	7
	D	As	11	Arsenic	4
	D	Cd	10	Cadmium	4
	D	NO_3	.	Nitrate aerosol	7
	D	SO_4	.	Sulphate aerosol	7
	D	$C_6H_5CH_3$	37	Toluene	4
Spain	H	CH_4	16	Methane	13
	H	TSP	5	Total Suspended Particulates	118
	H	T-VOC	.	Volatile organic components	17
Sweden	D	SO_4	.	Sulphate aerosol	4
United Kingdom	D	SA	46	Strong acidity	179

[1)] H: hour; D: day

[2)] . : no EoI code

Table E2 Non-EU countries which have delivered measurement data of non-directive components, 2001

Country	Time resolution [1)]	Formula	EoI Code [2)]	Component	Number of stations
Bulgaria	H	NH_3	61	Ammonia	9
	D	Cd	10	Cadmium	6
	H	HCl	.	Hydrogen chloride	1
	H	H_2S	51	Hydrogen sulphide	33
	D	TSP	5	Total Suspended Particulates	34
Estonia	D	TSP	5	Total Suspended Particulates	1
Iceland	H	THC (NM)	45	Non-methane hydrocarbons	1
Latvia	D	NH_4	.	Ammonium	2
	H	Hg	13	Mercury	1
	D	NO_3	.	Nitrate aerosol	2
	D	SO_4	.	Sulphate aerosol	2
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	NH_3	61	Ammonia	10
	D	Cd	10	Cadmium	14
	D	HCHO	44	Formaldehyde	3
	D	TSP	5	Total Suspended Particulates	12
	D	SO_4	.	Sulphate aerosol	3
Switzerland	H	THC (NM)	45	Non-methane hydrocarbons	5

[1)] H: hour; D: day.
[2)]: no EoI code.

European Topic Centre on Air and Climate Change
PO Box 1
3720 BA Bilthoven
The Netherlands
Phone +31 30 2743550
Fax +31 30 2744433
Email etcacc@rivm.nl
Website http://etc-acc.eionet.eu.int/