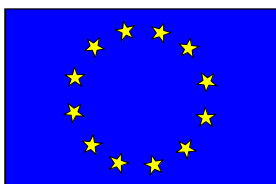


EUROPEAN TOPIC CENTRE ON AIR QUALITY

RIVM NILU NOA DNMI



EUROPEAN AIR QUALITY IN 1997

**ON THE BASIS OF DATA TRANSMITTED IN THE FRAMEWORK OF THE
EU COUNCIL DECISION 97/101/EC ON 'EXCHANGE OF INFORMATION'**

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Preface

Council Decision 97/101/EC establishes a reciprocal exchange of information and data from networks and stations measuring ambient air pollution within Member States. This exchange procedure is designed to help combat pollution and nuisance, with a view to improving the quality of life and environment throughout the Community, through monitoring long-term trends and improvements resulting from national and Community legislation. The information will be accessible to the public via the information system on the Internet of the European Environment Agency (EEA). The Commission is required to prepare reports on the information collected, summarizing the data and outlining the underlying trends in air quality in the European Union. The Commission has asked EEA to assist in the preparation of these reports.

Pilot reports on 1996 data and information were presented in 1999 to Member States and Commission for comment and feedback. The present report, on 1997 information and data, is the first published report in the context of the Decision. It was prepared by the European Topic Centre on Air Quality (ETC-AQ) and the Phare Topic Link on Air Quality (PTL-AQ) in collaboration.

While this report is a simple summary of the data and information collected, all information is contained in the European database AIRBASE and is accessible in full detail on the web site <http://etc-acc.eionet.eu.int/databases/airbase.html>. This report and the AIRBASE Internet access facility can be seen as steps forward in a process to provide full exchange and access to information on air quality state and trend in Europe.

Essential to this process is intensive interaction with the Member States and other European countries, both with experts managing and running monitoring and information systems and reporting data, and with those that use the information in support of air quality management.

This interaction has been taking place in EC meetings - Air Quality Steering Group, Exchange of Information Expert Group and Working Group- and in EEA meetings with partners in the Environmental Information and Observation Network (EIONET), particularly in a series of EIONET Air Quality workshops. This has been complemented by many informal contacts between national experts and the EEA, ETC-AQ and PTL-AQ.

Major developments in the Exchange of Information (EoI) system include:

- Establishment of the European air quality database AIRBASE, where quality assured data is combined with information on networks and stations
- Making available and further developing the air quality Data Exchange Module (DEM) enabling countries to update network and station information and to transmit data which is checked and inserted in AIRBASE and assigned to the proper monitoring station
- Providing public access on the Internet to all information in AIRBASE.

The EEA has, in close collaboration with 31 European countries, developed the design for EUROAIRNET, a European air quality monitoring network with sufficient

coverage and quality and relatively short reporting cycle to satisfy the information needs of EEA. The formulation of explicit monitoring goals and criteria for representativeness and quality for this network and the subsequent site selection with each country have been recognised as central to the EoI framework and results have been used in the revision of the Decision, which is now underway.

The enlargement of the EU provides a valuable opportunity to extend the current exchange to a wider range of European countries. Given the importance of long-range transport for many air pollutants, and the need for accession countries to comply with EU legislation, it is natural to include air quality information from these countries in EoI reporting, as is already the case in this report and in the reports under the Ozone Directive. The PTL-AQ, funded by EC Phare-EEA co-operation programme, produced the report "Air Quality in the Phare countries 1997" (EEA, 2000, to be published) which should be seen as a companion document to the present report.

This extension enhances the need for harmonization and streamlining of air quality reporting in Europe, in order to avoid unnecessary duplication (recognised in the Decision) and reducing the reporting burden in the countries. These now face many reporting obligations and requirements (EC, EEA, UNECE-EMEP, OECD, WMO, WHO....) often with different reporting procedures and deadlines. Recognizing that all international organisations work on the basis of mandates from European countries, EEA and Commission are required to help to increase compatibility and connectivity in reporting procedures and databases, and to collaborate with other international organisations in European air quality reporting.

Good air quality information is an essential basis for air quality management, particularly if air quality can be related to sources and sectors. The success of policies to reduce air pollution concentrations and related impacts on human health, ecosystems and materials, while ultimately to be evaluated on exactly these reductions, can often be monitored more closely by looking at the trends in emissions. An obvious example is ozone, where precursor emission reductions are much easier to monitor than the trends in ozone concentrations and exceedances, which are subject to large year-to-year variations obscuring the relatively small trends. In line with the Commission's combined proposal for a new Ozone Directive and a National Emission Ceilings Directive, it appears appropriate to present in future versions of this report air quality and air emission trends together and to discuss their interrelations.

It is evident that the usefulness of these EoI reports and the information presented can benefit from better coverage in space and time. An additional challenge is to report available data for those pollutants of most concern and those for which legislation is in preparation. This could be valuable for instance for EC Working Groups preparing position papers for such pollutants.

Finally, the EEA would appreciate receiving comments and suggestions on the present report and the AIRBASE information system, and on ways to improve them to meet the challenges as presented in this foreword.

Roel van Aalst, EEA project manager Air Quality

Note: Further documentation on issues referred to in this foreword is available at the EEA web site www.eea.eu.int

Executive Summary

This report is based on air quality data for 1997 transmitted by countries on a voluntary basis in the framework of the "Exchange of Information" Decision (97/101/EC). According to Article 5.7 of Decision 97/101/EC, a general report is to be prepared for the public, summarising the collected data and outlining the underlying trends in air quality in the European Union. This report addresses this requirement and presents summarized air quality data, supplemented by maps showing the location of stations and the concentrations measured at those stations, within selected ranges.

The extent of data reporting has increased very significantly from 1996 to 1997. 1997 data were reported by 11 EU Member States and 10 non-EU countries, totalling 3,965 component-station combinations from the 21 countries (of which 3,272 from EU Member States). The corresponding number for 1996 data was 256. SO₂ was reported from 776 stations in EU Member States (937 for all countries) and NO₂ from 730 stations (865 for all countries). PM₁₀ was reported from 40 stations in EU Member States, and in total 145 stations from all countries.

In the preamble of Decision 97/101/EC it is stated that the information collected should be sufficiently representative to enable pollution levels to be mapped throughout the European Union. Articles 3 and 5 set requirements for the selection of stations and data to be reported under the Decision. Although the reporting has improved significantly, data reported for 1997 are still generally less than required to make an acceptable map and a complete assessment of air quality in EU and in Europe. It is therefore recommended that Member States evaluate their station selection, in accordance with Articles 3 and 5.1 of the Decision, and also with a view to the selection of stations for EUROAIRNET, which has been made.

The data in the EoI database has become rather fragmented during the period of voluntary data transmission after expiration of the previous EoI Decision. The AIRBASE now contains fairly long time series for some components from a limited number of stations in some countries. However, it was decided not to go into trend analysis in this report, since information from the available database will not necessarily give a representative picture of trends on the EU or European scales. It is recommended that Member States transmit data collected between 1989 and 1999, in accordance with Article 5.4 of Decision 97/101/EC.

For proper assessment of air quality, characterization of the stations emission environment is essential. However, meta-information of this kind also remains incomplete, available for only about 30% of the component-station combinations.

Based upon the above, it is concluded that the 1997 data reporting under EoI has improved significantly compared to 1996, but is still insufficient to draw acceptably complete conclusions on spatial and temporal variations and on trends of air quality on the EU and European scales. EoI reporting which fully complies with statements in Decision (97/101/EC) would, however, serve such needs, particularly if viewed also in connection with the EUROAIRNET station selection process.

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EUROPEAN AIR QUALITY IN 1997

1. Introduction

EU Member States have a long tradition of exchanging air quality data. This reciprocal exchange between 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", in short "EoI") was adopted by the European Council in 1997.

According to Article 1.2 of Decision 97/101/EC, the Commission will call upon the European Environment Agency (EEA) as regards the operation and practical implementation of the EoI information system. The European Topic Centre on Air Quality (ETC-AQ), under contract to EEA, is managing the database system AIRBASE. The information submitted under EoI is stored in AIRBASE and is made publicly available on the Internet:

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

According to Article 5.7 of Decision 97/101/EC, the Commission is to prepare annually a general report for the public, summarising the data collected and outlining the general trends in air quality European Union. For 1996 the ETC-AQ produced a pilot version of this report, with the aim to present this report to Member States and receive feedback on structure and contents.

The present report presents summaries of data reported for the year 1997, with a format based upon the pilot report and feedback and comments received from the EU Member States.

Switzerland, Norway, Iceland and Liechtenstein and Phare countries exchange air quality information in the framework of EEA's EUROAIRNET according to a strict set of criteria for site selection and using the same reporting procedures as EU Member States. Air quality data of Switzerland, Norway, Iceland and Liechtenstein and Phare countries are, as far as available, included in this report in order to provide a better European coverage.

Unless otherwise mentioned, all information in this report relates to data received by December 1999, covering reporting of 1997 data. For technical information on the data transmitted, refer to the "Pilot technical report on meta information and air quality data collected for 1997 in the framework of EU Decision 97/101/EC" (ETC-AQ, 1999).

Note that in some tables in the report presenting statistics as calculated from time series, the number of stations is lower than the number of stations for which data were submitted. This is because the requirement of completeness of time series leads to the exclusion of some stations from the summaries presented. This is for instance the case for stations operating only in the winter half-year which is the

case e.g. for some stations in Sweden and Norway. Also, in some cases the ETC-AQ was not able to match all the time series to stations.

Throughout this report, air quality data are presented, grouped by the following "station types": rural, urban (background) and street. This classification was based on station meta information available from AIRBASE. Stations, which could not be classified are summarised under the heading "other" or "undefined".

Results are presented in summary tables and on maps. It is realized that the present map format and scale do not allow seeing clearly the pollution concentration in a given city, where cities are close together compared to the map scale. Rather, the maps are intended to give a visual indication of the extent of air pollution problems in countries and regions in Europe, as given by the data that have been reported. It will be considered how to improve the map presentations for future reports.

It has also been noted that the coordinates are not exactly correct for all stations, so stations are placed on the maps skewed compared to their real location. This is especially visible, where stations seem to be located offshore. Some member states are asked to scrutinize the station coordinates, and correct these if necessary. Note that tabular and map presentations and data from specific stations can be obtained from AIRBASE. (<http://etc-acc.eionet.eu.int/databases/airbase.html>)

Although data reported in the framework of Decision 97/101/EC should not, and will not, be used to assess compliance of countries with limit, guide and threshold values set in specific air quality Directives, these values will be used in general terms where appropriate, while describing the pollution concentrations reported here.

Note that this pilot report is based on data, which was transmitted on a voluntary basis. The number of stations and components for which data have been reported has increased considerably compared to previous years' reporting (1997 data compared to 1996 data), see chapter 3. Still the total reporting is generally less than required under Decision 97/101/EC.

2. Air Quality in 1997

2.1 Sulphur Dioxide and Strong Acidity

2.1.1 Sulphur Dioxide

Table 1 presents annual average SO₂ concentration by country and by station type; Table 2 presents 98 percentile of 24-hour concentrations and Table 3 maximum observed 24-hour concentrations.

Data are reported from 776 stations in 9 EU Member States and from 161 stations in 10 non-EU countries. Reported annual average SO₂ concentrations at almost all stations in EU Member States are below the lower limit of the EU guide value of 40 µg/m³. Average concentrations above the upper limit of the EU guide value of 60 µg/m³ are reported from some stations in Eastern Europe.

Nearly all reported 98 percentile SO₂ concentrations are below the lower EU limit for daily value of 250 µg/m³, but some stations in Eastern Europe were above this limit.

The EU guide value for maximum daily value of 100-150 µg/m³ was exceeded at many stations both in EU and non-EU countries.

Map 1 on pages 13-16 shows the geographical distribution of stations and the reported data.

Table 1: Average, minimum and maximum SO₂ annual concentration (µg/m³) in 1997. Figures between brackets refer to the number of stations

Country	Annual average including range				
	rural	urban	street	other	non-defined
Austria	7 1-15(51)	9 4-15(44)	10 1-20(26)	10 5-16(16)	
Belgium	10 6-16(13)	15 7-25(28)	17 11-26(11)	25 17-40(9)	
Denmark	1(1)		3 3-5(3)		
Finland	1(1)		4 2-5(5)	2(1)	2(1)
Germany	9 3-26(24)	11 3-30(84)	11 3-25(96)	12 5-18(11)	9 1-29(227)
Greece			28 17-38(6)		21 16-26(2)
Netherlands	5 2-14(23)	9 4-16(11)	9 5-16(5)		
Sweden	0-1(6)	6(1)	4(1)		
United Kingdom	7 3-10(5)	15 7-45(39)	25 12-44(3)	14 13-16(2)	
<i>Non EU Countries</i>					
Czech republic	18 5-37(19)	28 16-43(34)	26 25-28(2)	26(1)	
Estonia	1(1)	8(1)	5(1)	10 (1)	
F.Y.R.O.M.		25 6-83(12)	39 13-69(8)	32 9-70(4)	
Hungary	10 5-17(4)	42 38-45(3)	49 46-51(4)	35(1)	
Latvia	1 1-1(2)				
Lithuania			9(1)		
Poland		22 10-45(11)		51 51-52(2)	
Slovak republic		29 15-63(13)	24 15-31(8)	31 6-64(9)	
Slovenia		39 35-43(2)	23(1)		
Switzerland	4 1-8(6)	7 4-13(9)	7 4-13(7)	8 5-11(4)	

Table 2: Average, minimum and maximum 98-Percentile of 24 hour values, SO_2 ($\mu g/m^3$) in 1997. Figures between brackets refer to the number of stations

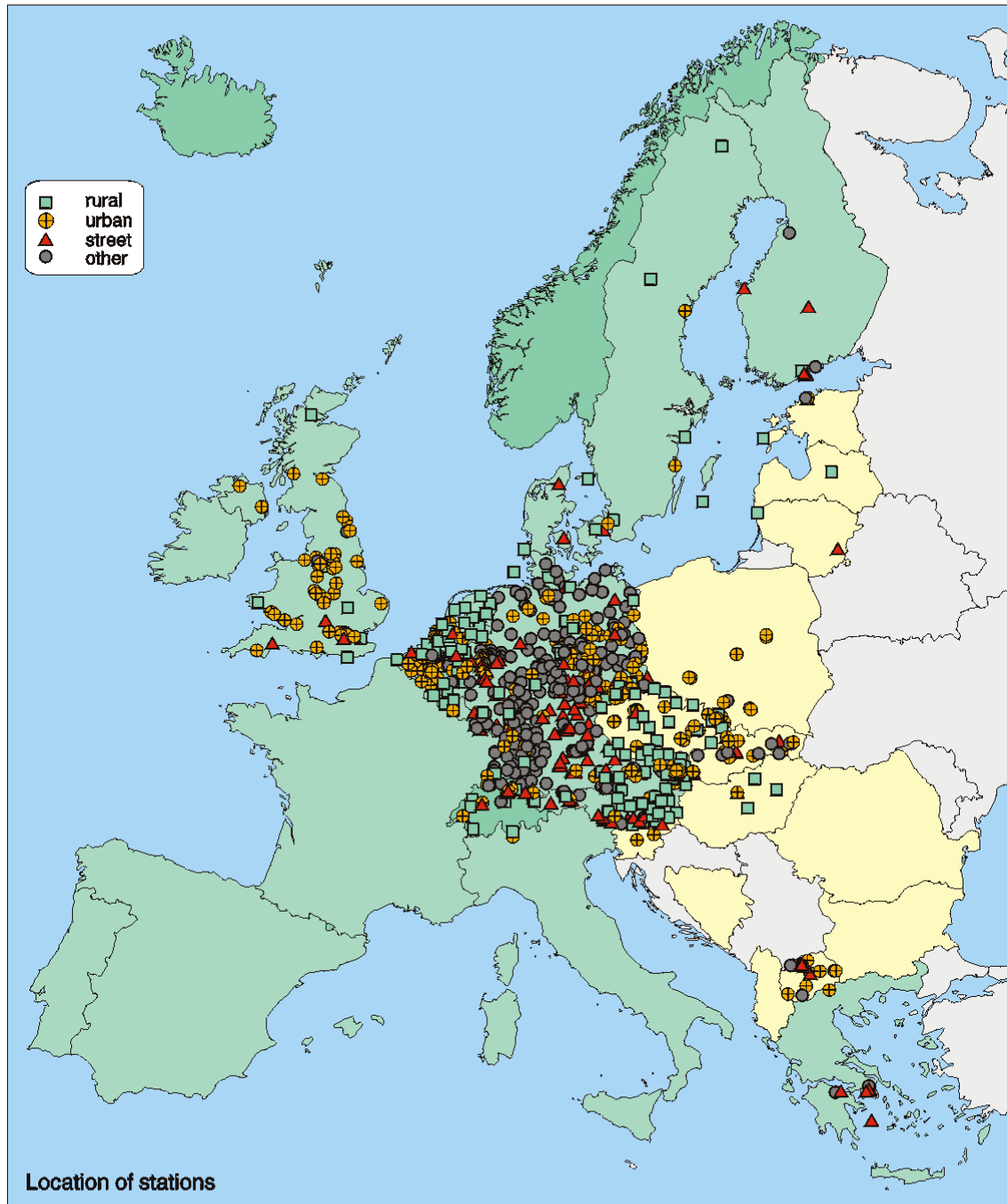
Country	98 Percentile of 24 hour values including range				
	rural	urban	street	other	non-defined
Austria	32 3-78(51)	38 13-68(44)	32 8-81(26)	36 12-81(16)	
Belgium	36 25-53(13)	52 30-116(28)	56 36-72(11)	78 56-121(9)	
Denmark	8(1)		13 11-16(3)		
Finland	6(1)		15 9-25(5)	7(1)	10(1)
Germany	48 7-152(21)	55 14-178(83)	50 6-134(96)	49 16-28(11)	45 2-132(222)
Greece			71 40-102(5)		61 34-88(2)
Netherlands	23 8-53(23)	38 21-69(11)	33 17-57(4)		
Sweden	4 1-7(6)				
United Kingdom	28 13-40(5)	51 22-178(34)	64 34-95 (2)	42(1)	
<i>Non EU Countries</i>					
Czech republic	84 27-170(19)	137 70-246(33)	134 125-142(2)	128(1)	
Estonia	2(1)	38(1)	15(1)	32(1)	
FYROM		90 18-208(11)	143 50-282(7)	111 30-246(4)	
Hungary	52 29-83(4)	99 95-102(3)	103 98-105(4)	92(1)	
Latvia	3 3-4(2)				
Lithuania			30(1)		
Poland		91 45-183(9)		177 174-180(2)	
Slovak republic		130 50-268(9)	88 57-142(6)	139 49-311(7)	
Slovenia		113(1)	68(1)		
Switzerland	11 3-22(6)	25 13-36(8)	23 13-36(7)	25 13-38(2)	

Table 3: Average maximum observed 24 hourly SO₂ concentrations (µg/m³) in 1997, including range. Figures between brackets refer to the number of stations

Country	Maximum 24 hour values including range				
	rural	urban	street	other	non-defined
Austria	67 7-179(51)	74 18-147(44)	58 15-130(26)	71 18-135(16)	
Belgium	75 61-92(13)	86 62-135(28)	83 65-118(11)	131 90-253(9)	
Denmark	12(1)		25 21-27(3)		
Finland	8(1)		32 16-50(5)	14(1)	18(1)
Germany	108 12-357(24)	115 33-404(83)	95 9-426(96)	109 24-267(11)	94 6-533(222)
Greece			93 48-147(5)		95 72-118(2)
Netherlands	54 17-95(23)	65 42-105(11)	58 33-93(4)		
Sweden	10 4-16(6)	9 8-10(3)			
United Kingdom	60 22-95(5)	85 27-244(34)	81 42-120(2)	119(1)	
<i>Non EU Countries</i>					
Czech republic	183 64-548(19)	286 128-752(33)	187 158-216(2)	161(1)	
Estonia	47(1)	65(1)	49(1)	47(1)	
FYROM		245 33-678(11)	346 120-604(7)	209 52-457(4)	
Hungary	109 39-204(4)	147 135-157(3)	128 114-139(4)		
Latvia	4 3-5(2)				
Lithuania			39(1)		
Poland		171 92-326(9)		270 269-271(2)	
Slovak republic		340 75-1029(9)	149 74-291(6)	410 80-1159(7)	
Slovenia		200(1)	90(1)		
Switzerland	16 5-34(6)	38 18-68(8)	31 18-47(7)	50 18-83(2)	

Map 1: Sulphur dioxide; location of stations and station type, annual average, 98 percentile of 24 hour values and maximum observed 24 hour values ($\mu\text{g}/\text{m}^3$), 1997.

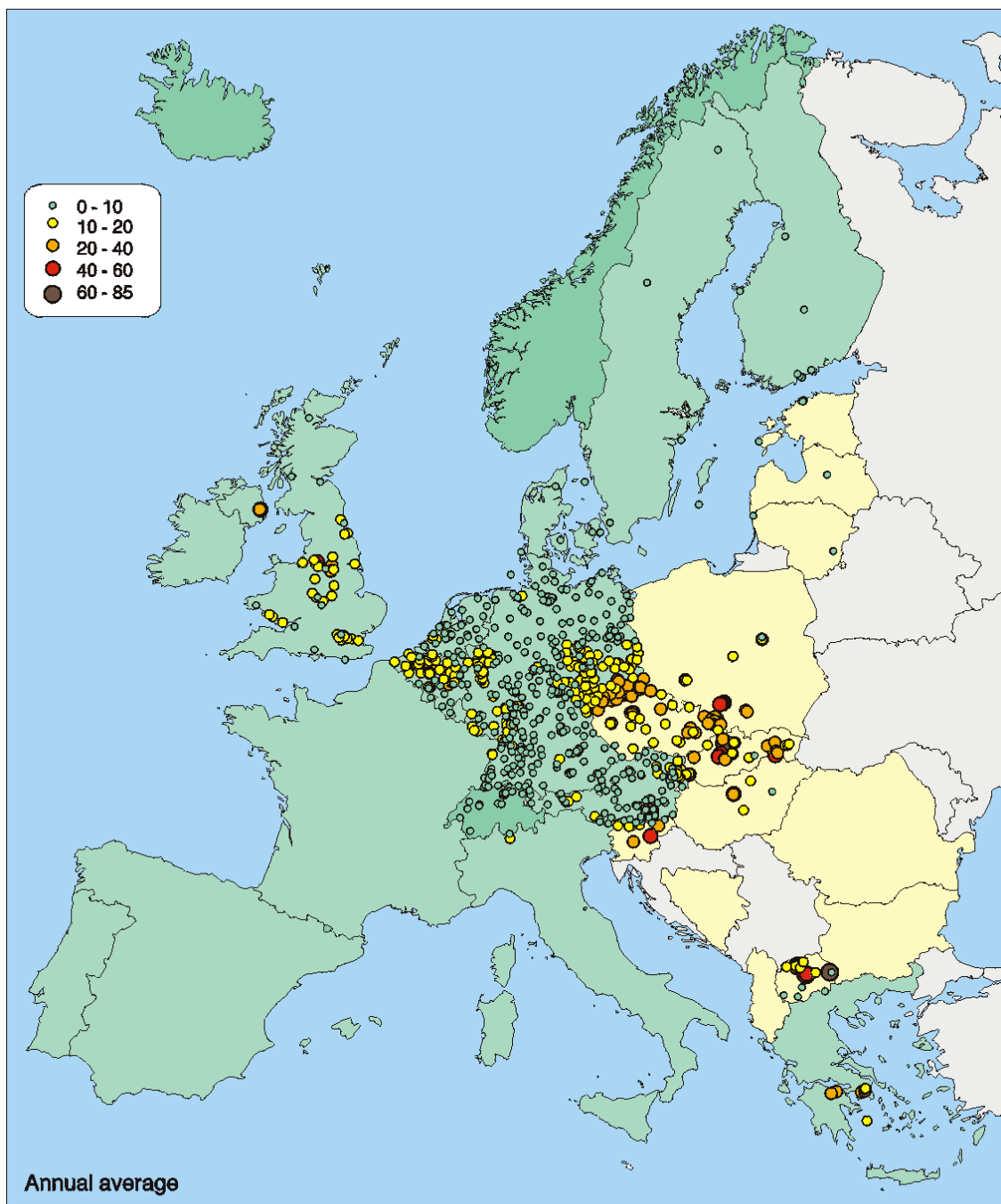
Sulphur dioxide



- EU
- EFTA
- PHARE
- other

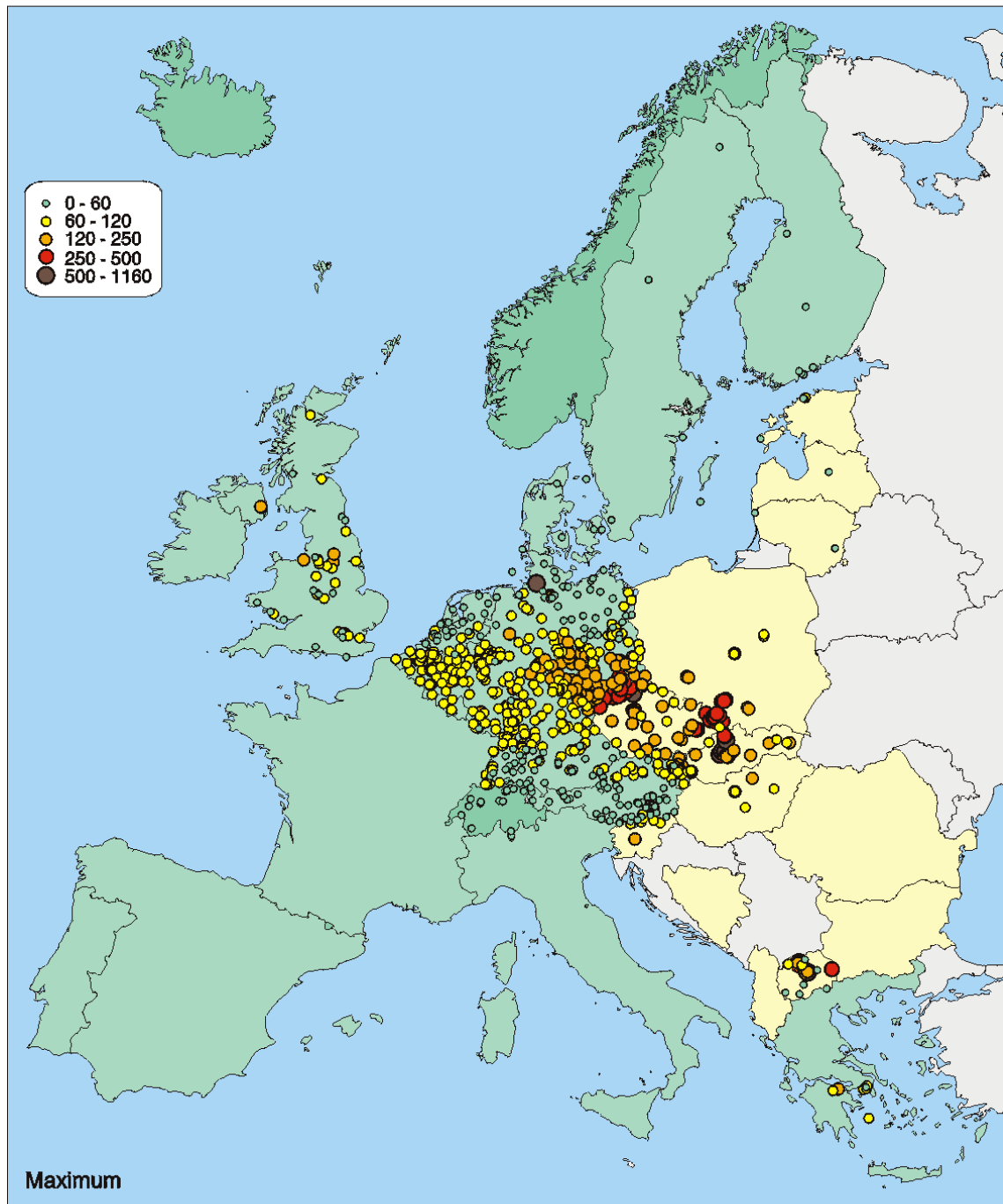
Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

Sulphur dioxide



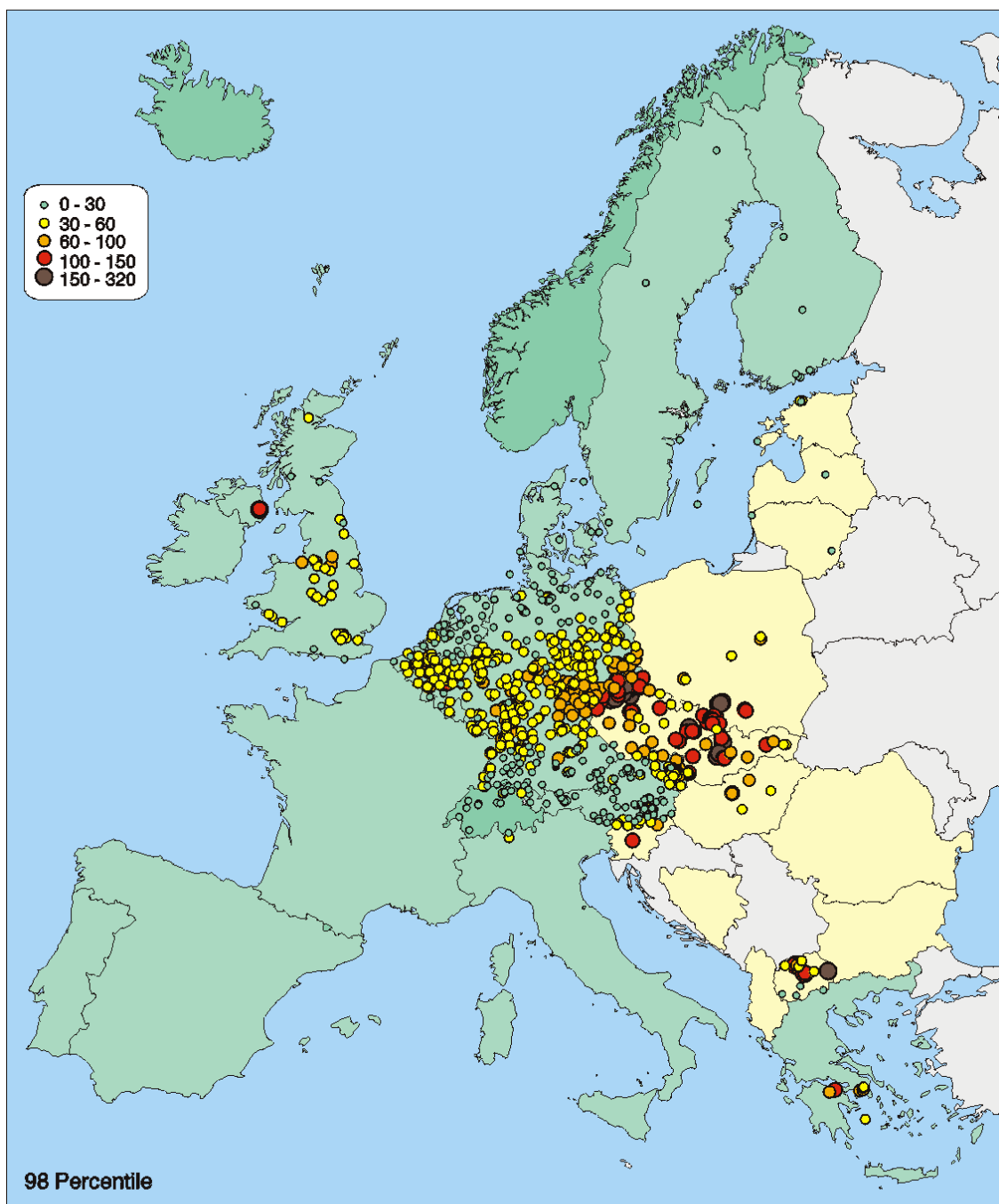
Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

Sulphur dioxide



Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

Sulphur dioxide



Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

2.1.2 Strong Acidity

Strong acidity monitoring is still carried out in some countries. Two EU Member States reported data for 211 stations. Tables 4, 5 and 6 present the annual average, 98 percentile of 24-hour values and maximum 24-hour values reported strong acidity concentrations, respectively.

Maximum daily values reported from some stations in Belgium and United Kingdom are very high if compared to the EU SO₂ limit guide value of 100-150 µg/m³.

Table 4: Average, minimum and maximum annual average strong acidity concentrations (µg/m³) in 1997. Figures between brackets refer to the number of stations.

Country	Annual average including range				
	rural	urban	street	other	non-defined
Belgium	20 10-27(5)	22 5-70(27)	13 7-19(5)	35 19-55(6)	15 13-18(2)
United Kingdom		22 4-52(161)	23(1)	33 19-48(2)	28 18-37(2)

Table 5: Average, minimum and maximum 98-Percentile of 24 hour values, strong acidity (µg/m³) in 1997. Figures between brackets refer to the number of stations.

Country	98-Percentile of 24 hour values including range				
	rural	urban	street	other	non-defined
Belgium	66 51-86(5)	79 15-236(26)	52 36-69(5)	95 54-135(6)	66 59-73(2)
United Kingdom		55 34-104(5)			74 40-107(2)

Table 6: Average maximum observed strong acidity concentrations (µg/m³) in 1997, including range. Figures between brackets refer to the number of stations.

Country	Maximum 24 hour values including range				
	rural	urban	street	other	non-defined
Belgium	99 81-121(5)	166 22-1509(26)	72 51-92(5)	144 69-238(6)	90 88-92(2)
United Kingdom		106 58-177(5)	55(1)	104 56-151(2)	110 87-133(2)

2.2 Particulate Matter

Particulate matter concentrations are reported either as PM₁₀, total suspended particulate (TSP) or black smoke. PM₁₀ data were reported from 72 stations in 4 EU Member States and from 73 stations in 3 non-EU countries according to the annual average statistics. TSP data were reported from 460 stations in 3 EU Member States and from 33 stations in 4 non-EU countries. Black smoke data were reported from 244 stations in 5 EU Member States and from 33 stations in 2 non-EU countries. All together particulate matter data were reported from 776 stations in 9 EU Member States and from 139 stations in 7 non-EU countries.

Table 7 presents annual average concentrations by country and station type, Table 8 presents 98 percentile concentrations based on 24-hour values and Table 9 presents maximum observed 24-hour concentrations.

EU Directive 80/779/EC (on SO₂ and suspended particulates) sets limit and guide values for concentrations measured as black smoke or TSP (but not for PM₁₀).

The EU TSP annual limit value of 150 µg/m³ was not exceeded on any station in EU and non-EU countries. There is no EU limit 98-percentile 24-hour value for TSP. The 95-percentile limit value is 300 µg/m³. Only one station reported TSP 98 percentile value above 300 µg/m³ (in a non-EU country). There is no EU maximum limit value for TSP.

Reported annual black smoke concentrations were in general below the lower limit of the EU guide value of 40 µg/m³, with the exception of some stations in two EU Member States and one non-EU country. The 98-percentile 24 hour black smoke 24-hour limit value of 250 µg/m³ was not exceeded on any station. The EU guide value for 24-hour maximum black smoke of 100-150 µg/m³ was exceeded on many stations in EU and non-EU countries.

Map 2 on pages 22-25 shows the geographical distribution of stations and the reported data.

Table 7: Average, minimum and maximum annual particulate matter concentrations ($\mu\text{g}/\text{m}^3$) in 1997. Figures between brackets refer to the number of stations.

		Annual average including range				
Country	measured as:	rural	urban	street	other	non-defined
Belgium	PM10		33 27-41(5)	30 24-34(4)	39 34-47(3)	
Finland	PM10			22(1)		
Netherlands	PM10	39 32-45(8)	40 38-44(6)	44 42-49(5)		
United Kingdom	PM10	15 10-20(3)	23 18-28(30)	29 24-32(5)	21 19-22(2)	
Austria	TSP	25 1-42(24)	33 16-65(43)	33 8-65(26)	37 23-79(13)	
Denmark	TSP	26(1)		54 47-61(3)		
Germany	TSP	22 6-42(21)	38 20-60(66)	46 27-89(91)	43 32-59(10)	35 13-75(162)
Belgium	Black S.	12 8-15(5)	16 9-27(32)	22 13-37(6)	13 9-19(6)	18 15-22(2)
Greece	Black S.					27(1)
Netherlands	Black S.	10 7-13(8)	14 12-14(3)	30 22-44(3)		
Sweden	Black S.	2 1-2(3)				
United Kingdom	Black S.		11 2-25(166)	53 23-102(5)	8 5-10(2)	12 9-15(2)
<i>Non EU countries</i>						
Czech Republic	PM10	25 13-51(19)	38 24-60(34)	51 50-52(2)	38(1)	
Poland	PM10		48 34-59(5)	77(1)	65 57-73(2)	
Switzerland	PM10	32(1)	29 19-37(5)	34 29-43(3)		
Estonia	TSP			36(1)		
Hungary	TSP		55 48-59(3)	53 44-65(4)	68(1)	
Slovak Republic	TSP		51 36-74(8)	49 21-65(6)	44 31-90(9)	
Switzerland	TSP	25(1)				
F.Y.R.O.M.	Black S.		23 5-42(15)	29 11-48(8)	25 12-36(4)	
Poland	Black S.		23 10-35(6)			

Table 8: Average, minimum and maximum particulate matter 98 Percentile 24 hour values ($\mu\text{g}/\text{m}^3$) in 1997. Figures between brackets refer to the number of stations.

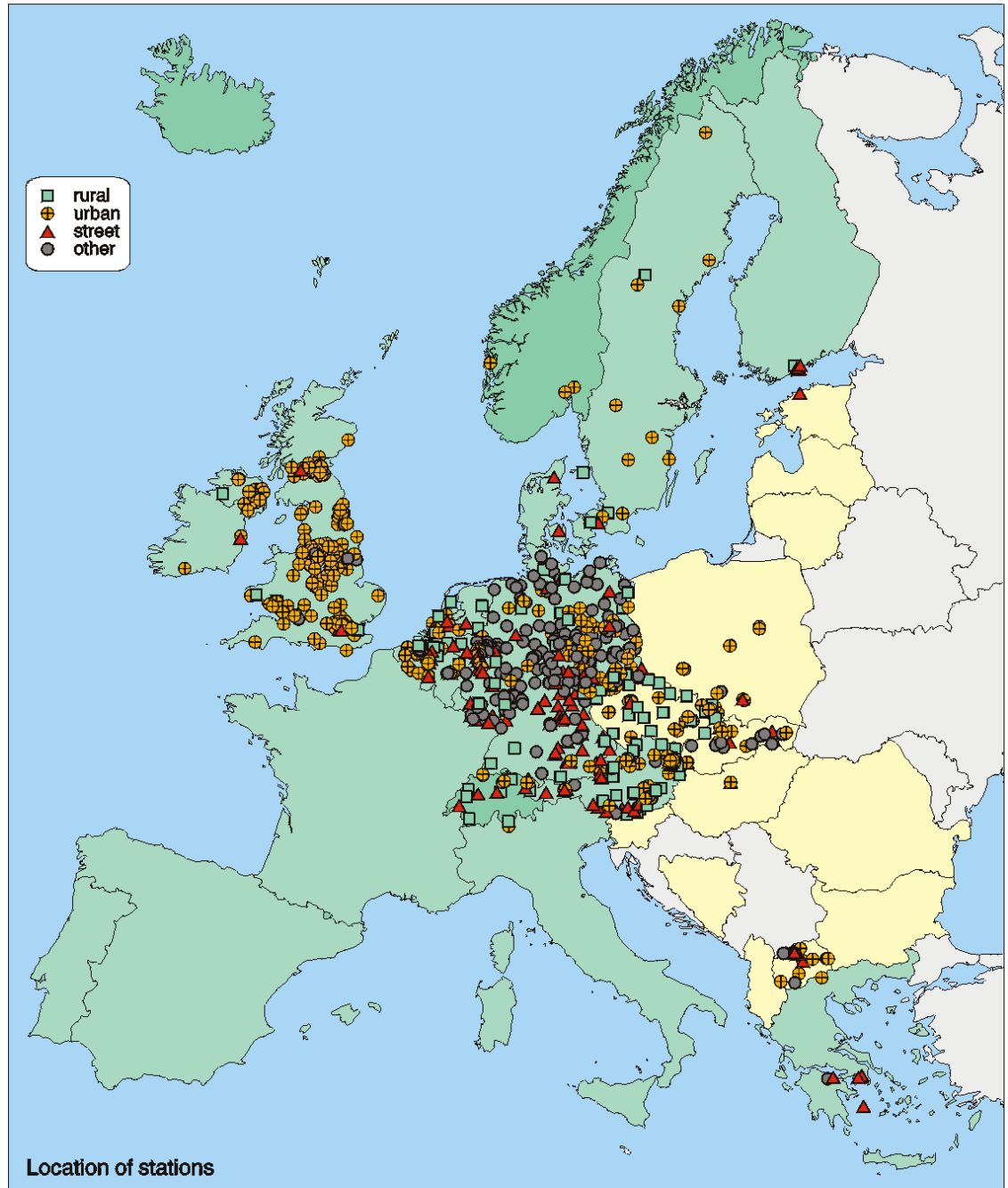
		98 Percentile 24 hour values including range				
Country	Measured as/av. over:	rural	urban	street	other	non-defined
Belgium	PM10		83 60-107(5)	81 60-101(4)	94 77-116(3)	
Finland	PM10			50(1)		
Netherlands	PM10	96 84-111(7)	96 92-101(6)	109 94-134(5)		
United Kingdom	PM10	32 23-44(3)	54 41-87(29)	64 57-74(4)	54(1)	
Austria	TSP	71 14-122(24)	90 41-148(43)	89 53-145(26)	93 56-199(13)	
Denmark	TSP	60(1)		120 95-155(3)		
Germany	TSP	58 17-110(17)	94 48-146(66)	113 62-243(91)	114 91-150(10)	89 36-175(159)
Belgium	Black S.	38 29-49(5)	52 30-87(31)	61 43-76(6)	46 32-65(6)	61 47-75(2)
Greece	Black S.			133 75-215(5)		93(1)
Netherlands	Black S.	42 31-51(8)	48 45-51(3)	77 64-98(3)		
Sweden	Black S.	6 1-10(3)				
United Kingdom	Black S.		46 26-65(5)			45 44-46(2)
<i>Non EU countries</i>						
Czech Republic	PM10	75 34-178(19)	122 67-175(33)	149 147-150(2)	117(1)	
Poland	PM10		139 109-188(3)	211(1)	180 171-188(2)	
Switzerland	PM10	87(1)	89 48-109(5)	87 69-113(3)		
Estonia	TSP			332(1)		
Hungary	TSP		134 126-141(3)	124 110-137(3)	162(1)	
Slovak republic	TSP		121 66-164(5)	127 97-153(3)	111 73-221(8)	
Switzerland	TSP	59(1)				
F.Y.R.O.M.	Black S.		92 20-194(14)	110 32-162(7)	108 68-139(4)	
Poland	Black S.		91 42-148(6)			

Table 9: Average maximum 24 hour particulate matter concentrations ($\mu\text{g}/\text{m}^3$) in 1997 including range. Figures between brackets refer to the number of stations.

		Average maximum 24 hour concentrations including range				
Country	measured as:	rural	urban	street	other	non-defined
Belgium	PM10		116 68-159(5)	137 66-175(4)	169 120-233(3)	
Finland	PM10			83(1)		
Netherlands	PM10	156 103-211(7)	160 136-173(6)	181 145-215(5)		
United Kingdom	PM10	50 29-82(3)	82 50-169(29)	91 74-102(4)	149(1)	
Austria	TSP	103 33-186(24)	133 55-229(43)	135 67-221(26)	134 91-232(13)	
Denmark	TSP	72(1)		201 140-316(3)		
Germany	TSP	97 26-213(17)	157 76-305(66)	176 84-354(91)	188 140-258(10)	148 50-357(159)
Belgium	Black S.	58 44-73(5)	84 44-150(31)	98 63-131(6)	66 54-97(6)	107 76-138(2)
Greece	Black S.			180 103-285(5)		150(1)
Netherlands	Black S.	73 57-84(8)	76 68-89(3)	120 114-126(3)		
Sweden	Black S.	14 4-23(3)				
United Kingdom	Black S.		91 53-154(5)			77 74-79(2)
<i>Non EU countries</i>						
Czech Republic	PM10	139 55-330(19)	232 101-502(33)	285 266-303(2)	268(1)	
Poland	PM10		179 138-257(3)	279(1)	347 294-399(2)	
Switzerland	PM10	132(1)	142 78-197(5)	114 95-132(3)		
Estonia	TSP			492(1)		
Hungary	TSP			167 158-185(3)	234(1)	
Slovak republic	TSP		188 90-334(5)	173 122-231(3)	164 109-285(8)	
Switzerland	TSP	67(1)				
F.Y.R.O.M.	Black S.		161 31-454(14)	241 106-338(7)	224 100-427(4)	
Poland	Black S.		203 91-326(6)			

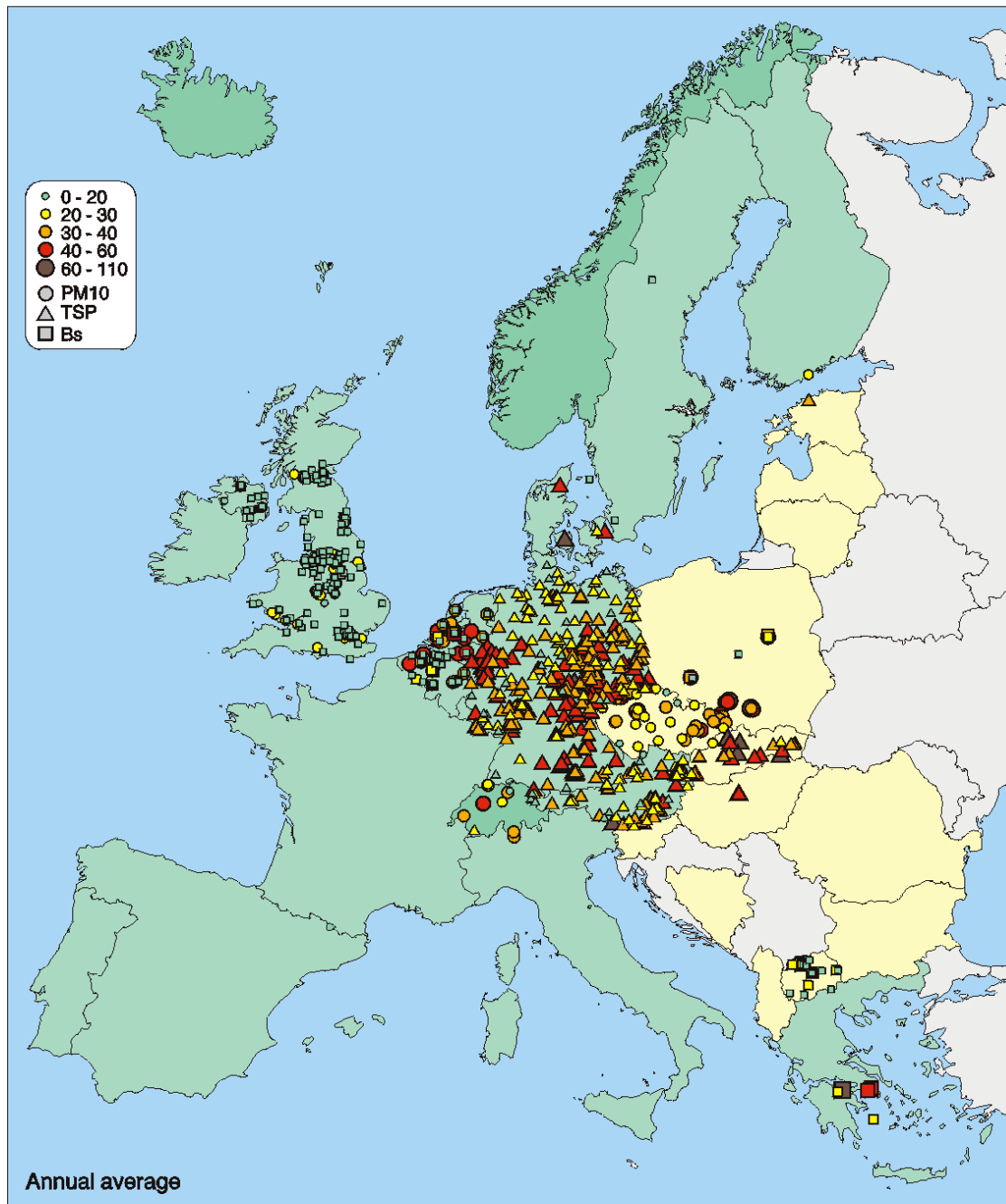
Map 2: Particulate matter; location of stations and station type, annual average, 98 percentile of 24 hour values and maximum observed 24 hour values ($\mu\text{g}/\text{m}^3$), 1997.

Particulate matter



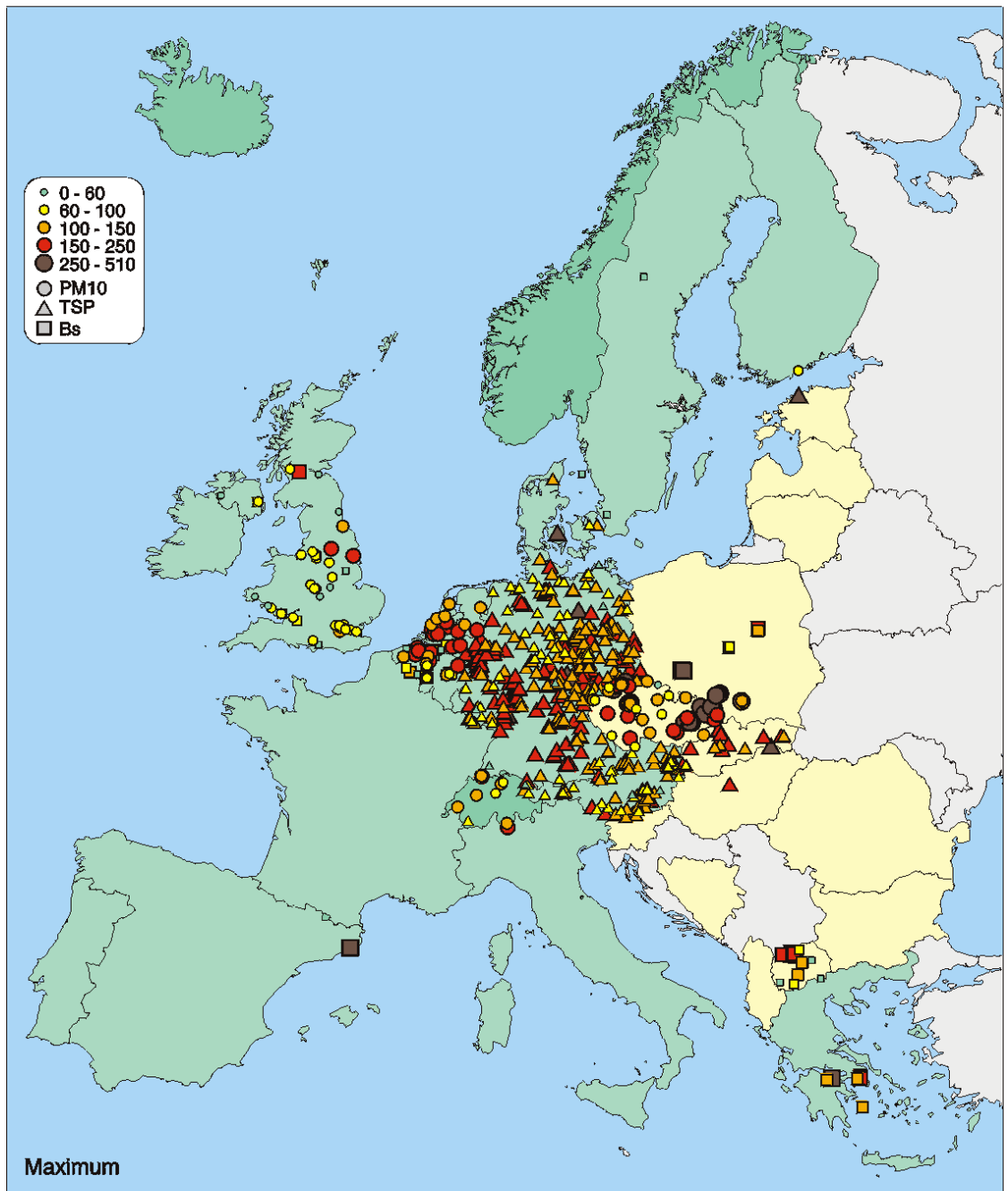
Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

Particulate matter



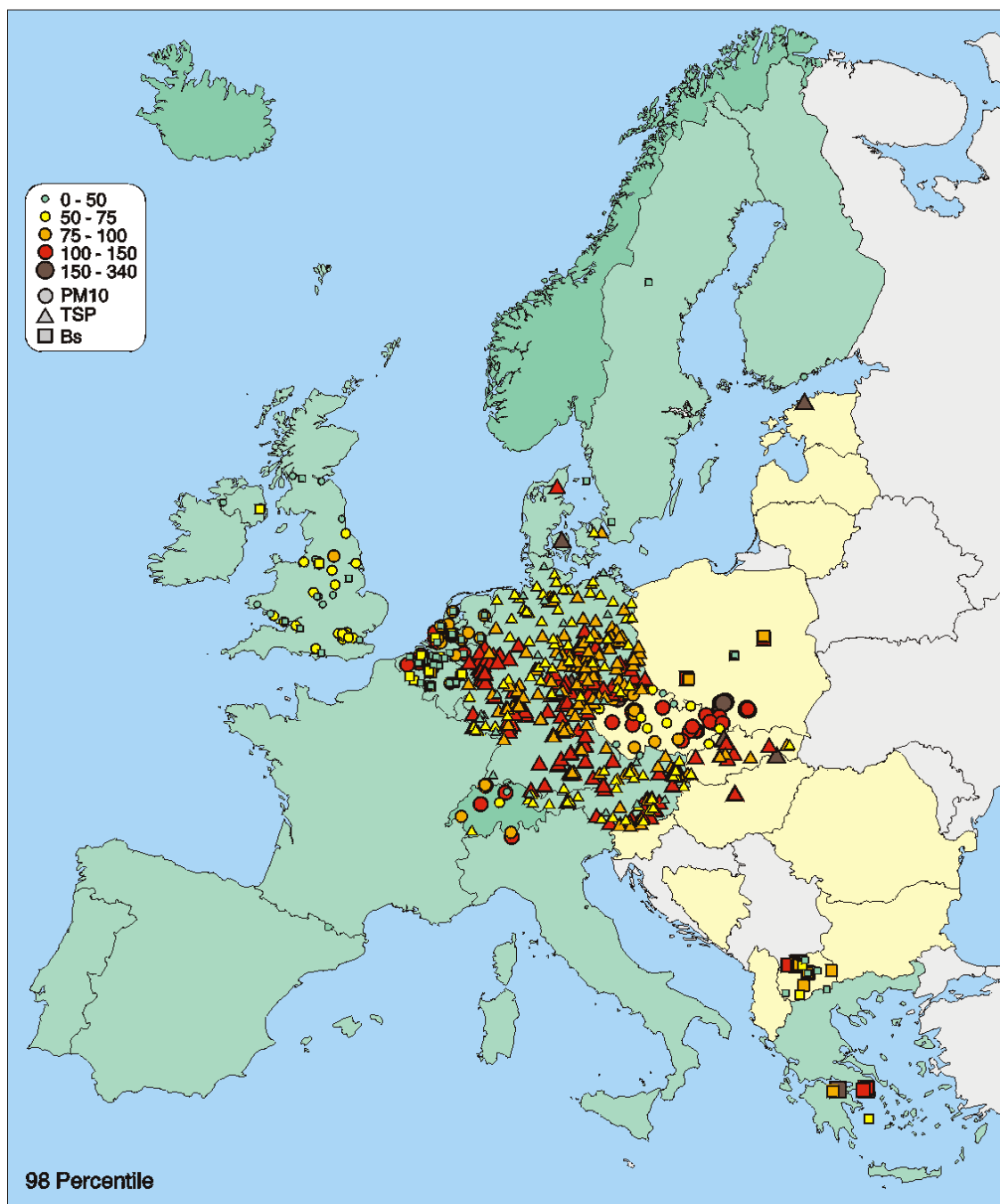
Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

Particulate matter



Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

Particulate matter



- EU
- EFTA
- PHARE
- other

Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

2.3 Nitrogen Dioxide

Tables 10, 11 and 12 present the 1997 reported annual average concentrations, the 98 percentile of 1 hour NO₂ values and the maximum 24-hour NO₂ concentrations, respectively. Data were reported from 730 stations in 11 EU Member States and from 135 stations in 9 non-EU countries.

The EU annual guideline value of 50 µg/m³ was exceeded at some stations in 8 EU Member States and 4 non-EU countries. Only one EU Member State reported 98 percentile 1-hour value above the EU limit value of 200 µg/m³. The guideline value of 135 µg/m³ was exceeded at some stations in 6 EU Member States and 4 non-EU countries. There is no EU limit or guideline values for maximum 24 hour NO₂ concentrations.

Map 3 on pages 30-33 shows the geographical distribution of stations and the reported data.

Table 10: Average, minimum and maximum annual NO₂ concentrations (µg/m³) in 1997. Figures between brackets refer to the number of stations.

Country	NO ₂ annual average including range				
	rural	urban	street	other	non-defined
Austria	14 1-33(41)	25 4-44(46)	31 12-63(29)	21 10-34(12)	
Belgium	23 16-34(8)	37 24-47(7)	47 37-70(7)	34 29-37(3)	
Denmark	12(1)		37 34-42(3)		
Finland	7(1)		27 22-36(6)	10(1)	
Germany	15 5-37(24)	30 16-71(85)	43 18-78(106)	33 15-43(10)	29 7-72(215)
Greece			68 46-95(5)		51(1)
Ireland				50 16-83(2)	
Netherlands	25 14-37(22)	38 28-48(9)	50 37-61(12)		
Portugal		34 24-44(3)			
Sweden	4 1-7(5)	27(1)	52(1)		
United Kingdom	20 6-42(5)	43 22-70(43)	61 39-74(12)	40 31-50(4)	
<i>Non EU Countries</i>					
Czech republic	14 5-23(16)	33 22-48(25)	46(1)		
Estonia		6(1)	37(1)	8(1)	
Hungary	8 3-14(4)	53 39-66(3)	46 31-55(3)	25(1)	
Latvia	1 1-1(2)				
Lithuania			35(1)		
Poland	21(1)	29 20-34(10)	68(1)	27 23-31(2)	
Slovak Republic		26 10-41(12)	38 28-53(8)	23 18-29(9)	
Slovenia		17(1)	50(1)		
Switzerland	16 8-27(7)	32 23-44(10)	46 33-56(10)	31 29-34(4)	

Table 11: Average, minimum and maximum NO₂ 1 hour 98 percentile ($\mu\text{g}/\text{m}^3$) concentrations in 1997. Figures between brackets refer to the number of stations.

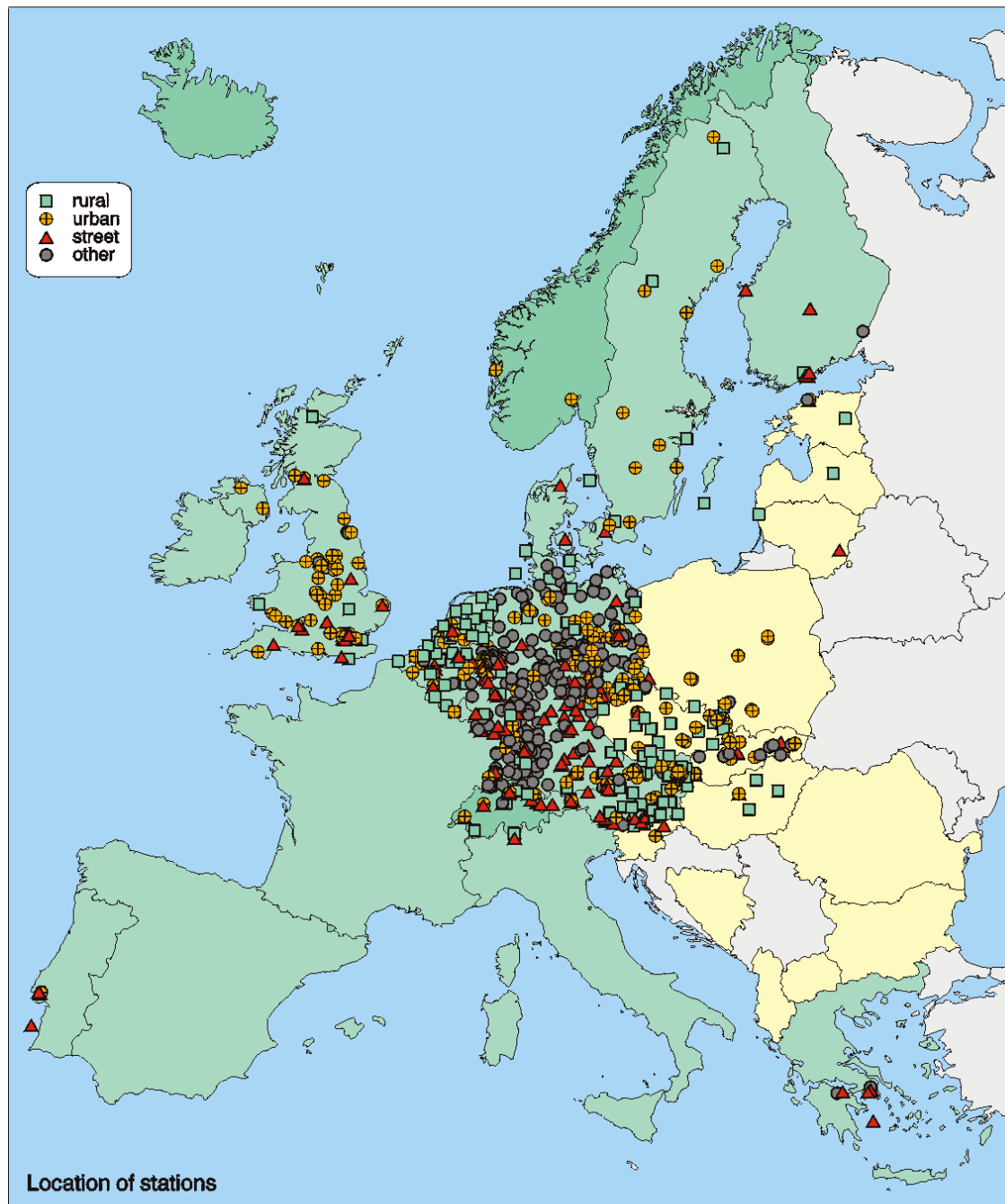
Country	NO ₂ 98 Percentile based on hourly concentrations, including range				
	rural	urban	street	other	non-defined
Austria	46 7-88(42)	73 47-106(46)	76 43-126(30)	61 41-80(12)	
Belgium	72 52-132(7)	91 67-110(5)	104 84-138(6)	76(1)	
Finland	32(1)		73 62-84(6)	39(1)	
Germany	55 26-88(20)	78 43-150(82)	99 64-200(104)	84 48-117(10)	77 29-159(209)
Greece			160 132-206(5)		136(1)
Ireland			115 44-185(2)		
Netherlands	70 54-96(22)	89 70-101(9)	106 85-131(13)		
Portugal		107 79-148(3)			
Sweden		79(1)	11(1)		
United Kingdom	60 53-73(3)	104 67-143(37)	133 99-157(7)	94 78-103(3)	
<i>Non EU Countries</i>					
Czech republic	46 21-71(16)	84 69-106(25)	101(1)		
Estonia			85(1)		
Hungary	18 10-26(4)	114 95-140(3)	98 73-118(4)	73(1)	
Latvia	3 3-3(2)				
Lithuania			142(1)		
Poland			136(1)		
Slovak Republic		93 74-140(7)	93 74-129(6)	65 54-90(8)	
Slovenia		49(1)	94(1)		
Switzerland	48 23-68(7)	79 64-95(10)	97 81-117(10)	76 73-80(4)	

Table 12: Average, minimum and maximum NO₂ 24 hour maximum concentrations (µg/m³) in 1997. Figures between brackets refer to the number of stations.

Country	NO ₂ 24 hour maximum including range				
	rural	urban	street	other	non-defined
Austria	51 12-93(41)	84 46-158(46)	84 40-159(29)	73 48-122(12)	
Belgium	94 64-168(7)	97 70-112(6)	114 80-156(7)	74(1)	
Denmark	81(1)		92 88-96(2)		
Finland	36(1)		74 67-84(6)	30(1)	
Germany	82 29-320(20)	123 49-393(82)	141 68- 378(104)	149 72-273(10)	124 35-435(207)
Greece			145 108-190(3)		120(1)
Netherlands	90 63-128(21)	104 84-119(9)	123 97-143(12)		
Portugal		102 71-150(3)			
Sweden	45 11-79(5)				
United Kingdom	97 50-188(4)	127 74-206(37)	149 81-208(7)	96 78-122(3)	
<i>Non EU Countries</i>					
Czech republic	69 40-107(16)	110 76-161(25)	141(1)		
Estonia		47(1)	86(1)	49(1)	
Hungary	27 16-40(4)	118 94-130(3)	98 78-113(3)	69(1)	
Latvia	4 3-4(2)				
Lithuania			70(1)		
Poland	85(1)	86 63-123(9)		78(1)	
Slovak Republic		98 70-149(7)	96 72-139(6)	70 52-104(8)	
Slovenia		62(1)	149(1)		
Switzerland	59 36-84(5)	94 71-128(9)	97 81-127(9)	86 75-94(4)	

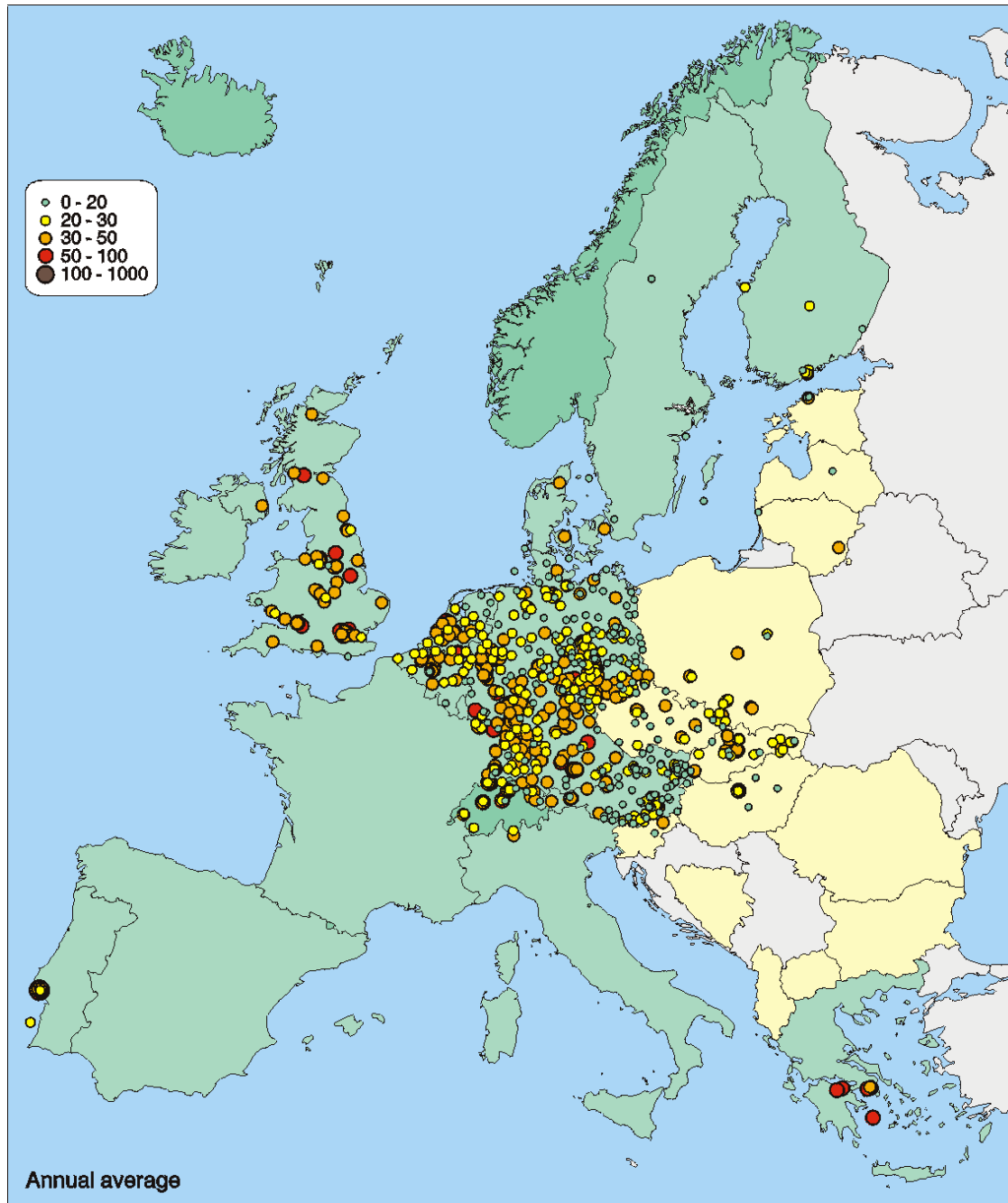
Map 3: Nitrogen dioxide; location of stations and station type, annual average, 98 percentile and maximum observed 24 hour values ($\mu\text{g}/\text{m}^3$), 1997.

Nitrogen dioxide



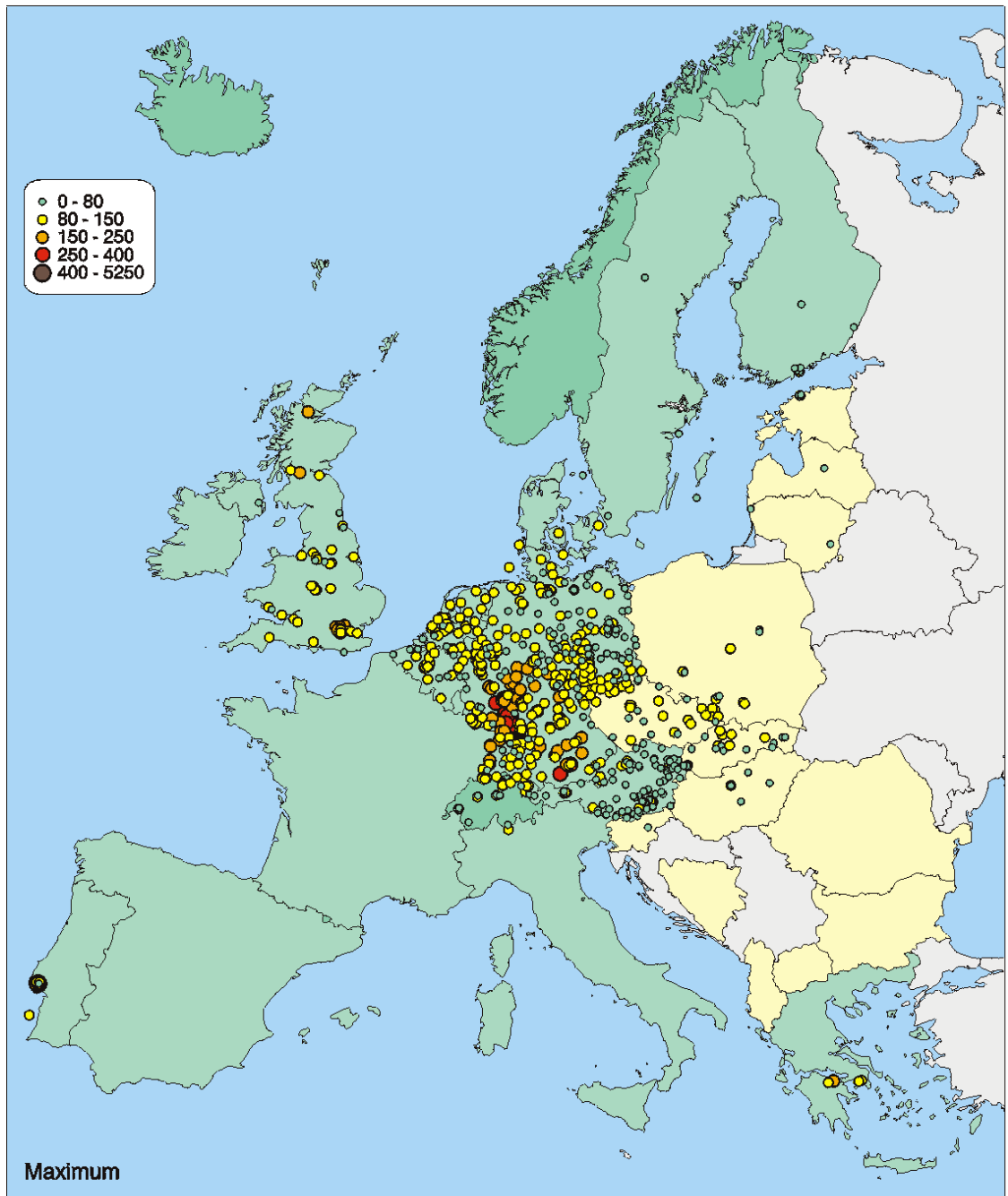
Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

Nitrogen dioxide



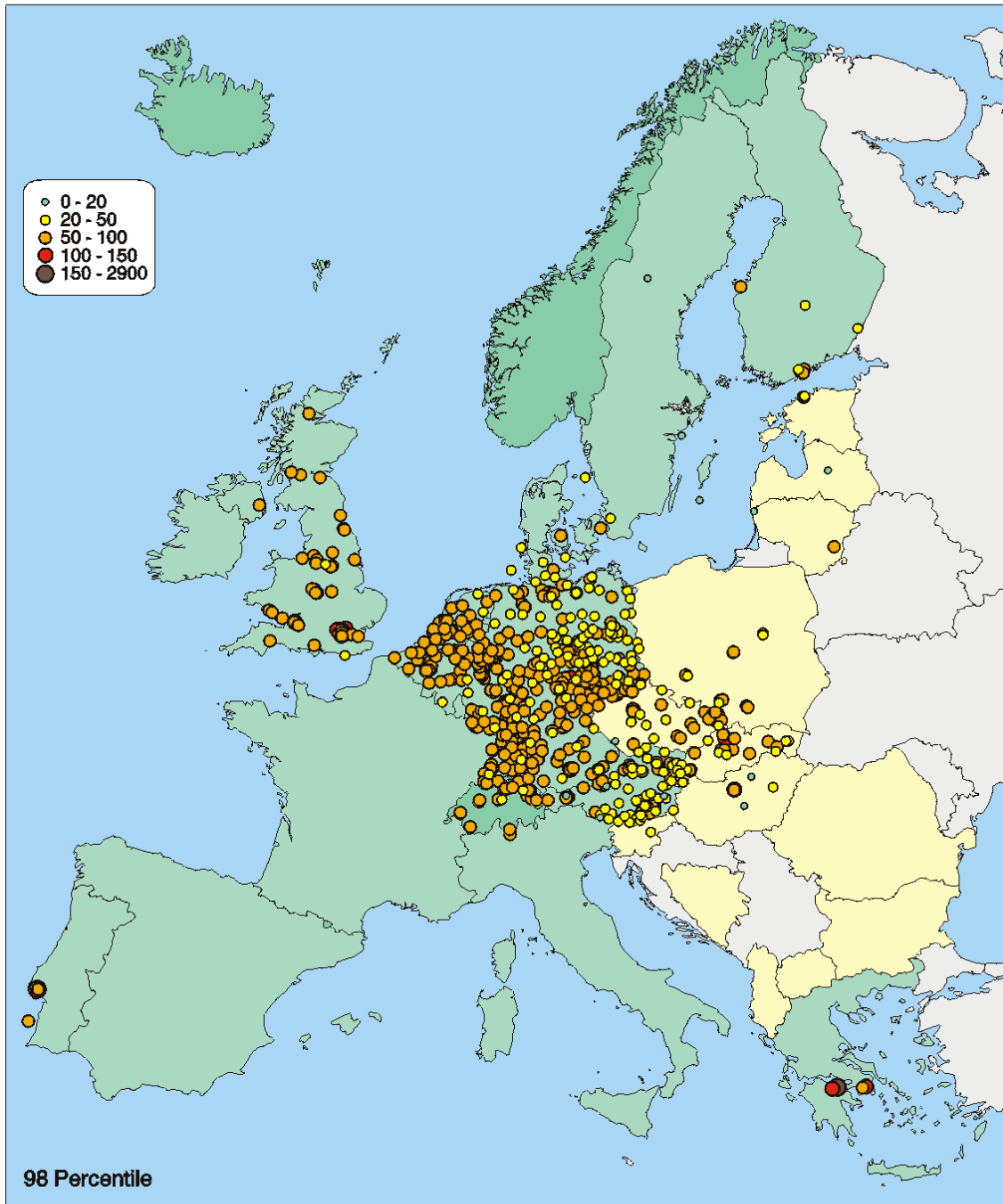
Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

Nitrogen dioxide



Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

Nitrogen dioxide



- EU
- EFTA
- PHARE
- other

Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

2.4 Lead

Table 13 presents the annual average lead concentrations for 1997 reported from two EU Member States (51 stations). All values are well below the EU limit value of 2 $\mu\text{g}/\text{m}^3$.

Table 13: Average, minimum and maximum Pb annual concentrations ($\mu\text{g}/\text{m}^3$) in 1997. Figures between brackets refer to the number of stations.

Country	Pb annual concentrations including range			
	rural	urban	street	other
Belgium	0.035 0.024-0.053(7)	0.128 0.062-0.216(6)	0.099 0.056-0.134(9)	0.260 0.044-1.355(25)
Denmark	0.007(1)		0.015 0.014-0.017(3)	

2.5 Carbon Monoxide

Tables 14, 15 and 16 present the 1997 reported CO annual average concentrations, the 98 percentile and the maximum concentrations (the two latter based on 8 hour moving averages), respectively. Data were reported from 148 stations in 8 EU Member States and from 58 stations in 7 non-EU countries based on the statistics for annual averages.

No EU limit or guide line values are set for CO. Except for one EU Member State the WHO 8 hour maximum limit value of 10 mg/m^3 was exceeded at some stations in all countries.

Map 4 on pages 37-40 shows the geographical distribution of stations and the reported data.

Table 14: Average, minimum and maximum CO annual concentrations (mg/m³) in 1997. Figures between brackets refer to the number of stations.

Country	Annual average including range				
	rural	urban	street	other	non-defined
Austria	0.31 0.02-0.71(9)	0.52 0.14-1.10(16)	0.85 0.24-1.64(24)	0.56 0.18-1.19(9)	
Belgium			1.53 1.14-1.92(2)		
Finland			0.51 0.41-0.75(6)		
Greece			2.76 1.47-5.35(6)		1.93 1.72-2.14(2)
Netherlands	0.49 0.35-0.60(5)	0.56 0.51-0.62(4)	0.96 0.53-1.37(12)		
Portugal		0.21 0.07-0.28(3)	0.96 0.52-1.80(5)		
Sweden		0.5(1)			
United Kingdom		0.67 0.35-0.95(33)	1.54 0.89-2.19(9)	0.48 0.36-0.61(2)	
<i>Non EU Countries</i>					
Czech Rep.	0.40 0.32-0.48(2)	0.70 0.41-1.00(21)	1.17(1)	0.90(1)	
Estonia			1.15(1)		
Hungary		2.16 2.12-2.21(3)	2.74 2.49-2.9(4)	2.44(1)	
Lithuania			2.23(1)		
Poland		0.98(1)	2.85(1)		
Slovak Republic			1.82 1.25-2.44(5)	1.13(1)	
Switzerland	0.28 0.18-0.38(2)	0.61 0.44-0.79(4)	1.04 0.48-1.77(9)		

Table 15: Average, minimum and maximum CO 98-percentile concentrations (mg/m^3) in 1997 (based on 8 hourly moving average concentrations). Figures between brackets refer to the number of stations.

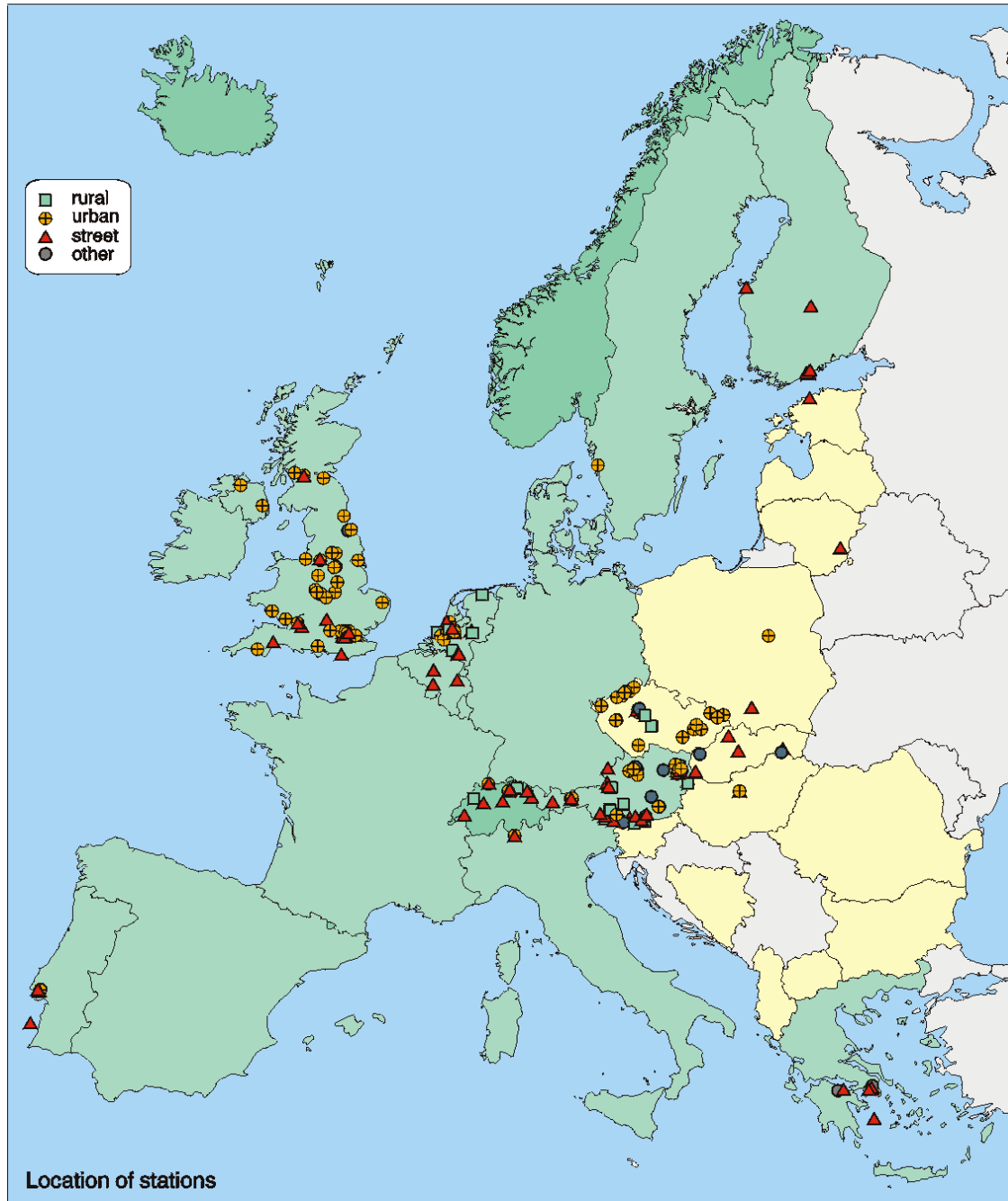
	Maximum 98 percentile 8 hour moving average including range				
Country	rural	urban	street	other	non-defined
Belgium			2.8 2.2-3.5(2)		
Finland			1.6 0.8-2.0(6)		
Greece			7.6 4.7-12.4(5)		5.4(1)
Netherlands	3.4 0.8-5.7(5)	1.6 1.4-1.8(3)	2.5 1.2-3.0(12)		
United Kingdom		2.4 1.3-4.2(29)	5.2 2.9-6.9(5)	1.7 1.2-2.2(2)	
<i>Non EU Countries</i>					
Czech Republic	0.8 0.7-0.8(2)	2.0 1.0-3.1(18)	3.0(1)	2.2(1)	
Hungary		3.9 3.4-4.3(2)	5.2 4.2-5.8(4)		
Lithuania			5.4(1)		
Slovak Republic			11.4 3.2-18.9(4)		

Table 16: Average, minimum and maximum CO maximum 8-hour concentrations (mg/m^3) (based on moving average) in 1997. Figures in brackets refer to the number of stations.

	Maximum 8 hour moving average including range				
Country	rural	urban	street	other	non-defined
Belgium			6.6 5.7-7.5(2)		
Finland			5.1 3.2-8.2(6)		
Greece			13.1 8.9-18.1(5)		11.6(1)
Netherlands	20.4 1.6-37.5(5)	6.7 3.6-10.6(3)	7.4 4.9-9.9(12)		
United Kingdom		6.4 2.8-11.5(29)	10.4 5.4-13.8(5)	3.7 3.4-4.1(2)	
<i>Non EU Countries</i>					
Czech Republic	19.1 11.7-26.4(2)	9.8 2.1-27.3(18)	4.8(1)	5.5(1)	
Hungary		5.7 5.3-6.1(2)	8.6 6.8-10.9(4)		
Lithuania			14.8(1)		
Slovak Republic			28.8 9.4-38.6(4)		

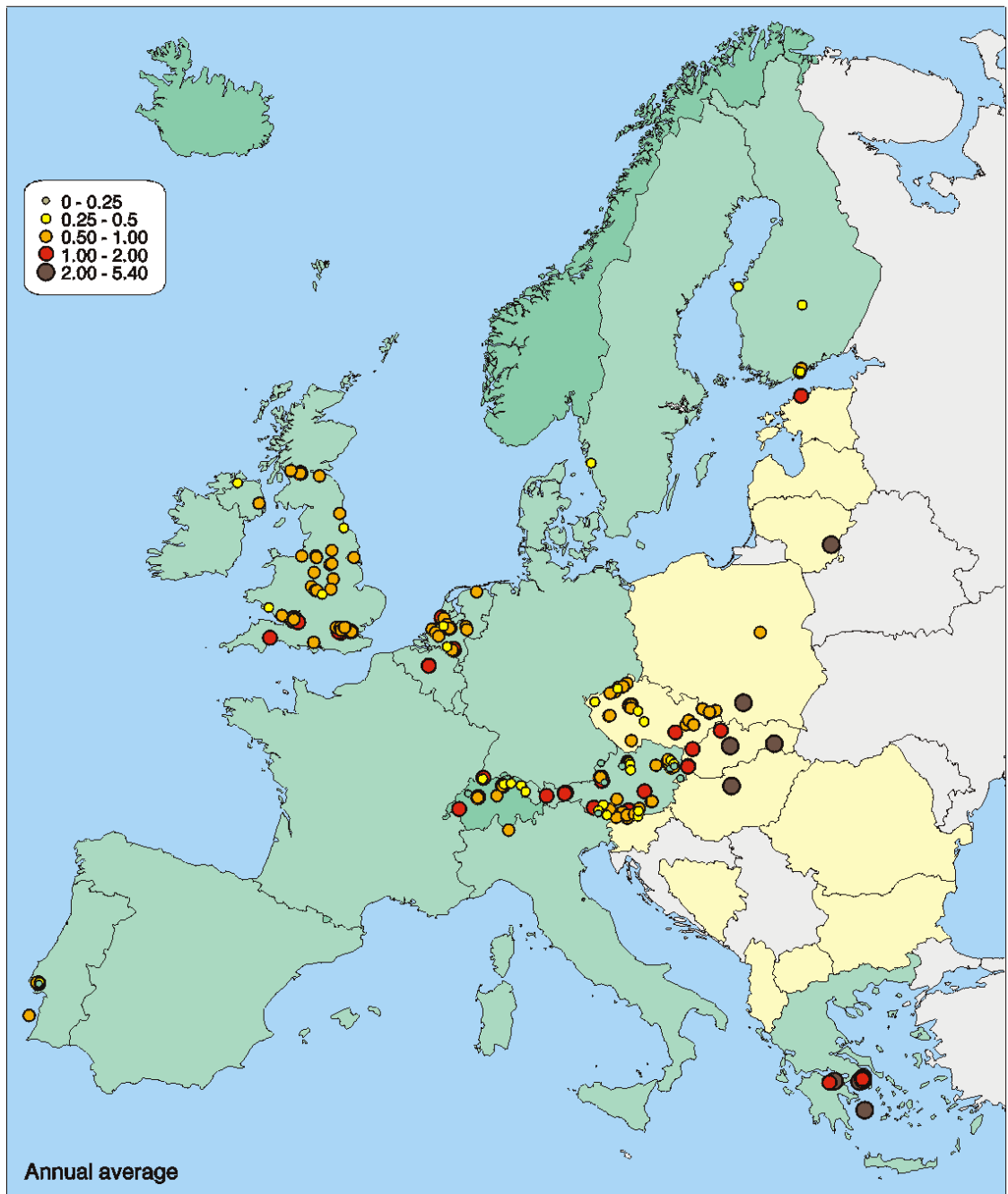
Map 4: Carbon monoxide; location of stations and station type, annual average (based on hourly values), 98 percentile and maximum (based on 8 hourly moving averages) (mg/m^3), 1997.

Carbon monoxide



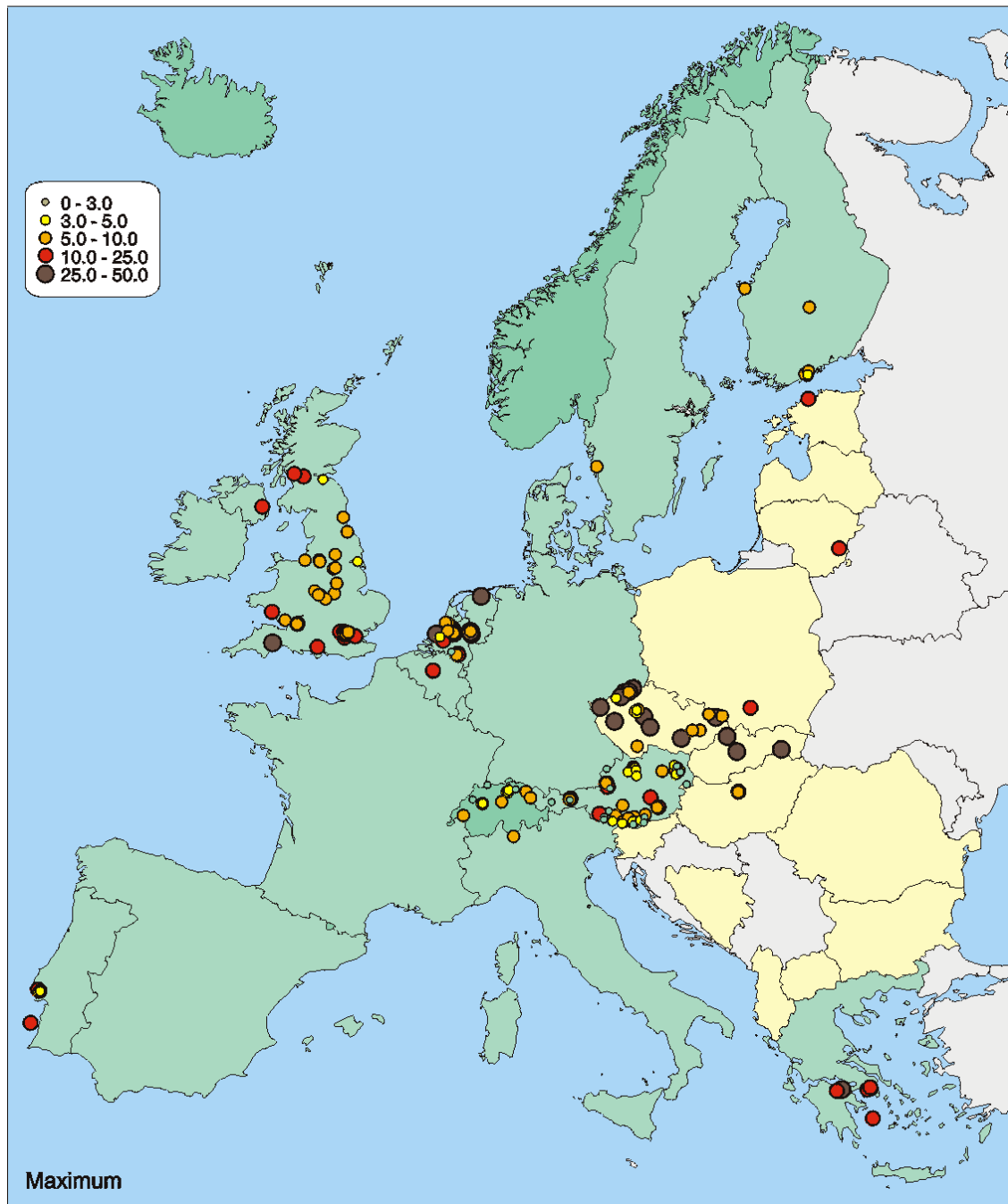
Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

Carbon monoxide



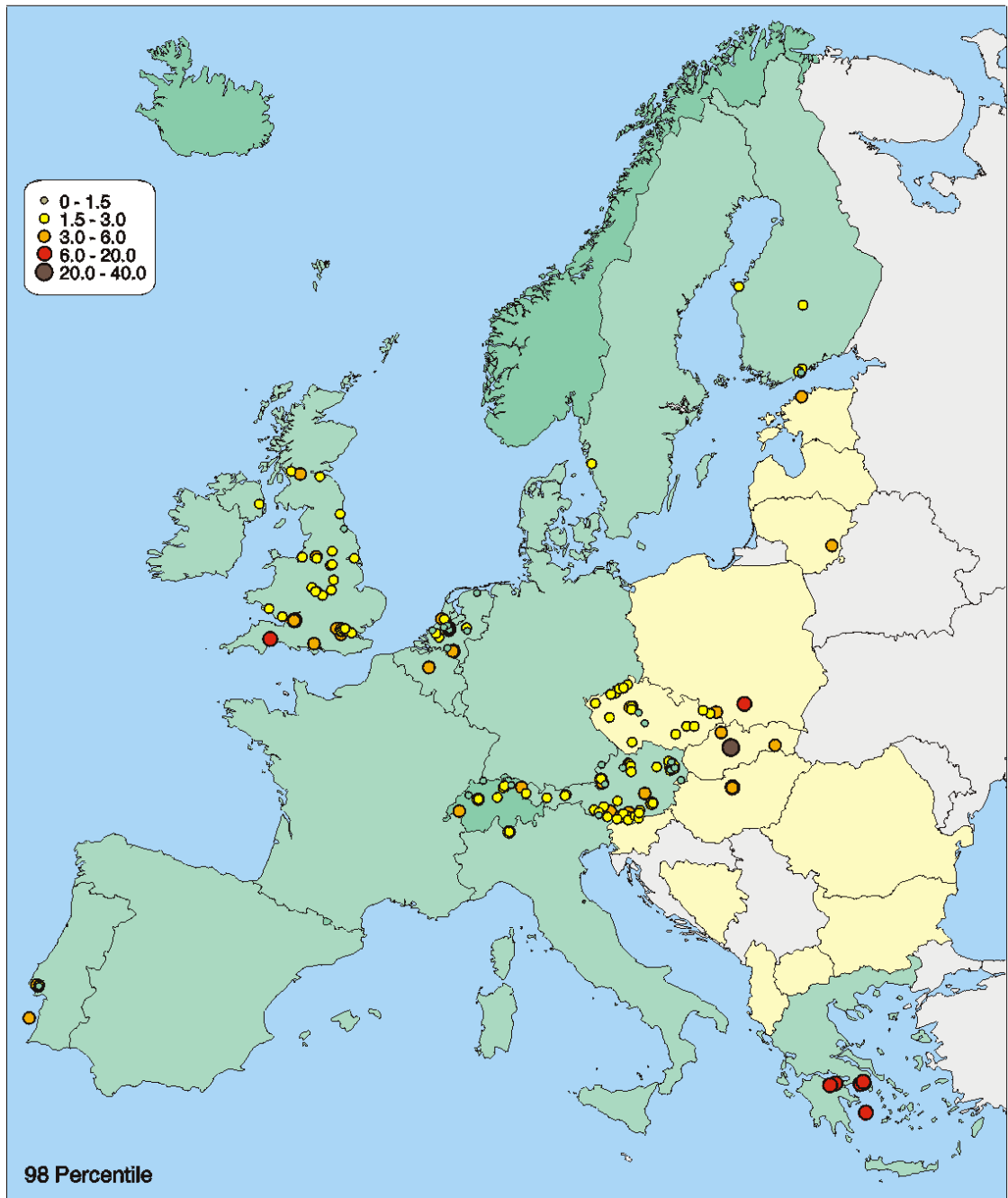
Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

Carbon monoxide



Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

Carbon monoxide



Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

2.6 Ozone

Tables 17 and 18 present average maximum 1 hour O₃ concentrations and average maximum 8-hour O₃ concentrations (based on moving average), respectively. Data were reported from 580 stations in 9 EU Member States and from 61 stations in 6 non-EU countries.

Under the Ozone Directive, information for 1997 was reported by all 15 EU Member States from a total of 984 stations (See “Air pollution by ozone in Europe in 1997 and summer 1998” EEA Topic Report 3/1999). It is clear that not all stations under the Directive report in the Exchange of Information framework, as required in Article 3 of Council Decision 97/101/EC.

The EU 1 hour population warning value of 360 µg/m³ was not exceeded on any reported station in any country. The population information value of 180 µg/m³ was exceeded at stations in most countries. Maximum 1-hour values tend to be lower in northern European countries than in countries further south.

The EU health protection 8-hour value of 100 µg/m³ was exceeded at some stations in all countries except Portugal. Maximum 8-hour values were generally 150-200 µg/m³. One country reported above 250 µg/m³ at one station.

Table 17: Average, minimum and maximum O₃ 1 hour maximum concentrations (µg/m³) in 1997. Figures in brackets refer to the number of stations.

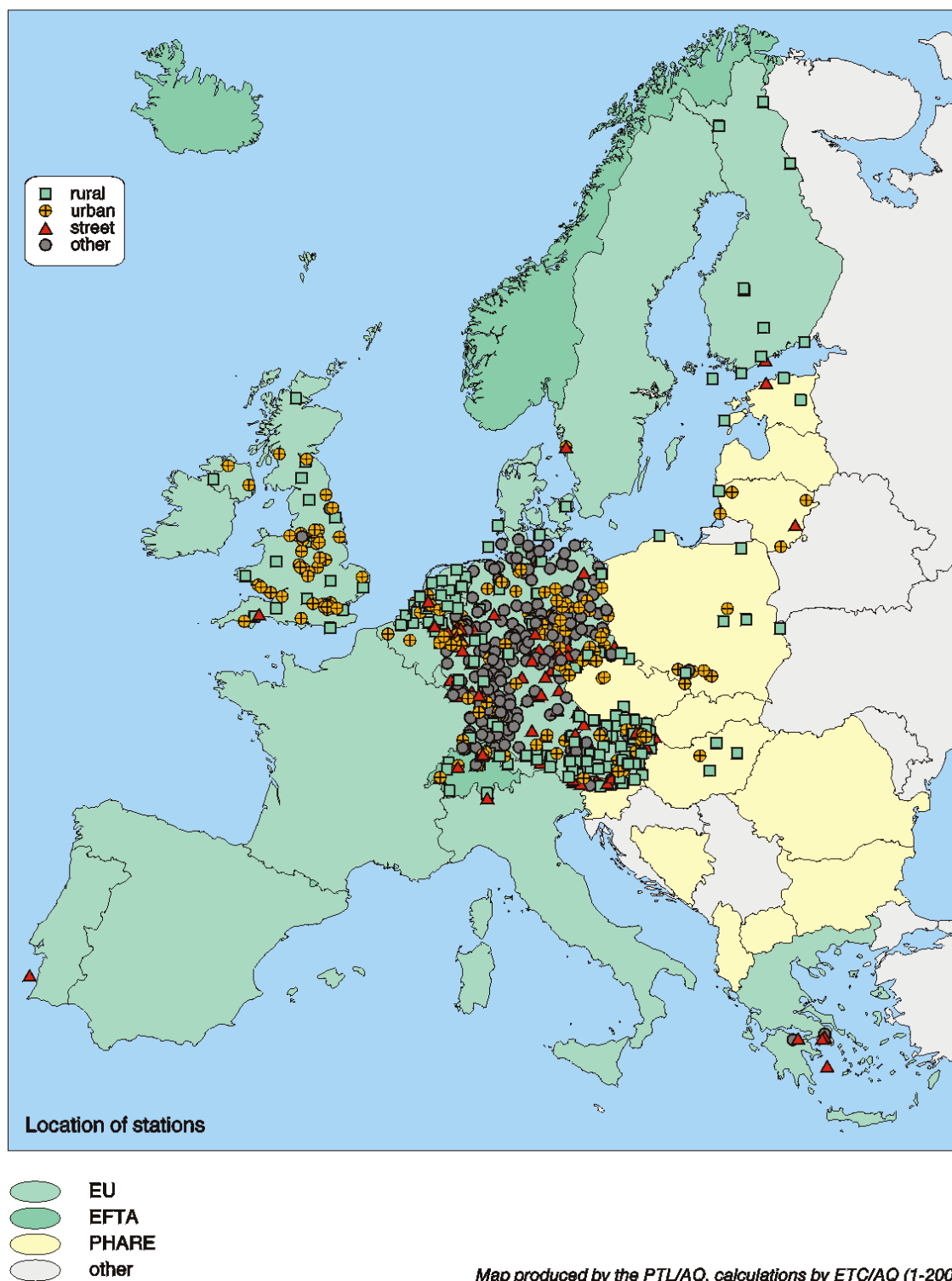
Country	Maximum 1 hour concentrations including range				
	rural	urban	street	other	non-defined
Austria	164 139-206(60)	166 138-209(26)	161 124-228(13)	155 136-180(9)	
Denmark	176 172-181(2)				
Finland	144 119-179(6)		118(1)		
Germany	187 160-244(30)	189 149-223(74)	172 109-253(54)	193 166-208(4)	186 118-241(201)
Greece			217 137-256(5)		284 252-315(2)
Netherlands	198 153-266(22)	187 168-222(7)	181 156-234(8)		
Portugal			77(1)		
Sweden		144(1)	117(1)		
United Kingdom	178 132-226(15)	168 110-232(38)		208(1)	
<i>Non EU countries</i>					
Czech Republic	171(1)	172 160-182(5)			
Switzerland	177 156-211(6)	189 162-267(11)	166 121-259(9)	192 177-206(5)	
Estonia	166(1)		122(1)		
Hungary	184 165-199(4)	157(1)			
Lithuania		130 122-143(3)	180(1)		
Poland	155 136-175(7)	182 142-222(6)		141(1)	

Table 18: Average, minimum and maximum O₃ 8 hour maximum concentrations (µg/m³) in 1997 (based on moving 8h average). Figures in brackets refer to the number of stations.

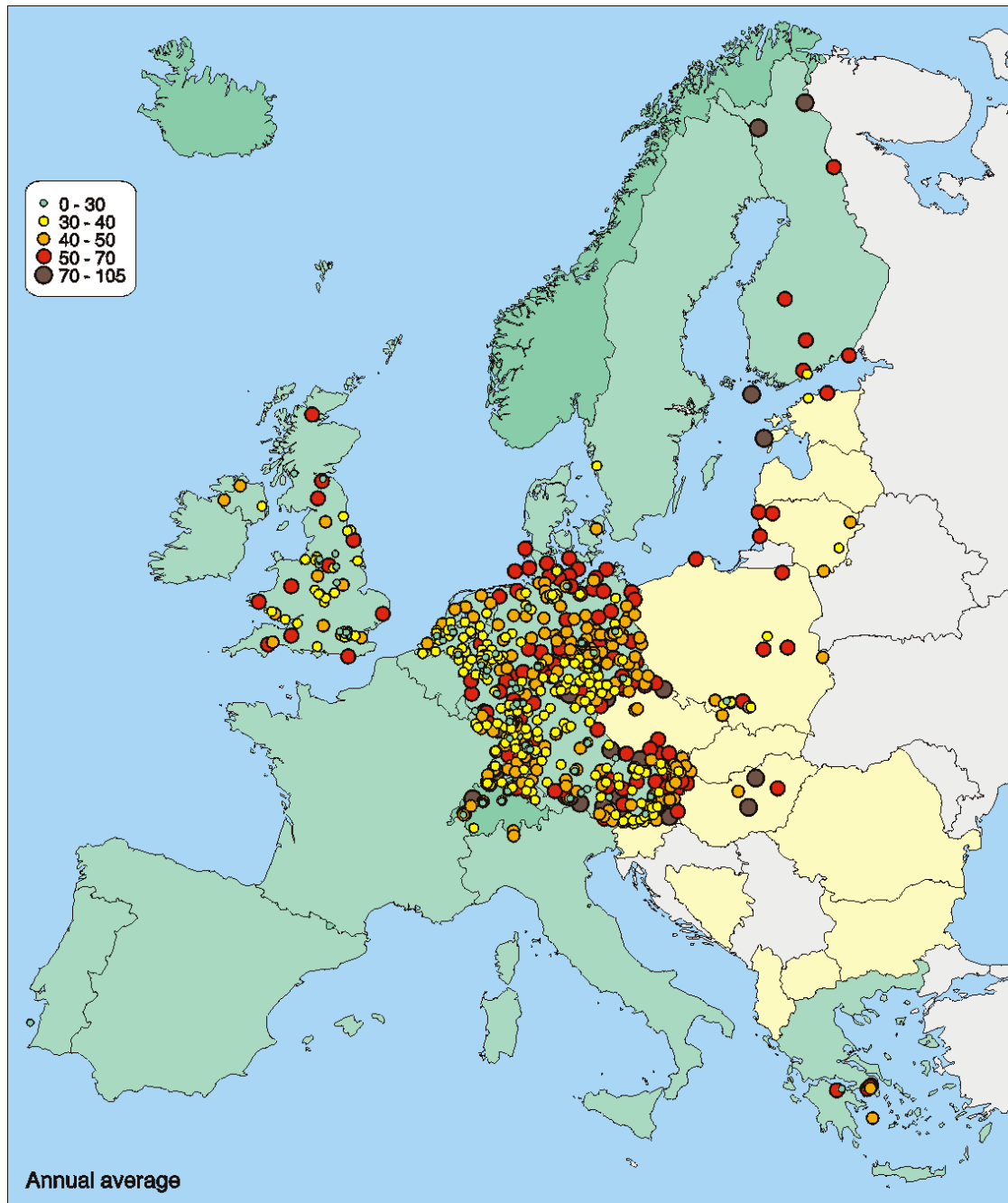
Country	Maximum 8 hour concentrations including range				
	rural	urban	street	other	non-defined
Austria	149 124-174(60)	142 122-165(26)	139 112-156(12)	137 126-163(9)	
Denmark	157 157-158(2)				
Finland	127 114-147(6)		102(1)		
Germany	169 150-213(30)	161 130-201(75)	148 93-181(54)	168 141-178(4)	161 97-226(201)
Greece			172 109-201(5)		228 205-252(2)
Netherlands	166 131-198(20)	163 150-178(7)	147 109-186(8)		
Portugal			57(1)		
United Kingdom	160 128-195(15)	147 100-199(38)		176(1)	
<i>Non EU countries</i>					
Switzerland	153 141-168(6)	167 150-203(9)	137 111-158(8)	171 157-191(5)	
Czech Republic	154(1)	151 147-155(5)			
Estonia	152(1)		107(1)		
Hungary	165 146-177(4)	136(1)			
Lithuania		120 113-127(3)	157(1)		
Poland	146 130-167(7)	151 125-175(6)		134(1)	
Slovenia	174 161-187(2)	179 162-195(2)	120(1)		

Map 5: Ozone; location of stations and station type annual average, maximum and 98 percentile observed 1 hour values ($\mu\text{g}/\text{m}^3$), 1997.

Ozone

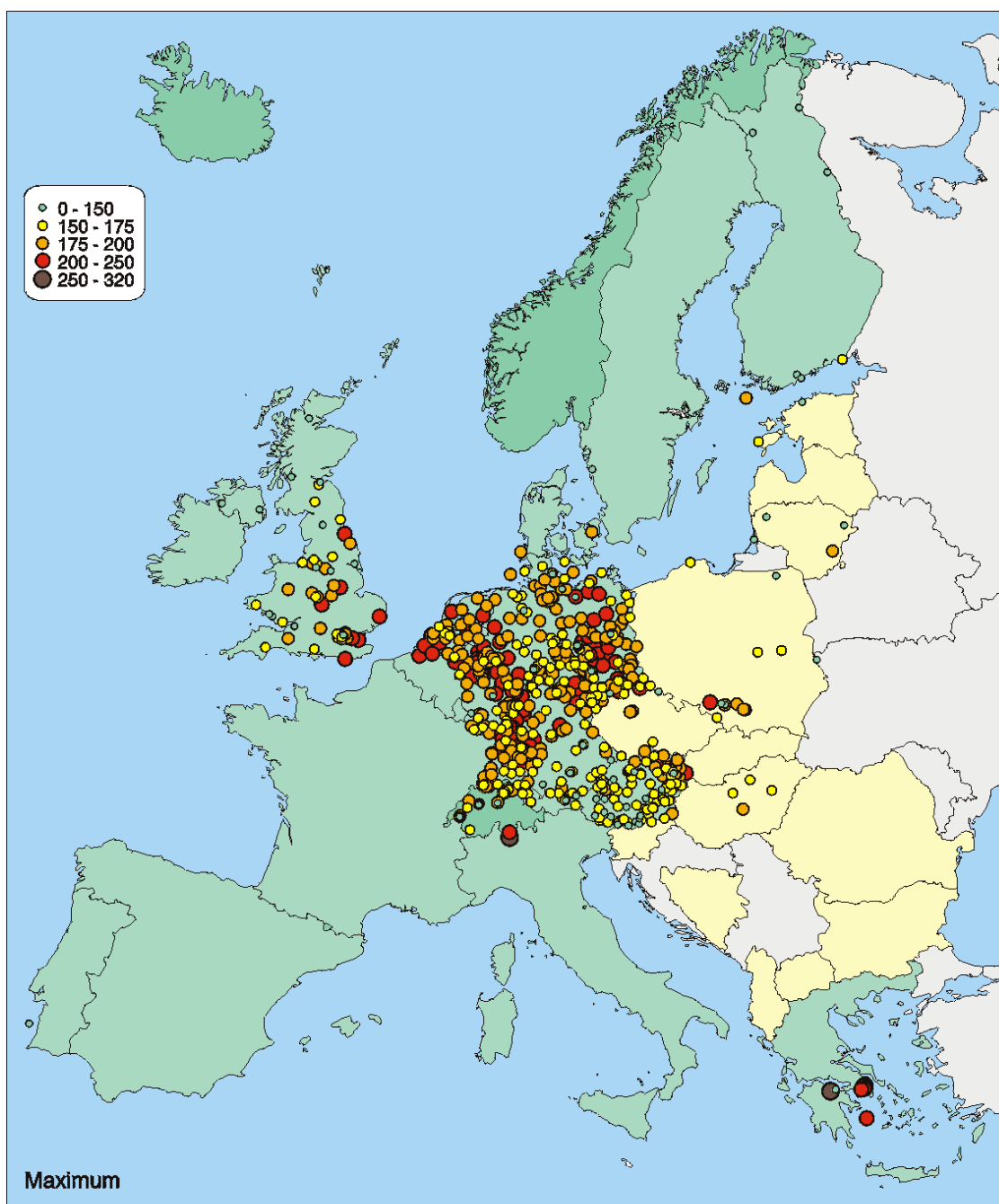


Ozone



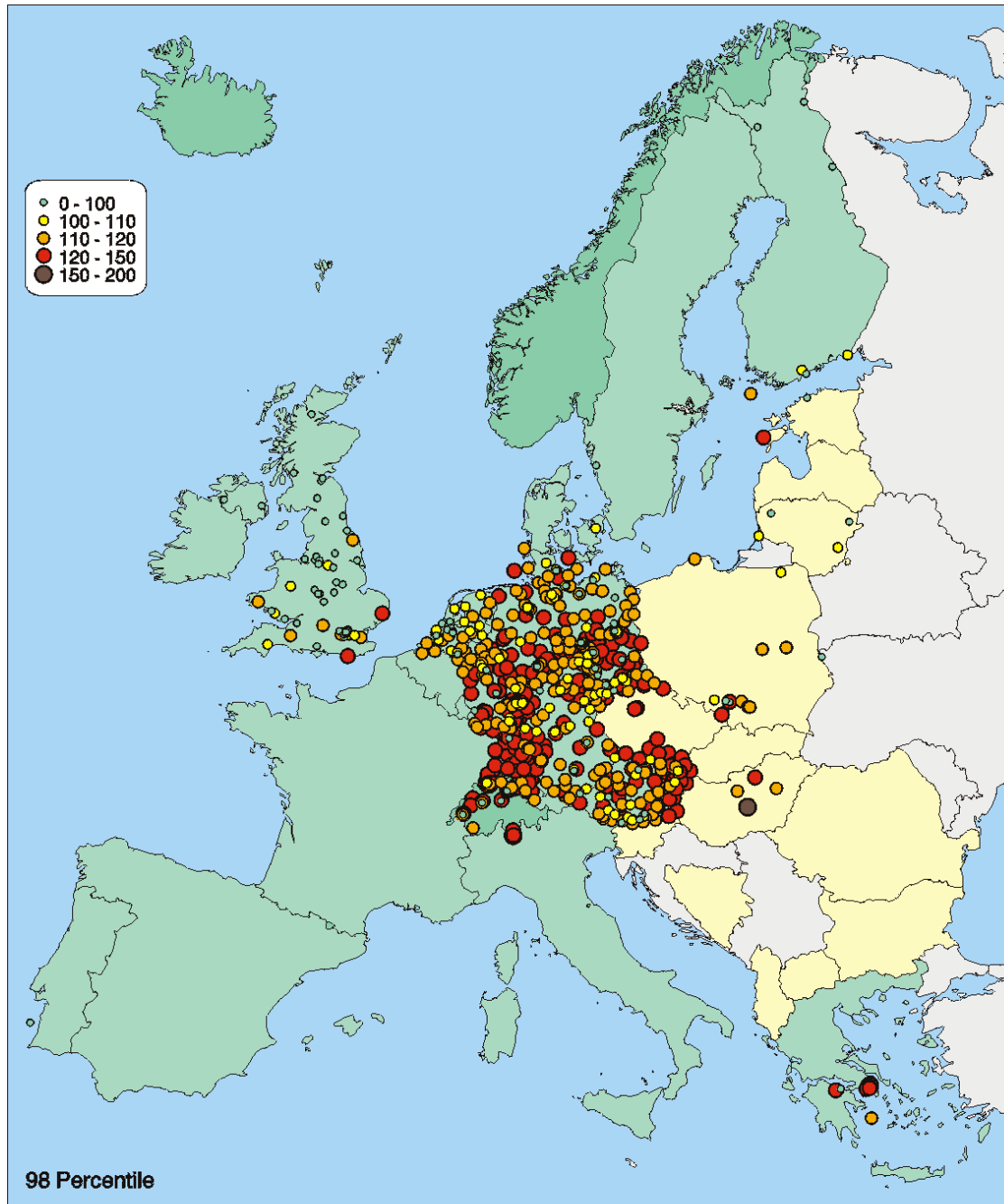
Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

Ozone



Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

Ozone



Map produced by the PTL/AQ, calculations by ETC/AQ (1-2000)

3. Discussion, conclusions and recommendations

Table 19 summarizes the number of stations for which 1997 data, as well as 1996 data, were reported, per component. Table 20 summarizes the 1997 data reporting in more detail (per country).

11 EU Member States reported 1997 data. 9 of those have reported at least the 4 components SO₂, PM, NO₂ and O₃. No information was available from France, Italy, Luxemburg and Spain. 10 non-EU countries reported 1997 data.

The extent of the reporting has increased very significantly from 1996 data to 1997 data (Table 19), from 8 to 11 EU Member States, and from 10 to 21 countries in total. Regarding component-station combinations, it increased from 251 for 1996 to 3,272 for 1997 data from EU Member States, and to 3,965 component-stations in total from 21 countries for 1997 data.

In the preamble of Decision 97/101/EC it is stated that the information collected should be sufficiently representative to enable pollution levels to be mapped throughout the Community. Articles 3 and 5 set requirements for the selection of stations and data to be reported under the Decision. The maps show clearly that reporting of 1997 data under EoI does not cover all of the EU area, and that the spatial density of stations vary greatly. Although the 1997 data reporting is much more extensive than the 1996 reporting, the spatial coverage is still not complete enough to enable an acceptable assessment of the air quality within EU. Therefore, it is recommended that the Member States evaluate their station selection, in accordance with Articles 3 and 5.1 of the Decision. In this process, it is recommended to see the selection also in connection with the selection of EUROAIRNET stations, which has been made.

Article 5.1 states that data shall be transmitted under the EoI Decision, unless they have been made available to the Commission under existing legislation on air quality. At present, it is not clear to the ETC-AQ to what extent data (time series and statistics) from stations for which information (in the form of exceedances and statistics) have been reported under the Air Quality Directives, have been submitted also in the framework of EoI.

Article 7 of the EoI Decision states that in its report the Commission will outline underlying trends in air quality in the European Union. AIRBASE now contains fairly long time series (several years) of data for certain components (e.g. SO₂, BS) for a limited number of stations in some countries. We have nevertheless chosen not to present trends from such a limited basis, since it would not necessarily provide a representative picture of the trend on a European scale.

It is recommended that those Member States which have not done so, transmit data collected between 1989 (the last year of mandatory reporting under Decision 82/459/EEC) and 1996 to enable trend analysis, in accordance with Article 5.4 of Decision 97/101/EC. This topic can then be covered more fully in the 1998 data report.

Table 19: Number of stations for which data were reported, for 1996 and 1997 data.

Component	1996 data	1997 data
EU Member States		
Sulphur dioxide	69	776
Strong Acidity	23	211
Black Smoke	21	244
TSP	29	460
PM ₁₀	-	72
Nitrogen dioxide	40	730
Lead	7	51
Carbon monoxide	32	148
Ozone	30	580
Non EU countries		
Sulphur dioxide	4	161
Strong Acidity	-	-
Black Smoke	-	33
TSP	-	33
PM ₁₀	7	73
Nitrogen dioxide	8	135
Lead	-	-
Carbon monoxide	4	58
Ozone	4	61

In order to enable proper assessment of air quality based upon reported air quality data, it is necessary to group stations according to their emission environment. Decision 97/101/EC presents a station type classification (traffic, industrial, background) and type of zone classification (urban, suburban, rural). For this report, the ETC-AQ has attempted to classify the stations according to station types (rural, urban, street). Many stations could not be classified because meta information on stations is (partly) missing. This concerns about 28% of the component-stations in the average for all components (up to about 40% for TSP and O₃). This also limits the use of the air quality data for assessments.

Table 20: Number of stations for which 1997 data were reported, based on statistics for annual mean values.

	SO ₂	SA	PM ₁₀	TSP	BS	PM ₁₀ , TSP, BS	NO ₂	Pb	CO	O ₃
Austria	137			106		106	128		58	108
Belgium	61	45	12		51	84	25	47	2	
Denmark	4			4		4	4	4		2
Finland	8		1			1	8		6	7
Germany	440			350		350	440			363
Greece	8				1	1	6		8	7
Ireland							2			
Netherlands	39		19		14	33	43		21	37
Portugal							3		8	1
Sweden	8				3	3	7		1	1
United Kingdom	71	166	40		175	215	64		44	54
EU Member States	776	211	72	460	244	776	730	51	148	580
Czech Republic	56		56			56	42		25	6
Estonia	4			1		1	3		1	2
F.Y.R.O.M.	24				27	27				
Hungary	12			8		8	11		8	5
Latvia	2						2			
Lithuania	1						1		1	4
Poland	13		8		6	14	14		2	13
Slovak Republic	20			23		23	29		6	
Slovenia	3						2			
Switzerland	26		9			10	31		15	31
NON EU countries	161		73	33	33	139	135		58	61
All countries	937	211	145	493	277	915	865	51	206	641