

# **European Topic Centre on Air Quality**

## **Air Quality Annual Topic Update 1997**

By Roel M. van Aalst

January 1998

This report was prepared under the supervision of  
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# 1. INTRODUCTION: EEA AND THE EUROPEAN TOPIC CENTRE ON AIR QUALITY

## 1.1 The European Environment Agency

The European Environment Agency (EEA), based in Copenhagen, was established in 1990 by a Council Regulation of the European Union (1210/90). The main purpose of EEA is to provide objective, reliable and comparable information for those concerned with framing, implementing and further developing European environmental policy, and for the wider European public.

One of the major tasks of EEA is the co-ordination and further development of the European Environmental Information and Observation Network, EIONET, consisting of co-ordinating institutes (national focal points) and expertise centres (national reference centres) in the participating countries, and European Topic Centres (ETCs). These ETCs work on behalf of EEA with the countries and the European Commission on specific environmental areas.

In a collaboration with the EU PHARE programme, the work of EEA has been extended to 13 central- and eastern European countries to cover more than 30 European countries.

## 1.2 The European Topic Centre on Air Quality

The European Topic Centre on Air Quality (ETC-AQ) was established by EEA at the end of 1994. The goal of ETC-AQ is to support EEA in all its tasks as far as air quality is involved.

A consortium of four institutes was contracted for the period 1995-1997:

- National Institute of Public Health and the Environment (RIVM), Bilthoven, the Netherlands (lead institute)
- Norwegian Institute for Air Research (NILU), Kjeller, Norway
- National Observatory of Athens (NOA), Athens, Greece, supported by the University of Athens and the University of Thessaloniki
- Norwegian Meteorological Institute (DNMI), Oslo, Norway

In 1997, the Management Board of EEA decided to continue working with this consortium for a further period 1998-2000.

The ETC Leader, Roel van Aalst (RIVM)<sup>\*</sup>, is supported by a Steering Group consisting of the contact persons for the participating institutes in ETC matters.

In the Management Committee, which consists of the Steering Group and the task leaders, the planning and progress of work and plans for future work are discussed and endorsed. The Committee meets twice a year in a plenary meeting of the ETC.

The work of ETC-AQ is described in the EEA Multiannual Work Programme, and, more specifically in the context of this report, in the Annual Work Programme 1997. The work is further specified in the technical annex to the agreement between EEA and ETC-AQ, and in work plans, where tasks, products and time schedules are defined in detail.

The work on each of the tasks, as defined in the work plan, is carried out by task teams composed of team members from different institutes, lead by a task leader who is responsible to the ETC Leader for the task and its deliverables.

Information on the work programme, progress and products of ETC-AQ in 1995 and 1996 can be found in the Annual Summary Reports 1995 and 1996 (EEA Topic Reports 22/1996 and 5/1997). The current report presents a summary of the results of the work in 1997.

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<sup>\*</sup> In the course of 1997, the project leader was temporarily replaced while on extended leave for health reasons.

In the framework of the EEA-PHARE collaborative project, a consortium lead by AEA Technology (UK) has been contracted to help extend the ETC-AQ work to PHARE countries. This PHARE Topic Link will closely co-operate with ETC-AQ under the co-ordination of the ETC-AQ leader, to ensure that ETC-AQ and PTL-AQ in fact act as a joint extended Topic Centre.

For further information, visit the Website of ETC-AQ:

<http://www.etcaq.rivm.nl/>

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### 1.3 National Primary Contact Points

Albania	Maksim Deliana	Ministry of Health and Environment
Austria	Ruth Baumann	Umweltbundesamt Wien, Dept. for air quality
Belgium	Alain Derouane	Cellule Interrégionale de l'Environnement/ Intergewestelijke Cel voor Leefmilieu - CELINE/IRCEL
Bosnia-Herzegovina	Ahdin Orahovac	Federal Ministry for Physical Planning and Environment
Bulgaria	Iordanka Stoyanova	Ministry of Environment
Czech Republic	Vaclav Krejci	Ministry of Environment
Denmark	Niels Zeuthen Heidam	Danmarks Miljøundersøgelser
Estonia	Leo Saare	Estonian Environment Information Centre
F.Y.R.O.M.	Strahinja Trpevski	Ministry of Urban Planning, Construction and Environment
Finland	Tapani Säynätkari	Finnish Environment Institute
France	René Guillermo	Ecole des Mines de Douai
Germany	Horst Werner	Umweltbundesamt
Greece	Michael Petrakis	Institute of Meteorology and Physics of the Atmospheric Environment, National Observatory of Athens, NOA
Hungary	Pal Bozo	Ministry of Environment and Regional Policy
Iceland	Ólafur Pétursson	Environment and Food Agency
Ireland	Michael McGettigan	EPA Regional Inspectorate Dublin
Italy	Roberto Abbondanza	Sistema Informativo Nazionale per l'Ambiente, MAMB - SINA
Latvia	Ilze Kirstuka	Latvian Environmental Data Centre
Liechtenstein	Petra Bockmühl	National Office for Forests, Nature and Landscape
Lithuania	Evaldas Vebra	Ministry of Environmental Protection
Luxembourg	Théo Weber	Administration de l'Environnement
The Netherlands	D. Van Lith	Rijksinstituut voor Volksgezondheid en Milieu, RIVM
Norway	Steinar Larssen	Norsk Institutt for Luftforskning, NILU
Poland	Zbigniew Kamiński	State Inspectorate for Environmental Protection
Portugal	Maria Leonor Gomes	Ministerio do Ambiente
Romania	George Dulcu	Ministry of Water, Forest and Environmental Protection
Slovak Republic	Jan Jezny	Ministry of the Environment
Slovenia	Anita Velkavrh	Ministry of the Environment and Regional Planning
Spain	Pedro de Pablo Ricote	Subdirección General de Protección del Medio Atmosférico, Dirección General de Política Ambiental (MOPTMA)
Sweden	Ebbe Kvist	Swedish Environmental Protection Agency
Switzerland	U. Nyffeler	Swiss Agency for the Environment, Forests and Landscape
United Kingdom	Paul Swallow	Department of the Environment

## **2. PROGRESS IN 1997**

### **2.1 General**

Progress in the work was reported to EEA and EIONET in four quarterly reports. An Annual Summary Report 1996 was prepared by the ETC and published by EEA (Topic Report 5/1997).

Throughout the year, various contacts were maintained with international organisations and a wide variety of institutions.

Inside EEA, various contacts were maintained, and particularly collaboration with the European Topic Centre Air Emission (ETC-AE) has been very important. The collaboration resulted in a joint report "Air Pollution in Europe 1997", published by EEA as Environmental Monograph no. 4.

Collaboration with ETC Inland Waters has also been intensive in preparing proposals for information systems and facilitating data exchange with countries.

Contacts were particularly frequent and intensive with the European Commission DGXI.D3, and JRC-ERLAP. Contacts with the DGXIII Environmental Telematics Programme and with DGIII were also very useful.

Connections to UN-ECE, particularly the EMEP programme, are traditionally strong: two ETC partner institutes are Co-ordinating Centres of EMEP, and the ETC leader is a member of the Bureau of the EMEP Steering Body. Efforts were taken to ensure intercompatibility of the ETC air quality information system AIRBASE and the EMEP database EBAS.

Collaboration with WHO was mainly through the WHO European Centre for Environment and Health in Bilthoven.

Contacts with research communities included DGXII and EUROTRAC (see 2.3).

### **2.2 Air Quality Aspects of EIONET**

The National Focal Points (NFPs) and National Reference Centres (NRCs) for air quality have been involved in the work of ETC-AQ in a number of ways.

First, NFPs were involved in discussions on the work plan. Work plans and developments were presented at NFP/EIONET meetings in Copenhagen.

Five ETC reports prepared in 1996/1997 were submitted for comment to NFPs/NRCs, and useful comments were received and used for improvements.

The ETC organised the Second European Workshop on Air Quality Monitoring and Assessment in Brussels in September. The workshop was attended by representatives from 14 EEA member countries and 13 PHARE countries. Present were also representatives from EEA and ETC-AE, from DGXI and JRC-Ispra. See Box 2.1 for more information on the workshop.

**Box 2.1      Second European Workshop on Air Quality Monitoring and Assessment**

This second workshop, held in Brussels on 22-23 September 1997 had a more technical orientation than the first one (Copenhagen, April 1996), which was more oriented towards the general assessment strategy and the ETC work programme.

After an opening address by Gordon McInnes (EEA), Pierre Hecq from DGXI the status of the EU Exchange of Air Quality Information process.

A draft report on the criteria for the design of the so-called EUROAIRNET had been prepared for the meeting, and was presented by Steinar Larssen.

There is active work on the further development of AIRBASE in ETC-AQ, and a report on the present status and further development plans for AIRBASE was presented by Rob Sluyter and Charlos Potma (ETC-AQ).

The main objective of the workshop was to discuss these two reports, and to receive guidance from the participating countries on further development of EUROAIRNET and AIRBASE. There was a vivid discussion and the ETC received many useful comments and feedback from the experts from the participating countries.

The final session of the workshop was titled "Progress and development towards European-scale assessments".

Jock Martin presented EEA's views on "Customer's needs and expectations" regarding the ETC-AQ products. Among his recommendations was a plea for less technical reports, and more key facts/indicators.

For assessments, a combination of monitoring and modelling on various scales is needed.

The final presentation by the Steinar Larssen (ETC-AQ), on "European-scale assessments of air quality and effects", stressed the need to move towards exposure and effect assessment, and thus to the damage costs in the cost-benefit analysis to support effective policies on air quality improvement.

NFPs and/or NRCs delivered upon request national air quality data. Most of these were provided under the EU Exchange of Information Decision (EoI); the procedures for non-EU members were synchronised with the EoI, and the same formats and procedures were used. (See also 2.5)

A newsletter on activities in the ETC was produced and circulated in 1997 among some 1000 addresses, including many readers in central and eastern Europe. A second newsletter, addressing the PHARE Topic Link, the Workshop, and EUROAIRNET/AIRBASE, was completed to be sent out in January 1998.

A program for visiting EEA member countries has been continued. In these visits, mostly combined with national meetings of regional/urban institutions for air quality monitoring and assessment, ETC work is presented, with emphasis on the monitoring network EURO-AIRNET and the information system AIRBASE, the national infrastructure in monitoring, modelling and data bases and information systems is discussed, and prospects for intensified collaboration are explored. These visits were considered very useful, both by the ETC and the national experts.

As mentioned in the Introduction, the work of EEA and ETC-AQ is now extended towards countries in central and eastern Europe, by establishing the PHARE Topic Link (PTL). Box 2.2 provides more information on the PTL.

**Box 2.2      Introducing the PHARE Topic Link - Air Quality (PTL-AQ)**

In collaboration with the PHARE programme from EC DG1a, EEA is formally extending its geographical coverage by the inclusion of the 13 PHARE countries - Albania, Bosnia-Herzegovina, Bulgaria, Czech Republic, Estonia, F.Y.R.O.M, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic and Slovenia.

This extension will a.o. be achieved by the formation of PHARE Topic Links to extend the work of several of the corresponding European Topic Centres to the PHARE countries. In Autumn 1997, the contract for the PHARE Topic Link consortium for Air Quality was announced.

For air quality, the PHARE Topic Link (PTL-AQ) includes air monitoring and modelling experts from AEA Technology (AEA), The Czech Hydrometeorological Institute (CHMI), The Slovak Hydrometeorological Institute (SHMU) and Decision and System Management Ltd (DASY) in Hungary. The PTL leader is Jaroslav Fiala (CHMI).

The overall aim of the PHARE Topic Link is to assist EEA to extend its work on air quality to the PHARE partner countries. This will be achieved by working closely with the existing ETC-AQ to form, in effect, a single extended topic centre to cover all 31 countries now included within the remit of EEA.

The work of PTL-AQ will be devoted to assisting the integration of the PHARE countries into EEA. The workplan of the PTL-AQ builds on that of ETC-AQ in the areas of EIONET development, air monitoring networks, air information systems, modelling infrastructure, air quality assessment and EEA reporting. During the 2-year contract of the PTL-AQ we will be visiting a number of the PHARE countries to further explain and clarify the needs of EEA, particularly in relation to AIRBASE and EUROAIRNET. The PHARE countries will be assisted to assimilate and provide appropriate data and other information. In addition, PHARE countries will be kept fully informed of EEA, ETC-AQ and PTL-AQ activities and the extended ETC will promote their reports and other information outputs through EIONET and the world-wide-web.

The PTL will also seek to bring forward ideas, comments, and problems related to air quality issues from the PHARE countries to European level discussion.

For modelling, amongst other tasks, the PTL will promote and encourage the inclusion of models used in the PHARE countries into the ETC-AQ Model Documentation System.

Its task will also be to ensure that PHARE countries data and viewpoints are incorporated, wherever applicable, into the reports and other outputs of EEA and ETC-AQ and other international fora such as UNECE and WHO.

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## 2.3 Ad-Hoc Technical Support to EEA

The ETC participated in the Environmental Assessment Group (EAG) of EUROTRAC, the EUREKA environmental project on air pollution. The EAG, in which DGXI, DGXII, EMEP, EEA and scientists co-operate, forms an interface between the scientific research in some 260 research groups, and the information needed in environmental policy in Europe, as provided by these operational agencies.

The ETC supported IVM, the Netherlands, in the DGXI project "Evaluation of air quality targets" by providing concentrations of particulate matter (PM10), calculated on the basis of an emission inventory compiled for RIVM and the Dutch Environment Ministry by TNO.

The ETC contributed to the EEA project Data Flow Analysis for Integrated Assessment, in which data flow and tools for integrated assessments were inventoried.

## 2.4 Further Development of the Air Quality Monitoring Network EUROAIRNET

EUROAIRNET is the working acronym for the European Air Quality Monitoring System that is to be established for the purpose of making ETC-AQ and EEA able to report timely, on an annual basis, on the assessment of European air quality. The network will be based upon sites included in reporting under the EoI Decision but extended by a selection of already existing local/national networks and stations in the European States to ensure sufficient representativeness at the European level. Data will be transferred to the air quality data base of ETC-AQ, the AIRBASE. The outlook is pan-European, i.e. the network should include stations from all countries in Europe (not restricted to the EU Member states). The emphasis of EUROAIRNET is on urban air quality, but regional stations will also be included.

The EUROAIRNET was first discussed at the Workshop on European Air Quality Monitoring and Assessment at EEA in April 1996. Since then, criteria for the development of the EUROAIRNET have been developed (see Box 2.3), and countries have been asked to propose stations for EUROAIRNET according to these draft criteria.

"Country visits" have been conducted to NFPs/NRCs (see Annex 1) to get updated information on the networks and stations in each country, and to discuss the criteria, selection of stations, data availability, national reporting, etc. ETC-AQ has conducted such visits to Finland, Sweden, Denmark, UK, Ireland, Germany, France, Italy, Spain, Portugal, as well as Norway, the Netherlands and Greece where the ETC partners is also a designated NRC. Visits are planned to other western European countries. The PHARE Topic Link will conduct similar visits to the PHARE countries. Reports from these visits will be put together as a technical report to EEA in 1998.

16 countries have made a first proposal of "EUROSITES", and returned the questionnaire containing key information about the stations. This first selection contains totally 444 stations in 141 cities in the following countries: Austria, Bulgaria, Czech Republic, Estonia, Finland, Hungary, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Sweden and the UK. Most stations are urban background stations (45%) or traffic stations (45%), while about 7% are industrial stations. The philosophy behind locating monitoring stations vary between countries. Some have mostly urban background stations, and some mostly traffic (hot spot) stations. In the further work with each country to finally select stations for EUROAIRNET, this question of representativeness of the stations in terms of "exposure" (of population, materials, etc.) will be an important topic.

A first publication with description of EUROAIRNET, the network and the stations, will be worked out during the first half of 1998.

Work was finalised on a guidance report on quality assurance, on the basis of an earlier draft report on a common minimum quality assurance program prepared in 1995 in collaboration with JRC-ERLAP.

A report "First evaluation of representativeness and quality of monitoring networks and stations" has been prepared by the ETC and circulated for comments to the EIONET prior to publication as a EEA Technical report in 1998.

### **Box 2.3 EUROAIRNET Report: Criteria for Development of the Network**

The main objective of EUROAIRNET is to provide the basis for estimating the effects of the pollution, representative of the air quality both in space and in time at the European level, and ultimately to establishing the actual emissions-exposure relationship as a basis for developing cost-effective abatement strategies. The specific objectives for the EUROAIRNET network can be described in three stages:

- Stage 1: Air quality assessments produced by monitoring alone;
- Stage 2: Air quality assessments produced by a combination of monitoring and modelling;
- Stage 3: The network supports quantitative assessments of exposure and effects, and thus also analysis of cost-effective abatement strategies.

Initially ETC-AQ is developing the stage one of EUROAIRNET.

The report describes the following criteria for the design and development of EUROAIRNET:

- Selection of areas to be monitored;
- Classification of monitoring sites;
- Area of representativeness of stations;
- Quality assurance and quality control.

Criteria for selection of areas to be monitored is developed for representative exposure assessment of human population, materials and ecosystems. General criteria are described, to the extent it is possible to make criteria of a general nature. Classification of monitoring sites will broadly follow the scheme used in the EU Exchange of Information (Eol) Decision (1997), but for some classes of stations (e.g. traffic stations), some additional station location data will be needed in order to be able to use data from the stations to estimate exposure, to compare between countries, etc.

Guidelines for selection of stations in the selected areas are given in the report.

The draft report was discussed at the 2nd. European Workshop on Air Quality Monitoring and Assessment in Brussels in September 1997, and comments from countries that came up at the workshop and in later correspondence, have been worked into the present draft of the report which is to be sent to NFPs for final comments early in 1998. The final report will then be completed by the ETC for publication by EEA.

## **2.5 Further Development, Implementation and Update of AIRBASE**

### **AIRBASE**

Air quality information collected by ETC-AQ is stored and made widely available by means of a three-layer air quality information system AIRBASE, accessible on the Internet. Two of these layers have been implemented: a relational database which forms the basic layer, and an Internet World Wide Web access facility as the top layer, which was opened in 1996. Due to budget restrictions, a PC version, designed as the third, intermediate layer could not be fully implemented and facilities in the top layer are still limited.

In accordance with the new Exchange of Information (Eol) Decision, The European Commission and EEA have reached agreement that ETC-AQ will be responsible for maintenance and further development of an Eol information system. AIRBASE will serve this Eol system, but it will also incorporate data from other sources, including EUROAIRNET, data submitted under the EU Ozone Directive, and data collected for EEA periodical reports.

The 1997 status of AIRBASE and proposals for extensions were presented to national experts at the second European workshop on air quality monitoring and assessment. The workshop position paper is available from the ETC-AQ Website (address: <http://www.etcacq.rivm.nl>).

Countries agreed that the only way to ensure timely reporting of good quality information to the database, especially the meta-information on networks and stations, is to have a software module available for the transfer of data between countries, the Commission and EEA/ETC-AQ, preferably using the EIONET Telematics Network.

A pilot version of such a PC module, called AIRBADM, was made available to the countries in 1996 and it has been increasingly used in 1997. Based on the experience gained with AIRBADM, on feedback from the countries given during country visits and at the workshop, draft specifications were written for an enhanced Data Exchange Module (DEM). The DEM, which will feature all AIRBADM functionality, is fully in accordance with the new EoI Decision (which comes into force in 1998) and will offer the possibility not only to transmit raw air quality data, but also the statistics required under the Ozone Directive.

Extensions foreseen for the AIRBASE Web application were also presented at the workshop. These extensions mainly concern the presentation of selected data in the form of graphs and maps and will improve the response time of the system by so-called 'mail results to' functionality.

Two Java pilots were prepared by IT University students and a software company focusing on the use of the Internet for presentation of AQ data in the form of maps, graphs and tables. Experience gained will be used during the implementation of the Web extensions for AIRBASE.

### **IRENIE**

A consortium of ETC-AQ, ETC Inland Waters, the University of Thessaloniki and NILU/Norgit, supported by the Topic Centres on Catalogue of Data Sources and ETC-AE was successful in a bid for funding from the DGXIII Telematics Applications Programme to develop an environmental information system. This project will be called IRENIE.

Starting in January 1998, ETC-AQ will develop the Data Exchange Module and extensions to the Web server as part of the IRENIE project. The DEM will be available in June 1998 for the EoI update. Analogous to the air quality Data Exchange Module and AIRBASE information system concept, ETC-IW will develop an information system and DEM for water data within this project. The modules will be tested and implemented by EIONET and in local systems by the project partners NILU/Norgit in Fredrikstad (Norway), the University of Thessaloniki in Athens (Greece) and WRc plc in river Thames catchment area (UK).

### **Update of AIRBASE**

The 1995 data update of the system was finalised in 1997 and software routines to calculate summary statistics according to the "old" EoI Decision 82/459/EEC from the transmitted raw air quality data were implemented. At the moment of writing this report, the 1996 data update is in full progress. The table below presents an overview of data received (by 31-12-97) from EEA/PHARE countries and Switzerland. New software routines for the calculation of statistics in accordance with the new EoI Decision are currently under development and will be implemented in the beginning of 1998.

### **Exchange of Information Reporting**

DGXI and EEA have reached agreement that ETC-AQ will produce both the annual technical report on EoI reporting as well as an annual report summarising the collected data and outlining the underlying trends in air quality. The reports are required under the new EoI Decision (97/101/EC).

ETC-AQ will produce a pilot report covering the 1996 EoI data update, which will be published in the second quarter of 1998.

## ETC Website

ETC-AQ maintains a website (address: <http://www.etcaq.rivm.nl>) on which, along with general Topic Centre information, newsletters and reports are published. The EEA air quality information system (AIRBASE) can be accessed through this Web platform. The website was restyled in 1997.

### 1996 AIRBASE Air Quality Data Update Summary.

Countries: EEA, PHARE, Switzerland.

Status as of 31 December 1997.

Country	Metadata Supplied*	Metadata Update in AIRBASE	1996 Data supplied	1996 Data update in AIRBASE	Meta/Data Received	Data format
Albania						
Austria	+	+	+		Dec 1997	NA-1001
Belgium			+	+	Nov 1997	Eol
Bosnia and Herz.						
Bulgaria						
Czech Republic	+	+	+		Nov 1997	ISO-7168
Denmark			+	+	Nov 1997	Eol
Estonia	+	+			Jul 1997	
F.Y.R.O.M						
Finland	+	+	+	+	Nov 1997	ISO-7168
France						
Germany	+				Aug 1997	
Greece	+			+	Mar 1997	
Hungary						
Iceland						
Ireland			+		Dec 1997	Eol
Italy						
Latvia						
Liechtenstein						
Lithuania	+	+	+		Nov 1997	Custom
Luxembourg						
Netherlands			+	+	Nov 1997	Eol
Norway	+	+	+	+	Jan 1997	NA-1010
Poland	+				Oct. 1997	
Portugal						
Romania						
Slovakia	+	+	+		Dec 1997	ISO-7168
Slovenia						
Spain**			+	+	Nov 1997	Eol
Sweden			+		Dec 1997	NA-1001
Switzerland	+	+	+		Dec 1997	NA-1010
United Kingdom			+	+	Nov 1997	

\* All meta data was supplied through AIRBADM software.

\*\* Spain supplied 1995 data.

## 2.6 Further Development of Air Pollution Modelling Infrastructure and Applications

The two reports "Review on Requirements for Models and Model Applications" (Topic report 18/1996) and "Ambient Air Quality, Pollutant Dispersion and Transport Models" (Topic report 19/1996) were published by EEA. A guidance document "Selection of models and input data for groups of applications", has been circulated to member countries for comments, and is expected to be submitted for publication by EEA in early 1998. A guidance report on urban modelling "Model applications in the assessment of urban air quality" was produced and has been submitted as a final draft to EEA. Box 2.4 summarises this document.

The ETC had earlier developed, in collaboration with the Ad-hoc initiative on harmonisation of modelling for regulatory purposes, an information and documentation system on atmospheric models (MDS), accessible through the Internet. A pilot version, including description of some 30 models, was made available via the ETC home page in spring 1997.

On 25 September 1997, ETC-AQ organised a workshop in Cambridge, UK, with MDS users and expert modellers, to evaluate the MDS and discuss its further development. Box 2.5 contains a short report of this workshop.

In December, an updating effort was launched, following the recommendations of the workshop. A questionnaire/letter was sent to some 600 addresses, announcing the upgrade of the MDS, and inviting modellers throughout Europe to (re)submit documentation on their models. Responses are awaited by 15 February, 1998.

### Box 2.4

#### Model Applications in the Assessment of Urban Air Quality

This report provides guidance for the application of models in the assessment of urban air quality.

Several air pollution problems in cities and urban areas are identified, and guidance is given on types of models available to assess these problems. Moreover, the need is stressed for high quality input data regarding air flow within the urban airshed and for detailed description of air pollutant emissions at proper spatial and temporal resolution. It is also emphasised that there is a strong link between the required input data accuracy and the desired spatial and temporal resolution of the model. The input requirements are higher in case of more complex and detailed models.

Existing urban air quality models cover a wide range of scales for pollution dispersion, from very local models regarding single blocks in streets, to near meso-scale models covering both the city and parts of the rural surroundings. Urban air pollution occurs as a result of emissions and chemical reactions of a wide range of chemical species from a wide group of source categories. The scales of interest in assessing the related problems range from seconds and a few meters to several kilometres and averaging times of up to years. Simplified, urban air pollution can be characterised as the agglomeration of many local pollution sources, from single roads, single stacks, single households etc.

In modelling urban air pollution, a calculation procedure is established to provide a relation between emissions and actual ambient concentrations. The needed complexity of the calculation procedure depends upon the complexity of the true physical and chemical process and the desired accuracy of the model results.

**Box 2.5****Review of EEA-ETC-AQ's Model Documentation System**

ETC-AQ has developed a Model Documentation System (MDS) with the aim to provide to potential model users information on what is available and to offer guidance in the process of selecting a model. The MDS has been made publicly available on World Wide Web since spring 1997. It can be easily accessed via the home page of ETC-AQ ([www.etcaq.rivm.nl](http://www.etcaq.rivm.nl)).

For a model to be included in the MDS an information sheet has to be submitted consisting of two parts: (i) basic information in pre-defined key words ("short description") and (ii) a more detailed model presentation ("long description").

At the workshop held in Cambridge the concept of the MDS was unanimously considered adequate, though several participants recommended that the quality assurance aspect should be taken into account more strongly in the future. There was also agreement that both search facilities implemented in the MDS ("structured search" based on the key words or "unstructured search" using any text string as search parameter) are adequate. All key words included in the MDS were found to be relevant and only few amendments were suggested in the case of the pre-defined terms.

In the case of models which may be useful for regulatory purposes, the long description should contain sufficient clarifying information, e.g. on the potential use for addressing issues introduced by the Framework Directive, or on the applicability to questions raised by national legislation. It was also suggested that a section on "model limitations" be included in the long description, in spite of the fact that modellers are not expected to address this important issue in a fully consistent manner.

The importance of providing information on technical support was stressed. Ideally a link should be foreseen for giving the user the chance to directly pose questions related to the model. Such a link would make clear to a potential user that, if needed, qualified support would be provided by the modeller himself or other authorised experts. Furthermore, it was suggested to include in the long description the opinion of the modellers themselves on the level of documentation and evaluation of their model. It was agreed to adopt the scheme of quantification recommended in the report "Ambient Air Quality, Pollutant Dispersion and Transport Models" (EEA Topic Report 19, 1996).

In the section on documentation, relevant references (preferably to open literature) should be given. In a short descriptive section on model evaluation the modeller should indicate (if relevant) whether or not his model has been participating in model evaluation activities (e.g. of the Ad-hoc initiative). Hyperlinks to these activities and/or literature references should be provided. The explicit request for information on model evaluation is expected to promote and stimulate the participation of modellers in relevant activities.

Procedures to update the system were also discussed. As links to the modeller's own home pages will be provided in future, a frequent update of MDS will not be necessary. An annual update on the scientific information is foreseen. Technical updates (e.g. changes in Web address) will take place on a regular base.

## **2.7 Assessments and Support to EU, International Organisations and Member States**

### ***Air Pollution in Europe 1997 Report***

This report, which analyses four major air pollution problems, was produced by ETC-AE and ETC-AQ and edited by EEA for publication as EEA Monograph no. 4. The problems considered are climate change, acidification/eutrophication, tropospheric ozone and (urban) air quality generally, and specifically for nitrogen oxides and ozone. The analysis use the DPSIR Driving Forces - Pressures - State - Impact- Response framework, highlighting interactions between these problems, such as common causes and impacts to the same risk groups. Box 2.6 provides more information on the report.

### ***Reporting for EC/DGXI under Ozone Directive***

On request of EC/DGXI, the ETC prepared two reports on air pollution by ozone in the European Community for 1996 and the summer 1997. These were produced on the basis of information

reported by the Member States in the framework of Council Directive 92/72/EEC on air pollution by ozone. The reports were submitted to the Directorate General for Environment (DGXI) and presented to the Environmental Council. Both reports will be published as EEA Topic Report and will be available through the EEA website (<http://www.eea.eu.int>). Box 2.7 summarises the conclusions.

On request of DGXI, and in collaboration with WHO and JRC-Ispra, the ETC produced a draft "Consolidated report on ozone" as announced under article 8 of the Ozone Directive (92/72/EEC). The draft was presented and discussed at several meetings of the EC ozone working group and will be finalised in January 1998 for publication as a joint EC/EEA report. Box 2.8 provides some information from the report.

### ***Supporting and Improving Ozone Forecasting and Information Exchange***

In May 1996, in London, the Ministers for the Environment at the Conference on Tropospheric Ozone in Northwest Europe called on EEA, in co-operation with technical experts throughout Europe, to develop an action plan for a co-ordinated European system for data exchange and for forecasting air pollution episodes. The Ministers agreed to establish a pilot group for the North European subregion. Under co-ordination of ETC-AQ, a Technical Working Group on Data exchange and Forecasting for Ozone episodes in Northwest Europe (TWG-DFO) was formed. This group, with experts from 10 countries, met twice in 1996 and 1997, and produced a report, reviewing national systems for ozone episode forecasting, developing criteria for evaluation, and making recommendations on near-real time data exchange. The report was finalised by ETC-AQ in 1997 for publication by EEA in 1998, and plans were set up for follow-up (see 4.7).

#### **Box 2.6 Air Pollution in Europe 1997**

This report has been timed to support new EU policy initiatives in 1997/1998 and assessed several environmental problems in which air pollution plays a major role. The main focus of the report is on pressures, state and impacts, but information is also provided on the main driving forces that influence the state of the environment. The report can be regarded as a building block for the production of an EEA Annual Indicator Report and covers the five environmental problems:

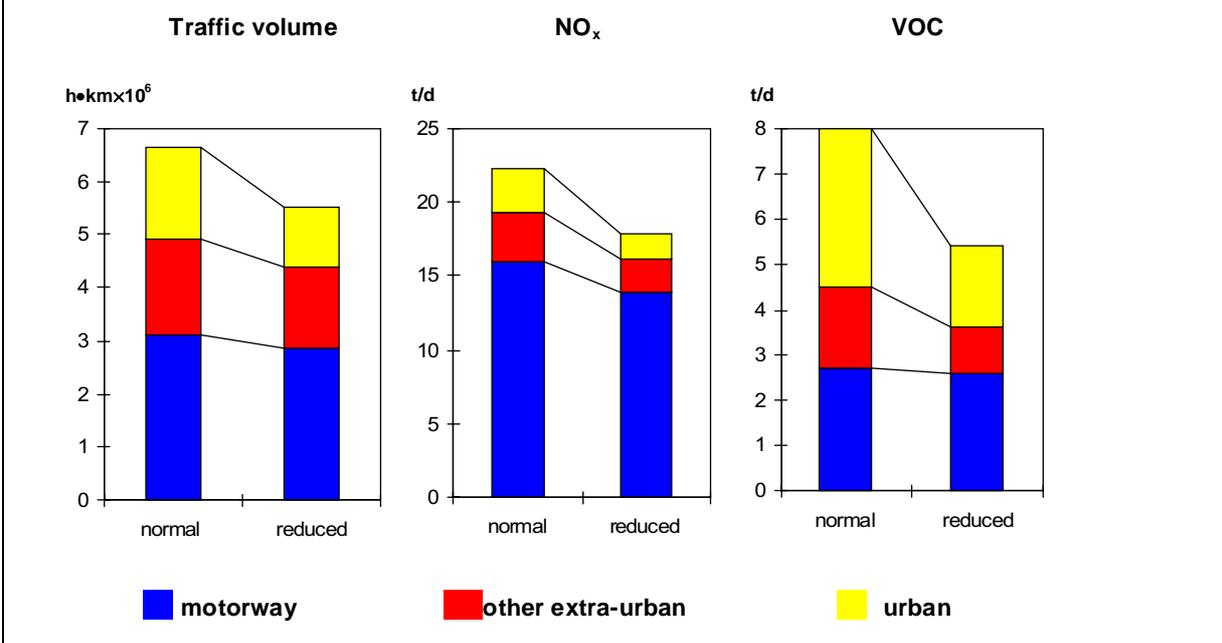
- climate change;
- acidification;
- eutrophication from atmospheric deposition;
- urban air quality; and
- tropospheric ozone.

The main conclusions of the report are:

- only a relatively small number of pollutants released by human activities in the five economic sectors targeted in the EU fifth Environmental Action Programme contribute to five of the main environmental problems currently facing Europe;
- some improvements have emerged in recent years, particularly in those environmental problems which have been recognised for some time, where remedial measures are readily available, and where abatement measures and policy can be very specifically targeted, such as urban lead concentrations from leaded petrol, or acidification caused partly by sulphur emissions from large point sources, such as power plants;
- other problems such as climate change, urban air quality and tropospheric ozone, are more difficult to tackle, either due to increased economic activity or due to the large and increasing number of diffuse emission sources based on fossil fuels, for example vehicles.

However since the same pollutant in many cases is relevant for several of the environmental problems, reductions of emissions to improve one problem will also benefit others. For example, measures to reduce CO<sub>2</sub> emissions to address climate change will also help reduce SO<sub>2</sub>, NO<sub>x</sub> and CO emissions and hence reduce acidification and tropospheric ozone and improve urban air quality.

The figure below from the report shows as an example estimated reductions in traffic volume and traffic emissions on a working day during the Heilbronn ozone experiment (Germany in July 1994) relative to comparable days without intervention



### Box 2.7 Exceedances of Ozone Threshold Levels in the EU

#### Annual report 1996

For the calendar year 1996 information has been received from 836 stations in 13 Member States. Data from France and from Italy were not fully available to be included in this report. The main conclusions from an analysis of the information are:

- Spatial coverage and documentation on monitoring data quality need improvement. The present subset of rural stations is not representative: it is estimated to cover only 40-50% of the land area of the EU. The subset of urban stations is insufficient to estimate the exposure of the population living in cities: the urban stations cover about 30% of the urban population, less than 20% of the total population in the EU.
- The threshold value set for the protection of human health is exceeded substantially and in all Member States reporting. The subset of urban stations is assumed to give representative values of the exposure of an urban population of about 65 million people. 86% of this population is exposed to ozone levels exceeding the threshold during at least one day; 6% is exposed to exceedances during more than 50 days.
- The threshold value of daily average concentrations set for the protection of vegetation is exceeded substantially (by up to a factor 3), widely (in all reporting Member States) and frequently (four Member States report exceedances during more than 300 days at one or more of their stations). Exceedances during more than 150 days are estimated for more than 31% of the area covered by rural stations. The threshold value of hourly average concentrations is exceeded largely and widely (reported by 10 out of 13 Member States) on a limited number of days: in 44% of the mapped area exceedances during 1-5 days are reported.
- The threshold value for providing information to the population has been exceeded in almost all EU Member during a limited number of days. Exceedance of the threshold value for warning of the population has been reported from two stations.

## Box 2.7 Exceedances of Ozone Threshold Levels in the EU - Continued

### Ozone in summer 1997

For the summer period 1997 (April-August) information on the occurrence of exceedances of the threshold values for warning of the population and for providing information to the public has been received from 14 EU Member States. The main conclusions on these data were:

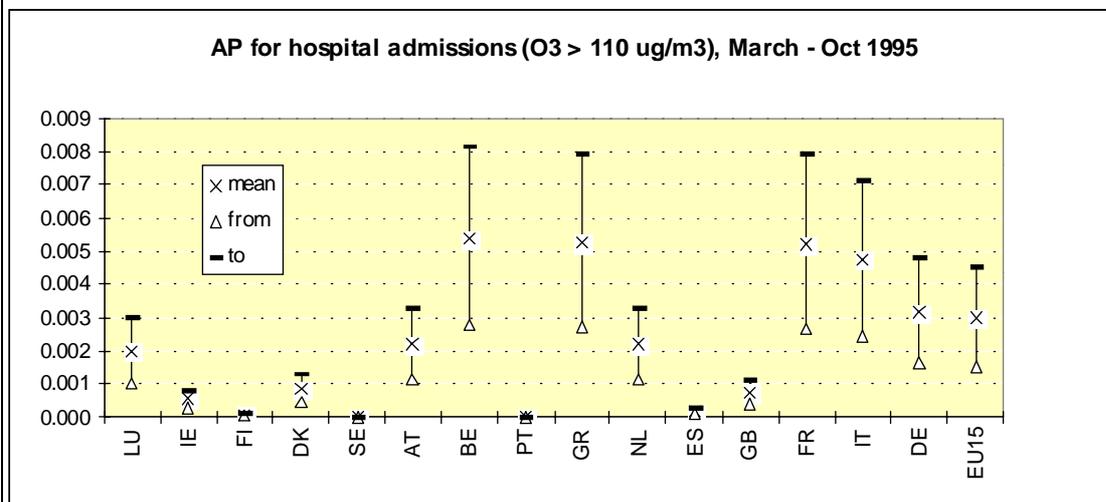
- The threshold for warning of the public ( $1\text{h} > 360 \mu\text{g}/\text{m}^3$ ) was exceeded at one station during summer 1997 in the Athens conurbation (station Lykovrissi,  $383 \mu\text{g}/\text{m}^3$  on 18 June).
- The threshold for information of the public ( $1\text{h} > 180 \mu\text{g}/\text{m}^3$ ) has been exceeded in all Member States with the exception of Ireland, Finland, Denmark and Sweden. The number of days on which at least one exceedance was detected ranged from 5 in Luxembourg to 49 in Italy. 41% of all stations reported one or more exceedances during the 1997 summer season. On average 3.4 exceedances occurred this year on stations which recorded at least one exceedance. The average length of an episode was 2.7 hours.
- The number of stations reporting exceedances, the number of exceedances, and maximum concentrations were lower this year than during the 1995 and 1996 summer seasons. This is mainly to be attributed to year-to-year weather variability.
- A first estimate was made of the percentage of the urban population exposed to at least one exceedance of the population information threshold. From all the cities in which at least one monitoring station was operational, 43% (157 cities) reported one or more exceedances. 25 million people (34% of the population in cities with monitors operational) may have been exposed to these exceedances.

## Box 2.8 "Tropospheric Ozone in the European Union, the Consolidated Report"

This report deals with tropospheric ozone in the perspective of the EU Council Directive on air pollution by ozone (92/72/EEC) and the 5<sup>th</sup> Environment Action Programme (5EAP). The report discusses:

- reporting under the Ozone Directive
- quality and coverage of the current monitoring network
- emission reduction targets
- exceedances of threshold values and effects of exposure
- trends in ozone
- abatement strategies

The figure below from the draft report shows the proportion of emergency hospital admissions for obstructive respiratory diseases per EU Member State attributable to ozone exposure above  $110 \mu\text{g}/\text{m}^3$  eight-hour average during the summer 1995.



### ***Participation in EC AQ Directive Working Groups***

On request of EC/DGXI, ETC experts participated in six EC Air Quality Directive working groups, preparing position papers for SO<sub>2</sub>, NO<sub>2</sub>, lead, fine particulate matter (for which the position papers were finalised in 1997), and for ozone and benzene, and in the Steering Group supervising these activities. These position papers provide a basis for the Commission's proposals for new Daughter Directives for these pollutants under the Council Directive on Ambient Air Quality Assessment and Management (96/62/EC).

The work of the DGXI Ad-hoc working group on Ozone was launched in February 1997. The group consists of two subgroups: on Monitoring Strategy and on Risk Assessment and the full working group meets regularly during plenary meetings in Brussels. The Topic Centre participated in several meetings of the Monitoring Strategy subgroup and attended meetings of the Risk Assessment subgroup occasionally. These groups are preparing chapters for the ozone position paper. The groups closely follow the work from WHO and UN-ECE on human health and vegetation respectively. Recommendations in the field of new threshold values will possibly be closely connected to the latest 'thinking' in these organisations. ETC-AQ serves the subgroups with the Consolidated Ozone Report and with its experiences with assessments under the current Ozone Directive.

### ***Participation in the EC Auto-Oil Programme***

On request of DGXI, and in close collaboration with EEA and ETC-AE, ETC-AQ participated in meetings the Technical Support Group of WG1 of the Auto-Oil II Programme. A project description was developed by ETC-AQ for a Generalised Empirical Approach (GEA) for assessing air quality in European cities in relation to transport and other sources. The GEA approach is complementary to other work in WG1, where a more deterministic approach is followed, necessarily for a smaller set of 10-12 European cities.

### ***Guidance Report on Supplementary Assessment under EC AQ Directives***

On request of EC/DGXI, the ETC, in collaboration with DGXI and JRC-ERLAP, has prepared a draft guidance report on preliminary assessment under the EC "Framework Directive on air quality assessment and management". The report should provide guidance, not on assessments for compliance under the Directive, but rather in preparation for such assessments, in cases where representative monitoring is not available. The report recommends to use combinations of measurements, emission data, and modelling for these assessments. An earlier draft was revised and submitted to the Steering Group on Air Quality Directives in 1997. In a small working group with six Member States, the report was finalised. The EC will publish the report in various languages. Publication on the Internet is scheduled for early 1998.

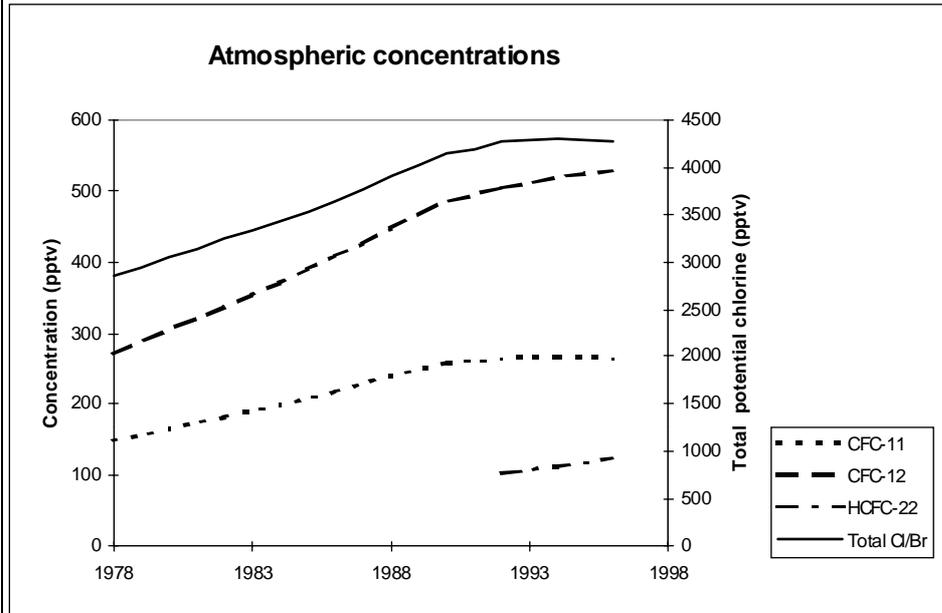
## **2.8 Contributions to EEA Periodical Assessment Reporting**

The ETC contributed to the Europe's Environment "Dobris+3" report. The ETC had responsibility for collecting data and for writing the chapters on stratospheric ozone, tropospheric ozone, and acidification, and contributed to the chapters on urban stress and chemicals. A questionnaire on urban air quality was sent to 115 major European cities, and met with good response. Boxes 2.9 and 2.10 highlight some of the findings in air pollution problems.

The ETC was also involved in definitions and preparation of the EEA "EU98" report. A proposal was made for contributions by the ETC, including projections for ozone depletion, and photochemical smog, in close coordination with the study "Economic assessment of priorities for a European environmental policy plan" commissioned by DGXI to a consortium lead by RIVM.

**Box 2.9 Dobris+3 Chapter 3: Stratospheric Ozone Depletion**

The policy measures that have been taken to protect the ozone layer are beginning to show their effect. Global production of ozone-depleting substances has dropped to 10-20% of its maximum value and emissions also exhibit a strong decrease. The concentration of several ozone-depleting-substances in the troposphere have decreased over the past few years. The total ozone-depleting potential of all chlorine and bromine species (CFCs, halons etc.) in the troposphere exhibit a maximum in 1994 followed by a slow decrease (see fig.). The maximum mixing ratio of ozone depleting substances in the stratosphere is expected to be reached in 1998.



### Box 2.10 Dobris+3: Urban Air Quality

Much of the information in the chapter was based on data provided by APIS/AIRBASE and on responses to a questionnaire distributed to 115 European cities with a population of more than 500,000 inhabitants comprising approximately 24% of the total European population. Analysis of this information led to the following conclusions.

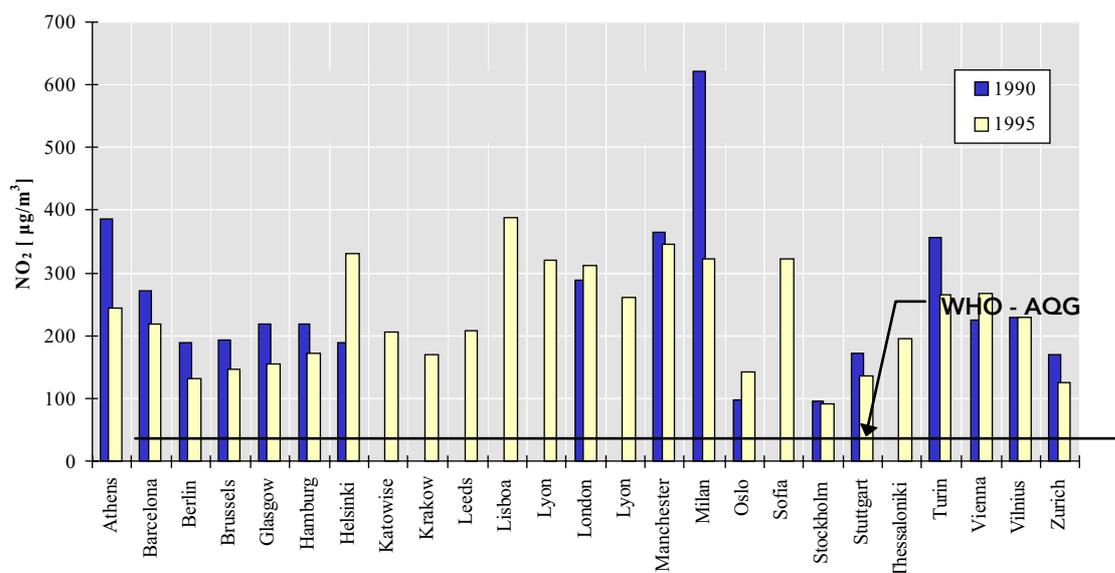
Although air quality in Europe and particularly in the large European urban areas has improved in recent decades, air pollution is still a prominent problem in most European cities. The substitution of coal and heavy fuel oils by cleaner fuels such as gas oil and natural gas and by electricity had as a result the considerable decrease of SO<sub>2</sub>, lead and particulates emissions which led to a clear downward trend in the ambient concentrations of these pollutants in most European cities. Nevertheless, exceedances of short term SO<sub>2</sub> and particulates air quality standards set by WHO have still been recorded in the vast majority of European cities.

In contrast to the decreasing SO<sub>2</sub>, lead and particulates ambient concentrations, pollutants associated to road transport such as NO<sub>x</sub>, CO, VOC and indirectly O<sub>3</sub> have increased considerably during the last decades and only very recently their levels have been stabilised and in some cases (i.e. CO) declined. In 1995, exceedances of ozone short term WHO AQG have been recorded in 75% of the cities that provided ozone data whereas the corresponding percentages for NO<sub>2</sub> and CO are 60% and 52% respectively.

Other pollutants such as PM<sub>10</sub>, PM<sub>2.5</sub> or VOCs with characteristic representatives the carcinogenic benzene or the polycyclic aromatic hydrocarbons for which no EU limit or guide values exist, may reach very high values as well. Unfortunately, in the large majority of European cities, monitoring data for such pollutants are not available. Only 10 out of the 62 cities that responded to the questionnaire provided information on benzene and with one exception the long-term WHO AQG was exceeded in all these cities.

Efforts towards long term abatement have been intensified during the last years. Meeting the increasingly stringent air pollution targets is, however, a very difficult task as the Auto Oil Programme has proved. According to its striking conclusion, even with the maximum technical package introduced in the EU, for three out of the seven cities taken as examples, the emission targets would not be achieved. In summary, the efforts for air pollution abatement have to be continued and reinforced. There is still a long way ahead and unless very drastic actions are taken, a clean urban atmosphere is not to be expected for the near future in many European cities.

The figure shows maximum 1 hour NO<sub>x</sub> concentrations for the 25 most affected European cities.



\* Note that concentration values for Milan and Turin refer to 1996

### **3. ETC REPORTS AND OTHER PRODUCTS**

#### ***Reports Published by EEA in 1997***

- Annual Summary report 1996, EEA Topic Report 5/1997
- Air Pollution in Europe 1997, EEA Environmental Monograph No.4 (in collaboration with ETC Air Emissions)
- Requirements on European air quality information, EEA Topic Report 17/1996
- Report on state of the air pollution monitoring situation in Europe - problems and trends, EEA Topic Report 26/1996
- Air quality in Europe 1993, a pilot report, EEA Topic Report 25/1996
- Air Pollution by Ozone in the European union. Exceedance of Ozone Threshold Values in 1995 and Summer 1996, EEA Topic Report 29/1996
- Review on requirements for models and model applications, EEA Topic Report 18/1996
- Ambient air quality, pollutant dispersion and transport models, EEA Topic Report 19/1996

#### ***Reports Prepared for EC (and for EEA Publication in 1998)***

- Exceedance of Ozone threshold values in the European Community in 1996
- Information Document concerning air pollution by Ozone - Overview of the situation in the European Union during the 1997 summer season (April-August)

#### ***Position Papers Presented at the Workshop and Available on the ETC Website***

- Criteria for the design of EUROAIRNET, the EEA air quality monitoring and information network
- AIRBASE: 1997 development status and extensions foreseen

#### ***Draft Reports Presented and Discussed at EC Meetings with Member States***

- Guidance report on preliminary assessment under EC air quality directives (EC publication in 1998)
- Tropospheric ozone in the European Union - the consolidated report (collaboration with WHO and JRC-ERLAP, joint EC/EEA publication in 1998)

#### ***Final Draft Reports Circulated to Member States in 1997***

- Recommendations for an assessment approach at the European level
- First evaluation of the representativeness and quality of monitoring network and stations
- Selection of models and input data for groups of applications
- National ozone forecasting systems and international data exchange in Northwest Europe (in collaboration with 10 countries)

#### ***Final Draft Reports Sent to EEA In 1997***

- Model applications in the assessment of urban air quality
- A common minimum quality assurance program

#### ***Other Products***

- Second European workshop on air quality monitoring and assessment, Brussels, 22-23 September 1997 (Proceedings to be published in 1998)
- ETC internet WWW site (restyled in 1997) (with newsletters, AIRBASE access and documentation, ozone reports) <http://www.etcaq.rivm.nl/>
- Information and documentation system on atmospheric models on the Internet, pilot version (<http://aix.meng.auth.gr/lhtee/database.html>)

## **4. PLANS FOR 1998**

This chapter reflects the status of planning in the beginning of January 1998 for the main activities in 1998. Changes may occur during the year. An overview of scheduled events and products is provided in Table 4.1.

### **4.1 Air Quality Aspects of EIONET**

The most important new development will be the enhanced interaction with the 13 EEA/PHARE countries by the PHARE Topic Link Air Quality as part of the extended ETC-AQ. All countries will be kept informed about work planning and progress. There will be two joint newsletters, and a common web site. An important highlight will be the third European Workshop on Air Quality Monitoring and Assessment (see 4.4) which, as in previous years, will be held with all EEA/PHARE countries in September.

### **4.2 Further Development of the Air Quality Monitoring Network EUROAIRNET**

Six more country visits are scheduled, where the status of selected national sites, QA/QC and data availability will be discussed with NRCs. The site selection report will be finalised on the basis of these visits. Simultaneously, the PHARE Topic Link will visit PHARE countries. The ETC will arrange the third European Workshop on Air Quality Monitoring and Assessment, which will focus on urban monitoring, station selection for EUROAIRNET, data flow and training on related ETC software, development of a European assessment strategy, and QA/QC requirements. A status report on EUROAIRNET will be produced.

### **4.3 Further Development, Implementation and Update of AIRBASE**

Further development of the AIRBASE information system will be carried out with additional support from the DGXIII Telematics Applications Programme. A Data Exchange Module for user-friendly data transfer will be produced, as well as an extension of the AIRBASE Web application. Depending on further support from DGIII/IDA, the functionality of the Web system will be extended to include data selecting, statistics, tabulating and mapping facilities to meet user requirements. Training sessions for the new DEM software will be scheduled together with EMEP.

The contents of the database will be updated with data from the Exchange of Information Decision (Eol), the data under the ozone Directive, data from EUROAIRNET, and data collected in the "Dobris+3" and "EU98" reports. A technical report on Eol data collection will be combined with the Eol pilot report (see 4.8)

### **4.4 Further Development of Air Pollution Modelling Infrastructure and Applications**

The Model Documentation System will be maintained and expanded following the recommendations of the evaluation workshop held in 1997. The ETC will report progress at the Conference on Harmonisation of Atmospheric Dispersion Modelling for Regulatory Purposes in Rhodes in May 1998.

The ETC will recommend in a report criteria for model selection and development needs for its modelling applications in support of EEA air pollution assessments.

### **4.5 Assessments and Support to EU, International Organisations. and Member States**

The ETC will continue to support DGXI and Member States in the work on developing new Air Quality Directives.

In the framework of the Auto-Oil II programme, the ETC will, in collaboration with ETC-AEM and JRC, quantify the potential for improved air quality in European cities through transport related measures, in a generic approach.

As a follow-up on the work of the TWG-DFO (see 2.7), a pilot system for near real time ozone data exchange will be established on the Internet. Two meetings are planned, with southern European countries and with central and eastern European countries, to expand the work to those regions.

#### 4.6 Contributions to Periodical Assessment Reporting

Of key importance in 1998 is the ETC contribution to the EEA "EU98" report, writing the chapters on stratospheric ozone depletion, acidification, and tropospheric ozone, and providing material on air quality for other chapters.

The ETC will contribute to the development of an EEA indicator report to be published in 1999.

As in previous years, two assessment reports are scheduled to be produced in October on the basis of data submitted under the EC Ozone Directive, one on the year 1997, and one on summer 1998.

The ETC will, on request of DGXI, produce a pilot report on Eol information as required in the Eol Decision. The ozone and Eol reports may include data from PHARE countries, depending on agreement between DGXI and EEA.

**Table 4.1 ETC Workplan Overview, ETC Air Quality, DATE: January 1998**

EVENT/ACTIVITY	EVENT DATE	RESPONSE DEADLINE	EXPECTED OUTPUT	OUTPUT DATE
<b>Workshops</b>				
AQ monitoring and Assessment	Sept.		Workshop Proceedings	Dec.
Data exchange training	Sept.		To help in data supply	Sept.
<b>Country visit to :</b>			Visit Reports, copied to NFPs and EEA	
six countries (to be confirmed)				
<b>Questionnaires/Requests:</b>				
Model Doc. System	Dec. 97	15 Feb. 98	Model Doc. System update	May, Nov.
Ozone forecasting	Jan 98	15 Mar. 98	TWG-DFO extension	1999
<b>Data Update Requests:</b>				
EC ozone data 1997	June	July	ozone report 1997	Oct.
EC ozone data 1998	June	Sept.	ozone report summer 1998	Oct.
Eol data	June	1 Oct.	Eol report	Dec.
<b>Draft reports for review:</b>		<b>Final draft to EEA:</b>		<b>Publication:</b>
EUROAIRNET Workshop Proceedings		March		Sept.
Criteria for the design of EUROAIRNET		April		Oct.
Guidance on Urban Modelling		Dec. 97		Oct.
Site selection report		June		Oct.
EUROAIRNET Status Report		Sept.		1999
Future AQ in European cities		Sept.		1999
"EU98" chapters		July		1999
Model selection criteria report		Dec.		1999
<b>Other main milestones:</b>				
Newsletters				May/Nov
AIRBASE Data Exchange Module, beta-test version				May
AIRBASE Web site upgrade				June
Validated Eol information in AIRBASE				Nov.
Validated AIRBASE information				Dec.
Rhodes Modelling Conference, presentation				May
Pilot system on ozone data exchange				Aug.