

Topic report No 12/1999

# Air Emissions

## Annual topic update 1998

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# 1. Introduction

## 1.1. The European Environment Agency

The European Environment Agency (EEA), based in Copenhagen, was established in 1990 by a Council Regulation. The main mission of the Agency is to provide „timely, targeted, relevant and reliable information to policy making agents and the public“, and thereby to „help achieve significant and measurable improvement in Europe’s environment“.

One of the current major tasks is the co-ordination and further development of the European Environment Information and Observation Network, EIONET, consisting of co-ordinating institutions (National Focal Points, NFPs) and centres of expertise (National Reference Centres, NRCs) in the participating countries, and European Topic Centres (ETCs). ETCs have been appointed directly by EEA to work on specific environmental areas and carry out specific tasks described in EEA’s Multiannual Work Programme.

The EU PHARE programme has made possible the extension of EEA work to 13 central and eastern European Countries possible (see 1.3).

## 1.2. The European Topic Centre on Air Emissions (ETC/AE)

ETC/AE was established by EEA in 1994 to support the Agency in its tasks involving air emissions.

A consortium of five institutions was contracted for the period 1995-1997:

- Federal Environmental Agency (UBA), Berlin, Germany (lead organisation)
- European Network of Environmental Research Organisations (ENERO), consisting of
  - AEA Technology, Culham, United Kingdom
  - Italian National Agency for new Technology Energy and the Environment (ENEA), Rome, Italy
  - System Analysis Department, Risø National Laboratory (Risø), Roskilde, Denmark
  - Institute of Environmental Sciences, Energy Research and Process Innovation (TNO), Apeldoorn, the Netherlands
- Federal Environmental Agency (UBA), Vienna, Austria
- Centre Interprofessionnel Technique D’Etudes de la Pollution Atmosphérique (CITEPA), Paris, France
- POSEIDON S.A. Industrial Consultants (POSEIDON), Thessaloniki, Greece.

In 1997, the EEA Management Board decided to extend the contract for a further period of up to three years.

The ETC leader, Dr. Dietmar Koch (UBA, Berlin), is supported by a Steering Committee of contact persons from three of the participating organisations:

- Dr. Simon Eggleston, AEA Technology
- Niels Kilde, Risø
- Dr. Tinus Pulles, TNO

The main objective of ETC/AE is to provide EEA and its clients, in particular the EU Member States and the European Commission, with all relevant information on air emissions related to key environmental problems such as climate change, acidification, tropospheric ozone, dispersion of hazardous substance (such as heavy metals) and urban air quality. In order to fulfil this task, the ETC/AE collaborates closely with NFPs, NRCs, the European Commission Environment Directorate General (DGXI), other European

Topic Centres, PHARE Topic Links, Eurostat (the Statistical Office of the EU), JRC (EU's Joint Research Centre, UNECE/EMEP (Co-operative programme for monitoring and evaluation of the long range transmission of air pollutants in Europe) and the OECD/IEA/IPCC (International Governmental Panel on Climate Change) programme on greenhouse inventories.

### 1.3. PHARE Topic Link on Air Emissions

EU's PHARE Programme provided the necessary funds to make possible the extension of EIONET to central and eastern European countries. In 1998, a consortium of three organisations (PTL/AE) was contracted by the Directorate General IA for a period of two years consisting of

- ATMOTERM, Opole, Poland (lead organisation)
- Slovak Hydrometeorological Institute (SHMU), Bratislava, Slovak Republic
- National Centre for Environment and Sustainable Development (NCESD), Sofia, Bulgaria

The PTL/AE Leader, Ms Wanda Pazdan (Atmoterm), is supported by a group of contact persons from the participating institutions.

The PTL/AE work programme was jointly developed with ETC/AE in order to co-ordinate the common technical tasks and to ensure that ETC/AE and PTL/AE work together as a joint extended European Topic Centre on Air Emissions.

### 1.4. ETC/AE and PTL/AE information and work programmes

Further information on work programmes can be obtained from

- EEA's website: <http://eea.eu.int>
- ETC/AE's website: <http://etc-ae.eionet.eu.int/etc-ae/index.htm>
- PTL/AE's website: <http://www.ptl-ae.atmoterm.pl>

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### 1.5. Primary Contact Points on Air Emissions

Most of the 18 EEA countries and 13 PHARE countries have appointed National Reference Centres on Air Emissions (NRCs). Furthermore, ETC/AE co-operates with several other countries. In all countries a Primary Contact Point (PCP) has been appointed by the country, which can be an NRC, NFP (National Focal Point) or other organisation. ETC/AE co-operate closely with PCPs, which are the regular collectors and suppliers of environmental data and information in their country. A full list of Primary Contact Points on Air Emissions is presented in Annex 1.

## 2. Progress in 1999

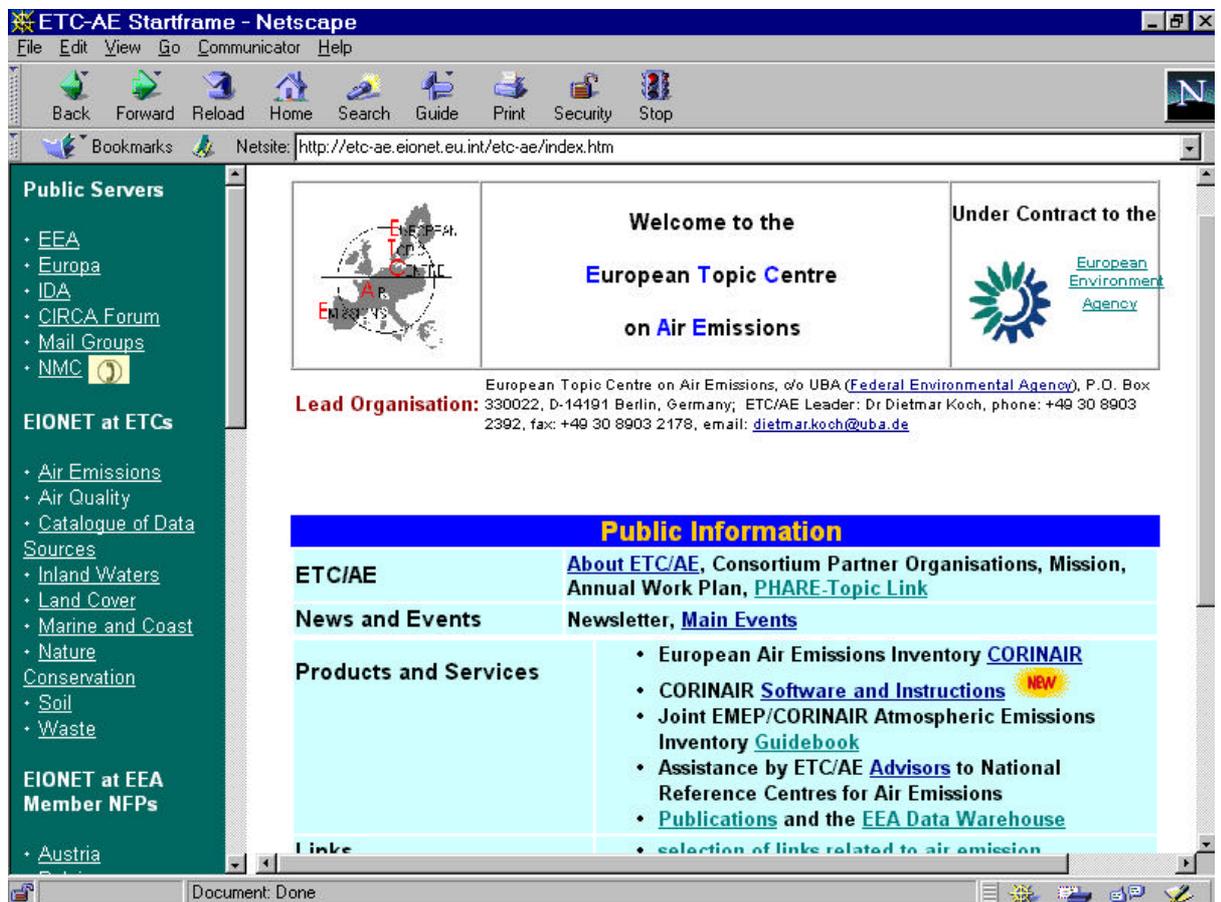
### 2.1. Annual Emission Inventories

#### 2.1.1. *The CORE INventory Air (CORINAIR) for Europe*

The process of establishing European air emission inventories is closely linked with the European Commission's original CORINAIR programme that, from its start in 1983, created the framework for collecting air emission data. The EEA and its ETC/AE have revised the original programme resulting in a new project in operation since 1994: the CORINAIR (CORE INventory Air emissions) project. The CORINAIR project provides the necessary guidebooks, methods and software tools to countries to report all mandatory national air emission estimates under EU legislation and various international conventions (mainly UNFCCC, the UN Framework Convention on Climate Change and UNECE/CLRTAP, the Convention on Long-range Transboundary Air Pollution). Furthermore EEA requests participating countries to provide ETC/AE with the same data and, where appropriate and required, more detailed data. In that way the CORINAIR project provides the results of different analyses and comparisons of national emissions data on various levels of detail.

Information on European emission data is available from the ETC/AE website (see also Figure 1).

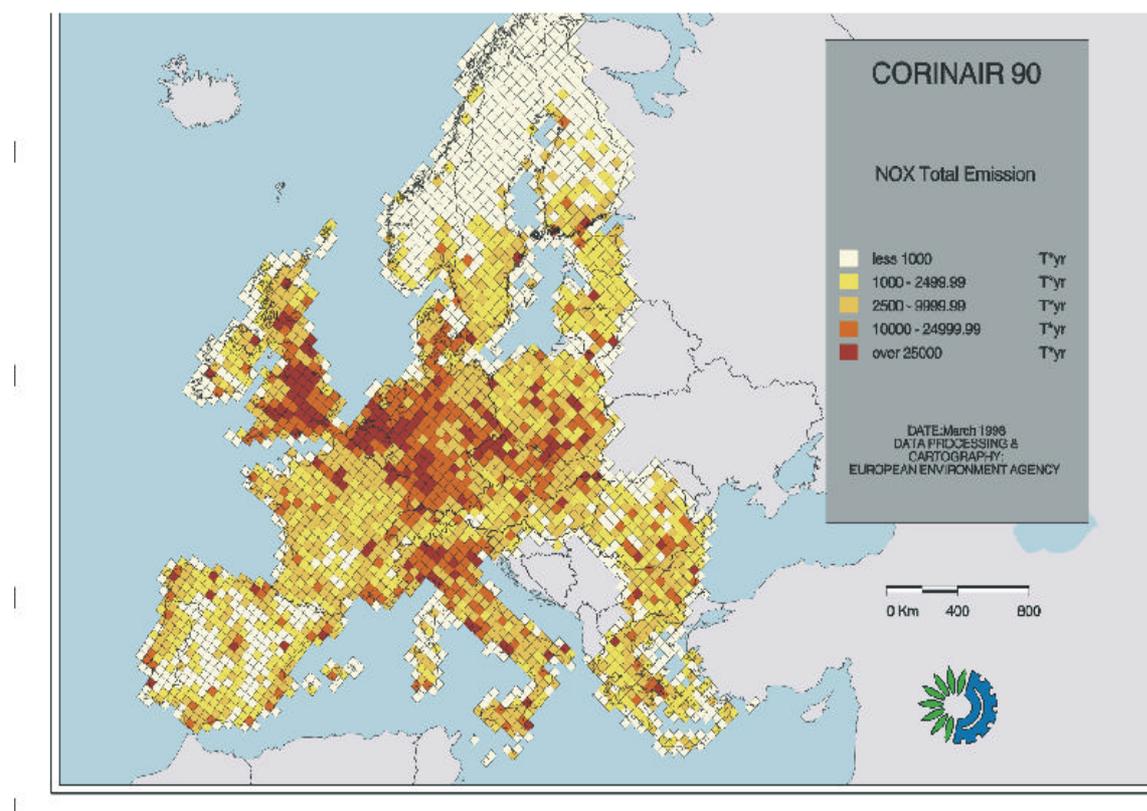
Figure 1: ETC/AE public website



Source: ETC/AE

Major progress in the CORINAIR project was made in 1998. ETC/AE has compiled various validated time series of national total and sectoral air emissions data for use in various EEA reports in 1998 and beyond. Furthermore ETC/AE has prepared detailed maps on emissions of the major pollutants in Europe for 1990 (complete data sets on spatially detailed air emissions for 1995 are not yet available from all participating countries). As an example, figure 2 provides NO<sub>x</sub> emissions in Europe on a 50 km x 50 km grid from 1990 for the participating countries, prepared by EEA using a GIS system to distribute point and area sources into the regular (EMEP) grids..

Figure 2: Corinair90 - NO<sub>x</sub> emissions in Europe 1990



Source: EEA

### 2.1.2. CORINAIR 95/96

In 1998 EEA requested all participating countries to submit the following data and information to ETC/AE:

- emissions for 1995 at NUTS level 3, on the sectoral level of detail of SNAP level 1 (or if possible level 2) (see below for more explanation)
- detailed 1996 emissions data (SNAP level 3)
- updated time series of emissions for 1980 (or 1990 for greenhouse gases) to 1996
- copy of the submissions to UNFCCC and DGXI on greenhouse gas emission inventories 1990-1996 (IPCC format summary table 7A)
- copy of the submission to CLRTAP on acidifying pollutants and ozone precursors 1980-1996 (EMEP format, which is identical to CORINAIR format, SNAP level 1 or if possible SNAP level 2).

In 1998, ETC/AE focused its assistance to participating countries on the compilation of their spatially and sectorally detailed CORINAIR 95 inventory and the subsequent annual inventory 1996, as well as any updated time series from 1990 to 1996 (and if feasible also 1980 to 1990). Such revisions can be necessary in cases where the methodology of air emission estimates has changed, new scientific evidence has led to new emission factors or a revision of activity data has occurred.

Inventories can be compiled for different levels of detail. The nomenclature for sources of air pollution used by ETC/AE in the CORINAIR project (SNAP = selected nomenclature for sources of air pollution) defines 3 levels of which the most detailed level (level 3) covers specific types of emission sources, such as several kinds and sizes of combustion based power generating installations (for example see Table 1).

Table 1: Example of the most detailed SNAP level 3

SNAP_GR	SNAP_SG	SNAP_ID	SNAP_NAME
LEVEL 1	LEVEL 2	LEVEL 3	
01			COMBUSTION IN ENERGY PRODUCTION AND TRANSFORMATION INDUSTRIES
	0101		PUBLIC POWER
	0101	010101	PUBLIC POWER - COMBUSTION PLANTS >= 300 MW (BOILERS)
	0101	010102	PUBLIC POWER - COMBUSTION PLANTS >= 50 AND < 300 MW (BOILERS)
	0101	010103	PUBLIC POWER - COMBUSTION PLANTS < 50 MW (BOILERS)
	0101	010104	PUBLIC POWER - GAS TURBINES
	0101	010105	PUBLIC POWER - STATIONARY ENGINES
	...		...

Source: ETC/AE

SNAP-level 1: groups („SNAP\_gr“)  
 SNAP-level 2: subgroups („SNAP\_sg“)  
 SNAP-level 3: activities („SNAP\_id“)

As a result of ETC/AE assistance, participating countries have now at their disposal air emission inventories on SNAP level 2 or 3 and NUTS level 3 for various years (1990 and/or 1995). NUTS, Nomenclature des Unités Territoriales dans l'Union Européenne (Nomenclature of Territorial Units for Statistics) is maintained by Eurostat.

The NUTS level indicates the spatial range of emission data. It should be noted that regions within the same NUTS level but in different EU Member States cannot be compared easily because these regions can differ greatly in terms of area, population, economic weight or administrative powers. For example, NUTS areas are shown for UK and Germany in the following table.

Table 2: Explanation of NUTS areas in UK and Germany

NUTS Level	UK	Germany
<b>3</b> (local)	County/local authority region	„Kreis“, „Stadt“ (local authority)
<b>2</b> (consists of one or more NUTS level3 areas)	Groups of counties	„Regierungsbezirk“ (district government)
<b>1</b> (consists of one or more NUTS level 2 areas)	Standard statistical region	„Länder“ (federal states)
<b>0</b> (the EU state)	United Kingdom	Germany

Source: EUROSTAT

### ***2.1.3 State of play of national annual inventories and ETC/AE databases***

Inventories and databases have been compiled by EU Member States for the years 1980 to 1996. However, gaps still remain, in particular for the period 1980 to 1990. National inventories have been submitted to the Commission and the conventions with copies to EEA (and subsequently to ETC/AE) and directly to EEA (ETC/AE) at different levels of detail. Most of the EU countries supplied the ETC with air emission estimates for the CORINAIR 95/96 databases in 1998, but not all delivered the information at the requested level of detail (SNAP 2 or 3, NUTS 3).

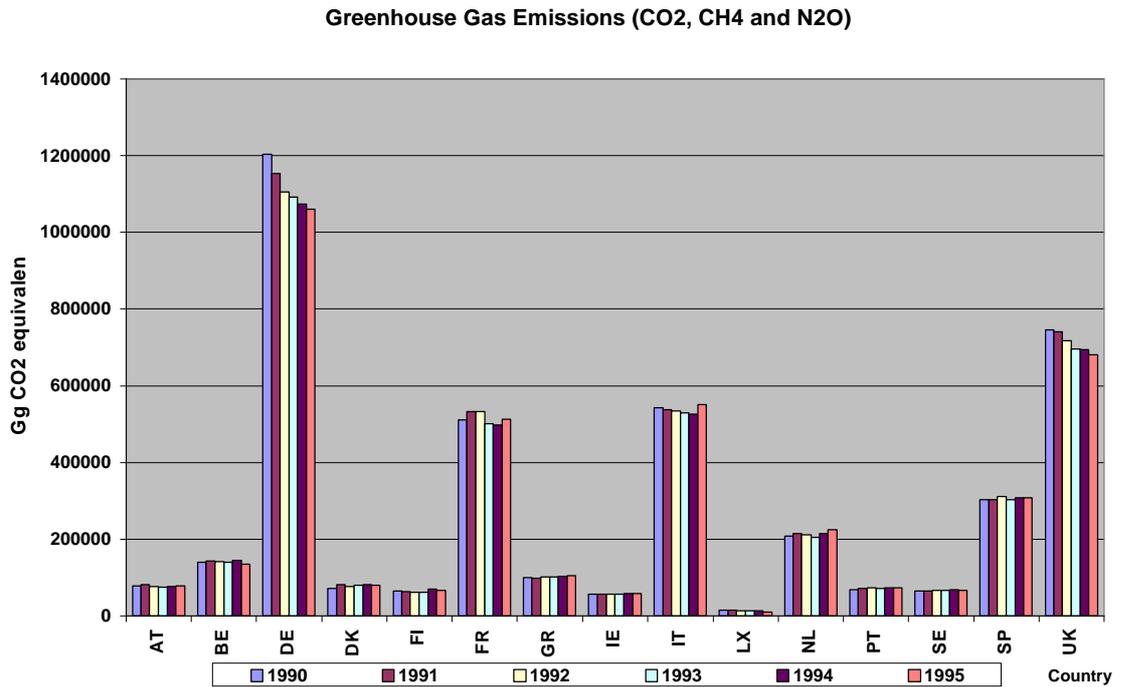
In November 1998 ETC/AE finalised and delivered to EEA its main comprehensive database, that mainly had been prepared for the EEA report "Environment in the EU at the turn of the century" (published in 1999). It includes data on greenhouse gas emissions up to 1996 in the format of IPCC (Intergovernmental Panel on Climate Change), updated emissions data in the format of EMEP/CORINAIR and Eurostat 1980 to 1996 economic statistics. This database was designed as a basis for all ETC/AE activities and products described in the following chapters.

Examples of emissions estimates from the ETC/AE database are presented in Figures 3 to 6. Trends in greenhouse gas emissions for the 15 EU member states from 1990 to 1996 are shown in Figure 3.

ETC/AE compiled these estimates on the basis of national submissions for two ETC/AE products that were drafted in 1998 and finalised for publication by EEA in 1999: "Annual European Community Greenhouse Gas Inventory 1990-1996, submission to the Secretariat of the UNFCCC" (EEA Technical Report no. 19, 1999) and "Overview of national programmes to reduce greenhouse emissions" (EEA Topic Report no. 8, 1999), which is a report related to the EU Monitoring Mechanism for CO<sub>2</sub> and other greenhouse gases.

Emissions for three main greenhouse gases (CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O) have been aggregated after conversion of CH<sub>4</sub> and N<sub>2</sub>O emissions into CO<sub>2</sub> equivalents. The applied conversion factor is called a Global Warming Potential (GWP) relative to CO<sub>2</sub>. The GWP is strongly dependent on the time horizon considered. Often a time horizon of 100 years is used, also in the ETC/AE databases. The current 100-year GWPs are 21 for CH<sub>4</sub> and 310 for N<sub>2</sub>O. This means for example that 1 Gg of N<sub>2</sub>O emissions has the same warming effect on climate as an emission of 310 Gg of CO<sub>2</sub>.

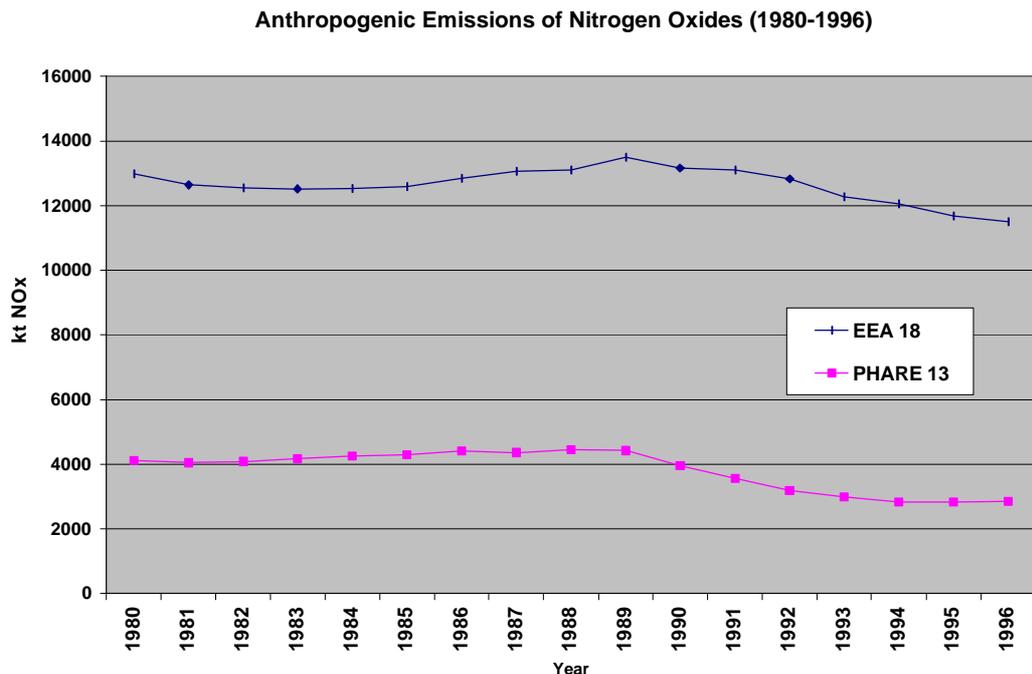
Figure 3: Trend in aggregated greenhouse gas emissions 1990-1995 in Gg (CO<sub>2</sub> equivalents)



Source: ETC/AE, officially submitted data under UNFCCC and/or EU Monitoring Mechanism

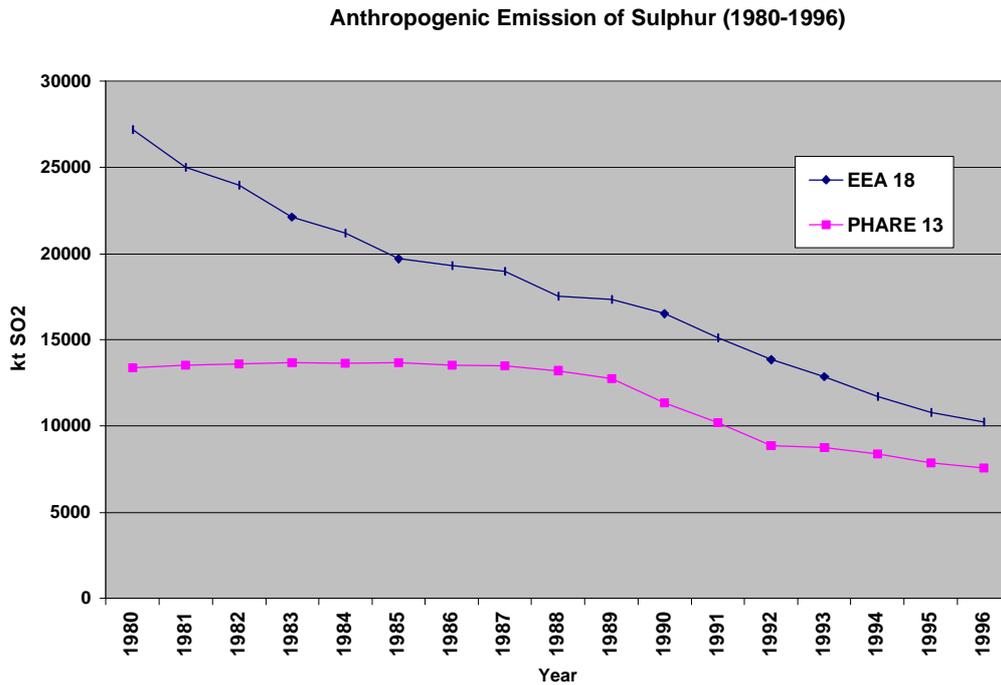
Figure 4 presents the trend in total NO<sub>x</sub> emissions in the 18 EEA member countries (15 EU Member States and Liechtenstein, Switzerland and Iceland) and also total NO<sub>x</sub> emissions of the 13 PHARE Central and Eastern European countries. To provide meaningful trend information a few gaps in the data have been filled provisionally by interpolation between years.

Figure 4: Trend in NO<sub>x</sub> (as NO<sub>2</sub>) emissions for 1980-1996



Source: ETC/AE, officially submitted data under UNECE CLRTAP

Figure 5: Trend of SO<sub>2</sub> emissions for 1980-1996

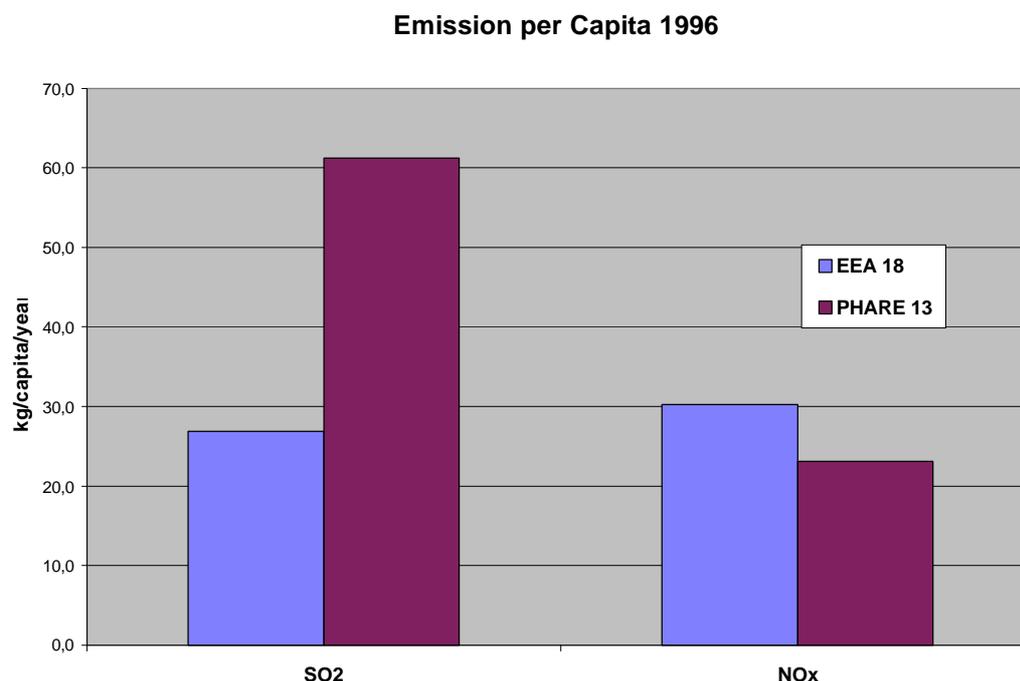


Source: ETC/AE, officially submitted data under UNECE CLRTAP

Figure 5 shows the trend in SO<sub>2</sub> emissions in the 18 EEA member countries and the emissions in the 13 PHARE countries between 1980 and 1996. Total emissions of SO<sub>2</sub> and NO<sub>x</sub> in the 18 EEA member countries have declined by more than 40 % and 15 % respectively between 1989 to 1996. In the same period total emissions of SO<sub>2</sub> in the 13 PHARE countries also declined by more than 40 %. NO<sub>x</sub> emissions in these countries decreased between 1989 and 1992 by about 35 %, but the downward trend appears to have levelled off since 1992.

The per capita SO<sub>2</sub> emissions are much higher in PHARE countries than in EEA countries, while the per capita NO<sub>x</sub> emissions are (slightly) lower in PHARE countries (Figure 6).

Figure 6: Per capita emissions of SO<sub>2</sub> and NO<sub>x</sub> in 1996



Source: ETC/AE

Figures 3 - 6 indicate that there is a rather complete picture of total emissions from 1980 to 1996 for SO<sub>2</sub> and NO<sub>x</sub>, although there are still many remaining gaps in the period 1980 to 1990 for the more detailed sectoral emissions. The picture is different for heavy metals and persistent organic pollutants (POPs) where scarcely any data have been made available to ETC/AE. EEA has therefore asked NFPs to adapt their national systems for estimating emissions to ensure the timely transmission of these data which would also help to meet international reporting requirements.

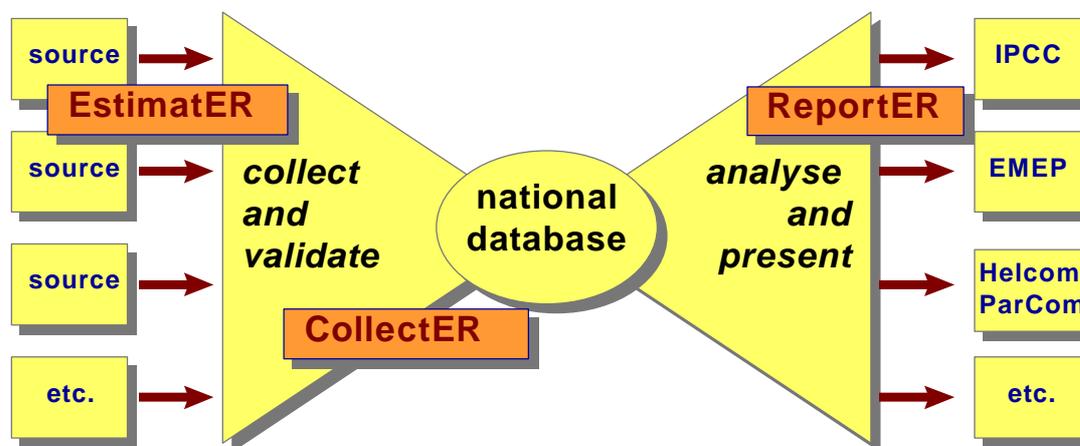
## 2.2. Maintain and develop the air emissions aspect of EIONET

### 2.2.1. Assistance to NRCs

An important part of the ETC mission is to maintain and develop co-operation within EIONET (European Environmental Information and Observation Network) connecting NFPs, NRCs and other contact points. Since 1995, ETC advisers have provided direct assistance in the form of workshops, training sessions and ad hoc advice to these network partners in about 30 countries in Europe. After the establishment of PTL/AE, more assistance has been provided to PHARE country partners.

An important achievement in 1998 was the distribution to countries of the new CORINAIR software system with its modules for data collection, data processing and reporting specifically designed to fulfil the countries' needs. This modular system separates inputs and outputs from the database. The system design is illustrated in the figure below.

Figure 7: The national Corinair system: Different tools for different tasks



Source: ETC/AE

Table 3 provides an overview of modules prepared or still under construction.

Table 3: Modules of the Corinair software system

Name	Purpose	Intende d users	Status (december 1998) With outlooks
CollectER	Tool to compile a national emission inventory	NRCs	Version 1.0 available and distributed, download available on ETC/AE
EstimatER	Tool to estimate emissions, using activity rate data; this will probably be a set of separate systems, each for a well defined source category	NRCs	First tool available: copert ii for road transport Tools for other processes are under development by ETC/AE and PTL/AE
ReportER	Tool to extract and present data from the national inventory for the purpose of reporting in the requested sub-division and formats to conventions and EU legislation: <ul style="list-style-type: none"> <li>· UNFCCC and IPCC, e.g. table 7A</li> <li>· CLRTAP, EMEP/Corinair at SNAP1 and 2 level</li> <li>· HTML-file format for automated data flow</li> <li>· LCP directive</li> <li>· IPPC / per</li> <li>· OSPAR/HELCOM request</li> </ul>	NRCs ETC/AE	Modules in Corinair 94 system available The beta version of ReportER, producing the ipcc 96 tables from a completed CollectER was ready by December 1998; an improved release is expected by March 1999.
ReceivER	Combines output from national CollectER databases into the European centralised emissions inventory COREInventoryAIR	ETC/AE	to be designed
ValidatER	Tool to analyse and compare national inventories to identify possible locations of errors and inconsistencies. Techniques to be used are: <ul style="list-style-type: none"> <li>· comparisons with national energy statistics,</li> <li>· correlations with driving forces (population sizes, car fleets, industrial production etc.</li> <li>· comparisons of emission factors</li> <li>· other analyses</li> </ul>	ETC/AE	to be designed; might in part be derived from the MICADO (system to compare emissions factors across sectors and countries) approach in the Corinair 90 and 94 systems
ImportER	Tool to import data from EstimatERs or other sources, such as copert or national database systems.	National Experts	Available for COPERT II import

Source: ETC/AE

The new Corinair modules have been designed with specific user needs in mind. For instance, the collecting tool includes a limited reporting interface in order to facilitate the input process.

#### ***2.2.1.1. The CollectER system***

The CollectER system, software (beta version 2.0) and documentation were released at the EIONET workshop on air emissions in Wismar, Germany in June 1998 (see 2.2.3), including the document "TrainER" that guides the experts who are preparing national emissions inventories based on the CollectER software. In addition, a software manual has been prepared. Both can be downloaded from the ETC/AE web site. Furthermore, ETC advisors, assisted by SPIRIT (the software developer) extensively trained with CollectER and assisted the transformation of national databases from the previous CORINAIR 94 software to the new CollectER tool. For further assistance the software developer SPIRIT can be contacted by email: [xspirit@savba](mailto:xspirit@savba).

New developments in 1999 could be directed towards regularly updating SNAP, pollutants and energy balances, storing time series of emission estimates and producing regularly gridded data from the CollectER tool. These and other possible extensions of the software will be evaluated in 1999 by EEA together with ETC/AE and PTL/AE.

#### ***2.2.1.2. ImportER***

The beta-version 2.0 of the CollectER software has provided an import routine called ImportER. This was implemented to import data generated by separate tools such as the COPERT 2 module for estimating emissions from road transport. Other tools might be developed to facilitate detailed air or water emission estimates for specified areas such as lakes or catchments and sectors such as solvent use and agriculture.

#### ***2.2.1.3. The ReportER system***

A first version of ReportER was distributed to NRCs for testing in December 1998. This version enables reporting in the IPCC format (spreadsheet). A final version is expected to be released in the spring of 1999.

#### ***2.2.1.4. COPERT 2***

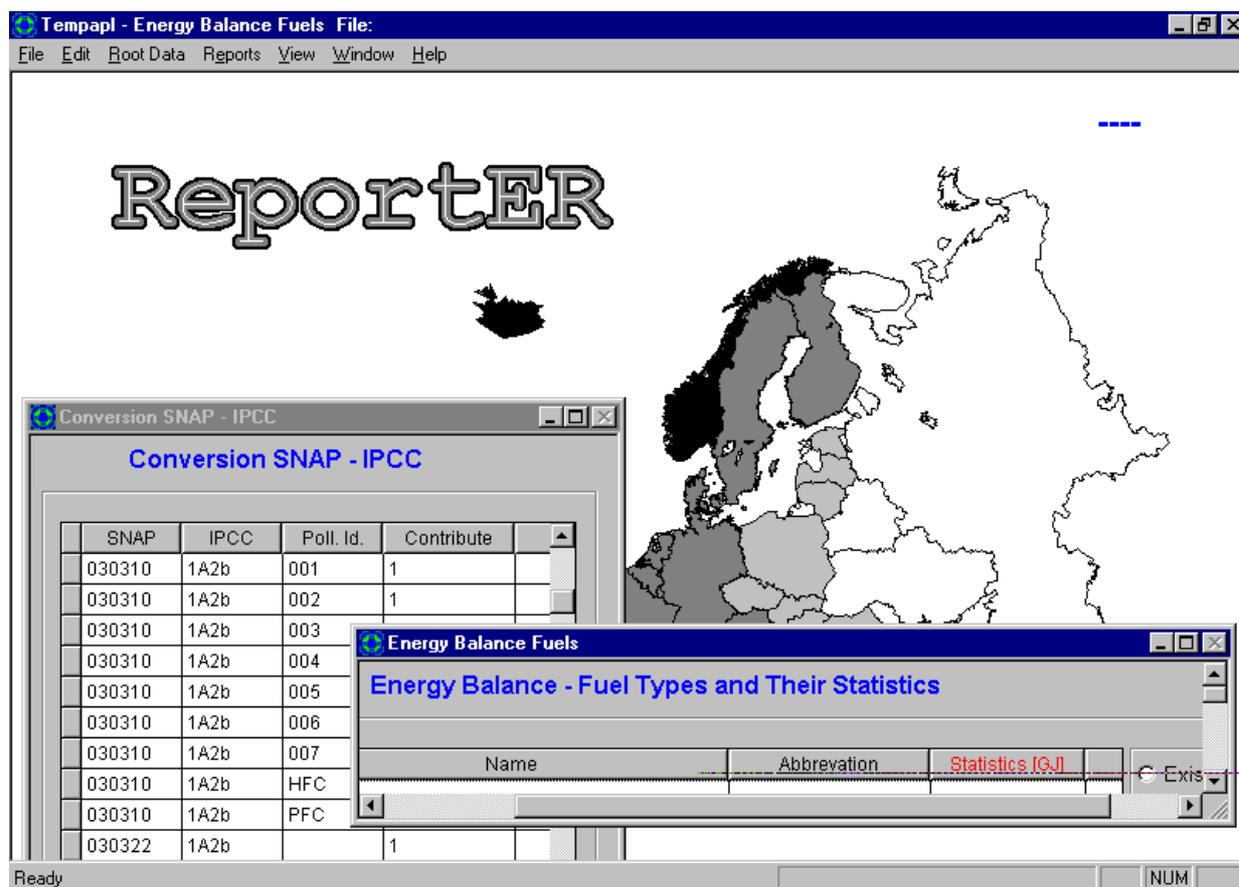
COPERT2 (Computer Programme to Calculate Emissions from Road Transport) and the associated software manual and methodology report has been made available in March 1998 by ETC/AE responsible partner LAT/POSEIDON on the website: <http://vagina.eng.auth.gr/mech/lat/copert/copert.htm>

Since then assistance has been provided to several organisations in various countries and an increasing number of national reference centres are making use of COPERT 2 for compiling their national and/or local/regional road transport emission inventories.

COPERT 2 does not yet fully incorporate all relevant results from DGVII projects MEET (Methodologies for Estimating Emissions from Road Transport) and COST319, and the Auto Oil2 programme coordinated by DGXI. This will be done in 1999 through the development and launch of COPERT 3.

The software tools CollectER, ReportER and COPERT 2 are being implemented by NRCs. Progress with implementation will be reviewed at the next EIONET air emissions workshop in May 1999.

Figure 8: Example from ReportER



Source: ETC/AE

### 2.2.2. Air emissions data flow project

The ETC provides assistance to EEA in the improvement of data collection, processing and reporting, making use of EIONET telematics (CIRCLE). A project on air emissions data flow was launched at the EIONET User Group meeting in December 1997. Its aim was to test the use of CIRCLE for efficient data flow and management between NRCs, NFPs, ETC/AE and EEA, taking into account data flows towards the European Commission, UNECE/CLRTAP and UNFCCC. There is a need to involve all countries participating in the EEA work programme in order to achieve a reliable and timely system of air emissions dataflow on the national and international level. This will help relieve the countries of the burden of contributing to various international and EEA reporting needs and will assure the most up-to-date time series of air emissions data.

A technical working group involving EEA, ETC/AE and experts from several countries was established which prepared recommendations to improve air emissions data flow for consideration at the NFP/EIONET meetings in 1998. EEA asked NFPs to organise national participation in the data flow project covering data reported to UNFCCC and the EC (IPCC format) and to CLRTAP (EMEP format), asking them to make these data available on their national EIONET servers. To assist countries, in December 1998 ETC/AE provided pre-filled IPCC 7A tables, based on data compiled in the database (November 1998). ETC/AE had uploaded all pre-filled templates onto the CIRCLE Interest Group. EEA has asked countries to update their national tables with data from later years and also to provide tables with their data in EMEP/CORINAIR format.

The success of the project will depend on active participation by all countries involved in the EEA work programme. There is a specific role for each of the stakeholders:

EEA: to co-ordinate the project overall;  
ETC/AE: to provide pre-filled templates, validate national returns and provide the countries with the European wide data sets and analyses;  
NFPs and NRCs: to ensure national data are quality assured and uploaded on their national EIONET servers in time.

### ***2.2.3. Annual EIONET air emissions workshop***

The annual EIONET air emissions workshop for NRCs and associated experts was held in conjunction with the meeting of the EMEP Task Force on Emissions Inventories (TFEI) on 4 June 1998 in Wismar, Germany. The main aim of the workshop was to exchange experiences with the implementation of tools for data collection and reporting in the participating countries, to review the progress of national reporting of air emissions data and to present various EEA and ETC/AE products and reports.

New products and the service provided by ETC/AE were demonstrated. Most of the countries intend to use the new tools but need help and some time for testing. The new tools combined with direct technical assistance are regarded as the two main elements for comparable national data collection and timely reporting.

Participants in the TFEI meeting reported that the joint EMEP/CORINAIR Atmospheric Emission Inventory Guidebook (published by EEA in 1996) is now referred to in the draft procedures recommended to the EMEP Steering Body for reporting emissions under the LRTAP Convention. The guidebook is quoted as a reference work on good emissions inventorying practice and as a checklist to ensure all relevant activities are included. Since the seventh TFEI meeting thirteen chapters have been significantly revised and 21 new chapters have been written. The second edition of the guidebook is planned for publication by EEA in 1999.

To recall the benefits of the EEA air emissions project for all parties, full participation in workshops will be important to achieve consistent, comparable and timely reporting of information thus supporting improved data flows and streamlining of reporting by EEA member countries to international bodies. The proceedings of the workshop are available from ETC/AE. The 1999 workshop is scheduled for June and will be held at Risø, Roskilde, Denmark.

## **2.3. Contribution to the EEA report Environment in the EU at the turn of the century**

### ***2.3.1. General approach and preparation***

This main EEA report aims to assess the present and foreseeable state of the environment, societal trends and current legislation in the EU including information about environmental changes in eleven accession countries and some border regions. The report is intended to support strategic environmental planning within the European policy process by providing reliable, comprehensive and up-to-date information to policy-makers as well as the public.

An important element of the report are trends for the future with respect to the state of the environment, the pressures and potential impacts. This includes a comparison with reference values, policy targets and environmental standards. The "business as usual" (baseline) scenario aims to indicate the trend to 2010 (and 2050 for climate change) assuming overall economic growth and implementation of policies agreed by August 1997.

### 2.3.2. ETC/AE contribution to the report

ETC/AE has collected and delivered air emissions data to EEA for inclusion in several chapters and prepared the chapter on climate change. The work was performed by the ETC/AE partners TNO and UBA Vienna.

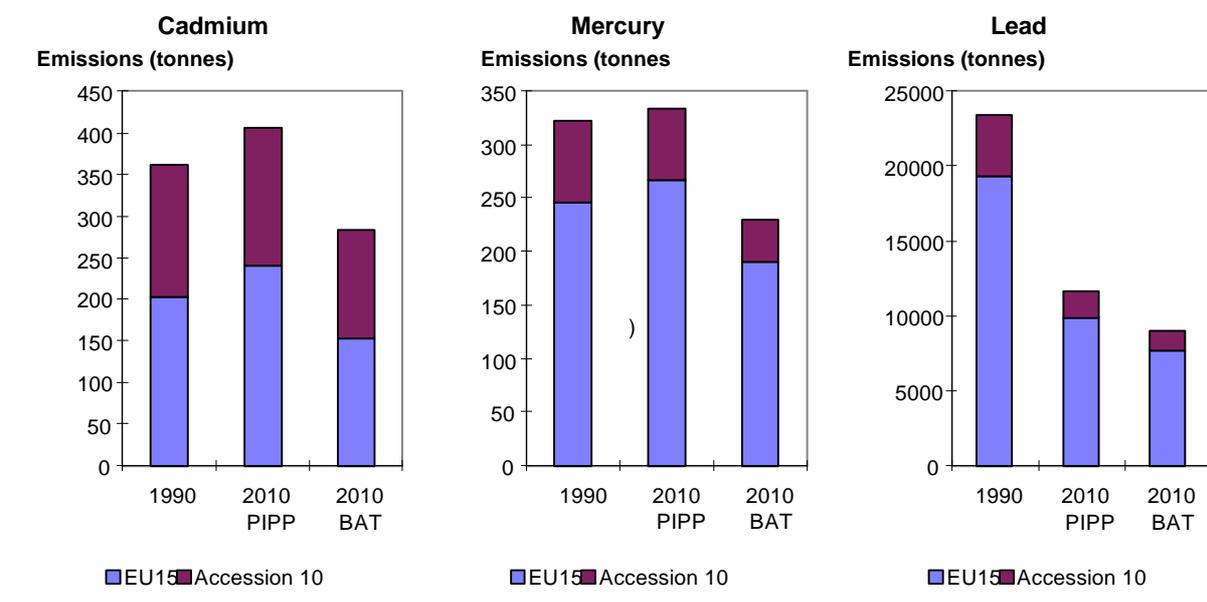
The ETC/AE contribution to the report was as follows:

- Background study on 'Emissions of selected heavy metals and persistent organic pollutants in Europe';
- Compilation of the air emissions database;
- Draft the chapter on climate change.

#### 2.3.2.1. Emissions of heavy metals and persistent organic pollutants (POPs) in Europe

The background study 'Emissions of selected heavy metals and persistent organic pollutants in Europe' presents emission projections prepared for selected HM and POPs and for fine particulate matter (PM 10). Projections are based on available forecasts for the year 2010 of macro economic developments (scenarios). Included in this project are the 'Policies in Place and Pipeline' (PIPP) scenario and an evaluation of currently foreseen and further environmental policy measures. Figure 9 presents the projected emission estimates for the heavy metals cadmium, mercury and lead in 2010. For possible comparison, projections based on best available technologies (BATs) have also been included.

Figure 9: Projected emissions of selected heavy metals



PIPP = Policies in Place and Pipeline  
BAT = best available technologies

Source: ETC/AE

Estimated future trends prepared in the background study were also used for judging environmental problems such as Chemical Risk and Urban Stress. The results of the scenario projections have been processed into urban emission inventories for 42 major cities in Europe and used for air quality analyses undertaken by the ETC on Air Quality.

### ***2.3.2.2. Compilation of the air emissions database***

The ETC/AE consortium partner UBA Vienna has compiled a database specifically to provide a consistent assessment in this report (see section 2.1.3). These aggregated data are available in the European Environmental Reference Centre (revised EEA website), which will be open for public access in 1999.

### ***2.3.2.3. Greenhouse gases and climate change***

The major findings of this chapter can be summarised as follows:

Despite international efforts to stabilise greenhouse gas emissions at 1990 levels, these emissions are projected to increase under the (baseline) business as usual scenario in the EU by about 6 % from 1990 to 2010. For the period 1990 to 2050, atmospheric concentrations of CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O could increase as much as 45 %, 80 %, and 20 % respectively. Temperatures are forecast to rise by 1 to 2 °C for the Northern Hemisphere by 2050. The rate of sea level rise is predicted to accelerate during the 21<sup>st</sup> century, amounting to an increase of about 15-20 cm by 2050 and 40-50 cm by 2100.

At the UNFCCC Kyoto Conference in 1997, the EU agreed to reduce emissions, measured as CO<sub>2</sub> equivalents, by 8 % between 1990 and 2010. Since the baseline projection shows an increase of EU emissions of 6 %, the target of an 8 % decrease would require substantial additional emission reductions (estimated to be 600 Mt below the projected 2010 emissions).

It is unlikely that stable, potentially sustainable values for atmospheric greenhouse gas concentrations, sea level rise and temperature increase will be realised before 2050 under present policy provisions. It has been estimated that industrial countries would need to reduce greenhouse gas emissions by at least 35 % between 1990 and 2010 to be in line with provisional sustainable target values for temperature increase and sea level rise.

In the EU, CO<sub>2</sub> emissions declined by 1 % between 1990 and 1996 (3 % between 1990 and 1995), although there is considerable variation between Member States. This favourable trend was due to a combination of low economic growth, increases in energy efficiency and the effects of policies and measures to reduce greenhouse gas emissions. Specific circumstances in the UK and Germany also had a significant role - UK's switch from coal to natural gas, and Germany's economic restructuring of the New Länder.

**Table 4: Reported (1990 and 1996) and projected (2000) national CO<sub>2</sub> emissions of EU member states**

MEMBER STATE	Inventory 1990 (million tonnes CO <sub>2</sub> ) (Mt)		Projections 2000
	1990 (base year)	1996	2000 with Measures
Austria	62	62	57
Belgium	116	129	125
Denmark	52	60	54
Finland	59	66	60
France	392	399	377
Germany	1 014	910	894
Greece	85	92	98
Ireland	31	35	35
Italy	442	448	446
Luxembourg	13	7	7
Netherlands	161	185	189
Portugal	47	51	50
Spain	226	248	258
Sweden	55	63	60
United Kingdom	615	593	578
<b>EU-15</b>	<b>3 372</b>	<b>3348</b>	<b>3 290</b>

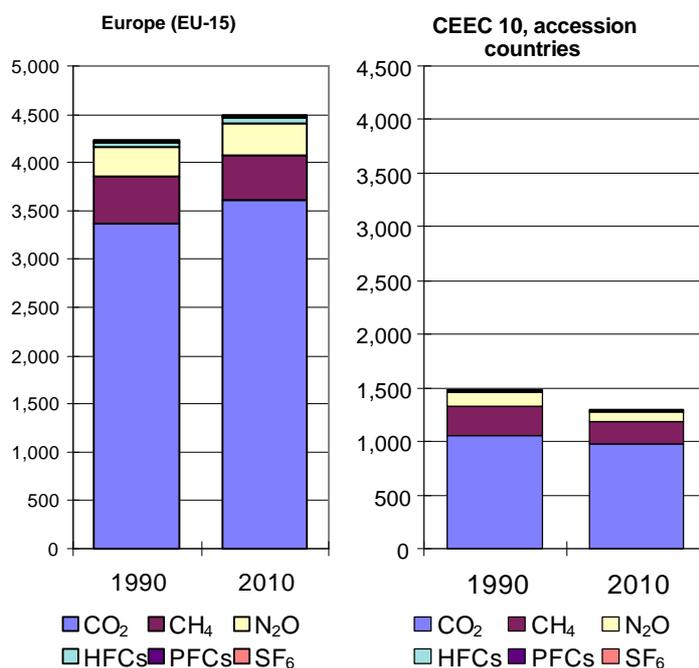
Source: EEA, Environment in the EU at the turn of the century

Forest carbon sinks in Europe can only achieve up to 1 % of the agreed emissions reduction for the EU. Furthermore the approach regarding sinks in the Kyoto Protocol could, although not intended, lead to negative impacts on biodiversity conservation and soil protection.

EU15 CO<sub>2</sub> emissions by 2000 are projected to be in the range of 98 to 102 % of 1990 levels, suggesting that the stabilisation target could be achieved. EU total greenhouse gas emissions are projected to increase under the business-as-usual scenario by 6 percent between 1990 and 2010, mainly due to CO<sub>2</sub> emissions increases by 8 percent. The increase in CO<sub>2</sub> emissions is less than the increase in total energy consumption - the difference being mainly due to a shift from solid to gaseous fuels. The main driving force for increasing emissions of CO<sub>2</sub> comes from the transport sector (projected emissions in 2010 are 39 % above the 1990 level); in contrast, industrial CO<sub>2</sub> emissions are projected to decrease by 15 % by 2010, while little change is projected in emissions in the domestic/tertiary sector and in the power and heat producing sector. EU total methane emissions are projected to decrease by 8 %, while nitrous oxide emissions are projected to increase by 9 %, and fluorocarbons, although currently a minor contributor to the total greenhouse gas emissions, will increase by 40 %.

CO<sub>2</sub> emissions in the 10 CEE (central and eastern European) Accession Countries are projected to decrease by 8 %. Based on the limited information available, total greenhouse gas emissions in 2010 of the 10 CEE countries are estimated to decrease in the business as usual scenario by 11 % from 1990 levels. Combined with the projected increase by 6 % in EU15 this would mean an increase of 2 % by 2010 from 1990 levels in the emissions of a potentially enlarged EU25.

Figure 10: Greenhouse gas emissions projections by 2010 (million tonnes CO<sub>2</sub> equiv.)



Source: EEA Environment in the EU at the turn of the century

## 2.4. Support to EU legislation and policy development

### 2.4.1. EC Monitoring Mechanism

The purpose of the Monitoring Mechanism is to monitor if emission reduction of anthropogenic CO<sub>2</sub> and other greenhouse gases the European Community is sufficient to ensure progress towards the greenhouse gas emission targets laid down in international legal obligations binding the European Community (United Nations Framework Convention on Climate Change, ratified by the European Community on 21 December 1993). Decision 93/389/EEC to establish a Monitoring Mechanism was adopted by the Council of Environment Ministers in 1993. It requests the European Commission to report on an annual basis to the Council of Ministers and the European Parliament on progress towards the stabilisation of CO<sub>2</sub> emissions in EU Member States at 1990 levels by the year 2000. The European Commission has presented two evaluation reports (COM(94) 67 final, 10.3.1994, and COM(96) 91 final, 14.3.1996).

In 1998 ETC/AE prepared a draft report as an input to the third evaluation report to be prepared by the Commission for the EC (DGXI). It is based on:

- information submitted by the Member States to the Commission under the Monitoring Mechanism,
- the second National Communication under the UNFCCC by Member States,
- the Community's second Communication under the UNFCCC (July 1998),
- CO<sub>2</sub> emission estimates and GDP data from Eurostat, and
- the EU CO<sub>2</sub> emissions projections from the pre-Kyoto energy scenario (COM(97)1996).

The report presents the EU15 inventory of carbon dioxide, methane, and nitrous oxide emissions, as well as removals of carbon dioxide, for the years 1990, 1996 and 1997 (as well as supplementary data on ozone precursors). The evaluation included a review of national programmes, national emission projections for the year 2000 and effects of national measures. Also the pre-Kyoto emission projections prepared by the Commission

are described and compared with the EU-15 inventory based on the Member States' own emission projections.

The analysis shows that a decreasing CO<sub>2</sub> emissions trend has occurred in only three out of 15 Member States. Germany, mainly through economic restructuring of the new *Länder* following reunification, has contributed most to the EU CO<sub>2</sub> emissions reduction followed by UK mainly by shifting fuel used from coal to natural gas. Other Member States reported increases in CO<sub>2</sub> emissions. EU15 emissions are projected to be in the range of - 2 % to + 2 % of 1990 levels.

#### ***2.4.2. IPPC Directive Polluting Emissions Register (PER)***

In 1997, the EU Commission established a Committee to prepare the implementation of Article 15 (3) of the IPPC (Integrated Pollution Prevention and Control) concerning PER Directive (96/61/EC).

In 1998 the Commission requested EEA to prepare a first paper on data quality and data flow, which was presented at the third meeting of the Committee in December 1998. The paper contains proposals on how to collect, process and transmit the relevant data from the operator to the competent authorities, to the national authority, and to the Commission. EEA (with ETC/AE) is prepared together with Eurostat to assist DGXI in the collection, validation, management and presentation of the European PER. The discussion in the PER Committee is expected to result in a Council Decision in 1999 or 2000 describing in detail the scope of reporting of national PER data to a European PER.

#### ***2.4.3. The new LCP Directive (Large Combustion Plant)***

In 1998, the European Commission adopted a proposal to amend Directive 88/609/EEC on the limitation of emissions of certain pollutants into the air from large combustion plants (LCPs). This Directive limits emissions of three types of pollutants: sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>) and dust. The new proposal introduces ELVs (emission limit values) that are twice as strict as the current values. These new values are applicable to all new installations put into operation after 1 January 2000. The proposal enlarges the scope of the Directive to include gas turbines and sets limit values for NO<sub>x</sub> emissions from such installations. In addition, the revision encourages use of combined heat and power generation (cogeneration) in new LCPs as well as the use of biomass as a fuel.

A principal reason for the revision was that in 1988 it was evident that neither the reduction targets for existing plants nor the emission limit values for new plants would suffice to protect the environment. In 1990 LCPs were emitting 63 % of sulphur dioxide and 21 % of nitrogen oxides in the EU15. EEA (with ETC/AE) have proposed to assist the Commission in the collection, validation, management and presentation of the emission data that will have to be reported under the new LCP directive.

#### ***2.4.4. Auto Oil 2 Programme***

In 1998 ETC/AE co-operated with JRC and ETC/AQ in the Auto Oil 2 programme and assisted in particular working group 1 (Environmental objectives). Emission estimates of large point sources (1990 and partly 1994/1995) were made available to JRC for its air quality modelling of 10 urban areas in Europe. Assistance was also provided to ETC/AQ on the urban emission inventories, prepared in 1997, for use in this programme. The ETC/AE database contains urban emission estimates based on the CORINAIR 90 NUTS 3 emissions that were used by ETC/AQ for their air quality modelling for a large number of European cities (100-150 cities), using the Generalised Empirical Approach (GEA). The GEA project is led by ETC/AQ and is expected to result in 1999 in estimates for urban air quality in 2010, based on the business-as-usual scenario of AOP2.

#### ***2.4.5. Towards integrated emission inventories***

In support of implementation of the IPPC Directive and development of the draft Water Framework Directive, a project was undertaken jointly with the ETC on Inland Waters to develop a conceptual model for IEIs (Integrated Emission Inventories). The objective of the task was to propose a methodology for estimating emissions to water, incorporating and making use of experiences with air emission estimation methodologies. ETC/IW prepared a draft methodology for estimating emissions to water, including the requirements from various EU Directives such as the draft Water Framework Directive, and other international requirements, while ETC/AE brought in expertise and ongoing work e.g. related to the IPPC Directive (see section 2.4.3). The need for Member States to monitor and collect information on the state of inland waters and the pressures arising from catchment activities is likely to be a fundamental legal requirement under the Water Framework Directive when adopted.

The proposed methodology is published in EEA Technical Report no. 8 „First proposal for a European Inventory of Emissions to Inland Water“ that concentrates on four main issues:

- The substances to report. Methods to be used for the selection should be based on legal requirements, environmental needs, and feasibility. Compatibility with the substances used by other international organisations is an important criterion.
- The sources generating emissions. These are to be described either in terms of economics or the processes involved.
- The spatial scale for reporting. The river or lake basin is the relevant unit for the assessment of emissions to water in line with the catchment management approach taken more broadly. There are potential problems because currently much pressure data are gathered on the basis of administrative units rather than the catchment level.
- The time scale for reporting. For water issues, different temporal resolutions are needed for different purposes although annual reporting will still be appropriate for many legal purposes and for state of the environment reporting.

### 3. Products/outputs provided by ETC/AE

An overview of products and services provided by the ETC/AE available by the end of 1998 is presented.

TYPE OF PRODUCT	TITLE	EEA Report no.
<b>General</b>	Annual Summary Report 1995	Topic report 9/1996
	Annual Summary Report 1996	Topic report 5/1997
	Annual Topic Update 1997	Topic report 4/1998
<b>Methodology and data</b>	Review of Corinair 90 - Proposals for Air Emissions 1994	Topic report 6/1996
	Recommendations for Revised Data System	Topic report 12/1996
	Review study on Urban Emission Inventories	Topic report 30/1996
	Atmospheric Emission Inventory Guidebook	Technical Report, CDROM and EEA web site
	Corinair 90: Summary report no 1 (Sectors)	Topic Report 7/1996
	Corinair 90: Summary report no 2 (Sub-sectors)	Topic Report 8/1996
	Corinair: 90 Summary report no 3 (Large point sources)	Topic Report 20/1996
	Corinair 94 Inventory	Topic Report 8/1997
<b>Software</b>	CollectER Methodology and software manual	Technical Reports, ETC/AE web site
	COPERT2 Methodology and software manual	Technical Reports 5/6 ETC/AE web site
<b>Databases</b>	Corinair 90 and Corinair 94	ETC/AE web site
	Air emissions 80-96	EEA web site
<b>Information and Assessment Reports</b>	Air Pollution in Europe 1997 (jointly with ETC/AQ)	Monograph No 4

## 4. Workplan for 1999

The following two tables provide an overview of tasks the ETC/AE will perform in 1999 and beyond.

The events, activities and the expected output by the ETC/AE are outlined in the first table, and are mainly addressed to NFPs and NRCs.

EVENT/ ACTIVITY	EVENT DATE	RESPONSE DEADLINE	EXPECTED OUTPUT	OUTPUT DATE
<b>Workshops</b>	7-8 June 1999		ETC/EIONET Annual Workshop report	June 1999
<b>Country visit to</b>	-	-	-	
<b>Questionnaires</b>	-	-	-	
<b>Data Update Requests</b>	December 1998	31 December 1998	EU15 emission inventory EMEP/CLRTAP data	March 1999
	1 March 1999	15 April 1999	EU15 GHG emission inventory for UNFCCC	May 1999
	1 June 1999	31 July 1999	EU15 GHG emission inventory for current EU CO2 Monitoring Mechanism + Tech report	October 1999
	1 December 1999	31 December 1999	EU15 emission inventory EMEP/CLRTAP data	March 2000
<b>Draft reports for review</b>	1 February 1999	1 March 1999	Topic report „Annual topic update 1998,“	April 1999
	1 March 1999	1 May 1999	Evaluation of national programmes under the Monitoring Mechanism of CO2 and other greenhouse gas emissions	June 1999
	1 May 1999	1 June 1999	Updated Corinair software and technical report/manuals (CollectER/ReportER and COPERT3)	July 1999
	1 May 1999	1 June 1999	Auto Oil 2 report (ETC/AQ with ETC/AE input)	July 1999
	1 September 1999	1 October 1999	Air emissions in Europe 1990-1997 (main Topic Report)+ technical report on air emissions data quality	November 1999
	31 December 1999	1 February 1999	Climate change in Europe jointly with EUMETNET	May 2000

The second table shows ETC products and services by EEA programme area and project.

Programme/ project	Product and service	Delivery date
1. Databases and Topic Reporting	<ul style="list-style-type: none"> <li>Annual Topic Update 1999</li> <li>Topic Report Air Emissions in Europe 90-97</li> <li>Technical Report on air emissions data quality</li> <li>CORINAIR Database update, summary tables and Internet pages</li> <li>Further developed CORINAIR model and software</li> <li>Support IPPC/PER working groups (technical reports)</li> </ul>	15 Jan. 2000 Q3/99 Q3/99 Q3/99 Q4/99 Q1 - Q4/99
2. Integrated Assessment	<ul style="list-style-type: none"> <li>Climate change in Europe (jointly with ECSN/EUMETNET)</li> <li>Topic report CO2 Monitoring Mechanism (and EU communication UNFCCC)</li> <li>Contribute to final ETC/AQ Auto Oil 2 report (technical report)</li> <li>Air emissions baseline emission projections under the CAR programme (possibly technical report)</li> </ul>	Q4/99 Q2-Q3/99  Q1/99 to be confirmed
3. Periodical Reporting	<ul style="list-style-type: none"> <li>Contribution to indicator report („Environmental Signals“) and TERM</li> </ul>	July '99

# Annex National primary contact points on air emissions

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Luxembourg	Administration de l'Environnement 1 rue Bender L - 1229 Luxembourg	Mr Frank Thewes	Tel.: +35-24-05-65-62-41 Fax: +35-24-85-078 E-Mail: thewes@aev.etat.lu
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\*) Officially nominated NRCs are listed under <http://www.eionet.eu.int>

\*\*) CORINAIR experts acting in Wallonia, Flemish and Bruxelles regions

List of national primary contact points on air emissions (continued)

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\*) Officially nominated NRCs are listed under <http://www.eionet.eu.int>

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