Topic report 5/2001

Air emissions
Annual topic update 2000

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Legal notice

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It can be accessed through the Europa server (http://europa.eu.int).

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1. Introduction

1.1. The European Environment Agency

The European Environment Agency, based in Copenhagen, was established in 1990 by a Council Regulation of the European Union. The mission of the agency is 'to support sustainable development and to help to achieve significant and measurable improvement in Europe's environment through the provision of timely, targeted, relevant and reliable information to policy-making agents and the public'.

The regulation laid down a number of tasks for the agency. One of the main tasks is the establishment, coordination and further development of a network for collecting, processing and analysis of environmental data, EIONET (European Environment Information and Observation Network). EIONET consists of national coordinating institutes (national focal points, NFPs) and national centres of expertise on specific topics (national reference centres, NRCs) in the participating countries. Furthermore, European topic centres (ETCs) have been appointed directly by the agency to act as centres of expertise on specific environmental topics and to execute specific tasks identified in the EEA multiannual work programme.

1.2. The European Topic Centre on Air Emissions

The topic centre (ETC/AE) was appointed in December 1994 the by EEA to act as a centre of expertise on air emissions for use by the agency in support of its mission. In this report, a summary of the activities and products of the Topic Centre on Air Emissions in 2000 is presented. The report is the last one in the series of annual topic update reports produced by the ETC/AE between 1995 and 2000. Future work on air emissions will be carried out by the ETC on air and climate change (ETC/ACC).

The ETC/AE consortium

The German Federal Environmental Agency (UBA, Berlin) was appointed by the EEA as the lead organisation of the ETC/AE. The ETC is led by:

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The ETC/AE consists of a consortium of seven European organisations/institutes. These and their named representatives are:

- AEA Technology (Atomic Energy Authority, Culham, United Kingdom) — Simon Eggleston/Justin Goodwin;
- the ENEA (National Agency for New Technology and the Environment, Rome, Italy) —Riccardo de Lauretis;

- RISØ (National Laboratory, Roskilde, Denmark) — Niels Kilde;
- TNO (The Institute of Environmental Sciences, Energy, Technology and Process Innovation, Apeldoorn, the Netherlands) — Tinus Pulles;
- SPIRIT-informacné systémy a.s. (Slovakia) — Jozef Skákala;
- Umweltbundesamt (Vienna, Austria) — Manfred Ritter;
- CITEPA (Centre Interprofessionnel Technique d'Etudes de la Pollution Atmosphérique, Paris, France) — Jean-Pierre Fontelle;
- Poseidon (Industrial Consultants, Thessaloniki, Greece) — Zissis Samaras.

The ETC/AE Steering Committee

A Steering Committee was established in 1996 and is chaired by the ETC leader. In 2000, members of the committee were: Justin Goodwin (AEA Technology), Tinus Pulles (TNO) and Manfred Ritter (UBA, Vienna) who also acts as the ETC Data Manager. This committee supports the ETC leader's activities through scientific advice (review draft reports and updated work plans) and technical assistance, thus, serving all ETC partners, EEA and other bodies. It also provides the basis for quarterly progress reports and the annual topic updates to the agency.

Phare topic link on air emissions

The extension of the EIONET to central and east European countries was made possible through funding of the European Commission's Phare programme pending membership of the EEA which is likely to occur in 2001.

For air Emissions, a Phare topic link (PTL/AE) was appointed in 1998. This consists of a PTL leader, Wanda Pazdan (Atmoterm, Opole, Poland) with experts from two other organisations: SHMU (Slovak Hydrometeorological Institute) Bratislava, Slovak Republic and NCESD (National Centre for Environment and Sustainable Development) Sofia, Bulgaria. The PTL/AE leader and the ETC/AE leader jointly developed the PTL/AE work programme in order to coordinate the technical tasks to be undertaken. In this way the PTL/AE is seen as part of an extended Topic Centre on Air Emissions and in most cases in this report ETC refers to the extended ETC (including PTL). The work of the Phare topic link finished in September 2000.

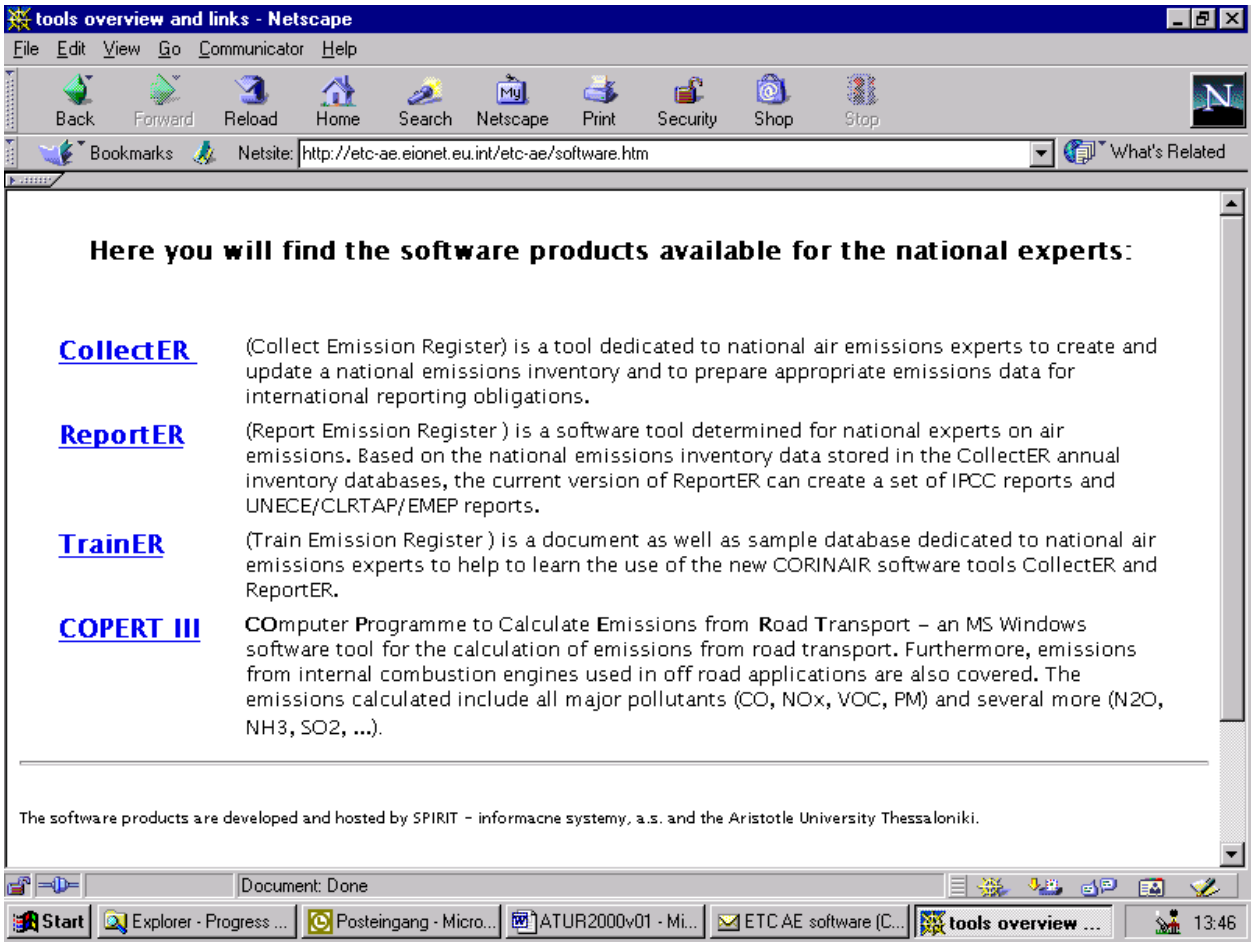
Further information on the ETC/AE and the PTL/AE in particular, and on EEA and other topic centres is provided on the following web sites:

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

The ETC/AE's plans, software tools, services and latest developments are made publicly available via the ETC/AE web site. For example, via the link http://etc-ae.eionet.eu.int/etc-ae/software.htm. Information about the ETC/AE software tools is presented in the figure below.

The ETC/AE web site is hosted at and maintained by UBA, Berlin. The EIONET Circle service at the ETC/AE provides an Intranet for registered members. They have access to special information held in so-called Interest Groups. These groups provide a forum for those who are interested in and actively participating in the ongoing activities of the topic centre and the EEA.

Figure 1: The ETC/AE web site



1.3. National reference centres for air emissions

A number of organisations throughout Europe also contribute to the EEA work programme — the national reference centres (NRCs). These are appointed and funded by the participating countries and collaborate with their national focal points (NFPs) and with ETCs to cover various topics, of which one is air emissions. NRCs for air emissions (NRC/AE) in the 18 EEA member countries were appointed by their NFPs in 1994/95, while in the Phare countries they were appointed following the nomination of NFPs in 1996/97. Furthermore, the ETC cooperates with several other countries, where there is neither a nominated NFP nor NRC, but where a contact point exists. NRCs are the regular collectors and suppliers of environmental data and information and/or possess relevant knowledge regarding environmental science, monitoring and modelling. An overview of NRC experts for air emission inventories is given in the annex to this report.

2. Work plan 2000

This section describes the objectives of the technical work plan of the ETC/AE for 2000, while section 3 presents some highlights from the progress in these tasks during the year.

Work plan 2000 — Tasks and objectives
1. Topic databases and reporting
Corinair database ETC-AE 2000 version 3.0 **Objective**: To compile, maintain and assure quality of air emissions data at European level. The database (ETC/AE2000v3.0) holds different sets of data at different levels of details for all participating countries. It is designed to serve the needs of the EEA, the European Commission, UN FCCC, CLRTAP and others. Data is regularly sent to the EEA data warehouse and the EEA web site for use in assessment reports and for public access.
Annual European Community GHG Inventory 1990–98 (EEA Technical report No 41) **Objective:** To compile data on emissions from sources and removals by sinks of greenhouse gases in the European Community in the period 1990 to 1998; to provide this inventory to the European Commission to be submitted to the UNFCCC secretariat on behalf of the European Community as a Party to the UNFCCC.
EIONET — Air emissions data flow project **Objective:** To assure greater transparency of data through electronic dissemination and access. Data flow is expected to facilitate reporting under UNFCCC, EU GHG monitoring mechanism, CLRTAP/EMEP and Eurostat/OECD joint questionnaire using EIONET as the platform for submitting air emissions data to all European reporting levels. By clarifying the roles of NFPs/NRCs for quality assurance and updates of national data and of the ETC/AE for the compilation, maintenance and quality assurance of data at European level, an efficient and regular data flow can be achieved in the future.
Development of the Corinair model and software **Objective:** To further develop the Corinair model by enhancing modules within the current software tools CollectER, the first EstimatER Copert III (a tool for estimating emissions of road transport), ReportER, and ProjectER. Priority areas identified by participating countries and ETC/AE were ReportER output tables for EMEP reporting and for reporting to UNFCCC using the new common reporting format (CRF). Further development of modules has been supported by the Teresa project funded under the EC IDA programme.
2. Integrated assessment
European Community and Member States GHG emission trends 1990–98 (EEA Topic report No 6/2000) **Objective:** To contribute to the evaluation of progress of the EC and its Member States towards meeting their greenhouse gas commitments under the UNFCCC and the Kyoto Protocol by compilation of emissions data from sources and removals by sinks of greenhouse gases in the Community in the period 1990 to 1998, and the main underlying socioeconomic driving forces.
European emissions of atmospheric pollutants 1980–98 **Objective**: To present and interpret air emissions data submitted by the EEA Member States and other countries to CLRTAP and UNFCCC and, to provide the related indicators compiled by the ETC/AE for periodical reporting of the main EEA assessment reports 'Environmental signals' and 'TERM'. In addition to actual emission trends, emission indicators are presented by main economic sector (energy, industry, transport, agriculture) showing the different contributions to the environmental issues described in this report. The topic report provides more detail than the indicator-based reports and presents all the main air emission indicators in a comparable and consistent way in one single report, in relation to emission reduction targets.
3. Periodical reporting
The EEA yearly indicator report — Environmental signals 2001 **Objective**: To update the work on indicators used in the Environmental signals 2000 report. In order to report on progress of environmental strategies being integrated in the policies of agriculture, energy, transport and industry, indicator sets have been developed further. The ETC/AE has prepared fact sheets on trends of emissions, distance to environmental targets and main policy developments. It also contributed to the issue chapter on climate change and air pollution.
Transport and environment reporting mechanism (TERM2001) **Objective**: To prepare, on request of the Council of Ministers, a contribution to monitoring of progress and effectiveness of the transport and environment integration strategies in the EU. In order to link indicators to the policy framework, the DPSIR assessment framework has been used to support indicator identification and prioritise indicators where policy can intervene — so-called leverage points. The ETC/AE prepared fact sheets on the description of the state and trends of emissions, distance to environmental targets and main policy developments.

3. Progress during 2000

3.1. Databases and topic reporting

3.1.1. Corinair database ETC-AE 2000

In Europe, a number of different datasets on air emissions exist corresponding to the various reporting requirements at European and international level. Air emissions data is collected for reports to international conventions (UNFCCC, CLRTAP), to the European Commission (monitoring mechanism of Community CO_2 and other greenhouse gas emissions), and to Eurostat/OECD (Joint Questionnaire 1998, JQ2000). The EEA does not perform separate data collection but provides, through the Corinair programme (CORe INventory for air emissions), software to countries to prepare detailed national inventories to enable countries to report their emissions according to the international requirements. Furthermore, the EEA requests copies of the various datasets, which countries submit internationally, and compiles these datasets into the European Corinair database, maintained by the ETC/AE.

The datasets are mainly defined by so-called reporting formats. The UNFCCC and CO_2 monitoring mechanism datasets have to follow the UNFCCC guidelines (http://www.unfccc.de/) and the IPCC format, described in detail in the 1996 IPCC guidelines (http://www.ipcc-nggip.iges.or.jp/), whereas the CLRTAP and Corinair datasets have to follow the EMEP (http://www.emep.int/index.html) format described in the joint *EMEP/Corinair Atmospheric Emission Inventory Guidebook* (available on the EEA web site at http://reports.eea.eu.int/EMEPCORINAIR/en). Whereas the JQ2000 and the Eurostat CO_2 from fossil fuels datasets have reporting formats of their own, the Eurostat CO_2 estimates closely follow the 1996 IPCC guidelines.

The datasets are different with respect to pollutants reported, geographic areas covered, and level of detail required. The following points illustrate this:

- CLRTAP (EMEP/Corinair format) requires reporting of SO_2, NO_X, CO, NMVOC, NH_3, CH_4, N_2O (CO_2 for validation purposes), plus from 1998 onwards some heavy metals and persistent organic pollutants. CLRTAP requires emission data from within the EMEP area (that is, Europe) because of its focus on European transboundary air pollution, whereas data submitted to the UNFCCC can include emissions from anywhere in the world, if judged as 'national' (for example, from overseas territories).
- The UNFCCC and CO_2 monitoring mechanism (UNFCCC/IPCC format) demand data on CO_2, N_2O, CH_4, NO_X, CO, NMVOC and also from 1998 onwards, three 'new' greenhouse gases HFC, PFC and SF_6.
- The EEA-ETC/AE requests reporting of the same pollutants as reported to CLRTAP, UNFCCC and the CO_2 monitoring mechanism, but in more sectoral and spatial detail, if available (for example, NUTS3 administrative units every 5 years).
- The Eurostat/OECD data collection (JQ2000 format) requests reporting of SO_2, NO_X, CO, NMVOC, CO_2, CH_4, N_2O, PM/PM_{10}, Pb, chlorofluorocarbons and halons.
- The level of detail in terms of subtotals for the national total differs considerably between the different datasets. Corinair is the most detailed with up to 414 subtotals followed by UNFCCC (and CO_2 monitoring

mechanism) with up to 36 subtotals. CLRTAP requires 11 subtotals and encourages reporting of approximately 60 more detailed sectors. The JQ2000 asks for approximately 15 subtotals (in aggregated socioeconomic sectors according to NACE) and the Eurostat CO_2 estimates from fossil fuels provide 21 subtotals.

One of the main objectives of the ETC/AE has been to improve compatibility between these different datasets. For this purpose, international experts under the lead of the ETC/AE have reviewed the Corinair approach (software tools and guidebook) regularly. A second focus of the ETC/AE was the assistance in and contribution to, efficient flows of air emission data from the Member States to the European Commission and to the relevant authorities under the international conventions.

The focus of the work of the ETC/AE in 2000 was in providing consistent and reliable time series of these different datasets for use in the EEA's key products.

The air emission datasets are managed by the ETC/AE Data Manager (UBA, Vienna) in one MS Access database. The total of these datasets is in general referred to as the 'ETC/AE (Corinair) database'. Access to this database is possible through the ETC/AE Circle Interest Group for all registered users. The most aggregated level of these data, meaning time series of national totals and of the main sectoral emissions, are publicly available through the EEA web site (http://www.eea.eu.int/) under data service).

The EEA-ETC/AE data collection includes the following datasets, which are copies of datasets officially approved by Member States and officially provided under the various international reporting obligations:

- CLRTAP/EMEP/Corinair format (data officially submitted to either UNECE/CLRTAP or in some cases to the EEA): national totals and SNAP level 1 for 1980 to 1998, and SNAP levels 2 or 3 for 1990, 1994–98 (SO_2, NO_X, CO, NMVOC, NH_3, CH_4, N_2O, CO_2).
- UNFCCC/IPCC format (data officially submitted to either UNFCCC or the European Commission under the CO_2 monitoring mechanism): national totals and summary Table 7A for 1990 to 1997/1998 (CO_2, N_2O, CH_4, NO_X, CO, NMVOC, HFC, PFC and SF_6).
- Emission density maps at NUTS3 level and sectoral split for 1990 for SO_2, NO_X, NMVOC, NH_3.

In April 2000, the ETC/AE released the first version of the ETC/AE 2000 (Corinair) database. The latest version of 2000 was released in October and used in:

- Topic report EC and MS greenhouse gas emission trends 1990–98 (EEA, 2000).
- Technical report Annual European Community Greenhouse Gas Inventory 1990–98, Submission to the Secretariat of the UNFCCC (EEA, 2000).
- Topic report Air emissions in Europe 1980–98 (final draft) (EEA, 2001).
- EEA assessment report Environmental signals 2001 (EEA, 2001).
- EEA assessment report Are we moving in the right direction? TERM2001 report (EEA, 2001).

In addition to the aggregated air emissions data, the ETC/AE has collected copies of various more detailed national inventories including activity data (for example, energy balances, number of livestock etc.) and emission factors for various years from 1990 onwards. These data were provided through the Corinair90 project and the new Corinair project implemented since the start of the ETC/AE in 1994.

These detailed, complete air emission inventories were prepared by a number of countries using Corinair software tools (made available in 1996) and/or the completely revised and improved CollectER and ReportER software tools (initially available in 1998 and updated in 1999 and 2000). The EEA and ETC/AE encourage countries to use these new software tools, recognising, however, that various countries also continue to use their own national database/software systems.

Detailed inventories would ideally contain all information required to fully understand the inventory and make it fully transparent, usually resulting in large and complex national databases. If a country uses the full Corinair (CollectER) approach, a detailed inventory would contain all activity data and emission factors on SNAP level 3, all large point sources (including large combustion plants) and be fully spatially disaggregated into NUTS3 administrative units and/or 50 x 50 km grids. In some cases, nationally developed systems will contain even more detailed data.

The ETC/AE Data Manager in UBA, Vienna has been maintaining the complete and validated Corinair90 database (in Oracle). For subsequent years, as well as for updates for the year 1990, it is each country's responsibility to prepare and maintain such detailed inventories. A number of countries provide these inventories to the ETC/AE, which carries out some initial data quality and consistency checks. National detailed inventories are continuously revised, updated and improved as knowledge improves. Therefore, these detailed national inventories only give the state of play valid at a certain moment in time. There will often be a time delay between compilation of the detailed emission inventory and the official reporting of the aggregated data. Due to these considerations, the copies of national detailed emission inventories held by the ETC/AE can neither be considered as the latest officially approved and validated national detailed estimates, nor be regarded as validated by the EEA-ETC/AE.

3.1.2. Annual European Community GHG Inventory 1990–98

The European Community, as the only regional economic integration organisation, which is a Party to the UNFCCC, has to report annually greenhouse gas inventories for the area covered by its Member States. The European Community (EC, or EU-15) greenhouse gas inventory has to be submitted to the UNFCCC by 15 April each year.

The EEA, through the work of its European Topic Centre on Air Emissions (ETC/AE) assists the Commission in the compilation of the annual EC inventory. These activities result in:

- A draft EC inventory to be circulated to the Member States by 1 March;
- a final EC inventory to be submitted by the Commission to the UNFCCC Secretariat by 15 April.

This report is an update of the report previously produced by the ETC/AE. Changes with regard to the report prepared in 1999 are as follows:

Reporting year: Since all Member States submitted data for 1998, the EC was able, for the first time in 2000, to submit a complete EC greenhouse gas inventory for the previous but one year for CO_2, CH_4 and N_2O emissions and sinks (where relevant).

Reporting format: The EC submission presents emission data in Summary 1.A and Summary 2, tables of the new common reporting format, although many Member States reported in IPCC 96 tables 7A.

Data gaps and reference data: In case of missing data on CO_2, CH_4 and N_2O emissions, a specific data gap procedure has been applied, as was described on page 8 of this report. In addition, data are provided for industrial F-gases and for CO_2 from fossil fuels according to the reference approach for CO_2 from fossil fuel combustion. For industrial F-gases, the results of two recent studies have been presented and for the reference approach, Eurostat CO_2 emission data from fossil fuel combustion is referred to in an annex, while Member States' own reference approach CO_2 estimates are presented also in an annex.

Time series: A complete time series of EC greenhouse gas emission data from 1990 to 1998 are reported in an annex. In addition, main aggregates are presented in the main report (see Table 1 below).

Table 1: Overview of greenhouse gas emissions in the EC from 1990 to 1998

GREENHOUSE GAS EMISSIONS	1990	1991	1992	1993	1994	1995	1996	1997	1998
	CO_2 equivalent (Gg)								
Net CO_2 emissions/removals	3105794	3124555	3056590	2987329	3009543	3056460	3143575	3081470	3123880
CO_2 emissions (without LUCF)	3320481	3348636	3268949	3205347	3217380	3260298	3335895	3278534	3327520
CH_4	439844	428164	413678	397478	386891	384725	374211	370375	367466
N_2O	398652	391770	376572	363314	375459	376838	391682	389362	359561
Total (with net CO_2 emissions/removals)	3944290	3944489	3846841	3748121	3771892	3818022	3909467	3841207	3850906
Total (without LUCF)	4149509	4158611	4050511	3957560	3970512	4011613	4092358	4030272	4045632

The EC greenhouse gas inventory has been compiled on the basis of data delivered by the Member States under Council Decision 99/296/EC for a monitoring mechanism of Community CO_2 and other greenhouse gas emissions. Member States data have been considered as available to the Commission by 1 April 2000. Since the data are revised and updated for all years, they replace EC data previously published, in particular, in the 1999 submission to the UNFCCC Secretariat Annual European Community Greenhouse Gas Inventory 1990–96 (the Commission, with the EEA, 1999) and in the report — Overview of National Programmes to Reduce Greenhouse Gas Emissions (EEA, 1999).
The report also provides information on reporting methods applied and on data/inventory formats requested for comparability and completeness.

For PFCs and SF_6, Ecofys estimates emissions of 15 and 18 million tons of CO_2 equivalents respectively for 1995. Data, as reported by Member States, adds up to 8 and 13 million tons for PFCs and SF_6 respectively. This means that EC emission estimates on PFCs as submitted by Member States were 47 % and estimates on SF_6 emissions were 28 % below the independent estimates.

Data gaps on the reference approach for CO_2 from fossil fuel combustion: For EU-15, data on the reference approach for CO_2 from fossil fuel combustion in Tables Summary 1.A are omitted, since not all Member States reported these data. Adding up incomplete data would not provide relevant EC total emission

information in this case. Instead, latest Eurostat calculations of CO_2 emissions from fossil fuels (Eurostat, 2000) are provided for information purposes in the footnotes to Tables Summary 1.A in Annex A. However, for those Member States that reported CO_2 emissions from fossil fuels, estimated with the reference approach, these estimates are provided in the separate Annex B to this report.

Reporting Method and Format: The EC greenhouse gas inventory was compiled according to the recommendations for inventories set out in the UNFCCC Guidelines for the Preparation of National Communications by Parties included in Annex 1 to the Convention, Part 1: UNFCCC Reporting Guidelines on Annual Inventories. These guidelines are part of the comprehensive document UNFCCC Guidelines on Reporting and Review (document FCCC/CP/1999/7), adopted as UNFCCC COP Decision 3/CP.5. In accordance with this Decision, the IPCC 1996 Guidelines for National Greenhouse Gas Inventories have also been applied.

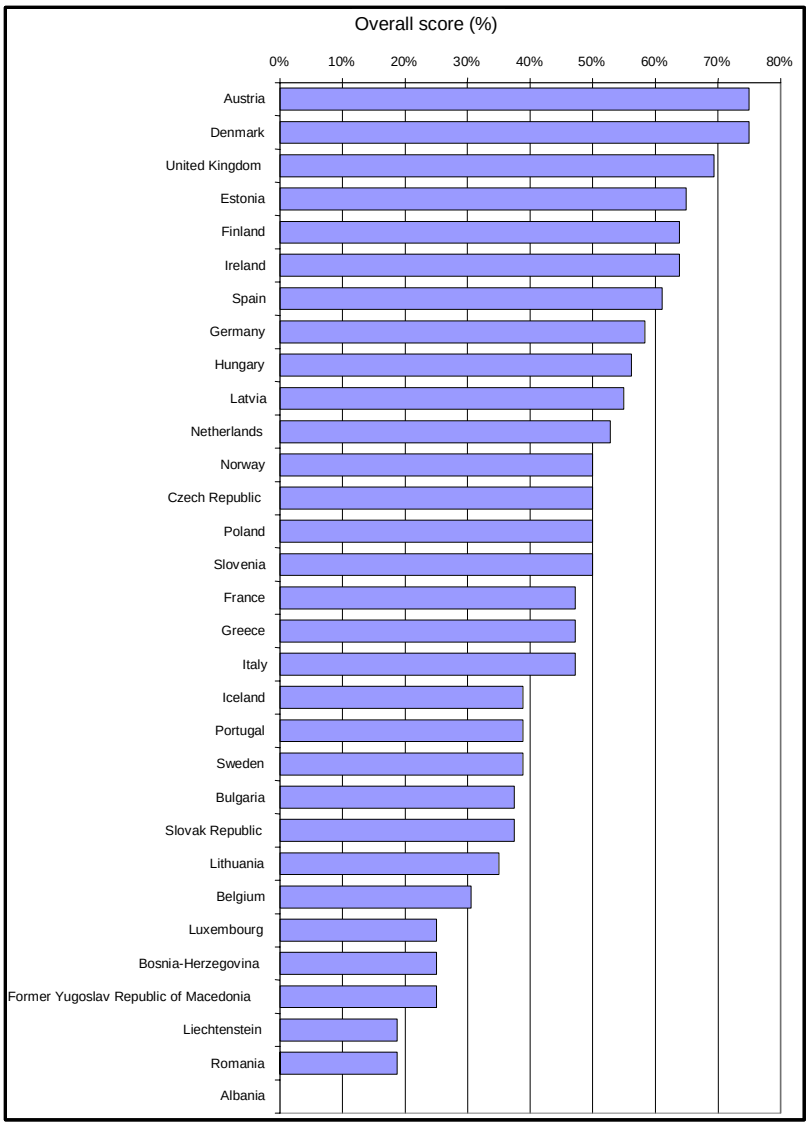
3.1.3. EIONET air emissions data flow project

Since the establishment of the EIONET air emissions data flow project in 1997, participating countries (EEA18, some Phare countries) have been posting data (copies of their data submissions to the Conventions' secretariats and the European Commission) on their national EIONET servers. NFPs regard the data flow Interest Group as a useful dissemination point to their ministries and other authorities in their own country. The ETC/AE regularly collects the pages into the European database to produce and publish European summaries (the EC annual greenhouse gas inventory report, for both the monitoring mechanism (1999/296/EC) and UNFCCC, and the EC annual inventory report to UNECE/CLRTAP). While it can be stated that the project has been successfully developed into a routine activity the following issues will have to be considered further:

- NFPs and NRCs to ensure more up-to-date data and to provide links to where detailed data is held;
- the EEA-ETC/AE (including PTL) to support further implementation in Phare countries;
- the EEA to improve the system and extend functions towards meeting annual indicator reporting requirements;
- the ETC/AE to provide templates for formats of the data to be reported;
- the EEA together with Management Board members and NFPs to raise awareness in the countries to use the Interest Groups to make national reports/data more transparent, share data with national officials, NGOs, industry etc. and facilitate access to it (for example, Swedish EPA has all data on its public web site, Austria and Denmark provide additional information etc.).

The state of play of data flow projects across topic centres has been regularly evaluated by the EEA. Figure 2 provides an overall country analysis for air emissions data in 2000. A detailed analysis of data flows in EIONET (all six ETCs) by the EEA is provided at the following location:
http://eea.eionet.eu.int:8980/Members/irc/eionet-circle/nfp-eionet/library?l=/eionet_progress/2000_06&vm=detailed&sb=Title

Figure 2: Overall country scores for emissions data in 2000



3.1.4. Development of the Corinair model and software

Following the official release of Collect*ER* and Report*ER* software tools, further development in 2000 has mainly been carried out under the separate Teresa project (European Commission's IDA programme), in particular the AE-DEM (air emissions-data exchange module) subproject.
National data are collected by the NRCs using the Collect*ER* software tool. This tool provides the user with all definitions of activities, fuels, locations and pollutants and allows for both point source and area sources emissions input. The tools create a database (MS Access), containing all information on emissions and activity data needed to produce consistent reports.

Estimat*ER* tools are expert systems providing the user with specific knowledge on emission estimation methods and the parameters (emission factors) to use them in the specific national situation. One Estimat*ER* ('Copert III') is available for the sector road traffic; another expert system to estimate emissions from the agriculture sectors is being developed.

Copert III was finalised by the ETC and made available to NRCs and other interested experts at the end of 2000. Copert is an MS Windows software programme developed to enable users to calculate emissions from road traffic.

Furthermore, emissions from internal combustion engines used in off-road applications are also covered. The emissions include all major transport pollutants (CO, NOX, VOC, PM) and several more (N_2O, NH_3, SO_2, PAH, POP etc.). In addition, fuel consumption estimates are computed. A detailed methodology report is available. Copert III methodology can be applied for the calculation of traffic emission estimates at a relatively high aggregation level, both temporally and spatially, on a yearly basis for each country. However, it has been shown that the methodology can also be used at a higher resolution, for the compilation of urban emission inventories with a spatial resolution of 1 x 1 km² and a temporal resolution of one hour. Copert III is an updated and extended version of CopertII. The methodological revisions and extensions originate from the DG TREN programmes COST 319 Action (estimation of emissions from road transport) and MEET (methodologies to estimate emissions from transport), the European Commission's Auto Oil II programme and the EPEFE programme of ACEA and Europia.

Once the national database in the Collect*ER* format has been completed, Report*ER* helps to produce the following reports:

(a) Emission estimates of acidifying pollutants, selected heavy metals and POPs as requested by the UNECE/CRLTAP protocol and the EMEP;
(b) emission estimates of greenhouse gases in the so-called common reporting format of UNFCCC. Report*ER* is able to complete most of the fields in the summary tables and sectoral tables. Completion of sectoral background tables is not possible in a number of cases since the data are not present in the Collect*ER* database structure;
(c) emissions from large combustion plants (EU directive 88/609/EEC, being amended), consisting of three tables:
    I A list of all large combustion plants in the database, including an indication of whether the plant is an 'old' or a 'new' plant (according to the directive);
    II a list of all stacks, connected to these large combustion plants;
    III a list of emissions and emission factors per stack and per large combustion plant;
(d) releases of air pollutants only following the format being developed under the IPPC/EPER decision (require reporting by IPPC Annex 1 activity).

Train*ER* is a background document, describing the system and providing a step-by-step example on how to use the software for national emission inventory and reporting to UNFCCC and the EMEP.

The software tools and technical reports, which describe the methodology and relevant emission factors, are available from the ETC/AE web site at the following location: http://etc-ae.eionet.eu.int/etc-ae/software.htm or http://www.spirit.sk/products/Corinair/s_Corinair.html

While the ETC/AE is providing technical support to the users (additional training seminars were held in Lithuania and Estonia), the development of tools greatly benefited from the active participation of several national reference centres. In 2001, tools will be developed further focusing on adaptations required by changing reporting specifications (for example, the reporting workshop, held on 29 January 2001 in The Hague).

3.1.5. Joint UNECE/EIONET workshop on air emissions

The first joint UNECE task force and EIONET workshop was held at Palazzo Rospiglioso in Rome, Italy from 15 to18 May 2000. About 155 participants (registered for either the EIONET workshop and/or the task force meeting) and

observers from about 35 mostly European countries attended (two non-European countries — USA and Canada — also attended, as well as representatives from the Commission (DG Environment, Eurostat), UNECE/CLRTAP Secretariat, EMEP, UNFCCC Secretariat, and experts from the EEA, the ETC/AE and the PTL/AE. The Italian host organisation, ANPA (Agenzia Nazionale Protezione Ambiente), provided excellent conference facilities and organised a social event for the participants. The workshop was jointly organised by the UNECE TFEIP (task force on emission inventories and projections) and the EEA-ETC/AE. The specific EIONET part of the workshop took place on 16 and 17 May. On 17 May, the EIONET sessions (software training) were organised parallel to the expert panel meetings of the UNECE TFEIP. This gave participants the opportunity to take part in either the expert panel meetings or in the ETC/AE software training sessions.

Conclusions and further actions required:

On the joint workshop:

- The joint UNECE task force and EIONET workshop on emission inventories and projections can be considered as a success, and the EEA is interested to organise future similar joint workshops. However, an evaluation is advisable and some improvements could be made, taking into account the different mandates of the organisations involved.
- The EEA welcomes the proposed workshop (by the end of 2000, early 2001) on 'requirements for reporting of emissions to UNECE/CLRTAP' and is interested to contribute to such a workshop.

On data collection and efficient use of data:

- The EEA is in a consolidation phase, where data flow and management will continue to be built on EIONET as the basis for a routine regular system from monitoring to indicator-based EEA reporting, in cooperation with Eurostat;
- the EIONET data flow project shares the objectives of transparency, consistency and comparability and the common goal of a distributed approach to data management and reporting on national web sites; the advantage of this approach needs to be further disseminated to a wider audience;
- only policy relevant mandatory data can be expected to be reported by countries, owing to increasing obligations and resource constraints; linking emissions to economic activities (NACE) is desirable, but the policy relevance needs to be clarified and tested (NAMEA, OECD/Eurostat joint questionnaire);
- improvement has been made on linkages between SNAP, NOSE-P, IPCC sectors and the joint OECD/Eurostat questionnaire 2000, in close cooperation between Eurostat and the EEA;
- cooperation between the data requesting international bodies has improved, but further actions are needed, such as exchange of lists of national (nominated) experts;
- the EEA, Eurostat and CRLTAP/EMEP will further improve exchange of data.

On support to member countries:

- Progress has been made at national level with regard to cooperation between NFPs, NRCs, statistical offices and other experts responsible for reporting to the different national and international bodies;
- the EEA will continue to assist countries regarding mandatory reporting requirements for example by providing software tools, guidance documents and by organising workshops;
- the draft EEA-ETC/AE UNFCCC-CRF software module was welcomed as a good step forward, but will need further testing by national experts;
- CollectER and ReportER tools will be developed further by EEA in cooperation with national experts, the relevant conventions and the Commission (DG Environment), according to the agreed list of application priorities under the EEA/IDA Teresa (transparent environmental reporting for administrations) project;
- the CLRTAP/EMEP reporting guidelines are being revised; this will lead to a revision of the ReportER tool;
- Copert II has been used by an increased number of different types of users ranging from national authorities (for national inventories) to regional and local authorities, the scientific community and industry and is being developed into Copert III. To incorporate latest scientific knowledge, Copert III will be finalised by the end of 2000;
- the training sessions on Collect*ER* and Report*ER* were successful and could be repeated in future.

On the use of air emissions data and information in EEA reports:

- The EEA will continue to prepare its main assessment reports using air emissions data officially supplied by the countries under obligations for reporting to conventions (UNECE — CLRTAP, UNFCCC) and EU legislation;
- data provided by the countries will be used by the EEA, in cooperation with Eurostat, to produce annually updated air emission indicators as a building block for the regular environmental signals reports and sectoral reporting mechanisms (for example, TERM = transport and environment reporting mechanism);
- the EEA and Eurostat aim at a coordinated approach for the establishment of pressure indicators at EU level (for example, HM&POP);
- the EEA will regularly update its air emissions database and provide public access to data via the EEA environmental reference centre (web site).

On support to EU and international policy and legislative frameworks:

- On request of the European Commission (DG Environment) the EEA will produce assessment reports under specific legislation and policy development (ECCP=European climate change programme, GHG monitoring mechanism, CAFE=clean air for Europe programme, LCP Directive, IPPC Directive/PER and the future National Emissions Ceilings Directive;
- the EMEP/Corinair methodology will be developed further in cooperation with TFEIP and the EEA will continue to maintain the joint *Atmospheric Emission Inventory Guidebook* on its web site.

The second joint UNECE/EIONET workshop will be held on 9 to 11 May 2001, in Geneva.

3.2. Integrated assessment

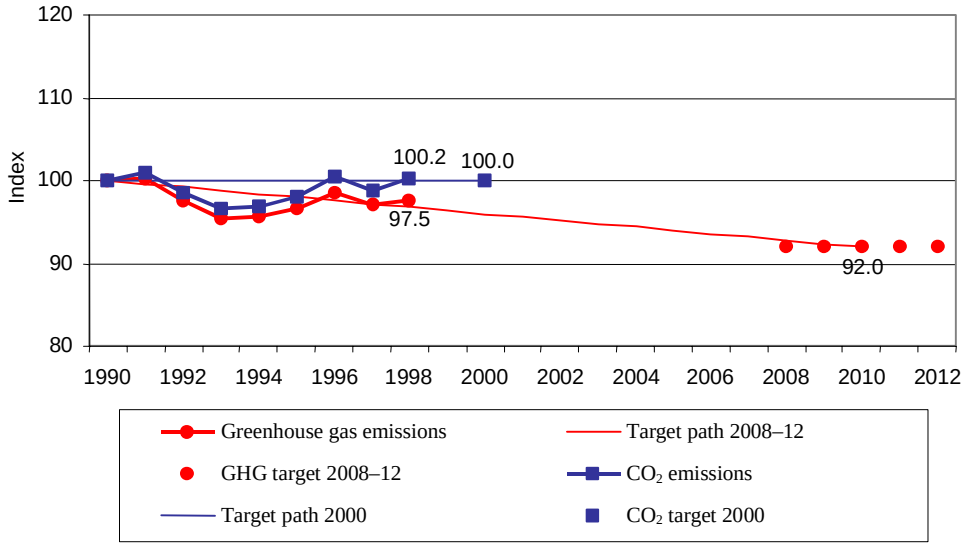
3.2.1. European Community and Member States' greenhouse gas emission trends 1990–98

The year 2000 marks an important milestone in European Community climate policy, as many targets for greenhouse gas emissions refer to this year. Firstly, the Council of Ministers agreed in 1990 on the objective to stabilise EU carbon dioxide (CO_2) emissions by 2000 at 1990 levels. This commitment was repeated when the United Nations Framework Convention on Climate Change (UNFCCC), signed in Rio de Janeiro in June 1992, committed Annex I Parties (including the European Community (EC) and all EC Member States) to aim at returning their anthropogenic CO_2 and other greenhouse gas emissions to 1990 levels by the year 2000. Finally, most EC Member States have adopted national limitation and reduction targets for greenhouse gas emissions for the year 2000, which are linked but not dependent on the entry into force of the relevant international agreements.

The report on emission trends 1990–98 (EEA Topic report No 6/2000) prepared by the EEA and the ETC/AE, serves as input to the annual progress evaluation report of the European Commission to the Council and the European Parliament, as required under the monitoring mechanism. It focuses on actual progress by comparing 1990–98 greenhouse gas emission data of the EC and its Member States with two (hypothetical) linear target paths: the UNFCCC target path for 2000; and the Kyoto target path for 2008–12. By calculating the deviations from these target paths in 1998, a measure of actual progress of the EC and its Member States in 1998 is established. Actual progress is further analysed by evaluating major driving forces and characteristics of greenhouse gas emission trends from 1990 to 1998. The main findings of the report are presented in the following paragraphs.

Greenhouse gas emissions in the European Community decreased by 104 Tg or 2.5 % between 1990 and 1998 (Figure 3). About 82 % of EU-15 greenhouse gas emissions are CO_2 emissions; CH_4 and N_2O emissions account for about 9 % each. Whereas CO_2 emissions almost stabilised between 1990 and 1998 (+7 Tg or +0.2 %), CH_4 and N_2O emissions decreased by 16.5 % and 9.9 % respectively. Therefore, in 1998, the European Union as a whole was in line with its target paths for 2000 and 2008–12. However, actually achieving the targets for 2008–12 will still be difficult and require large efforts, as GDP and energy consumption are expected to grow in the next decade.

Figure 3: EU-15 Greenhouse gas emissions compared with targets for 2000 and 2008–12 (excluding industrial F-gases and land-use change and forestry)

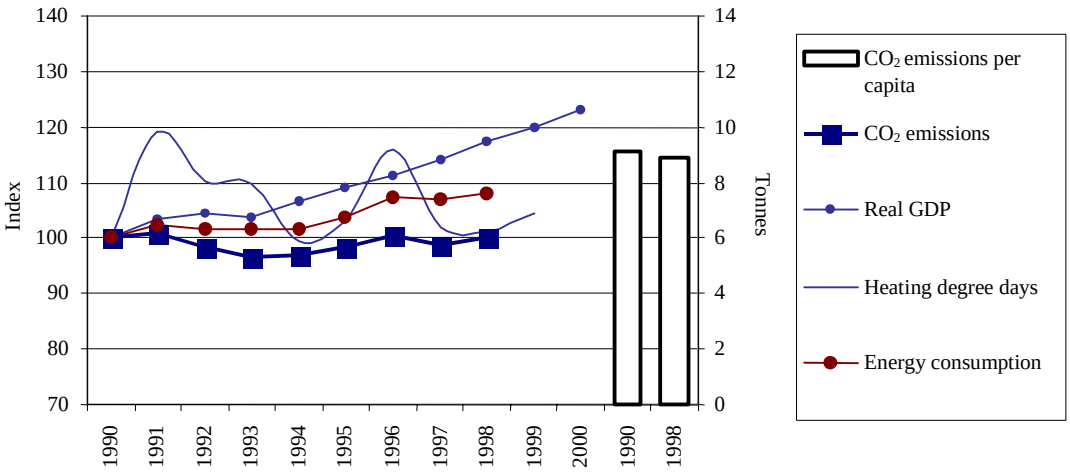


Note: Greenhouse gas emission data, as referred to in this report, include neither industrial F-gases (HFCs, PFCs, SF_6) nor emissions and removals from LUCF. In addition, no adjustments for temperature variations or electricity trade are considered.

CO_2 emissions

Fossil fuel energy consumption is the main driving force of CO_2 emissions. Two factors strongly influence energy consumption: economic growth and outdoor temperature (that is, cold or mild winters). CO_2 emissions decreased in the early 1990s due to slow economic growth throughout all Member States and due to large reductions in Germany and the United Kingdom. Emissions were highest in 1991 and 1996 — the two coldest years in the 1990s — thus illustrating the influence of temperature variations on CO_2 emissions. In recent years, temperature adjusted CO_2 emission trends appear to be rising again. In 1998, CO_2 emissions were third highest in the 1990s, but with relatively mild temperatures (Figure 4).

Figure 4: EU-15 CO_2 emissions and driving forces (real GDP growth, heating degree days and energy consumption)

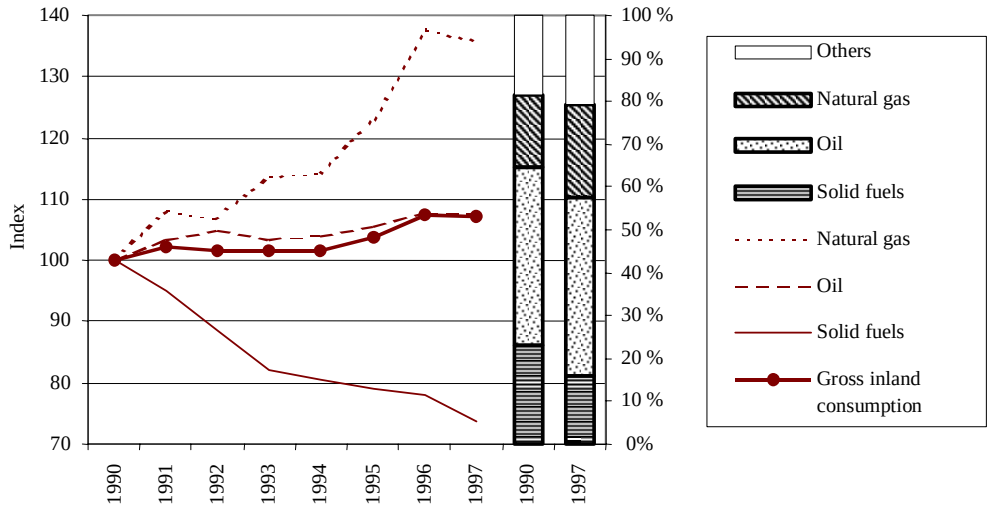


Note: The figure shows the trends of CO_2 emissions, real GDP, heating degree days and gross inland energy consumption (also referred to as 'energy consumption' in this report) as an index, with 1990=100 (left side of the figure) and the CO_2 emissions per capita in tonnes (right side of the figure). Real GDP figures for 1998–2000 are estimates; the index of energy consumption for 1998 has been calculated on the basis of monthly data; heating degree days were taken from EC (2000).

Carbon intensity of GDP and of energy consumption decreased considerably as GDP increased by 17.4 % and gross inland energy consumption grew by 8.2 % between 1990 and 1998 (compared to a 0.2 % growth of CO_2 emissions). The main reasons for the decarbonisation were: (1) large energy efficiency improvements after the German unification and the related economic restructuring in the new Länder; (2) the switch from coal to gas in the UK electricity generation; (3) a general switch from coal to gas, renewable energies and nuclear power.

Fossil fuel combustion is the main driving force of CO_2 emissions. The reliance on fossil fuels is still high. Figure 5 shows that their share in gross inland energy consumption declined slightly from 81 % in 1990 to 79 % in 1997 (oil: 42 %, gas: 21 %, solid fuels: 16 %). Nuclear power accounts for approximately 15 % and renewable energies for approximately 6 % of gross inland energy consumption in 1997. The EU target of 12 % of energy supply renewable in 2010 will require significant additional efforts.

Figure 5: EU-15 gross inland energy consumption by fossil fuel type

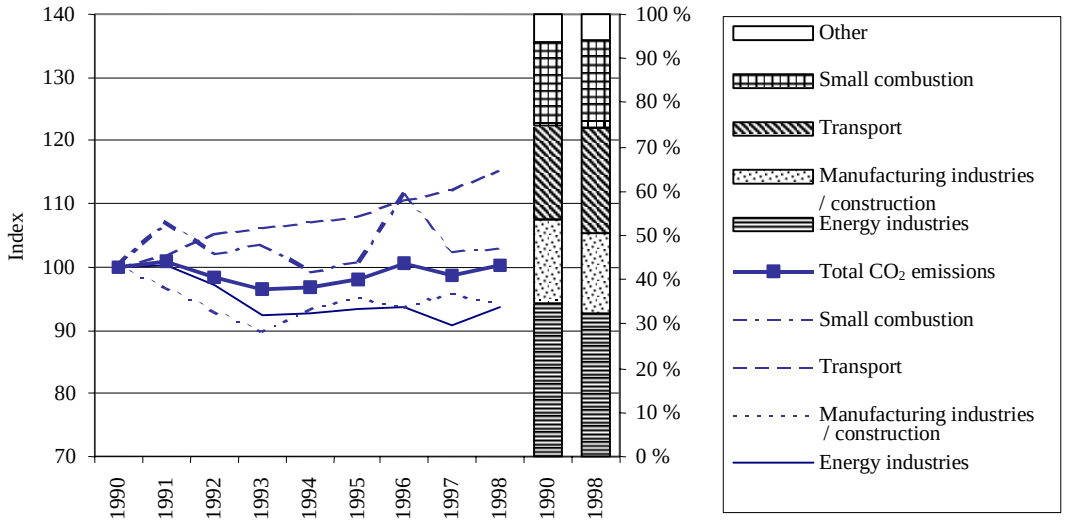


Note: The figure shows the trend of gross inland energy consumption of fossil fuels as an index, with 1990=100 (left side of the figure) and the percentage contribution of fossil fuels to total gross inland consumption in 1990 and 1997 (right side of the figure). 'Others' include nuclear power and renewable energy sources.

Sectoral breakdown of CO_2 emissions: More than 90 % of CO_2 emissions come from fossil fuel combustion. Figure 6 shows that energy/industry is the largest CO_2 emitting sector accounting for 32 % of total CO_2 emissions in 1998. Second was transport with 24 % after considerable growth in the 1990s. Small combustion and manufacturing industries account for 20 % and 18 % respectively. In general, a shift from energy and manufacturing industries to transport and small combustion can be observed.

Further details are contained in the full report available in print from the EEA as well as from the EEA web site.

Figure 6: Sectoral breakdown of EU-15 CO_2 emissions (excluding LUCF)



Note: The figure shows the trend of sectoral CO_2 emissions from fossil fuel combustion as an index, with 1990=100 (left side of the figure) and the percentage contribution of the sectors to total CO_2 emissions 1990 and 1998 (right side of the figure). Sector names follow CRF categories except 'small combustion' (renaming CRF category 1A4) and 'other' (including all remaining CRF categories).

CH_4 emissions decreased almost steadily and were 16.5 % below 1990 levels in 1998. The main sources of CH_4 emissions are agriculture (enteric fermentation and manure management), waste (mainly waste disposal in landfills) and fugitive emissions from fuels (for example, in the gas distribution networks). CH_4 emissions from agriculture were reduced by 6 % but their share in CH_4 emissions increased to 49 % in 1998. Emissions from waste decreased by 24 %; their share in CH_4 emissions declined to 30 % in 1998. Fugitive emissions from fuels accounted for 17 % of CH_4 emissions in 1998. The most important reasons for declining CH_4 emissions are emission control from landfills (collection for flaring or power generation), leak reductions in gas distribution systems and reductions of coal mining. There are large variations in CH_4 emission trends in the Member States: whereas Finland and Germany reduced there CH_4 emissions by 42 % and 36 % respectively, Spanish CH_4 emissions grew by 26 %. In absolute terms, Germany, France, the Netherlands and the United Kingdom, achieved the largest reductions, whereas Spanish CH_4 emission increases were the highest.

N_2O emissions were almost 10 % below 1990 levels. The main sources of N_2O emissions are agriculture (soils and fertiliser use) and industrial processes (mainly adipic and nitric acid production). Agricultural N_2O emissions reduced only slightly (-2 %), but emissions from industrial processes declined by 36 % between 1990 and 1998. Accordingly, the share of agriculture in N_2O emissions increased to 61 % in 1998, whereas the share of industrial processes declined to 20 %. A small but rapidly increasing source of N_2O emissions almost doubling between 1990 and 1998 is the transport sector after the introduction of the catalytic converter. Large N_2O emission reductions were achieved by Luxembourg (-31 %) and Germany (-27.5 %), whereas N_2O emissions in Finland increased by 33.9 % between 1990 and 1998. In absolute terms, Germany, France, Italy and the United Kingdom achieved the largest reductions, whereas Spain and Finland increased most. A large share of German reductions were achieved in 1998 after new N_2O emission reduction methods were introduced in two acidic plants.

Progress of Member States

In 1998, only three Member States (Germany, Luxembourg and the United Kingdom) were well below their greenhouse gas emission target paths for 2000 and 2008–12 (Table 2). France was below its CO_2 emission target path for 2000 and near to its linear Kyoto target path. Sweden was well above its CO_2 emission target path for 2000 but also near to its linear Kyoto target path. All other Member States were well above their greenhouse gas emission limitation and reduction paths. Denmark, Spain, Ireland and the Netherlands were more than 10 index points above their linear Kyoto target paths in 1998.

The countries that reduced emissions: In 1998, Germany, as the largest emitter of the EU, was 7.4 index points below the linear target path for 2008–12. The main reason for this was large emission reductions after the German unification. Luxembourg was 47.2 index points below the Kyoto target path mainly due to reduced coke use in metal industry and higher electricity imports. The United Kingdom was 4.5 index points below the linear Kyoto target path in 1998. The bulk of the United Kingdom greenhouse gas emission reduction was achieved through the fuel switch from coal to gas in the power-producing sector.

Table 2: Progress of EU-15 and the individual Member States in 1998

	In line with	
	CO_2 emission target path for 2000	**Greenhouse gas emission target path for 2008–12**
EU-15	😐	😐
Austria	☹	☹
Belgium	☹	☹
Denmark	☹	☹
Finland	No target	☹
France	☺	😐
Germany	No target	☺
Greece	☹	☹
Ireland	☹	☹
Italy	☹	☹
Luxembourg	☺	☺
Netherlands	☹	☹
Portugal	No target	☹
Spain	☹	☹
Sweden	☹	😐
United Kingdom	☺	☺

Note: The smileys are awarded according to the deviation of the CO_2/greenhouse gas emissions from the relevant linear target path in 1998. The following ratings apply:

☺ more than 2 index points below linear target path
☹ more than 2 index points above linear target path
😐 in a range of plus/minus 2 index points of linear target path

3.2.2. Atmospheric pollutants in Europe 1980–98

The report provides information available by the end of 2000. It contains updated information (excluding greenhouse gases, which are covered by another report) provided in the previous report 'Atmospheric Pollutants in Europe 1980–96' published as Topic report 9/2000 by the EEA accessible via http://reports.eea.eu.int/Topic_report_No_92000/

This topic report has a specific focus on emissions of atmospheric pollutants and the progress towards emission reduction targets and emission ceilings. The report aims at providing transparent, consistent, comparable, complete and reliable indicators of emissions of atmospheric pollutants, or 'air emissions'. While assisting member countries in collecting and reporting emission data, the ETC/AE compiles from this country data a European emissions database (Corinair) and from this is able to provide air emissions data and indicators for the main EEA assessment reports. The data and indicators presented in the report are fully consistent with the data and indicators presented in the most recent EEA indicator-based report 'Environmental signals 2001' and the EEA TERM report (transport and environment reporting mechanism, EEA, 2001). Data used for this report are the official data submitted by countries, by the end of 2000, to the various international reporting obligations. The report provides more detail than the indicator-based reports and presents all the main air emission indicators in a comparable and consistent way in one single report. The geographical coverage includes EEA member countries as well as central and east European countries, through the EEA-Phare programme. In addition to trends in national total emissions, emission indicators are also presented by main economic sector

(energy, industry, transport, agriculture) showing the different contributions to the environmental issues, described in this report. The main findings of the report are as follows.

Acidification, tropospheric ozone and urban air quality (emissions of acifidying pollutants and ozone precursors)
Within CLRTAP in December 1999, national emission ceilings were agreed in a new multi-pollutant Protocol for SO_2, NMVOC, NO_x and for the first time for ammonia (NH_3), for many European countries, including EU Member States. These targets are much more strict than the previously agreed targets. In May 1999 the European Commission prepared a proposal for a Directive on national emission ceilings (NECD) for the same pollutants. The Council did not adopt this proposal in 2000, but a common position was reached in June 2000. For a number of Member States, the proposed NECD targets are more strict than those agreed within CLRTAP.

Emissions of acidifying pollutants
Total EU emissions of acidifying gases have decreased significantly (45 % from 1980 to 1996), showing a decoupling of emissions from GDP growth. This is mainly due to SO_2 emission reductions. Since 1980, EU Member States have reduced their sulphur dioxide emissions by over 60 %. Reduction targets for 2000 have already been achieved for the EU as a whole. The proposed NECD and agreed CLRTAP targets for 2010 appear to be attainable for the EU, although additional measures will be required in some EU Member States. For most Phare central and East European countries, SO_2 emissions decreased between 1990 and 1996 (up to 60 %), and emissions are below the 2010 CRLTAP targets. This is due to economic restructuring, fuel switching, desulphurisation of emissions from power plants and other measures. In some countries additional measures will be required.

The EU as a whole has achieved the CLRTAP target of stabilised nitrogen oxide emissions at 1987 levels. Emissions decreased by 14 % from 1990 to 1996. However, the EU 5EAP target is unlikely to be reached by 2000. To achieve the proposed NECD and agreed CLRTAP targets for 2010 additional measures will be required in various EU Member States. For most Phare central and East European countries, NO_x emissions decreased between 1990 and 1996 (30 to 60 %). This is due to economic restructuring, fuel switching, deNOx installations for power plants and other measures. In various countries additional measures will be required to achieve the CRLTAP targets for 2010.

EU ammonia emissions have decreased slightly (7 %) from 1990 to 1996, with substantial decreases (15 to 35 %) in a few Member States. Ammonia emission reduction targets have been defined for the first time. The proposed NECD and agreed CLRTAP targets for 2010 will be difficult to achieve for the EU and additional measures will be required in various countries. Emissions from all Phare countries decreased (between 10 % and 80 %), probably due to the economic restructuring process. However, Poland and Slovenia need further reductions to meet the CLRTAP targets for 2010.

Emissions of ozone precursors
EU emissions of ozone precursors have decreased 15 % from 1990 to 1996 against increasing economic growth demonstrating a decoupling of emissions from GDP. Total EU emissions of NMVOCs fell by 13 % between 1990 and 1996, with substantial decreases (30 to 40 %) in Ireland and Germany. However, emissions from some other Member States have increased. Further reductions in EU

emissions will be necessary to achieve the EU 5EAP target for 2000 and the proposed NECD and agreed CLRTAP targets for 2010. Emissions from most Phare countries decreased from 1990 to 1996 (10 % to 70 %,) probably due to the economic restructuring process. The Czech Republic and Slovenia need further reductions to meet the CLRTAP targets for 2010 and additional measures will be required.

Emissions of particulates and toxic/hazardous substances (heavy metals and POPs)
In 1998, CLRTAP Protocols were adopted that require reductions in the use and emissions of a number of heavy metals (such as mercury, cadmium) and persistent organic pollutants (POPs, such as dioxins). Furthermore, in the EU, air quality targets for PM10 have been adopted in 1999. Uncontrolled combustion of coal in stationary sources and diesel in transportation contribute significantly to PM_{10} emissions in Europe. EU-15 urban area PM_{10} emissions are dominated by road transport. Phare countries' urban area PM_{10} emissions are influenced by high emissions from industry and energy production within the urban area. The use of leaded petrol contributed to about 75 % of lead emissions across the EU in 1990. The phase-out of leaded petrol has reduced emissions dramatically over recent years. Significant EU emissions of cadmium and mercury originate from industrial processes. Waste treatment and industry are primary sources of dioxins and furans in the EU. PAH emissions from wood treatment and wood combustion contribute significantly to EU and Phare accession countries' emissions.

Emissions by main source sectors (energy, industry, transport and agriculture)
An overview of sector contributions to environmental issues is presented in Figure 7. The main findings are as follows:

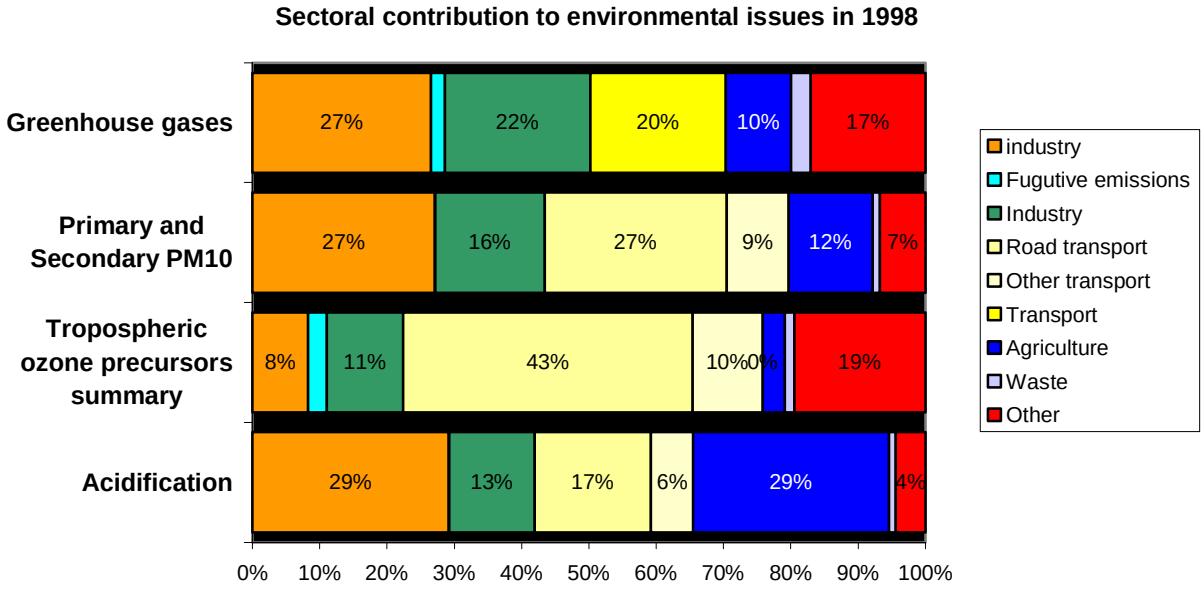
Energy sector: emissions of acidifying gases, tropospheric ozone precursors and carbon dioxide from the energy sector decreased between 1990 and 1996 by 26 %, 15 % and 5 % respectively, while primary energy demand increased by 7 %. Reductions are due to implementation of end-of-pipe abatement measures, increased efficiency in power generation strategies and the increased share of natural gas.

Industry sector: emissions of acidifying gases, tropospheric ozone precursors and greenhouse gases from the industry sector decreased between 1990 and 1996 by 36 %, 10 % and 8 % respectively, while industrial production and energy use in 1996 were on 1990 levels. This suggests a positive development of eco-efficiency in industry. Emission reductions are due to a range of abatement measures and end-of-pipe technology, increased energy efficiency and a trend from solid and liquid fuel to natural gas. The Large Combustion Plant (LCP), the Integrated Pollution Prevention and Control (IPPC) and the 'Solvents' Directives are expected to contribute to further emission reductions.

Transport sector: emissions of acidifying gases and ozone precursors from transport decreased by 11 % and 18 % respectively between 1990 and 1996, while in the same period transport activity increased (passenger road transport by 12 %). The emission reductions are mainly due to an increasing share (30 % in 1996) of petrol driven passenger cars fitted with catalytic converters. Greenhouse gas emissions resulting from transport have increased by 10 % from 1990 to 1996. However, there has been little or no improvement in energy efficiency of transport. The negotiated agreement between the European Commission and the car industry is expected to reduce CO_2 emissions of new passenger cars.

Agricultural sector: Emissions of ammonia, nitrous oxide and methane from agriculture have reduced by 1–2 %, 4 % and 5 % respectively between 1990 and 1996, mainly due to reductions in livestock numbers. Changes in agricultural practices will be necessary to further reduce EU emissions.

Figure 7: Sectoral contribution to environmental issues in 1998



Sector indicators used in the report show links between the activities of societal sectors (transport, energy, forestry, etc.) and the environment. As well as showing the sector's absolute burden on the environment and the development in its eco-efficiency, sector indicators also deal with a sector's development in size and character and its specific responses to environmental issues. Sector indicators are in various stages of development; those for air emissions are amongst the most advanced.

Summary: The report fits into the DPSIR assessment framework used by the EEA, for structuring, presenting and reporting the causal chain of different environmental issues. Since much of the policy action at EU or Member State level is focused on driving force (D) and pressures (P) within the DPSIR framework, many policy-relevant indicators described in the report show developments in these parts of the chain. The report is part of a series of EEA reports on air emissions. Thus, by the beginning of 2002, an update will be produced covering the period 1980 to 2000.

3.3. Periodical reporting

3.3.1. EEA Environmental signals 2001

The EEA yearly indicator-based report series (Environmental signals) is a collection of concise environmental assessments based on the information provided through selected indicators. It fills the gaps between the three- to five-year comprehensive assessment reports that the EEA produces on the environment in Europe.

The second report in the series (Environmental signals 2001) will, similarly to the first one, contain sectoral and issue chapters. The ETC/AE contributed to the

report by providing emission data and information (including the description of state and trends of emissions and deviations from environmental targets) and contributed to the chapter on climate change, air pollution and energy.

Issue chapters focus on the main political themes at the time of publishing, thus, consider progress in the integration of the environment in other policies, the sixth EAP adopted by the Commission on 24 January 2001, and sustainable developments requested by the Helsinki Council. This gives at least two entry points to tell the stories: 'the contribution of sectors' and 'the meaning of sustainable development'. The contribution of sectors and the use and effectiveness of policy measures are suited to be central lines in climate change, air pollution, water quality and waste (and of course the sectoral chapters).

Some parts of the Environmental signals 2001 report are discussed below.

Climate change: A decrease in the total emissions of the three main greenhouse gases (carbon dioxide, methane and nitrous oxide) of 1 % occurred between 1990 and 1996, despite a substantial increase in GDP. The 1998 data show a further small decrease in total emissions of 2 % of all six gases between 1990 and 1998, mainly due to a stabilisation of carbon dioxide emissions and reduction of nitrous oxide and methane emissions. Most of the 1990 to 1998 decrease resulted from large decreases in Germany and the UK. Emissions increased in all other EU countries except Luxembourg.

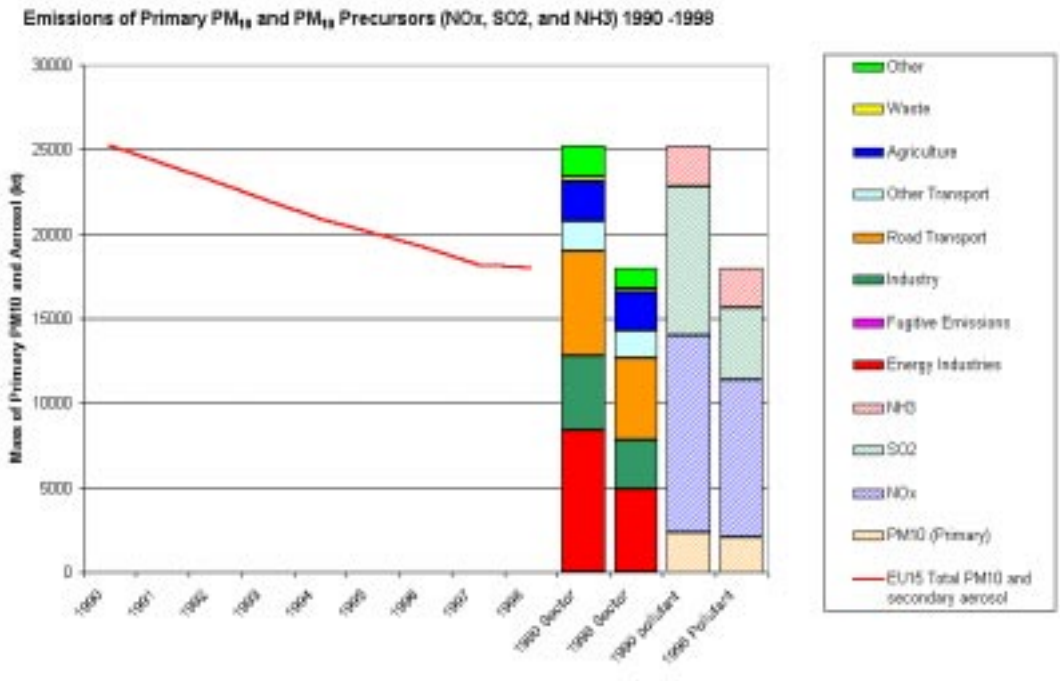
Air pollution: Most of the reductions in emissions of atmospheric pollutants that have been achieved over the last two decades have resulted from economic change, from measures directed at large sources in the industry and energy sectors and measures to limit emissions from road transport. There has been less success in reducing emissions from other sources such as agriculture. The area where the critical loads of acidification are exceeded has fallen significantly.

Reduction in emissions of SO2, NOx and primary PM10 from energy industries and a change from solid fuels to gas and renewables have contributed significantly to a 29 % reduction of total PM10 emissions from 1990 to 1998.

However, substantial parts of the population in the EEA member countries are still exposed to high concentrations of ground level ozone and fine particles. Reaching the emission reduction targets for 2010 for ozone precursors will require substantial further reductions and additional policies and measures in most member countries.

As an example of the ETC/AE contribution to the Environmental signals 2001 report, the analysis of the indicator 'emissions of primary and secondary particulate precursors' is presented here (Figure 8).

Figure 8: EU-15 emissions of primary and secondary fine particulates (PM10)



Note: Primary and secondary fine particulates are summed up in this indicator, by using aerosol formation factors for secondary particles as follows: SO2 0.54; NOx 0.88 and NH3 0.64 based on an approach developed by ETC-AQ.

Source: EEA — ETC / AE

Emissions (EU) of particulates

Emissions of primary PM_{10}, and secondary PM_{10} precursors (NOx, SO2 and NH3) contribute to elevated levels of fine particles in the atmosphere. These particles have adverse effects on human health and can be responsible for a number of complicated respiratory problems. A large fraction of the urban population is exposed to levels of fine particulate matter in excess of limit values set for the protection of human health. Primary PM10 refers to fine particles emitted from sources while the precursors are formed in the atmosphere. These estimates are uncertain since the data for primary PM10 is not as robust as for other pollutants and the weighting factors are based on assumptions about the deposition and reactions of the precursor pollutants.

EU emissions of primary PM_{10}, and secondary PM_{10} precursors have reduced in the EU by 29 % between 1990 and 1998. Energy industries, road transport and industry have contributed most strongly to this reduction between 1990 and 1998 through fuel switching and abatement in the energy industries and industry and by means of increased penetration of catalytic converters for road vehicles. Emissions of NO_X (52 %) and SO2 (24 %) are the most significant pollutants contributing to atmospheric PM_{10} in 1998. Primary PM_{10} and NH_3 contribute 11 % and 13 % in 1998 respectively. Road transport and energy industries are the dominant sources, both contributing 27 % of the EU-15 total for 1998. Road transport, energy industries and industry are both significant sources of NO_X, and primary PM_{10} while energy industries and industry (16 % of total primary PM10 and PM10 precursors in 1998) also produce large quantities of SO_2. Agriculture (12 % in 1998) is responsible for significant NH_3 emissions from livestock rearing.

Other sources include commercial, and domestic combustion contributes another 7 % of the EU-15 total in 1998.

Emissions of primary PM_{10}, and secondary PM_{10} precursors are expected to reduce in the future as improved vehicle engine technologies are adopted and stationary fuel combustion emissions are controlled through abatement or use of low sulphur fuels such as natural gas. Despite this, it is expected that in the near future in the majority of the urban areas over the EEA18 territory, PM_{10} concentrations will still be well above the limit values.

3.3.2. Transport and environment reporting mechanism

The transport and environment reporting mechanism (TERM) was set up in 1998 on request of the Council — to monitor progress and effectiveness of the transport and environment integration strategies in the EU. The main output of TERM is a regular indicator-based report, prepared jointly by the European Commission (various DGs and Eurostat) and the EEA.

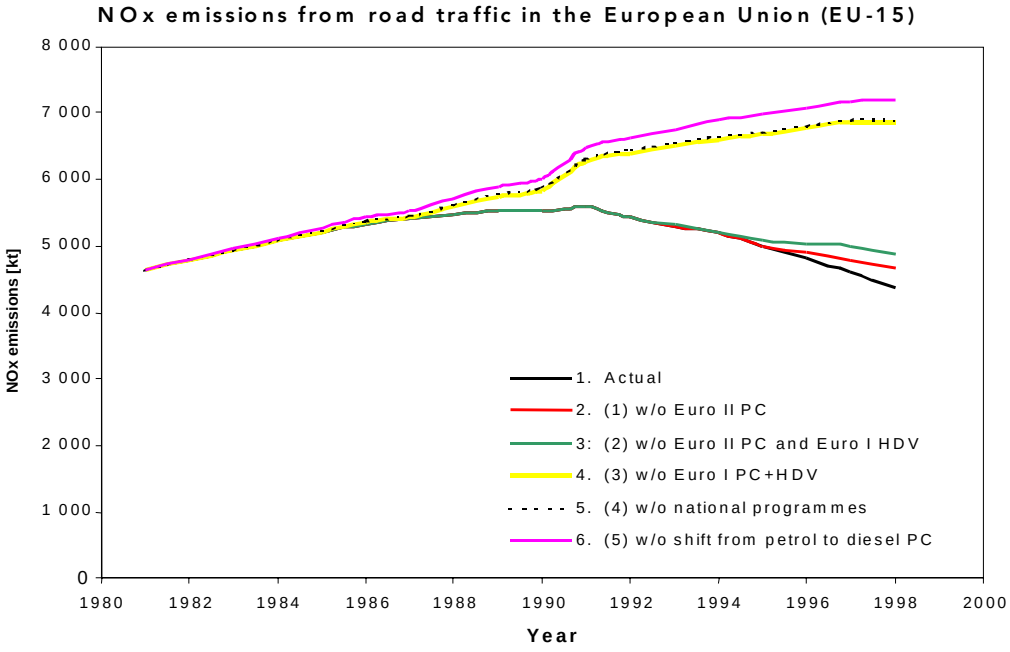
TERM indicator trends have been evaluated against a number of 'integration' objectives and targets. These were drawn from international policies and plans, such as the fifth EAP (and sixth EAP), the common transport policy, environmental directives, various other international conventions and agreements, and the OECD work on environmentally sustainable transport. Additional national objectives and targets were obtained from a review of national regulations and transport and environmental policy documents and plans. Most of the targets used in analysing progress have been brought together in the EEA 'Inventory of European policy environment targets and sustainability reference values' (STAR database: http://star.eea.eu.int/).

'Are we moving in the right direction?' — the first indicator-based report for TERM, published by the EEA, has identified about 31 key indicators that can be tracked and compared with concrete policy objectives. In some cases, proxy indicators were used because of data limitations. In the report, seven integration questions are addressed, which policy-makers in the EU regard as a key to understanding whether the current policy measures and instruments are influencing transport/environment interactions in a sustainable direction.

The second TERM report also to be prepared by the European Commission and the EEA, is being developed into a fully multi-modal assessment that includes road, rail, aviation, inland waterways, short-sea shipping, cycling and walking. The ETC/AE contributed to this report with information and data, description of indicators and trend analyses, by using results from the Corinair database and by performing a comparison of emission estimates from road transport carried out by the countries with those undertaken centrally by the ETC/AE partner Poseidon using the Copert model. Results from the Environmental signals 2001 work have also been used. A 'comparison between national and central estimates for air emissions from road transport for TERM' has been laid down in a draft ETC/AE technical report (November 2000) to be published by the EEA in 2001. The comparison covers each Member State and EU-15 average for the pollutants CO_2, NO_X, VOC and PM for the period 1981 to 1998. The comparison identified the main differences in the national and central estimates and made some recommendations to improve the quality of the estimations. In order to provide a picture of the future emission trends in EU-15, emission projections (with existing policies and measures) for the period 2000 to 2020 were also compiled (Foremove model) and presented.

Moreover, the report presents the main findings of a sensitivity analysis performed in order to identify and explain the differences in the projected road transport emissions between the Auto-Oil II programme and the EEA turn of the century report. In the framework of this analysis, the results produced by the Rains model (IIASA) for the EEA turn of the century report, are compared against corresponding data obtained with both the Tremove model for the needs of the Auto-Oil II programme and the centralised methodology applied within TERM. The aim of this comparison is to understand the reasons for different results of these models. An important part of this report focuses on the assessment of various emissions reduction measures, in terms of their effectiveness in reducing NO_x emissions from road transport, which is illustrated in Figure 9.

Figure 9: Effectiveness of measures to reduce EU NO_x emissions from road transport



Road traffic central emission estimates for the period 1981 to 1998 produced in the framework of Environmental signals 2001 are presented. NO_x emissions from road transport in the EU-15 countries increased by about 20 % from 1980 to 1990 and were then reduced, so that by 1998 they essentially returned to the 1980 levels. This evolution was primarily caused by the introduction of three-way catalyst cars in the late 1980s and early 1990s in all EU countries, (Directive 91/441/EEC) — although many Member States had encouraged the penetration of catalyst cars sooner than required by the legislation (before 1990). Emission standards for heavy-duty vehicles (91/542/EEC stage I) also contributed — although to a smaller extent — to the emission reductions. Without these measures, emissions in the EU would have been up to 50 % higher in 1998. The introduction of stricter directives both for passenger cars (94/12/EC) and heavy-duty vehicles (91/542/EEC Stage II) resulted in further reduction of NO_x emissions (of the order of 5–10 %) after 1995, which will be made more apparent in the following years. Additional measures at national level, implemented in the late 1980s, such as the early introduction of oxidation catalysts for gasoline cars, did not have any significant effect, since the phase-in of three-way catalysts was a much more drastic measure. The gradual increase in sales of diesel passenger cars in some European countries contributed further to a reduction in NO_x emissions, which was

significant in Belgium, Germany, France, the Netherlands and Austria. EU-wide, dieselisation caused a drop in emissions of 2–4 % in the 1990s.

The results of the comparisons between the national and central estimates reveal the need for further investigation. However, in some cases, the observed deviations are within acceptable limits. Steps that could be taken by means of further studies are:

- Harmonisation of parameter definition in order to have uniformity in data sets;
- filling of data gaps not only through interpolation but also with other calculation methods;
- calibration of the calculation method and data sets for selected years.

4. Products/outputs produced by the ETC/AE (1995–2000)

Type of product	Title	EEA report No.
General	Annual summary report 1995	Topic report 9/1996
	Annual summary report 1996	Topic report 5/1997
	Annual topic update 1997	Topic report 4/1998
	Annual topic update 1998	Topic report 12/1999
	Annual topic update 1999	Topic report 8/2000
	Annual topic update 2000 (this report)	Topic report 5/2001
Methodology and data	Review of Corinair 90 — Proposals for air emissions, 1994	Topic report 6/1996
	Recommendations for a revised data system	Topic report 12/1996
	Review study on urban emission inventories	Topic report 30/1996
	Atmospheric Emission Inventory Guidebook, First Edition	Technical report, CDROM and EEA web site
	Atmospheric Emission Inventory Guidebook, Second Edition	Technical report, EEA web site
	Corinair 90: Summary report No 1 (Sectors)	Topic report 7/1996
	Corinair 90: Summary report No 2 (Subsectors)	Topic report 8/1996
	Corinair 90: Summary report No 3 (Large point sources)	Topic report 20/1996
	Corinair 94 Inventory	Topic report 8/1997
Software	CollectER Methodology and software manual	Technical report No 31
	TrainER manual for self-training use of CollectER	Technical report No 33
	Copert II User manual; methodology & emission factors	Technical reports Nos 5 and 6
	ReportER — new output module for CRF	Technical report No 32
	Copert III — User manual; methodology and emission factors	Technical report Nos 49 and 50
Database	Corinair 90 and Corinair 94	ETC/AE web site
	Corinair database air emissions 80–98	EEA web site (data service)
	Annual European Community CLRTAP — emission inventory 1980–96	Technical report No 52
	Annual European Community GHG Inventory 1990–96	Technical report No 19
	Annual European Community GHG Inventory 1990–98	Technical report No 41
Information and assessment reports	Air pollution in Europe 1997 (jointly with ETC/AQ)	EEA monograph No 4
	Overview of national programmes to reduce GHG emissions	Topic report 8/1999
	European Community and Member States GHG emission trends 1990–98	Topic report No 6/2000
	European emissions of atmospheric pollutants 1980–96	Topic report No 9/2000

5. Towards a new ETC

5.1. The ETC on air emissions

The ETC/AE finalised its work in March 2001. In the past six years it has contributed to the development of the first-generation ETCs and hence to the development of EIONET and the agency. The evaluation of EEA and EIONET and preparations for the next generation of ETCs have both recognised the value of the ETC/AE and the partners involved. Through EEA staff based in Copenhagen and ETC experts based in a cross-section of participating countries, the ETC/AE also contributed to the establishment of the EIONET model for developing the quality of environmental information and supporting policy-makers at EU and national level. This model is being extended to a broader range of expertise and countries (original and new members) participating in new ETCs. In this context, some of the original partners who gained experiences and other benefits from their participation will be able to continue contributing to the further development of EIONET and the agency.

5.2. The new ETC on air and climate change

The new ETC/ACC is to start working in early 2001 and is expected to cooperate closely with NRCs for air emissions and for air quality. The main policy processes to be supported through ETC/ACC activities across the monitoring to reporting chain are: on air quality and pollution, the clean air for Europe programme (CAFE) and the UNECE/ EMEP work programmes on air quality and air emissions; on climate change issues, the EU greenhouse gas monitoring mechanism and the EU climate change programme. NRCs are expected to ideally have responsibility for air quality monitoring, data exchange and air pollution modelling, including QA/QC. The EIONET air quality network and the country network in the UNECE/EMEP task force on measurements and modelling (TFMM) are expected to be gradually merged. The second meeting of the TFMM will be held from 30 May to 1 June 2001 in Portoroz, Slovenia.

Expertise on air pollutant and greenhouse gas emission inventories (emission monitoring and estimation methodologies), including quality assurance is also required. The EIONET air emissions network and the country network in the UNECE/EMEP task force on emission inventories and projections (TFEIP) are also expected to be gradually merged. The second joint UNECE/EIONET workshop is to be held from 9 to 11May 2001 in Geneva, Switzerland.

On integrated assessment for air pollution — a new area requiring NRC expertise on analysis of effectiveness (and possibly costs) of policies and measures for mitigating air pollution and prospective analysis on air pollution: This new area of work is expected to link with the UNECE task force on integrated assessment modelling (TFIAM) and the EU network to be set up under the CAFE programme (clean air for Europe).

Annex: List of NRCs for air emissions inventories

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