European Topic Centre on Air Emissions

ANNUAL SUMMARY REPORT 1995

by

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1. BACKGROUND

In 1994 the Umweltbundesamt (UBA)/Federal Environmental Agency (Germany, Berlin) was appointed by the EEA as the project leading organisation for the European Topic Centre on Air Emissions (ETC/AEM.

During 1995 the ETC/AEM consisted of the following organisations and teams :

- UBA Berlin (Germany)
    - Dr. Dieter Jost
    - Dr. Dietmar Koch
- UBA Vienna (Austria)
    - Mr. Klaus Radunsky
    - Mr. Erich Grösslinger
    - Mr. Manfred Ritter
- ENERO
    - Mr. Neil Hurford (AEA/NETCEN, UK)
    - Dr. Simon Eggleston (AEA/NETCEN, UK)
    - Mr. Roberto Del Cielo (ENEA, Italy)
    - Mr. Nils Kilde (Risø, Denmark)
- CITEPA
    - Mr. Jean-Pierre Fontelle
    - Mr. Jean-Pierre Chang

ENERO is the European Network of Environmental Research Organisations and consists of organisations in most EU countries .

2. WORK PROGRAMME

The following projects from the Agency's Multiannual Work Programme 1994-1999 under the first annual subvention were undertaken by the ETC/AEM in 1995 :

- SA1: Air emissions - general approach and assessment;
- SA2: Air emissions inventories 1990 and 1994.

In this chapter some of the relevant texts of the Multiannual Work Programme (Programme Sheet 5) and the Technical Annex for the 1994 Subvention to the ETC/AEM are quoted (""), to summarise the different tasks of the ETC/AEM in 1995.

"The air emissions project will be coordinated and developed in conjunction with several other projects in the Work Programme, in particular with the other source-oriented monitoring projects and projects on air quality (MA1-3), integrated assessment (IA), scenarios (SC2) and periodical reports (PR). The EEA will be responsible for the overall coordination. However, throughout the period of subvention(s) the ETC/AEM will work closely with the EEA, national focal points (NFPs), DGXI, Eurostat, JRC, UNECE/EMEP, IPCC/OECD/IEA and other international organisations with an interest or responsibility for air emission methodologies/inventories, as well as other ETCs and contractors working on other related projects".

2.1 Project SA1-Air Emissions General Approach and Assessment

The main objectives are "the analysis of the situation and the development of guidelines for air emissions inventories at different levels and Europe wide".

Background and methods to be used :

- "review the experience/outcome of CORINAIR 1990 as a basis for planning, harmonising and more fully integrating future work on air emissions".
- "make recommendations on the main goals and guidelines for future work on air emission inventories".

2.2 Project SA2-Air emissions inventories 1990 and 1994

The main objectives are:

- "to review, consolidate and adjust the CORINAIR methodology to contribute to the development of the common tools for integrated inventories".
- "to compile an emissions inventory for Europe for the year 1994 covering the eight pollutants covered by CORINAIR 1990 as well as heavy metals, persistent organics and other pollutants required under the various conventions and commitments of countries involved".

3. PROGRESS IN 1995

Project SA1 was finished in 1995, project SA2.1 (Air emissions inventories 1990) will be finished in the first quarter of 1996. Project SA2.2 (Air emissions inventories 1994) is ongoing in 1996.

For each project the progress in 1995 is described here in more detail. All products delivered by the ETC in 1995 are summarised in chapter 5.

3.1 Project SA1-Air Emissions General Approach and Assessment

3.1.1 Review of CORINAIR90 and Recommendations for Air Emissions94

The first task of the ETC/AEM was to review the experiences and the results of CORINAIR90.

CORINAIR 90 was started by the EEA Task Force, which was part of the EU Environment Directorate (DG XI) until August 1994, when it was taken over by the EEA as part of the Work Programme. CORINAIR 90 has achieved the most complete, consistent and transparent air emissions inventory for Europe to date. In total 29 countries participated and provided the emissions on several levels of detail. However there still remain a number of gaps and inconsistencies. Furthermore the process to deliver the final data took five years, while a much shorter period was required and expected.

The CORINAIR 1990 system, consisting of software, an emission factor handbook and technical support was made avalaible in 1991 to the following countries :

- EU12 (Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, United Kingdom);
- EFTA5 (Austria, Finland, Sweden, all now members of the EU, and Norway and Switzerland);
- 3 Baltic States (Estonia, Latvia, Lithuania);
- 9 Central and Eastern European Countries (CEEC) (Albania, Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia, Slovenia);
- Malta and Russia.

A source nomenclature (SNAP90 or Selected Nomenclature for Air Pollution 1990) was used for approximately 250 emission generating activities in 11 main sectors:

- public power, cogeneration and district heating;
- commercial, institutional and residential combustion;
- industrial combustion;
- production processes;
- extraction and distribution of fossil fuels;
- solvent use;
- road transport;
- other mobile sources and machinery;
- waste treatment and disposal;
- agriculture;
- nature.

The inventory covered 8 pollutants :

- sulphur dioxide (SO_2);
- oxides of nitrogen (NO_x);
- non-methane volatile organic compounds (NMVOC);
- ammonia (NH_3);
- carbon monoxide (CO);
- methane (CH_4);
- nitrous oxide (N_2O);
- carbon dioxide (CO_2);

Inventories were delivered by all mentioned countries in a final version in 1994 or 1995, except by Albania, Russia and Croatia. Albania and Russia were not able to deliver inventories because of technical and fiinancial problems. Croatia provided summary tabels, but not a complete database.

The review of CORINAIR1990 was partly based on a questionnaire sent out in 1994 to the National Experts of all participating countries, so that the experiences of the experts involved were taken into account. The review and proposals for future work were presented in the first report from the ETC/AEM “Review of CORINAIR90- Proposals for Air Emissions94”, published by the EEA as a final report in September 1995”;

The main results of the review, presented in this ETC/AEM report, are summarised here.

Delay in completing CORINAIR90
Reasons for the delay include : required manpower and funding, waiting for other statistics, large effort to learn to use the system, low priority given to CORINAIR90, internal disagreement within the country, large amount of data requested, reluctance to submit preliminary/provisional data.

Comparisons with energy statistics approaches
The emission of a number of the eight pollutants is mainly related to fuel combustion (SO_2, NO_x, CO_2) and can therefore be estimated by methods based on fuel consumption data and emission factors. The IPCC uses this approach. It is useful to verify CORINAIR emission estimates for these pollutants on an aggregated level using energy statistics. However these energy balance calculations and comparisons with the emissions inventories prepared for the IPCC are not possible with the CORINAIR90 software.

Source nomenclature (SNAP)
The SNAP codes for emission generating activities are based on the emission generating technologies/processes and not on economic sectors. This means that data are source related and can easily be used for air pollution modelling purposes. However the feasibility of strategies and policies for emission control is less easy to determine.

Inconsistencies
Source sector 11 (Nature emissions) has been incompletely and inconsistently quantified, especially for CO_2. Some countries included emissions of quickly cycled CO_2 and others made no estimates for this sector. Emissions from other mobile sources apart from road traffic, sector 8, were not quantified by all countries separately. Emissions from waste treatment and disposal (sector 9) were not completed by some countries.

Confidentiality
Several countries have included plant specific information for LPS, which has to be maintained as confidential, e.g. for legal reasons. In CORINAIR90 this could be performed by using a system of "flags" to identify the confidential data.

International and other requirements
Countries in Europe have committed themselves to supplying data under the following international agreements :

- IPCC (Greenhouse gas data) : 30 September , 2nd year;
- EMEP (SO_2, NO_x, NH_3, NMVOC) : 31 December, 1st year;
- EU CO_2 Reporting : 31 July, 1st year (initial)
  31 July, 2nd year (revisions);
- EU Large Combustion Plant Directive : 30 September , 1st year.

In all cases only national totals are required, split by source sector, which are laid down in the reporting requirements for each agreement. However EMEP also requires a spatial disaggregation every four or five years, which coincides with CORINAIR90 and the new ETC/AEM inventory for 1994. Furthermore for EMEP in 1996 the number of pollutants will be extended to include heavy metals and persistent organic pollutants (POPs).

Apart from the international agreements for policy making on a national and European scale other requirements for the inventories in general are :

- Completeness
  The inventory should include all relevant sources, but most effort should be given to the significant sources;
- Consistency
  Each contribution to the final inventory should be comparable between countries.
- Transparency
  Enough data should be provided to allow a third party to reconstuct the inventory from national activity data and assumptions.
- Timeliness
  (Provisional) data should be available on the dates, which are required in international agreements.

Finally urban inventories are becoming increasingly important for specific purposes, e.g. to assess the feasibility of emission reduction policies for road traffic. The CORINAIR90 methodology , which makes use of the EU system for classification of territorial units (NUTS, level3 = county/department) is suitable at the national and European level, but the system needs to be further developed to be well suited for local and urban inventories.

Proposals
Based on the review and the requirements the following proposals for the next inventories have been made in the report :

- priority should be given to national totals , split into a source nomenclature which is the same for all purposes (e.g. IPCC, CORINAIR, EMEP), or which can be transformed easily;
- inventories should be collected annually for national data within six months, which is especially important for CO_2. For all eight CORINAIR pollutants and the new pollutants (heavy metals and POPs) national totals, split in 11 sectors, should be available within twelf months. The detailed sectorial and disaggregated data can be delivered in the second year (18-24 months);
- due to the required timescales data will be provisional, especially in the first half year, and can be revised later;
- a range of development tasks for 1994 and later inventories have been identified : improvement of the source nomenclature (SNAP) to be compatible with the IPCC approach, comparison with energy statistics, development of the methodology of collection, verification and validation in cooperation with EMEP (e.g. joint EMEP/CORINAIR Emission Factors Guidebook), improvement of the software, including software for estimation of road transport emissions,
- intensive training and assistance to most countries is necessary to ensure the completion of the inventories on time.

3.1.2 Revised Data System for Air Emissions Inventories

Based on the Review Report (CORINAIR 1990), which was described above, recommendations were used to set up a revised data model for air emissions inventories for 1994 and later years. This resulted in the second report of the ETC/AEM “Recommendations for Revised Data System for Air Emission Inventories (final report, January 1996)”. The software for the new data model is based on the CORINAIR90 software. A distinction has been made between changes with high priority, to be accomplished in 1995 and lower priority tasks to be undertaken in 1996. The main changes in the model and the software, which have been performed in 1995 are :

- use of a revised source sector split (sources and fuels), which is corresponding as much as possible with the IPCC source sectors;
- possibility to transfer the complete 1990 data into the new software, as a starting point for the 1994 inventory;
- inclusion of the new pollutants (heavy metals, POPs);
- inclusion of an energy balance, using national energy statistics;
- possibility to easily calculate national aggregated data;
- inclusion of default emission factors (c.f. EMEP/CORINAIR Guidebook);
- improved method for using detailed disaggregated data for setting up a national inventory (bottom-up);
- reporting possibility for CO_2 emissions, as required by the EU;
- use of the latest territorial unit nomenclature (NUTS, Eurostat).

Improvements to be undertaken in a later stage are :

- long-term software development;
- output modules to meet reporting requirements (EMEP, IPCC, LCP Directive, PARCOM/HELCOM).

3.2 Project SA2.1 - Air emissions inventory 1990

The results of the inventory have been compiled into an ORACLE database, initially stored at one of the ETC/AEM partners. The database will be copied to the EEA in January 1996 and can hence be used widely within the EEA Workprogramme and the EIONET.

The results of CORINAIR90 are presented in four separate reports :
- CORINAIR90 Summary Report 1;
- CORINAIR90 Summary Report 2;
- CORINAIR90 Summary Report 3;
- Comprehensive report on CORINAIR90.

Furthermore the main summary tables have been widely distributed and presented on the Internet homepage of the EEA for broad dissemination.

Report no. 1 provides for each pollutant the contribution of individual countries to the total European emissions as well as emissions per main source category, per capita and per km^2 and the emissions for groups of countries (EU-12, EU-15, EFTA-5, PHARE-10).

Report no. 2 examines the 57 source subsectors within the 11 main sectors, for which the results are described in the first summary report. Of these 57 subsource groups 38 contributed for more than 90 % of the emissions for all substances, except for NMVOC and CO_2. In general emissions of the following substances is mainly caused by combustion of fuels : sulphur dioxide (SO_2), oxides of nitrogen (NO_x), carbon monoxide (CO), carbon dioxide (CO_2). Another group consists of substances mainly caused by agricultural and natural sources : ammonia (NH_3), methane (CH_4), nitrous oxide (N_2O). Finally non-methane volatile organic compounds (NMVOC) consist of a large range of substances and can be traced to several sources : road transport, other mobile sources, solvent use and nature.

Report no. 3 provides an analysis of the most important LPS (Large Points Sources) in Europe.

The comprehensive report is being prepared and will be published in the first half year of 1996. This comprehensive report will have the following contents :
- European totals (11 main sectors; national emissions per capita, per area, and gross national product);
- environmental burden (causes of acidification by means of aggregation of deposition of SO_2, NO_x, and NH_3 ; greenhouse gas emissions as modelled by CH_4, CO_2 and N_2O; national emission density maps);
- analysis per economic sector;
- inter-country comparisons;
- discussion on the overall quality of the database, with respect to policy studies.

3.3 Project SA2.2 - Air emissions inventory 1994

Preparations for the 1994 inventory were finished in 1995. As was mentioned earlier in this report the software was revised, based on the recommendations described in the second ETC/AEM report.

The continuation of CORINAIR94 under the 1995 Subvention is discussed in chapter 6.

3.4 EEA projects related to SA2.1 not carried out by ETC/AEM

In 1995 several verification studies on the CORINAIR90 data were performed by a number of institutes outside the ETC/AEM. These institutes/organisations were separately contracted by the EEA.

The following studies have been performed :
- Eastern European countries (Rentz, University of Karlsruhe).

The following comparisons with external data have been performed : activity data (energy conversion, industrial production), other national emission data, emission densities, emission factors.

- CORINAIR90 Verification (Lenhart, University of Stuttgart).
  The usefulness of CORINAIR90 for the temporal disaggregated emission data in GENEMIS was evaluated.
- Large point sources (Hansen, Rostock University).
  The following verifications have been done : completeness of data , plausibility of technical and emission data, international statistics.
- CORINAIR90 Verification (Kilde, Risø).
  The emphasis of this verification was on emissions of CO_2.
- Verification of CORINAIR90 emission inventory by comparison with ambient air measurements (Pulles, TNO and Mareckova, SHMU).
  The verification was performed by comparison of measured and calculated air quality values of SO_2, NO_x, CO. The air quality was calculated by the LOTOS model on a 60x60 km^2 grid over Europe. Measurements in the Netherlands and the Slovak Republic were used for comparisons.

The results of all verification studies will be used by ETC/AEM and the national experts to improve the quality of the CORINAIR 94 emission inventory.

Within the related EEA project SG1 (Common tools for emissions and waste integrated inventories) one project (Nomenclatures) has been started under the 1995 budget under a separate contract between the EEA and CITEPA (one of the ETC/AEM partners).

4. MEETINGS

In table 1 the main meetings are listed, in which members of the ETC/AEM were involved, as part of the tasks of the ETC/AEM.

Table 1 Main meetings by ETC/AEM

No.	Location	Date / 1995	Objectives
1	Copenhagen, EEA	18/19 January	1st ETC consortium arrangement
2	Culham, NETCEN	13/14 February	Brainstorm on review study and use of CORINAIR90 data
3	Paris CITEPA	22nd March	1st draft review study
4	Copenhagen	11/12 April	1st draft on recomm.for the air emissions data system
5	Vienna, UBA	9/10 May	review and propose specification of future work
6	Oslo, SFT	16th June	CORINAIR expert group meeting
7	Roma, ENEA	21/22 September	Revised software, Proposals for work in 1996/97, Proposals on several reports.
8	CPH, EEA	11/12 December	Review the work under the 1994 Subvention CORINAIR94 Software training

5. REPORTS AND OTHER PRODUCTS

1. Review of CORINAIR90- Proposals for Air Emissions94, final draft, March 1995 (final report, September 1995);
2. Recommendations for Revised Data System for Air Emission Inventories, final draft, November 1995 (final report, January 1996);
3. Newsletter no. 1, September 1995;
4. CORINAIR90 Summary Report 1, final draft, June1995 (final report expected February 1996);
5. CORINAIR90 Summary Report 2, final draft, December 1995 (final report expected February 1996);
6. CORINAIR90 Summary Report 3, first draft, November 1995 (final report expected February 1996
7. Software Air Emissions (CORINAIR) 1994, version 1.01, including Instructions for Use, to be released February 1996;.
8. European Emissions of CO_2, SO_2 and NO_x, 1990-1994, Estimated from Fuel Statistics, draft report, December 1995;

These reports were delivered in draft by the ETC during 1995 and are being finalised with National Focal Points and other technical experts prior to publication by the Agency during 1996.

6. PROPOSED WORK PROGRAMME UNDER 1995 AND 1996 SUBVENTION

Project SA2.2 is continuing in 1996, consisting of the CORINAIR94 inventory and other tasks.

The CORINAIR94 inventory will be performed according to the following timeschedule for 1996 :

- February 1, 1996 :
  Send to the National Focal Points/National Reference Centres : revised software; instruction manual; report “Recommendations for Revised Data System for Air Emission Inventories (final report, january 1996)”;
- March 1996 :
  To be provided by the National Experts : provisional national data for the first 8 pollutants and 11 source sectors, which can partly be presented at the meeting on 25-27 March 1996 of the UNE-ECE EMEP Task Force on Emission Inventories.
- June 28, 1996 :
  Deadline for submission of the CORINAIR94 (provisional) national summary tables to the EEA (first 8 pollutants, 11 (SNAP level 1) sectors, 58 (SNAP level 2) subsectors).
- December 20, 1996:
  Deadline for submission of the CORINAIR94 national totals to the EEA (all 27 pollutants, 11 (SNAP level 1) sectors, 57 (SNAP level 2) subsectors, 277 (SNAP level 3) activities and the spatially disaggregated data for the first 8 pollutants).

One of the main tasks during completion of the 1994 inventory will be the assistance of the National Experts. A detailed work plan for this assistance is being prepared. The ETC/AEM will assist the National Experts most intensively in setting up the first provisional national inventory, which will be started by transferring the 1990 inventory into the new 1994 software. An important aspect for improvement of the quality of the inventory is the use of all country-specific information gathered in 1995, e.g. the results of the verification studies.

Apart from completing the 1994 emission inventory the ETC/AEM will perform several other tasks, which are summarised in table 2. One of these tasks is the preparation of the CORINAIR 90 comprehensive report (March 1996).

Table 2 Tasks under the 1995 Subvention

The activities mentioned in the table, including meetings and missions, are estimated to require 380 kECU from the 1995 budget with a provisional breakdown as follows.

	TASK	BUDGET (kECU)
1.	Support to national experts	120
2.	Development and coordination of verification/validation procedures	20
3.	Preparation of the CORINAIR90 final/comprehensive report	35
4.	Ad hoc technical support to the EEA to be specified by the Project Manager and the ETC Project Leader	45
5.	Enhancement and update of the COPERT system for estimation of emissions from road traffic	50
6.	Completion of software enhancements	30
7.	Review on local/urban/regional air emissions inventories	20
8	Design of the long-term model for air emissions and projections	20
9.	Preparation of a chapter on methodology for aircraft emissions (joint EMEP/CORINAIR Emission Inventory Guidebook)	10
10.	Maintenance and development of the Emission Inventory Guidebook	10
11.	ETC Coordination	20
	TOTAL	**380**