Trainer*ER*

Compiling a National Emission Inventory using the Collect*ER* and Report*ER* software system

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A great deal of additional information on the European Union is available on the Internet.
It can be accessed through the Europa server (http://europa.eu.int)

Contents

Your Train*ER* for the new CORINAIR software system

This report is part of the documentation distributed to users of the new CORINAIR software system for air emission inventories and accompanies the distribution of the new tools **Collect*ER*** (version 1.2) and **Report*ER*** (version 1.0). The document is accompanied by separate User Guides for each of the two tools.

This report
1. describes the basics of the system as far as necessary and useful for the National Reference Centre as the intended user of the software.
2. provides an overall description of the inventorying process that the software can support.
3. provides step by step guidance for the inventory collection using **Collect*ER*** and **Report*ER*** for a virtual country called **Middle Earth.** This country is derived from the novel The Lord of the Rings by the Oxford story teller JRR Tolkien. This choice was made since the actual start of the modernisation of the CORINAIR system took place at the EIONET meeting of National Reference Centres on Air Emissions in Oxford (UK) in 1996.

ETC/AE provides the sample inventory for Middle Earth 1997 in a MS Access file called MiddleEarth97.mdb. Chapter 3 of this document assumes the availability of this database to the user of this report.

The report is, like the new CORINAIR software system itself, based on earlier reports by ETC/AE:
- Simon Eggleston, Review of CORINAIR 90 – proposals for air emissions 1994; EEA Topic Report 6, 1996
- Jean-Pierre Fontelle and Jean-Pierre Chang, Recommendations for revised data system for air emission inventories; EEA Topic Report 12, 1996
- Simon Eggleston, Tinus Pulles, Redesigning the CORINAIR software; a proposed design; Final draft report, April 1997

In addition to this document a User Guide for the software has been prepared by ETC/AE, describing in detail the database format and all technical information needed.

We hope that use of this software will greatly facilitate the development of more consistent, transparent and comparable emission inventories in all countries participating in the EEA work programme.

On behalf of ETC/AE

Tinus Pulles

1. Introduction

1.1. Background

The **Collect*ER*** and **Report*ER*** tools are designed to help National Reference Centres on Air Emissions to collect the relevant air emission data for delivery to the European Commission and to international conventions.

Collect*ER* and **Report*ER*** have been prepared by the European Topic Centre on Air Emissions (ETC/AE) as part of the work on CORINAIR (CORe INventory for AIR emissions) for the European Environment Agency. The new system is a complete revision of the previous software package CORINAIR94 that was made available by ETC/AE to NRCs in 1996.

This section gives background information on the framework for which the new CORINAIR system, including these new software tools, has been developed the past years by EEA and ETC/AE.

It is assumed in this document that the new tools will also be made available to PHARE countries, through the½ EEA-PHARE programme and the PHARE Topic Link on Air Emissions (PTL/AE). In 1998 the PTL/AE was established to develop and deliver the work on air emission inventories in conjunction with the ETC/AE activities.

1.1.1. Legal framework

The legal framework for reporting of air emissions consists for all European Union (EU) Member States and other Parties of the following international conventions:

- UNECE Convention on Long Range Transboundary Air Pollution (CLRTAP): SO_2, NO_x, CO_2, CH_4, NMVOC, CO, NH_3. Under UNECE/CLRTAP from 1998 onwards reporting of emissions of heavy metals (HMs) and POPs is required after the agreement on two additional Protocols in 1998.
- UN Framework Convention on Climate Change: CO_2, CH_4, N_2O, NO_x, NMVOC, CO and from 1998 onwards also HFCs, PFCs and SF_6;
- HELCOM/OSPARCOM: heavy metals and persistent organic pollutants (POPs).

Apart from the individual Member States the EU is also a Party to UNECE/CLRTAP and UNFCCC, requiring the EU to report total EU15 emissions.

Furthermore the following EU Decisions and/or Directives require reporting of emission data to the European Commission:

- EC Monitoring Mechanism of Community CO_2 and other Greenhouse Gas Emissions (93/389/EEC);
- Large Combustion Plant Directive (88/609/CEC): SO_2 (plants with a capacity larger than 50 MW).
- IPPC Directive (96/61/EC) (Polluting Emissions Register).

The Commission has prepared a proposal for revision of the EC Monitoring Mechanism, mainly including reporting also after the year 2000 and including all gases for which reporting is also required under UNFCCC and with the reporting requirements fully in line with UNFCCC/IPCC. The revised Decision is expected to be adopted in 1999. Also the LCP Directive is currently being revised, with adoption expected in 1999. This will lead to some changes in the reporting obligations, from the year 2002. Finally the IPPC Directive requires EU Member States to report the 'principal emissions' of IPPC installations by means of a PER (Polluting Emissions Register). The exact nature of the reporting requirements is currently being discussed by a special Committee under the IPPC Directive (article 19). The first PER is foreseen in 2002.

The reporting requirements for each of the two main conventions (UNECE/CLRTAP/EMEP and UNFCCC/IPCC) are different. One of the main differences is the source categories used, on various levels of aggregation. UNECE/EMEP uses 11 main source categories, or SNAP (Selected Nomenclature for sources of Air Pollution) level 1, for which reporting is required. From December 1997 countries are asked to also try to report the emissions from approximately 60 source subsectors (or SNAP level 2). On the highest level of aggregation UNFCCC/IPCC uses 6 source categories. Furthermore there are some differences between both conventions in reporting of emissions from international shipping and aircraft ('international bunkers').

Both conventions require reporting of annual emission inventories (and sinks). In addition EMEP requires every five years reporting of disaggregated emissions (on the EMEP 50x50 grid) mainly for use in the EMEP atmospheric transport/chemistry models.

1.1.2. Corinair

There is a need for one common EU and European system for estimating and reporting air emissions for EU Member States and other countries participating in the EEA work programme, such as Norway, Iceland, Switzerland and a number of central and eastern European countries. This system should improve consistency, transparency, completeness and timeliness of reporting. For this purpose the CORINAIR approach was set up.

In the past CORINAIR was in general used by participating countries mostly for reporting to UNECE/EMEP and less for reporting of greenhouse gases (UNFCCC, Monitoring Mechanism) and other purposes like the LCP Directive. UNFCCC has in 1997/1998 changed its reporting requirements and therefore accommodating the CORINAIR approach also for the purpose of UNFCCC was necessary. The SNAP (Selected Nomenclature for sources of Air Pollution) used within CORINAIR was therefore adapted to fit all needs of reporting to UNFCCC in accordance with the revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories resulting in SNAP97 (used within CollectER).

For reporting of point sources (LCP Directive and future PER/IPPC Directive) the CORINAIR approach has also been made more suitable. The improvements of CORINAIR in the past 2-3 years and the need for further improvements the coming years are all based on the requirement that the system must be suitable for countries to report according to all international air emissions reporting obligations.

The EU is a Party to both Conventions mentioned. This is another reason to have a common EU system of reporting of emissions to enable the EU (Commission, DGXI) to report the EU15 emissions regularly and consistently.

1.1.3. Data flow management

Reporting of air emissions data for various purposes requires co-ordinated actions by all actors involved.

The preparation of reporting guidelines has been done by IPCC for UNFCCC (IPCC 1996 Guidelines for National Greenhouse Gas Inventories) and by EMEP/TFEI for UNECE/CLRTAP(joint EMEP/CORINAIR Atmospheric Emission Inventory Guidebook, 1996). EEA and ETC/AE have been involved in these in the past years trying to ensure compatibility.

To optimally use the expertise of ETC/AE and also considering the national obligations the following data flow system is foreseen in a completely functioning annual system, focused on EU Member States as well as other countries participating in the EEA work programme. Some details of this data flow are described below in table 1.

In the review/checking processes in Table 1-1 EEA (ETC/AE) and EUROSTAT (for EU Member States) both have a role. EUROSTAT can assist for example by supplying statistics of activity data to 'prefill' the member states inventory database (CollectER) with EUROSTAT (for EU Member States) energy statistics, later to be extended with other statistics if required, for first estimates, to be replaced by national statistics if required by the National Reference Centre. Both EEA (ETC/AE) and EUROSTAT can assist by checking the first national emission estimates. Checking can be done by comparing with other activity statistics and by comparing emission factors from various information sources.

Table 1-1   Data flow in an annual EU emission reporting system

Date	Reporting requirement	Data flow	EEA/ETC-AE [2]
31 July	Current EC Monitoring Mechanism [1]	First estimates from country (NRC) to Commission (DGXI)	Copy to EEA/ETC-AE
Oct-Dec			review/checking
31 Dec	UNECE/CLRTAP (EMEP)	Estimates from country (NRC) to UNECE/EMEP	Copy to EEA/ETC-AE
Jan/Mar		EMEP review	review/checking
15 April	UNFCCC	Estimates from country (NRC) to UNFCCC	Copy to EEA/ETC-AE preparation of EU15 estimate for UNFCCC
May-June		UNFCCC review	review/checking Annual ETC/NRC workshop
July			Annual EEA report, database, Internet

1) in the proposal for revision the reporting date is changed to 31 December
2) together with EUROSTAT

To improve the chances of success of the proposed system it is believed that an approach using EEA's organisational and telematics EIONET (European Environmental Information and Observation Network) based on Internet (with password protection) can be beneficial for the following reasons:

- updating of emission estimates by country (assisted by NFP = National Focal Point and NRC = National Reference Centre) can be done more timely;
- countries (NFPs/NRCs) are able to access emission estimates from other countries easily;
- EEA/ETC/AE is able to perform validation in a better and easier way;

- filling the European database and preparing the EU15 emission estimates by EEA/ETC-AE will be easier and more timely;
- publication of EU15 and EU Member States (and other countries participating with EEA) emission estimates can be done more timely (Internet and paper reports).

Although these new possibilities are not fully implemented yet into the new software system, it is fully prepared to be used within the EIONET technical structure. The **Report*ER*** module for instance could be equipped quite easily with a report in any yet to be defined HTML format that can serve as the NFP/NRC web-page presenting the emission estimates. Other possibilities the new system offers are indicated elsewhere in the text of this document.

1.2.   The CORINAIR process

The CORINAIR programme has been developed by EEA since 1994, and prior to that by the Commission, to assist member states in providing the data on emissions to air as required in a number of international conventions and by the Commission. The specifications of the CORINAIR inventory system are fully derived from the specifications of these reporting requirements. A second objective of the programme is to harmonise the data with respect to methodology between the participating countries. In addition the EEA uses the CORINAIR database to produce European scale reports on the state of the environment such as the *Europe's Environment: The Second Assessment.*

The over all data flow within the EEA inventorying activity (CORINAIR) is shown in Figure 1-1. Data are collected by countries (NFPs, NRCs) and after validation by the country the data can be transferred, on various levels of detail, into the central EEA database CORINAIR and from that used by EEA/ETC-AE for presenting the data in the various international reporting formats and for analysing trends and sources for various reports (for example state of the environment reports, environmental outlooks).
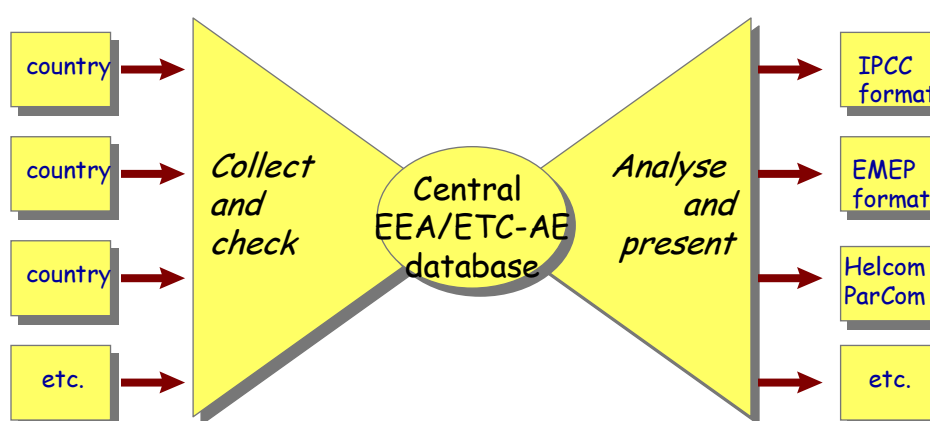
Figure 1-1 Data flow in the EEA/ETC-AE (CORINAIR) inventorying activity

From this over all picture the following user groups for the CORINAIR system are foreseen:
- National Reference Centres (NRCs), compiling the national inventories using a national CORINAIR (CollectER) system (see section 1.3);

- country representatives (Ministries and/or National Focal Points and/or National Reference Centres), responsible for reporting nationally collected and compiled emissions data (from NRCs) to international organisations like UNFCCC/IPCC, EU CO_2 Monitoring Mechanism, CLRTAP/EMEP, IPPC Directive (PER), Helcom/Parcom etc. (nationally reported data);
- EEA/ETC-AE: assist countries in checking of national inventories and combining these, in the various internationally agreed reporting formats, into the European emissions inventory which is the EEA/ETC-AE European CORINAIR database on various levels of detail;
- EEA and its clients (such as the Commission), requesting emission data for trend analyses, air quality studies and emission projections;
- other users of the data collected.

The CORINAIR software system is developed to assist these users in performing the tasks related to this information flow. At present the first module in this system (**CollectER**) is available as well as a first version of a national **ReportER** tool. This **TrainER** document describes the use of these tools in collecting inventory data at the national level (see also section 1.3).

1.3.   The new CORINAIR system

1.3.1.   *Modular design*

The new CORINAIR system consists of a set of software tools each adapted to a different use and user group respectively.

The new system is a complete revision of the previous software package CORINAIR94 that was made available by ETC/AE to NRCs in 1996.
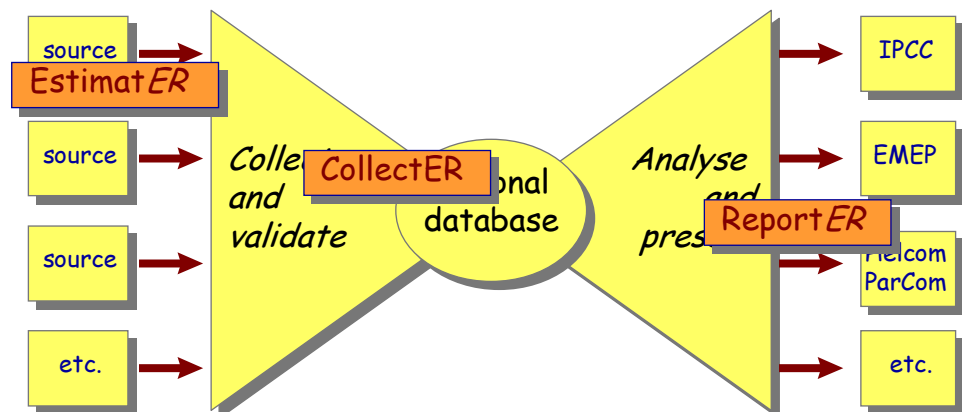
Figure 1-2 The national CORINAIR system: different tools for different tasks

The new system separates inputs and outputs from the databases and specific tools are proposed for specific tasks within the data flow. This is shown in Figure 1-2. The overall process is as follows.

1. **Data collection phase**. Initially there is a data collection phase. This has to be performed by each country (NRC), although there is assistance from EEA/ETC-AE. This data is then stored in a nationally held database (CollectER). This process can be different for each user, according to the national needs. Some users may need to link to existing national database

systems, others might need a complete data entry system. The data collection can be based on the previous years information updated where needed. The data will include measured emissions, fuel use, other activity statistics, emission factors and spatial disaggregated data.

√ The **Estimat*ER*s** are process (SNAP) specific expert systems that contain all necessary information on emission factors and emission estimation methods needed to make a quality assured and quality controlled estimate for all relevant emissions. **COPERT2** (Computer Programme to estimate Emissions from Road Transport) is an **Estimat*ER*.** In 1997/1998 ETC/AE developed **COPERT2** for estimating emissions from road transport and made it available to NRCs in 1998 (see two ETC/AE Technical Reports on COPERT2).

√ The **Collect*ER*** tool allows the user to collect and store the national data for the base year of the inventory. This process produces estimates at the most detailed level, both in the source/fuel classification and in the spatial detail. **Collect*ER*,** the software tool described in this document is meant to support this procedure. This data are stored locally and will be submitted to EEA via ETC/AE for checking and assisting purposes. In a later stage it might be considered to use electronic links (EIONET) to directly access the nationally held data by ETC/AE.

2. **Data checking and central database compilation by ETC/AE.** The national data sent to ETC/AE is checked by ETC/AE and comments are communicated with the relevant NRCs. Subsequently the data is revised by the NRC where needed and the nationally approved data is submitted by countries to ETC/AE on an aggregated level (mainly emissions data). On the most aggregated level this data is also sent by countries to the international organisations requiring emissions estimates (Commission, UNFCCC, CLRTAP). Where possible countries also submit more detailed national activity data and emission factors to ETC/AE. The national data are combined by ETC/AE in a European emission inventory (database) on an aggregated level, containing mainly emissions data and on a detailed level containing activity data and emission factors. Currently ETC/AE maintains detailed databases for 1990 and 1994/1995 and a database with aggregated data for the period 1980 to 1996.

3. **Report*ER*s** have been and will be developed to operate on the national databases directly. These **Report*ER*s** will, as much as possible, directly produce the tables as required by the IPCC Guidelines and other reporting requirements, from the national database as stored by the tool **Collect*ER*.**

Below the basics of the **Collect*ER*** database structure are briefly described. Details are described in the technical manuals of the Installation and User Guide (version 1.2).

1.3.2. The database

Highest data level

Figure 1-3 shows the structure at the highest level: the INVENTORY contains a COLLECTION OF EMISSIONS. An emission is a number with three attributes:

1. the activity;
2. the location; and
3. the pollutant.
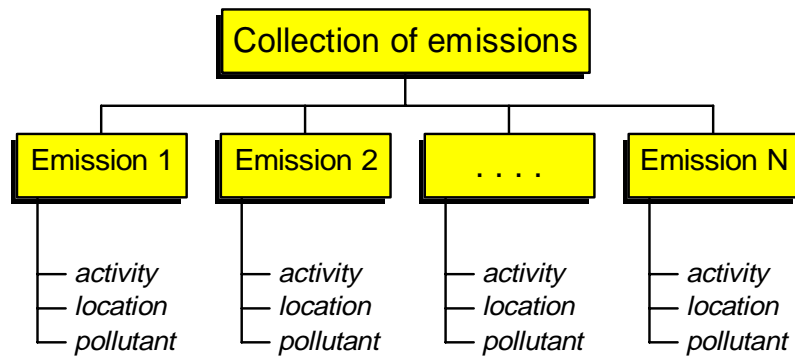
Figure 1-3 – The INVENTORY contains emission data

Since it is decided to store also emission factors and activity rates, the situation is a bit more complex (see Figure 1-4). An emission now is the result of a multiplication of an activity rate at a certain location and an emission factor for that activity and a certain pollutant. This can be accommodated by associating two numbers with an emission: the activity rate and the emission factor.
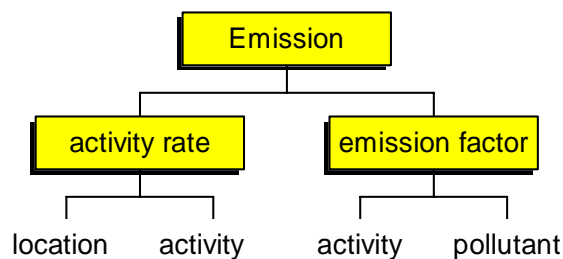
Figure 1-4 – Emission = (activity rate) x (emission factor)

At this level, each of these attributes is merely a pointer to an entity at the second data level. Details of all attributes will be given at the next data level. Consequently we need to define two structures:

1. ACTIVITY RATE as an entity having two attributes: activity and location and
2. EMISSION FACTOR as an entity having activity and pollutant as its two attributes.

Such a choice makes no essential difference with the one given in Figure 1-3.

Deeper data levels
Figure 1-5 and Figure 1-6 present schematically how at the second data level the attributes at the first data level location and activity are defined as entities at the second data level. It also indicates that all activities and locations defined are stored in collections. The attributes at the first data level point at entries in the collections of the second data level. Analogously, the attributes at the second data level will point at entities at the next data level.

Location
We do not aim here at a full definition of either entity. However it will be understood that the entity LOCATION will have at least the following attributes:
3. its code which should be a unique identifier; in **CollectER** the NUTS code is used for this
4. its name;
5. a set of co-ordinates, localising the location on a map; and
6. a parent location, allowing for aggregation.

If necessary more attributes can be added to the definition of the entity LOCATION.

```
┌─────────┐
│ Location│
└─────────┘
    │
    ├─ **NUTS code**
    ├─ Name
    ├─ Co-ordinates
    ├─ Parent location
    └─ other ...
```
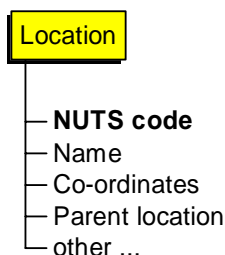
Figure 1-5   Attributes of the entity LOCATION. Bold printing indicates a unique identifier.

Activity

Similarly the entity ACTIVITY might be defined as having at least the following attributes. Again this list is not intended to be complete and could include economic sector and/or abatement technology.

1. name;
2. SNAP-code or an equivalent indicator;
3. fuel used, which might be an fuel indicator or empty if the activity is not energy related; and
4. unit in which its activity rate should be expressed (e.g.: vehicle kilometres per annum, or: number of inhabitants); in principle this might also be a set of units to allow for different activity data sources;

```
┌─────────┐
│ Activity│
└─────────┘
    │
    ├─ Name
    ├─ **SNAP code**
    ├─ **Fuel type used**
    ├─ Parent SNAP code
    ├─ Unit to express the activity rate
    └─ other...
```
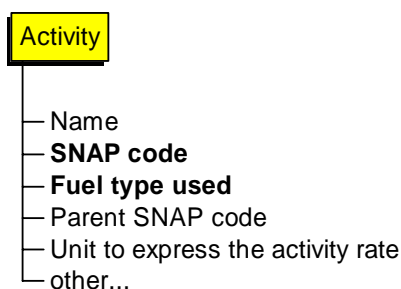
Figure 1-6   Attributes of the entity ACTIVITY. Bold printing indicates (combination to) a unique identifier.

Aggregation possibilities might either be included by using a hierarchical SNAP-code system or by explicitly introducing an attribute parent activity as indicated in Figure 1-6.

At this point it is stressed that in the new CORINAIR system the combination of activity code and fuel is treated differently as compared to the previous system. In fact an activity here is defined by both the SNAP-code **and** the fuel used. This means that in the system activities with the same SNAP but with different fuels used are treated as different activities. This ensures that the activity definitions are unique.

Pollutant

The entity POLLUTANT might have such attributes as:
1. a name
2. a unit (e.g. tonnes/annum)
3. **a code**, which should be a unique identifier
4. other …

Other attributes of pollutants might include Booleans to indicate whether or not the pollutant contributes to environmental problems like Climate Change, acidification etc. and weighting factors for aggregate indicators (GWP's, acid equivalents etc.). Such attributes are, however, mainly important for reporting and will not have any significance for the **Collect*ER*** application.

1.3.3. The modules

Above the new CORINAIR software system is described as a modular system consisting of a number of dedicated modules, each with its own limited functionality and dedicated to a specific use and user group. Figure 1-7 shows the overall idea of the data flow. Table 1-2 lists a number of such modules, their respective purposes and the intended users.

Table 1-2 Modules in the CORINAIR software system

name	purpose	intended users	status (April, 1999)
Collect*ER*	Tool to collect a national emission inventory	national reference centres	version 1.2 available and distributed with this document
Estimat*ER*	Tools to estimate emissions, using activity rate data; this will probably be a set of separate systems, each for a well defined source category	national reference centres	Copert2: available (1998) tools for other processes are under development
Report*ER*	Extracts and presents data from the national (national reference centres) or combined (ETC/AE) emissions inventories in a number of predefined formats (spreadsheets, in a later stage also as HTML files): • IPCC • EMEP/Corinair • HTML-file (WWW format) • LCP directive • EPER/IPPC	national reference centres, ETC/AE	Version 1.0 of **Report*ER***, producing the IPCC 96 and EMEP tables from a completed **Collect*ER*** database is ready (official release to NRCs in April 1999) Other reporting formats will be added.
Receiv*ER*	Combines output from national **Collect*ER*** databases into the central European emissions inventory CORINAIR.	ETC/AE	to be designed
Validat*ER*	Tool to analyse and compare national inventories to identify possible locations of errors and inconsistencies. Techniques to be used are: • comparisons with national energy statistics, • correlations with driving forces (population sizes, car fleets, industrial production etc. • comparisons of emission factors	ETC/AE	to be designed; might in part be derived from the MICADO approach in the CORINAIR 90 AND 94 systems
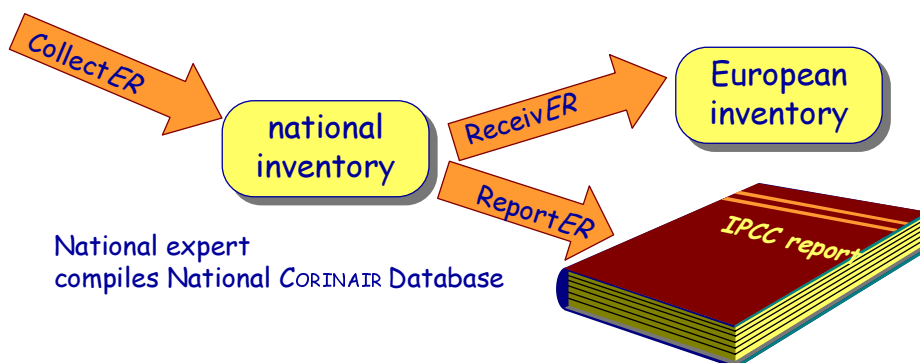
Figure 1-7   The overall data flow and tools in the new CORINAIR system as seen from the national reference centre.

1.3.4.   *Limitations of the new system*

Although the new CORINAIR system has been carefully designed to suit the requirements of the international obligations and of the national reference centres, the tools within the package should not be used without caution. In a number of respects, the user both within the guidelines of IPCC and EMEP and hence within the software, can choose different routes to estimate and store inventory data. These different routes might have different meanings in the national policy or in the international conventions.
An example of this might be the treatment of waste in boilers and/or incinerators with or without use of the heat generated. In one case the user might wish to regard the waste as a fuel burnt in a boiler, in another it would be seen as the feed stock in a waste treatment plant.

1.4.   Central European CORINAIR Database

Data collected by means of the **CollectER** tool or equivalent national tools will be sent to ETC/AE or PTL/AE for inclusion in the Central CORINAIR Database (CCD). This process is schematically represented in Figure 1-8. For the detailed data (activity statistics, emission factors, NUTS3 data) ETC/AE will use a special tool **ReceivER** to perform this task. For the more aggregated data (such as IPCC summary tables) the transfer can be done more easily. From the aggregated as well as the more detailed CCD, ETC/AE and PTL/AE will be able to fulfil the requirements of EEA's prime clients and to deliver the data for several reports. Compilation and maintenance of the CCD by ETC/AE is crucial for the prompt and reliable delivery of CORINAIR data to EEA's clients.
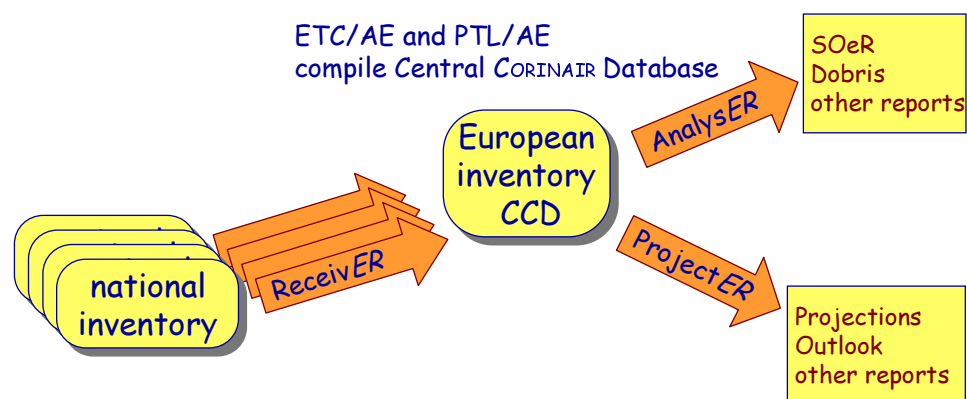
Figure 1-8   The overall data flow and tools in the new CORINAIR system as seen from the EEA

Not all the tools indicated here are available yet. As indicated in section 1.3, ETC/AE has currently available a detailed central database for 1990 (CORINAIR90) and an aggregated data database for 1980-1996. A proposal has been made for a new CCD structure for the detailed 1994/1995 data that ETC/AE already has available from many countries and for **Receiv*ER*.** A proposal for a **Project*ER*** module has also been prepared by ETC/AE.

To fulfil EEAs short term need for analysing and assessing emission trends ETC/AE has developed the more simple aggregated database that currently holds time series of aggregated emissions data as reported by countries to CLRTAP and/or EEA (in EMEP/CORINAIR format, SNAP level 1 or 2) and to UNFCCC and/or the Commission (in IPCC format). This database has been used for the EEAs EU98 State of the Environment and Outlook report.

1.5.   Annual national CORINAIR inventories

The CORINAIR system is an annual system, repeatedly collecting data as annual totals. The new software system exploits this fact by using the inventory of a former year as the first step for the inventory of the next year. The NRC using the system will therefore update the data in an inventory by replacing activity rates and emission factors with new values where applicable and available.

This can also mean that updating the Central European CORINAIR Database will also be started by copying the inventory for the earlier year into the new database as the first estimate of the new one. As soon as national databases become available, these will replace the earlier ones, thus updating the CCD.

1.6.   Future developments

1.6.1.   *Multi-media or integrated inventories*

The new CORINAIR software is suitable for expansions of the system to include integrated inventories. These are not specifically considered here, but will be of interest for EU Member States and EEA in the future, in particular for the IPPC Polluting Emissions Register (PER). A national PER will contain data on emissions from IPPC installations, to water classified by the source and location and possibly data on generation of waste. This requirement can fit into the model described here. New input tools and output tools would need to be developed but any

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changes to the data stored would require little effort due to the object oriented approach which should mean that changes need only to be made once. Since a common source classification will have to be developed if an integrated inventory is to capture the links between different emissions and abatement technologies, a common database structure will be needed. The one developed within this project as the base of the new CORINAIR software system could very well serve as the starting point for this development.

1.6.2. Trend analyses

When a series of CORINAIR inventories will be compiled, users will ask for trend analyses of the data. Since the system is designed as an annual inventory activity, such a trend analysis will need additional tools to relate inventories of different years.

Trend analyses can be included in a new tool to be developed, **Analys*ER*.**

1.6.3. Emission projections

For preparing emission projections, estimates for future years are usually based on the previous years' estimate modified by growth data, technological developments and penetration of newer and cleaner technologies. This process would be simplified if economic data were stored. A specific tool, **Project*ER***, could be developed to produce these forecasts.

1.7. Availability of the software and support

1.7.1. CORINAIR participants

The new CORINAIR software system has been developed for the participating countries in the CORINAIR project and is available at the ETC/AE's CIRCLE Interest Group, including the documentation needed to run the tools:

http://etc-ae.eionet.eu.int:8980/etc-circle/Public/IRCindex.pl

After inclusion of comments by NRCs and others the software will be made more widely available at the ETC/AE public Internet web site.

For any general questions on the software, the contact point is ETC/AE, Tinus Pulles, e-mail pulles@mep.tno.nl. Helpdesk and other support is provided on behalf of
ETC/AE by Spirit Inc. (xspirit@savba.sk) in Bratislava to the participating countries upon request.

The overall procedure of inventory compilation as described in the next chapter is part of EEA's work programme and applies to the national reference centres of countries participating in this activity.

1.7.2. Other users

The software can and may be used by others, but ETC/AE cannot provide support to these users. If such users decide to use the system, they should

1. always adapt the territorial splits (NUTS) to the one applicable to the own country. This should be a four level hierarchical split, the highest one being the national totals, entered into the MS Access format database in an appropriate way. This cannot be done in the **Collect*ER*** software. All information needed to

do this using MS Access, can be found in the **Collect*ER*** Installation and User guide.
2. use the UN/ECE Task Force on Emission Inventories' source sector splits and fuel definitions as implemented in the system to be able to use the **Report*ER*** facilities directly.

Other users can contact Spirit to arrange for support, if needed (xspirit@savba.sk).

2. Compiling a national inventory: Overall procedure

2.1. Overview

The compilation of a national emission inventory using the CORINAIR system follows a sequence of separate phases, described in Table 2-1 and schematically represented in Figure 2-1.

Table 2-1 The inventory procedure, using Collect*ER*: the annual cycle; base year N

phase	action	by
1	Distribution of national inventory for year N-1 to NFPs and NRCs, imported in the base year N definitions in **Collect*ER*** format	ETC/AE
2	Update the database to obtain the inventory for the base year N. **Collect*ER*** is meant as the tool for NRCs this phase. Submit database by NRCs to ETC/AE	NRC
3	Receive the updated database for year N at the central EEA/ETC-AE database	ETC/AE & PTL/AE
	Check the database and send results to national reference centre	ETC/AE & PTL/AE
4	Finalise the base year N inventory and submit to ETC/AE (by NRC)	NRC
5	Compile the Central CORINAIR Database	ETC/AE & PTL/AE
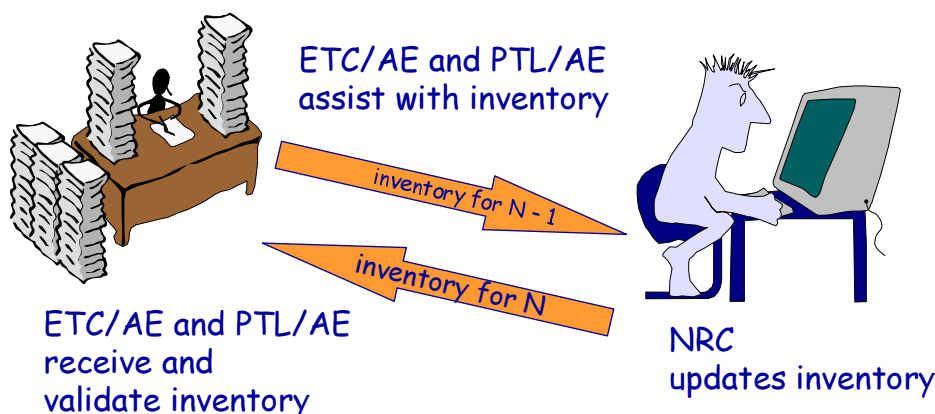
Figure 2-1 Overall inventory procedure

Below the successive steps are described in more detail. Chapter 3 presents information on using **Collect*ER*** in a step by step process.

2.2. Phase 1: Start of an inventory cycle

The CORINAIR inventorying process is planned by the European Environment Agency (EEA) and its European Topic Centre Air Emissions (ETC/AE), together with the Phare Topic Link Air Emissions (PTL/AE), after consultation of the national focal points (NFPs) and is part of the annual work programme of EEA. This description of the inventorying process, therefore, is based on the assumption that the participating countries have agreed on the compilation of a CORINAIR inventory for the next base year. It is furthermore assumed that an

earlier complete inventory is available. At this moment for many countries a full **Collect*ER*** type database is available for 1990 and/or 1994/1995.

An inventory cycle will be started by ETC/AE and PTL/AE by distributing to each National Reference Centre a copy of the latest version of the **Collect*ER*** software, loaded with the data of the previous base year. All relevant additional documentation will be sent by ETC/AE and PTL/AE as well.

Due to possible changes in definitions, for example in SNAP, it might be necessary to modify part of the database before starting the work on the new database. As far as such modifications can be automatically performed, ETC/AE and PTL/AE can assist. A data import report however should be produced by ETC/AE and PTL/AE as soon as the new system has been accepted and used annually (by the NRC), incorporating the changes proposed by ETC/AE and PTL/AE. The NRC has to explicitly check all changes proposed by ETC/AE and PTL/AE. The acceptance of the changes will be the responsibility of the NRC only.

2.3.   Phase 2: Collecting and inputting data

2.3.1.   *Prepare for the national data collecting process*

When the software has been received, the first decision the National Reference Centre has to take is whether or not the **Collect*ER*** software will be used. However the national database should ideally be submitted to ETC/AE in the MS Access format used by the **Collect*ER*** programme. For full details of the MS Access database structure, including all relations between the tables in this structure, see the Installation and User Guide.

Summarised, the National Reference Centre has two possibilities to update the national inventory from the base year (N – 1) inventory towards the base year N inventory:

1. Use the **Collect*ER*** software or
2. Modify the MS Access file directly, for instance by importing data from the national inventory system.

In this chapter it is further assumed that the National Reference Centre uses the **Collect*ER*** software.

2.3.2.   *Data collection and input*

Since a fully detailed database is available at the start of the inventorying process, a careful planning of the update is possible. The data for the previous year is available for comparison throughout the whole inventorying process.

To make full use of this approach, the National Reference Centre is advised to plan the updating process such that data on the most important sources is updated first. For the most important pollutants this means the energy related activities (SNAP sectors 1, 2, 3 and 7, 8) where data on the fuel use can quite easily be obtained and used to update the activity rates in these sectors. Once the activity rates have been updated, new emission factors can be entered where relevant and new measurements available for point sources can be entered into the database.

Newly inventoried point sources and activities not inventoried so far, could be entered next.

2.3.3. *Sending the draft national inventory to ETC/AE*

When the National Reference Centre is ready with the inventory, and/or the agreed time of delivery has come, draft data should be sent to ETC/AE or PTL/AE. Such a delivery will be done by sending the full **Collect*ER*** format MS Access database file either by floppy disk or by e-mail, via the National Focal Point (NFP) to ETC/AE at UBA Vienna. In addition copies of the aggregated emission data as sent to the Commission, UNFCCC and CLRTAP should also be sent to ETC/AE via the NFPs.

The present procedure of ETC/AE for compiling the Central CORINAIR Database is to copy all national emissions data at a high aggregated level into the CCD (in particular EMEP/CORINAIR format SNAP level 1 and 2 and IPCC summary table format). In the future national activity data, emission factors and emissions data might be stored in the CCD at more detailed level. For checking of the national database by ETC/AE, the full details will be useful in addition to the more aggregated emissions data alone.

2.4. Phase 3: Data validation

After sending the draft national inventory to the ETC/AE or PTL/AE a checking and screening process starts. During this process ETC/AE and PTL/AE will use **Validat*ER*** and/or other methods to check and screen the draft inventory delivered by the national reference centre.

Various checking procedures are run on both the new draft national database and on the new CCD database and screening reports will be produced. These reports might be a set of two types of reports:

1. country specific results (intra-inventory screening);
2. country comparisons (inter-inventory screening).

The second type of information will be distributed to all NRCs, the first type only to the NRCs concerned.
Currently checking is mainly done on the more aggregated data levels in order to inform NRCs of the main inconsistencies and/or data gaps.

2.4.1. *Intra-inventory screening*

It is stressed that, due to the use of a relational database structure in the new system, a number of screening tasks will automatically be done, via the software, while entering the data. In the new system it is for example impossible to use non-existent NUTS, SNAP or fuel codes. In addition consistency between different levels of aggregation is automatically maintained.

Furthermore the **Collect*ER*** tool includes some simple screening in the calculation function that is activated upon entering the Report menu item. This screening will check for zero and negative emission factors and will identify some missing data. A list of errors will be copied to the screen or to a text file.

More advanced screening methods to include into the **Validat*ER*** tool still have to be designed and developed. ETC/AE and PTL/AE will draw on the experience with the MICADO procedure in the earlier (1996) version of the CORINAIR software. **Validat*ER*** might include the following procedures:

- compare the new database with earlier versions and report on
  - √ large changes
  - √ unchanged activity rates
  - √ missing activities
- compare the emission factors in the database with the default values as available in the EMEP/CORINAIR Guidebook
- produce a (geo)graphical presentation of the results to check the spatial location of area sources and point sources
- comparisons with national energy statistics

Validat*ER* will produce a country screening report to be sent to the national reference centre for comments.

2.4.2. *Inter-inventory screening*

The above procedure assures that a complete database in the new CORINAIR format at the national level is always available. NRCs send their inventory as is at predefined points in time. If a number of national inventories are available, ETC/AE and PTL/AE can start inter-country comparisons. Again these analyses will be performed using a **Validat*ER*** tool.

These comparisons might include:
- correlations with driving forces (population sizes, car fleets, industrial production etc.) as has been done in the Comprehensive Summary report on the 1990 Corinair inventory
- comparisons of emission factors analogous as been done by the MICADO procedure

Reports on inter-country comparisons will be published as part of the documents describing a completed European Emissions Inventory.

2.5. Phase 4: Finalising the national inventory

2.5.1. *Sending the final national inventory to ETC/AE*

National Reference Centres respond to the comments and screening reports prepared by ETC/AE and modify, if necessary, the national database accordingly. This will result in the final aggregated data and if feasible the full database, to be sent to ETC/AE for import into the final EEA emission inventory (CCD) for base year N.

Further changes might be entered, if necessary, at pre-set dates. National Reference Centres are responsible for the version management of national inventories and ETC/AE and PTL/AE are responsible for the version management on the European level. If there are differences between the national and EEA/ETC-AE time schedules for including revised and updated data, temporal differences between national and EEA databases might occur. To be able to manage this process properly it is important that clear procedures are in place in order to always track the original source of specific data (and its date), available either at NRCs, at ETC/AE or EEA.

2.5.2. *National reporting*

The **Collect*ER*** tool has a limited set of reporting facilities available, enabling the production of tables of emissions per SNAP or per NUTS area for each pollutant.

More possibilities have been included into the national **Report*ER*** if needed. Further additions could either be made for individual countries upon request with additional budgets or these could be included in the work programme of EEA and ETC/AE under the task 'Development of the CORINAIR methodology', if many countries see this as a high priority task.

Since the system is quite flexible and open, other possibilities to produce national reports can be used, by using MS Access directly.

2.6.   Phase 5: Compiling the central CORINAIR database

Upon receiving a national aggregated data and/or the detailed final database, ETC/AE and PTL/AE upload these national data into the EEA database (CCD) for Europe. The data in this database will be reported in EEA Topic Reports and on the ETC/AE Internet site.

3. Collecting a national inventory using Collect*ER*

3.1. An example inventory

This chapter presents an example inventorying activity in a (non-existent) country called Middle Earth. The geography of this country is taken from the story by J.J.R. Tolkien's Lord of the Rings. A limited number of activities is introduced in this inventory and in the course of this chapter updating this data and adding new sources will be demonstrated. Emission factors are taken from existing (**Collect*ER***) inventories available at ETC/AE by mid-April 1998.

Figure 3-1 gives a map of the region and Table 3-1 presents a short description of the existing administrative units within Middle Earth and the number of inhabitants ('hobbits') living in each unit. In total Middle Earth has 3,000,000 hobbits. In addition the inventory contains data on the number of cattle per NUTS3 region (250,000 cows in total).

Table 3-1 NUTS definitions and short characteristics of Middle Earth

NUTS1	NUTS2	NUTS3	code	Description	inhabitants
Coastal	Eriador	Arnor	me111	Cement factories; agriculture	62814
		Angmar	me112	Some mining (brown coal) and power plants. Agriculture and forestry	128151
		Forlindon	me113	Fisheries, agriculture	94348
		Harlindon	me114	same	106456
		Minhiriath	me115	same and some industry	238644
		Enethwaith	me116	same and some more industry	259330
		Rhudaur	me117	Forests, heather and natural reserves	96366
	Gondor	Anfalas	me121	Some fisheries	77698
		Belfalas	me122	Harbour activities, chemical industries	481324
		Lebennin	me123	Refining industries	292124
		Lamedon	me124	Living areas, relatively highly populated, small industries	477288
		Harondor	me125	Swamps and agriculture	9435
Inland	Rohan	Fangorn	me211	Agriculture and forestry	108474
		Western Emnet	me212	Agriculture: wheat, corn, etc.	47931
		Eastern Emnet	me213	same	37840
		Wolde	me214	Some forests, dairy farming	17154
	Rhovanion	Demster Forest	me221	Forests and heather fields	6508
		Iron Hills	me222	Metal mining, primary steel	107970
		Dagorlad	me223	Low intensity agriculture: sheep, cows	52976
	Mordor	Nurn	me231	Coal mining, power plants, primary steel	121592
		Gorgoroth Plateau	me232	Iron and steal; heavy industry	175577

Figure 3-1   A map of Middle Earth and longitude/latitude co-ordinates   (the map is adapted from http://www.users.wineasy.se/claesbe/fantasy/tolkien/rings/)

Based on this description a (limited) 1996 inventory (in 1997 SNAP) has been prepared for training purposes. The data in the inventory is based on data available in a number of real inventories. The resulting country is meant to be rather diverse and not too large and detailed. The inventory for 1996 contains data on the activities as given in Table 3-2 and Table 3-3.

Table 3-2   Available area sources in the Middle Earth 1997 inventory as delivered by ETC/AE

SNAP	Description	Split	Fuel
020205	Other equipments (stoves, fireplaces, cooking,...)	106A	brown coal briquettes
020205	Other equipments (stoves, fireplaces, cooking,...)	111A	wood and similar wood wastes
020205	Other equipments (stoves, fireplaces, cooking,...)	117A	agricultural wastes (corncobs, straw, etc...)
050102	Underground mining	507	
100401	Dairy cows		
100501	Dairy cows		

Table 3-3   Available point sources in the Middle Earth 1997 inventory as delivered by ETC/AE

Name	NUTS3		longitude	lattitude
Saruman Power Plant	me231	Nurn	12.63 - W	55.69 - N
Lebennin Refineries	me123	Lebennin	11.25 - W	55.21 - N
Arnor Cement Ltd.	me111	Arnor	9.98 - W	57.06 - N
Aluminium Frodo	me122	Belfals	6.58 - W	53.18 - N
Gollem's Artificial Diamonds	me232	Gorgoroth Plateau	6.57 - W	53.17 - N
NorthEast Power	me112	Angmar	4.28 - W	51.55 - N
Mordor Steel Plants	me232	Gorgoroth plateau	6.68 - W	53.02 - N

At the start of the inventory this 1996 inventory is copied into the **Collect*ER*** software tool as the first estimate for the 1997 inventory. The values of the 1996 inventory remain visible as 'Old values' in a number of input screens.

It is advised to make a backup copy of the inventory, before starting any change or update to the database to enable returning to the original state whenever wanted.

3.1.1.   *Overview of the starting point*

It is advisable to start the process of updating the inventory as delivered by ETC/AE and PLT/AE by producing overviews of the data as reproduced in Figure 3-2. In the newly delivered database all data for the earlier year are copied into the new base year. This enables the user to check the starting point before any updates have been performed. If needed the data for the new year can be modified. Earlier year data can not be modified. To do this the following steps are needed:

Step 1: Start the **Collect*ER*** programme and select the inventory by clicking the menu item **Files | Open database**; the standard Windows95 open file dialogue pops up; find and select the **MiddleEarth97.mdb** database and click **Open**.

Step 2: Select the **Reports | Emissions (SNAP)** menu item and the dialogue window of Figure 3-2 (left) appears. The upper part of the window allows for selections of territorial units to be included in the overview and for inclusion of area sources or point sources or both. When a selection is made (**All** and both **Area** and **Point sources**), the emissions should first be calculated by clicking the **Calculate** button. This calculation is needed to synchronise all different aggregation levels within the data and for multiplying all available activity rates with the corresponding emission factors. During this calculation a warning will appear:
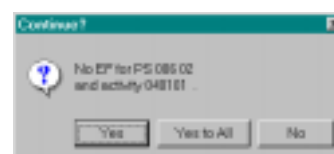
This warning means that in the database an activity rate is entered that is not used because no corresponding emission factors are available. This warning can be answered by clicking on **Yes to all**. Depending on the size of the national database (and the power of the processor), it might take a few minutes before the resulting emissions appear in the gridded table.

Check the resulting emissions table. The buttons on the bottom of the window allow for selections in the table as calculated.

Step 3: Repeat this procedure for the **Reports | Emissions (TU)**, (Figure 3-2, right) **Reports | Emissions (AS)** and **Reports | Emissions (PS)** menu items respectively.
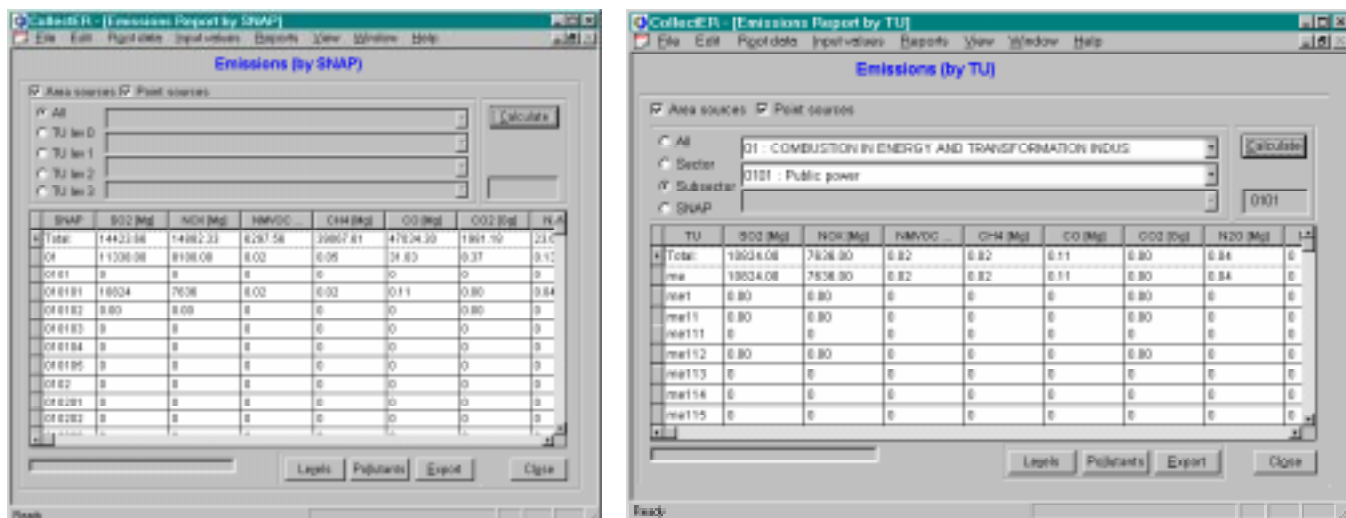
Figure 3-2 Overview of the national total emissions by SNAP (left) and by NUTS (right), produced with the Report menu commands of Collect*ER*

This procedure can and should be used to check the data conversion that might have taken place by ETC/AE and PTL/AE due to the changes in SNAP definitions. Since only a few activities have been entered in the database, tables as represented in Figure 3-2 for Middle Earth will contain many zeros.

The **Root data** menu is meant to browse, edit and define all types of variables available to the user. The menu item **Input values** allows for inputting data. Section 3.2 will describe the possibilities of the first and section 3.3 of the latter.

3.2. Root data

The root data are divided in three groups:
1. Base data
    √ Pollutants
    √ Territorial units
    √ SNAP
    √ Splits
    √ Fuels
2. Auxiliary data
    √ Conversions
    √ Units
    √ Comments
    √ Default activities and Emission factors
3. Surrogate data
    √ Surrogate data types
    √ Surrogate data
    √ Allocation formulae

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3.2.1. Base data

Pollutants

The system contains all pollutants that are predefined by ETC/AE and PTL/AE as pollutants to be included in the CORINAIR inventory. The user however can define his own pollutants, enabling him to use the system for a national inventory containing more pollutants than the ones requested by CORINAIR.

Territorial Units: NUTS

Figure 3-3 shows the NUTS definition window. By double clicking on any one of the NUTS codes or names, the tree of NUTS definitions expands or compresses. The view level check boxes can also be used to select one or more levels. The edit button allows the user to change names of territorial units, not NUTS codes!

For the EU Member States, the NUTS codification is the responsibility of EUROSTAT. To enable easy integration into the European database, a centrally managed code system is required. For the other participating countries a procedure for territorial classification still has to be established. Experts of these countries however are asked not to change the territorial classification for their countries unless absolutely necessary. For easy applicability of the data a stable code system for all main dimensions of the inventories is desirable.
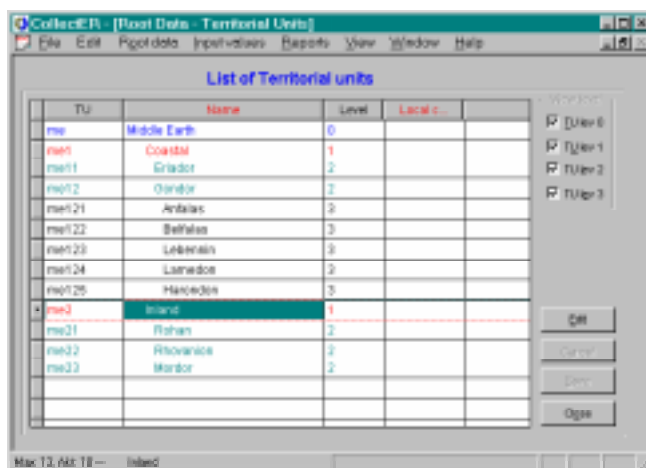

**Figure 3-3   Root data – Territorial Units window**

SNAP

Collect*ER* is preloaded with the SNAP nomenclature that is relevant for the base year of the current inventory. However, the user might need some kind of split within an activity, comparable to the rubrics as used in the earlier version of the CORINAIR software. To do this, the user can define splits by first selecting the appropriate SNAP, then click on **Split | New** and select one of the available splits (see also the next section).

Splits

The table of splits is meant to enable the user to define different varieties of an certain SNAP and fuel combination, whenever he or she needs to. A long list of possible splits is predefined in the system. The user can apply them for instance to discriminate between cars equipped with differing technologies as described in a variety of European regulations (see the dialogue window below. In defining area activities (see also section 3.3.1), the user can only select splits that have been defined here.
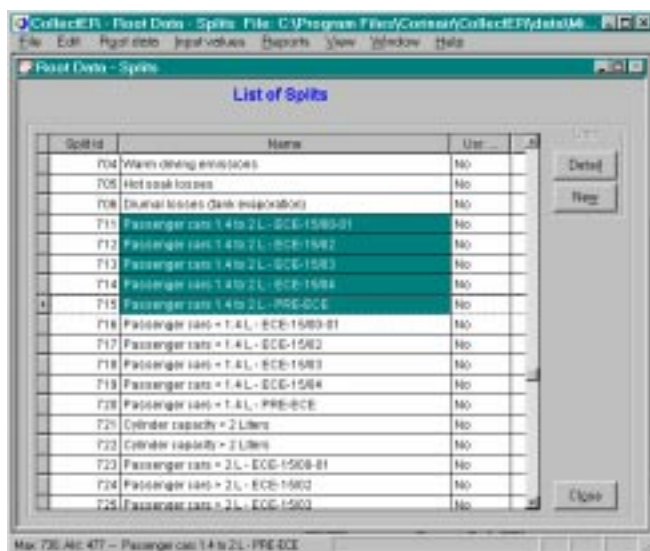
Fuels

The table of fuels changed as compared to earlier versions of the CORINAIR software. To allow fuels with different properties (S-content, ash content and the like) within comparable fuel groups. Hence the fuels as used in the old system, now are called 'fuel groups'.

Within each fuel group that is used in the inventory, a fuel should be defined. A number of these fuels is predefined and the user can add to these. When defining a new fuel within a fuel group, the user has to provide some properties of this fuel.

The user also can define new fuel groups, if needed. This however is not recommended, since the NAPFUE nomenclature, that is available as fuel groups, should allow for all possible fuels in the system.

This implements the fuel properties into the system.

3.2.2. Auxiliary data

Collect*ER* makes a number of auxiliary tables available, that al can be supplemented by the users' own definitions and data. All of them are rather self-explanatory. We explain here only the way the Default Emission Factors of the EMEP/CORINAIR guidebook on emission inventories are implemented.

Default Emission Factors

The system allows and organises the use of default emission factors. As indicated in section 0 fuels now are defined within fuel groups. The default emission factors however are available for NAPFUE fuels, now stored as fuel groups. These default emission factors can be viewed and edited by clicking on the **Root data | Auxiliary data | Default activities and Emission factors** menu item. The following window will appear, after applying a filter to see all available default activities within the SNAP 030106 subsector and sorting the **Fuel** column by double-clicking its header.

By clicking the **Em. Factors** button a dialogue window appears to edit, add and delete the default emission factors.

Whenever a SNAP – fuel group combination is defined for use in the inventory (see under **Adding an area source at NUTS 3 level** in section 3.3.1.), **Collect*ER*** checks the default emission factors table whether or not default emission factors for this newly defined elementary activity are available and, if so, **Collect*ER*** proposes to use them. If the user accepts to use them by clicking **Yes**, all emission factors connected to the newly defined SNAP – fuel group are copied to the newly defined activity – fuel combination. They can be edited later during data entry.

Whenever the user accepts the default emission factors, he or she should always check them. In many instances not all emission factors that the user might expect are available as default values. This is especially true for SO_2.

3.2.3. *Surrogate data*

Surrogate data are used in **Collect*ER*** as proxies to distribute activity rates, given at higher NUTS levels over underlying NUTS levels. As many other data in the system, inputting these data is essentially a two step procedure:

Step 1: define a surrogate data type; each data type is defined at one and only one NUTS level.

Step 2: enter the surrogate data. Surrogate values can be entered for all territorial units at the level at which the data type is defined. If no data is entered for a certain region, a zero value is used.

The CollectER database is preloaded with more than 30 surrogate data types. None of them are at present preloaded with data. When the data flow will be established as indicated in section 1.1.3, the tables will be preloaded with the official EUROSTAT data for the relevant year.

Step 3: To use the surrogate data in spatial disaggregation, allocation formula need to be defined. This can only be done for user defined elementary activities.

Surrogate data types
The surrogate data types table contains upon first use of the programme some 33 predefined surrogate data types, all supposed to be available at the lowest level of NUTS. The dialogue window reproduced below shows the detail dialogue for the

surrogate data type horses where the user decided to change the unit to animals in
Edit mode.
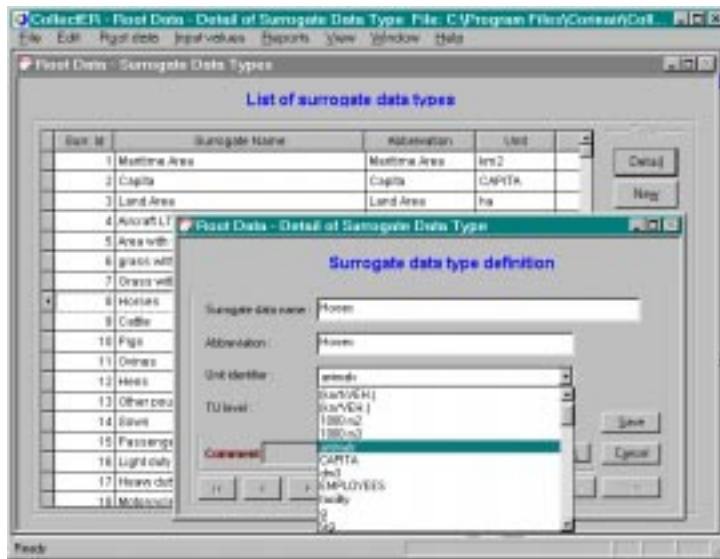
The user could in this screen also decide to define this surrogate value at NUTS
level 1 or 2 instead of the NUTS level 3 as predefined. In this example we change
the NUTS level to level 2 by clicking on the appropriate radio button. Next the
changes should be saved and the dialogue closed.

Surrogate data
The new data for the horses can be entered by clicking on the **Root data |
Surrogate data | Surrogate data** menu item, which will open a dialogue window,
where the surrogate data type **Horses** should be selected. By clicking on the **Add**
button in this window, a detail dialogue window will be opened and the new values
can be entered:
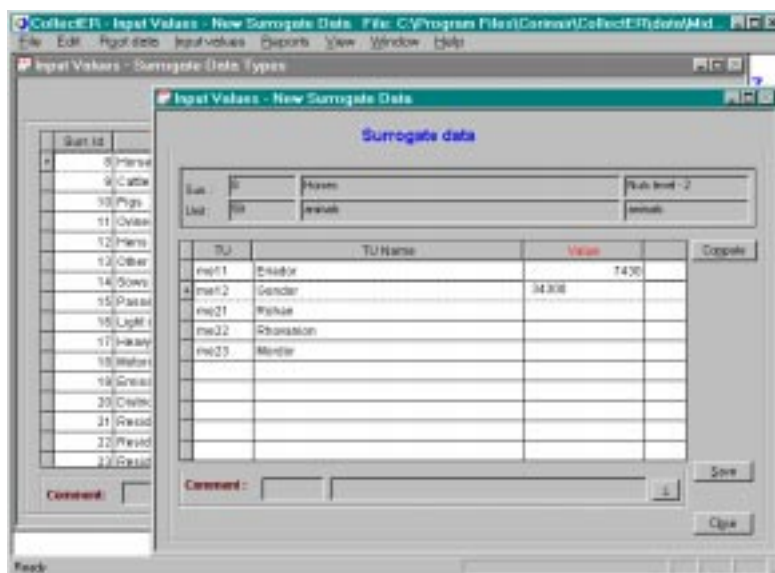
After entering the values as indicated the data should be saved and the dialogue
closed. It should be noted that in cases were already surrogate data has been
entered, editing these can be done in the detail window by clicking on the **Detail**
button.

Allocation formulae

The user can define allocation algorithms using up to three different surrogate data types as proxies for the real territorial distribution of the activity rate. This functionality will be used below (see under **Adding area sources at higher NUTS levels,** section 3.3.1.).
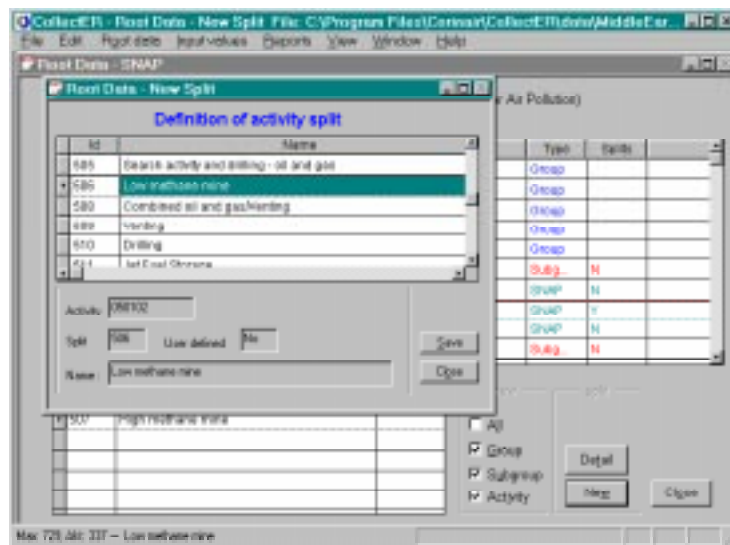
3.3. Input values

3.3.1. Area sources

3.3.1.1. Adding an area source at NUTS 3 level

Between 1995 and 1996 Middle Earth developed a new coal mine in **Nurn** (NUTS me231). This coal mine has a lower methane emission as compared to the existing one in the same area. The existing activity is stored in the database as an area source at SNAP 050102 (**Underground mining**) Split 507 (**High methane mine**) and no fuel used.

Step 1: Add the split 506 (Low methane mine) to the activity 050102 as follows:

√ click **Root data | Base data | SNAP** and select 050102 by double clicking on SNAP sector 05 to expand, then on Subsector 0501 to expand again and click on the activity.

√ Next click on **New** in the split group, select ID 506 **Low methane mine** and click **Save** then **Close**. Note that splits already used for this SNAP (507 in this case) are not available for selection.

The **Root data | SNAP** window can be closed by clicking on the **Close** button.

Step 2: Add the new activity fuel combination to the list of area activities:

√ open the **Input values | Definitions | Area activities and Emission factors** window, click the **Apply** button to see all available area activities and click **New**.

√ in the **RootData – New Activity window** select SNAP 050102. Check the **Split** checkbox; select **Low methane mine**; select unit **Mg Ex. Coal** and uncheck the **fuel** checkbox at the bottom of the window.
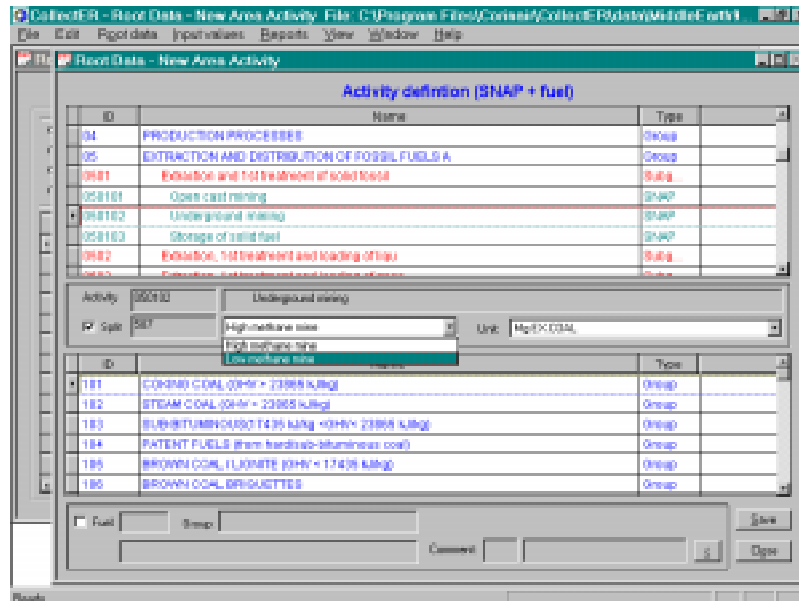
√ click **Save** and **Close** to return to the **Root data – Area Activities** window. **Collect*ER*** recognises the availability of default emission factors for this area activity and proposes to use them. Click **Yes**. The new area activity is now in the list and selected.

Step 3: Define emission factors for this activity:

√ click on the **Em. Factors** button. You will get a window where you can edit the emission factor for methane. For editing, the grid should first be made editable by clicking the **Edit** button.

√ To enter new emission factors, first select the pollutants by clicking on **Add EF**. Select pollutants in the window by clicking with the right mouse button on the appropriate pollutants. Emission factors now can be entered for all pollutants selected after clicking on **Edit**.

Close the windows.

Step 4: Now that the area activity is defined and emission factors have been entered, the emissions connected to this activity can be entered by giving an activity rate at one or more NUTS region. This can be done as follows:

√ Select menu item **Input values | Data entry | Area sources** click **Apply** and select **SNAP 050102, split 506**.
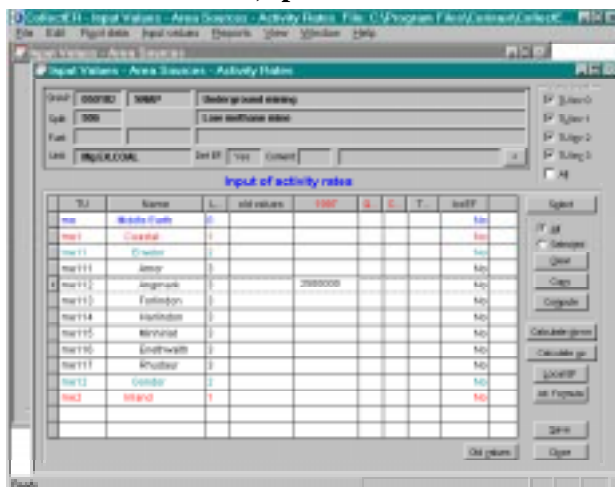
√ Click **Rates** to open the **Input values – Area Sources – Activity rates** window; enter the value 2500000 in NUTS **me112 Angmark**.

√ Click **Calculate up** to synchronise all higher NUTS levels, **Save** and **Close** the window.

With this the emissions related to the new activity have been entered in the system.

Adding area sources at higher NUTS levels

In many cases the national reference centre will not have data available at the lowest NUTS level and will need a tool to distribute the emissions over the country. As an example we will add the emissions of NMVOCs due to painting of the hobbits' wooden homes. It is assumed that 2 250 000 kg of paint is used in 1997. This can be done as follows:

Step 1: Enter the area activity definitions (**060107, Paint application: wood**, no split, no fuel, unit Mg Paint) and emission factors (400 kg/Mg Paint) analogous as described above (section 3.3.1.1). Remember to set units as indicated.

Step 2: Define an allocation formula using the **Root data | Surrogate data | Allocation formula** menu item. If the formula is not available yet, the user has to define it by clicking on **New**. This will pop up a window as given below. The window is self-explicable. Up to three surrogate variables can be given each with its own weighting factor. In the example the allocation for 'Paint application; wood' (SNAP 060107) is defined as being proportional to the number of inhabitants (capita) at NUTS level 3.
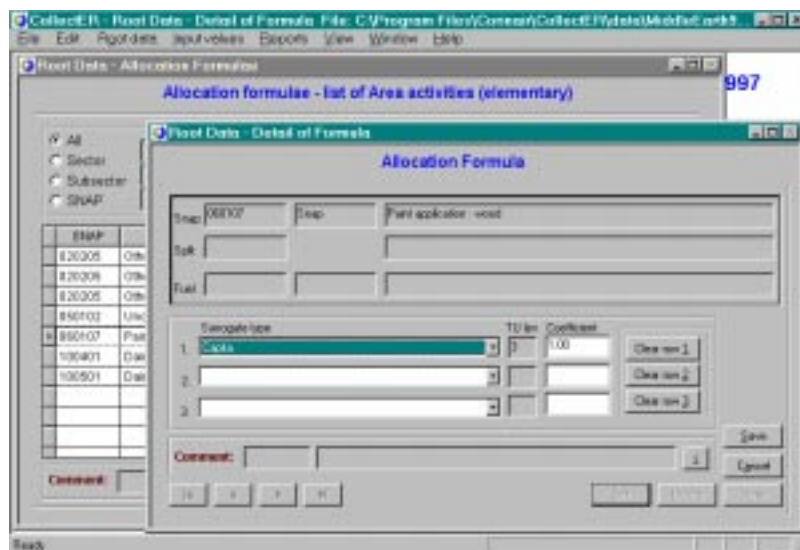
Step 3: Open the Area sources data entry by clicking the **Input values | Data entry | Area activities** menu item. **Apply** an appropriate filter, select the paint application activity and click **Rates**. Enter the total activity rate (2,250 Mg Paint) at the highest NUTS level and click on **Calculate down**. **Collect*ER*** will now

distribute the activity rates over the lower NUTS levels using the allocation formula defined above. This results in the window below.
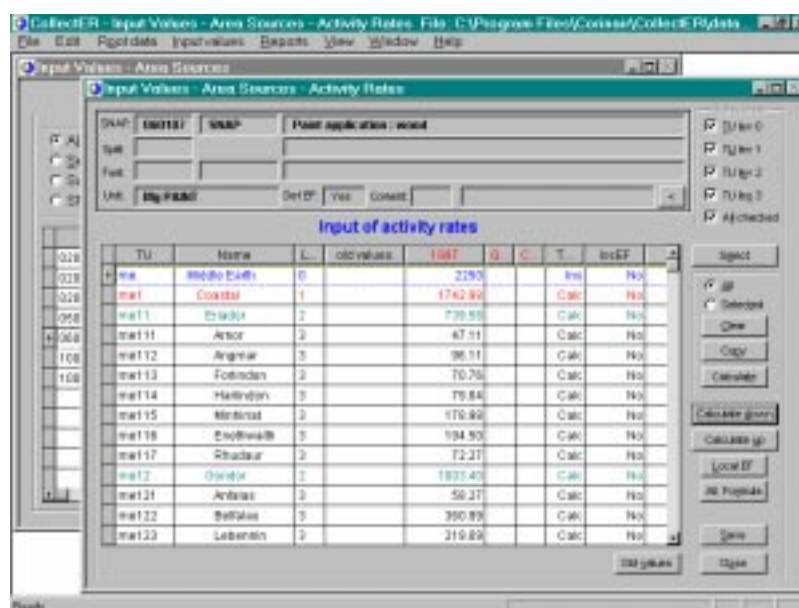
If activity rates would be entered at a lower level, aggregation of data to higher levels of NUTS is performed by clicking on **Calculate up**. This completes the input for this area source.

It is advised to check data input by opening a report using the **Reports | Emissions (TU)** or **Reports | Emissions (AS)** menu items, using appropriate selections. The emission by this activity should be 900 Mg NMVOC at the national total level. All other emissions for this activity should be zero.

Updating activity rates
Updating area source activity rates is quite analogous to entering new ones. Just select the appropriate SNAP and fuel at the **Input values | Data entry | Area sources** menu item and click on **Rates** to change any values in the activity rates per NUTS. Again **Calculate up** and **Calculate down** can be used for aggregation and disaggregation respectively if needed. The following example shows a few of the possibilities.

Assume that in all of Rhovanion (NUTS me22) the use of wood for residential combustion now is banned. In the rest of Middle Earth the use of wood for residential combustion decreased by 10 % because of the warm winter. The update of the data can be done as follows.

Step 1: Open the **Input values – Area sources – Activity rates** window as indicated above.

Step 2: Make sure that the **All** radio button is checked. Multiply all activity rates by 0.9 by clicking on **Compute** and entering the value 0.9 in the text box and clicking **Close**.

Step 3: Select the NUTS regions **me**, **me22** and all NUTS levels within **me22** by clicking in the leftmost column of the grid on the appropriate selection buttons. Check the **Selected** radio button and click **Clear**. This will result in the screen as given below.

Step 4: Enter the value 0 at me22 and click **Calculate down**. The three NUTS3 regions within Rhovanion will now be filled with calculated zeros. Clicking **Calculate up** will update the value for the higher NUTS levels.

Step 5: **Close** the window. **Collect*ER*** will prompt you to save the new data. Click **Yes**.

Similar changes need to be made for the other fuels used in this SNAP. All use of fuels for this activity might have been decreased by 10 % due to the warm winter. And of course the wood, used before in Rhovanion should be replaced by another fuel: set the fuel use for residential heating with Brown Coal in Rhovanion to 150 000 GJ as described above (clear relevant activity rates, enter the value, calculate down and up).

Updating emission factors
Emission factors can be changed using the **Input data | Definitions | Area activities** menu item and edit the emission factors for the selected activity and fuel combination.

3.3.2. *Point sources*

Adding a new point source
A new point source should be added to the list of point sources under the **Input values | Definitions | Point Sources** menu item. Each point source will contain one or more stacks and will be operated in one or more parts, each of them defined by a SNAP code. The **Root data – Point sources** window looks as indicated below. Using this window both new point sources can be entered and existing point sources can be edited by clicking on the relevant buttons.
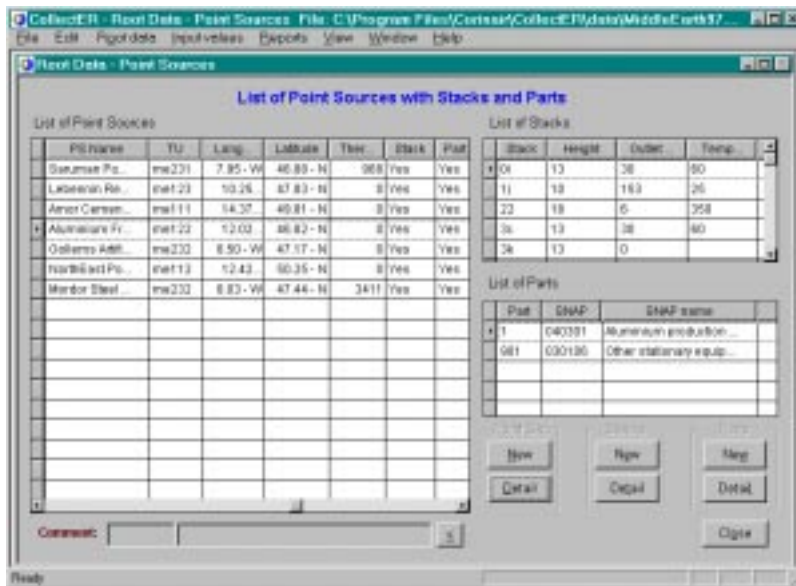
We add the new Municipal Waste Incineration in Barad-Dur (Gorgoroth Plateau) as follows:

Step 1: Click in the above window **Point Src | New** and add the data as indicated below
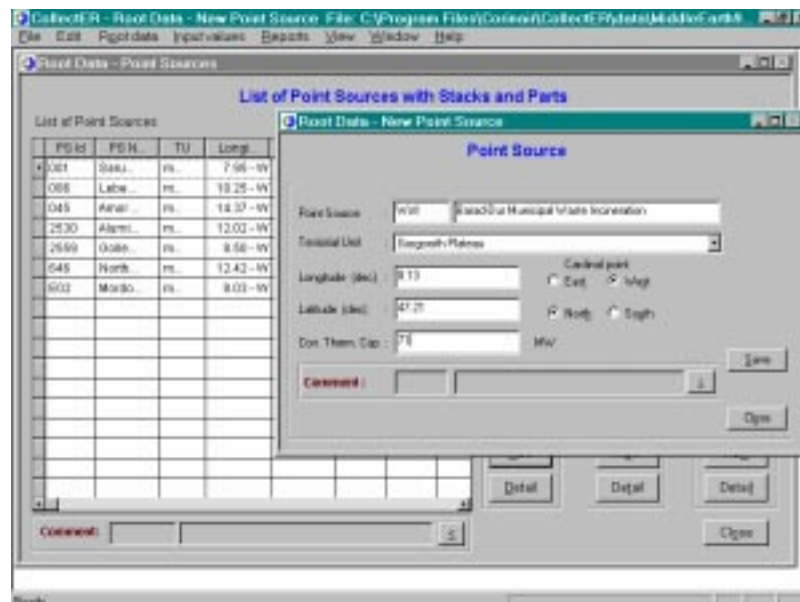
Click **Save** and **Close** the window.

Step 2: Add a 120 high stack (Stack ID: 1) with a **Outlet area** of 1 m^2, a outlet **Temperature** of 225^{0}C and a **Flow rate** of 50,000 Nm^2/hr. **Save** and **Close** the stack definition dialogue.

Step 3: Add one part with SNAP activity 090201, **Incineration of domestic or municipal wastes**, Part ID: 1. **Save** and **Close** the part definition dialogue.

Step 4: The new point source and its stack and part should no be included in the list. **Close** the point sources definition window.

This concludes the new point source definition.

Entering new emissions

For each point source new data can be entered by using the **Input values | Data entry | Point sources** menu item. This will open a window in which a point source can be selected and edited by either double clicking it or clicking on the **Parts** button. This will open a window as reproduced below. From this window either

the emissions can be entered directly (click **Emissions (SNAP)**) or activity rates can be updated after clicking **Activity rates**. By clicking **Stacks** the distribution of the emissions over the stacks can be adapted if necessary. We will demonstrate this procedure while entering emission data for the new waste incinerator.

Step 1: Click the **Input values | Data entry | Point sources** menu item and select the new waste incinerator and then click **Parts of point sources**. Then, with the part selected, click **Activity rates**. In the Point sources – Activity rates window click Add Activity. This opens a structured list, where a split, a fuel and a unit should be chosen. Enter the data as given below:
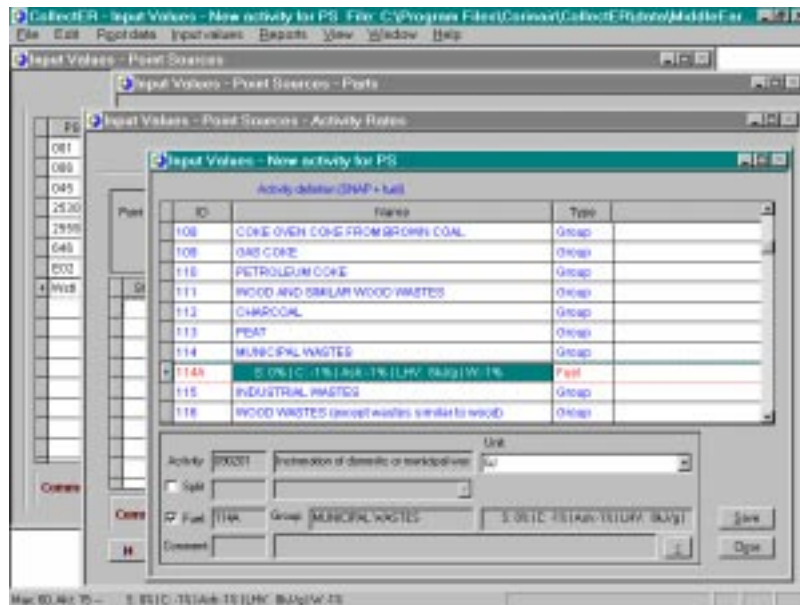
Save and **Close** the dialog window.

Step 2: Enter the activity rate by clicking **Edit**, then double-clicking the value in the **1997** column and enter 1 800 000. Click **Save**.

Step 3: Now emission factors need to be entered by clicking **Emission factors**, which opens the next window. **Add emission factors** for pollutants 001(SO_2), 003 (NMVOC) and 004 (CH_4) and enter the values as shown below.
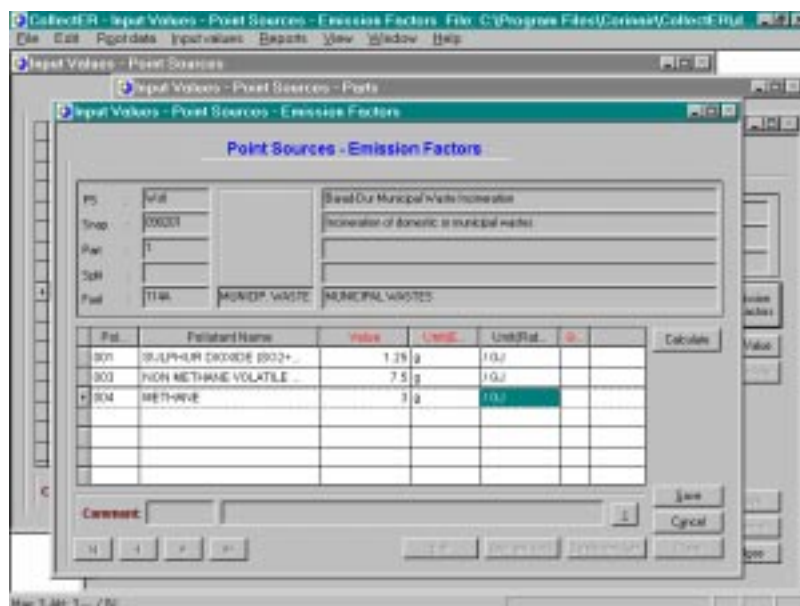
Save and **Close** the emission factors window.

Step 4: Click **Emissions** in the **Point sources – Parts** window to enter directly measured emissions. **Add Pollutants** 002 (NO$_x$), 005 (CO), 006 (CO$_2$) and 007 (N$_2$O). Go to **Edit** mode and enter the values as given in the window below

Take care that the units are correctly chosen! **Save** and **Close** the **Point sources – Direct emissions** window.

Step 5: Connect all emissions to the only stack of the point source by clicking **Stacks**, adding the stack and entering 100 in the **Activity (%)** column. **Save** and **Close** all windows.
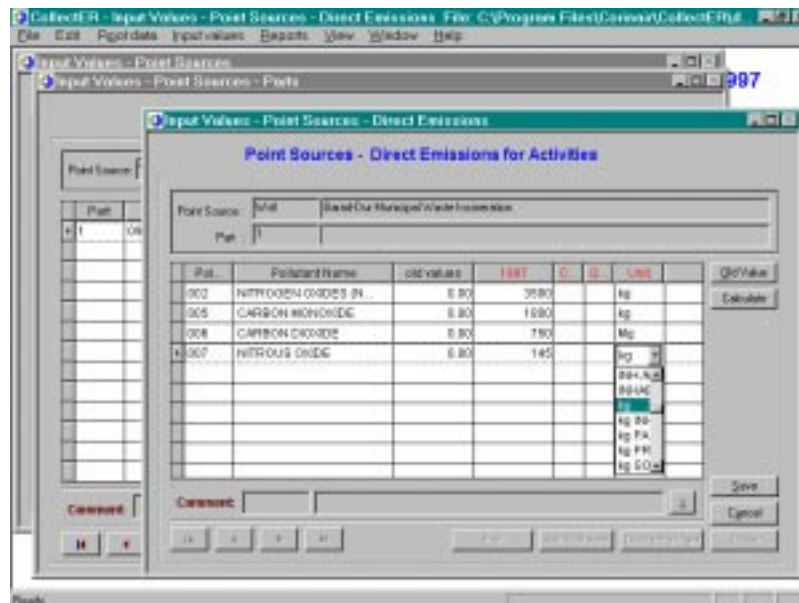
This will conclude the input of point source emission data. It is recommended to check the data entry by producing a point sources report using the **Reports | Emissions (PS)** menu item.

More stacks connected to one part

Emissions produced by parts within a point source go through one or more stacks. Any combination of parts and stacks is allowed. The user should indicate what percentage of the emissions produced by each part goes through each stack. After selection of a part and clicking the **Stacks** button a screen with a grid, containing a list of the stacks for the active part appears.
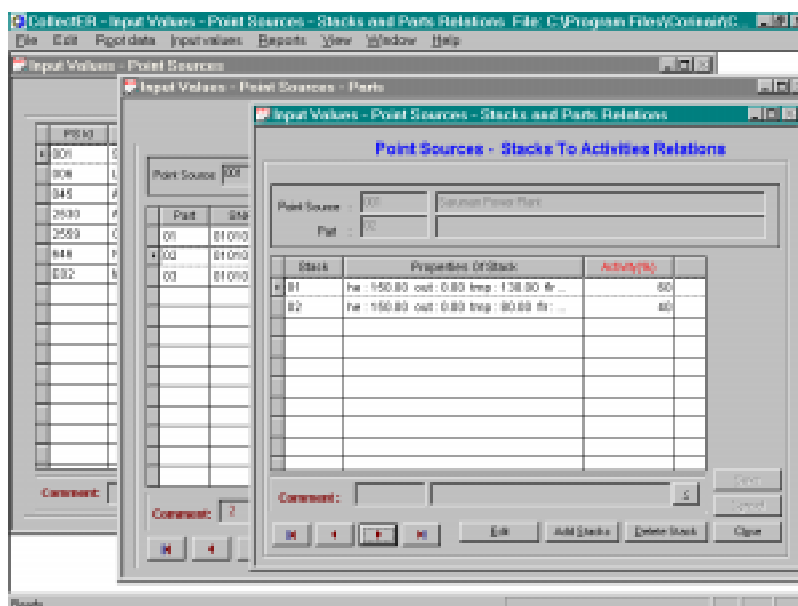
More parts connected to one stack

Stacks can be connected to several parts within a point source. There is no limitation to the number of parts connected to a stack.

3.4.   Further issues

3.4.1.   *LCP Directive: flagging point sources*

EU Member States agreed to report annually the emissions of so called Large Combustion Plants complying with the LCP Directive (see section 1.1.1). This obligation leads to the necessity to mark point sources in the inventory whenever they are to be reported according to this directive. This section will show how to mark point sources as ones to be reported as LCPs. Within **Collect*ER*** no further use of this flag is being made. In **Report*ER*** however an option can be included to produce the LCP report directly from the **Collect*ER*** database.

Assume that Middle Earth is a Member State of the EU and has to report according to the LCP directive. This will mean that we need to define a flag and set it for a number of point sources. This can be done as follows:

Step 1:   Define the flags by defining new Comments. Select **Root data** | **Auxiliary data** | **Comments** and click **New**. Since the LCP makes a difference between LCPs built before July 1987 (Old LCP's) and after July 1987 (New LCPs) we need to define two flags. So enter as **Code**: *NLCP* and as **Text**: '*Large point source, built after July 1987*' and click on **Save** (see below). Next type as **Code**: *OLCP* and **Text** '*Large combustion Plant built before July 1987*' and again click **Save**. Then **Close** the Comment Definition and Comment list windows.
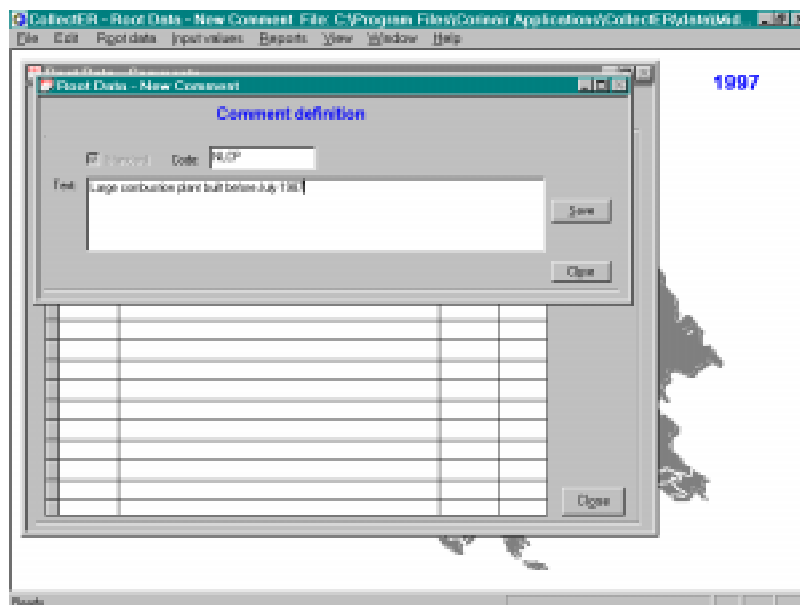
Step 2:   Set the flag on the individual parts of point source **001 Saruman Power Plant** by selecting part 01 of this point source in the **Input values** | **Definitions** | **Point sources** window, clicking on **Parts** | **Detail**; then on **Edit** to set the edit mode and edit comment by clicking on: ≤; select OLCP from the **Code select** list box. Click on **Close** to set the comment and **Save** the change. Select the next part by clicking the navigation button '❺'. Set the comments for the other two part on NLCP.

This will mark the first part of this power plant as an old LCP and the other two as new LCP. Other point sources could be marked accordingly.

If needed, the user can create his own flags by defining it as a standard comment and set it with any part, stack of a point source. It can also be set at area activities and emission factors.

As indicated above this possibility is at present not further used within **Collect*ER*** or **Report*ER***. As long as this is the case, an experienced user could use the possibilities of MS Access to extract the flagged data and report on it directly. If the user so wishes and budgets are made available the **Report*ER*** tool can be extended to include production of an LCP directive report.

3.4.2. *IPPC and PER: another flag for point sources*

Future obligations might emerge for reporting of emissions, when the IPPC directive will be operational requesting EU Member States to report 'principal emissions' of certain installations and plants to result in a European Polluting Emissions Register (EPER), based on national PERs. A flag can be defined similarly for point sources or parts of point sources to accommodate this national PER (IPPC Directive) reporting obligation.

3.4.3. *Using an area source or a point source?*

In most cases it is quite clear to the user whether to define an activity as a point source or as an area source. A large industrial plant, for example an IPPC installation and/or LCP installation, will in most cases be stored in the inventory as a point source, whereas the emissions caused by the inhabitants of a town in most cases will be stored as area sources. This section describes two examples applications of the different types of sources.

- In a number of cases the user might have the choice to enter a certain new activity as area source or as point source. An airport for instance could as well be stored in the inventory as a point source, at a certain location or as an area activity within a certain NUTS 3 territory. This section describes as an example both possibilities in some detail.
- A user might want to enter an urban emission inventory for a town that is smaller than the corresponding NUTS3 level and might therefore choose to store the emissions within the town as a point source.

A new airport
A new international airport '*JRR Tolkien International Airport*' has been developed and came into service during the base year of this inventory. The new airport is located in Anfalas. It first came into service during this base year and the emissions should be entered into the system.

a) The airport as area source
To enter the new airport as an area source, the user should first define the necessary SNAP (and split) and fuel combinations. Then the appropriate activity rates are entered and the emissions are calculated. The following steps should be performed.

Step 1: Define new SNAP – Split combinations by clicking the **Root data | Base data | SNAP** menu item and select SNAP activity 080501, Domestic airport traffic (< 1000m). Then click on **Split | New** and select each of the Splits **8A7**, **8E6** and **8E7**, **Boeing 747, Small commercial aircrafts** and **Propeller airplanes** respectively, saving each selected SNAP – split combination. After closing the split selection window the screen should look as reproduced below
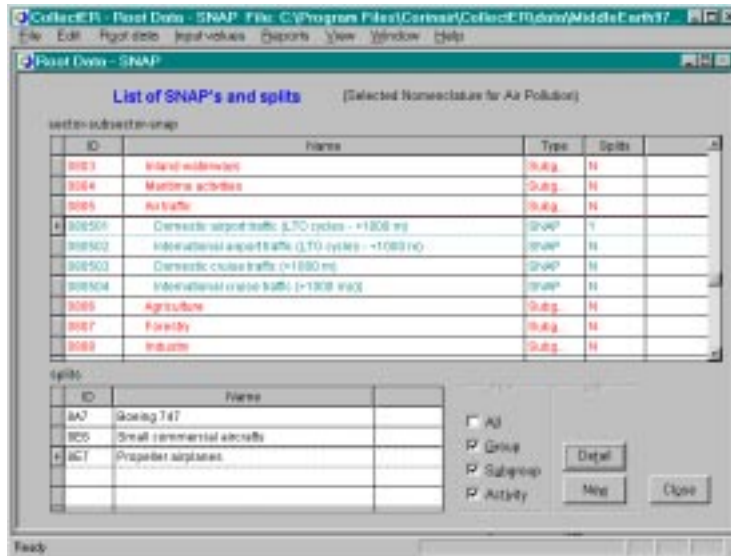
Close the window.

Step 2: Click **New** in the **Area activities and Emission factors** dialogue window (**Input values** | **Definitions** | **Area sources** menu item). Select the appropriate SNAP, check the **Split** checkbox and uncheck the **Fuel** checkbox. Select the **Boeing 747** from the list of splits and select as unit **LTO cycles. Save** the new activity definition and accept the default emission factors. Repeat this for the other two types of aeroplanes. No default emission factors are available for the latter two types of air planes.
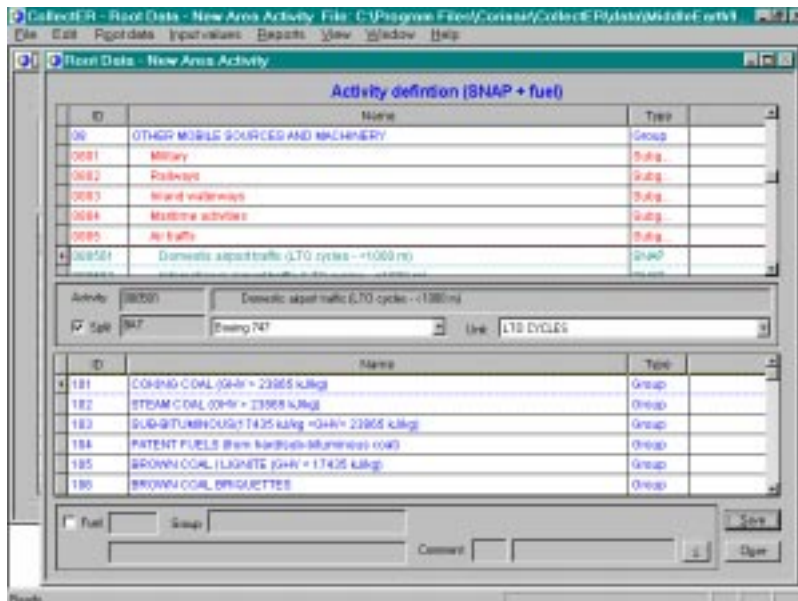
Close the Activities definition window.

Step 3: Emission factors should be added by clicking the **Em. Factors** button in the list of area activities window as described earlier, with either air traffic SNAP – split combinations selected. Copy the default emission factors for the Fokker 27 into the new area activity by:

√ adding the pollutants 001, 002, 003, 005 and 009 by clicking on **Add EF** and selecting these pollutants in the list. Click **Close**. The pollutants are now added to the list with zero values.

√ selecting the 080501 and 8C5 SNAP – split combination in the **Root data** | **Default Emission factors** window and clicking on **Em. Factors**; then select all values by dragging over the five value fields. Select **Edit** | **Copy** in the menu.

√ Return to the Emission factors for Area activities window, click **Edit** and then the SO₂ value field. Now click **Edit | Paste** in the menu and all values will be copied into the list:
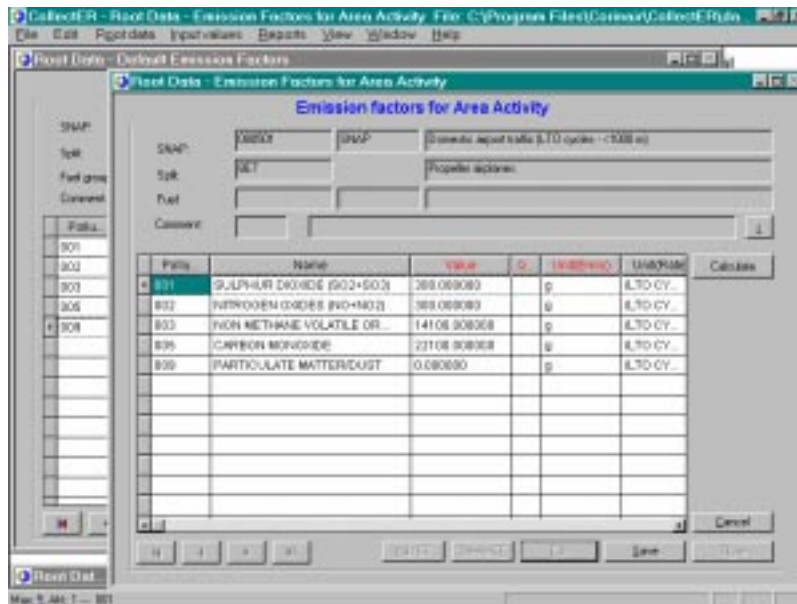
Click **Save** and repeat this procedure for the other type of aircraft.

Close all windows

Step 4: Now enter the activity rates as described in section 3.3.1.1. Assume that 730 Boeing 747 and 1460 both small commercial aircraft and propeller aircraft LTO cycles have happened in this year. Enter these values for NUTS **me121 Anfalas** Click **Calculate up** to aggregate to higher NUTS levels:
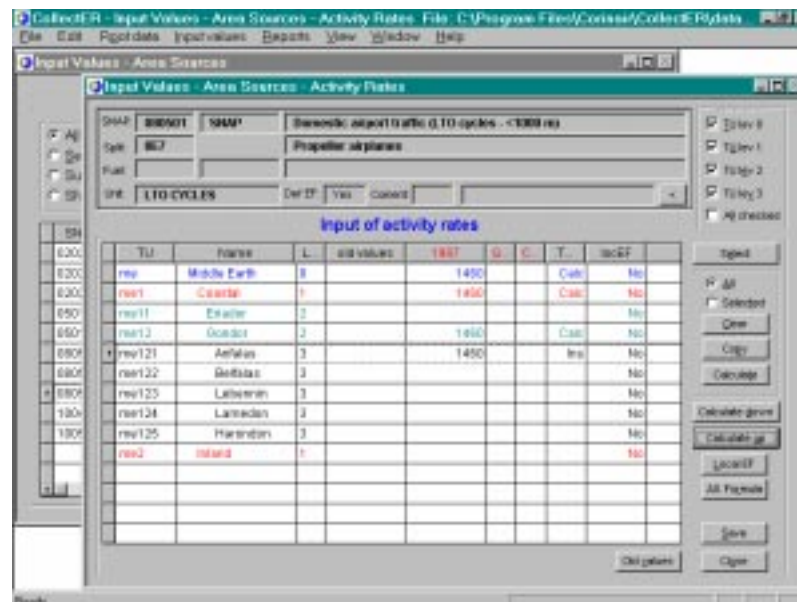
This completes the data entry. **Close** all windows.

Step 5: Check the result by clicking the **Report | Emissions (AS)** menu item, selecting the air traffic **Activities** and **Calculate** the result. This will show the following report
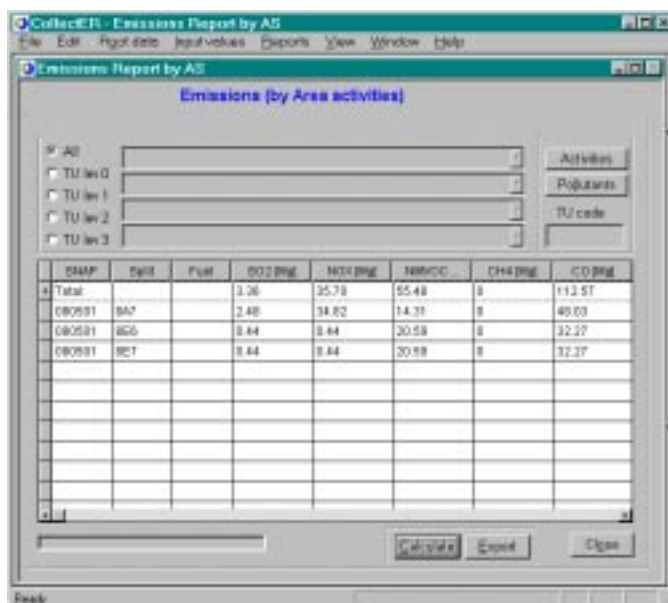
b) The airport as point source

To enter the new airport as a point source, first delete the area sources as entered above. This can be done by clicking on the **Delete** button in the **Detail** window of the **area sources definition** dialog for each of the three aircraft types. Then perform the following steps:

Step 1: Define a new point source with 1 stack and 1 part as shown in the window below
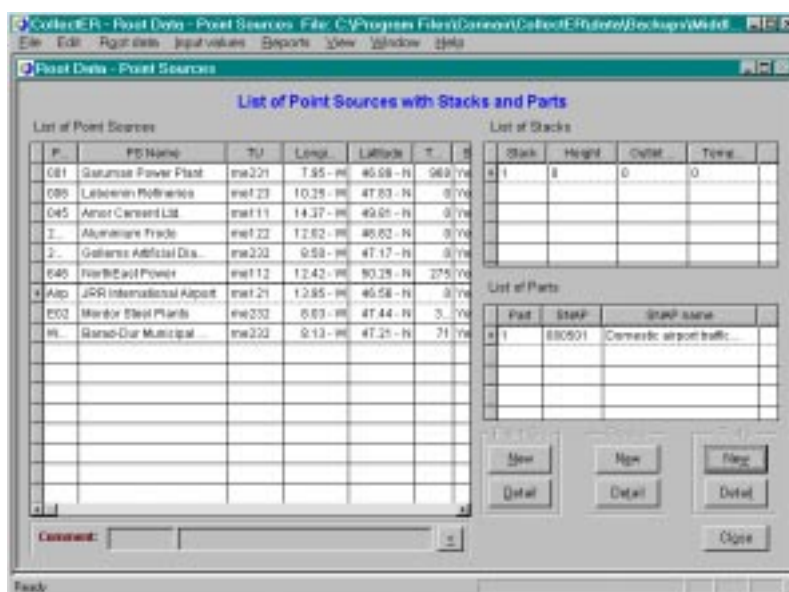
Step 2: Add the activity rates in the **Input values | Data entry | Point sources** menu item, by selecting the airport and clicking on **Parts of point sources.** This will open a new dialogue, where **Activity rates** should be clicked. Now add new activities by clicking the appropriate button and combining the SNAP 080501 with the three available splits. Remember to set the correct **Unit** and to uncheck the **Fuels**. This should result in the window reproduced below.
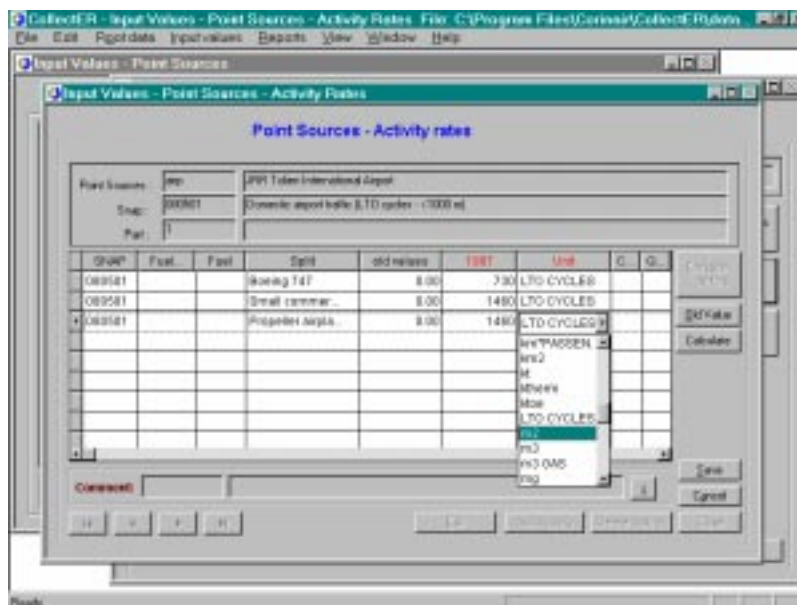
Emission factors can again be entered by copying those of the Fokker 27 as described above.

Step 3: **Close** all windows and check the input by the **Report** | **Emissions (PS)** menu item. The same values as obtained above should appear now.

3.4.4. Urban inventories

Whenever a country expert wants to enter the urban emissions for one or more towns within a NUTS3 territory separately, he or she can use the Point sources format. In such a case simply define the town as a new point source and add all relevant SNAP - split - fuel combinations as parts to this point source. Activity rates and emission factors can be entered as described in this document. The location of the town can be indicated by the co-ordinates of the point source. Different emission heights can be used by defining more than one stack.

The user has the full responsibility to avoid any double counting. Hence when a town is entered as point source, the relevant activity rates should be subtracted from the ones for the NUTS 3 area in which the town is situated.

3.4.5. Using different surrogate values at different NUTS levels

In some cases data might be available to make a more accurate spatial disaggregation by using surrogate values at different levels. For instance amount of money spent on fuels used for heating in all NUTS2 regions might be available from economic statistics, whereas the further disaggregation can only be done by using population density. In such a case the money spent should be defined as a new surrogate data type at NUTS level 2 and the data should be entered. The national total activity rate now can be calculated down to NUTS level 2 using this allocation formula first.

Next redefine the allocation formula by now using the population density as the proxy. Calculate down now will distribute the values to the lowest NUTS level.

3.4.6. Data quality

The system is able to store a quality indicator for most data. No further use has been made of this possibility so far. This label could be used by the user to indicate his or her own progress in the following way. All update and input of new data should be checked by producing an appropriate report, using the **Report**

menu. When the input is OK, the user could set the quality indicator. The guidebook proposes to use a 5 point scale (A … E) as defined below:

A) An estimate based on a large number of measurements made at a large number of facilities that fully represent the sector;

B) an estimate based on a large number of measurements made at a large number of facilities that represent a large part of the sector;

C) an estimate based on a number of measurements made at a small number of representative facilities, or an engineering judgement based on a number of relevant facts;

D) an estimate based on a single measurement or an engineering calculation derived from a number of relevant facts and some assumptions;

E) an estimate based on an engineering calculation derived from assumptions only.

Table 3-4 reproduces the proposed default quality indicators per SNAP sector and per pollutant as proposed in the Guidebook. The user is encouraged to use this facility and if no extra information is available to use the indicators as given in the table.

Table 3-4   Default quality indicators as proposed by the joint EMEP/CORINAIR Atmospheric Emission Inventory Guidebook (EEA, 1996)

	SNAP CATEGORY	SO_2	NO_x	VOC	CO	NH_3	HM/POP	CO_2	CH_4	N_2O
1	public power, cogeneration and district heating	A	B	C	B		D	A	C	E
2	commercial, institutional & residential combustion	B	C	C	C		E	B	C	E
3	industrial combustion	A	B	C	B		D	A	C	E
4	industrial processes	B	C	C	C	E	E	B	D	D
5	extraction & distribution of fossil fuels	C	C	C	C		E	D	D	
6	solvent use			B			E[1]			
7	road transport	C	C	C	C	E	E[2]	B	C	E
8	other mobile sources and machinery	C	D	D	D		E	C	D	D
9	waste treatment	B	B	B	C		D	B	C	E
	disposal activities	C	C	C	C	E	E	C	D	E
10	agriculture activities		D	D	D	D	E	C	D	E
11	nature	D[3]	D	D	E	E	E[3]	D	E	E

1) In some cases, solvents may be toxic compounds
2) Rating representative of typical pollutant source category combination; some specific cases may have higher ratings
3) Natural sources could be contributed from volcanoes and other geothermal events

3.4.7. *Confidential data*

Although use of confidential data in the CORINAIR inventory is not encouraged, the system provides for a flag to indicate confidentiality. This flag will be copied into the central CORINAIR database and data delivery from the central database to third parties will be prohibited.

3.5.   Reporting in Collect*ER*

Collect*ER* has a few simple reporting possibilities (menu: **Reports**). These reports are mainly aimed at giving an overview of the data entered into the system. Reports can be produced

1. by territorial unit
2. by SNAP
3. for (a selection of) point sources
4. for (a selection of) area sources.

The use of these simple reporting facilities has been demonstrated earlier in this document. The user is encouraged to use this option frequently to check updates and import of new data, especially if the user decides to use the quality indicator to record as proposed in 3.4.6.

4. Producing national emission reports using Report*ER*

Report*ER* is the tool in the new CORINAIR system that is aimed to do the final tasks the system is designed for: producing national reports in the format of international conventions and protocols from the detailed data as collected in the national inventory.

Report*ER* version 1.0 is able to produce:
1. the IPCC reporting tables in MS Excel format, according to the revised IPCC 96 guidelines[1];
2. the UNECE/LRTAP report at SNAP-levels 1 ('summary') and 2 ('sub-sectors')[2]

The programme uses the MS Access format database produced by **Collect*ER*** directly and an additional database (file name reporter.mdb) containing amongst others the SNAP vs. IPCC definitions relations.

4.1.   UN FCCC reporting

4.1.1. Introduction

When running **Report*ER*** on a **Collect*ER*** database to produce a UNFCCC report, the first step should be performing the calculations in the database. This ensures that all data at all levels of aggregation (SNAP, NUTS and fuels) are consistent and that all special exclusions and aggregations according to the IPCC guidelines are performed. When the calculations have been made, the individual IPCC summary tables can be produced at the push of a button.

To produce UNFCCC summary reports, perform the following steps:

Step 1: Click the **Reports | Revised 1996 IPCC format reporting** menu item.

Step 2: Click the **Calculate** button in the **Reports – IPCC 1996** window. The calculations will be performed as indicated by the progress bar. When ready, all **table i** buttons will be enabled. The screen now should look as the one reproduced below.

---

[1] IEA/OECD (1996) Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories Reporting Instructions (Volume 1), IEA/OECD, Paris, URL: http://www.iea.org/ipcc/general/invs1.htm

[2] McInnes, G. (Ed.), (1996), *Joint EMEP/CORINAIR Atmospheric Emission Inventory Guidebook*, First Edition, European Environment Agency, Copenhagen, URL: http://www.eea.eu.int

Step 3: The aggregations for each of the IPCC summary table will be performed after clicking the appropriate button. The results of the aggregation can be viewed using the grid on the report window. As an example, the figure below shows the report window for IPCC summary table 7a. The user can scroll through the grid by using the horizontal and vertical scroll bars.
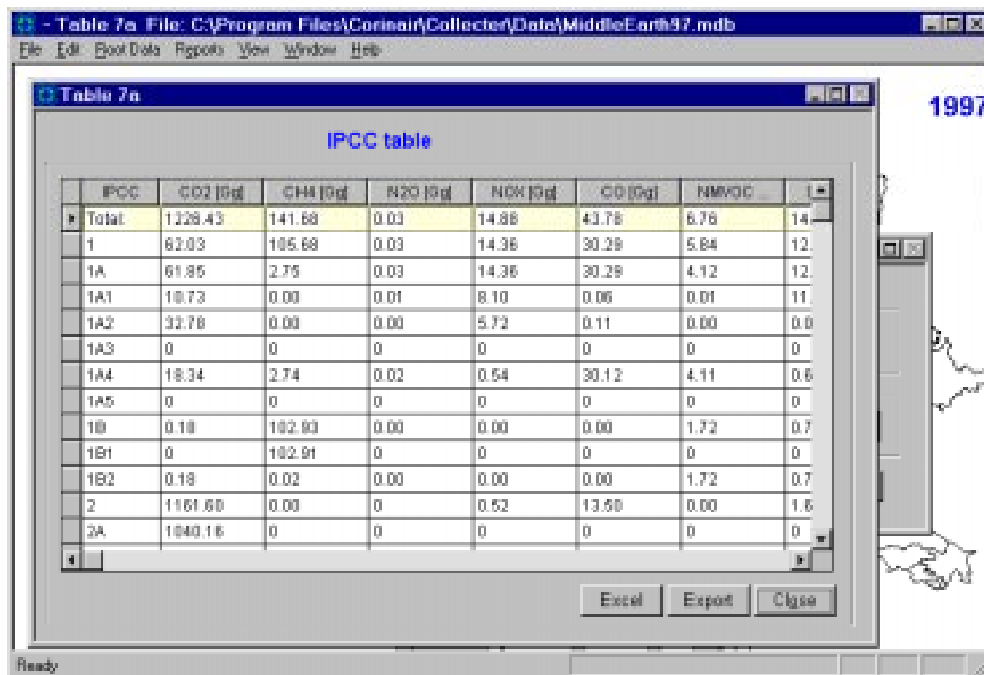
Step 4: The resulting table can be exported into other software, using the buttons on the bottom of this window. Two exports are available:

√ to Microsoft Excel by clicking on the **Excel** button. The following dialog will appear:
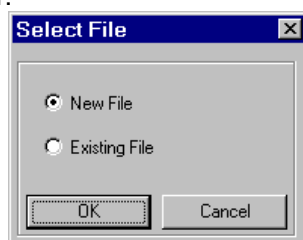
The user selects either a new Excel workbook or can add data to an existing one by selecting the appropriate radio button. On clicking **OK** a standard Windows file open dialogue will be opened to enable the user to enter a file name. When such a file is successfully opened, the table will be filled with the results of the aggregation.

If an existing file is opened, it should be based on the IPCC template as stored in the ExcelDir directory of **Report*ER***.

√ to a tab separated text file by clicking on the **Export** button. The user should provide a file name in the dialog opened after the click. Most commercial word processor, database, spreadsheet and graphics programs will allow for import of this format.

Please note that IPCC Summary table 8 can not be compiled from the data available in the inventory. Additional information is needed. Clicking it will open an error message as reproduced below.
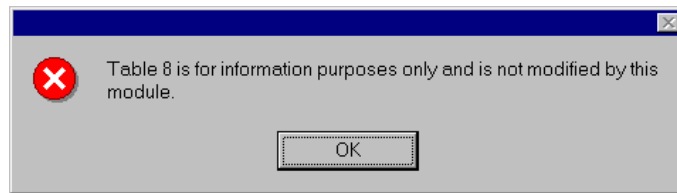
Below, summary tables 1 and 7a as produced by **Report*ER*** and exported into Microsoft Excel for Middle Earth 1997 are reproduced. In these tables, all changes in the original Middle Earth inventory as described in chapter 3 have been entered. Still, because this inventory contains only a limited number of sources and sectors, many zeros occur in the tables.

TABLE 1 SECTORAL REPORT FOR ENERGY

(Sheet 1 of 3)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)							
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	NO_x	CO	NMVOC	SO_2 [1]
Total Energy	**62,03**	**105,68**	**0,03**	**14,36**	**30,29**	**5,84**	**12,83**
A Fuel Combustion Activities (Sectoral Approach)	**61,85**	**2,75**	**0,03**	**14,36**	**30,29**	**4,12**	**12,07**
1 Energy Industries	**10,73**	**0**	**0,01**	**8,1**	**0,06**	**0,01**	**11,34**
a Public Electricity and Heat Production	2,04	0	0,01	7,64	0,03	0,01	10,82
b Petroleum Refining	8,37	0	0	0,46	0,03	0	0,51
c Manufacture of Solid Fuels and Other Energy Industries	0,32	0	0	0	0	0	0
2 Manufacturing Industries and Construction	**32,78**	**0**	**0**	**5,72**	**0,11**	**0**	**0,04**
a Iron and Steel	0,09	0	0	0,01	0,1	0	0,01
b Non-Ferrous Metals	0	0	0	0	0	0	0
c Chemicals	0	0	0	0	0	0	0
d Pulp, Paper and Print	0	0	0	0	0	0	0
e Food Processing, Beverages and Tobacco	0	0	0	0	0	0	0
f Other (please specify)	32,69	0	0	5,71	0	0	0,03

(1) Please provide links from Worksheet 1-4 for each sector where applicable.

TABLE 1 SECTORAL REPORT FOR ENERGY

(Sheet 2 of 3)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)							
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	NO_x	CO	NMVOC	SO_2
3 Transport	**0**	**0**	**0**	**0**	**0**	**0**	**0**
a Civil Aviation	0	0	0	0	0	0	0
b Road Transportation	0	0	0	0	0	0	0
c Railways	0	0	0	0	0	0	0
d Navigation	0	0	0	0	0	0	0
e Pipeline Transport	0	0	0	0	0	0	0
4 Other Sectors	**18,34**	**2,74**	**0,02**	**0,54**	**30,12**	**4,11**	**0,69**
a Commercial/Institutional	0	0	0	0	0	0	0
b Residential	18,34	2,74	0,02	0,54	30,12	4,11	0,69
c Agriculture/Forestry/Fishing	0	0	0	0	0	0	0
5 Other (please specify)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
B Fugitive Emissions from Fuels	**0,18**	**102,93**	**0**	**0**	**0**	**1,72**	**0,75**
1 Solid Fuels	**0**	**102,91**	**0**	**0**	**0**	**0**	**0**
a Coal Mining	0	102,91	0	0	0	0	0
b Solid Fuel Transformation	0	0	0	0	0	0	0
c Other (please specify)	0	0	0	0	0	0	0
2 Oil and Natural Gas	**0,18**	**0,02**	**0**	**0**	**0**	**1,72**	**0,75**
a Oil	0	0	0	0	0	1,72	0,6
b Natural Gas	0	0	0	0	0	0	0
c Venting and Flaring	0,18	0	0	0	0	0	0,15

TABLE 1 SECTORAL REPORT FOR ENERGY

(Sheet 3 of 3)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)							
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	NO_x	CO	NMVOC	SO_2
Memo Items [1]	693,26	0	0	0	0	0	0
International Bunkers	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Aviation	0	0	0	0	0	0	0
Marine	0	0	0	0	0	0	0
CO_2 Emissions from Biomass	693,26	0	0	0	0	0	0

(1) Please do not include in energy totals.

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 Emissions	CO_2 Removals	CH_4	N_2O	NO_x	CO	NMVOC	SO_2	HFCs		PFCs		SF_6	
									P	A	P	A	P	A
Total National Emissions and Removals	**1226,43**		**141,68**	**0,03**	**14,88**	**43,78**	**6,76**	**14,46**		**0**				
1 Energy	**62,03**		**105,68**	**0,03**	**14,36**	**30,29**	**5,84**	**12,83**		**0**				
A Fuel Combustion (Sectoral Approach)	61,85		2,75	0,03	14,36	30,29	4,12	12,07		0				
1 Energy Industries	10,73		0	0,01	8,1	0,06	0,01	11,34		0				
2 Manufacturing Industries and Construction	32,78		0	0	5,72	0,11	0	0,04		0				
3 Transport	0		0	0	0	0	0	0		0				
4 Other Sectors	18,34		2,74	0,02	0,54	30,12	4,11	0,69		0				
5 Other (please specify)	0		0	0	0	0	0	0		0				
B Fugitive Emissions from Fuels	0,18		102,93	0	0	0	1,72	0,75		0				
1 Solid Fuels	0		102,91	0	0	0	0	0		0				
2 Oil and Natural Gas	0,18		0,02	0	0	0	1,72	0,75		0				
2 Industrial Processes	**1161,6**		**0**	**0**	**0,52**	**13,5**	**0**	**1,63**		**0**				
A Mineral Products	1040,16		0	0	0	0	0	0		0				
B Chemical Industry	0		0	0	0,06	1,25	0	0,76		0				
C Metal Production	121,43		0	0	0,46	12,25	0	0,87		0				
D Other Production	0		0	0	0	0	0	0		0				
E Production of Halocarbons and Sulphur Hexafluoride	0		0	0	0	0	0	0		0				
F Consumption of Halocarbons and Sulphur Hexafluoride	0		0	0	0	0	0	0		0				
G Other (please specify)	0		0	0	0	0	0	0		0	0			0

P = Potential emissions based on Tier 1 Approach. A = Actual emissions based on Tier 2 Approach.

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 Emissions	CO_2 Removals	CH_4	N_2O	NO_x	CO	NMVOC	SO_2	HFCs		PFCs		SF_6	
									P	A	P	A	P	A
3 Solvent and Other Product Use	**2,8**		**0**	**0**	**0**	**0**	**0,9**	**0**		**0**				
4 Agriculture	**0**		**36**	**0**	**0**	**0**	**0**	**0**		**0**				
A Enteric Fermentation	0		25	0	0	0	0	0		0				
B Manure Management	0		11	0	0	0	0	0		0				
C Rice Cultivation	0		0	0	0	0	0	0		0				
D Agricultural Soils	(1) 0	(1)	0	0	0	0	0	0		0				
E Prescribed Burning of Savannas	0		0	0	0	0	0	0		0				
F Field Burning of Agricultural Residues	0		0	0	0	0	0	0		0				
G Other (please specify)	0		0	0	0	0	0	0		0				
5 Land-Use Change & Forestry	**(1) 0**	**(1)**	**0**	**0**	**0**	**0**	**0**	**0**		**0**				
A Changes in Forest and Other Woody Biomass Stocks	0 (1)	(1)	0	0	0	0	0	0		0				
B Forest and Grassland Conversion	0		0	0	0	0	0	0		0				
C Abandonment of Managed Lands	(1) 0	(1)	0	0	0	0	0	0		0				
D CO_2 Emissions and Removals from Soil	0 (1)	(1)	0	0	0	0	0	0		0				
E Other (please specify)	0		0	0	0	0	0	0		0				
6 Waste	**0**		**0,01**	**0**	**0**	**0**	**0,01**	**0**		**0**				
A Solid Waste Disposal on Land	0		0	0	0	0	0	0		0				
B Wastewater Handling	0		0	0	0	0	0	0		0				
C Waste Incineration	0		0,01	0	0	0	0,01	0		0				
D Other (please specify)	0		0	0	0	0	0	0		0				
7 Other (please specify)	0		0	0	0	0	0	0		0				

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 3 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 Emissions	CO_2 Removals	CH_4	N_2O	NO_x	CO	NMVOC	SO_2	HFCs		PFCs		SF_6	
									P	A	P	A	P	A
Memo Items	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
International Bunkers														
Aviation														
Marine														
CO_2 Emissions from Biomass														

(1) Please do not provide an estimate of both CO_2 emissions and CO_2 removals. You should estimate "net" emissions of CO_2 and place a single number in either the CO_2 emissions or CO_2 removals column, as appropriate. Please note that for the purposes of reporting, the signs for uptake are always (-) and for emissions (+).

4.1.2. Pitfalls and caveats

The definitions of sources and fuels as given both in the UN/ECE joint EMEP/CORINAIR Guidebook and in the IPCC Guidelines are not always interpreted by different countries in exactly the same way. Although the SNAP97 definitions have been very carefully adapted to these formats, the national reference centre should always be careful in applying them and should always check the results. Some examples of such issues are described in this section together with a solution the user might decide to apply.

Waste as a fuel

Due to the definitions of 'fuel' and 'waste', a problem arises when reporting the CO_2 emissions due to combustion or incineration of wastes.

Combustion of wastes might occur in SNAP sectors 1, 2 and 3 (and could occur in 7 and 8 when biofuels or gasified wood is applied as car fuel). In such cases, the waste is regarded as a fuel. This fuel might contain some biomass. According to the reporting guidelines, the CO_2 emissions from that part should, like the emissions due to all biomass fuels, be excluded from the inventory. ReportER contains a table where all biofuels are listed and where for each of them the part of the CO_2 that should be included in the inventory is given.

It is assumed that 15 % of the carbon in municipal wastes (plastics) and 100 % of the industrial wastes is not biomass, and hence should be included in the inventory. The user can edit this table using the **Root data | Managing of CO_2 | CO_2 contributions by fuel** sub menu. The default table is reproduced below.

fuel_id	fuel_gr_name	contribution to CO2 emission
111	WOOD AND SIMILAR WOOD WASTES	0%
112	CHARCOAL	0%
114	MUNICIPAL WASTES	15%
115	INDUSTRIAL WASTES	100%
116	WOOD WASTES (except wastes similar to wood)	0%
117	AGRICULTURAL WASTES (corncobs, straw, etc...)	0%
118	SEWAGE SLUDGE	0%
119	REFUSE DERIVED FUELS	0%
215	BLACK LIQUOR	0%
223	BIO-ALCOHOL	0%
309	BIOGAS	0%
310	GAS FROM WASTE TIPS	0%

Incineration of waste occurs in SNAP sector 9. In this case, the waste is interpreted as the feed stock to the process and if part of this feed stock is organic, the CO_2 emissions associated with the combustion of that part should be excluded. Here a similar solution is implemented, which can be edited by the user using the **Root data | Managing of CO2 | CO2 contributions by SNAP** menu item.

SNAP 0301: Combustion in boilers, gas turbines and stationary engines

Since the industrial split in the IPCC sectors is along economic sectors and not along technology as in SNAP, a problem appears when allocating industrial combustion to these economic sectors. Allocation of these emissions to the correct industrial sectors is not possible. The user has to correct his tables manually if needed.

Reference method for CO_2

The IPCC guidelines ask for the inclusion of the CO_2 emission estimate based upon the reference method. The corresponding field in Summary table 7A however cannot be filled from the inventory. This estimate can only be derived from the official energy balance of the country. These data are not entered in **CollectER** and hence the estimate can not be made. The user has to add this information manually.

High GWP gases

Two of the three 'new' gases included in the Kyoto protocol and sometimes referred to as 'high GWP[3] gases, in fact are mixtures of a range of gases. Some countries might wish to include the different HFCs and PFCs separately. The software allows for this, but does not have the possibility of summing these individual gases to the group totals. The user has to do this manually.

4.1.3. Errors and warnings
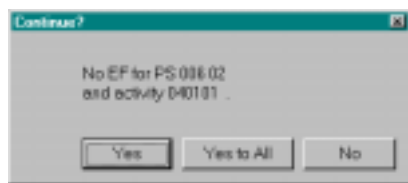
For the indicated activity, activity rate data have been entered, but no corresponding emission factors have been defined. For point sources, this might be due to the fact that emissions are entered as direct emissions only.
Check the data entry in **CollectER** if necessary.

4.2. UN/ECE LRTAP reporting

4.2.1. Producing and interpreting the report

Producing the UN/ECE LRTAP reports is fully analogous to producing the IPCC format reports.

UNECE ANNUAl EMISSIONS REPORT
Estimation from CORINAIR Anual National Data
(According to SNAP97)
SUMMARY TABLE OF ANNUAL EMISSIONS

SOURCE SECTORS	SO2[Mg]	NOX[Mg]	NMVOC[Mg]	CH4[Mg]	CO[Mg]	CO2[Gg]	N2O[Mg]	NH3[Mg]	As[kg]	Cd[kg]	Cr[kg]
Total	14461,24	14879,6	6761,23	141681,5	43782,03	1226,43	33,01	7425,34	211,82	56,41	24,06
1 COMBUSTION IN ENERGY AND TRANSFORMATION INDUS	11339,42	8101,09	7,05	4,78	59,44	10,73	11,44	0,34	0	0,39	2,75
2 NON-INDUSTRIAL COMBUSTION PLANTS	693,16	544	4112,63	2741,85	30120,79	18,34	21,13	0	0	47,02	0,31
3 COMBUSTION IN MANUFACTURING INDUSTRY	41,41	5716,45	4,36	3,94	105,21	32,78	0,44	0	0	0	0
4 PRODUCTION PROCESSES	2233	517,73	1723,69	20,28	13496,56	1161,6	0	0	0	9	21
5 EXTRACTION AND DISTRIBUTION OF FOSSIL FUELS A	0	0	0	102905,3	0	0	0	0	0	0	0
6 SOLVENT AND OTHER PRODUCT USE	0	0	900	0	0	2,8	0	0	0	0	0
7 ROAD TRANSPORT	0	0	0	0	0	0	0	0	0	0	0
8 OTHER MOBILE SOURCES AND MACHINERY	0	0	0	0	0	0	0	0	0	0	0
9 WASTE TREATMENT AND DISPOSAL	154,25	0,32	13,5	5,4	0,04	0,18	0	0	0	0	0
10 AGRICULTURE	0	0	0	36000	0	0	0	7425	0	0	0
11 OTHER SOURCES AND SINKS	0	0	0	0	0	0	0	0	0	0	0

- For all pollutants except CO2, ECE guidelines are followed. Concerning CO2, IPCC guidelines are folloved.
  For all pollutants, the UNECE annual emission report relates to sources located inside the EMEP area.

- CO2 emissions are expressed as 'net' ultimate CO2 emissions: CO2 from 'Land use and Wood Stock Change' is reported in sector 11. CO2 from combustion of biomass fuels and biomass-based waste fuels is not reported. CO2 from agriculture is not reported except from agriculture soils if available.
  CO2 from sector 9(waste...) includeds CO2 from oil/gas flaring and more generally CO2 contributions from non-biologic wastes. CO2 in sector 6(solvent use) relates to CO2 from NMVOC.

4.2.2. Pitfalls and caveats

Emissions from international aviation and shipping

An inconsistency within the UNECE LRTAP reporting is due to the requests of EMEP that the CO_2 emissions as reported within this protocol are equal to the ones reported to UNFCCC. This inconsistency is caused by the fact that the IPCC guidelines do not include the emissions due to international bunkers (SNAP 0804 and 0805). The table below shows what emissions are included in each of the two reports.

---

[33] Global Warming Potential

SNAP	Description	in EMEP CO$_2$	other gases	in IPCC CO$_2$	other gases
080402	National sea traffic within EMEP area	+	+	+	+
080403	National fishing	+	+	+	+
080404	International sea traffic (international bunkers)(h)	-	+	-	-
080501	Domestic airport traffic (LTO cycles - <1000 m)	+	+	+	+
080502	International airport traffic (LTO cycles - <1000 m)	-	+	-	-
080503	Domestic cruise traffic (>1000 m)	+	-	+	+
080504	International cruise traffic (>1000 m)	-	-	-	-

PAH

Analogous to what is described above for the high GWP gases, some countries might wish to store emission data for individual PAHs separately, in most cases the so-called Borneff 6. Again the software allows for this, but the user has to enter the individual values manually to obtain total PAH emissions.

4.2.3. Errors and warnings
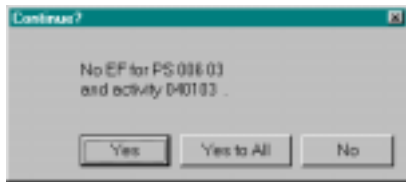
    See section 4.1.2

4.3.   Other reports

Other reports are not available yet in **Report*ER*** version 1.0.