# Train*ER*

## *Compiling a National Emission Inventory using*

## *AE-DEM (version 2.01)*

## DRAFT

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# YOUR Train*ER* FOR THE AE-DEM

***The Air Emissions Data Exchange Module.***

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 version 2.0 of the new tools **Collect*ER*** and **Report*ER***. A separate Database Guide for the two tools accompanies the document. In addition the new tool **Estimat*ER*** is described.

As part of the developments under he IDA programme (Framework Contract No 501 998), the CORINAIR software system has been further developed as part of the Data Exchange Modules (DEM). These data exchange modules are designed to facilitate the data flow between countries and international conventions, e European institutions and other organisations. The software system for data exchange in the field of air emissions is on of these DEMs and called AE-DEM.

The tree members of the AE-DEM family of tools are:

1) The new version of CollectER now supporting:
   a) An improved user interface that is expected to be more intuitive, distinguishing between
      i) The “Inventory View”, giving as read only direct access to all facilities (formerly: point sources), area sources and the resulting emissions
      ii) The “Facilities View”, allowing the user to define, edit and delete all facility (point source) information
      iii) The “Area Sources View”, allowing the user to define, edit and delete all area source information
   b) Data collection in the framework of the EU IPPC/EPER directive (see #@#)
   c) Storage of the economic sector classification with every record
   d) An improved input QA/QC report, allowing the user to produce overviews of (a selection) of all activity rates and emission factors used.
2) The new version of ReportER now supporting the production of reports in
   a) The Common reporting Format (CRF) of UNFCCC (#@#)
   b) The New Reporting Format (NFR) as defined within the UNECE CLRTAP convention (#@#)
   c) Reports of facility level and economic sector level emissions; these reports have not yet some final agreed format, but are present now as first drafts.
3) The new tool EstimatER, implementing an expert system for the estimation of emissions for
   a) Emissions of greenhouse gases from, agriculture, using the 1996 revised IPCC Guidelines
   b) Emissions of CO2 due to combustion of energy, using he so-called Reference Approach of the IPCC Guidelines

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 CollectER and ReportER for a virtual country called Middle Earth. This country is derived from the novel The Lord of the Rings by the Oxford storyteller JRR Tolkien.

ETC-ACC provides the sample inventory for Middle Earth 2000 in a MS Access file called MiddleEarth2000.mdb. Chapter 2 of this document assumes the availability of this database to the user of this report.

This document replaces an earlier version, published by EEA as Technical Report 33 (November 1999). Experienced users of **Collect*ER*** are recommended to read section 3.3 where the new interface is described in detail. Most other functions are only marginally changed.

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-ACC

Tinus Pulles

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# 1 INTRODUCTION

## 1.1 Background

The **Collect*ER*** ,**Report*ER*** and **Estimat*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. They have been developed over the last 10 years, originally as a dBase oriented system CORINAIR94, and later as an integrated set of MS Windows tools.

These tools have been prepared by the European Topic Centre on Air and Climate Change (ETC-ACC) as part of the work on CORINAIR (CORe INventory for AIR emissions) for the European Environment Agency. They have been further developed as part of the tasks under Specific Agreements 2 and 4 o the IDA programme (Framework Contract No 501 998) as the Air Emissions Data Exchange Module AE-DEM.

This section gives background information on the framework for which the CORINAIR (CORe INventory for AIR emissions) system, including these software tools, has been developed the past years by EEA and ETC-ACC.

All tools are available free of charge from the ETC-ACC web site at (http://etc-acc.eionet.eu.int/tools).

## 1.2 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) : SO2, NOx, CO2, CH4, NMVOC, CO, NH3, heavy metals (HMs), POPs and particulkatye matter.
- ✓ UN Framework Convention on Climate Change : CO2, CH4, N2O, HFCs, PFCs and SF6;
- ✓ 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 EU member states emissions.

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

- ✓ EC Monitoring Mechanism of Community CO2 and other Greenhouse Gas Emissions (93/389/EEC), amended by Council Decision of 26 April 1999 amending Decision 93/389/EEC for a **monitoring mechanism** of Community CO 2 and other greenhouse gas emissions (1999/296/EG);
- ✓ Large Combustion Plant Directive (88/609/CEC), recently amended by directive 2001/80/ec of the European parliament and of the council of 23 October 2001: $SO_2$ and $NO_x$ (plants with a capacity larger than 50 MW).
- ✓ IPPC Directive (96/61/EC) (Polluting Emissions Register) and EPER Decision (#@#).
- ✓ The National Emission Ceilings Directive (directive 2001/81/ec of the European parliament and of the council of 23 October 2001)

The reporting requirements for each of the two main conventions (UNECE / CLRTAP and UNFCCC / CRF) are different. One of the main differences is the source categories used, on various levels of aggregation. UNECE / CLRTAP uses 11 main source categories, or NFR level 1 ("New Format for Reporting"; equal to the 11 main source sectors defined by SNAP, Selected Nomenclature for sources of Air Pollution), for which reporting is required. From Dec. 2001 countries are asked to report the emissions from approximately #@# source sub-sectors (or NFR level 2). On the highest level of aggregation UNFCCC / CRF 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 CRLTAP requires every five years reporting of geographically disaggregated emissions (in NUTS3 to be gridded or directly in grids, 50x50 km) mainly for use in the EMEP atmospheric transport/chemistry models.

## 1.3 AE-DEM

### 1.3.1 A bit of history: CORINAIR

The CORINAIR system has been developed since the mid 1980s to support participating countries in preparing emission inventories complying with international obligations. The activities of the CORINAIR programme have been closely related and supported by the EMEP Task Force on emission Inventories and Projections (TFEIP).

The CORINAIR programme consisted of two parts:

1) The development of a standardized methodology, allowing strong harmonization between countries and between the different international obligations. This has resulted in the publication of the CORINAIR / EMEP Guidebook on Emission inventories[1]. The third edition of the Guidebook is underway.
   The definitions and methods as described in this guidebook are consistent with the methods and definitions as given in the 1996 Revised IPCC Guidelines[2]. Further standardisation and harmonisation is developed as part of ETC-ACC's contribution to TFEIP and to activities within the IPCC Greenhouse Gas Inventories Programme and the development of reporting and review guidelines by UNFCCC.
2) The development of a set of software tools and database definitions (AE-DEM), that can be used by countries to compile their national emissions inventory and to report to the various conventions from this database.

The AE-DEM has originally been developed as a dBase application. Since 1996 this dBase application has been replaced by a set of mutually related MS Windows software tools, using an MS Access database structure. Version 2 of this system now is available to the user. This document is adapted from the earlier publication of **Train*ER*** to users of this version 2.

[1] EMEP/CORINAIR Atmospheric emission inventory guidebook - Second edition, Technical report No 30, EEA, Copenhagen 1999

[2] Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, JT Houghton, LG Meira Filho, B Lim, K Treanton, I Mamaty, Y Bonduki, DJ Griggs and BA Callender (Eds) IPCC/OECD/IEA Paris 1996.

### 1.3.2 New functionality in Collect*ER* and Report*ER* Version 2

The new version of **Collect*ER*** now supports:

1) An improved user interface that is expected to be more intuitive, distinguishing between
   a) The "Inventory View", giving as read only direct access to all facilities (formerly: point sources), area sources and the resulting emissions
   b) The "Facilities View", allowing the user to define, edit and delete all facility (point source) information
   c) The "Area Sources View", allowing the user to define, edit and delete all area source information
2) Data collection in the framework of the EU IPPC/EPER directive (see #@#)
3) Storage of the economic sector classification with every record
4) An improved input QA/QC report, allowing the user to produce overviews of (a selection) of all activity rates and emission factors used.

The new version of **Report*ER*** now supports the production of reports in

1) The Common reporting Format (CRF) of UNFCCC (#@#)
2) The New Reporting Format (NFR) as defined within the UNECE CLRTAP convention (#@#)
3) Reports of facility level and economic sector level emissions; these reports have not yet some final agreed format, but are present now as first drafts.

In addition a new tool **Estimat*ER*** is published. This tool presents to its user an expert system, providing all necessary methods to estimate emissions in a certain sector, exactly following the methods as presented in Guidelines or Guidebook. At present this tool is available for the IPCC sector Agriculture and for the Reference Approach for $CO_2$ emissions Energy (1996 revised Guidelines).

## 1.4 The AE-DEM system

### 1.4.1 Annual national CORINAIR inventories

The AE-DEM is an annual system, collecting repeatedly 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 for where applicable and available.

### 1.4.2 Modular design

The AE-DEM 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-ACC to NRCs in 1996.

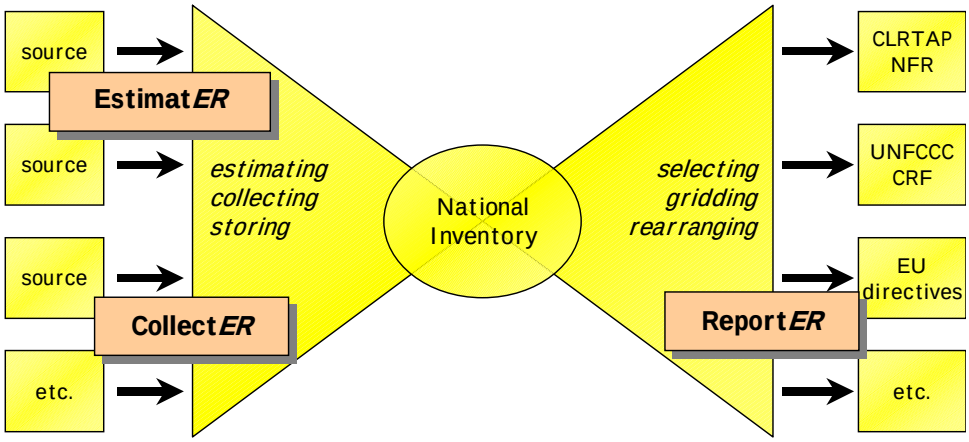



**Figure 1-1 The national AE-DEM: different tools for different tasks**

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 1-1. 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 ETC-ACC. This data is then stored in a nationally held database (**Collect*ER***). 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.
   a) The **Estimat*ER***'s are sector 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. COPERT3 (Computer Programme to estimate Emissions from Road Transport) is an **Estimat*ER***. In 1997/1998 ETC-ACC has developed COPERT2 for estimating emissions from road transport and made it available to NRCs in 1998 (see two ETC-ACC Technical Reports on COPERT2).
   b) 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-ACC 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-ACC.
2) **Data reporting phase**: **Report*ER*** has been and will be further developed to operate on the national databases directly. **Report*ER*** will, as much as possible, directly produce the tables as required by UNFCCC CRF and UNECE CLRTAP NFR and other reporting requirements, from the national database as stored by the tool **Collect*ER***.

Below shortly the basics of the **Collect*ER*** database structure are described. Details are described in the technical manual (version 2.0 #@#).

## 1.4.3 The database

### *1.4.3.1 Highest data level*

Figure 1-2 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.

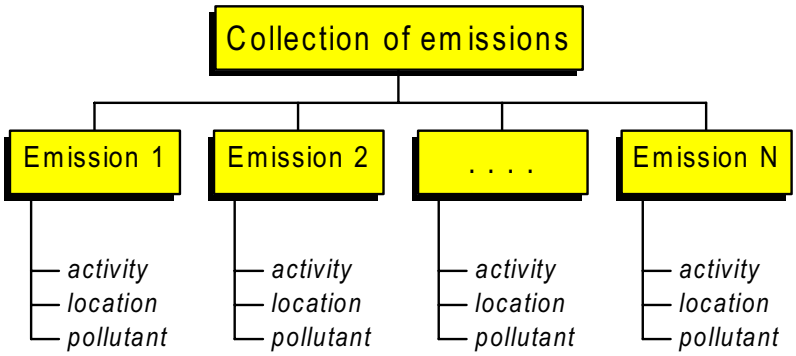



**Figure 1-2 - The INVENTORY contains emission data**

Since it is decided to store also emission factors and activity rates, the situation is a bit more complex (see Figure 1-3). 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.

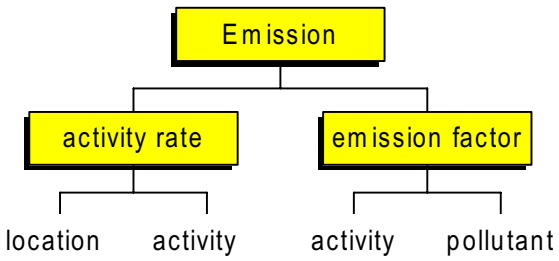



**Figure 1-3 - Emission = (activity rate) x (emission factor)**

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 1-2.

#### *1.4.3.2 Deeper data levels*

Figure 1-4 and Figure 1-5 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.

#### 1.4.3.3 *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:

1. its code which should be a unique identifier; in **Collect*ER*** the NUTS code is used for this
2. its name;
3. a set of co-ordinates, localising the location on a map; and
4. a parent location, allowing for aggregation.

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

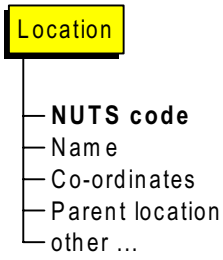



**Figure 1-4 Attributes of the entity LOCATION. Bold printing indicates a unique identifier**

#### *1.4.3.4 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. its name;
2. its SNAP-code or an equivalent indicator;
3. its fuel used, which might be an fuel indicator or empty if the activity is not energy related; and
4. its unit in which the 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;

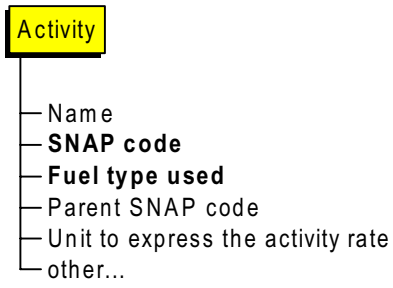



**Figure 1-5 Attributes of the entity ACTIVITY. Bold printing indicates (combination to) a unique identifier**

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 1-5.

At this point it is stressed that in the AE-DEM 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.

#### 1.4.3.5 *Pollutant*

The entity POLLUTANT might have such attributes as:

1. a name
2. a unit (e.g. tons/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.

### 1.4.4 The modules

Above the AE-DEM 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. Table 1-1 lists a number of such modules, their respective purposes and the intended users.

**Table 1-1 Modules in the AE-DEM**

| name | purpose | intended users | status (February 2002) |
|---|---|---|---|
| **Collect*ER*** | Tool to collect a national emission inventory | national reference centres | version 2.0 available and published on ETC-ACCs web site |
| **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 | Copert3: available (2001) **Estimat*ER*** published on the ETC-ACC web site for the sectors Agriculture and Energy (Reference Approach) |
| **Report*ER*** | Extracts and presents data from the national (national reference centres) or combined (ETC-ACC) emissions inventories in a number of predefined formats (spreadsheets):<br>• UNFCCC CRF<br>• UNECE CLRTAP NFR<br>• LCP directive<br>• IPPC/EPER | national reference centres, ETC-ACC | Version 2 published on the ETC-ACC web site. |

### 1.4.5 Limitations of the new system

Although the AE-DEM 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 and store these data in the sector “Industrial Combustion”, in another it would be seen as the feed stock in a waste treatment plant and store these data in the sector “Waste treatment”.

## 1.5 Future developments

### 1.5.1 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 (EPER). A national EPER 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.

In the present version 2 of the tools, additional fields are added to the source definitions, allowing the user to input the IPCC source category, NOSE code and NACE codes. The system has to be a bit further adapted to also be able to output this information as requested by the IPPC / EPER reporting obligations, which will come into effect by 2003.

### 1.5.2 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. Furthermore, both UNFCCC and UNECE CLRTAP request time series of emission inventories. Some users have developed MS Access queries that extract such data from a series of annual **Collect*ER*** format databases. When users so request, ETC-ACC could develop a special tool to this purpose.

### 1.5.3 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. A first trial version of a user interface has been developed.

## 1.6 Availability of the software and support

### 1.6.1 CORINAIR participants

The AE-DEM has been developed for the participating countries in the CORINAIR project and is available at ETC-ACC web site at (http://etc-acc.eionet.eu.int/tools), including the documentation needed to run the tools.

For any general questions on the software the contact point is the ETC-ACC, Tinus Pulles, email mailto:pulles@mep.tno.nl.

Help desk and other support is provided on behalf of the ETC-ACC by Spirit Inc. (mailto:xspirit@savba.sk) in Bratislava to the participating countries upon request.

### 1.6.2 Other users

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

1) they should 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) they should 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 ReportER facilities directly.

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

# 2 BUILDING A NATIONAL INVENTORY USING AE-DEM

## 2.1 An example inventory for Middle Earth

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

Figure 2-1 gives a map of the region and Table 2-1 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).


**Figure 2-1 A map of Middle Earth and longitude/lattitude co-ordinates** (the map is adapted from http://www.users.wineasy.se/claesbe/fantasy/tolkien/rings/)

**Table 2-1 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, Diary 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 |

Based on this description a (limited) 2001 inventory (in 1997 SNAP definitions) has been prepared for training purposes. The data in the inventory are based on data available in a number of real inventories. The resulting country is meant to be rather divers and not too large and detailed. The inventory for 2001 contains data on the activities as given in Table 2-2 and Table 2-3.

**Table 2-2 Available area sources in the Middle Earth 1997 inventory as delivered by ETC-ACC.**

| SNAP | Description | 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 | Extraction and 1st treatment of solid fossil : Underground mining | | |
| 100401 | Enteric fermentation: Dairy cows | | |
| 100402 | Enteric fermentation: Other cattle | | |
| 100403 | Enteric fermentation: Ovines | | |
| 100404 | Enteric fermentation: Fattening pigs | | |
| 100405 | Enteric fermentation: Horses | | |
| 100407 | Enteric fermentation: Goats | | |
| 100408 | Enteric fermentation: Laying hens | | |
| 100501 | Manure management regarding organic compounds: Dairy cows | | |
| 100502 | Manure management regarding organic compounds: | | |

| SNAP | Description | Fuel | |
|---|---|---|---|
| | Other cattle | | |
| 100503 | Manure management regarding organic compounds: Fattening pigs | | |
| 100505 | Manure management regarding organic compounds: Ovines | | |
| 100506 | Manure management regarding organic compounds: Horses | | |
| 100507 | Manure management regarding organic compounds: Laying hens | | |
| 100511 | Manure management regarding organic compounds: Goats | | |

**Table 2-3 Available point sources in the Middle Earth 1997 inventory as delivered by ETC-ACC.**

| 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 Diamants | 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 2000 inventory is copied into the **Collect*ER*** software tool as the first estimate for the 2001 inventory. The values of the 2000 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.

## 2.2 Updating the 2000 inventory for the year 2001

### 2.2.1 Overall procedure

We will use the database for Middle Earth 2000 to show the different changes the user can include, while updating the 2000 inventory to the 2001 inventory. After competing the update, we will produce the CRF and NFR reports 2001 for the country, as far as they can be completed automatically from the AE-DEM tools.

This task is assumed to consist of three consecutive steps:

| | | *Section* |
|---|---|---|
| *Step 1:* | Copy the 2000 inventory into a new database for the year 2001 | 3.1 page 21 |
| *Step 2:* | Updating the data in the inventory: activity rates and emission factors for both area sources and facilities (in earlier versions of the tools called "point sources") | 3.3 page 30 |

*Step 3:* Producing the CRF and NFR Excel spreadsheets from the database. 4 page 56

In addition, chapter 5 will describe the possible use of the new expert system **Estimat*ER*** while estimating emissions of the Agriculture sector and by using IPCC's Reference Approach for carbon dioxide emissions from energy.

### 2.2.2 Detailed list of actions explained in the example

The table below presents a list of all actions described in the next chapter. The reader can use this table to find examples of most actions he or she is planning to undertake, while updating an existing inventory for the new year. This assumes the availability of such an earlier inventory.

If such an inventory is not available, the user can start from scratch and will primarily need adding facilities, processes within facilities, area sources and emission factors. For each of these examples are given below.

| *Change in 2001* | *Example* | *Page* |
|---|---|---|
| **Open a new inventory** | The 2000 inventory for Middle Earth is copied into a new inventory for 2001 | 21 |
| **Update facility activity rates** | Production in the Saruman Power plant changed by +10, +5 and –10% for the three boilers in 2001 as compared to 2000 | 33 |
| **Update facility emission factors** | One of the boilers of the North East Power facility (boiler 1) is equipped with low $NO_x$ burners, resulting in a 40% lower emission factor for $NO_x$ | 34 |
| **Define a new facility** | A new municipal waste facility is included in the inventory; this facility has one process in place: a municipal waste incinerator | 34 |
| **Entering emissions for a process** | The new waste incinerator has measured values for some pollutants and others are estimated, using activity rate and emission factors. | 37 |
| **Emissions by stacks** | Two stacks are defined for the Saruman Power plant and emissions for all three boilers are channelled through these stack | 41 |
| **Updating area source activities** | Due to a cold winter, the emissions due to heating of private houses increased | 44 |
| **The spatial distribution of emissions is changed** | In one county of Middle Earth, using agricultural wastes for heating purposes is stopped. In this area, this fuel is replaced by wood. | 45 |
| **Adding a new area source** | A new low methane underground coalmine is established in the country. This source is added as an area source | 46 |
| **Spatially disaggregate activity rates** | A new source is introduced in the inventory, describing the Hobbits painting their wooden houses. Only a national total emission is available, which is distributed using the population density. | 51 |

**…**

# 3 THE Collect*ER* TOOL

## 3.1 Starting a new inventory

When starting a new inventory, two possibilities exist:

1) The new inventory is the next one I a series, where the inventory for an earlier year has been produced in the **Collect*ER*** format. In this case we start the new inventory by copying it into a new database for the new reporting year. The user can choose to copy all activity rates and emission factors into the new database. The values of the original database will however also be stored in the database for comparison. The data for the new year can be modified. The earlier year data cannot be modified.
2) No earlier inventory exists and the new inventory is to be built from scratch. In this case the process is started by copying a "blank" database into the new inventory. A blank database is delivered with the installation set of **Collect*ER*** under the name "blank97.mdb".

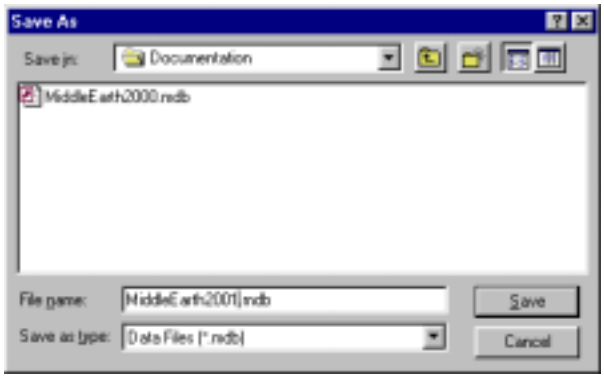
To start a new inventory the following steps are needed (we assume here that an earlier version is available):

*Step 1:* Start the **Collect*ER*** programme and select the inventory by clicking the menu item **File | Open database**; the standard Windows95 open file dialogue pops up; find and select the **MiddleEarth2000.mdb** database and click **Open**[3]. By doing so, the Middle Earth database for 2000, as provided with this document is opened for use.

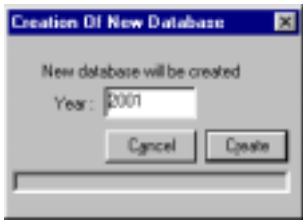
**Collect*ER*** remembers the database used in the previous run and automatically opens the main window. In this case the **File** menu is disabled. If so, you first need to close the main window by clicking on the **Close** button of this window (see below). After the first installation, no database is opened and the **File** menu is enabled.

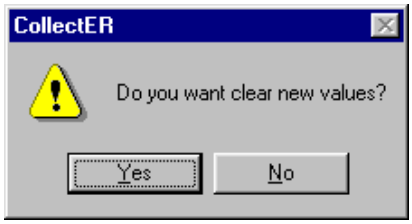
[3] To start a blank database, select **Blank97.mdb.**

*Step 2:* Click on **File | New database** and the standard windows save dialog as shown below will appear.




Type "Middle Earth2001" in the file name edit box and click on **Save**. A dialog will appear where the user can enter the new inventory's base year. Type "2001" and click on **Create**. After a few moments a new dialog will appear, asking whether or not the values for the new year should be cleared. Click **No** to copy the 2000 values into the new database.



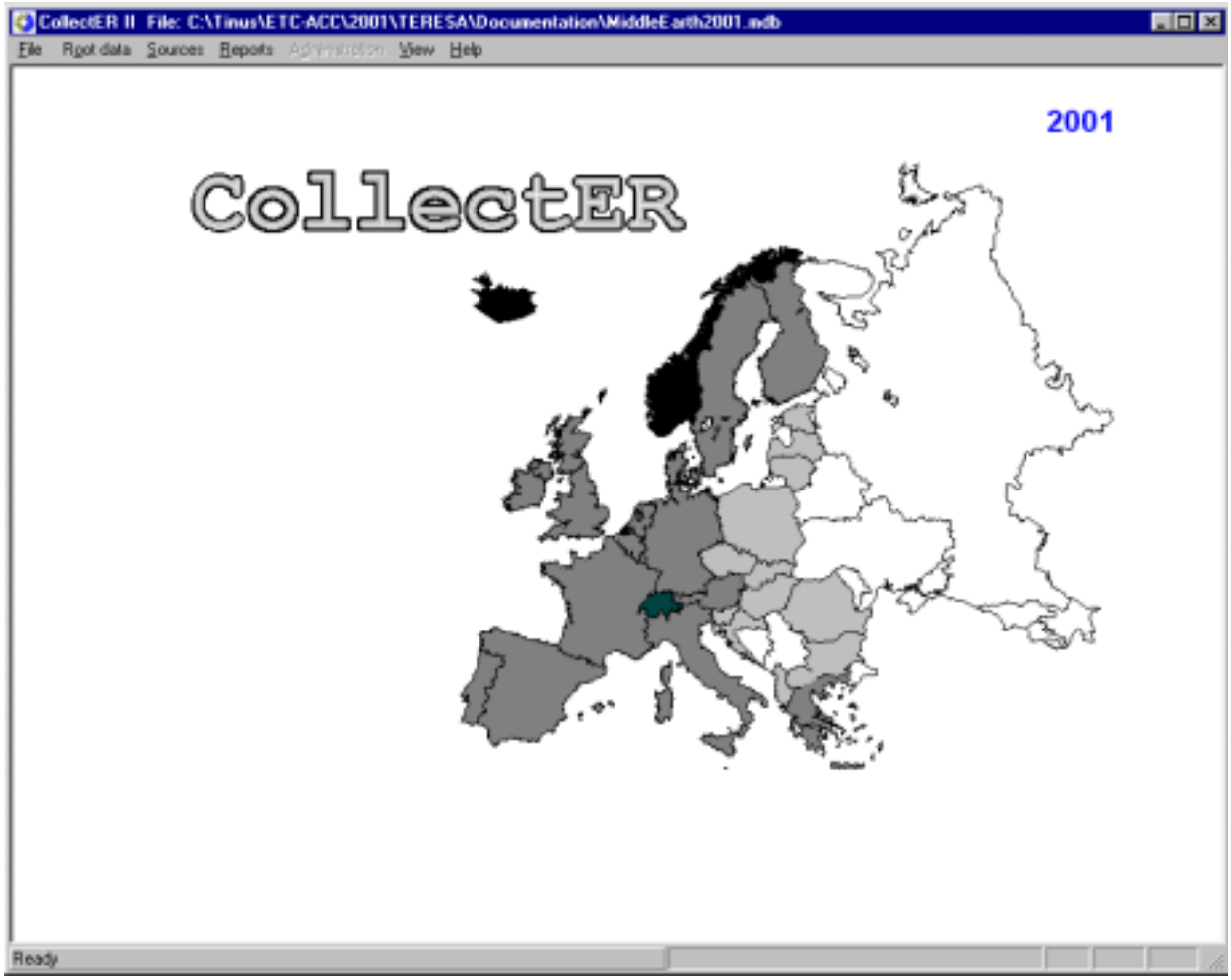




After a few more moments, **Collect*ER*** will report the successful creation of a new inventory and the new base year will appear on the screen.

This procedure now has copied the existing inventory into a new database and has set the base year to 2001. All values for the base year 2000 have been copied into the new database as first estimates of the values for 2001. Furthermore the 2000 values have been copied as "old values" into the database and will be visible to the users during data entry.

If the user has started from the "Blank97" database, obviously no activity rate and emission factor data are available and the user has to build the inventory from scratch.

In the case of MiddleEarth2001 the **Collect*ER*** window should look as copied below.




The **Collect*ER*** window shows the following main menu options:

| | |
|---|---|
| **File** | The usual Windows help menu, allowing opening and creating databases etc. |
| **Root data** | Giving access to the definition tables of all dimensions of the inventory (geographical, sectors, pollutants and a range of auxiliary tables) |
| **Sources** | The main window, used for input and updating of the inventory data |
| **Administration** | Disabled for the normal user |
| **QA/QC Reports** | Producing overviews of input data. |
| **View** | Switches status bar on and of |
| **Help** | Access to the **Collect*ER*** help file. |

## 3.2 Root data: definition tables

The root data are divided in three groups:

1) Base data
   a) Pollutants
   b) Territorial units
   c) SNAP
   d) Splits
   e) Fuels
2) Auxiliary data
   a) Conversions
   b) Units
   c) Comments
   d) Default activities and Emission factors
3) Surrogate data
   a) Surrogate data types
   b) Surrogate data
   c) Allocation formulae

### 3.2.1 Base data

#### *3.2.1.1 Pollutants*

The system contains all pollutants that are required for reporting under the NFCCC and UNECE CLRTAP conventions. 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 these reporting obligations.

#### *3.2.1.2 Territorial Units: NUTS*

Figure 3-1 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 all check box will fully expand the tree. 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.

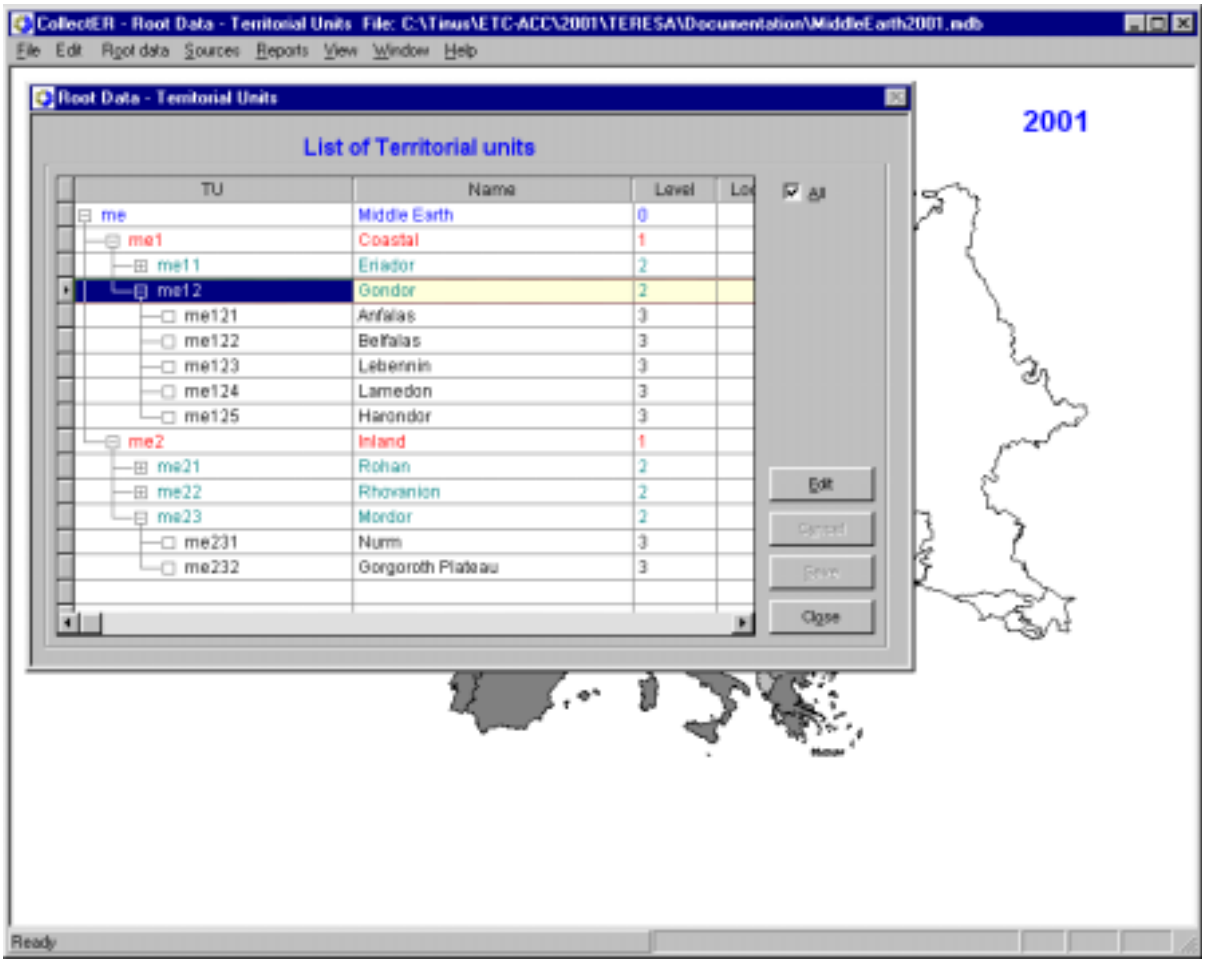



**Figure 3-1 Root data - Territorial Units window**

### *3.2.1.3 SNAP*

**Collect*ER*** is preloaded with the SNAP nomenclature that is relevant for the base year of the current inventory. The user might need however some kind of split within an activity to allow for input of different varieties of one single technology. 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 section 0). The SNAP definition window is shown in Figure 3-2. It behaves similar to the NUTS definition window. Column widths can be changed by clicking and dragging the column header separators.

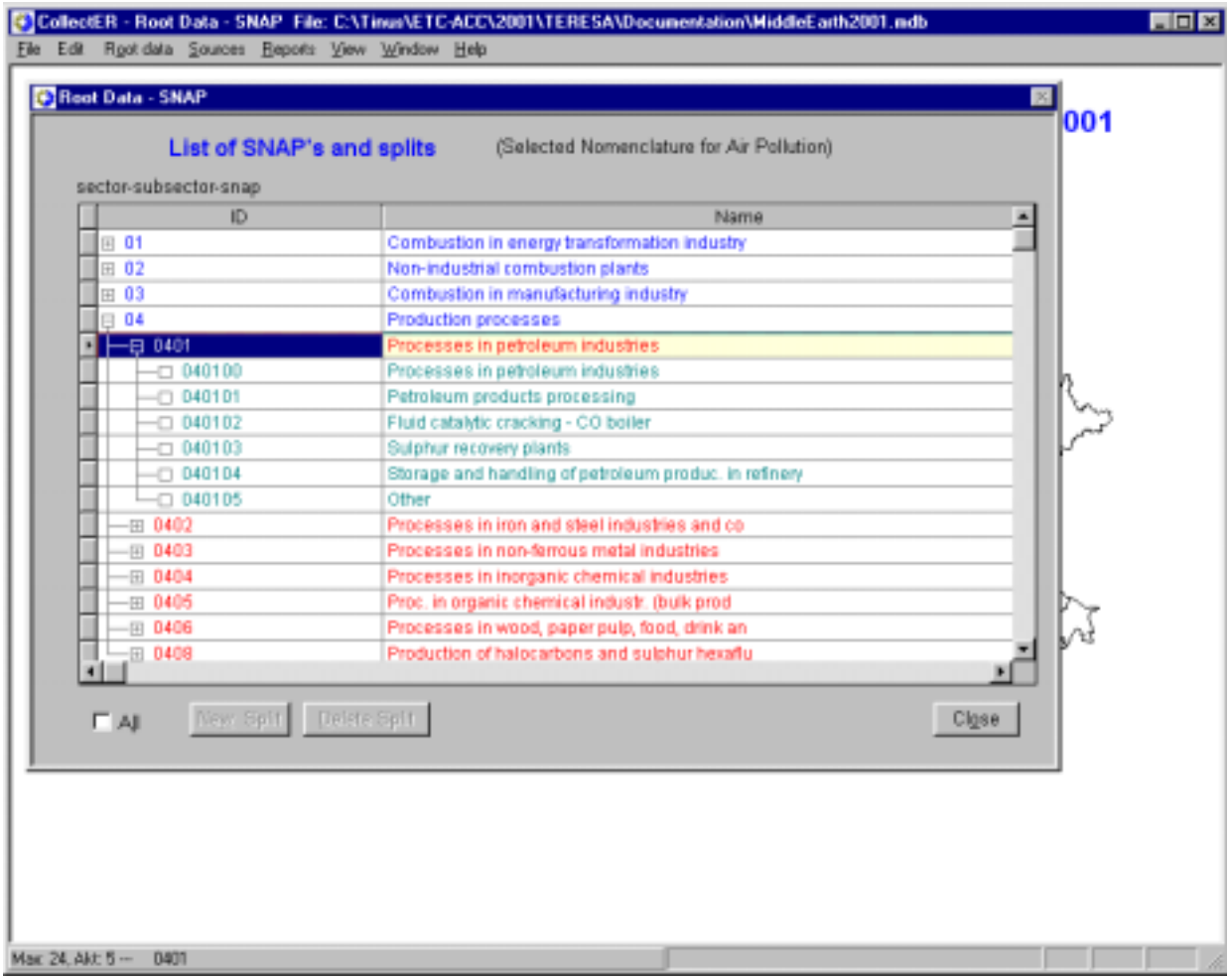



**Figure 3-2 SNAP definition window**

### *3.2.1.4 Splits*

The table of splits is meant to enable the user to define different varieties of a certain SNAP and fuel combination, whenever he or she needs such. 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 dialog window below. We will show the use of splits in section 3.3.3.1.

The earlier version of the database contained a large set of predefined splits. These have been removed in the blank database, now delivered with the installation set. All splits defined in earlier versions of the database are included automatically when earlier versions of existing databases are converted. Hence they still are available for the user.

### *3.2.1.5 Fuels*

To allow fuels with different properties (S-content, ash content and the like) within comparable fuel groups, fuels are defined in a two level hierarchical structure. The fuel group implements the NAPFUE fuel codification.

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.

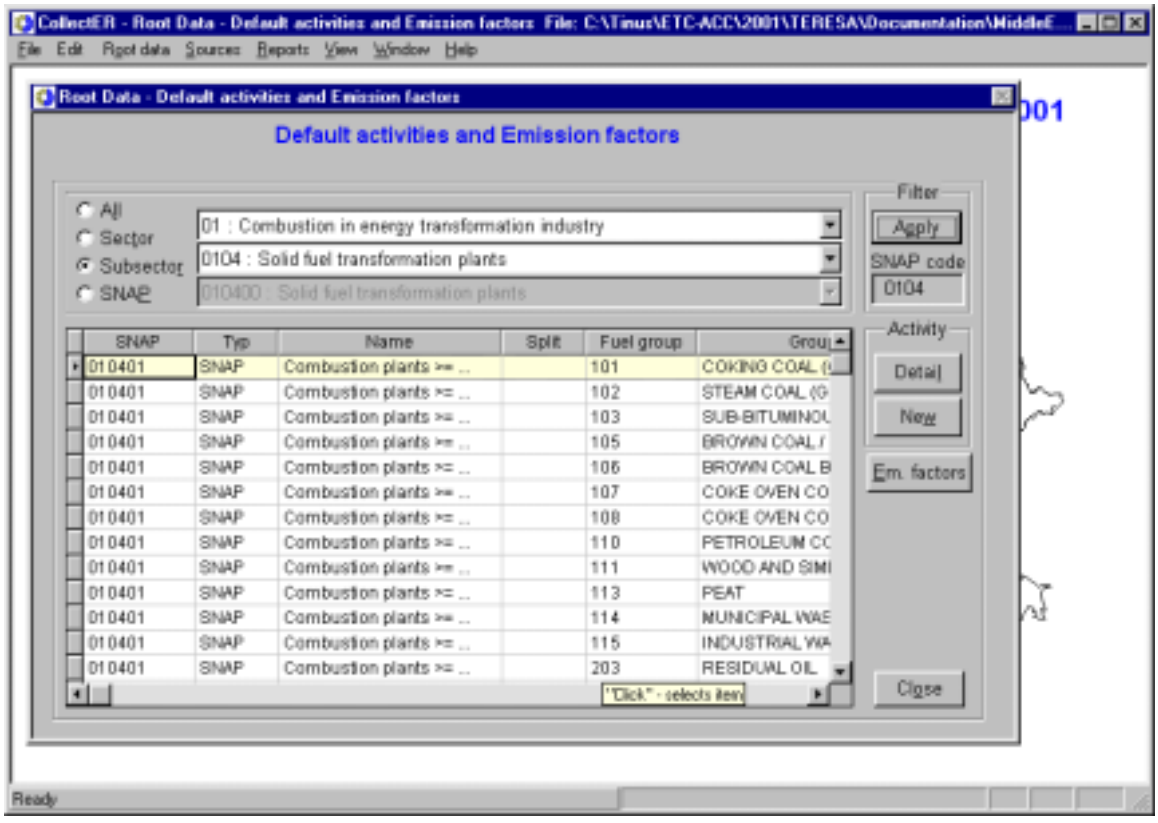
The user also can define new fuel groups, if needed. This however is not recommended, since the NAPFUE nomenclature, that is available as fuel groups, should allow for all possible fuels in the system.

## 3.2.2 Auxiliary data

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

### *3.2.2.1 Default Emission Factors*

The system allows and organises the use of default emission factors. As indicated in section 3.2.1.5 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 0104 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 section 3.3.3.1), **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 $SO_2$.

Some caution is needed here. The default emission factor table, available in the software now is old and incomplete due to limited resources.

## 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.

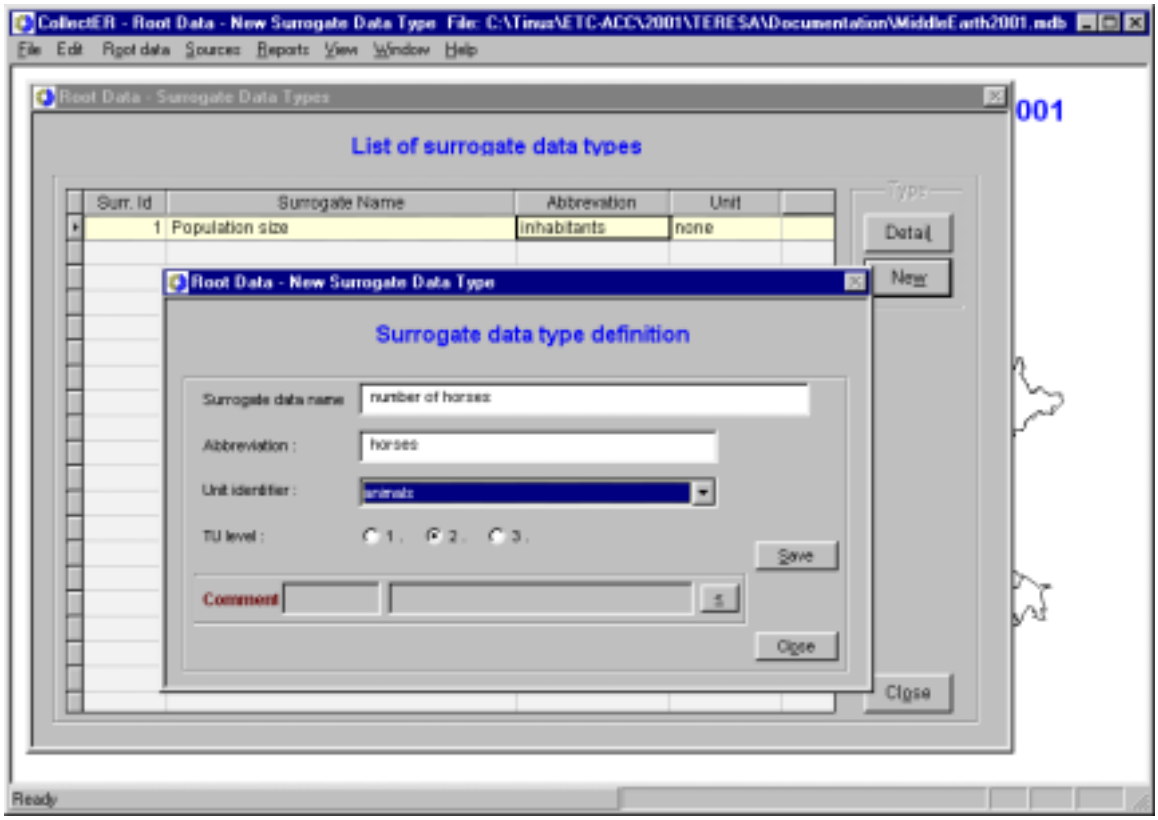
*Step 2:* Enter the surrogate data. Surrogate values can be entered for all territorial units at the level at which the data type is defined. If no data is entered for a certain region, a zero value is used.

The **Collect*ER*** database is preloaded with more than 30 surrogate data types. None of them are at present preloaded with data.

*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.

### *3.2.3.1 Surrogate data types*

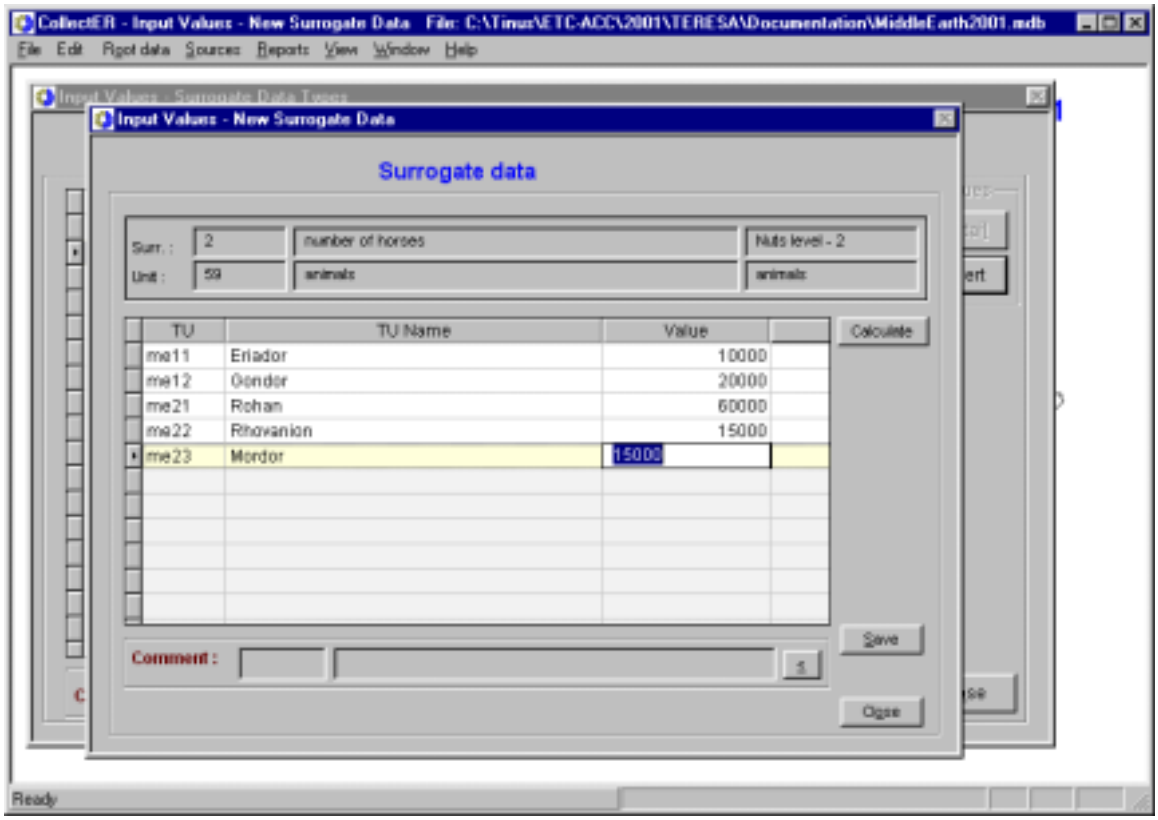
The surrogate data types table contains upon first use of the programme some 33 predefined surrogate data types, all supposed to be available at the lowest level of NUTS. The dialog window reproduced below shows the detail dialog for the surrogate data type “horses” where the user decided to change the 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.

### *3.2.3.2 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 have been entered editing these can be done in the detail window by clicking on the **Detail** button.

#### *3.2.3.3 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 (section 3.3.3.3)

## 3.3 Sources: data entry

When **Collect*ER*** is started and an inventory is loaded automatically, the main window of the application will open automatically (see Figure 3-3). All emission factors and activity rates data entry functions of the tool are available from this window.

When **Collect*ER*** is started for the first time, no inventory is loaded. The user then has to use the **File | Open database** menu item to open a database and to click on the menu item **Sources**.

### 3.3.1 Inventory view

The user interface of **Collect*ER*** version 2 has been changed considerably as compared to version 1. Both from responses of users during presentations and training courses and in response to some questions to the helpdesk,

it was concluded that the separation between source definitions and data entry was felt as not very intuitive. Furthermore navigating through the database could be improved.

Version 2 of **Collect*ER*** now has implemented the concept of "Views". This section describes the three views now available:

1) The **Inventory View (read only)**
2) The **Facilities view (input)** and
3) The **Area Sources View (input)**

The **inventory view** (Figure 3-3) gives an overview of all data stored in the inventory. The left part of the view allows the user to navigate through the inventory. The tree structure here follows the SNAP structure.

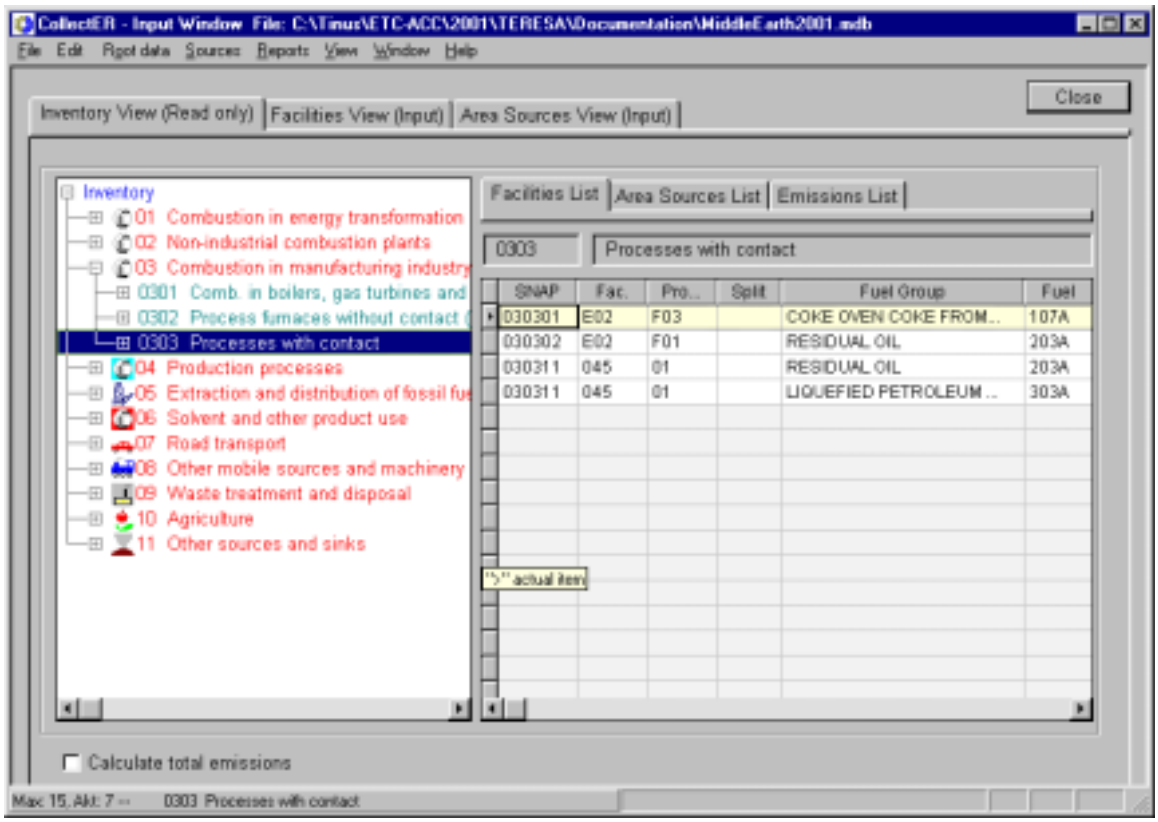



**Figure 3-3 The inventory view in the main window of Collect*ER***

The right part of the view shows the entries in the inventory under the SNAP selected in the left part. Three lists can be viewed by clicking on the relevant tabs:

1) **Facilities list**: lists all processes ("parts" in **Collect*ER*** version I) in all facilities ("point sources" in **Collect*ER*** I) that have SNAP codes within the SNAP selected in the left part
2) **Area Sources list**: lists all area sources defined within the selected SNAP
3) **Emissions list**: calculates and lists all emissions within the selected SNAP. This list is empty when the full **inventory** is selected in the tree, since this calculation would take a relatively long time.

The **Inventory View** is read only. To input, edit or delete inventory information, the user has to select the **Facilities view** or **Area Sources View** for facility (=point source) or area source data entry respectively.

## 3.3.2 Facility view

### *3.3.2.1 Viewing Facility data*

In the **Facilities view** (Figure 3-4) the user can add, edit and delete data on facilities. Again the left part of the view allows the user to navigate between facilities ("point sources" in **Collect*ER*** I) and the right part allows viewing different parts of the data set for the selected facility or process ("part" in **Collect*ER*** I) within the facility. In the figure the Lebennin Refinery is selected and the Activity rates are defined for all 4 processes within this facility as shown in the right part (**Activity rates** tab).

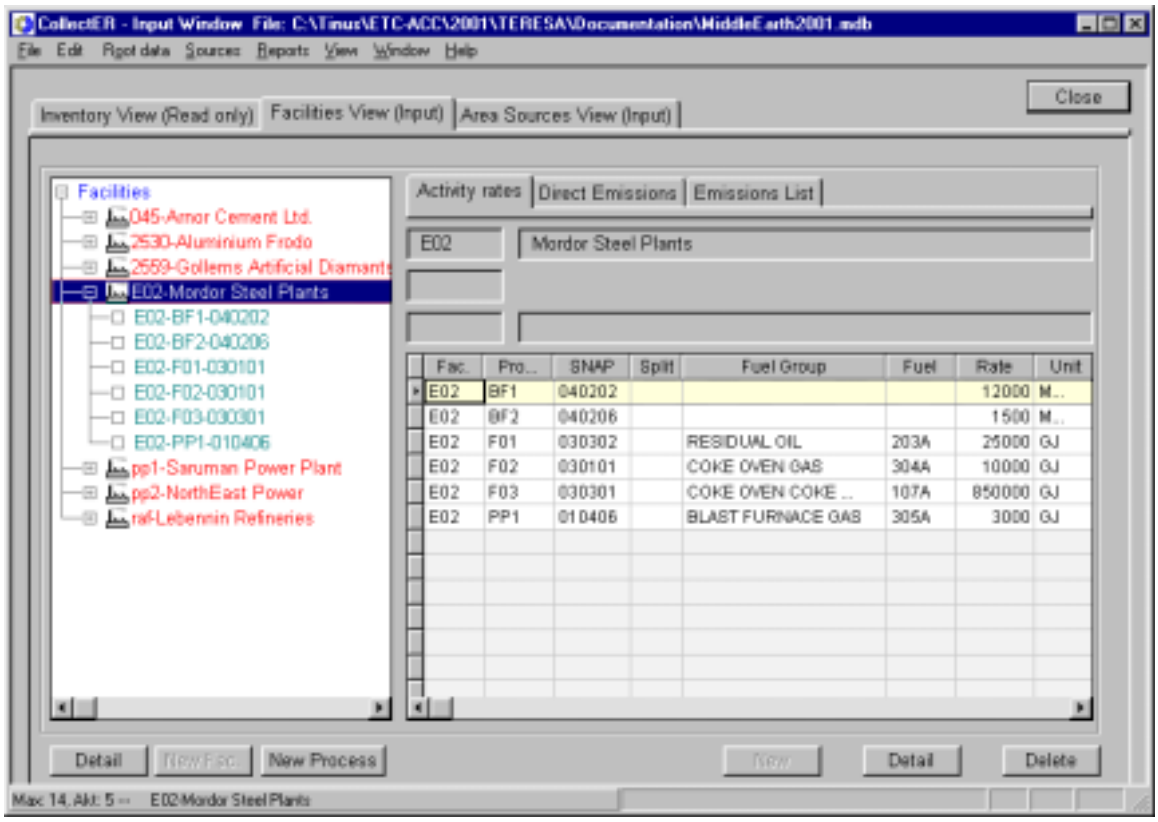



**Figure 3-4 The Facilities view in Collect*ER***

Details of the selected facility can be viewed and edited by clicking the **Detail** button underneath the facilities tree (left part). Details of the activity rate can be viewed by clicking the Detail button underneath the **Activity Rates** list (right). The functionality of these buttons will be explained below, where the introduction of a new facility into the database will be explained.

The buttons for both creating, deleting and viewing facilities, processes and activity rates are dependent on the selected entry ion the facilities tree. This functionality

1) A new facility can only be defined when the highest level in the tree "**Facilities**" (in blue) is selected. (#@# Detail should be disabled here !!!). No new activity rates can be defined.

2) A new process within a facility can only be defined, when the facility is selected in the tree. The **Detail** button then will give access to (editing of) the details of the facility definition. No new activity rates can be defined.
3) When a process is selected, a new Activity Rate can be defined by clicking the **New** button underneath the activity rates list.

In a similar manner the user can view, edit and delete entries in the "**Direct Emissions**" and the **Emissions List**. The functionality for these tabs is rather self-explanatory.

The next sections will describe the definition of a new facility and entering emission data for it, which will also provide the information on how editing and deleting information that is already included in the inventory.

#### *3.3.2.2 Updating the activity rate*

The power produced by the Saruman Power plant in 2001 as compared to the 2000 values. This section will show how to update activity rates for this facility.

*Step 1:* Open the **Facilities view** in the **Collect*ER*** in the **Collect*ER*** main window and select the first boiler (pp1 – Bo1) of the Saruman Power Plant in the facilities tree at the left. Select the fuel **Steam Coal** in the **Activities** list at the right.

Click the **Details** button underneath the **Activities** list to open the **Facilities – Activity Rates** window (Figure 3-5),click the **Edit** button to bring the window in edit mode and update the activity rate to 110% of the old value = 46200 TJ.

Click **Save** to store the new value in the database and **Close** the window.

*Step 2:* Repeat these steps for the other fuel in the same boiler and similar for the other two boilers (+ 5% and – 10% respectively).

This concludes updating the activity rates for this facility. Note that the original value remains visible in the Details window for reference. This value is the one that was stored in the database from which the Middle Earth 2001 inventory was copied.

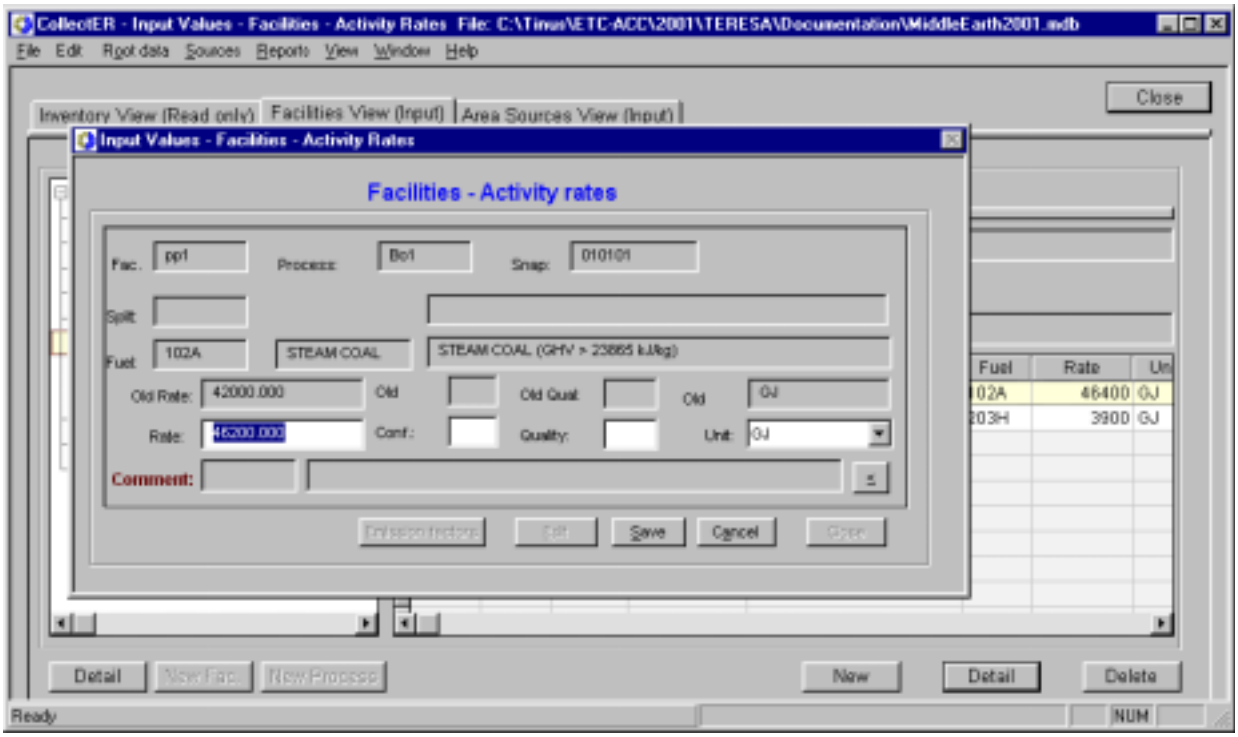



**Figure 3-5 Updating an activity rate for a process within a facility**

### *3.3.2.3 Updating emission factors*

Boiler 1 (Bo1) of the North East Power Plant has been equipped with a low $NO_x$ burner and hence the emission factor for this pollutant needs to be decreased by 40%. To do this, the following steps should be made:

*Step 1:* Open the **Facilities View** in the **Collect*ER*** main window and select boiler 1 of "**North East Power**" in the facilities tree to the left. Since this process only has one fuel connected to it, this fuel is automatically selected in the **Activities** list.

Click the **Details** button underneath the activities list to open the activity rate detail window and click **Emission factors** to open the **Facilities Emission Factors** window.

*Step 2:* Bring this window in edit mode by clicking the **Edit** button and update the emission factor for pollutant **002 nitrogen oxides (NO+NO2)** to 45 g/TJ (Figure 3-6)

Clicking **Save** and **Close** will store the new value in the database. Close also the Activities detail window.

Note that the emission factor is stored with the specific process. This means that by the method described here only the specific emission factor for the process and facility selected is updated. **Collect*ER*** does not provide a tool to update all facility emission factors with the same amount.

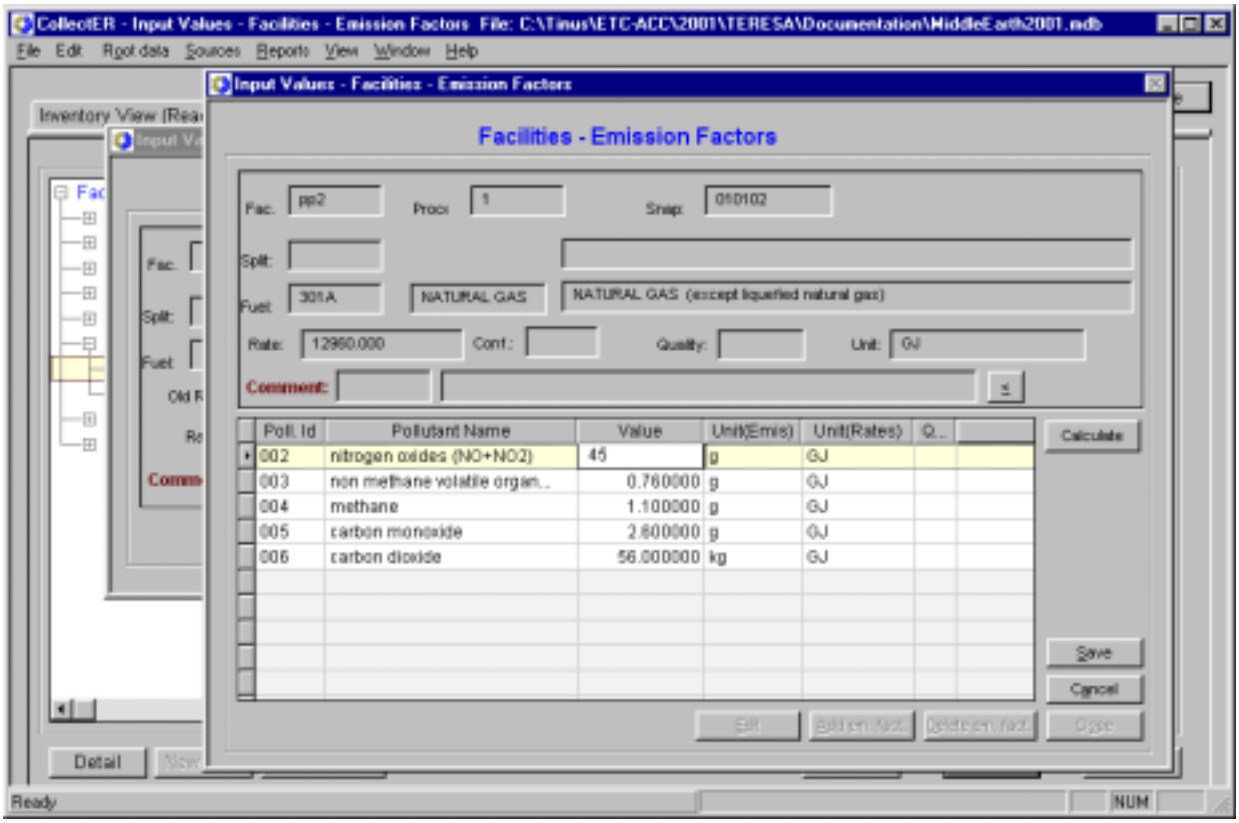



**Figure 3-6 Updating facility emission factors**

### *3.3.2.4 Adding a new point source*

In 2001 MiddleEarth opened a new waste incineration plant that has to be included in the inventory. Adding this new Municipal Waste Incineration Plant in Barad-Dur (Gorgoroth Plateau) works as follows:

*Step 1:* Open the **Facilities View** in the CollectER main window and select "**Inventory**" in the facilities tree to the left. The right part of the window will show a list of all activity rates connected to the processes in the facilities as stored in the inventory.

The **New Facility** button will be enabled only when the highest level in the tree is selected.

*Step 2:* Click on the **New Facility** button and a new **facility definition** window will open.
Enter the data in the relevant fields as indicated in Figure 3-7. Note that also an IPPC code and a NOSE code now can be attributed to the facility. Here the so-called "Main" IPPC code and the corresponding NOSE code should be entered4. Also the NACE code, connected to the facility should be given here.

This facility definition window can be re-opened for editing by selecting the facility in the tree and clicking on the Details button underneath the tree. Editing however can only be done, after switching

[4] See the IPPC / EPER Guidance document @#@

this window to edit-mode by clicking the **Edit** button. (This **Edit** button is not visible when a new facility is to be defined)

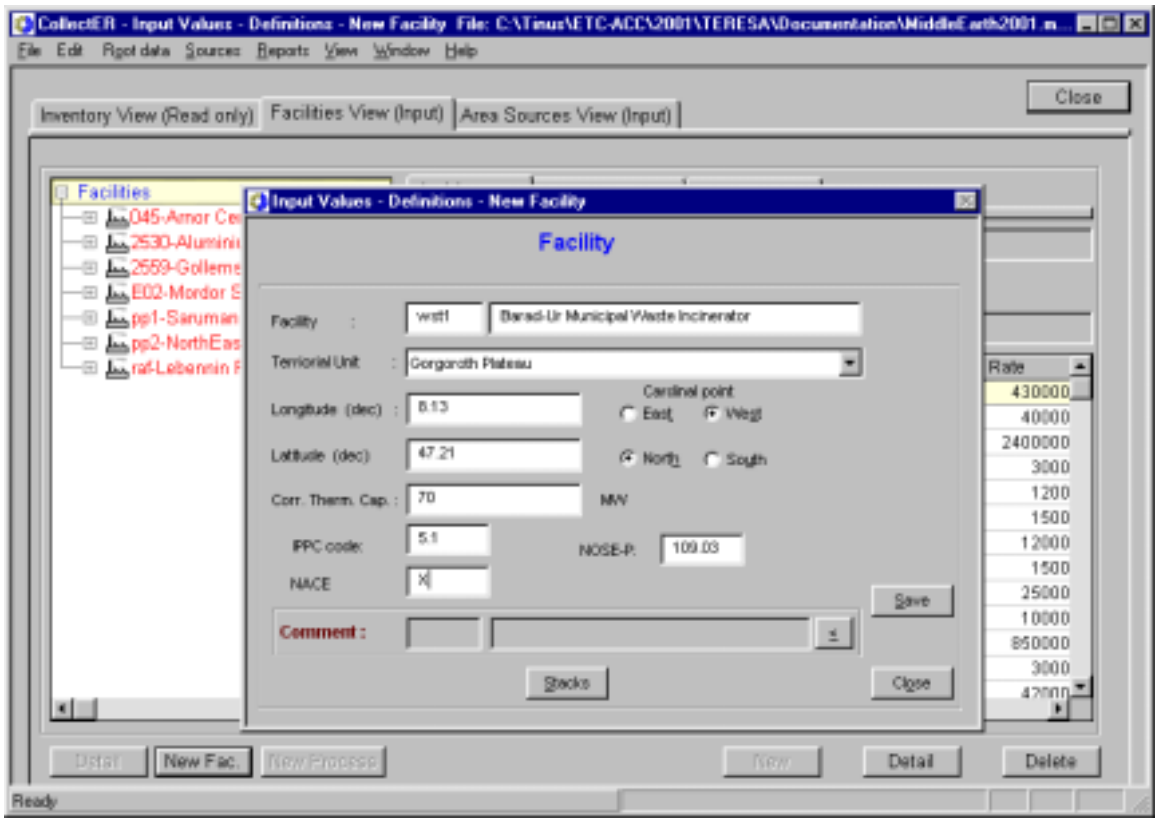



**Figure 3-7 Defining a new facility in the Facilities View**

Click **Save** and **Close** the Facility Definition window.

*Step 3:* Select the waste incinerator in the facilities tree. The **New Process** button will be enabled. Click on this button and the **New Part definition** window will be opened (Figure 3-8).
Select SNAP activity 090201, Incineration of domestic or municipal wastes, Part ID: 1. And select the **No** radio button for LCP. This defines this source as not being a Large Point Source as defined by the LCP directive.

If the user so wishes a comment can be added to the process by clicking on the button at the right of the comment boxes. **Save** and **Close** the part definition dialogue.

The user can add many processes to one single facility as is needed by repeating the above steps. Please take care that the process ID is unique within the facility for every process. **Collect*ER*** will issue a warning when the proposed ID is not unique.

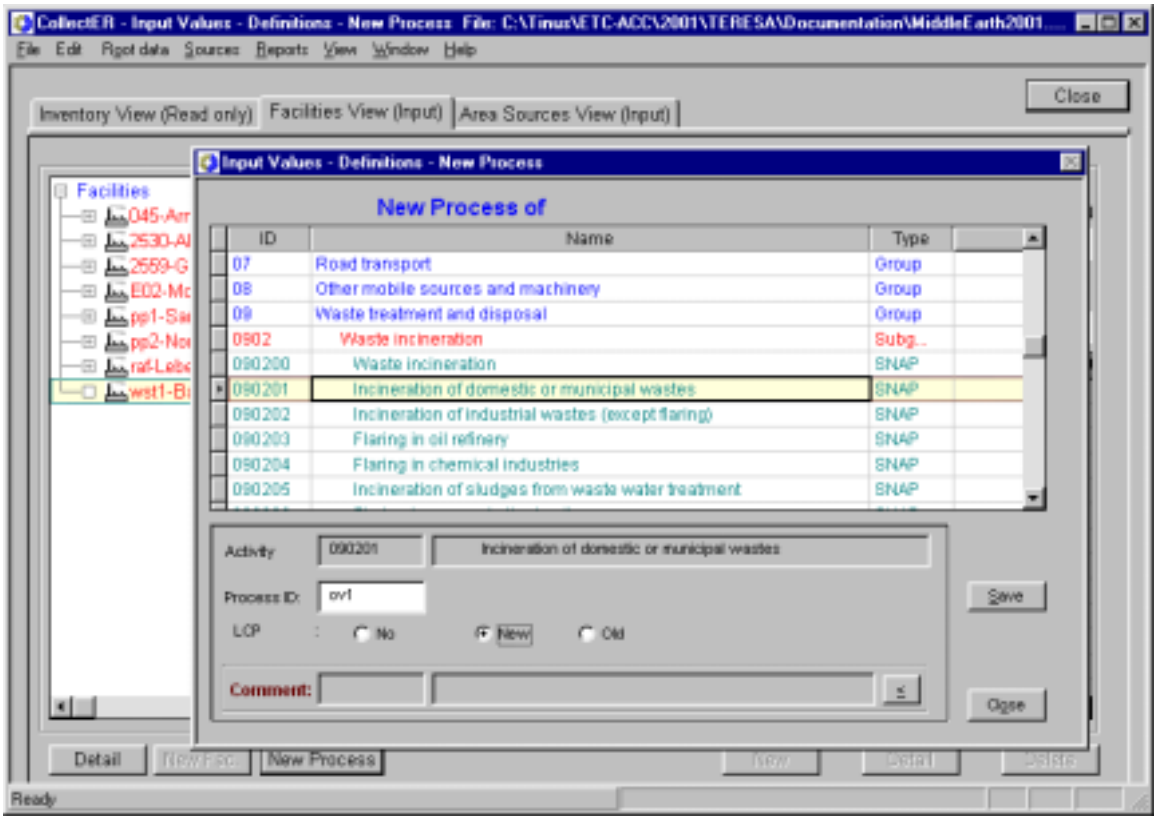



**Figure 3-8 Entering a new process to a facility**

The new point source and process should now be included in the facilities tree. Click the + sign in front of the Baradur Waste Incineration to see the process just defined. This concludes the new point source definition. Since no emissions or activity rates for the process within the facility is defined, the process will not appear in the list of **Activities** at the right part of the window. The next section will show how to connect new emissions to the process.

### *3.3.2.5 Entering new emissions*

Use the **New** button below the list of activities to enter new data for a process. This button will be enabled when a process is selected in the facilities tree. We will now enter emission data for the waste incineration process of the new facility.

*Step 1:* Select the process "wst1-1-090102" in the tree and click the **New** button below the list. This will open a window as reproduced below, presenting a list of fuels. Since we choose to not regard the waste incinerated here as a fuel unselect the checkbox in front of **Fuel**.
Set the unit to **Mg Waste** (see Figure 3-9). Click **Save** and **Close**.
This procedure can be repeated several times. This might be of use when in a combustion process more than one fuel is used.
Please note that you can only define multiple entries here, when each of them is connected to a different fuel. Similarly only one entry without a fuel is allowed.

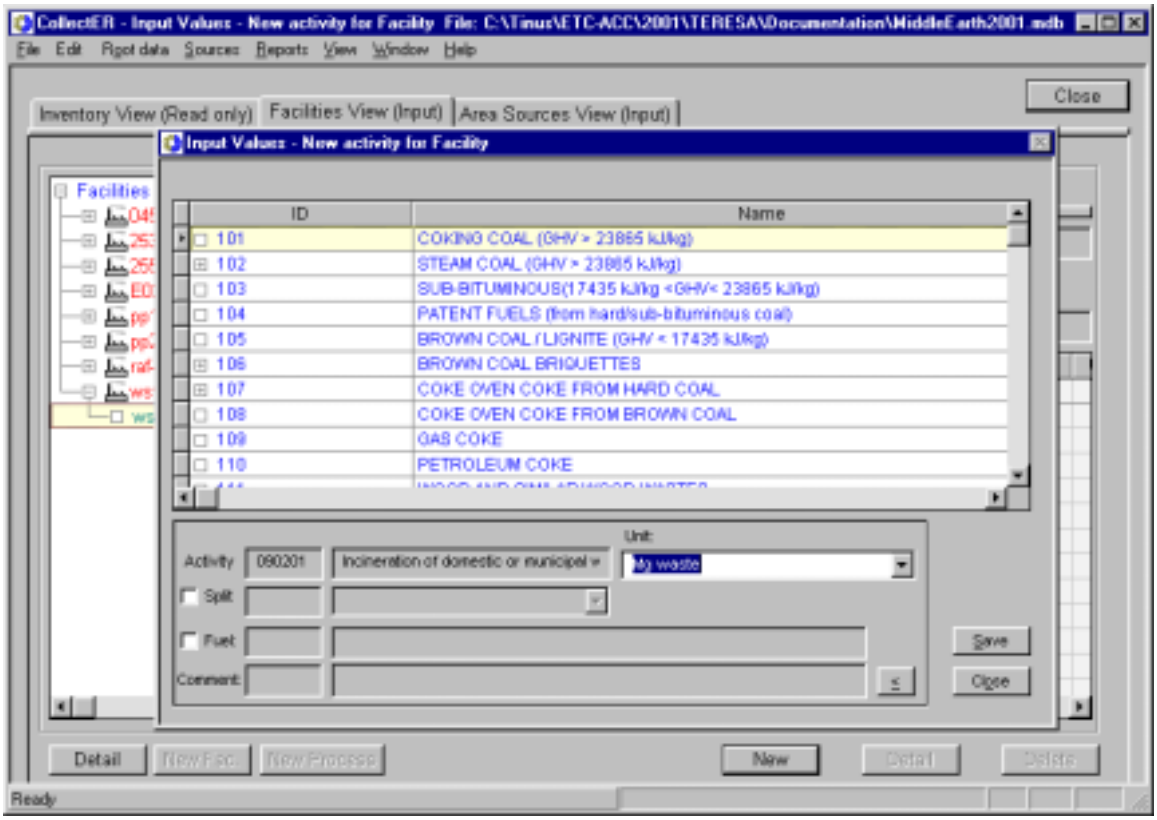



**Figure 3-9 Defining an activity rate for a process**

**Save** and **Close** the dialog window. The activity will now be visible in the list to the right of the window, with an a value of 0 Mg Waste.

*Step 2:* Click on the **Detail** button to open the Facilities Activity Rates dialog. Enter the activity rate by clicking **Edit** and enter 1800000 as the activity rate. Note that you can also information on the confidentiality and the quality here. Both are not used in any other function of the software system, but the entries here are stored in the database. Click **Save**.
The next step will be to include the emission factors.

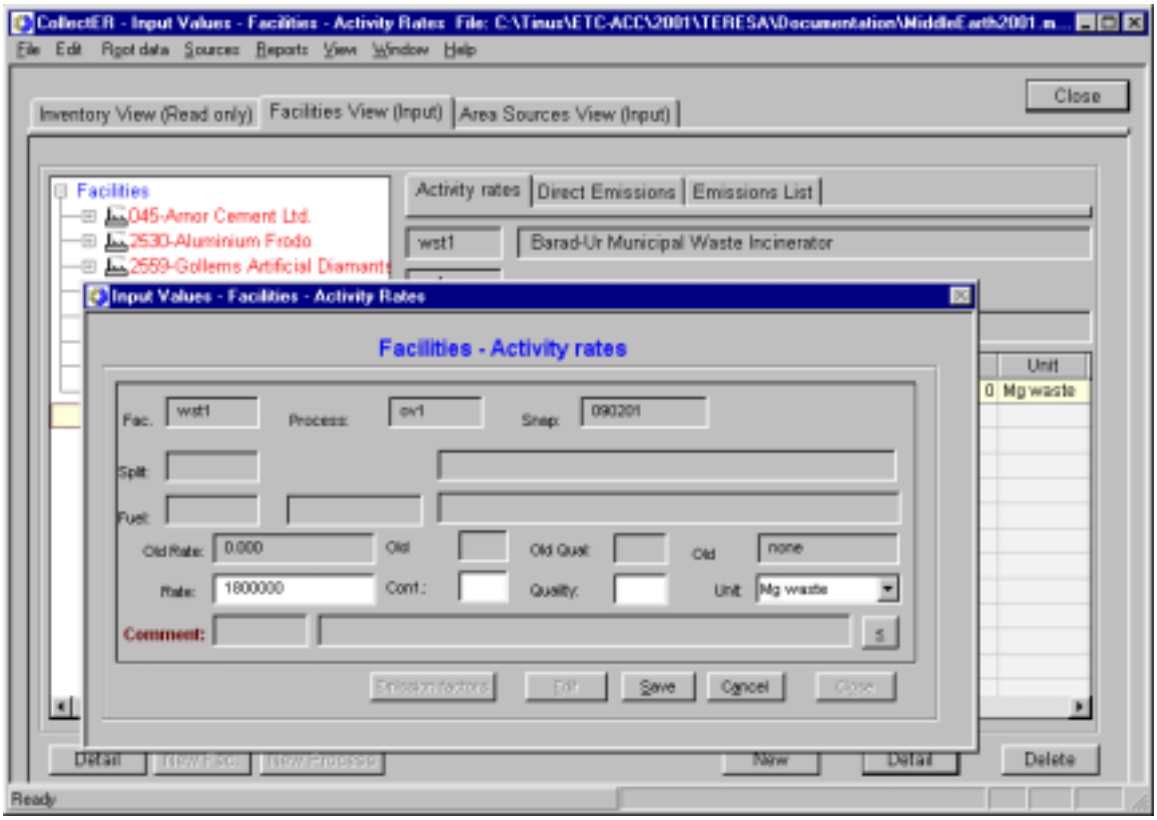



**Figure 3-10 Entering activity rates for a process in a facility**

*Step 3:* Now emission factors need to be entered by clicking **Emission factors**, which opens the Facilities Emission Factors window. No emission factors have been defined, so the list will be empty.
To add emission factors click **Add em fact** and select the pollutants 001(SO2), 003 (NMVOC) and 004 (CH4) and click **Save**. The three new emission factors will be listed with a value 0 g / ###

*Step 4:* Bring the window in edit mode by clicking **Edit**. Enter the values as shown below in Figure 3-11.
**Save** and **Close** the emission factors window.
**Close** the Facilities Activity Rates window.

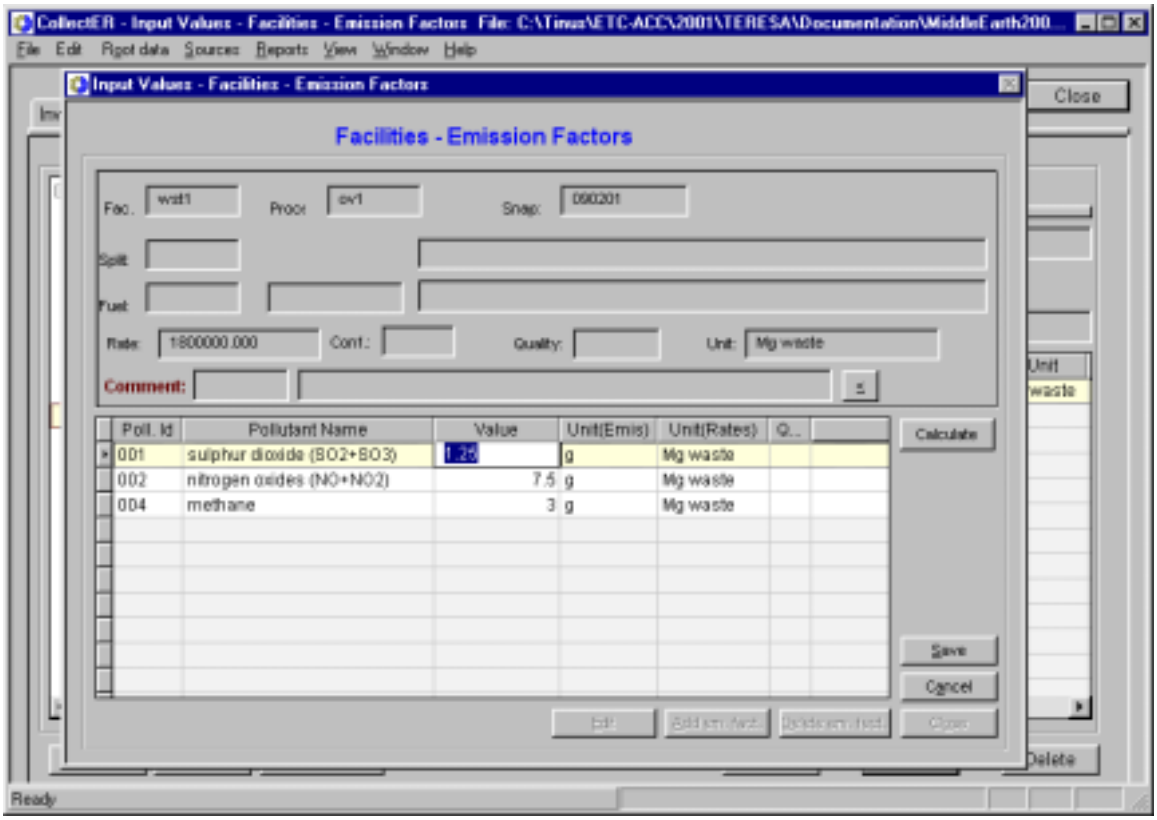



**Figure 3-11 Entering emission factor values**

Apart from the emissions calculated from activity rate × emission factor, for a number of pollutants directly measured emissions need to be entered. This is done as follows:

*Step 5:* While the newly added process in the waste incinerator is still selected, choose the **Direct Emissions** list and click **New**. Select pollutant **002** ($NO_x$) and enter the value 3500 kg. Take care that the units are correctly chosen (see Figure 3-12)! **Save** and **Close** the **Facility - New Direct emissions** window.

It is very important here to realise that, when for a certain process in a facility only direct emissions are included, the export to CRF will not include the corresponding activity rate. This will result in an error message while exporting to the CRF format, using **Report*ER***.

The database for Middle Earth does not contain any other direct emissions.

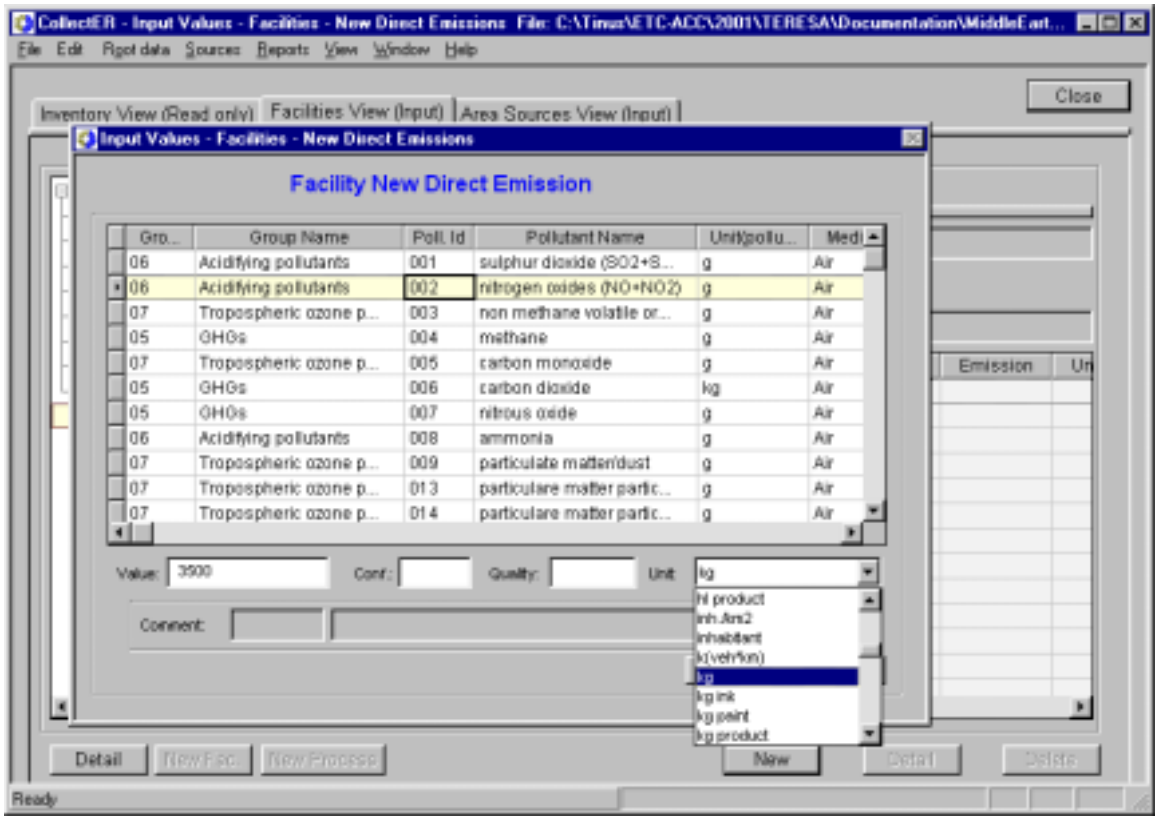



**Figure 3-12 Inputting new direct emissions**

*Step 6:* Repeat this procedure for 005 (CO, 1800 kg), 006 ($CO_2$, 750 Mg) and 007 ($N_2O$, 145 kg).

This will conclude the input of point source emission data. It is recommended to check the data entry by Carefully look at the **Emissions List** in the **Facilities view**.

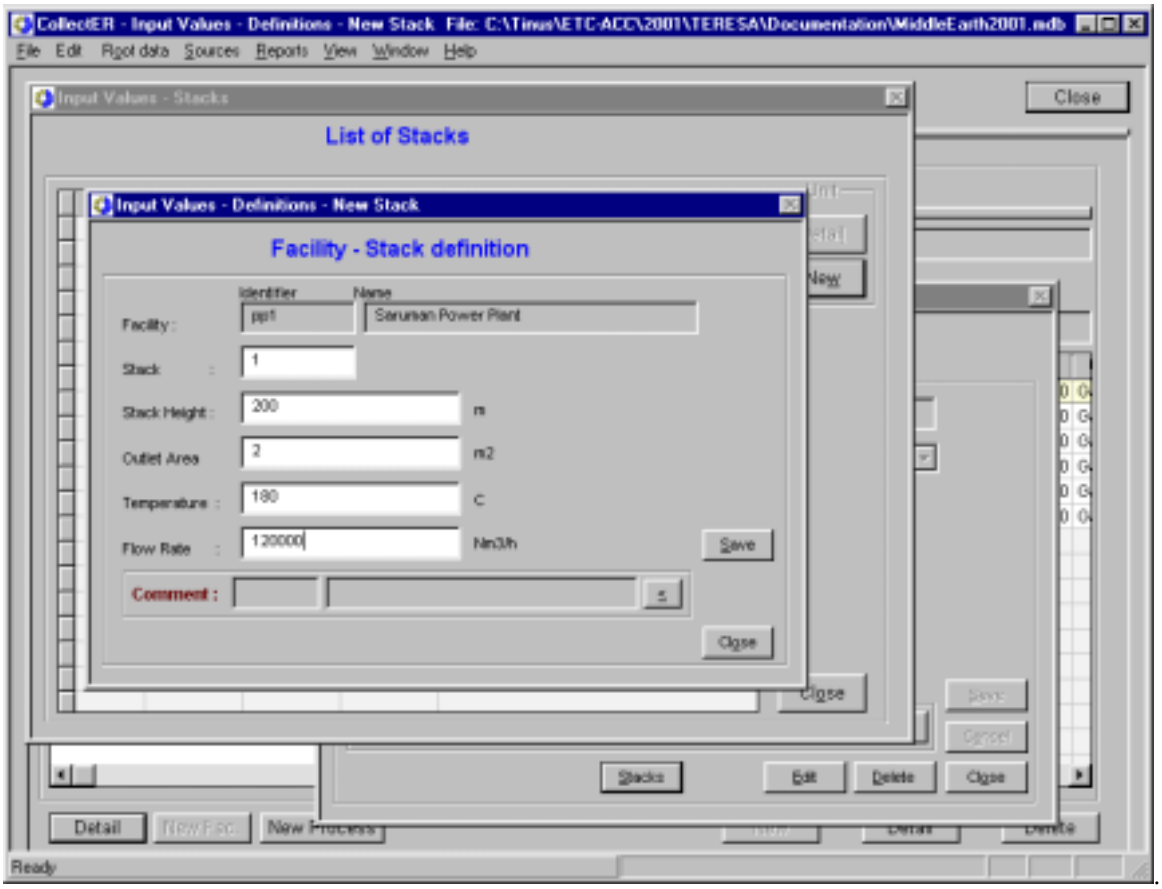
### *3.3.2.6 Emissions and stacks*

**Collect*ER*** implements also the concept of stacks. Stacks are not relevant for the annual data submissions to either UNFCCC or UNECE / CLRTAP. Nevertheless, for applications of the emission inventory in air quality modelling, information on stacks is crucial. The standard reports, produced by **Report*ER*** do not use the information on stacks. This may be changed in the future, when users so request (and budgets are available).

The user can add any number of stacks to every facility and direct the emissions from one or more processes through one or more stacks. All combinations are possible.

The Middle Earth inventory, as delivered by ETC-ACC does not include stacks. Here we will include two stacks in the Saruman Power plant and direct the emissions from its three boilers, each with two fuels, trough these two stacks. This works as follows:

*Step 1:* Select the Saruman Power Plant in the **Facilities view**'s navigation tree and click **Details** underneath the tree. In the **List of Stacks** window click **New**. This will open **Faciltiy – Stack Definition** window. Enter the values as given in the figure below. And click **Save** and **Close**.




Define a second stack, with the same parameters, but a height of 120 m by repeating step 1. The stacks will be listed in the stacks window.

Close the **Facility – Details** window. Now the stacks have to be connected to each of the facility's three processes.

*Step 2:* Select the first process within the Saruman Power Plant and click the **Details** button. This opens the Process – Details window. Click Stacks to open the list of stacks, connected to the process. This list is empty.

*Step 3:* Click **Add stacks** to open the **Stacks for Facility Processes** window and **Select All** stacks. (see ) Save and Close the window. Both stacks will now appear in the list of stacks, both with a activity share of 0%. Click **Edit** and enter the values 80 and 20 for the respective stacks. This will direct 80% of the emissions through the 200 m stack and 20 % through the 120 m stack.

*Step 4:* Add flows through stacks for the two other processes within the power plant, using the same procedure.

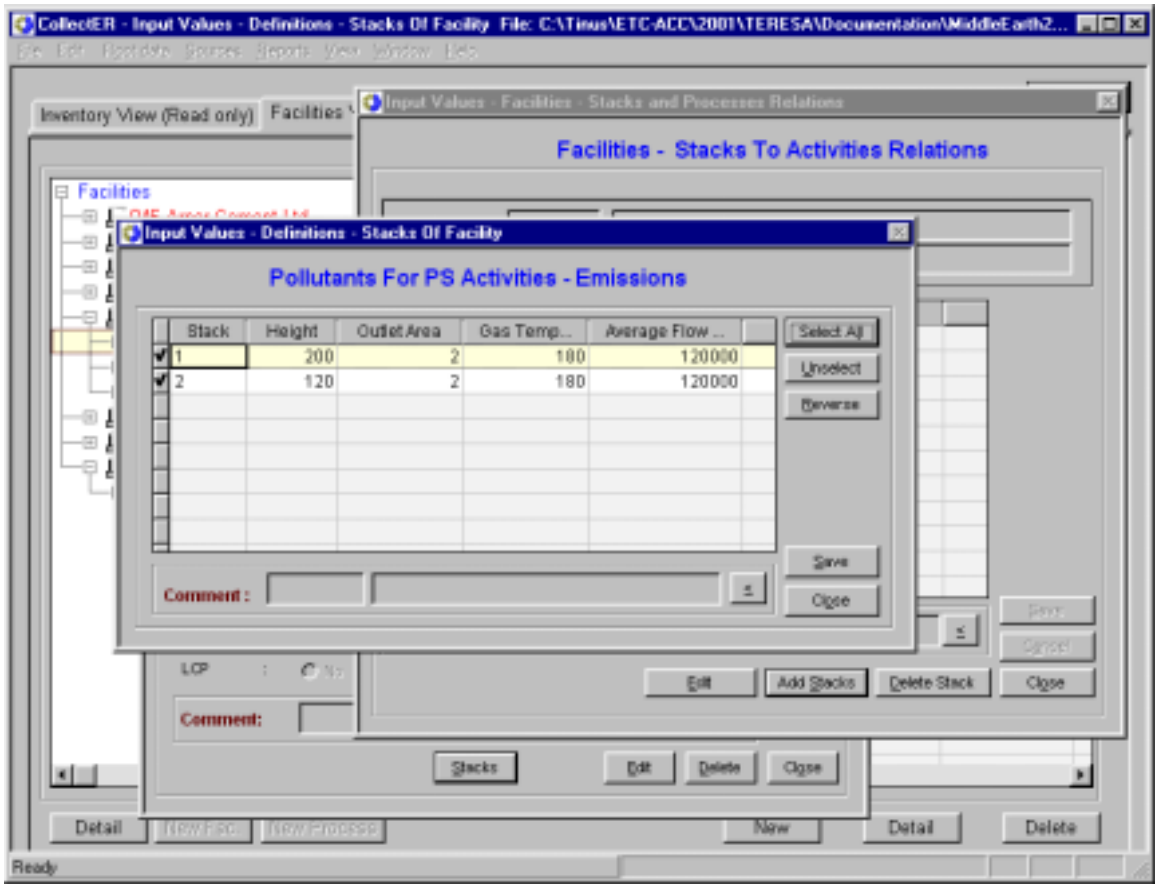



**Figure 3-13 Adding stacks through which the emissions of a process will flow.**

## 3.3.3 Area sources view

### *3.3.3.1 Viewing and editing Area source data*

In the **Area Sources view** (Figure 3-14) the user can add, edit and delete data on area sources. Again the left part of the view allows the user to navigate between different source sectors and the right part allows viewing different parts of the data set for the selected source sector.

In the figure the activity describing heating stoves in houses (020205) is selected and in the right part of he window the list of activity rates already defined is shown. Activity rates are given for three fuels:

| Fuel | Activity in 2000 | Change in 2001 |
|---|---|---|
| 106: Brown coal briquettes | 46000 GJ | No change |
| 111: wood and similar wood waste | 2650000 GJ | 10% higher fuel use due to a cold winter |
| 117: agricultural wastes (corncobs, straw, etc...) | 4541400 GJ | 10% higher fuel use, because of cold winter, but agricultural wastes are not allowed anymore in Rohan. Here this fuel has been replaced by wood. |

We will now change the activity rate for two of these fuels as indicated in the table.

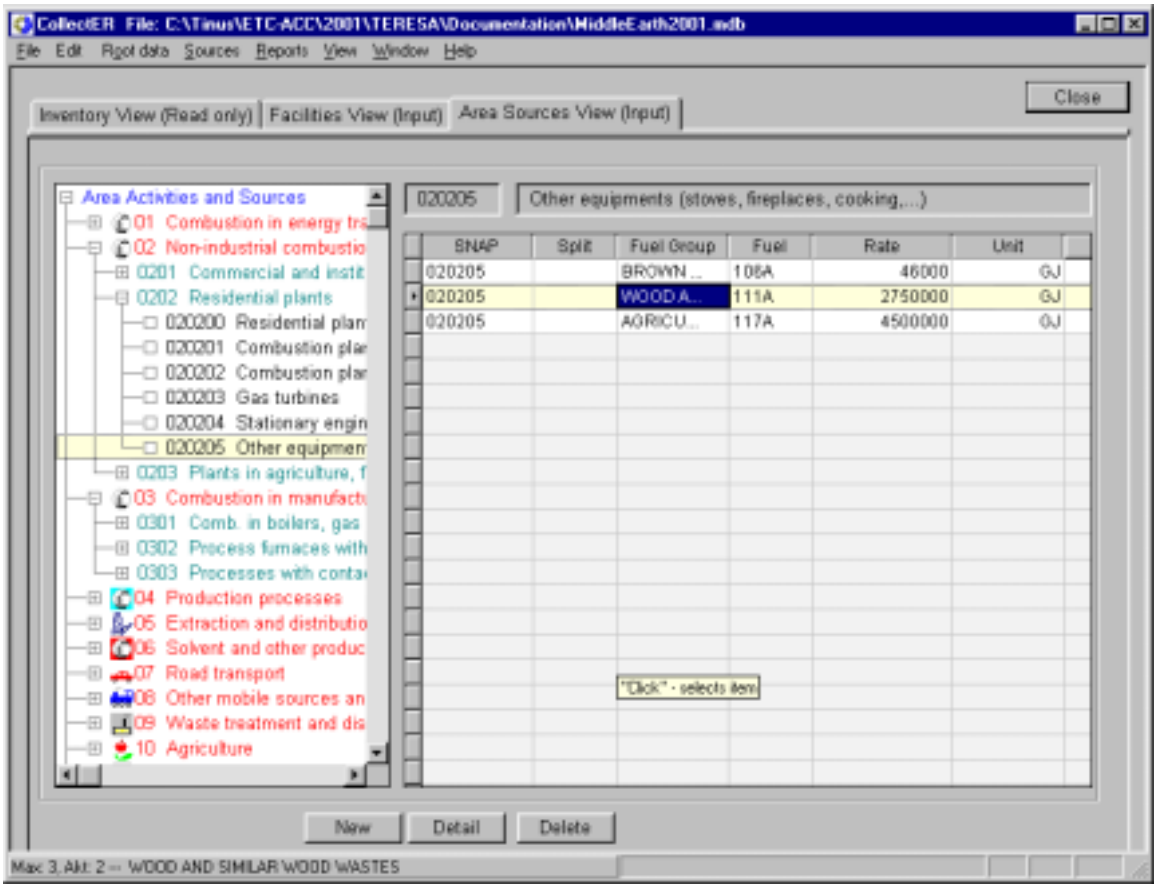
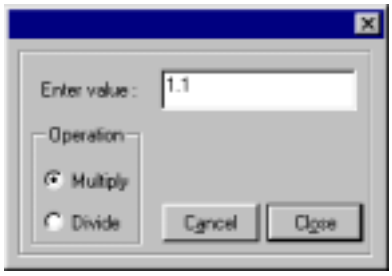



**Figure 3-14 Area Sources view in Collect*ER***

a) Using 10% more wood for heating in 2001




*Step 1:* Select the SNAP activity 020205 in the tree and the fuel 111A in the right part of the window. Click the **Detail** button to open the input window for area source activity rates. You can expand and collaps the territorial split of the data by clicking the + or – signs in the small boxes left of the NUTS codes.

*Step 2:* To change all activity rates to a 10% higher value, select the **All** radio button and click the **Calculate** button. A small additional window will open. Enter de value 1.1 and check whether the **Multiply** radio button is checked. Click **Close**.
All 2001 activity rates for this SNAP and fuel combination for 2001 will now be 10% above the 2000 value.
Note that, since the 2001 database was created by making a copy of the 2000 database, the original values remain available and the user can always revert to these values by clicking the **Copy** button in this window.

*Step 3:* Click **Save** and **Close** in the activity input window and the new value is entered in the database

The new activity rate will be shown in the grid of the **Area Sources View**.

b) Using 10% more agricultural wastes and replacing the waste by wood in the Rohan territory

In this section we use the population density to spatially disaggregate the national total activity rate. The 2001 Middle Earth inventory has the appropriate allocation formula defined and the surrogate data loaded.

*Step 1:* Select the fuel 117A and open the **Detail** window. Change all activity rates by multiplying with a factor of 1.1 as indicated above.

*Step 2:* Unselect all territories, if needed, by clicking **Select**, checking **Unselect** and **All** and closing the selection window. Be sure to expand the NUTS tree such that Rohan (me21) and all underlying territorial units are visible.
Select Rohan and all the areas within Rohan by clicking the small buttons at the left side of the grid.
Select also all territorial units of which Rohan is part of (**me2** Inland and **me** Middle Earth)
Note that the activity rate in Rohan is about 350000 GJ Agricultural wastes. This has to be added to the use of wood in this county..

*Step 3:* Check the **Selected** radio button and click **Clear**. This should clear the values for Rohan, for the Inland province and for the whole country, as shown in Figure 3-15.

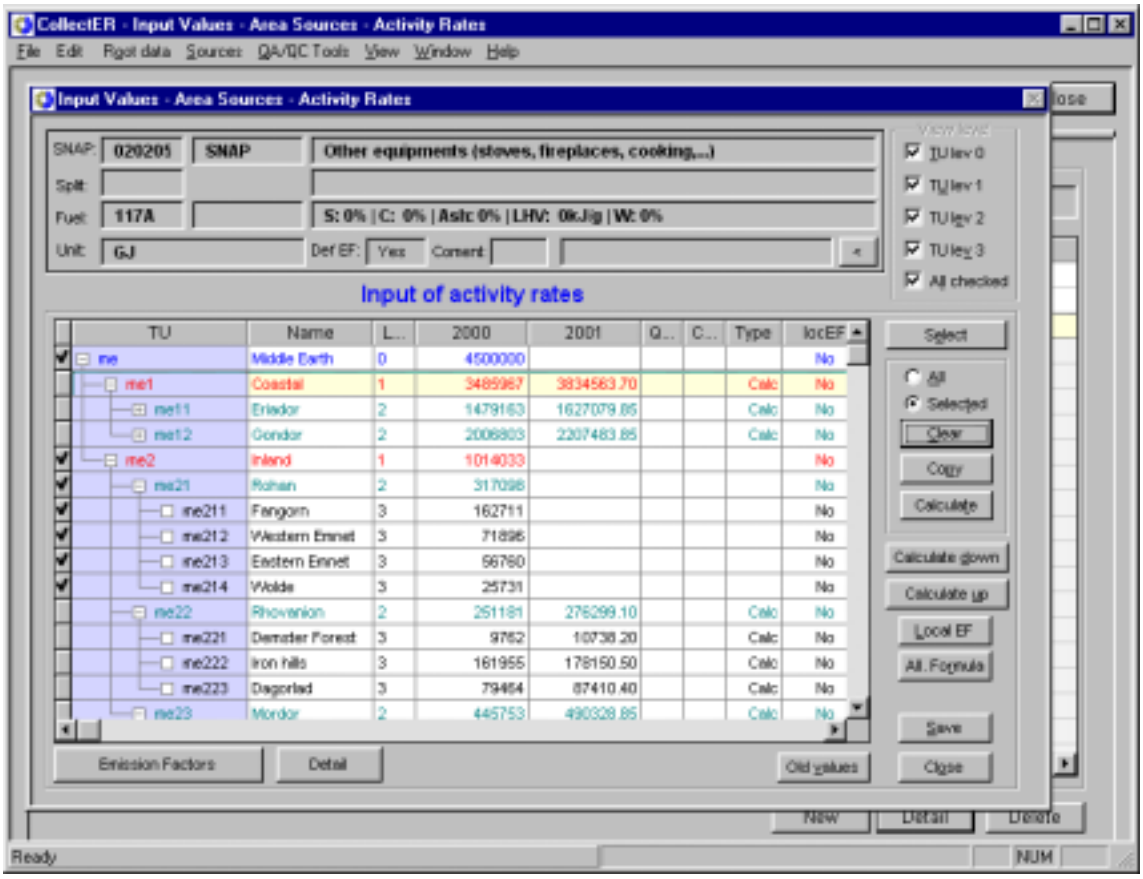



**Figure 3-15 Setting the activity rate for Agricultural Waste fired house heating to 0 in the county Rohan.**

*Step 4:* Enter the value 0 for the county Rohan. Click **Calculate down** top distribute this value to the underlying territories and **Calculate Up** to make all higher NUTS levels consistent with the change. **Save** and **Close** the activity rate input window.

*Step 5:* The activity rate of 380000 GJ of agricultural wastes as used in the previous year in the county Rohan, should be replaced by the same amount of another fuel. We assume that all of this will be "Wood" (fuel ID 111A). So open this detail window again. Enter the value 580000 GJ (= the original 200000 + the 380000 to replace agricultural wastes) for the county Rohan. Select all lower and higher NUTS codes, where Rohan is part of or contributing to (see Steps 2 and 3 above). Check the **Selected** radio button and click **Clear**. Click **Calculate down** top distribute this value to the underlying territories and **Calculate Up** to make all higher NUTS levels consistent with the change. **Save** and **Close** the activity rate input window.

This procedure allows the user to apply the so-called surrogate data while distributing the activity rate over te country. In this example, a surrogate data set "Capita" is already defined (**Root Data | Surrogate Data | Surrogate Data Types**) in the database and values have been included (**Root Data | Surrogate Data | Surrogate Data**). Also a so-called **allocation formula** is defined (**Root Data | Surrogate Data | Allocation Formulae**).

The Allocation formula can be viewed by clicking the **All. Formula** button in the activity rates input window.

#### *3.3.3.2 Adding an area source at NUTS 3 level and using the "Split" mechanism*

Between 1995 and 1996 Middle Earth developed a new coalmine in **Nurn** (NUTS me231). This coalmine 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**) and no fuel used. Since we want to apply different emission factors for both mines, we need to define two sources within the same SNAP activity code within the same area. To enable this, **Collect*ER*** has a Split mechanism available. The Split basically adds an additional level to the SNAP classification system that can be freely defined by the user. In this case we will define two "Splits": one for high methane mining and one for low methane mining.

*Step 1:* Define the splits 506 (Low methane mine) and 507 (High methane mine) as follows:
click **Root data | Base data | Split** to open the **Split definition** window.

Click **New** and enter **Split ID** 506; **Split Name** Low methane mine; Click **Save** and the new split will appear in the list.

Enter **Split ID** 507; **Split name** High methane mine and click **Save** and **Close**

**Close** the List of Splits window.

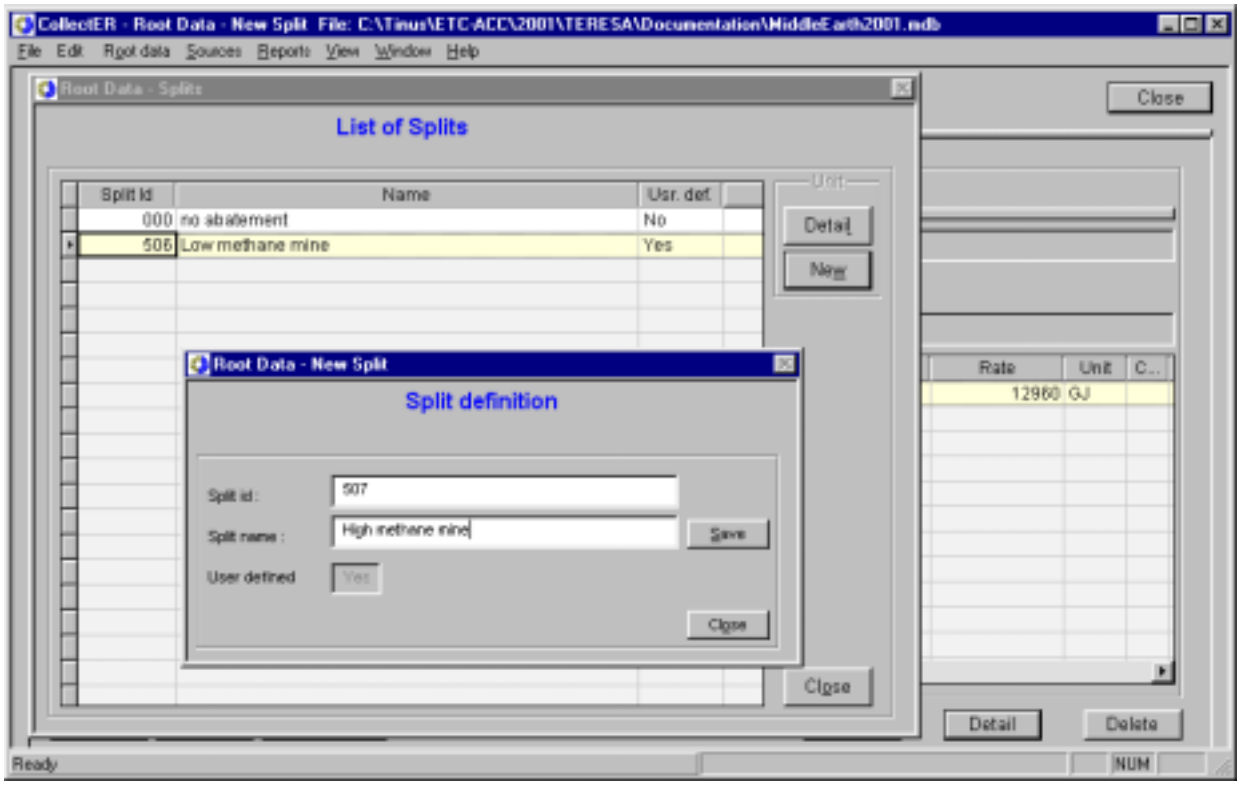



**Figure 3-16 Defining a new Split**

*Step 2:* The new splits have to be connected to the underground mining SNAP as follows.

Click the **Root Data | Base Data | SNA**P menu item, to open the List of SNAPS and Splits. Expand the tree and select SNAP 050102. Click **New Split** (Figure 3-17).

Select **low methane mining** and click **Save**. Select **high methane mine** and click **Save** again. **Close** the window. The splits are now added to the SNAP. **Close** the window.

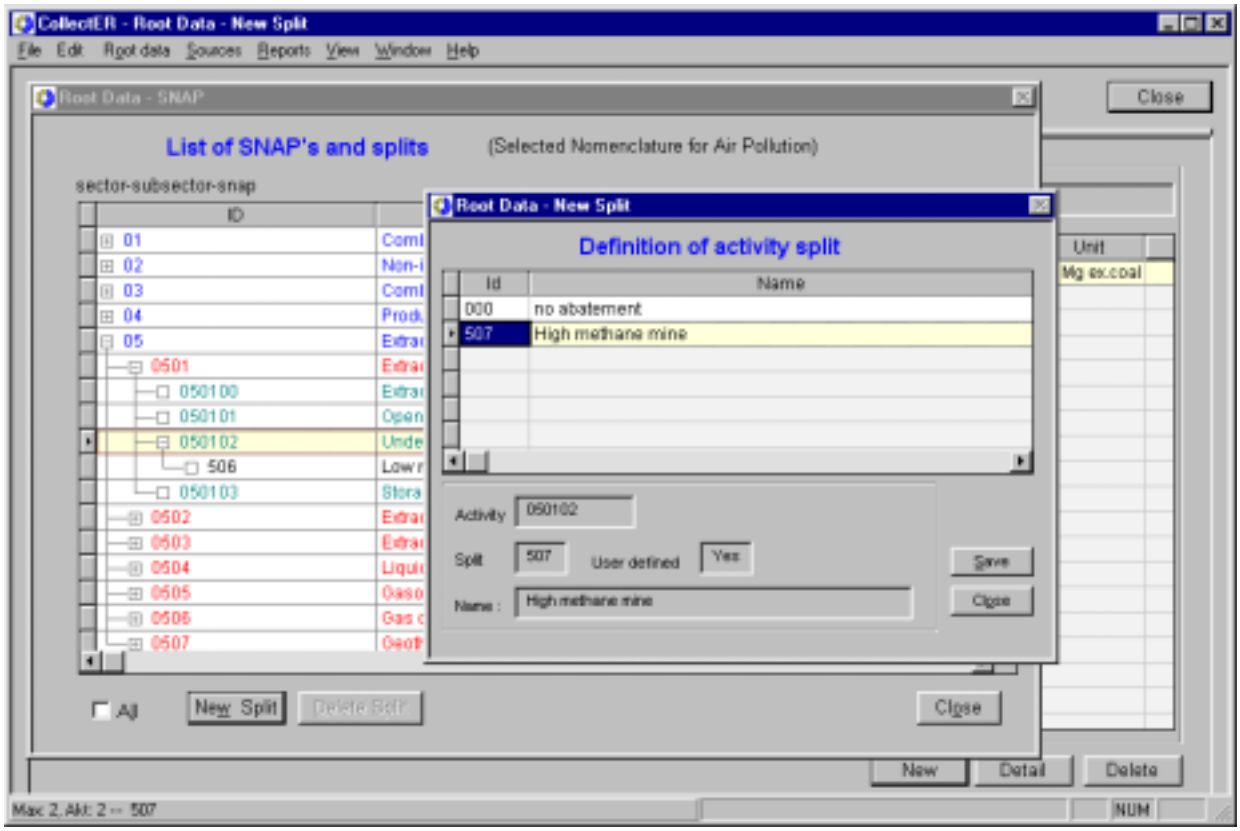



**Figure 3-17 Connecting a split to a SNAP**

The new splits can now be used to discern the two types of underground mining.

*Step 3:* Add the new activity to the list of area activities by selecting SNAP 050102 in the **Activities** tree of the **Area Sources view**. The existing mining activity will now be listed in the **activities** list. This activity does not have a Split connected to it. This cannot be changed, since the Split is part of the unique identifier of every activity. We therefore have to delete this on and add it again, but now with a split defined. It is wise to do this in the opposite order as follows:

Click **New** to open he activity definition window and uncheck the **Fuel** checkbox.

Make sure that he **Split** checkbox is checked and select the **High Methane mine** (Figure 3-18). Accept the default emission factors by clicking Yes when asked to copy the default emission factors. They will be changed later.

Select the unit "**Mg ex. coal**" and click **Save**.

Select **Low methane mine** and click **Save** again. Click **Close** to close the window.

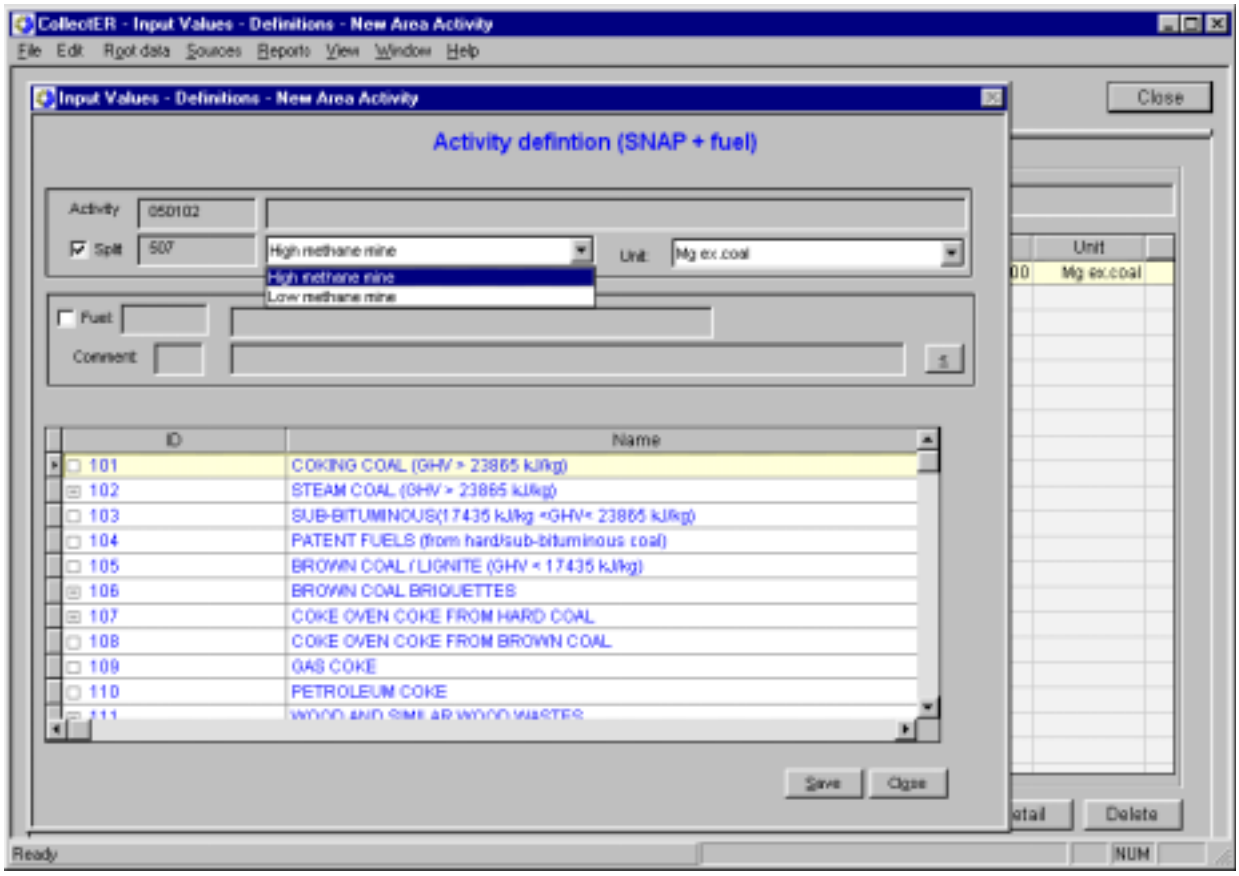



**Figure 3-18 Selecting a Split with an activity**

*Step 4:* Now the activity rates and emission factors have to be included. To facility this action, the user can use the new input QA/QC tool as follows:

Select the **QA/QC Tools | QA/QC Report Area Sources** menu item and make your selection for the report as indicated in the upper part of Figure 3-19. Select the region Angmar, since that is where the mines are, the pollutant methane, and the activity 050102 as indicated.

Click **Report** to produce the preview report as indicated in the lower part of the same figure. The report can be printed, by clicking the appropriate button. The report provides the data as selected. In this case, the system has copied default factors from the database[5]. In the case of the high methane mine this default emission factor is close to the one stored for 2000 in the database.

[5] Please be aware that the database of default values as present in CollectER is rather outdated and still uses the "standard" splits as defined in the earlier versions. That's why the split codes 506and 507 are used. Choosing another code would not have resulted in the availability of the default values.

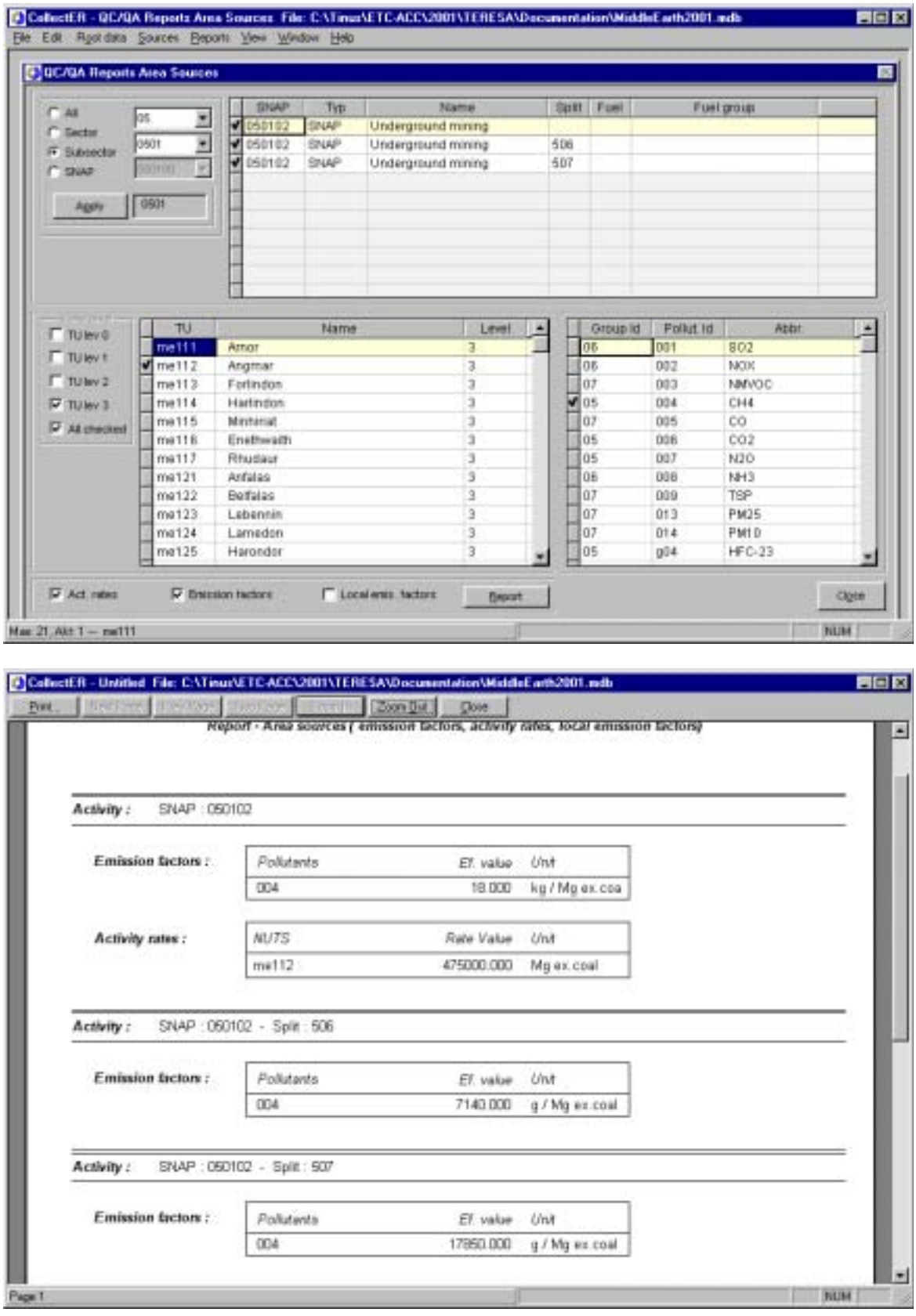



**Figure 3-19 Using the new QA/QC reporting tool for area sources**

*Step 5:* Now delete the original activity by selecting it and clicking the **Delete** button and update the high methane mine by clicking Details to open the Area sources details window. This opens the Area Sources Activity Rates window. Expand the NUTS tree such that the county Angmar is visible. Input the original activity rate (475000 Mg ex. Coal) for this county and click Calculate up (Figure 3-20) to aggregate the activity rate to higher NUTS levels.

Note that the value entered for Angmar is marked "Ins" (inserted), while the higher-level values are marked "Calc" for calculated. Since this is now a new source, the value for 2000 is not available for comparison.

Update the emission factor after clicking he **Emission factors** button.

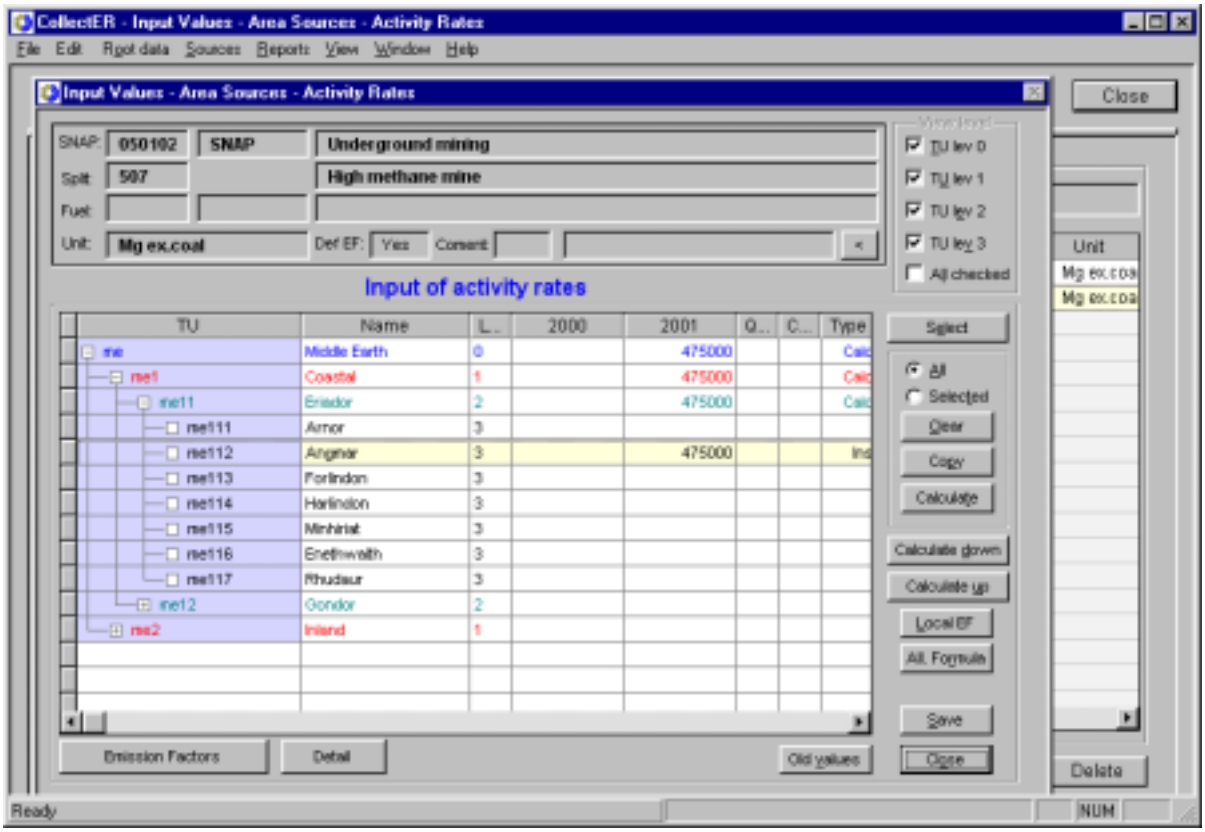



**Figure 3-20 Input of aea source activity rates**

*Step 6:* Add the activity rate for the new mine (275000 Mg ex. Coal) in Angmar as follows. Select the new coalmine in the list of activities and click Details.

This concludes the introduction of the new area source.

### *3.3.3.3 Adding area sources at higher NUTS levels*

In many cases the national expert will not have data available at the lowest NUTS level and will need a tool to distribute the emissions over the country. **Collect*ER*** provides such a tool. 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 2001. 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 3.3.3.2, step 4). Remember to set units as indicated.

*Step 2:* Define an allocation formula using the **Root data | Surrogate data | Allocation formula** menu item. This opens a list of surrogate data types. The upper part of this window operates as a filter. The user can define a filter and apply it by clicking A**p**ply. Select Sector 06 for the filter. The table now will contain the newly defined split, indicating in the column "**Formula**" that no formula is defined.

Click **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. Note that the sum of the coefficients should be 1.

**Close** the allocation formula windows.

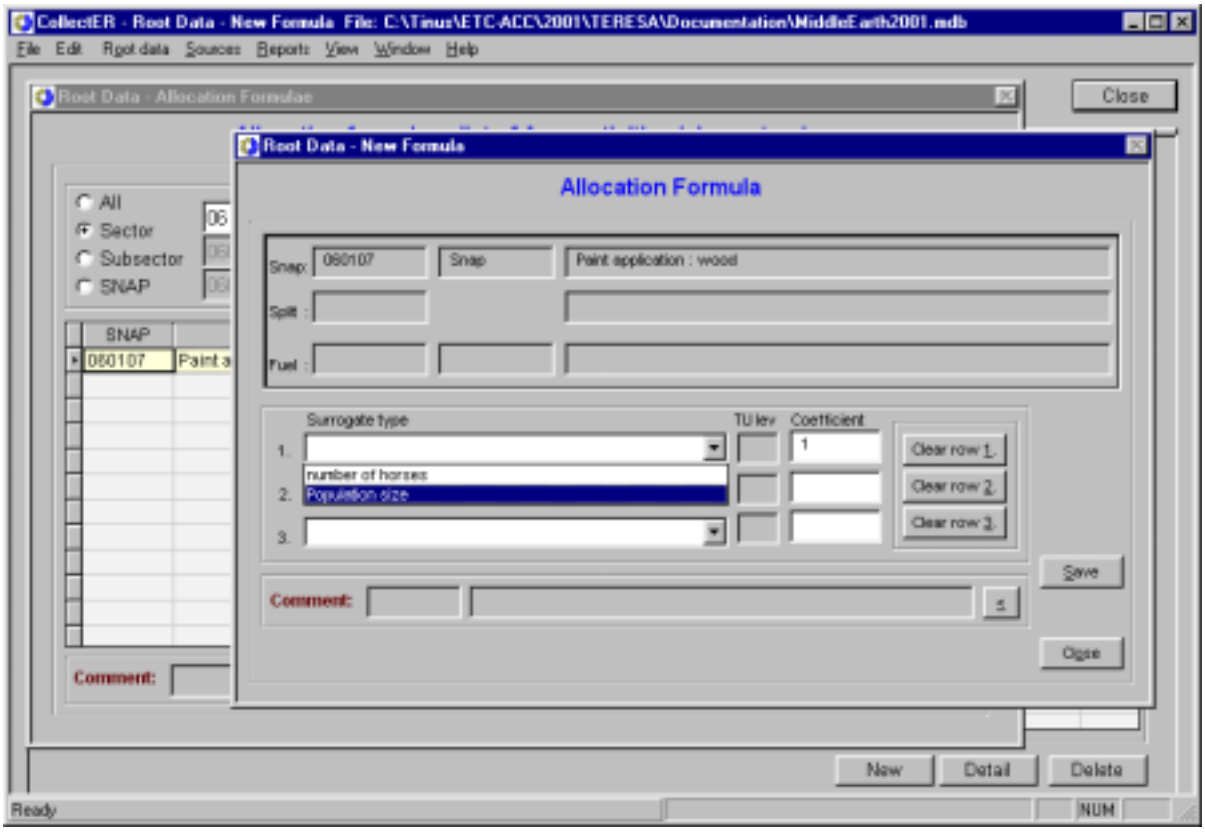
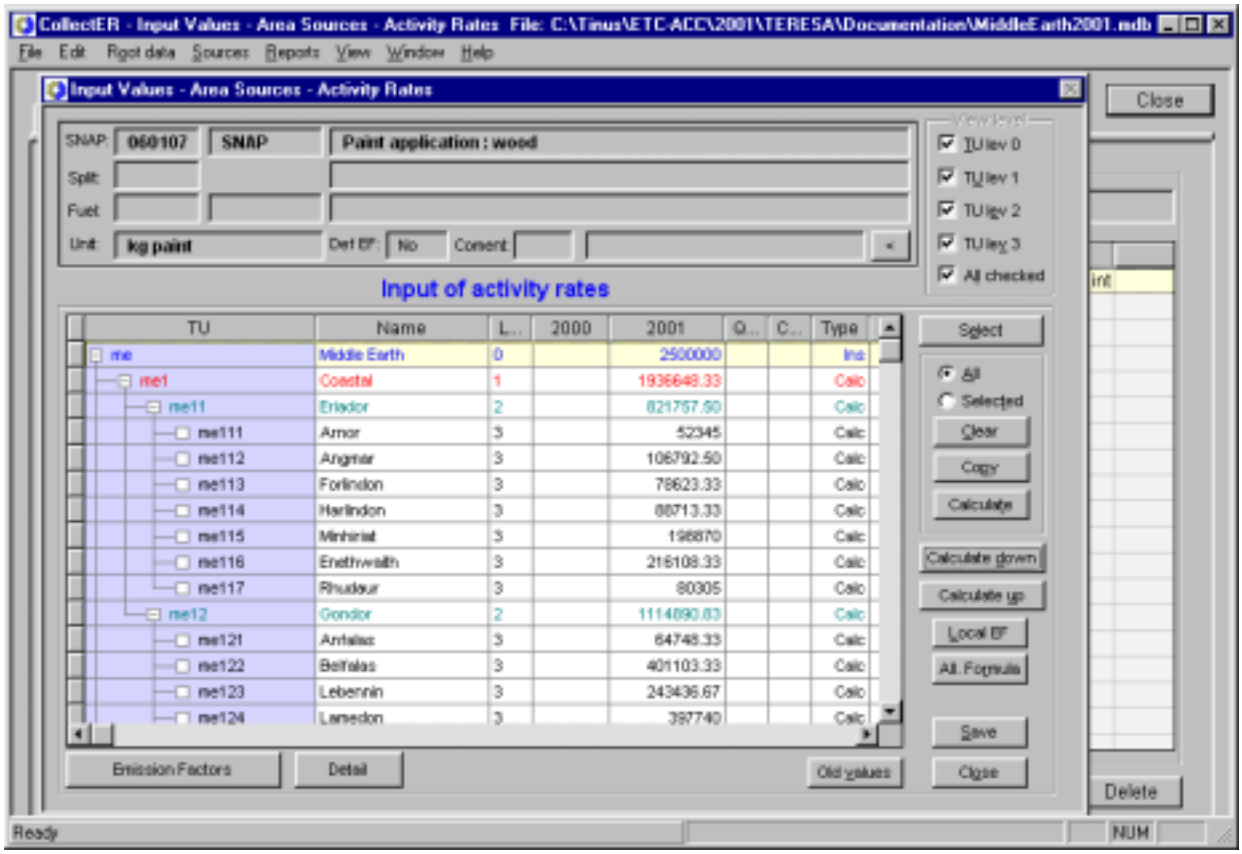



**Figure 3-21 Defining an allocation formula**

*Step 7:* Open the Area sources data entry for SNAP 060107 by clicking the **Detail** button. Enter the total amount of paint used (2,250,000 kg Paint) at the highest NUTS level. Expand the NUTS tree by checking All checked.

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.

Note: **Collect*ER*** only distributes activity rates to those regions that are visible in the tree. To view the allocation formula click **All. Formula**.**Save** and **Close** the window




*Step 8:* Add the emission factor (4 g/kg paint NMVOC) by clicking Emission Factors, add a factor for NMVOC and input the value as described above (section 3.3.2.3).

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.

### *3.3.3.4 Updating emission factors*

Emission factors can be changed using the Area Sources detail window. Simply click the Emission Factors button and a window similar to the one for adding emission factors for processes within facilities will open. Adding, editing and deleting emission factors works exactly as described for facilities (section 3.3.2.3).

## 3.4 QA/QC reports: checking input

**Collect*ER*** now makes a simple input-checking tool available to its users. We showed its use for area sources already above (section 3.3.3.2). This tool could also be used for example to check whether animal numbers in agriculture for fermentation and manure management are consistent. A similar tool is available for facilities.

## 3.5 Further issues

### 3.5.1 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.

### 3.5.2 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. The user could use this label to indicate his or her 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 give 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

### 3.5.3 Confidential data

Although use of confidential data in the CORINAIR inventory is not encouraged, the system provides for a flag to indicate confidentiality.

# 4 THE Report*ER* TOOL

**Report*ER*** is the tool in the AE-DEM 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*** II is able to produce:

1) The UNFCCC CRF report
2) The UNECE / CRLTAP report in a format as agreed at the TFEIP meeting in Geneva, 2001
3) A prototype Large Combustion Plants (LCP) report
4) An XML format output file, including all national total emissions at SNAP 3 level

Menu entries are available for an IPPC / EPER facilities report and for a NACE economic sectors report. These reports however have not been implemented yet.

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

## 4.1 UN FCCC reporting

Since two different aggregations of the database are needed to produce all sector tables, producing the CRF file needs a two step process:

1) Emissions (and activities): section 4.1.1
2) Fuels (background data): section 4.1.2

### 4.1.1 Emissions and activity rates

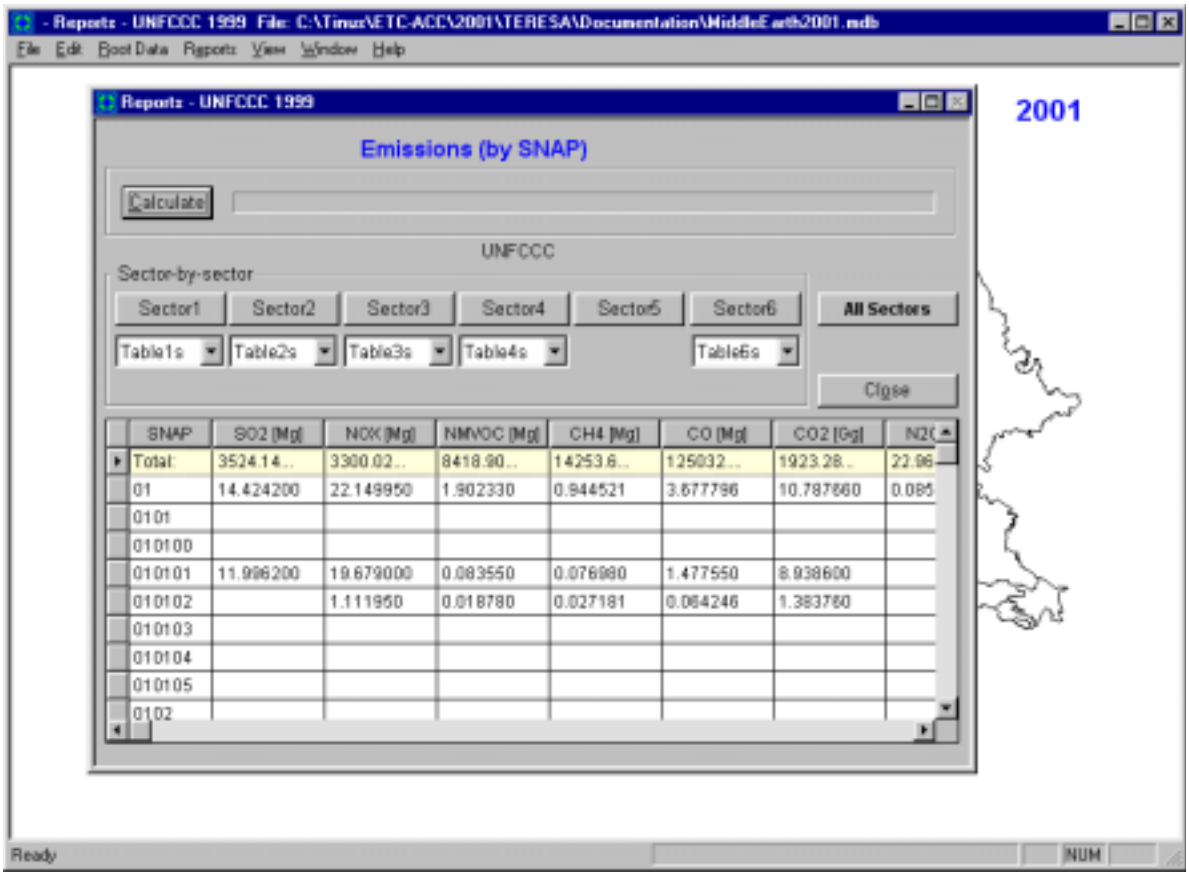
When running **Report*ER*** on a **Collect*ER*** database to produce a UNFCCC report, the first step should be performing the calculations in the database. This ensures that all data at all levels of aggregation (SNAP, NUTS and fuels) are consistent and that all special exclusions and aggregations according 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:* Start the **Collect*ER*** II programme and open the MiddleEarth 2001 database via menu **File | Open Database**

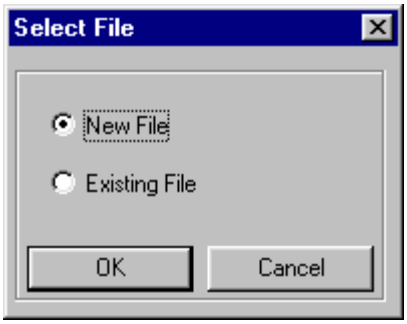
*Step 2:* Click the **Reports | UNFCCC CRF 19999 | Emissions (all sectors)** menu item.

*Step 3:* Click the **Calculate** button in the Reports – UNFCCC 1999 window. The calculations will be performed as indicated by the progress bar. When ready, all **Sector** buttons will be enabled. The screen now should look as the one reproduced below.




*Step 4:* The aggregations for each of the CRF tables will be performed after selecting the appropriate table number and clicking the corresponding **Sector** button. The results of the aggregation can be viewed using the grid on the report window.
The user can also export all tables in one run by clicking the **All sectors** button

*Step 5:* The resulting table or tables can be exported into the Microsoft Excel CRF template 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 CRF template as stored in the ExcelDir directory of ReportER.

### 4.1.2 Fuels background data

Clicking menu item **Reports | UNFCCC CRF 1999 | Fuels (sector 1)** will open another window, from which the CRF tables 1A1a and 1C can be completed. This is completely comparable to what is described above: calculate, select the table and export to the Excel template.

### 4.1.3 Pit falls 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.

#### *4.1.3.1 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 CO2 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 CO2 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 CO2 | CO2 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.

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

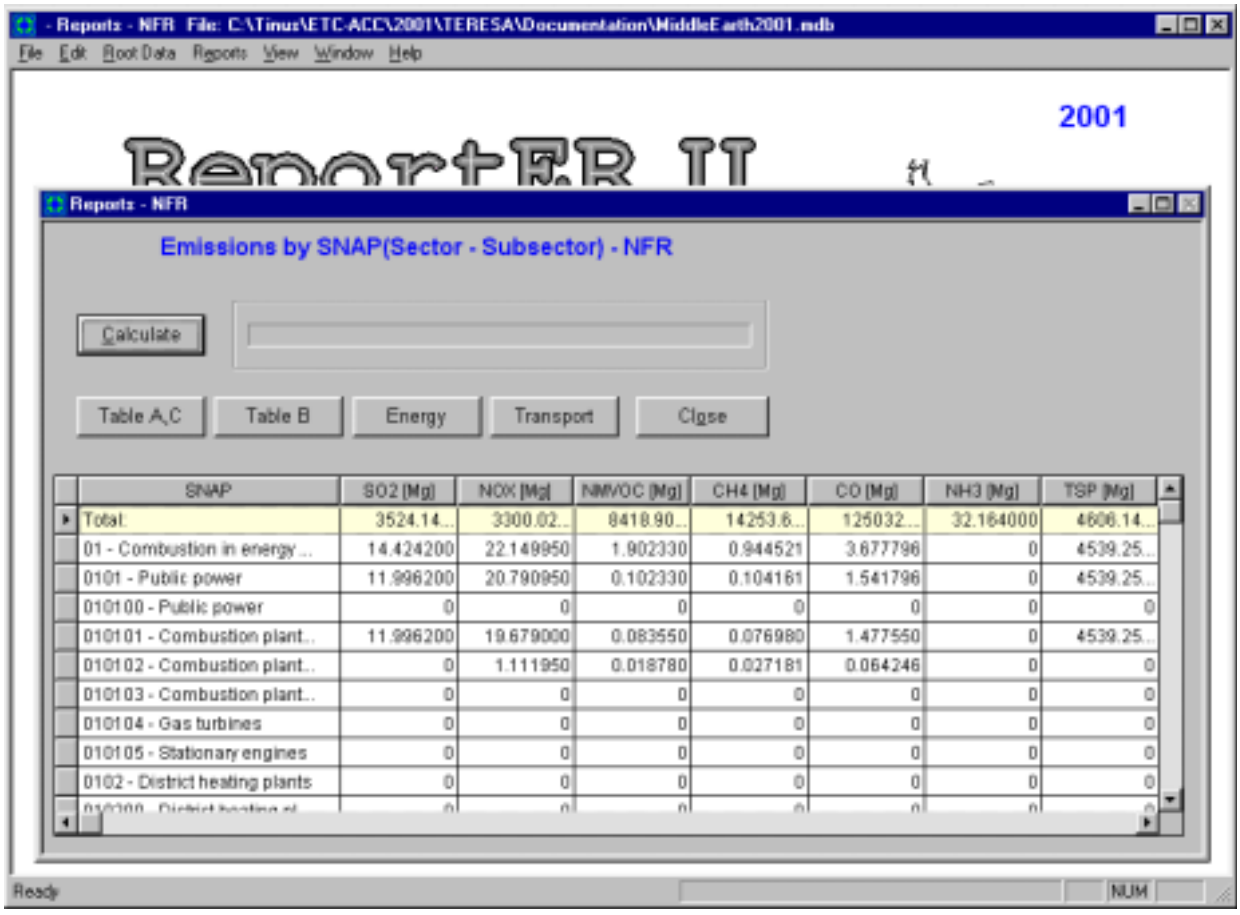
Since the industrial split in the IPCC sectors is along economic sectors and not along technology as in SNAP, a problem appears when allocating industrial combustion to these economic sectors. Allocation of these emissions to the correct industrial sectors is not possible. The user has to correct his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

#### *4.1.3.3 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 **Collect*ER*** and hence the estimate cannot be made. The user could however use the **Estimat*ER*** tool to perform this task.

## 4.2 UN/ECE LRTAP reporting

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



## 4.3 Large Combustion Plant reporting

The large combustion plant directive report of ReportER II will produce three different listings of facility data:

1) All processes within each facility, including the activity rates
2) All stacks, connected to these processes
3) All emissions originating from the selected processes.

The reports can be produced for different selections of the processes, depending on the value of the LCP flag for each process by checking the appropriate radiobutton. The **Report*ER*** window for this report is shown below.


## 4.4 IPPC / EPER facilties report

Not implemented yet.

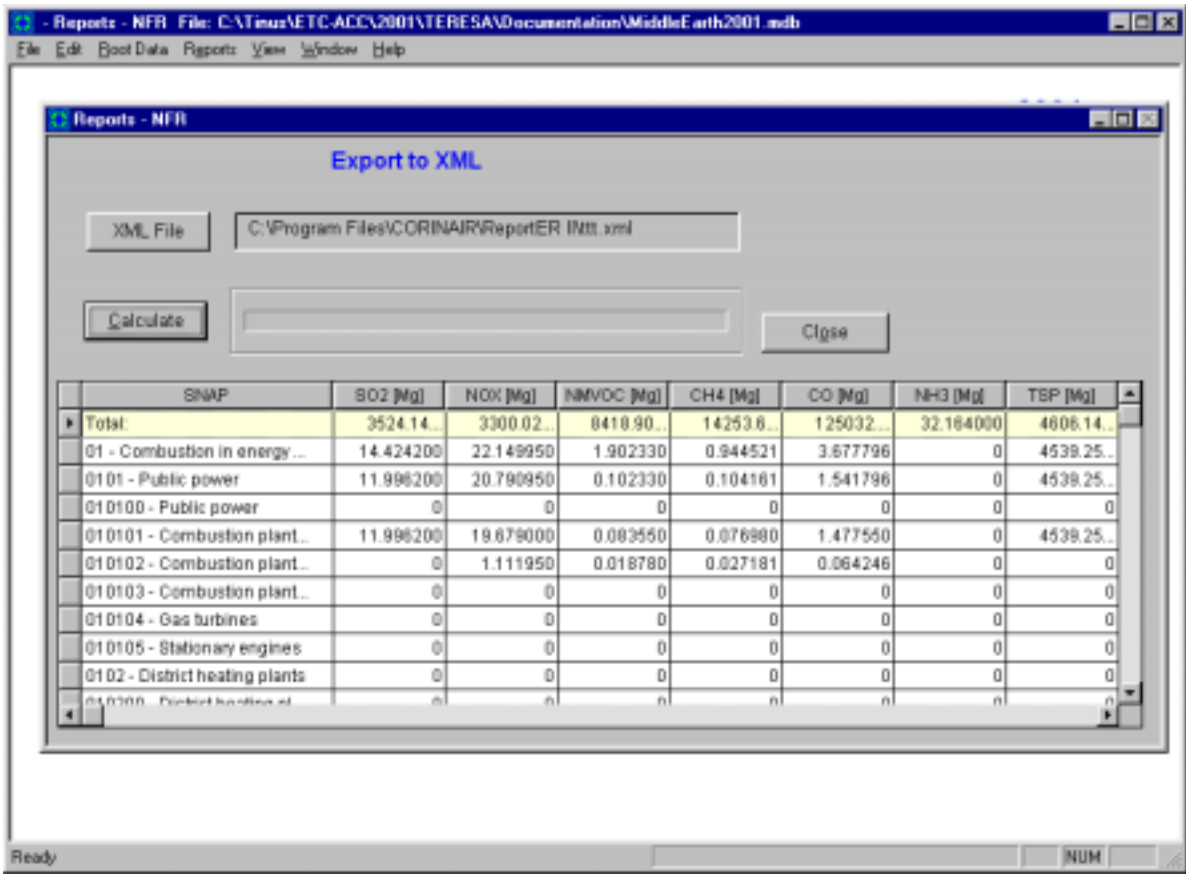
## 4.5 NACE economic sectors report

Not implemented yet.

## 4.6 XML export

Within the development of AE-DEM the possibility of export of data in a standard data exchange format was one of the objectives. An XML-file is a text file that includes both the description of the data and data structure and the data themselves. This enables standardized data exchange between different systems and software. Also within the Task Force on emission Inventories and Projections and within the technical preparation of reporting guidelines for greenhouse gas emissions, the developments towards a more stringent separation between “reporting” and “data flow” might yield a new data exchange format, that could be based on an XML schema.

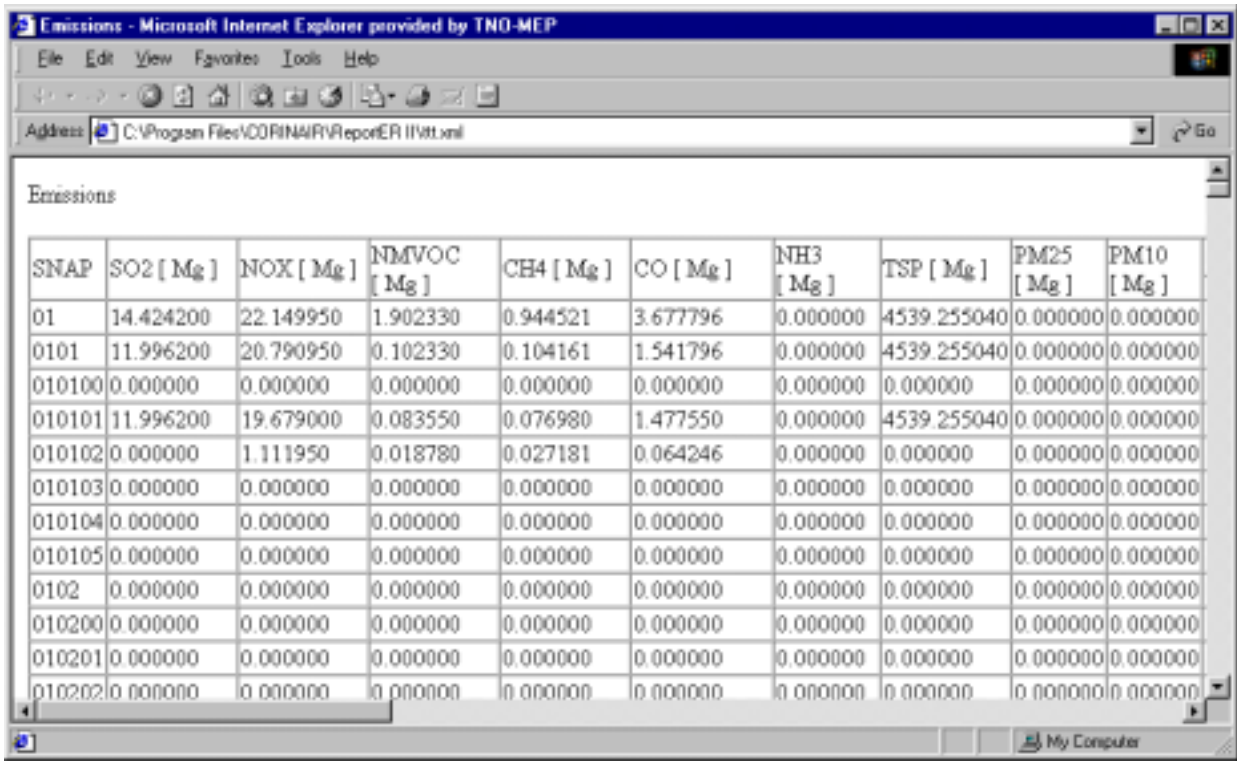
To be prepared for that, **Report*ER*** II implements a simple XML export facility, using the window below.




Simply select an XML filename and click **Calculate** to perform the export.

The implemented XML file can be viewed by using your internet browser. To do so, the file **style.xsl** needs to be stored in the sanme folder as the exported XML file. This style file informs the browser how to read and interpret the XML file.

If you open the XML file in your browser, a table with all emissions by sector should be shown:




| SNAP | SO2 [ Mg ] | NOX [ Mg ] | NMVOC [ Mg ] | CH4 [ Mg ] | CO [ Mg ] | NH3 [ Mg ] | TSP [ Mg ] | PM25 [ Mg ] | PM10 [ Mg ] |
|---|---|---|---|---|---|---|---|---|---|
| 01 | 14.424200 | 22.149950 | 1.902330 | 0.944521 | 3.677796 | 0.000000 | 4539.255040 | 0.000000 | 0.000000 |
| 0101 | 11.996200 | 20.790950 | 0.102330 | 0.104161 | 1.541796 | 0.000000 | 4539.255040 | 0.000000 | 0.000000 |
| 010100 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 010101 | 11.996200 | 19.679000 | 0.083550 | 0.076980 | 1.477550 | 0.000000 | 4539.255040 | 0.000000 | 0.000000 |
| 010102 | 0.000000 | 1.111950 | 0.018780 | 0.027181 | 0.064246 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 010103 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 010104 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 010105 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 0102 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 010200 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 010201 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 010202 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |

# 5 ESTIMATING EMISSIONS USING ESTIMATER

## 5.1 The working environment

**Estimat*ER*** is an application written in the C++ programming language running under the Windows95/98/2000 operating system on PC based personal computers. A simple reporting function is implemented in the current version.

Main task of the **Estimat*ER*** is to provide the user with an emission estimation model and to transfer data produced by this model into the appropriate sheets of the CRF report.

The following files are needed to run **Estimat*ER*** :

- ✓ EstimatER.exe file
- ✓ One or more library file(s) (ELF extension); the library file is created at design time by the software development team and cannot be accessed directly by the user.
- ✓ Model file(s) (created by EstimatER - with .esf extension); these files can be used by the user as starting point for a new estimate; when installing the tool these files are not present;
- ✓ Cross table file(s) (files containing transfer definition into CRF Report - created by **Estimat*ER*** - with .crf extension)
- ✓ CRF report MS Excel file - CRF_V1_01.xls (used as template)
- ✓ Report format file – "rep1.MRP" (this should be in the ./Report directory)
- ✓ Additional input files, providing country specific default values for activity rates

When the user does not have a license for MS Excel, the programme operates without any problem with the exception of the export to MS Excel. In this case the report function of the "Tools" main menu option can be used. However in this case the most important function of the tool, which fills in data into CRF Report is obviously not available.

Two separate documents are available, one describing in detail the background of the tool and one describing in detail the functionality. Both documents are available at the ETC-ACC web site.

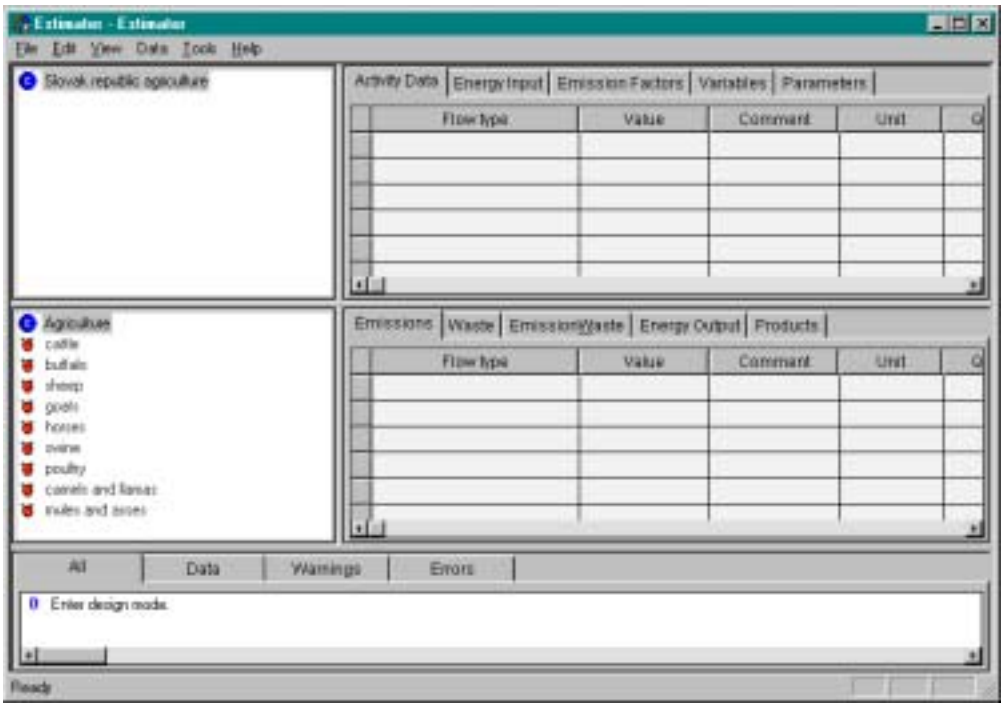
## 5.2 Inventory definition

When **Estimat*ER*** is installed as described above, a separate **Estimat*ER*** group will appear in the Start menu. Upon clicking the **Estimat*ER*** programme, the following window will appear. The structure of this window will be explained below.

Clicking on "File | New" will open a file dialog where the user should select a library. Two libraries are available at this moment:

- ✓ "agriculture.elf" and
- ✓ "ref_app.elf"

When the user selects a library, it is loaded into the application and the application will be in “design mode”, allowing the user to design the national agricultural sector. After selecting the agriculture library, the window will now look as shown below.

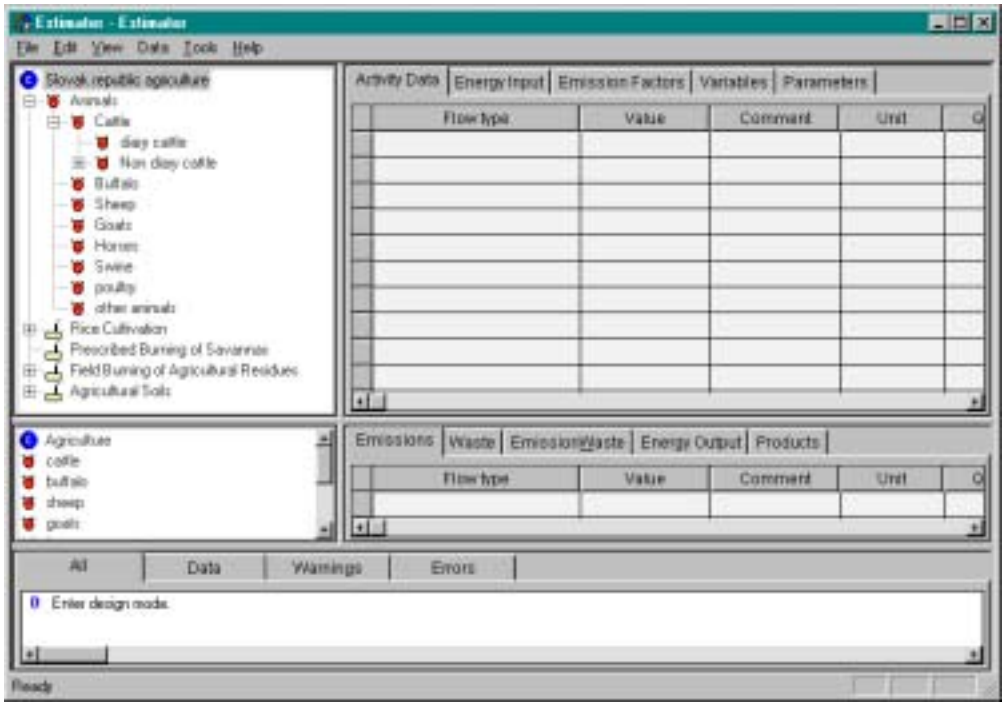



The 5 panes in the window can be resized by dragging the pane borders in any direction. The sizes of the upper four panes are coupled.

During design mode, the upper and middle left panes are important. The first one represents the sectoral inventory to compile and the latter one the processes available in the library. The inventory is designed by dragging one or more sectors into the inventory.

The inventory that is now available has a fully defined agriculture system (the first item called “Agriculture” in the library) and a number of additional animal groups. These animal groups could be added to the country’s animal husbandry sub-sector if the user so needs.

The country’s agriculture sector now is designed by dragging the full Agriculture sector and dropping it on the root entry (“Slovak Republic Agriculture”) in the inventory pane. The window now should look as shown below:




If the user wants to add an extra type of animals, he simply now drags it to the correct position. The application will not allow the user to drop it on an incorrect position within the inventory.

## 5.3 Emission estimation

The user now can bring **Estimat*ER*** in the calculation mode by selecting the “Data | Enter calc. Mode” menu option. The “library pane” is now no longer available and replaced by a “methods” pane.

The upper right pane now will show the default rates in the upper right pane and the estimated emissions in the middle right pane. The user can browse through the inventory by selecting any sub-sector or sector in the inventory pane. The input and output data shown in the right panes will reflect the data at the selected level. The different tab pages in the panes present different types of input (upper pane) or output (lower pane) data.

A quality indicator accompanies all numbers, consisting of two parts:

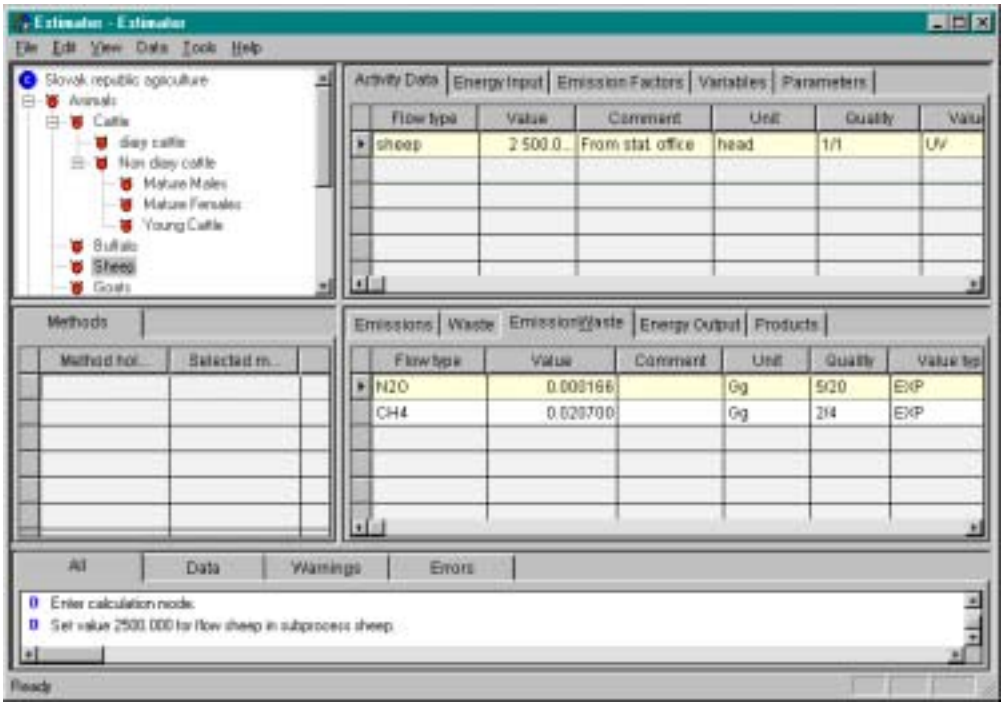
1. A quantitative one (“quality”), expressed as N/M, where M is the number of default values used in the calculation and N is the number of default values replaced by user values. When building an inventory from scratch, all Ns will be 0.

4) A qualitative one (“Value type”) with the following coding:

| | |
|---|---|
| DV | Default value |
| UV | User defined value |
| SUM | Sum of deeper levels |
| DIST | Distributed from a higher level to lower levels |

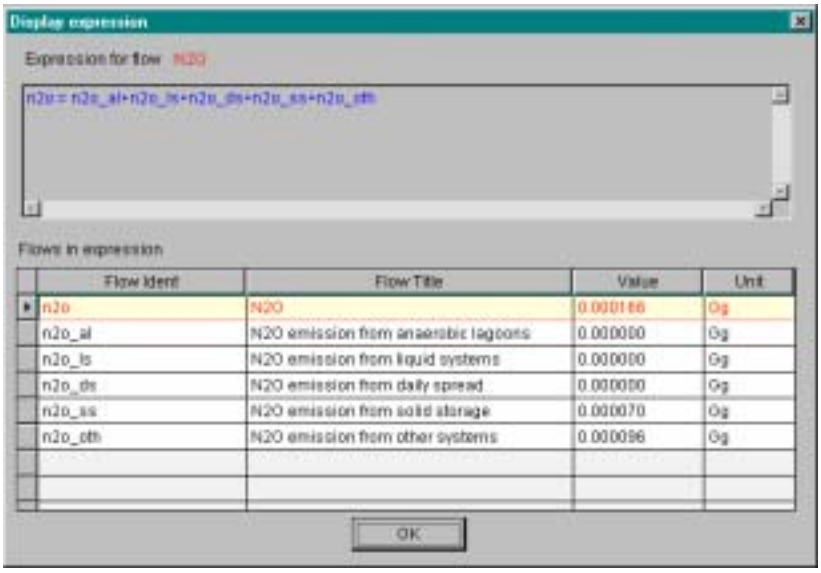
EXP Some algebraic expression.

The user now can replace any number by simply double clicking it. In the example below, a number obtained from the Statistical Office of the country has replaced the number of sheep. The comment field here is used to enter reference information. The window now looks as follows:



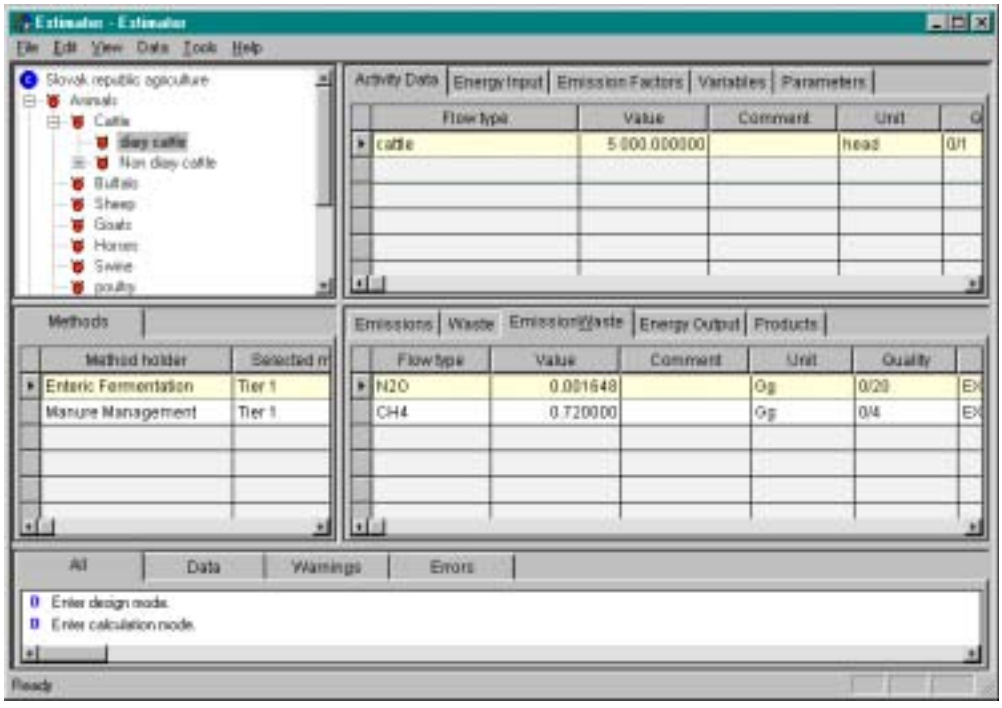

The lower pane keeps a log of the user inputs.

When a value is calculated, using an expression, the user can view and edit this expression by clicking the "EXP" field in the specific row. This will open a window as shown below




The expression is given in the upper part of the window and the parameters in the lower part. The value in red is the resulting estimate.

In some sectors alternative estimation methods are available. In such cases these can be selected by double clicking the relevant line in the "methods pane". This is now available for instance at the "cattle" subsector:




In this case, the Tier 1 methods can be replaced by Tier 2 methods. One the user does this, the number of default values in the methane estimate will increase from 4 to 39 if both enteric fermentation and manure management are estimated using a Tier 2 approach.