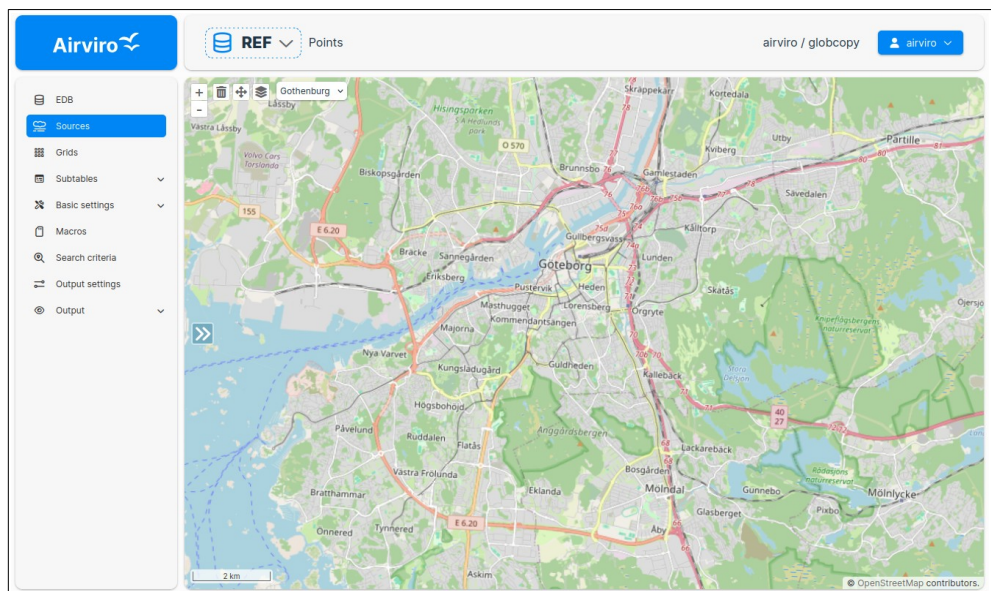


## Working with the Emission DataBase (EDB)



**How to construct a dynamic emission database  
and simulate emission scenarios**

# How to construct a dynamic emission database and simulate emission scenarios

## Amendments

| Version | Date changed | Cause of change                 | Signature |
|---------|--------------|---------------------------------|-----------|
| 3.11    | July 2007    | Upgrade to Airviro version 3.11 | GS        |
| 3.12    | Jan 2009     | Upgrade to Airviro version 3.12 | GS        |
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| 3.21    | July 2012    | Review                          | GS        |
| 3.22    | Sept 2012    | Upgrade                         | GS        |
| 3.22    | March 2013   | Review                          | GS        |
| 3.23    | May 2013     | Upgrade                         | GS        |
| 3.23    | July 2015    | Review                          | GS        |
| 4.00    | Sep 2015     | New Version                     | GS        |
| 4.00    | Aug 2018     | Review                          | GS        |
| 4.01    | March2019    | Review                          | GS        |
| 5.00    | Oct 2019     | Upgrade                         | GS        |
| 5.00    | Jan 2021     | Review                          | DC        |
| 5.01    | Oct 2022     | Upgrade                         | GS        |
| 5.10    | Jan 2023     | Upgrade                         | GS        |
| 6.00    | Aug 2025     | Upgrade                         | GS        |
| 6.00    | Jan 2026     | Review                          | GS        |
| 6.00    | Apr 2026     | Review                          | DC        |

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## 1.1 Introduction

The Airviro emission database (EDB) is not only a database. In fact the main emphasis has been placed on the user interface, the simulation models and the output facilities. EDB includes tools for management and administration of emission sources. A diagram explaining the structure of the EDB can be found in *Appendix 1C: Structure of an EDB*.

### How does EDB client work?

This Airviro module runs on any PC or device running later versions of Microsoft Edge, Firefox, Google Chrome, Safari or any other Mozilla based browsers.

Once Airviro has been properly installed on the *server*, you can start using it by typing the correct URL in your web browser over the Intranet/Internet.

After logging into Airviro typing your user-ID and password, a domain must be selected. After that it is possible to select the EDB module. Any user with the required privileges, can access the EDB module. Privileges must be previously defined to avoid unauthorised access.

### A Structured Way of Storing Emission Data

The tables provided enable you to describe emissions from:

- Point sources - the emissions are concentrated in a very small area, such as a chimney or stack. Information describing the stack conditions must be given for use in the Dispersion models.

- Area sources - emissions are evenly distributed over a rectangular area and are assumed to be leaking.
  - Facilities- several point sources can be related to a Facility, i.e. Point and Area sources concentrated in the same geographic area, using the same administrative information (address, reporting, and other information).
  - Road sources - emissions are assumed to be evenly distributed over a line. This is usually used as an approximation for road traffic.
  - Grid layers - background emission levels can be defined in the form of grids.
  - Ships - Information from ships is gathered using IAS radio messages from the ships. This includes coordinates, velocity and a unique ship identifier. With this information the emissions are calculated for each ship individually.
- Emissions time variation depending day type, month and scenario.
  - Emission factors and emission functions for point and area sources.
  - Different road types describing traffic patterns.
  - Vehicle characteristics and speed-dependent emission factors.

as well as other features that help you to convert obtainable information into emission figures.

## **Simulating “What Happens If...” Scenarios**

The search functionality allows you to restrict the sources from which the emissions are coming. A search can be made using the following restrictions:

- Source name and information strings.
- Point, area, road or grid sources, or a combination of them.

- One or several road types and vehicle types.
- Congestion vehicle and speed.
- Emission factors, Time variations and Emission functions.
- Any combination of search keys.
- A restricted area of the map.
- Restrictions on time and temperature.

Using search keys you can find emission values such as:

- Total emission of SO<sub>2</sub> from heating plants at 6 o'clock in the morning.
- Contribution to the total NO<sub>x</sub> emission of heavy vehicles in the city centre at rush hour.
- Emission of toluene from paint spraying industries in the northern part of the town when the outside temperature is over 20 degrees.

In this chapter a number of examples and recommendations on how to use the EDB module will be presented. Following these recommendations you will be able to simulate the consequences of hypothetical situations such as:

- What would happen if heavy vehicles were removed from the city centre?
- What would be the effect of changing the speed limit on the main roads?
- How much would emissions be reduced if low sulphur oil was introduced?

### **Integration with Dispersion Models**

The dynamic EDB can be used with the Airviro dispersion models, allowing you to combine different emission scenarios with various dispersion conditions. Given the weather and the parts of the day or year that you are interested in, relevant emissions will

be used as input data to the dispersion calculation.

See *Airviro User's Reference, Volume 2: Working with the Dispersion Module*, for examples on how to use EDB for dispersion simulations.

## The Report Generator

The report generator or Output can produce information from the EDB for presentation on screen, storage in a file or as a printout. You can visualise source locations and emission factors, as well as time dependent information concerning emission loads for a given period and area, a standardised output for road noise emission levels (colour-coded range), etc.

This output can be configured for source, grid, noise and report (only ASCII Text). Reports can be produced in different formats (GIF, PDF and ASCII Text) to be used by other applications.

## How to Collect the Relevant Information to be Stored in the EDB

When working with EDB, it is recommended initially to collect all relevant information directly from the industry, local authorities, etc. and save the data in the EDB. Working through the examples in this chapter you will be able to design suitable questionnaires.

Later on, you should be able to carry out dispersion calculations based on the EDB data for historical periods and compare the results with measured ambient data. By simulating different wind directions and weather conditions you will have a good chance of identifying sources that are not properly described in the EDB. Try to correct the emission data by collecting new information. If this method does not improve the results, we recommend you to use the Receptor Model to estimate emissions (Dispersion Module).

Once you are satisfied with the historical simulation results based on the EDB, you are ready

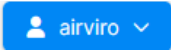
to work with real time dispersion applications (now casting) or forecasts for the next 24 hours.

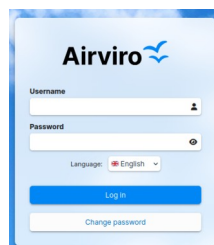
## 1.2 Getting started

After logging in to Airviro with your user name and password (*Figure 1.2.1*) a domain must first be selected and then EDB module should be chosen from the available modules. See *Figure 1.2.2*.

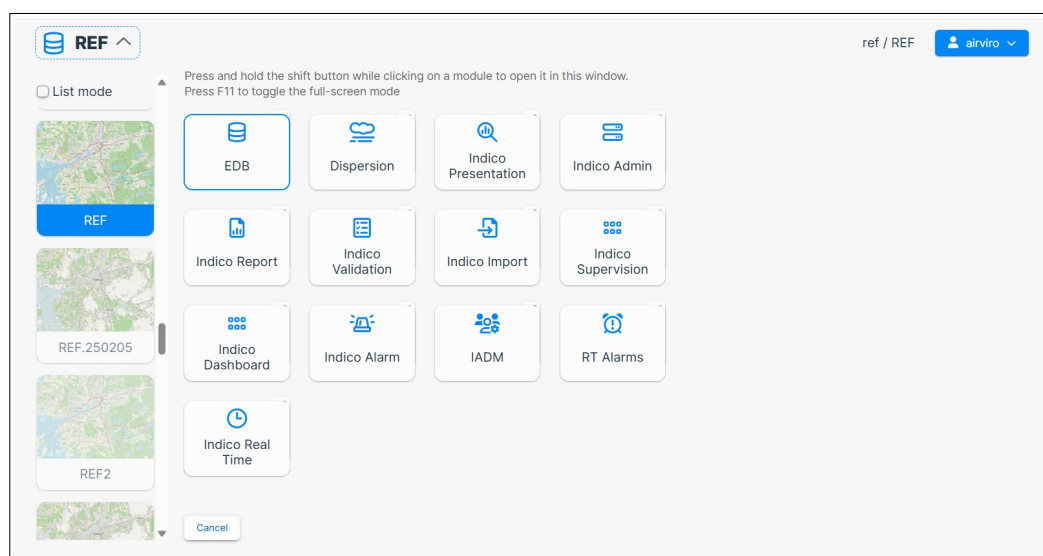
By clicking on the Current language [down arrow] button it is possible to select the language to work with. This functionality is not yet implemented.

Once a module has been selected. At the top of the window, the tab header displays the name of the currently selected module. When you hover the mouse pointer over the selected Domain name a tooltip appears showing the name of the module currently selected. Clicking on the **[down arrow]** button next to the name allows you to select a different domain and module.

By clicking on the button ^ **[down arrow]**, next to the user button text,  the **[Logout]** button, is shown. By clicking on the Logout button, the current module is closed and the Airviro login page is displayed instead. See *Figure 1.2.2*



*Figure 1.2.1 Logging in to Airviro*



*Figure 1.2.2 Available Domains and Modules.*

This manual will show you how to set up the EDB module. This includes:

- Selecting an EDB to work with - either the global EDB or a personal EDB.
- Creating a new personal EDB by either copying another EDB or by copying the empty EDB.
- Customising some of the menu texts.
- Adding new substances to the substance list.
- Creating Emission Factors.
- Working with the map.

Some of the examples shown here are based on real data from the Airviro (Göteborg) Reference System, included in all Airviro installations.

## 1.2.2 Selecting an EDB to Work with

Once EDB has been loaded into the web browser, you will see the main menu options on the left side

Go to the **Edb menu** (see *Figure 1.2.2.1*).

There are two list boxes labelled **User** and **Edb**. If you decide to work with the global EDB, select the **global** user in the list box to the left, then the edb's list will be blank. Press the **[Apply]** button. Alternatively you can select other user and edbs.

The following functionalities are available:

**ADD NEW EMPTY:** Allows you to add a new empty database.

**COPY:** Allows you to copy an existing database. Select it from the available list.

**DELETE:** Allows you to delete an existing database.

**INFORMATION:** a new windows is displayed with the following database information, nr roads, nr points, nr areas and nr grids.

**CHECK EDB:** Checks the consistency of the EDB database and displays any errors found.

**REPAIR EDB:** Repairs a corrupted EDB.

Shapes and CSV files generated using other GIS system can be easily import into Airviro using this new functionality: Manage shape/csv, Import grid, Import road and Import point.

**MANAGE SHAPE/CSV:** Imports and deletes shape files. Shapes generated using other GIS system can be easily imported into Airviro.

**IMPORT GRID:** To Import a grid you must assign it a name, select the file type (shape or CSV), assign it the grid fields to the corresponding fields in Airviro, (for example, name, info, info2, address, date, search keys and activity code), define grid size and the position of the first point in it and select substances from the list.

**IMPORT ROAD:** To import roads, select a shape file from the list and then assign the shape headers to the corresponding fields in Airviro EDB.

**IMPORT POINT:** To import points, select a shape file from the list and then assign the shape headers to the corresponding fields in Airviro EDB.

**ASSIGN HOUSE HEIGHTS:** To assign a shape field containing height of building for use in Aermod dispersion model.

**ASSIGN GEO CODES:** Import geo codes from shape files by selecting the code position in the edb code field to be assigned or replaced, the field name containing the code in the shape file and format in the shape file in which the code must be interpreted by Airviro.

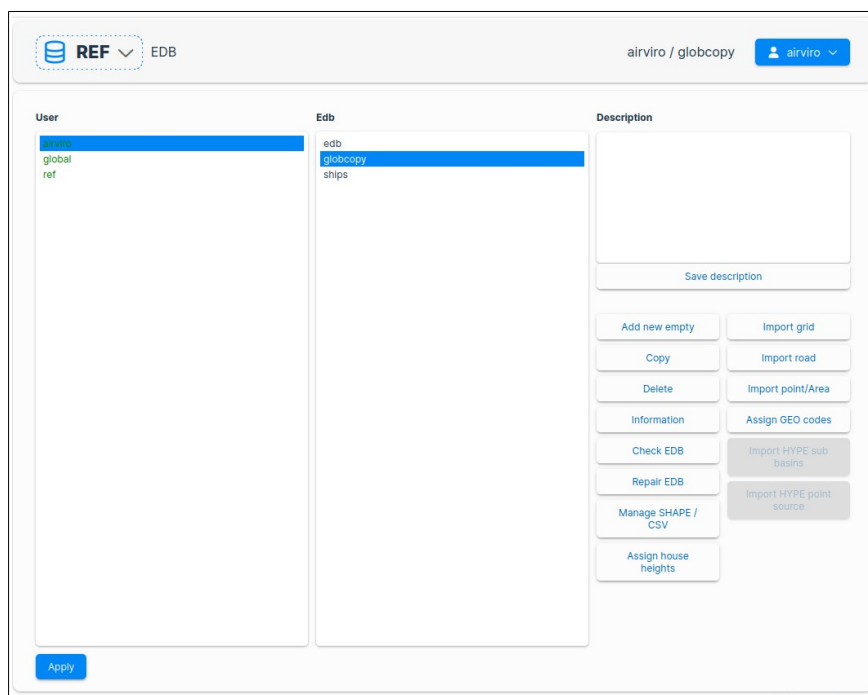
**IMPORT HYPE SUB BASINS:** Not yet supported for this version.

**IMPORT HYPE POINT SOURCE:** Not yet supported for this version.

To be able to use the csv / shape files within Airviro you must first import them into the Airviro server. The shape files saved in the user's pc can be copied into the Airviro server through the **Manage Shape** menu.

These files are saved in the shp folder ( /usr/airviro/data/name/shp).

The **Description** text box can be used to describe the contents of the selected database. You can add a description to the Edb selected by entering some text and pressing the button **[Save description]**.



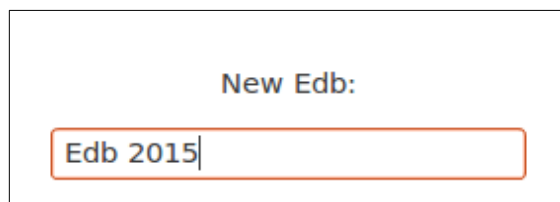
*Figure 1.2.2.1 Select user and Edb*

**Note:** A global EDB is the official, original emission database in the system consisting of a substance list that should be approved and supported by the system manager. Usually, no one but the system manager should be able to edit the global EDB. However, any user can access the contents of the global EDB and make a copy of it with a different name, and then edit it.

**Note:** It is possible to set up privilege levels in the Airviro system so that different users can have different privilege levels for different emission databases. This task should be done by the system administrator. The system administrator have to make sure that the global EDB can only be edited by responsible persons and that other users can make their own personal copies of the global EDB if needed. It is not only the global EDB that can be protected in this way. Privilege levels can also be set up for a user's personal EDBs. If you have trouble accessing an existing EDB that you think you should be able to access then ask your system administrator about your privilege levels.

## Creating a New Copy of the Global EDB

Usually, only the system administrator is allowed to edit the global EDB, but you can make your own copy. Select the user “global” and then press the button **[Copy]**, write a new name for the edb and press the **[Ok]** button (see *Figure 1.2.2.2*), The new copy of the global edb will appear in your personal edb folder, under your log in user name.



*Figure 1.2.2.2 Adding a new EDB or a copy.*

## Creating a Copy of Someone else's Personal EDB

Same as copying the global edb, but instead of the “global” user, select an edb from your own personal folder or from someone else, and follow the same steps as before.

---

**Note:** It is even possible to set privileges on individual EDBs so that other users cannot even view them or copy them. This is done in the privilege level file, which should be maintained by the system administrator.

---

## Deleting an Edb

Select an edb from your own personal folder and then press the **[Delete]** button. An alert will appear requesting you to confirm or cancel the removal.

---

**Note:** Usually, it is only possible to delete your own personal edbs. If you choose someone else's personal EDB, or the global EDB, then the **[Delete]** button will be disabled. However, it could be possible to delete someone else's Edb by setting the corresponding privilege level by the system administrator.

---

## Creating a New Empty EDB

Just press the **[Add new empty]** button and write a name for your new edb (See Figure 1.2.2.2.). The new empty edb will appear in your personal edb folder, under your log in user name.

### Exercise 1

Create an empty personal EDB with the name: **My\_first\_EDB**.

### Check and repair EDB

Clicking on the **[Check EDB]** button the system will check the consistency of the personal EDB selected in the list.

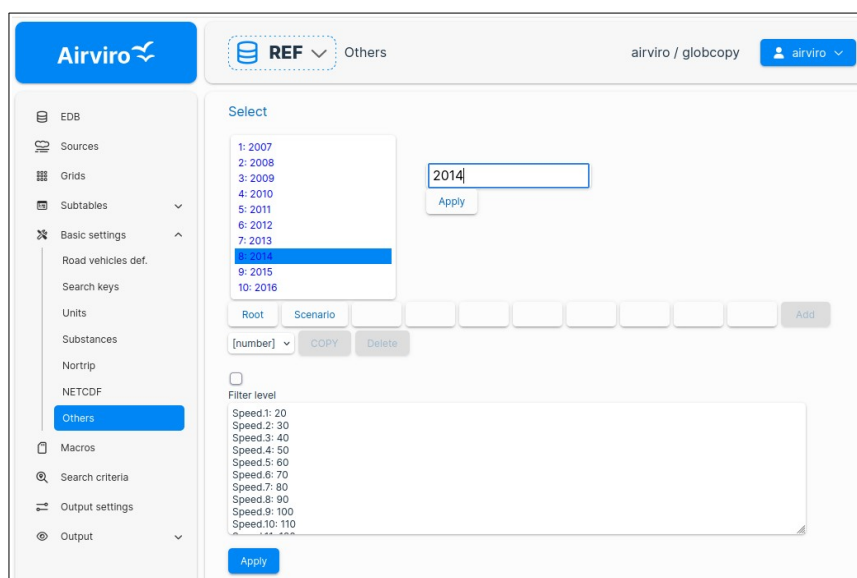
Clicking on the **[Repair EDB]** button the system will try to repair the personal EDB selected in the list.

## 1.2.3 Modifying Basic Settings Texts

Select your personal Edb: **My\_first\_EDB**, which should be empty. This EDB has been created with default texts for certain tags and list options, but it is possible to modify some of them. You should only modify texts in an empty EDB, that is before you start entering data, because these texts will apply to every single source in the EDB.

To look at the currently defined texts, go to the different sub-menus under the **Basis settings** menu. You can define: **Scenario** texts, **Speed** texts, **Temperature** texts, Search keys, activity codes, geographical codes, noise and Units.. Choose one of them, for example **Others**, and then select **Scenario....** from the list. A new list appears displaying the default scenario definitions as consecutive years starting from the year 2003. But what

if you have emission estimations for the year 2015? To be able to incorporate these figures into your EDB, change one of the scenarios (e.g. change scenario 10) to 2015. Now, whenever you enter or edit a source, the year 2015 will appear in the scenario list in the 6th position. See *Figure 1.2.3.1*.



*Figure 1.2.3.1. Basic Setting*

You can modify the speed and temperature texts too, as they have been set up to comply with Swedish traffic (i.e.) and weather conditions but might not be so relevant to other countries.

## 1.2.4 Adding Substances to the Substance List

Select the “global” user in EDB. This edb contains the default substance list, which is also used for all local Edb. To view the substance list select **Substances** under the menu **Basic Settings**.

A list of substances will be presented as in the figure 1.2.4.1, also included in the appendix. There are 1023 positions for different substances. These can be grouped in categories

depending on the type of chemical substance. It is recommended not to change the positions of existing substances, however, you may introduce any new substances at the empty positions in the substance list.

| Key | Substance Name | Key | Substance Name |
|-----|----------------|-----|----------------|
| 0   |                | 512 |                |
| 1   | NO             | 513 |                |
| 2   | NO2            | 514 |                |
| 3   | NOx            | 515 |                |
| 4   | HNO3           | 516 |                |
| 5   | HNO2           | 517 |                |
| 6   | PAN            | 518 |                |
| 7   | NH3            | 519 |                |
| 8   | N2O            | 520 |                |
| 9   | -              | 521 |                |
| 10  | NOx lätta      | 522 |                |
| 11  | NOx tunga      | 523 |                |
| 12  | -              | 524 |                |
| 13  | -              | 525 |                |
| 14  | -              | 526 |                |
| 15  | SO2            | 527 |                |
| 16  | H2SO4          | 528 |                |
| 17  | SO3            | 529 |                |
| 18  | H2S            | 530 |                |
| 19  | CS2            | 531 |                |
| 20  | SF6            | 532 |                |
| 21  | -              | 533 |                |
| 22  | -              | 534 |                |
| 23  | -              | 535 |                |
| 24  | -              | 536 |                |
| 25  | CO             | 537 |                |
| 26  | CO2            | 538 |                |

Figure 1.2.4.1 Substances

**Note:** There is only one substance list shared by the global EDB and all local Edb's. The substance list can only be modified in the global EDB, so you must have privileges for editing the global EDB.

**WARNING:** Internally, Edb does not use the substance names that you write in the substance list. It does, however, look for their positions in the list. This means that there are 1023 substances with internal keys: 1 to 1023. For instance, If you use position 11 for substance AA and position 12 for BB, and later, when you define an emission source you assign substance AA as emitted from that source, then edb will actually use key 11. If you then change substance names between positions in the substance list, for instance swap 11 to BB and 12 to AA, the emission source defined will still be pointing to position 11, independently of the name you have given to it, so you will have to redirect the pointer from all the emission sources already defined to the correct positions in the substance list. Consequently, you should set up the substance list as completely as possible before you start to fill the Edb with information.

## 1.2.5 Emission factors in EDB

Sometimes it will be convenient to define emission factors as a specific mixture of the substances defined in the substance list. Thus, you can define an emission factor called **standard petrol**, assigning it the percentage of different hydrocarbons, lead, etc. This will simplify your work later on when you have to define all sources emitting gases from **standard petrol**, or if the composition of **standard petrol** needs to be changed.

To define an emission factor:

Select the **Emission Factor** submenu from the **Subtables** main menu, and then press the button **[Add]**

Type a name for the new emission factor in the text field **Name**.

- Select the required substances from the list and add them by pressing the **[Add to factors]** button.
- The emission is calculated using a linear equation ( $\text{Emission} = k * \text{activity} + m$ ). The values for  $k$  and  $m$ , must be specified for each substance. The activity is specified when a point or area source is defined.
- Save your emission factor by clicking **[Apply]**.

The example below shows an emission factor that has been created to describe hydrocarbon emission from vehicles and it is a particularly illustrative example of how Emission Factor can be used. Many different hydrocarbons are emitted from combustion of petrol, and we have details about a few of them. The emission factor consists entirely of hydrocarbons from petrol, therefore we enter a value for  $k$  and 0 for  $m$  for each substance. However, contained in HC Traffic we know there are about 4% benzene, 12% toluene and 13% total xylenes. We can link the description of hydrocarbon emissions from cars to this emission factor instead of just to the substance HC Traffic. In this way we have the option of

searching for either total hydrocarbon emission or for each one of the individual hydrocarbons.

**Emission factor** airviro / globcopy

**Name**  
Name: HC from car fuel

**Substances**

- 1,1,1-Trichloro
- 1,2-Dichloroeth
- 238Totant10\*13
- Accumul10\*13
- Acetaldehyde
- Acetone
- Acetylene
- Altken1\_10\*13
- Altken2\_10\*13

**Factors (Emission = Activity \* k + m)**

| Name           | k   | m | Unit |
|----------------|-----|---|------|
| NOx            | 100 | 0 | %    |
| Benzene        | 4   | 0 | %    |
| Toluene        | 12  | 0 | %    |
| Xylene (total) | 13  | 0 | %    |

Buttons: Add, Delete, Apply

Figure 1.2.5.1 The emission factor sub window.

## Exercise 2

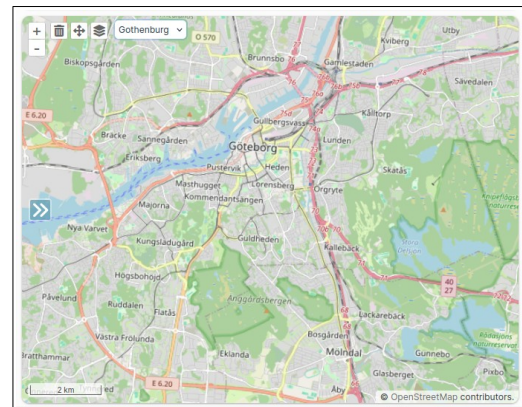
Define an emission factor called **Standard Petrol** consisting of 5% Benzene, 12% Toluene and 3% P-Xylene.

## 1.2.6 Map tools

### - Choosing a Geographical Area

#### Selecting a Map-

Some Airviro installations include multiple maps. Use the drop-down list to select the desired map (*Figure 1.2.6.1*). For example in this figure Gothenburg is selected with a map coming from Open Street Map.



*Figure 1.2.6.1. Map*

#### Selecting a Geographical Sub area Within a Map

It is possible to zoom in/out the map clicking on the buttons **[+]/[-]**, alternatively you can use the mouse scroll wheel. Use the [pointed cross] button to restore the original zoom (*Figure 1.2.6.1.*).

A particular area can be selected by clicking on **[Select on map]** button above the source list and then hold down the **[Ctrl+left]** mouse button while dragging the mouse pointer to select the area. Click on the left mouse button and drag the mouse to stretch a rectangle. Release the mouse button when you are satisfied with the selected area.

## To Clear a Map

Pressing the **[Show]** button will show the emission sources on the map, to clear them out, press the button **[Clear]** in the map dialogue area (*Figure 1.2.6.1.*).

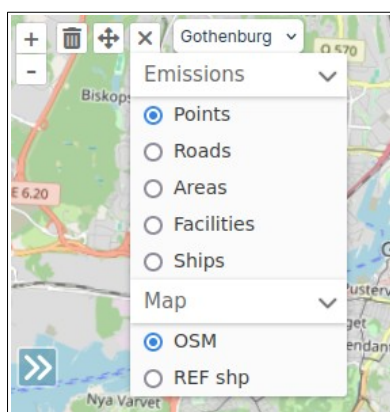
## Pan

To display another area of the map with the same scale, with the mouse pointer over the map, click on the left mouse button and move you mouse over the map, without releasing the button, when the desired area is shown, release the mouse button.

## - Integrated UI: Gis & Airviro mode in one.

## Layers

Pressing the **[Layers]** button will show the emissions sources and maps. Use layer button to change source type and/or select the map of interest.



*Figure 1.2.6.2. Layers.*

## Slide-in menu for listing source



Press this button to access the source window. It is the same windows as in previous Airviro versions.

## Sources

For Point Sources, clicking on each red dot on the map, will displays a window where you can choose to edit, modify or delete the source. For Area sources, you must do a click on any part of the area. In the same way to be able to edit/modify or delete a road source, you can do a click on any part of the road segment.

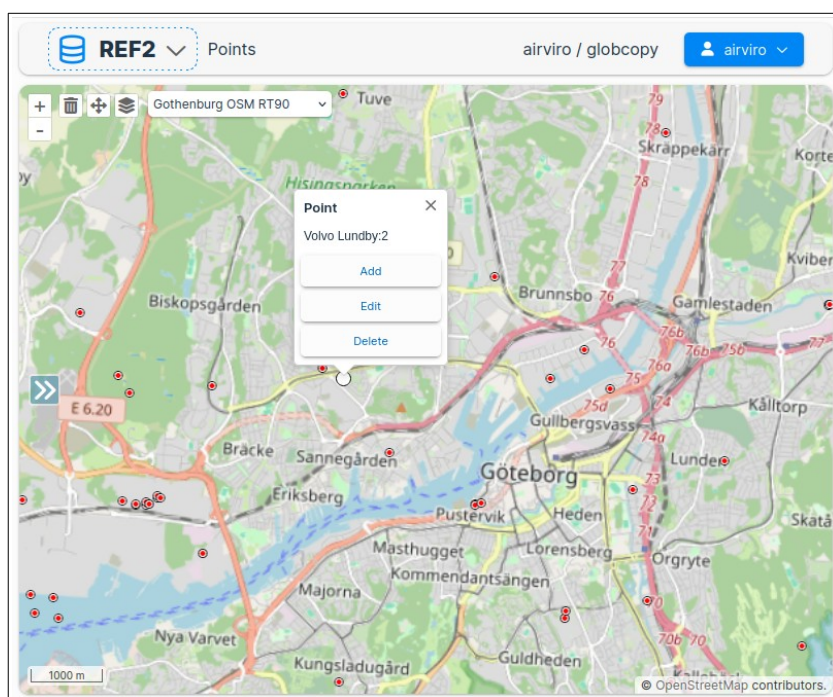


Figure 1.2.6.3. Sources.

## 1.2.7 Notes on Filling in Tables in the Edb

When entering data into an EDB you will often come across large tables that have to be filled in with emission factors.

It is very important that there are no extra spaces in the table.

By default, tables are created with the value 100 in each cell.

## 1.3 Point sources in the EDB

The emission from a point source can be defined in three different ways:

1. By defining the total amount of each substance emitted in a year.
2. By using emission factors, i.e by defining the amount used by an activity and applying an emission factor for that activity.
3. By defining an emission formula with a number of variables and specifying values for the variables.

The following steps will be explained:

- Information required when entering a point source.
- How to specify a time variation.
- Static information needed for dispersion modelling.
- Using the search conditions to calculate emission values from your sources.
- Defining a point source with emissions based on a dependency of temperature using a time series macro.
- Creating an emission formula.
- Defining a point source based on an emission formula.
- Grouping sources using facilities.
- Defining a company and associating facilities to the company.

### 1.3.1 What is a Point Source?

If the air pollutants are emitted from

- a well defined position
- a small restricted volume

then we define the source as a point source. An emitting stack or chimney is a typical point source. In the Edb, you can describe the effect of heat and momentum fluxes on point source emissions, i.e. information that is necessary in order to make realistic dispersion simulations from a stack.

### 1.3.2 General Principles

When adding a point source to the Edb the following information must be specified:

- **Name information** assigns the name of the source plus two information strings (Info, Info2). These strings can be used as search conditions when searching in the EDB.
- **Coordinates:** assigns the x and y coordinates.
- **Emissions:** assigns the information that is directly associated with the emission, such as a yearly emission from a substance and a time variation that describes the emission as a function of day type and hour.

**Emission** from the source either directly in terms of the substances emitted, or linked to an emission factor or an emission function.

It is also possible to link the emission to an *Indico Presentation* macro. Instead of specifying the emission for a substance, you can select a macro previously defined in *Indico Presentation*. The unit of the resulting time series from the macro must be g/s.

The emission can be defined with a substance, an emission factor, and/or an emission function at same time.

- **Chimney** assigns values such as chimney height, exhaust gas temperature, house width/height, etc. These values do not affect the emission strength, nor do they vary over the year, but they are required in order to describe the exact location of the initial pollutant plume. This type of information is vital for the dispersion simulations.
- **Searchkey** it is possible to assign up to five groups of search keys in order to organise the pollution sources into groups that can be used to separate the total emissions.
- **Other** such as **geographical codes**, **additional info** and AERMOD data.

### 1.3.3 Time variation for a point source

Before entering any general or static information it is important to create a time variation that describes how the emission changes over a period of time. In most cases, we know that emissions variation within a large city have the same order of magnitude as long-term average emission. An empty Edb, contains only one predefined time variation, the so-called **STANDARD** time variation, which contains a time constant emission.

The emission variations specified in the time variation tables are interpreted in two ways: The yearly variation is given as absolute values but all other variations are normalised in a way that the yearly emission always will be the percentage of the annual emission specified by the yearly variation percentage.

We will begin by considering the first group as this expresses a more general formulation of emission variations. In *1.3.7 Introducing a Point Source Based on Knowledge About the Emission Process* we will discuss the second alternative to be used for emission variations where we have information about the emission process.

To create a time variation:

- Click on **Time Variation Point** under the **Subtables** menu to open the Time variation Point window.
- Click on **[Add]** (or click on **STANDARD** if you want to edit the default Time Variation).
- Type in a Time Variation name in the **Name** text box.
- Define the corresponding variations for **DAY TYPE**, and **SCENARIO & MONTH**.

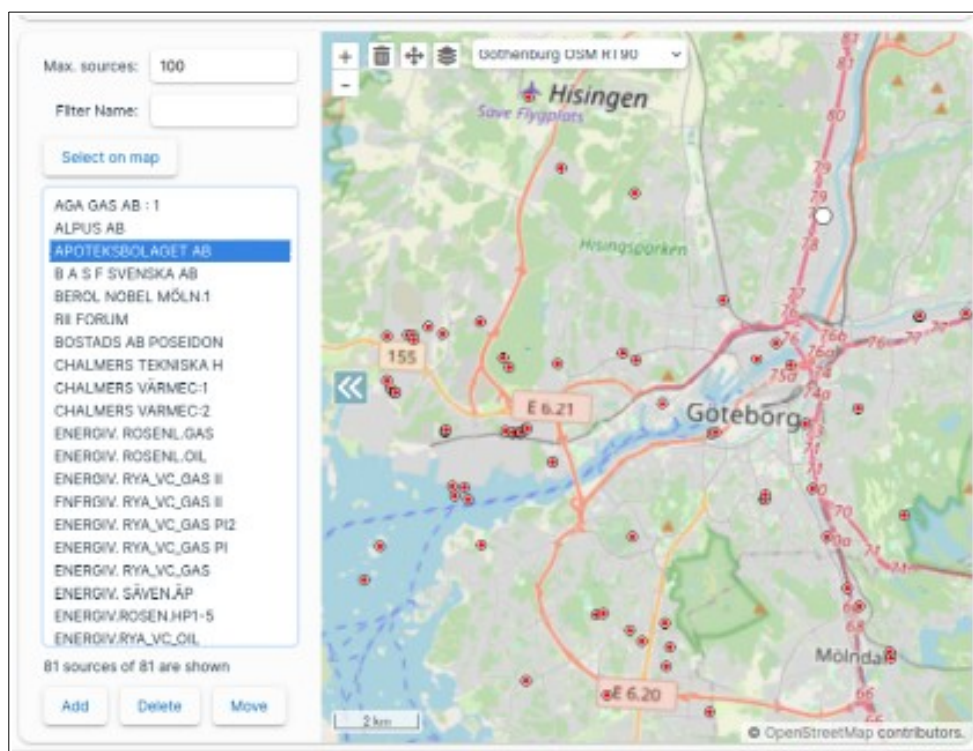


Figure 1.3.3.1. The Point sources subwindow

The **Scenario & Month** sub window has 12 text fields for Monthly variation values to describe the relative variation of emission during the year. It also has 10 text fields for Scenario variation labelled yearly, (see section 1.2.3). In these text fields you can enter the absolute variation of emission in percentage over the years.

The screenshot shows a web-based configuration form. At the top, under 'Name Information', the 'Name' field is set to 'STANDARD'. Below this, the 'Configuration' section has a 'Day type' dropdown menu currently set to 'SCENARIO & MONTH'. Under 'Scenario variation', there is a table with years from 2007 to 2016, each with a corresponding input field containing the value '100'. Under 'Monthly variation', there is a table with months from January to December, each with a corresponding input field containing the value '100'. An 'Apply' button is located at the bottom left of the form.

| Scenario variation |      |      |      |      |      |      |      |      |      |  |  |
|--------------------|------|------|------|------|------|------|------|------|------|--|--|
| 2007               | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |  |  |
| 100                | 100  | 100  | 100  | 100  | 100  | 100  | 100  | 100  | 100  |  |  |

| Monthly variation |          |       |       |     |      |      |        |           |         |          |          |
|-------------------|----------|-------|-------|-----|------|------|--------|-----------|---------|----------|----------|
| January           | February | March | April | May | June | July | August | September | October | November | December |
| 100               | 100      | 100   | 100   | 100 | 100  | 100  | 100    | 100       | 100     | 100      | 100      |

Figure 1.3.3.2. Scenario and Month

Usually, you should type 100 for the present year, meaning a factor equal to 1. If you estimate that the yearly emissions will double by the year 2000, then type 200 in that text field.

**Day Type:** In the same way, describe the daily and hourly emission variation according to the type of day; that is, working day, weekend, etc (see Figure 1.3.3.3).

The values entered here will be normalised at the moment EDB uses them to estimate emissions. This will be explained mathematically in **Appendix 1B**, and you will see the effects and understand the principles later on when you perform dispersion calculation (simulations).

Example1: If you write 100 for all months but set June and July = 0 then it means that no pollutants are emitted during these summer months, but the total yearly emission will be evenly distributed over the other ten months. If you had written 200 instead of 100 for all months except June and July = 100 the result would have been the same.

Example2: If you write 75 for 6 months (October-March) and 25 for the other 6 months (April-September), then emission will be three times higher in the winter than in the summer. You will get the same result if you had given the figures 300 and 100 instead of 75 and 25.

## Exercise 3

Create a Time Variation named **industry\_2shift** with a constant emission during working days between 6 a.m. and 10 p.m., and no emission at all during other times of the day (or during weekends). The industry is completely closed in July.

- Define the daily and hourly variation by clicking on **Day type**. This subwindow has 4 columns labelled with the day types: Monday-Thursday, Friday, Saturday and Sunday are displayed. The 24 text fields on each column define the hours during the days. In these text fields you can enter the relative variation of emissions during the week.

Example3: If you write 100 for all hours during Monday-Thursday and Friday but 0 for the weekend days, then no pollutants are emitted during Saturday and Sunday but 7/5 of the weekly average emissions will be emitted during workdays.

|         | 00 - 01 | 01 - 02 | 02 - 03 | 03 - 04 | 04 - 05 | 05 - 06 | 06 - 07 | 07 - 08 | 08 - 09 | 09 - 10 | 10 - 11 | 11 - 12 | 12 - 13 | 13 - 14 | 14 - 15 | 15 - 16 | 16 - 17 | 17 - 18 | 18 - 19 | 19 - 20 | 20 - 21 | 21 - 22 | 22 - 23 | 23 - 24 |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Mon-Thu | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     |
| Fri     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     |
| Sat     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     |
| Sun     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     | 100     |

Figure 1.3.3.3. Day type variation

### 1.3.4 Static Emission Information

There are important emission characteristics that do not affect the emission strength, but must be known so as to be used by a dispersion model in order to determine the effect of emissions in the ambient air.

The static information required is:

- **Chimney height.** It is important to know the release height when we apply a dispersion model. Generally speaking: the higher the stack is, the lower pollutant concentration on the ground close to the stack.
- **Inner diameter** of chimney and **Exhaust gas velocity** are used to calculate the vertical displacement of the pollutants before the horizontal wind and turbulence transports the pollutants and mixes them down to lower levels. We use these values to calculate the so-called *effective stack height*.

It is also important to know the **Exhaust gas temperature** to determine the *effective stack height*. If the gas is considerably warmer than the surrounding air, then the buoyancy effect will create a large plume lift.

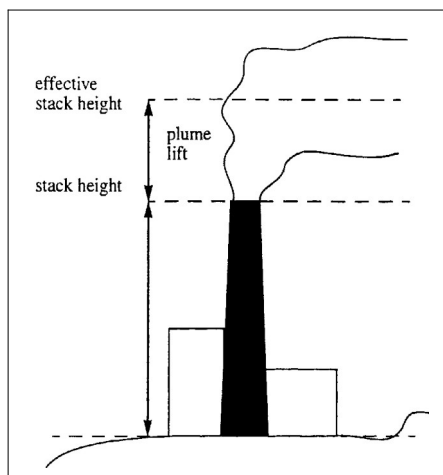
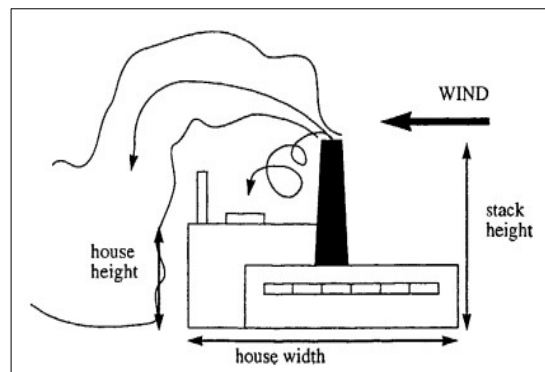


Figure 1.3.4.1. Effective stack height

The **Outer diameter** of the stack as well as large buildings in the vicinity affect the wind flow close to the stack and consequently the dispersion pattern. In some cases a considerable down draught can occur creating high concentrations of pollutants on the ground close to the source.



*Figure 1.3.4.2. Buildings*

Buildings can create an effect if the stack is less than 2.5 times as high as the buildings. You should specify the dimensions of the largest nearby building, as this will have the greatest influence.

**Note:** The static information is not necessary to simulate emissions in the EDB module, but it is vital to simulate the air quality effects using the dispersion models in the Dispersion module. Therefore, we recommend that you always enter the static information when adding a point source to the EDB.

### 1.3.5 Specifying a Point Source Based on Yearly Total Emission Figures

You are now ready to introduce the first point source in the EDB. The first example is based on a typical situation from real life. You have asked Mr. John Smith, the environmental manager of a medium size company (a cement factory) about the emissions of  $\text{NO}_x$ .

He has given you the total emission figures for the year and indicated the periods during which the factory is closed. Additional information about stack height, exhaust temperature, etc. has also been provided and the information can be summarised as follows:

Company name: Cement and Son Ltd.

Total yearly emission of  $\text{NO}_x$ : 600 tons

Stack height: 45 m, outer diameter: 2 m, inner diameter: 1 m.

Stack mounted on a building of dimension 50\*40 m<sup>1</sup> and height 32 m.

Exhaust gas temperature: 12°C, velocity: 8 m/s

Production on working days (Monday-Friday) between 6 a.m. and 10 p.m. Closed in July.

1. The house width should be calculated as  $\sqrt{length \times width}$

Mr. John Smith estimates that the production will increase by about 10% per year until the year 2000.

## How to add your First Point Source in the EDB

Under the menu **Sources**, click on **[Select on map]** or select a point or click on the red circle on the map and then click on **[Edit]**.

The screenshot shows a web form for adding or editing a point source. The form is organized into several sections:

- Name Information:** Includes fields for Name (pre-filled with 'My\_first\_EDB'), Info, Info2, Facility (0,0), and a dropdown menu set to 'none'.
- Coordinates:** Includes fields for X1 Coord (1271700), Y1 Coord (6401478), X2 Coord (0), and Y2 Coord (0).
- Emissions & Chimney:** A section with four tabs: 'Emissions Substances', 'Emissions Factors', 'Emissions Function', and 'Chimney Settings'.
- Searchkey:** A row of five dropdown menus, all set to 'none'.
- Other:** Includes tabs for 'Codes', 'Additional info', and 'AERMOD'. Below these are fields for Date (250528) and Latest change (971014).

At the bottom of the form are 'OK' and 'Cancel' buttons.

Figure 1.3.5.1. Point source

Note that it is only necessary to select a sub area if you want to edit an existing point source or if you want to copy information from an existing source to a new one.

The list box to the left of the map will list all existing sources in the selected area. If you are working with the personal EDB: **My\_first\_EDB** (see *Exercise 1.2.2.2*), there should not be any sources.

Click on **[Add]** and move the mouse pointer over the map area to the desired location for the emission source, then click on the left mouse button. The edit **Points** sub window (*Figure 1.3.5.1*) will replace the map and you can start filling in the required information.

- Fill in the name of the company in the upper text field **Name**.
- Fill in the **Name Information, info** and **Info2** string (we will explain them later on in *1.3.8 Using Search Keys and Pattern Matching Facilities as Search Conditions*).
- To change the location of the source you can manually enter the **X Coord** and **Y Coord**.
- Fill in the emission values by clicking on **[Emission Substances]**. The **Substances** sub window appears. Select NO<sub>x</sub> from the list box and fill in the total yearly emission (tons/year) in the relevant text field. Select the appropriate **Time Var** (time variation) **industry\_2shift** for this exercise. Select the available **Additional information, Code** or **Time series**. Confirm by clicking on **[Ok]**.

Using the **[Copy first]** button you can copy the values/selections in the first row of the list to the others.

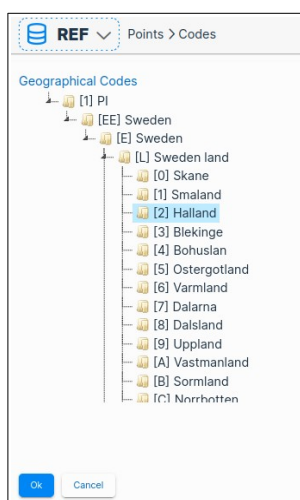
Select the available **Act.Code** and **Add. info**.

Codes are used to categorise sources in EDB. These can be geographic codes or activity codes. These codes are defined in the **Basic Setting** menu.

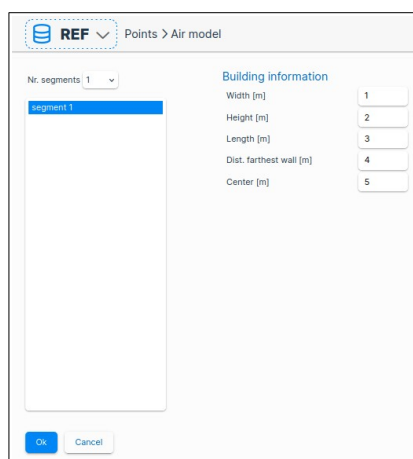
The **Additional information** can contain any amount of text. It is used to store data that is not categorised. The format required to include data in **Additional information** is **[tag\_name] = [value]**, for example:

NO\_CARS=12

FUEL\_CONSUMPTION=1000



*Figure 1.3.5.2. Codes*



*Figure 1.3.5.3. Additional info*

Fill in the **Aermod** menu, with the characteristics of surrounding buildings. These will be used in the Dispersion Module (Aermod Model). Width, height, length, centre, and distance to the farthest wall, must be entered for each building. All values must be in metres.

At least one segment must be defined for each point source.

REF Points > Air model

Nr. segments 1

segment 1

Building information

Width [m] 1

Height [m] 2

Length [m] 3

Dist. farthest wall [m] 4

Center [m] 5

Ok Cancel

Figure 1.3.5.4. Aermod

- Finally, save your new point source by clicking on **[Ok]**.

### 1.3.6 Emission calculation from a Point Source

We can use a point source to perform an emission calculation. Emission calculations are performed using the Search criteria subwindow. A search is carried out over the map area that you see on the screen, if you zoom in/out the map area then that visible area will be searched.

Click on **Search Criteria** in the EDB main menu. The **Emission** search window will appear on the screen. See *Figure 1.3.6.1*.

The screenshot shows the 'Search criteria' window. At the top, there's a 'REF' icon and a 'Search criteria' label. On the right, the user 'airviro / globcopy' is logged in. The main area is divided into sections:   
**Substance**: A dropdown menu showing 'NO' and a dropdown for 'Only emission'.   
**Sources**: Checkboxes for 'Point', 'Area', 'Road', 'Grid', 'Ship', and 'Treat ships as points'.   
**Variation**: A 'Scenario' dropdown set to '2007', and radio buttons for 'Time', 'From', 'To', and 'Resuspension from'.   
**Restrictions**: Text input fields for 'Name', 'Info', and 'Info2', and buttons for 'Point, Area & Grid', 'Road', 'Search key', 'Sub area', 'Codes', and 'Additional info'.   
**Correction**: Input fields for 'Point', 'Area & Grid', and 'Road', all containing the value '1'.   
At the bottom, there are three buttons: 'Apply', 'Apply & Show emissions', and 'Clear all'.

Figure 1.3.6.1. Search criteria

The following restrictions can be use to perform the search:

- **Substance:** The substance must be selected from the list. The substance can be emission only or resuspension. This is how Nortrip model integrates into the EDB search.
- **Sources:** You can select any combination of point, area, road, grid and ship. Also the option to treat ship as point sources instead of line sources is available.

For example, if you tick off **POINT** and **AREA** then only point and area sources will be included in the search.

- **Restrictions** consist of six subwindows with other optional restrictions.
  - **Name Information:** The three text fields Name, Info and Info2 give you the possibility to enter the character string you want to match when searching for sources. If you write Cement and Son Ltd. in the Name text field then all sources matching that name will be searched for, and not others. There is the possibility to use the so-called "wild cards" in connection with the character strings. For example: If you write Cem\* then all sources with a name beginning

with Cem will be searched for. For further information see 1.3.8 Using Search Keys and Pattern Matching Facilities as Search Conditions.

- **Point, Area & Grid:** Restrict the search to point/area/grid sources defined with a specific **Emission factor**, **Emission formula** and/or **Time Variation**. A maximum of 10 selections can be made in each list.
- **Road:** Restrict the search according to the number of vehicles per day (minimum and maximum) and road length (minimum and maximum), speed, etc. Selects line sources (traffic roads) that are based on a specific **Road type**, **Road Vehicle**, **Vehicle** type and typical **Speed**. Restrictions can also be made on the alternative emission model for road, **Road vehicles** and **Road time variation**. (see *1.6 Traffic Emissions in the EDB*). A maximum of 10 selections can be made on each list.
- **Sub area:** Change the map or select a sub area within a map. Define a geographical area in which to perform the search for emission sources.
- **Search keys:** Restrict the search according to the search keys, Emissions from sources that have been given specific search key (see *1.3.8 Using Search Keys and Pattern Matching Facilities as Search Conditions*). An unlimited combination of search keys can be made.
- **Codes and Additional info:** Restrict the search according to the codes that were previously defined or to filter sources depending on the additional info.
- **Correction:** It gives you the choice to multiply the emission values from point, area & grid and road sources by an arbitrary factor.
- **Variation:** button **[Time]** allows you to restrict the search to a different set of hours, day types and months and scenarios (years).
  - **From/To:** Used to restrict calculations to emissions within a specific time period. If the EDB contains sources that use time series to define the emission, this is the only way to calculate the emission from these sources.

- **Clear all:** This button resets all the selections to default.
- **Apply:** This button saves your setting.

## OUTPUT SETTINGS:

- There are five different types of outputs:
  1. **Sources:** All sources matching the search criteria will be displayed on the map (on the screen), both location and emission value. You can use the option *Show emission sources with nr of decimals*. A maximum of 8 decimals can be select in each list. Emission rates are usually expressed as grams per second (g/s) or other units.
  2. **Grid:** You can define a grid with a user-defined resolution over the map or a sub area within the map. The total emission in each grid cell will be displayed using graded colours. One can define the grid resolution, colours, etc.
  3. **Report:** Unlike the previous options, this output only displays different text formats. Here you can define several types of reports to display information from the EDB. The Report Generator is described in *1.8 Creating EDB Reports and displaying the Database structures*.
  4. **Noise:** All road noise emission levels will be displayed with different colours on the map. This is standardised with colour-coded range.
  5. **Codes:** This output includes Geographical and Activity codes.

**Example.** Make the following selections in the **Search Criteria** subwindow:

|                   |               |  |  |  |  |
|-------------------|---------------|--|--|--|--|
| Search strings:   | Name:<br>Cem* |  |  |  |  |
| <b>Substance:</b> | NOx           |  |  |  |  |

|                                                     |          |         |         |  |  |
|-----------------------------------------------------|----------|---------|---------|--|--|
| <b>Sources:</b>                                     | Point    |         |         |  |  |
| <b>Restrictions:</b>                                | -        |         |         |  |  |
| <b>Variation:</b><br><b>Corr.</b><br><b>Factors</b> | Point: 1 | Area: 1 | Road: 1 |  |  |

Then click on **Output** (Map, PDF or Report) menu. The location of the source and an emission estimation of 19 g/s for source named "Cement and Son Ltd." will be displayed. That is exactly the average value that will be emitted during the period selected. If you want that same value expressed as tons/year, the value displayed will be 600 tons, i.e. the yearly emission value that you entered when the source was defined. Click on **Output** (GIF or PDF) menu and then the estimated emissions will be 43.6 g/s. This is the mean emission rate coming from the stack during production time. The yearly emission equivalent represent the total emission during a year if the factory were running 24/7 during the whole year at that emission rate.

#### Exercise 4

Simulate the mean emission for Fridays during the period May-September. The answer should be 23.3 g/s.

Simulate the yearly mean emission for the year 2000 (Hint: use the correction factors). The answer should be 20.9 g/s, which is 660 tons per year- exactly a 10% increase on the present mean emission.

---

**Note:** When converting between g/s and tons/year it is assumed that there are 365.25 days in a year.

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#### Exercise 5

We will calculate the mean emission for an energy producer were the production and hence the emission, depends on the temperature.

Create a point source, similar to ENERGY.RYA\_VC\_GAS, with an emission specified as a time series. That is, selecting **emission substance** and specifying a time series defined as a macro in Indico Presentation. The source is an energy producer with a maximum effect of 120 MW. The emission factor for the fuel used is 0.5 g/MJ for NOX. The needed energy production is as:

|                      |    |    |    |    |    |     |     |
|----------------------|----|----|----|----|----|-----|-----|
| Out door temperature | 20 | 15 | 10 | 5  | 0  | -5  | -10 |
| Needed Energy MW     | 0  | 20 | 40 | 60 | 80 | 100 | 120 |

To accomplish this, do the following:

1 – In Indico Presentation: Select hourly values, the station Lejonet, Temperature, Instance 002 and value.

2 – The emission during full energy production is calculated as:

$$E = \text{Production} * \text{Emission Factor} \Rightarrow E = 120 * 0.5 = 60.$$

Create a formula in Indico that calculates the emission in g/s depending on the temperature:

$0.5 * (x1 < 20 \ \& \ x1 \geq 15) ? 20 : ((x1 < 15 \ \& \ x1 \geq 10) ? 40 : ((x1 < 10 \ \& \ x1 \geq 5) ? 60 : ((x1 < 5 \ \& \ x1 \geq 0) ? 80 : ((x1 < 0 \ \& \ x1 \geq -5) ? 100 : ((x1 < -5) ? 120) : 120))))))$

3- Save this settings in Indico Presentation as a macro.

4- In EDB Module, use this macro when you define the emission in emission substance.

5- Now, calculate the mean emission using Search Criteria and Output menus. Select the time period 89030700 – 90030700.

### 1.3.7 Introducing a Source Based on Knowledge About the Emission Process

The emission from a source can be calculated using emission functions. An emission function can be defined with any number of variables such as maximum effect, energy value or filter efficiency.

To incorporate all the information we know about such a source we have to work through the following steps:

1. Create a **Time Variations Point** describing the time variation of the source, specifying the daily, monthly and annual variation.
2. Create an **Emission Function** and specify the equation for the calculation of the emission and the variables that are used in the equation.
3. Create a point source linked to the time variation and use **Emission Function** to select the emission function. Here the values for the variables used in the emission function are specified.

The following example adds a point source with two emissions functions for a combustion process:

We start defining a **Time Variation Point** named **06-22** (*Figure 1.3.7.2 Time Variation*)

- (10 p.m. – 6 a.m.): no emission

- (6 a.m. – 10 p.m.): emission 100%

Please note that the Time variation for emission functions is not normalised. All figures are percentages.

Once this is done, we can define the emission functions. The emission functions are defined for one single substance only. So we will have to define two functions: One for NO<sub>x</sub> and one for SO<sub>2</sub>. To do that, go to the menu **Sub Tables** -> **Emission function** and add the new emission functions. The required information is: the name of the function, the function itself (an equation), the name of the variables used in the function and the type of time variation.

In our example:

The emission function for SO<sub>2</sub> has three variables (Effect, Energy value, and the emission factor for the fuel for SO<sub>2</sub> [%]). The emission function for NO<sub>x</sub> has two variables (Effect [MJ/kg] and emission factor for NO<sub>x</sub> in [g/MJ]).

1. For NO<sub>x</sub> (the emission factor is specified in g/MJ) the emission function is

$$\text{Total Emission [ton/year]} = f_a \text{ [g/MJ]} \times \text{Effect [MJ/s]} \times (1000 \times 1000 / (3600 \times 24 \times 365))$$

where  $f_a$  is the emission factor for NO<sub>x</sub>. The factor  $(1000 \times 1000 / (3600 \times 24 \times 365))$  is used to convert the result of the equation from g/s to ton/year. The result from the emission equation must always be in ton / year. The Effect should be variable and the emission factor constant.

For SO<sub>2</sub> (with an emission factor in %) the emission function is

$$TotalEmission[ton/year] = \frac{f_b \times \frac{Effect[MJ/s]}{EnergyValue[MJ/kg]} \times 1000 \times 1000}{(3600 \times 24 \times 365)}$$

$f_b$  is the emission factor for SO<sub>2</sub>. The factor  $(1000 \times 1000 / (3600 \times 24 \times 365))$  is used to convert the result of the equation from g/s to ton/year. The result from the emission equation must always be in ton / year. The Effect should be variable and the emission factor and EnergyValue constant.

2. After you have created the emission functions you have to define a point source with the emission specified as **Emi.Activ**:

- Click **Sources** in the menu. Then click on Layers  -> Point. The Point sources will be shown on the map. With button  opens a subwindow which allows you to view the sources in a list. Then you can Add, Edit or Delete **Points**. Click on **[Add]** and select a position on the map. Then, enter the **Name** name\_VC\_OIL for the source, complete the chimney specifications by clicking on **[Chimney Settings]**.
  - Stack height: 85 m, outer diameter: 2 m, inner diameter: 1 m.
  - Stack mounted on a building of dimensions 50\*40 m and height 32 m.
  - Exhaust gas temperature: 120 °C, velocity: 15 m/s

and save your source pressing **[Ok]**.

- Go to **Function** and enter the following values for the variables used in the emission functions, (*Figure 1.3.7.1 Emission Activity*).

*Fuel NOx, Fuel SO2 (two different):*

Maximum effect: 20 MW

Energy value: Oil (42.7 MJ/kg)

Emission factor SO<sub>2</sub>: 0.40 %

*Emission factor NO<sub>x</sub>: 0.1 [g/MJ]*

Figure 1.3.7.1 Emission Function.

| Day type | SCENARIO & MONTH | 00 | 01 | 02 | 03 | 04 | 05 | 06  | 07  | 08  | 09  | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 21 | 22 | 23 | 24 |
|----------|------------------|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|
| Mon      | Th               | 0  | 0  | 0  | 0  | 0  | 0  | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 0  | 0  | 0  |    |
| Fri      |                  | 0  | 0  | 0  | 0  | 0  | 0  | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 0  | 0  | 0  |    |
| Sat      |                  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0  | 0  | 0  |    |
| Sun      |                  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0  | 0  | 0  |    |

| Day type | SCENARIO & MONTH | 00 | 01 | 02 | 03 | 04 | 05 | 06  | 07  | 08  | 09  | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 21 | 22 | 23 | 24 |
|----------|------------------|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|
| Mon      | Th               | 0  | 0  | 0  | 0  | 0  | 0  | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 0  | 0  | 0  |    |
| Fri      |                  | 0  | 0  | 0  | 0  | 0  | 0  | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 0  | 0  | 0  |    |
| Sat      |                  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0  | 0  | 0  |    |
| Sun      |                  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0  | 0  | 0  |    |

Figure 1.3.7.2 Time variation point

---

**Note:** Use the Search Criteria subwindow to verify the emission. Observe that the time variation is NOT normalised.

---

### 1.3.8 Using Search Keys and Pattern Matching as Search Conditions

#### The Search Keys

All emission sources in the EDB can be classified using five groups of search keys. The first two groups can hold up to 128 individual search keys and the other three up to 32 each. The benefits of the search keys are obvious by looking at some examples:

Assume that you have a large number of districts (municipalities) in your territory. You could use the first group of search keys to define all the districts by name. The second, to group different activities that contribute to pollution, such as **Petrochemical industry, Automotive industry, Traffic, Lawn mowers**, etc. The third, to categorise your emitters into classes such as: **Private industry, State owned industry, Public sector, Private consumption**, etc. And the fourth, to categorise the areas in which the emitters are located, such as: **rural, sub-urban, residential, inner city**, etc.

Later on, when estimating the total emission from lawn mowers in a certain district in the residential areas you can obtain this result very easily.

If you analyse your future needs concerning emission estimation, before filling the emission database with data, you will find that the search keys can play an important role, giving you a convenient way to organise and handle your data.

You will benefit from building and using good search key lists. They provide a very efficient way of searching in the database for certain groups of pollution sources. You can perform searches using any combination of search keys from the different searchkey lists.

## The Search Strings

The **fields Name, Info1 and Info2** could be defined in all sources and can be extremely valuable as a complement to search keys when performing a search (see **Search criteria** section). The length of the field **Name** is 47 characters. You should always write the name of the source in this field (such as **Oxford street** or **Shell**, etc.) when adding a new source to the database. This name should be a string of alphanumeric characters that can be useful to classify the source in a convenient way. For example, a name could be a national identification code, property code, etc. If you use unique characters to separate the information written in this field, it will be easy (as shown in next paragraph) to use pattern matching when searching for emissions in the database.

The other two fields **Info** and **Info2** have a length of 47 characters each and can be used in the same way as **Name** to input information related to the emission source.

## Matching Search Keys

Emission calculations can be restricted by searching for emission sources that has their search keys set to specific values. This is made by selecting the search keys in the sub windows Search keys in the Search criteria page. Hold down the **[Ctrl]** key for multiple selections.

If more than one search key has been selected in a group, all sources belonging to any of the search keys selected will be searched for in the database (*or-criteria*). If combinations of search keys belonging to two different search key groups have been selected, then sources matching any searchkey in the selected subset in the first group and any searchkey in the selected subset in the second group will be searched for in the database. Between groups we have an *and-criteria*.

For example: Suppose you have selected **district1, district2 and district3** in the first search key group, and **Lawn mowers** and **traffic** in the second, but no selection in the

next three groups. The following sources will then match the criteria and therefore 'found' and used in the emission calculations:

All sources with 5 search key defined as:

a) District1, Lawnmowers, Private consumption, Resident, Green

b) District2, Lawn mowers, -, -, -

c) District3, Traffic, -, -, Yellow

The following sources will **not** match the criteria and therefore will not be 'found' nor used in the emission calculations:

d) District1, Petrochemical industry, Private industry, Sub-urban, Black

e) -, -, -, -, Brown

f) District3, -, -, -, -

The - indicates that no search key has been defined (empty list).

## Matching Search Strings

Using the **Search Criteria**, you can specify **Search** strings that match a specific source or that match all the sources that have some characters or numbers in common in the search string definition. The possible pattern matchings are:

A\*                      All strings beginning with an A (capital letter)

|                   |                                                                |
|-------------------|----------------------------------------------------------------|
| *street           | All strings ending with street                                 |
| *street*          | All strings that contain the word street                       |
| *street* *avenue* | All strings containing the word street or avenue               |
| ?A*               | All strings in which the second letter is an A                 |
| [Aa]*             | All strings that begin with an A or an a                       |
| [A-F]*            | All strings that begin with capital letters between A and F    |
| ^K*               | All strings that do not begin with an K                        |
| *[^h-k]           | All strings that do not end with small letters between h and k |

Considering the matching potential, a carefully prepared strategy concerning the search string definitions will allow you to have an unlimited number of possible selection criteria.

---

**Note:** When filling in the name and information fields for a source, you should not use the reserved characters |, \*, ^, \$, ., [, ], {, }, ?.

---

### 1.3.9 Saving your search criteria and output settings

Once you have defined your **Search criteria** and **Output settings**, you may save them as an EDB macro. An EDB macro contains all your selections in these user interfaces, so they can be used any other time.

Go to **Macro** menu to **load/save/delete** macros. Macros are saved in folders. Each user has his own folder, a common folder and some other folders may also be created. The

system administrator decides who is allowed to save macros in the common folder. You can always save macros in your own folders, but usually not in other users' folders, although it is possible to load macros from any folder.

Buttons **[Load Macro]** allows to load a macro, **[Save Macro]** allows you to save macros, and **[Delete Macro]** allows you to remove existing macros.

It is recommended that you save your Macro with a meaningful file name so that you can easily recognise the content.

### 1.3.10 Companies and Facilities

Various point sources can be grouped in a Facility, for example, all point sources belonging to the same installation. A facility can also be associated to a company previously defined in **Subtables -> Companies**. A facility is typically an industrial plant that contains several sources.

#### 1.3.10.1 Company

A facility can be associated to only one company. However, a company can be associated to multiple facilities.

Each company is identified by a unique ID and contains administrative information for the company.

Adding a Company:

- Go to menu **Subtables -> Companies**

- Click on the **[Add]** button.
- Specify a unique ID for identifying the company. The ID is a string of up to 31 characters. e.g.: The Tax Office ID (RUT) for the Company can be used.

Once an ID has been assigned and the company saved, the ID can not be changed.

- Continue filling in the rest of the fields
- Click on **[Additional info]** if you want to add complementary information.
- Click on **[Apply]** to save the company.

### 1.3.10.2 Adding a facility

Unlike **Companies** which is found under **Subtables**, **Facilities** are found under the menu **Sources** To add a facility:

- Select Facilities in Layers. Click in  button. (Or you can use **Layers -> Facilities**).
- Click on the **[Add]** button. Locate its coordinates and click on the map.
- Write the name of the facility in the text field **Name**.
- Continue filling in the rest of the fields
- Click on **[Additional info]** if you want to add complementary information.
- You can change the location of the facility manually changing the values X Coordinate, Y Coordinate (*Figure 1.30.10.3 Facilities*), or alternatively using the button **[Move]** below the facilities list. (*Figure 1.30.10.2 Linking a Facility to a Point Source*)
- Click on **[Apply]** to save the facility. (*Figure 1.30.10.3 Facilities.*)

The screenshot shows the 'Facilities' interface in Airviro. The 'Name Information' section includes fields for Name (OK RAFFINADERI:11), Info, Info2, and Facility (1262920,6405070). The 'Coordinates' section shows X1 Coord (1262741), Y1 Coord (6405341), X2 Coord (0), and Y2 Coord (0). The 'Emissions & Chimney' section has tabs for Emissions Substances, Emissions Factors, and Emissions Function. The 'Searchkey' section has five dropdown menus, all set to 'none'. The 'Other' section has tabs for Codes and Additional Info, with Date (920616) and Latest change (931221) fields. The interface includes a 'REF' dropdown, a 'ref / REF' label, a user profile icon, and 'Ok' and 'Cancel' buttons at the bottom.

Figure 1.30.10.1 Source.

Emission sources can be added to a facility, either using the facility interface (*Figure 1.30.10.2*) or using the interface for the source type (point or area) you want to associate to a facility with. (*Figure 1.30.10.1 Source*).

The screenshot shows the 'Facilities' interface in Airviro. The 'Name Information' section includes fields for Name (BEROL NOBEL MOLN:1), Info, Info2, and Facility (1273730,6400380). The 'Coordinates' section shows X1 Coord (1273730), Y1 Coord (6400380), X2 Coord (0), and Y2 Coord (0). The 'Emissions & Chimney' section has tabs for Emissions Substances, Emissions Factors, and Emissions Function. The 'Searchkey' section has five dropdown menus, all set to 'none'. The 'Other' section has tabs for Codes and Additional Info, with Date (920616) and Latest change (140910) fields. The interface includes a 'REF' dropdown, a 'ref / REF' label, a user profile icon, and 'Ok' and 'Cancel' buttons at the bottom.

Figure 1.30.10.2 Linking a Facility to a Point Source.

Company information

ID

2

Name

OK RAFFINADERI

Info

Info2

Address

Box 23037

Post address

400 73 Göteborg

Informant

Isf/Gösta Sjönell

Miscellaneous

Fackla

Additional info

Associated Facilities

OK RAFFINADERI

*Figure 1.30.10.3 Facilities.*

### 1.3.11 Ships

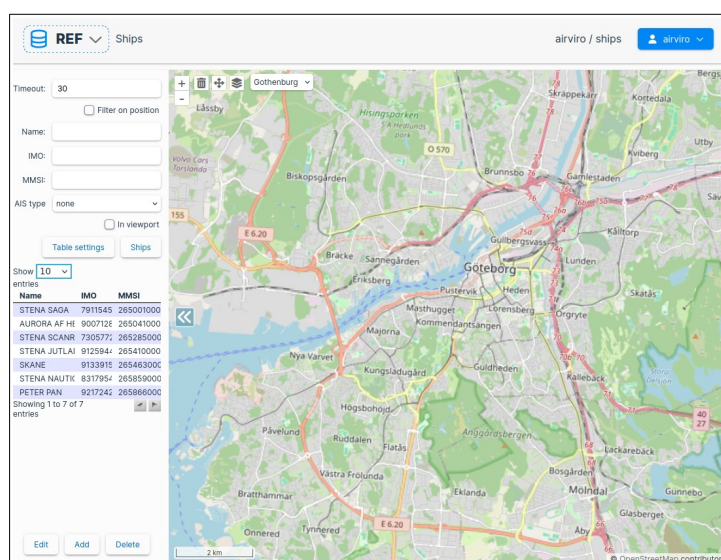
Maritime transport emits considerable amounts of different air pollutants, therefore it is considered as a particular emission source type with its own user interface. Example of ships: boats, ferries, merchant ships and other ships (cargo ships, sightseeing boats, navy ships, ice-breakers etc.).

Ships can be described as mobile point sources. Normally Airviro is connected to an AIS receiver. AIS is a standard radio protocol used by all ships above 50 tons. AIS messages are sent from the vessel every 30 seconds containing a unique identifier for the ship as well as its coordinates (position). All these coordinates are stored in the Time Series Database with a time resolution of 5 minutes for each ship.

In the **Ships** interface you can display the ships on the map for a certain period and area. Use **From/To** and **Filter on position**. Ships movements are displayed as trails when you click on a ship in the list. Colours are defined by the system administrator .

To add a ship:

- Click on **Ships** in **Layers**, to load the Ships subwindow. *Figure 1.3.11.1*
- Click on the **[Add]** button and fill out the data requested.
- Type in a name in the **Name** text field.
- Input the number IMO and transport number MMSI.
- Select the ship type in the list (search keys). For example, fishing, sailing, medical transport and passenger ship.



*Figure 1.3.11.1 Ships.*

Complete the general information, engine properties, miscellaneous properties and other information with the ship data.

In emission activity is used to calculate the emission from emission factors. *Figure 1.3.11.3*

Press **[Ok]** to save the ship.

**General Info**

Name: STENA SAGA

AIS ship type: 60 Passenger ship

IMO: 7911545

MMSI: 2650010X

Design speed (kn): 23.22

**Properties**

|                           | Main Engines | Auxiliary Engines |
|---------------------------|--------------|-------------------|
| Installed power (kW)      | 22941        | 6065              |
| Nr. of engines            | 4            | 4                 |
| SFOC (g/kWh)              | 170.81       | 220               |
| Usage factor, maneuvering | 0.2          | 0.50              |
| Usage factor, hotelling   | 0.0          | 0.20              |
| Usage factor, cruising    | 0.0          | 0.20              |
| Max usage factor          | 1.05         |                   |
| Load limit                | 0.85         | 0.85              |

**Other**

Created: 121111

Latest change: 140511

**Emissions**

Emission Activity x

OK Cancel

Figure 1.3.11.2. Edit mode. Ships.

**Emissions**

SEM, Fuel, ME  
SEM, Fuel, AE  
SEM, Fuel, B  
SEM, CO<sub>2</sub>, ME  
SEM, CO<sub>2</sub>, AE  
SEM, CO<sub>2</sub>, B  
SEM, SO<sub>x</sub>, ME  
SEM, SO<sub>x</sub>, AE  
SEM, SO<sub>x</sub>, B  
SEM, NO<sub>x</sub>, ME  
SEM, NO<sub>x</sub>, AE  
SEM, NO<sub>x</sub>, B  
SEM, CH<sub>4</sub>, ME  
SEM, CH<sub>4</sub>, AE

SEM, Fuel, ME  
SEM, Fuel, AE  
SEM, Fuel, B  
SEM, CO<sub>2</sub>, ME  
SEM, CO<sub>2</sub>, AE  
SEM, CO<sub>2</sub>, B  
SEM, SO<sub>x</sub>, ME  
SEM, SO<sub>x</sub>, AE  
SEM, SO<sub>x</sub>, B  
SEM, NO<sub>x</sub>, ME  
SEM, NO<sub>x</sub>, AE  
SEM, NO<sub>x</sub>, B  
SEM, CH<sub>4</sub>, ME  
SEM, CH<sub>4</sub>, AE

Multi selection  
Copy first  
Update multi

| STANDARD        | Alob  | Act. code     |
|-----------------|-------|---------------|
| _status_        | TS    | 1.000000      |
| fuel_cons_B_man | CONST | 180025.093750 |
| fuel_cons_B_anc | CONST | 180025.093750 |
| fuel_cons_B_ber | CONST | 180025.093750 |
| S_B             | CONST | 0.100000      |

OK Cancel

Figura 1.3.11.3. Emission Activity

## 1.4 Area Sources in the EDB

### 1.4.1 What is an Area Source?

An area source is a pollutant source that is widely spread over an area. The leakage from pipes, valves and tanks at a refinery is a typical example of an area source. Usually we don't know the exact locations of these emissions, so we treat the whole area as a source assuming that the emission is evenly distributed.

Static information (Chimney settings) used for point sources is not required for area sources. In the representation of the area source, the map is divided up into grid squares, and the emission in each square is calculated. This reduces the simulation time, so that an area source simulation could run faster than a point source simulation, if there are many small point sources. In a simulation, the area source emission is considered to take place at 2 m above the ground and there is no emission velocity.

### 1.4.2 General Principles

The general principles are the same as for point sources. In EDB you can define an area source as a rectangle. Adding an area source in the database is like adding a point source, but instead of clicking on a point you must define an area by dragging the mouse pointer over the map.

Likewise, emissions can also be defined using an Indico macro previously defined in Indico Presentation, you can save the **Search Criteria** and **Output Settings** as macros, and use **Emission factor**, **Emission Functions**, etc. in the same way you do for point sources.

## 1.5 Grid Layers in the EDB

### 1.5.1 What is a Grid Layer?

A grid layer in the EDB is a collection of area sources spread over a larger area. These sources are grouped into a grid layer. A typical example is household heating: it is often possible to estimate the amount of fuel that is consumed in each area of a city. From this information it is possible to create a grid of emission sources.

For each grid layer the information that is common for all grid cells is stored only once. Only the information that might be different, including the emissions, is stored for each grid cell.

It is of course possible to store the emission sources in the grid as area sources instead but the grid layer solution has some advantages compared to the area sources:

- Higher calculation speed.
- Lower disc space requirements, often quite dramatically.
- Simpler import format for grid sources than for area sources.

### 1.5.2 General Principles

A grid layer can only be created from the grid ASCII interface, a shape file or **Wedbed**. The geographical information about the grid, the specific data for each grid cell and the common information are used as an input to generate the grid.

The input menu for the grid layers is similar to those for area sources but only the common

information of the grid layer can be modified. The emission from a grid layer must be specified as substances or Emission Factor.

Once you have created the grid files using grid edb command in linux, **Wedbed** in excel or **IMPORT GRID** in **EDB** (see section 1.2.2), click on **EDB Module -> Grids**, to open the Grid editing window for modifying grid common data (*Figure 1.5.2.1. Grid Sources*).

The screenshot shows the 'Grid Sources' window. On the left is a list of grids with 'testgrid2' selected. The main area contains the following sections:

- Name Information:** Name (Test), Info, Info2.
- Grid Information:** Area (1230000,6245000 1380000,6575000), Grids (30 68).
- Emission:** A table with columns 'Substance' and 'Searchkey'. The first row has 'NOx' and '1 none'. The second row has 'Time Variation' and '2 none'. The third row has 'STANDARD' and '3 none'.
- General:** Address, Post address, Informant (Energloba), Miscellaneous, Date (0).

Buttons: 'Codes' (below General), 'Apply' (bottom left).

*Figure 1.5.2.1. Grid Sources*

## 1.6 Traffic Emissions in EDB

### 1.6.1 What is a Road source?

A road source is a mathematical abstraction that does not exist in reality. When we talk about road sources we usually mean emissions generated by traffic. Every vehicle that travels on a road is more or less like a point source, although we can never locate or follow any individual vehicle. For an EDB user it is quite convenient to define the traffic travelling along a road by simply drawing a line on the map.

In urban areas, the major part of the air pollution is generated by road traffic emissions. Consequently, the quality of the work related to traffic emission data is the most crucial part in building an EDB. However, the number of roads and vehicles in a large city is so huge that we need to make some simplifications to be able to handle the data. Below you will find a description of Airviro's traffic emission data processing principles. The method described here can be refined however, it is still very efficient in terms of the manpower required to set up a traffic emission database for a large urban region.

### 1.6.2 General Principles

Choose the location of a road on the map/screen interactively.

Once the location of the road has been set, information on traffic speed, traffic intensity and variation, as well as information on the types and number of vehicles travelling on that road must be provided.

Select a simplified "Simple" speed, to use just one speed for all traffic situations, or a more complex "multiple" speeds to use different speeds for different types of vehicles, that

is between light and heavy vehicles, and different traffic situations such as free flowing, heavy traffic, congested and stop & go.

There are three alternative ways to define traffic on a road. These are:

- **Road Vehicles:** the percentage of vehicles and the time variation of the vehicles are defined for each road. However, when the traffic behaviour is similar on several roads Road types is easier to use.

- **Road types:** the traffic variation as well as percentages of different vehicles on a road can be defined and reused for any number of roads. A typical number of Road types that you will have to define is likely to be 10-25 depending on the complexity of the area. Instead of defining all traffic variation characteristics on each road, you can simplify your work by addressing the information found in the **Road type** sub table. The emission factors for all vehicles are defined in the **Vehicle** sub table. These emission factors are then used to define **Road types** in the **Road type** sub table. In order to simulate traffic emissions you will likely have to define 5 to 25 different emission tables in the Roads **Vehicle** sub table.

- **Emission:** emission factors for substances emitted and the time variation are defined for each road.

The typical amount of traffic information that you will need to provide to describe traffic emissions in a large city is:

- **Roads:** 500-1000 roads or road links
- **Road types:** 10-25 different road types
- **Road Vehicles:** 5-25 tables with emission factors from different vehicles.

To open the Road interface, click on **Source -> Layers -> Roads** in the EDB main menu.

**Name Information**

Name: Gunnestorpsvägen

Info: Info2:

**Road / Traffic**

☐ Road vehicles ☒ Road Type Resident 50 1% 5s ☐ Emission Correction factor: 1.00

Vehicles per day: 8000 Macro Macro

**Speed** ☒ Single speed ☐ Multiple speeds

Use this speed for all traffic situations: 50

**Searchkey**

1: none 2: none 3: none 4: none 5: none

**Other**

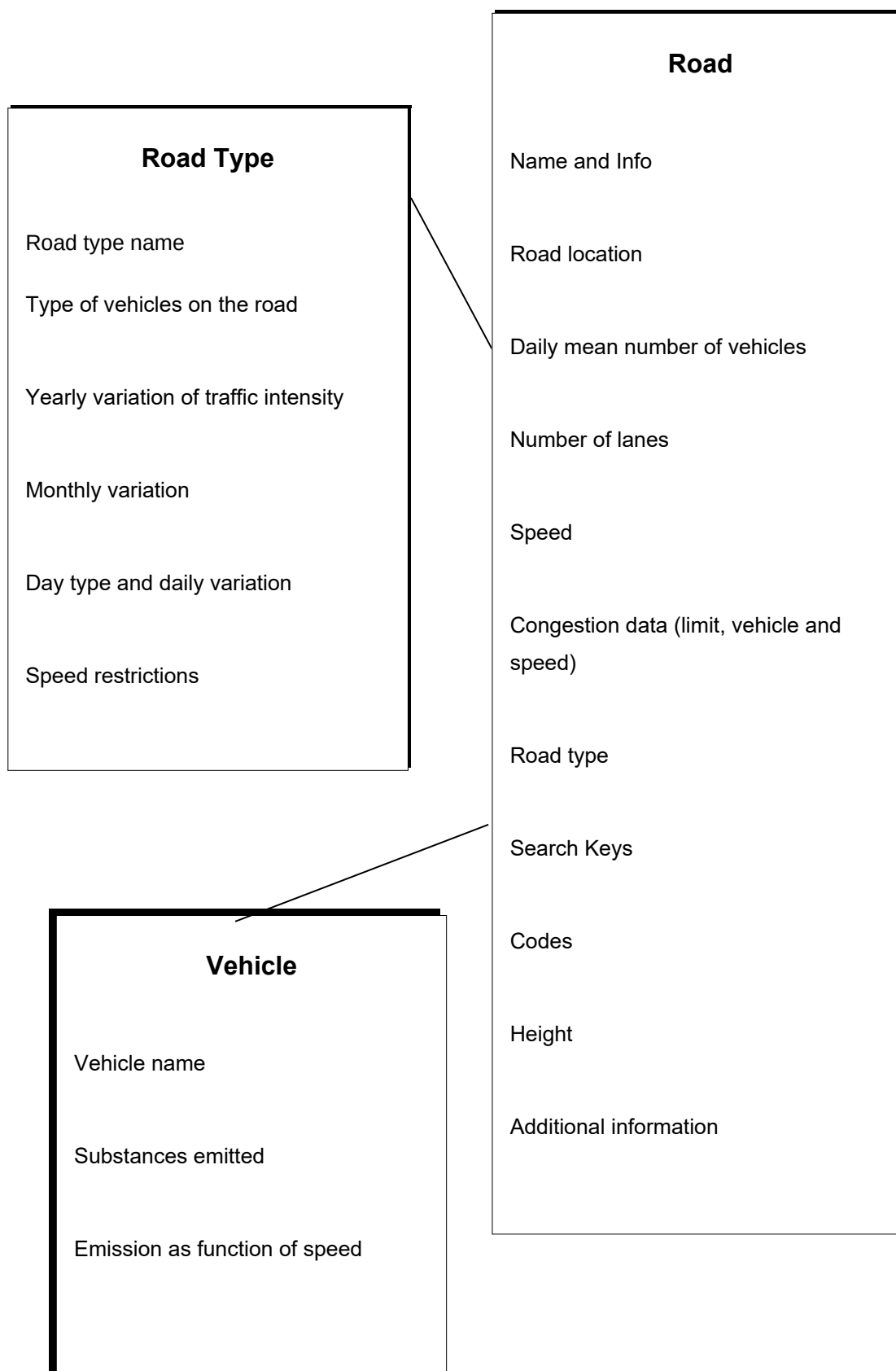
Codes Attributes Additional Info Resuspension Road length: 1418.19

Ok Cancel

*Figure 1.6.2.1 Roads*

For noise calculations, noise factors can be specified. These factors depend on the noise emission selected, but typical parameters are: vehicle speed, percentage of heavy vehicles, gradient and surface type (for example, bitumen and concrete)

The following table shows the relationships between Road, Road Type and Vehicle.



*Figure 1.6.2.2 Relation between Road, Road Type and Vehicle.*

When using Road Vehicles the emission factors are defined in the Road Vehicle. The emission factors for Road Vehicles are not only dependent on the vehicle type and speed but can depend on up to 11 different variables such as road type, traffic situation, slope, sinuosity etc. When using Road Vehicles the factors and their possible values are specified when defining the emission model. Then the emission factors are specified for all possible combinations of variables for each vehicle. Instead of having a table with emission factors for speeds we will have a multi dimensional cube, where the number of dimensions are the same as the number of variables. The vehicles are referred directly from the road and the percentage of each vehicle on that road is specified as well as time variations. The values of the variables are specified directly on the road.

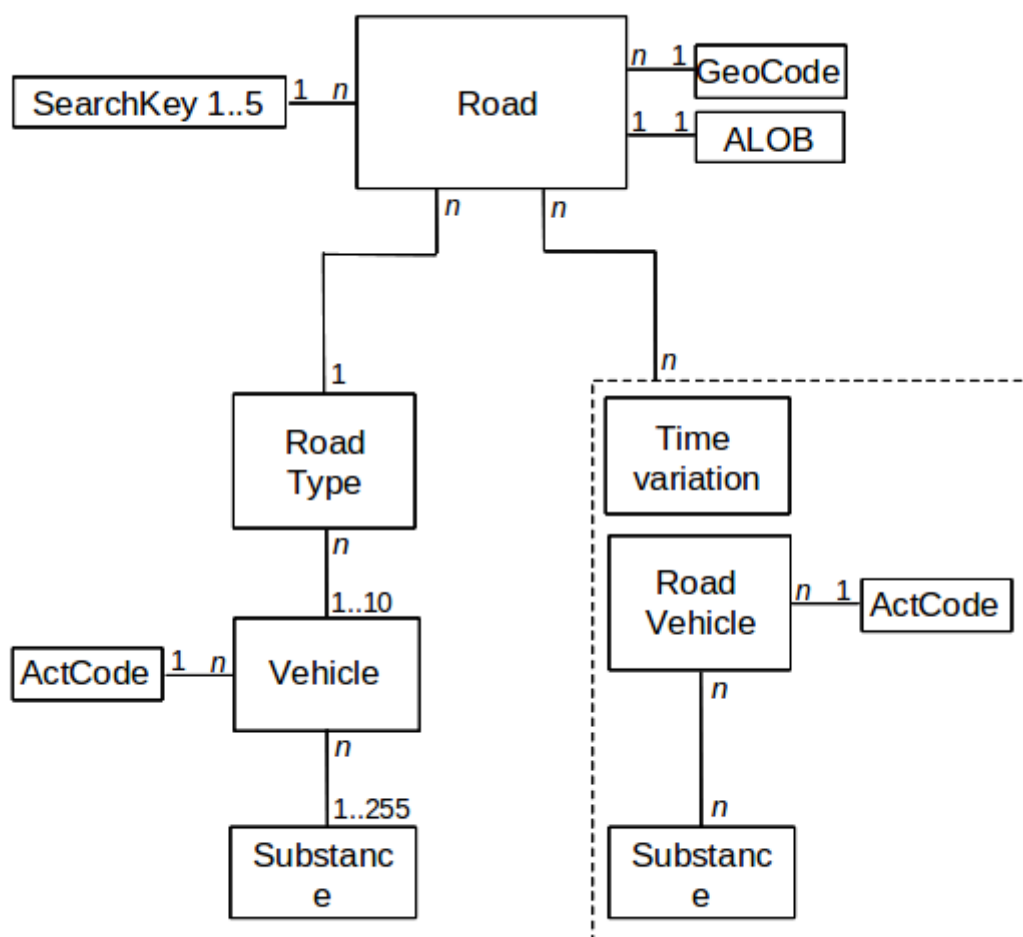


Figure 1.6.2.3 Structure of the road database describing the two emission models.

### 1.6.3 Introducing Emission Factors for Vehicles

Vehicle emissions depend mainly on:

- Type of vehicle, classified according to the engine type, fuel used, weight class, ambient temperature and types of pavement.
- Driving behaviour and general traffic environment.
- Vehicle travel speed.

In many countries, emission factors have been obtained based on the above factors. You can include these in the EDB. Predefined emission factors are included in the **Vehicle** sub table in the Airviro Reference database. The emission factors are basically derived based on:

- **Substance**                      NO<sub>x</sub>, CO and total HC
- **Speed**                              0-120 km/hour
- **Type of vehicle**              Light vehicles and Heavy vehicles (>3.5 ton)

To include the driving pattern, separate emission factors must be given for various traffic situations since, for instance, vehicles circulating in the city centre tend to accelerate and decelerate more often than those on a highway. The name "**Lv cat tho 50 10s**" given to one of the vehicles types in the aforementioned sub table is a kind of acronym which indicates the emission factors for light vehicles (**lv**) equipped with catalytic converters (**cat**), travelling on a through-road (**tho**), maximum speed limit: 50 km/hour (**50**), and making 10 stops or turns/km (**10s**).

The structure of the road types and vehicle types is based on the Swedish VETO model, this is the model used here as a typical example. There are other models not exactly the same, but you should be able to adapt the EDB to these other traffic models when defining road types and vehicle types. You may also want to refine your traffic EDB by introducing

other important processes, e.g. defining vehicles with higher emissions due to low temperatures in the combustion process (cold start), etc.

Go to the **Vehicles** edit window by clicking on **Subtables -> Vehicles** in the main menu

The list box on the left lists all the predefined emission factors in the Reference database. To edit one of the vehicle types, simply select the vehicle name in the list box. To define a new vehicle type and its corresponding emission factors, click on the **[Add]** button below the list-box. Assign a name to the new vehicle and add the emitted substances by selecting them on the **Substance** list and then pressing the **[Add to factors]** button to copy the selection to the **Selected** list-box, hold down the **[Ctrl]** key for multiple selections. Assign the emission factors to the selected substances and press **[Apply]** to save your new vehicle type.

To edit or add emission factors to each one of the substances selected based on the vehicle speeds you must click on the substance names in the Selected list-box in order to enable the **Speed table** for editing the emission factors depending on the vehicle speeds.

The screenshot shows the 'Vehicles' edit window. On the left is a list box containing various vehicle types such as 'Hv 1990 hlg', 'Hv 1990 th 50 1s', 'Hv 1990 th 50 3s', 'Hv 1990 th 50 5s', 'Hv 1990 th 50 10s', 'Hv 1990 th 70 1s', 'Hv 1990 th 70 1s', 'Hv 2000 hlg', 'Hv 2000 th 50 1s', 'Hv 2000 th 50 3s', 'Hv 2000 th 50 5s', 'Hv 2000 th 50 10s', 'Hv 2000 th 70 1s', 'Lv hlg', 'Lv th 50 1s', 'Lv th 50 3s', 'Lv th 50 5s', 'Lv th 50 10s', 'Lv th 70 1s', 'Lv cat hlg', 'Lv cat th 50 1s', 'Lv cat th 50 3s', 'Lv cat th 50 5s', 'Lv cat th 50 10s', 'Lv cat th 70 1s', 'Lv cat th 70 1s', and 'Lv th 70 1s'. The 'Hv 1990 th 50 3s' entry is selected.

In the center, there is a 'Name' field with the value 'Hv 1990 th 50 3s'. Below it is a 'Substance' dropdown menu showing '1,1,1-Trichloro'. To the right of this dropdown is an 'Add to factors' button. Below the substance dropdown is a list box for 'Emission factors' containing 'NOx', 'CO', 'PM10', and 'VOC'. The 'CO' entry is selected. To the right of this list box is a 'Remove factor' button. Below the list box is a 'Codes' button and a checkbox labeled 'Heavy vehicle' which is currently unchecked.

At the bottom left are 'Add' and 'Delete' buttons. At the bottom center is an 'Apply' button.

On the right side of the window is a table for editing emission factors. The table has two columns: 'Speed [km/h]' and 'Emission [mg/km]'. The data is as follows:

| Speed [km/h] | Emission [mg/km] |
|--------------|------------------|
| 20           | 15000.000000     |
| 30           | 11700.000000     |
| 40           | 11600.000000     |
| 50           | 10550.000000     |
| 60           | 10550.000000     |
| 70           | 10550.000000     |
| 80           | 10550.000000     |
| 90           | 10550.000000     |
| 100          | 10550.000000     |
| 110          | 10550.000000     |
| 120          | 10550.000000     |

Figure 1.6.3.1 Vehicles

In the example here shown (*Figure 1.6.3.1*), the vehicle **Hv 1990 tho 50 1s** is selected. The table of emissions as a function of the speed will appear once you select one of the substances in the **Selected** listbox as illustrated in the figure. You can edit the table and save your changes by clicking on **[Apply]**.

### 1.6.4 Standard for Naming Emission Factors

As soon as you start working with **Road types**, you will realise the need to have a naming convention to link different emission factors to the corresponding **Road types**. In the model used in the Airviro Reference database, the name assigned to the emission factors is defined by its characteristics: vehicle type and traffic environment, i.e. the emission factors are named as follows:

| Example           | Type of Vehicle | Vehicle subset         | Type of Road               | Signed maximum speed | Number of stops/turns per km |
|-------------------|-----------------|------------------------|----------------------------|----------------------|------------------------------|
| Lv cat hig        | Light vehicle   | Catalytic converter    | Highway                    | 90                   | 0                            |
| Hv 1990 tho 70 1s | Heavy vehicle   | Old type               | Through road               | 70                   | 1                            |
| Lv tho 50 10s     | Light vehicle   | No catalytic converter | Through road (city street) | 50                   | 10                           |

### 1.6.5 Introducing Road Types

In order to simulate the emissions generated by traffic at a specific time, we need to know the typical traffic variation on the streets and roads. However, from a practical point of view, it is not possible to define the traffic time variation separately for each road and street in an

urban region. In EDB it is assumed that typical traffic behaviour can be categorised into classes called **Road types**. These classes consist of:

- Proportions of different vehicle types on the road
- Yearly index (expected increase or decrease of traffic in the future)
- Monthly variation
- Daily variation (within 4 different day types and types of traffic)
- Hourly variation
- Speed restrictions

To add or edit a road type, go to **Subtables -> Road types**. To edit an existing road type, select one from the list box to the left. To add a new **Road type**, click on the **[Add]** button, at the bottom of the list-box and enter a name for the new road type in the **Name** input field. The next step is to define the type of vehicles that travel on this road type. Select the appropriate vehicles from the **Vehicles** list box on the right side. To define the vehicle percentages click on **[Scenario]**.

*Figure 1.6.5.1 Road Type*

In **Scenario** you have to assign the percentages for each vehicle types and year. You can

define the expected percentages for up to 10 different years or scenarios. This table is basically the same as the **Scenario** table in the Time Variation Road sub table, i.e. these values will be treated as absolute values (as percentage) *and will later on be multiplied by a daily total number of vehicles on a street*. The scenario values assigned to a **Road type** can be used to forecast future changes in traffic intensity, vehicle percentages and accordingly, future emissions caused by traffic. Click on **[Ok]** button to confirm these values and go back to the previous window.

**Note:** if the percentage for a specific scenario sums up to 100, the daily total number of vehicles will multiply the number 1.00. If the sum had been 120 for a different scenario, then the daily total number of cars on a specific street will multiply the factor 1.20.

As for the annual variation; to define monthly variations, click on the **[Month]** button. Note that this table is similar to the **Month** table in the **Time Variation Point** sub table, i.e. all figures are relative and will be normalised when used. Click on **[Ok]** button to confirm these values and go back to the previous window.

To define hourly traffic variation, click on the **[Day Type]** button. The principles here are similar to those for **Day type** table in the **Time Variation Point** sub table.

Vehicle: Hx 1990 m 50 l -

Copy from: Bus street 10s - Hx 1990 m 50 l - COPY

Day type variation

|     | 00-01 | 01-02 | 02-03 | 03-04 | 04-05 | 05-06 | 06-07 | 07-08 | 08-09 | 09-10 | 10-11 | 11-12 | 12-13 | 13-14 | 14-15 | 15-16 | 16-17 | 17-18 |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Mon | 60    | 40    | 40    | 15    | 10    | 135   | 555   | 565   | 555   | 540   | 585   | 535   | 715   | 630   | 630   | 670   | 59    |       |
| Tue | 60    | 40    | 40    | 15    | 10    | 25    | 135   | 555   | 565   | 555   | 540   | 585   | 535   | 715   | 630   | 670   | 59    |       |
| Fri | 60    | 40    | 40    | 15    | 10    | 25    | 55    | 250   | 390   | 525   | 580   | 590   | 550   | 520   | 500   | 480   | 430   | 38    |
| Sat | 60    | 35    | 20    | 10    | 10    | 20    | 30    | 100   | 150   | 200   | 300   | 370   | 420   | 500   | 570   | 570   | 50    |       |

Legend:  
 Free flowing (blue)  
 Heavy traffic (green)  
 Congested (red)  
 Stop and go (orange)

Buttons: Add, Delete, Ok, Cancel

Figure 1.6.5.2 Road type -Day type

Select one of the vehicles (*Figure 1.6.5.2*) from the **Vehicles** combo box and fill in the hourly traffic variations. Please note that the figures are relative, i.e. they will be normalised.

It is also possible to assign a type of traffic to the hours of the day. The type of traffic is used to select alternative emission factors. The type of traffic is indicated by the colour of the text box corresponding to each hour. The radio buttons on the right side of the table are used to assign or change the type of traffic for the selected cell in the table (focus on it). White indicates Free flowing, Blue Heavy traffic, Green Congested and Red Stop and Go.

Click on **[OK]** button to confirm these values and go back to the previous window.

| Vehicle Type       | Min speed | Max speed |
|--------------------|-----------|-----------|
| Bus street 10s     | 20        | 120       |
| City centre 5% 5s  | 20        | 120       |
| City centre 5% 10s | 20        | 120       |
| <b>Highway 5%</b>  | 20        | 120       |
| Highway 10%        | 20        | 120       |
| Highway 15%        | 20        | 120       |
| Resident 50 1% 5s  | 20        | 120       |
| n12                | 20        | 120       |
| Through 50 5% 3s   | 20        | 120       |
| Through 50 10% 3s  | 20        | 120       |
| Through 50 15% 3s  | 20        | 120       |
| Through 70 5% 1s   | 20        | 120       |
| Through 70 10% 1s  | 20        | 120       |
| Through 70 15% 1s  | 20        | 120       |

*Figure 1.6.5.3 Speed restrictions*

Finally, define speed restrictions for each type of vehicles defined on the Road type. Click on **[Speed restrictions]** to open this sub window, and assign a minimum and a maximum speed limit to each type of vehicle. This feature is very useful if you want to differentiate the speeds between heavy and light vehicles. Click on **[OK]** button to confirm these settings and go back to the previous window.

## 1.6.6 Introducing Time Variations for Roads

Time Variation for Road sources is similar to time variation for Points sources. It is used to define the time variation for a Road Vehicle. The main difference is that it is possible to define the type of traffic for each hour of the day in the same way as for a Road Type.

|    | 00  | 01  | 02  | 03  | 04  | 05  | 06  | 07  | 08  | 09  | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 21  | 22  | 23  | 24  |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Mo | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Tu | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| We | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Th | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Fr | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Sa | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Su | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

☒ Free flowing  
☐ Heavy traffic  
☐ Congested  
☐ Stop and go

Figure 1.6.6.1 Day type for Time Variation Road

## 1.6.7 Introducing Emission Factors for Road Vehicles

Emission factors for ordinary vehicles solely depend on the speed. Emission factors for **Road Vehicle** can depend on up to 11 different factors.

These factors are defined in **Basic settings ->Road Vehicle Def.**

Figure 1.6.7.1 Road Vehicle Def.

In the picture above three factors has been defined: Road type, Speed and Gradient. The factor Road type has 18 possible values. In this case the emission factors are a three-dimensional cube.

So, emission factors have to be defined for each cell in the cube, that is for all possible combinations of the three factors.

Figure 1.6.7.2 Road Vehicles

Factors are defined for 4 types of traffic. Normal, Heavy traffic, Congested and Stop and go. Which emission factor should be used, free flowing, or heavy traffic or congested, or stop and go, is defined in the hourly time variation in Time Variation Road.

Activity codes can be selected from the tree view after pressing the **[Codes]** button. It is also possible to define if the vehicle is heavy or not using the **Heavy** check box. This setting is used by the OSPM model in the Dispersion module. Some vehicles do not generate traffic flow. Usually, the additional emission from cold start vehicles is defined as an additional, fictitious vehicle. This can be configured using the **Traffic** check box. Airviro has several alternative emission models available. These are not described here and the traffic model selected should be "Normal". Vehicle weight can be specified to be used with US EPA Re-suspension model, on the other hand, MODEM IV & MODEM V models use the Flow value to adjust the flow, NORMAL model do not use any of these two values. For each combination of factors and substance, emission factors must be entered for each of the four types of traffic.

### 1.6.8 Introducing Traffic Information in the EDB

Once you have created emission factors for different types of vehicles as well as a number of typical road types you are ready to introduce road emissions into the EDB. Select **Sources** from the main menu, and click on the  button. Then click on **[Select on map]**, and select an area using the mouse pointer and the **[Ctrl]** key as already explained (see section 1.2.6). The list box on the left will list all the roads within the selected area. Clicking on the name of a road in the list, its location will be displayed on the map. To add a new road, click on the **[Add]** button below the list-box and move the mouse pointer over the map area to the desired location for the starting point of your new road. Click on the left mouse button. Move the mouse pointer to the next position of your road and click on the left mouse button again, a blue line will stretch between these two points. Repeat this until you have defined the whole length of the road. Then click the middle mouse button (escape) or right mouse button. The edit Road sub window (*Figure 1.6.8.1 Roads*) will replace the map and you can start filling in the required information.

*Figure 1.6.8.1 Roads*

Write the name of the road in the **Name** input field, use **Info** and **Info2** input fields for adding additional information. Fill in the total number of **Vehicles per day** (this should be the yearly mean traffic for a day). Enter **Number of lanes**, although this field is not currently used. You may also assign a **Correction factor**, by which the **Vehicles per day** is always multiplied. This factor should be set to 1 (default value) if you do not want to apply any correction. If there are traffic flows defined as time series in Indico Presentation, these can be linked to the road using an Indico macro. In this case, the flow will then be read from the time series database, hour by hour and the fixed value entered in **Vehicles per day** will be disregarded.

As already explained (section 1.6.2), emissions from road sources can be described in three different ways. 1) Road Types are used: Select the appropriate road type from the **Road type** list. The hours of the day which have alternative driving patterns are defined in the Road Type. Then select the typical speed for the road using the option single speed, alternatively use the option multiple speeds for heavy traffic, congested and stop and go .

*Figure 1.6.8.2 Road using Road vehicles.*

2) Road vehicles are used: press the **[Road Vehicle]** button to open the window depicted in *Figure 1.6.8.2*. Select the appropriate road vehicle factors from the drop down lists (see section 1.6.7). Select the appropriate road vehicles for the road, then specify their percentage of traffic and select a monthly/daily distribution (time variation). Hold down the [ctrl] key and the press the [=>] arrow button for multiple selections.

3) Emission is used: press the **[Emission]** button to open this window. Select the appropriate substances and add them to your selection pressing the **[Add to emissions]** button. then specify their emission factors and a monthly/daily distribution (time variation) from the drop down list.

Select suitable search keys from the drop down lists and a geographic code from the tree view in **Codes** as you did for point sources. Remember all these lists are defined in **Basic Settings**.

Press the button **[Atributtes]** to include complementary information about surrounding buildings (slope, distance to house, house width and house height) and **[Additional Info]** to include additional information as already explained for point sources.

Press the button **[Resuspension]** to include specific settings for NORTRIP. In *Figure 1.6.8.2* you can see the necessary parameters for this Nortrip model.

Specific settings for NORTRIP

☐ Model assumes when sanding has taken place

☒ Model assumes when salting has taken place

☐ Model assumes when cleaning of road surface has taken place

☐ Model assumes when ploughing has taken place

99 Percentage of winter tyres wintertime

65 Percentage of studded tyres wintertime

274 Day number when change period to winter tyres commence

335 Day number when change period to winter tyres end

91 Day number when change period to summer tyres commence

120 Day number when change period to summer tyres end

Time for sanding

Time for salting

Time for cleaning of road surface

Time for ploughing

OK Cancel

*Figure 1.6.8.2 Nortrip.*

Finally, if the EDB has been configured for noise calculations, noise factors can be specified. These factors depend on the noise emission chosen but typical parameters are: vehicle speed, percentage of heavy goods vehicles, gradient and type of the surface (e.g. bitumen, concrete and porous asphalt).

Save your road settings by clicking on the **[OK]** button.

## 1.6.9 Emission Calculation with Road Sources and Restrictions

Emission simulations based on road sources are identical to those from point sources as described in *1.3.6 Emission Simulation from a Point Source*, for a detailed explanation. However, there are certain features unique to road emissions, as can be seen under the **Search criteria** menu, in the Emission sub-window below.

Substance

PM10

Only emission

Sources

☒ Point

☒ Area

☒ Road

☐ Grid

☐ Ship

☒ Treat ships as points

Variation

Scenario 2007

Time

From:

To:

Resuspension from:

Restrictions

Name

Info

Info2

Point, Area & Grid

Road

Search key

Sub area

Codes

Additional info

Correction

Point 1

Area & Grid 1

Road 1

Apply

Apply & Show emissions

Clear all

Figure 1.6.9.1 Search Criteria.

To simulate only road emissions, in the section Sources tick off **Road** and uncheck the others checkboxes. Then only road sources will be included in the search.

Specific **Road** restrictions can be seen in *Figure 1.6.9.2 Roads Restriction*.

| Roadtype           | Vehicle           | Speed | Road Vehicle       | Road Timevariation |
|--------------------|-------------------|-------|--------------------|--------------------|
| Bus street 10s     | Hv 1990 hig       | 20    | car CNG/petrol     | STANDARD           |
| City centre 5% 5s  | Hv 1990 th 50 1s  | 30    | car diesel         |                    |
| City centre 5% 10s | Hv 1990 th 50 3s  | 40    | car C85/petrol     |                    |
| Highway 5%         | Hv 1990 th 50 5s  | 50    | car petrol         |                    |
| Highway 10%        | Hv 1990 th 50 10s | 60    | car_cold_diesel    |                    |
| Highway 15%        | Hv 1990 th 70 1s  | 70    | car_cold_petrol    |                    |
| Resident 50 1% 5s  | Hv 1990 tho 70 1s | 80    | city bus CNG       |                    |
| n12                | Hv 2000 hig       | 90    | city bus diesel    |                    |
| Through 50 5% 3s   | Hv 2000 th 50 1s  | 100   | city bus ethanol   |                    |
| Through 50 10% 3s  | Hv 2000 th 50 3s  | 110   | coach diesel       |                    |
| Through 50 15% 3s  | Hv 2000 th 50 5s  | 120   | mic petrol         |                    |
| Through 70 5% 1s   | Hv 2000 th 50 10s |       | truck diesel       |                    |
| Through 70 10% 1s  | Hv 2000 th 70 1s  |       | truck w trail dies |                    |
| Through 70 15% 1s  | Lv hig            |       |                    |                    |
|                    | Lv th 50 1s       |       |                    |                    |
|                    | Lv th 50 3s       |       |                    |                    |
|                    | Lv th 50 5s       |       |                    |                    |
|                    | Lv th 50 10s      |       |                    |                    |
|                    | Lv th 70 1s       |       |                    |                    |
|                    | Lv cat hig        |       |                    |                    |
|                    | Lv cat th 50 1s   |       |                    |                    |
|                    | Lv cat th 50 3s   |       |                    |                    |
|                    | Lv cat th 50 5s   |       |                    |                    |
|                    | Lv cat th 50 10s  |       |                    |                    |
|                    | Lv cat th 70 1s   |       |                    |                    |
|                    | Lv cat tho 70 1s  |       |                    |                    |
|                    | Lv tho 70 1s      |       |                    |                    |

None

None

None

None

None

Ok

Cancel

Figure 1.6.9.2 Roads Restriction

You can select up to 10 **Road type** restrictions and up to 10 **Vehicle** types. There are no limitations to the number of **Speed** that can be selected. (see *1.3.8 Using Search Keys and Pattern Matching Facilities as Search Conditions*).

In addition, you can change the speed by assigning a **New Speed**. For example: If you have selected all roads having a speed limit of 90 and then select a new speed of 70, then all roads defined as 90-roads will be selected but the emission will be calculated using a speed of 70.

### 1.6.10 Examples: traffic emission

#### **Example 1** Traffic Emission – Road vehicles

Using the EDB menu, verify that the edb globcopy, which already contains several road vehicles is installed in your system. These road vehicles has three dimensions: Road type, Gradient and Speed. We will copy the road vehicles to a new empty EDB, create a time variation for roads and then add a road using those road vehicles.

Steps:

1. First create a new empty EDB, called RoadV

Using the menu Edb select the user airviro and then the edb named globcopy, press the button **[Add new empty]**, enter a name for the new Edb and press **[Ok]**. The new empty EDB has been created.

2. Use Wedbed to copy the road vehicles already defined in the edb “globcopy” from Domain REF to your newly created edb:

Open an empty sheet in ms Excel and from the control panel select the menu

“Complements”. Then select the **Wedbed** menu, configure the correct IP address to the Airviro server in the **Host** menu, select the menu **Import EDB to Excel**, and copy only the structure from the globcopy EDB to the excel spreadsheet.

Then using the menu **Export EDB from Excel**, copy the EDB structure to your newly created edb RoadV.

### 3. Now we need to create a Time Variation Road:

Using the menu **Time Variation Road** under **Subtables** add a new one containing the following settings: stops and go from 8-9 am, all normal week days.

Finally we need to add a Road:

Using the **SOURCES** menu. Select **Road** and Add a new one named “TrainingRoad”, press the button [**Road Vehicles**] to add the following vehicles to the new road.

92% cars-petrol

1% Motorcycles

7% Buses.

Questions:

- Which is the average NOx emission during week days?

Enter the following:

Substance: NOx

Time: Hours: (All)

Day type: (All)

Months: All months

Click on **[Apply]** and select an **Output** option from the menu (MAP, PDF, Report). The answer should be 7.03 Ton/Year

- Which is the average for NOx between 8-9 AM during week days?

Substance: NOx

Time: Hours 8-9

Day types: (All)

Months: All months

The answer should be 11.37 Ton/Year. Because cars emits more NOx when they stop more frequently.

## 1.7 Emissions Displayed as a Grid

In previous examples, emissions have been estimated and presented as values located at each individual source on the map and added up for the visible area displayed. In several applications, you might be interested to see the spatial distribution of emissions that point out to hot spots. EDB provides you with the possibility of defining a grid in which all sources located in each grid cell are added up and displayed with a colour code.

To display emissions as a coloured grid select the **Grid** tab in the **Output Settings** subwindow.

**Intensity** values range from -100 (black) to +100 (white), moving in the RGB values. Use **Color Fade** to reduce the colours in grayscale. **Colour fade** values range from -100 (grey) to +100 (very grey).

There are two different ways to define the grid resolution Tick off the **Grid size/Number of cells** check button to define the length of the grid in the east-west direction (**dx**) and north-south direction (**dy**). These figures are given in metrical units. Uncheck the **Grid size/Number of cells** check button to define the numbers of grid squares in the east-west direction (**nX**) and north-south direction (**nY**). The grid size will now be determined by the size of the map area that you have chosen.

Using the colour palette and the colour table, define the number of levels, colours and emission intervals corresponding to the emissions per area unit. Colour intervals values can be integers or floats. Click on the coloured table cell to choose a colour from the colour palette. See *Figure 1.7.1*.

Use buttons **[Colour Auto Range]** and **[Level Auto Range]** to automatically set the scale for both items. Use button **[Colour Rainbow Range]** to automatically set the rainbow scale.

Click on **[Apply]** to save your settings.

If you set your resolution to 50×50 m and do a search for road emissions, then you will get a road map, displaying the roads in different colours depending on the traffic emissions.

The screenshot shows the 'Select' dialog box with the 'Grid' tab selected. The 'Output window' section shows 'Height' set to 400 and 'Width' set to 550. The 'Map' section has a 'Color' dropdown and two sliders for 'Intensity' and 'Color fade', both set to 0. The 'Sources' section has tabs for 'Grid', 'Report', 'Noise', and 'Codes'. The 'Grid' tab is active, showing a checked 'Gridsize/ Number of cells' with 'dx' and 'dy' both set to 500, 'Decimals' set to 0, and 'Units' set to 'g/s'. Below this, there are checkboxes for 'Auto level' (unchecked), 'Change Palette...' (button), and 'Interpolate between levels' (unchecked). There are three buttons: 'Level Auto Range', 'Color Auto Range', and 'Color Rainbow Range'. At the bottom left, there is a color palette with 7 levels, each with a corresponding value in a box: Level 7 (30, red), Level 6 (20, orange), Level 5 (10, yellow), Level 4 (5, green), Level 3 (3, cyan), Level 2 (2, blue), and Level 1 (1, white). An 'Apply' button is at the bottom left of the dialog.

*Figure 1.7.1 Output Settings: Grid*

## 1.8 Creating EDB Reports and displaying the Database Structures

EDB contains many different tables. Summaries of these tables, along with the substance list and searchkey lists can be printed.

It is also possible to create reports containing different information about the sources stored in the EDB.

The screenshot shows the 'Output Settings: Report' dialog box. At the top, there are sliders for 'Intensity' and 'Color fade', both set to 0. Below these are tabs for 'Sources', 'Grid', 'Report' (selected), 'Noise', and 'Codes'. The 'Report' tab contains several settings: 'Type' is 'Static', 'Format' is 'Text', 'Sort by' is 'Nothing', and 'Destination' is 'Viewer'. Under the 'Tables' section, there are two columns: 'Point,Area&Grid' and 'Road'. For 'Point,Area&Grid', 'Static emission' and 'Dynamic emission' are checked, while 'Extended fuel' and 'Extended formula' are unchecked. For 'Road', 'Dynamic emission' is checked, while 'Extended vector', 'Extended roadway', and 'Extended vehicle' are unchecked. The 'Page layout' section has 'Header' and 'Footer' fields, and 'Print empty fields', 'Print search conditions', and 'New page for each record' are all checked. The 'Others' section has 'Units' set to 'g/s'. The 'File name' is 'Default directory JustAirviro/tmp' and 'Filter' is 'none'. An 'Apply' button is at the bottom left.

Figure 1.8.1 Output Settings: Report.

To display emissions as reports select the **Report** tab in the **Output Settings** subwindow. Select the characteristics of the sources (point, area, grid and road) to be included in the report.

There are two types of reports: **static** and **dynamic**. **Static** reports can only be displayed in **Text** format. **Dynamic** reports also include the calculated emission and can be displayed in a **text** format, **SKV** format (more compact, and useful for exporting the data), **Grid** format or **GIS** format (these two just contain emission data -they provide two different formats that can be used for exporting the emission data to an external dispersion model or to a GIS system

-. Other available formats are **Shape**, **ESRI Grid** and **NETCDF Grid**

For text, SKV and Shape formats it is possible to select what information from the sources should be included in the report. See the lists in section **Tables**, in the middle part of the window.

Select a **Destination** for your report from the available options in the **Destination** drop-down list. If you select the option **File** then a **File name** must be entered. The report will be saved in a file. Under **Page layout** specify a header and footer for each page and select whether to print each record on a new page, print empty fields, and search conditions ticking off the corresponding checkboxes.

Some format options allow you to select a **Filter** to the output.

Click on **Output** in the menu and select **Report** to display the report.

The following is an example of the SKV output, generally quite suitable for exporting data to other applications.

```
"X1";"Y1";"X2";"Y2";"Name";"g/s";
1280000;6410300;0;0;"ANGEREDS VÏRMECENTRUM";0.221816;
1273730;6400380;0;0;"BEROL NOBEL MÏLN:1";0.0982328;
1280250;6406300;0;0;"BJÏRNDAMMENS HETV.";0.348568;
1271750;6402500;0;0;"CHALMERS VÏRMEC:1";0.126752;
1271751;6402501;0;0;"CHALMERS VÏRMEC:2";0.31688;
1274000;6399950;0;0;"ERICSSON RADAR:1";0.131505;
1276540;6406970;0;0;"GRAAB SÏVENÏS";17.3016;
1268600;6401600;0;0;"GÏTEBORGS STADS BOS";3.1688;
1270430;6397410;0;0;"HEDLUNDS PAPPER:1";0.00507008;
1268550;6399350;0;0;"MARCONICENTRALEN";2.24985;
1280800;6398900;0;0;"MÏLNLYCKE:1";0.522852;
```

*Figure 1.8.2 SKV output.*

## 1.9 Creating Noise Reports

To display noise emission reports select the **Noise** tab in the **Output Settings** subwindow.

Settings for this option are similar to those already described in *1.7 Emissions Displayed as a Grid*. We refer you to that section for a detailed explanation.

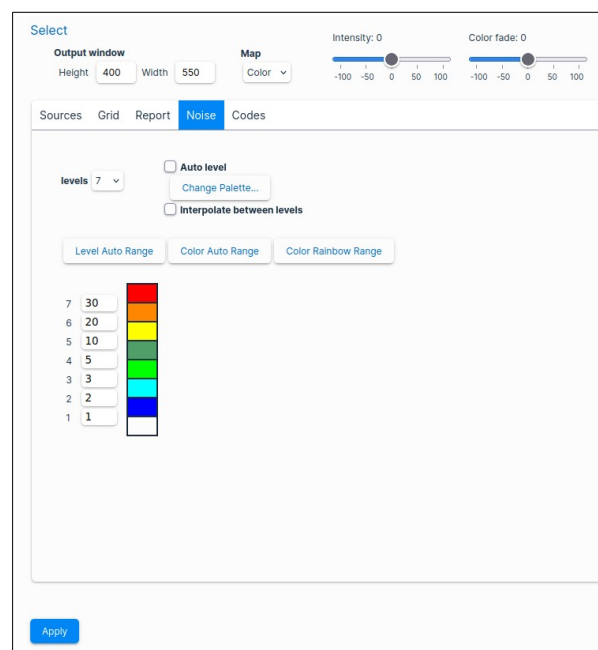


Figure 1.9.1 Output Settings: Noise

## 1.10 Creating Code Reports

To display emission code reports select the **Noise** tab in the **Output Settings** subwindow.

Select units and the activity and/or geographic codes from the lists.

When done, click on **[Apply]** button.

From the main menu, use the **Output** option Text to display the results

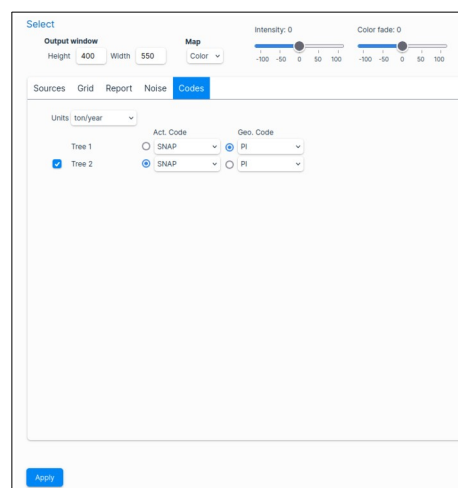


Figure 1.10.2 Output Settings: Codes

## Appendix 1A: Suggested Substance List

### 1A.1 Inorganic Gaseous Substances (1-39)

|                                           | Symbol                         | Position |
|-------------------------------------------|--------------------------------|----------|
| <b>Gaseous Nitrogen Compounds</b>         |                                |          |
| Nitrogen oxide                            | NO                             | 1        |
| Nitrogen dioxide                          | NO <sub>2</sub>                | 2        |
| (NO <sub>2</sub> 003+ NO)                 | NO <sub>x</sub>                | 3        |
| Nitric acid                               | HNO <sub>3</sub>               | 4        |
| Nitrous acid                              | HNO <sub>2</sub>               | 5        |
| Peroxyacetylnitrate                       | PAN                            | 6        |
| Ammonia                                   | NH <sub>3</sub>                | 7        |
| Nitrous oxide (laughing gas)              | N <sub>2</sub> O               | 8        |
| <b>Gaseous Sulphur Compounds</b>          |                                |          |
| Sulphur dioxide                           | SO <sub>2</sub>                | 15       |
| Sulphuric acid                            | H <sub>2</sub> SO <sub>4</sub> | 16       |
| Sulphur trioxide                          | SO <sub>3</sub>                | 17       |
| Hydrogen sulphide                         | H <sub>2</sub> S               | 18       |
| Carbon sulphide                           | CS <sub>2</sub>                | 19       |
| <b>Gaseous Carbon Compounds</b>           |                                |          |
| Carbon monoxide                           | CO                             | 25       |
| Carbon dioxide                            | CO <sub>2</sub>                | 26       |
| <b>Other Inorganic Gaseous Substances</b> |                                |          |
| Ozone                                     | O <sub>3</sub>                 | 30       |
| Hydrochloric acid                         | HCl                            | 31       |
| Hydrogen peroxide                         | H <sub>2</sub> O <sub>2</sub>  | 32       |

## 1A.2 Particulate (Inorganic, Non-metallic) Substances (40-49)

|                           | Symbol      | Position |
|---------------------------|-------------|----------|
| <b>Particulate Matter</b> | Dust        | 40       |
|                           | Soot        | 41       |
|                           | Carbon dust | 42       |

### Particulate Inorganic Substances (Nonmetallic)

|          |    |
|----------|----|
| Ammonium | 45 |
| Nitrate  | 46 |
| Sulphate | 47 |

## 1A.3 Metals (50-69)

|           | Symbol | Position |
|-----------|--------|----------|
| Arsenic   | As     | 50       |
| Lead      | Pb     | 51       |
| Iron      | Fe     | 52       |
| Cadmium   | Cd     | 53       |
| Copper    | Cu     | 54       |
| Chromium  | Cr     | 55       |
| Mercury   | Hg     | 56       |
| Manganese | Mn     | 57       |
| Nickel    | Ni     | 58       |
| Vanadium  | V      | 59       |
| Zinc      | Zn     | 60       |

## 1A.4 Organic substances (not halogens) (70-179)

|                             | Symbol       | Position |
|-----------------------------|--------------|----------|
| Volatile organic substances | VOC          | 70       |
| Total hydrocarbons          | HC traffic   | 71       |
| <b>Alkanes</b>              |              |          |
|                             | Alkanes      | 80       |
|                             | Methane      | 81       |
|                             | Ethane       | 82       |
|                             | Propane      | 83       |
|                             | Butane       | 84       |
| <b>Alkenes</b>              |              |          |
|                             | Alkenes      | 90       |
|                             | Ethene       | 91       |
|                             | Propene      | 92       |
|                             | Butene       | 93       |
| <b>Alkynes</b>              |              |          |
|                             | Alkynes      | 100      |
|                             | Acetylene    | 101      |
| <b>Aldehydes</b>            |              |          |
|                             | Aldehydes    | 110      |
|                             | Formaldehyde | 111      |
|                             | Acetaldehyde | 112      |
|                             | Butanal      | 113      |
|                             | Benzaldehyde | 114      |
| <b>Ketones</b>              |              |          |
|                             | Ketones      | 120      |
|                             | Acetone      | 121      |
| <b>Alcohols</b>             |              |          |
|                             | Alcohols     | 125      |
|                             | Methanol     | 126      |
|                             | Ethanol      | 127      |
|                             | Propanol     | 128      |

|                                                                 |                  |     |
|-----------------------------------------------------------------|------------------|-----|
|                                                                 | Butanol          | 129 |
|                                                                 | Phenol           | 132 |
| <b>Glycols</b>                                                  |                  |     |
|                                                                 | Glycols          | 135 |
|                                                                 | Etheneglycol     | 136 |
|                                                                 | Propeneglycol    | 137 |
| <b>Aromatic Substances</b>                                      |                  |     |
|                                                                 | Aromatics        | 140 |
|                                                                 | Benzene          | 141 |
| (= methylbenzene)                                               | Toluene          | 142 |
| (= dimethylbenzene)                                             | Xylene (total)   | 143 |
| (= vinylbenzene)                                                | Styrene          | 144 |
| Toluenediisocyanater                                            | TDI              | 145 |
| <b>Polycyclic Aromatic Compounds</b>                            |                  |     |
| Polyaromatic compounds (PAH including substituted polyaromates) | PAC              | 150 |
| Polyaromatic hydrocarbons (not substituted)PAH                  |                  | 151 |
| Nitric aromatic compounds                                       | nitro-PAH        | 152 |
|                                                                 | Naphthalene      | 153 |
|                                                                 | Anthracene       | 154 |
|                                                                 | Phenantrene      | 155 |
| <b>Complex Solvents (Petroleum Based, not Chlorides)</b>        |                  |     |
|                                                                 | Solvent HC total | 160 |
|                                                                 | Benzine          | 161 |
|                                                                 | Petroleum spirit | 162 |
|                                                                 | Vanolene         | 163 |
| <b>Naturally Emitted Hydrocarbons</b>                           |                  |     |
|                                                                 | VOC nat. total   | 170 |
|                                                                 | Isoprene         | 171 |
|                                                                 | Terpenes         | 172 |

## 1A.5 Halogenic Organic Substances (180-249)

|                                                        | Symbol                | Position |
|--------------------------------------------------------|-----------------------|----------|
| <b>Chlorinated Solvents</b>                            |                       |          |
|                                                        | Solvent Cl total      | 180      |
| (= Dichloromethane)                                    | Methylene Chloride    | 181      |
| (= Trichloromethane)                                   | Chloroform            | 182      |
| (= CCl <sub>4</sub> )                                  | Carbon tetrachloride  | 183      |
|                                                        | Vinyl chloride        | 184      |
|                                                        | 1,2-Dichloroethane    | 185      |
|                                                        | 1,1,1-Trichloroethane | 186      |
| (= trichloroethylene, Tri)                             | Trichloroethene       | 187      |
| (= Perchloroethylene)                                  | Tetrachloroethene     | 188      |
| <b>Chlorine-Fluorine-Bromine-Alkanes</b>               |                       |          |
| Completely halogenated freons:                         |                       |          |
| Chlorinefluorinecarbons (total)                        | CFC total             | 190      |
|                                                        | CFC-11                | 191      |
| (=R12)                                                 | CFC-12                | 192      |
|                                                        | CFC-113               | 193      |
|                                                        | CFC-114               | 194      |
| Incompletely halogenated CFCs:                         |                       |          |
| (Replacement for CFC - soft freons)                    |                       |          |
| (R22)                                                  | HCFC-22               | 200      |
| Incompletely fluoridated CFCs:                         |                       |          |
| (C <sub>2</sub> H <sub>2</sub> F <sub>2</sub> )        | HFC-134a              | 203      |
| Bromium-chlorine-fluorine carbons (Halons):            |                       |          |
| Completely halogenated halons                          | Halons total          | 210      |
| (= CF <sub>2</sub> ClBr)                               | BCFC-1211             | 211      |
| (= CF <sub>3</sub> Br)                                 | BFC-1301              | 212      |
| (=C <sub>2</sub> F <sub>2</sub> Br <sub>2</sub> )      | BFC-2402              | 213      |
| Incompletely halogenated halons (=CHF <sub>2</sub> Br) | HBFC-22B1             | 215      |
| Other halogenated organic substances                   |                       |          |

|                                                |                |     |
|------------------------------------------------|----------------|-----|
| (=1,1,1-trichloro-2-bis(4-chlorophenyl)ethane) | DDT            | 220 |
| Chlordane                                      | Chlordane      | 221 |
| Polychlorinated biphenyls                      | PCB            | 222 |
| Toxaphene                                      | Toxaphene      | 223 |
| Dioxines                                       |                |     |
| Polychlorinated dibenzo-p dioxines             | PCDD           | 225 |
| Polychlorinated dibenzo-furanes                | PCDF           | 226 |
| Brominated dioxines                            | Brom. dioxines | 227 |
|                                                | TCDD           | 228 |
|                                                | Lindan         | 229 |

## 1A.6 Others (250- )

|                              |      |     |
|------------------------------|------|-----|
| Number of vehicle kilometres | vekm | 250 |
|------------------------------|------|-----|

## Appendix 1B: Mathematical Definitions of the Formulae Used in the EDB

### 1B.1 Point, Area and Grid Source Emissions

In Airviro EDB, emissions are usually calculated as a function of the hour, day, weekday, month. Emissions can also be calculated using an arithmetic and logical function that depends on any number of variables. Finally, the emission can be calculated using a time series macro from Indico, i.e. using a number of time series that are combined with arithmetic and logical functions.

In order to identify non-working days when they appear in the middle of the week (e.g. when New Years Day appears on a Wednesday) the concept of day types is introduced, i.e.

| Day type (index)         | Meaning                    | Relative occurrence during a year |
|--------------------------|----------------------------|-----------------------------------|
| Monday-Thursday type (0) | Ordinary working day       | 4/7                               |
| Friday type (5)          | Day before non working day | 1/7                               |
| Saturday type (6)        | Non working day - Saturday | 1/7                               |
| Sunday type (7)          | Non working day - Sunday   | 1/7                               |

The following variables and functions are defined:

|                |                                                                                                                                                                                     |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dty            | = day type index = {0,5,6,7}                                                                                                                                                        |
| w(dty)         | = relative occurrence of day type dty                                                                                                                                               |
| M              | = index for month m= {1, 2, ..., 12}                                                                                                                                                |
| W(m)           | = relative occurrence of month m (approximated as 1/12)                                                                                                                             |
| H              | = hour during the day = {1, 2, ..., 24}, e.g. h=12 corresponds to mean value between 11 and 12                                                                                      |
| S              | = scenario index                                                                                                                                                                    |
| E <sub>0</sub> | = mean emission during the year (g/s)                                                                                                                                               |
| func(V1,...Vx) | = a function with x variables. The variables can be constant or they can vary with the time variation in a Time Variation Point. In that case the time variation is not normalized. |
| E(h,dty,m,s)   | = estimated emission for any hour, day-type and month for the scenario s                                                                                                            |
| TabS(s)        | is a table defining the variation with different scenarios and is not normalized.                                                                                                   |

TabM(m) and TabD(dty,h) are the tables defined in the EDB Time Variation Point that define the variation for months, for all hours of the day and all day types. TabS(s) is the table that defines the variation with scenarios. This table is not normalized.

A normalization constant k is calculated in order to fulfil the following condition:

$$k \times \frac{1}{12} \sum_m \text{TabM}(m) \times \frac{1}{24} \sum_h \sum_{dty} w(dty) \times \text{TabD}(dty, h) = 1 \quad (\text{eq B1.1})$$

The emission can be calculated in two different ways, i.e.:

$$E(h, dty, m, s) = E_0 \times \text{TabS}(s) \times k \times \text{TabM}(m) \times \text{TabD}(dty, h) \quad (\text{eq B1.2})$$

$$E(h, dty, m, s, V1, \dots, Vx) = \text{func}(V1 \times \text{Amp}, \dots, Vx \times \text{Amp}) \quad (\text{B1.3})$$

$$\text{where } \text{Amp} = \text{TabS}(s) \times \text{TabM}(m) \times [\text{TabD}(dty, h)] \quad (\text{eq B1.4})$$

The variables  $V1, \dots, Vx$  might or might not be variable with time, ie  $V(t)$ . This is decided when the function is defined. The Time Variation is not normalised, all the numbers in the Time Variation are treated as percentages.

Equation B1.3 can represent an upper emission limit constraint. If you describe the emission as originated from an oil-burning power plant, then the energy production rate and consequently the emissions will depend on the load. There is, however, an upper limit to the production rate, given by the maximum capacity of the boiler. *Equation B1.3 is used for the emission estimation in the EDB when you choose emission estimation based on **Emission Activity**.*

In equation B1.2 there is no such a restriction.  $E_0$  represents the total emission during a year if we convert the units from grams/second to tons/year. The factor **k** ensures that the mean emission from the source for the whole year is the figure  $E_0$ . The figures in **TabM**, **TabD** just give the variation within the year. *Equation B1.2 is used for the emission estimation in the EDB when you choose emission estimation based on **Substances (or Emission Factors)** and yearly emission figures.*

Consequently, equation B1.2 allows you to describe a scenario in which all pollutants

generated from a source are concentrated within a few hours.

## 1B.2 Road Source Emissions

The following variables and functions are defined:

|                           |                                                                                                        |
|---------------------------|--------------------------------------------------------------------------------------------------------|
| <b>Dty</b>                | = day type index = {0,5,6,7}                                                                           |
| <b>w(dty)</b>             | = relative occurrence of day type <b>dty</b>                                                           |
| <b>M</b>                  | = index for month $m = \{1, 2, \dots, 12\}$                                                            |
| <b>w(m)</b>               | = relative occurrence of month $m$ (approximated as $1/12$ )                                           |
| <b>H</b>                  | = hour during the day = {1, 2, ..., 24}, e.g. <b>h</b> =12 corresponds to mean value between 11 and 12 |
| <b>S</b>                  | = scenario index                                                                                       |
| <b>L</b>                  | = length of the road                                                                                   |
| <b>N</b>                  | = average number of vehicles per day on the road                                                       |
| <b>corr</b>               | = correction factor for the road                                                                       |
| <b>E(speed,h,dty,m,s)</b> | = estimated emission for any speed, hour, day-type and month for the scenario <b>s</b>                 |
| <b>TabS(s,v)</b>          | Is the table defining the variation with different scenarios and is not normalised                     |
| <b>TabR(speed,v)</b>      | Is the table defining the absolute emission from the                                                   |

vehicle with index  $v$  for different speeds.

**TabM(m,v)** and **TabD(dty,h,v)** are the tables defined in the formulae that give the variation for months, during the hours for all existing day types for a vehicle with index  $v$ . For each vehicle in a road type the normalisation constant **k(v)** is calculated in order to fulfil the following condition:

$$k(v) \times \frac{1}{12} \sum_m \text{TabM}(m, v) \times \frac{1}{24} \sum_h \sum_{dty} w(dty) \times \text{TabD}(dty, h, v) = 1 \quad (\text{eq B2.1}) \quad \text{The}$$

emission for a road is then calculated as:

$$E(\text{speed}, h, dty, m, s) = \text{corr} \times n \times 1 \times \sum_v (\text{TabS}(s, v)) \text{TabR}(\text{speed}, v) \times k(v) \text{TabM}(m, v) \times \text{TabD}(dty, h, v) \quad (\text{eq B2.2})$$

Four speeds are defined for each road: Free flowing, heavy traffic, congested and stop and go. In the daily time variation it is specified, hour by hour, which of these speeds should be used.

### 1B.3 Normalisation of Time variations in an EDB

Normalisation is needed whenever emission data is given as a total yearly emission, that is, for emission factors and for substances emitted from point sources, area sources and traffic. The normalisation guarantees that the yearly emission will always be exactly the one specified, despite the emission variations over time and as a function of temperature.

In the EDB calculations the following approximations are made:

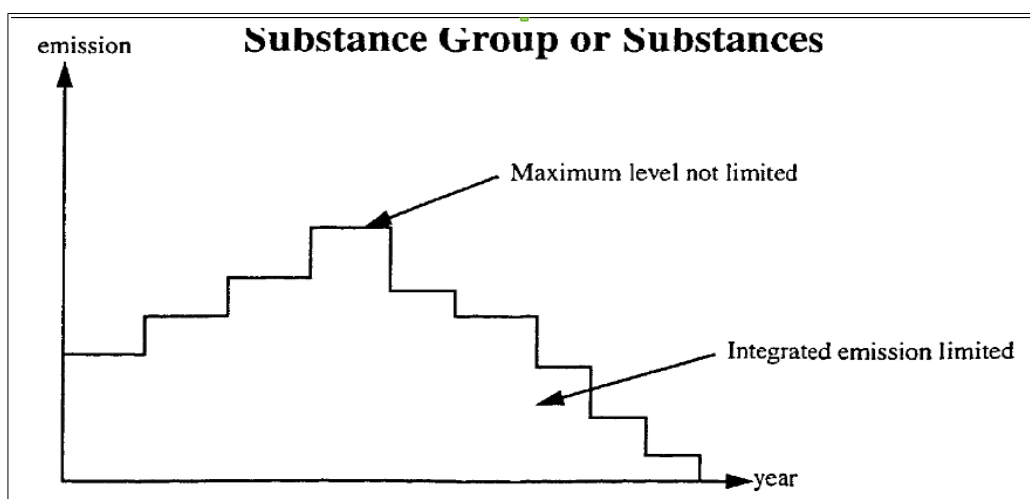
1 Year = 360 days

1 Month = 30 days

Mon-Thu This day type is weighted with 4/7

Fri, Sat, Sun These day types are each weighted with 1/7

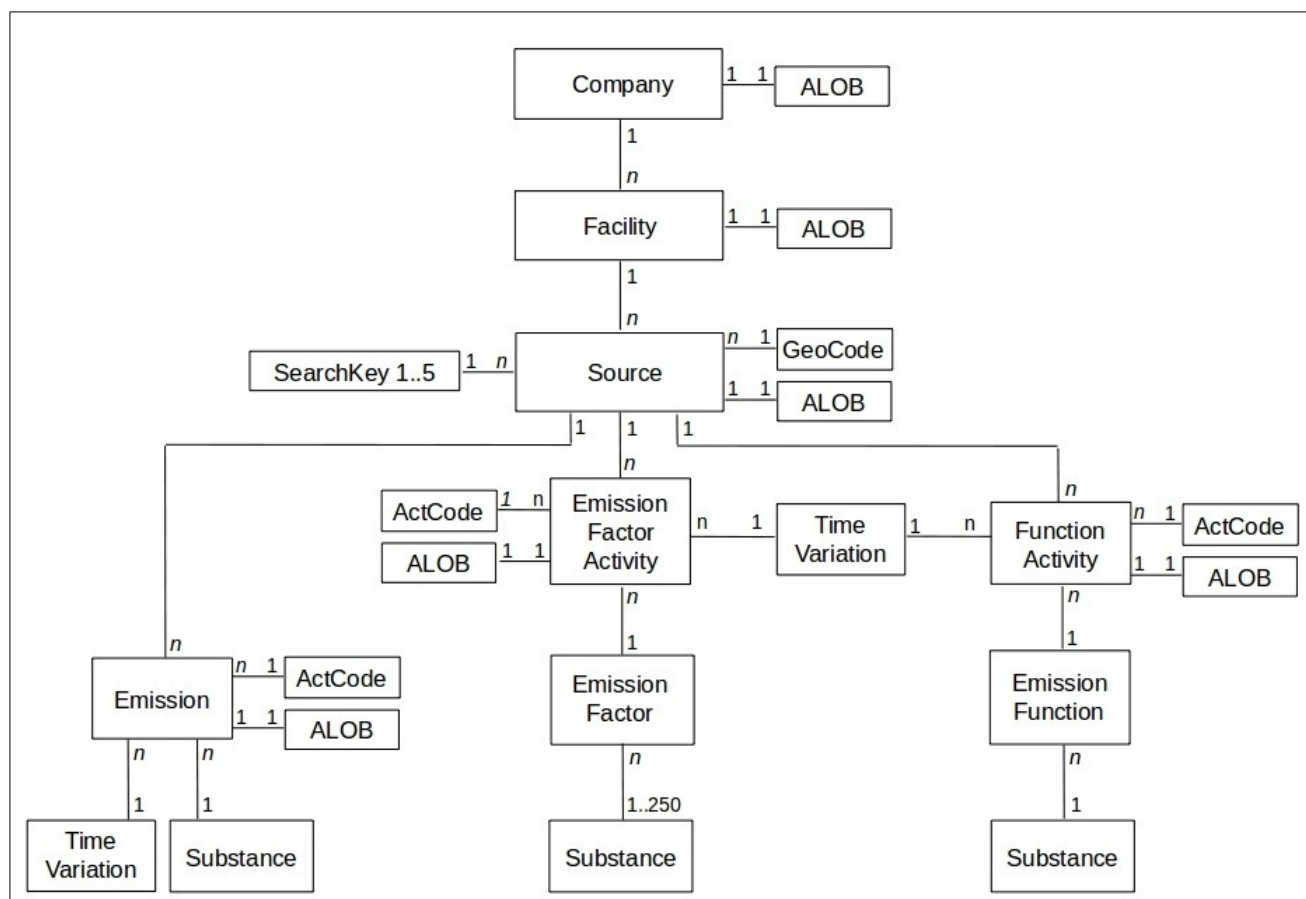
A total average emission  $E_0$  is given for the whole year. If the emission is generated evenly throughout the whole year then the emission per second will be  $E_0$ . However if the emission is generated evenly for just 12 hours every day then the emission for those hours will be twice as much while the emission outside those hours will be zero.



The most common emission specification is one where a yearly average emission is specified.

When emissions are described by an emission function there will be no normalisation. All variations specified in the tables will be interpreted as absolute percentage values.

## Appendix 1C: Point and area sources structure in EDB



## Appendix 1D: Wedbed

### 1D.1 Introduction

#### 1.D1.1 What is Wedbed?

**Wedbed** is a tool that integrates the Airviro emission database into MS Excel®. With **Wedbed** the following tasks can be easily performed:

- Wedbed allows you to use the whole power of MS Excel® with data from the fast and compact emission database of Airviro.
- With Wedbed it is easier to edit data. You just export the data to MS Excel®, make the changes there and import the data back to Airviro.
- Once you have the data in your MS Excel® workbook, you can either use the excellent reporting features of MS Excel® or easily cut and paste the data to other reporting tools.
- With Wedbed you can store an emission database in your PC as an MS Excel® workbook.
- With Wedbed you can make an extensive consistency check on the loaded emission database.

#### 1.D1.2 How does it work?

Dialogues for Airviro emission database access are added to the MS Excel® interface. Just choose import or export, select an emission database in Airviro and the transfer will take place instantly. The transfer of data between MS Excel and Airviro is done directly through internet or the local area network.

## 1.D.2.Overview and definitions

With Wedbed emission databases can be imported to MS Excel® from Airviro or exported to Airviro from MS Excel®. Each table or grid in the Airviro emission database is stored in separate sheet in MS Excel®. All the information from an emission database is stored in MS Excel® and can be easily changed. The emission database can reside in Excel until it is exported back to Airviro, i.e. the information can be manipulated “off line”. The emission database in MS Excel® can be thought of as a “pocket emission database.”

MS Excel®, a registered trademark by Microsoft Corporation, will be referred to as Excel in the rest of the document. EDB is an abbreviation for emission database.

## 1.D.3.Getting Started

The following steps are needed in order to use **Wedbed**:

- Download Wedbed from web site: [www.airviro.com](http://www.airviro.com) It is found under DOWNLOADS.
- Install **Wedbed** on your computer: Open the zip file and follow the instructions in the README file.
- Start Excel. Click on **Complements**, and select **Wedbed** from the list.
- Under the **Host** menu, you must enter the name or the IP address to the Airviro server you want to import/export data from/to.
- To transfer data from Airviro to Excel click on the **Import EDB to Excel** in the **Wedbed** drop down menu. The **Login** dialogue box will appear the first time Wedbed is used in a working session.
- The procedure to transfer data from Excel to Airviro is very similar. Just select **Export EDB from Excel** from the drop down menu.

### 1.D.4. The Wedbed menu in Excel

When **Wedbed** is installed the **Wedbed** menu is added in the Excel menu bar.

The following menu options are available:

1. Import EDB to Excel: Displays the import dialogue box.
2. Update sub tables: Updates the **Wedbed** tool bar. Each sub table has a list in the tool bar. The list contains the names of the sub table records. The list is used when the sub table is referred from e.g. a source. A warning and error list exist as well. The sub tables are described in the *“Working with Wedbed sheets in Excel”* section below.
3. Check: Checks the consistency of EDBs in Excel. Warnings and errors are reported in **Wedbed** tool bar.
4. About: Displays information about Wedbed.

### 1.D.6. Import EDB to Excel

In the **Import EDB to Excel** dialogue the databases, users and EDB:s are shown in three separate lists. The type of sources to import can be selected. Grid layers to import can be selected.

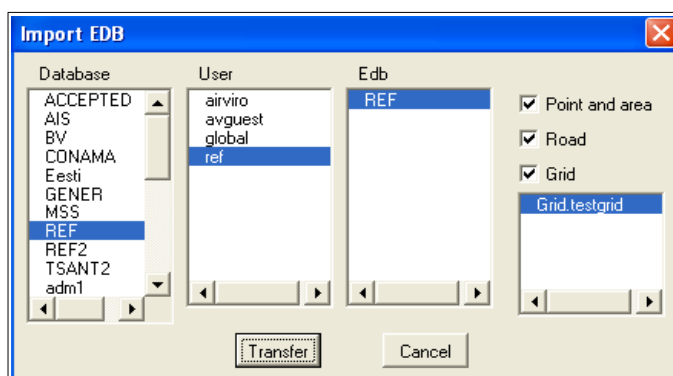


Figure D1. Import EDB

Once a database is selected, the users available for this database are shown in the users list. When a user is selected, the EDBs belonging to that user are shown in the EDB list. When an EDB is selected the *Point and Area*, *Road* and *Grid* check boxes are checked. The grid layers of the EDB are listed in the list box below the *Grid* check box. All grid layers are selected. The source types to import, can be limited by unchecking the check boxes. If the *Grid* check box is ticked off, a certain grid layer can be selected from the grid layer list. For multiple selections, hold down the *[Ctrl]* key on the keyboard while clicking on the grid layers

When the *Transfer* button is pressed the EDB is imported to Excel. Each table in the selected EDB is imported to a separate Excel sheet. Information about what happens is printed in the status bar of Excel.

Limitations: the sub tables will always be imported. No search criteria for the sources can be specified. Future versions will allow to select only sources that match search criteria.

## 1.D.7. Working with Wedbed sheets in Excel

### 1.D.7.1 Sub tables and sources

Emission sources in Airviro are point, area, road and grids. Point and area sources are stored in one sheet. Road sources are stored in another sheet. Each grid is stored in its own sheet. Each source is stored in one row. Sources are added by adding a new row.

The sub tables sheets are: Units, Speed-Temp-Scenario, Rsrc, Substance, Searchkey, Emission factor, Emission Function, Source timevar, Road timevar, Company, Facility, Source, Vehicle, Road Vehicle Def, RoadVehicle, Roadtype, Road. Each sub table entry is stored in one or more rows. Sub table entries are added by adding the proper number of rows.

### 1.D.7.2 General information about sheets

All sheets have a title row that defines the information stored in the sheet. Usually, cells that are not meant to be changed are write protected. The title row is write protected with the exception of sheets that refers to substances. In these sheets, substance/unit pairs can be added in the title row.

### 1.D.7.3 References to sub tables

References from sources or sub tables to other sub tables are made using names instead of indices. The Wedbed toolbar can be used when referring sub tables.

### 1.D.7.4 Wedbed Toolbar



Figure D2. Sheets.

The Wedbed toolbar contains a number of lists. Each list corresponds to a sub table and contains the names of the entries in that sub table. By selecting an entry in the list, that name is copied to the active cell in the active sheet. This way, references to sub tables can be made in an easy way from sources or other sub tables. The lists are loaded when an EDB is imported or by selecting “*Update sub tables*” in the Wedbed menu.

Besides the sub table lists, there are two special lists: Errors and Warnings. These contain errors and warnings from the consistency check in Wedbed. By selecting an error or warning in one of these lists, the cell that caused the error /warning becomes the active cell in the active sheet.

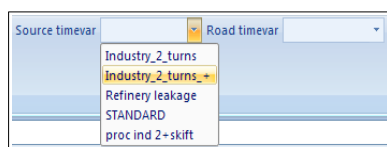


Figure D3. Toolbar: Source timevar Sheet.

### 1.D.8. Export EDB from Excel

In the **Export EDB from EXCEL** dialogue box the possible databases to export to are shown in a list box. There are two choices: Either to export the data to an *Existing Edb* or to create a *New Edb*. These alternatives are chosen with the radio buttons to the right of the database list.

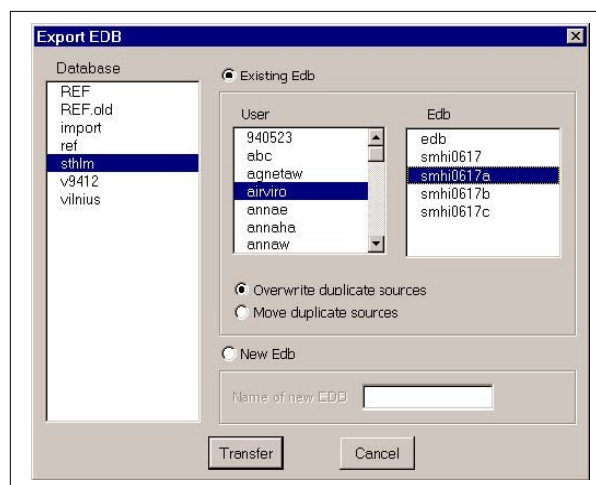


Figure D4 Export EDB Sheet.

When *Existing Edb* is chosen the User and the Edb can be selected from the lists. The sub tables and grid layers of the chosen Edb are always overwritten. Grid layers in the chosen Edb that do not exist in Excel are left as they are. For point, area and road sources two alternatives exists: Either to *Overwrite duplicate sources* or to *Move duplicate sources* until their coordinates become unique. These alternatives are chosen with the radio buttons below the User and Edb lists.

When *New Edb* is selected the name of the new Edb is input. The new Edb is created for the user used when logging on.

When [*Transfer*] button is pressed the following happens:

- The sub tables are updated.
- The consistency of the EDB is checked.
- If *Existing Edb* is chosen a check is made between the sub tables of the Airviro Edb to export to and the sub tables in Excel. Sub table entries having the same index in Airviro and Excel must have the same name. If errors are encountered, the export is aborted.
- The EDB is exported to Airviro.

Information about what happens is printed in the status bar of Excel.

#### **1.D.8.1. Consistency Check**

When an EDB is exported, a consistency check is performed. The check consists of the following steps:

- The sub tables are updated. If errors are encountered, the consistency check and export is aborted. The error and warning lists contains more information about the errors and warnings.
- Verification of the EDB in Wedbed. This includes syntax check of sheets, references to sub tables, length of strings, limits of values, required values, etc. If errors are encountered, the consistency check and export is aborted.

#### **1.D.8.2. Setting up privileges for export from Excel**

The same privileges are valid for Wedbed as for the Airviro EDB. The privileges for the Airviro EDB are set up in the *IADM* module in Airviro. For information about the resources effecting the Airviro EDB see the manual for the *IADM* module.

## 1.D.9. Layout of the Wedbed sheets in Excel

### 1.D.9.1. Units Sheet

This sheet corresponds to the unit part of the *edb.rsrc* file in Airviro. Units for different quantities in EDB are listed with their conversion factors. The first line below the title row states the default units of Airviro and may not be changed.

|    | A          | B          | C            | D         | E               | F          | G            | H         | I |
|----|------------|------------|--------------|-----------|-----------------|------------|--------------|-----------|---|
| 1  | Sub unit   | Conv fact  | Sub grp unit | Conv fact | Sub grp em unit | Conv fact  | Search unit  | Conv fact |   |
| 2  | ton/year   | 1.0        | %            | 1.0       | ton/year        | 1.0        | g/s          | 1.0       |   |
| 3  | g/s        | 31.557667  | ml/l         | 0.1       | g/s             | 31.557667  | kg/h         | 0.2778    |   |
| 4  | kg/day     | 2.73785079 | kg/ton       | 0.1       | kg/day          | 2.73785079 | ton/year     | 0.0317    |   |
| 5  | stones/day | 1.11       |              |           | stones/day      | 666        | ounce/minute | 0.017     |   |
| 6  |            |            |              |           |                 |            |              |           |   |
| 7  |            |            |              |           |                 |            |              |           |   |
| 8  |            |            |              |           |                 |            |              |           |   |
| 9  |            |            |              |           |                 |            |              |           |   |
| 10 |            |            |              |           |                 |            |              |           |   |
| 11 |            |            |              |           |                 |            |              |           |   |
| 12 |            |            |              |           |                 |            |              |           |   |
| 13 |            |            |              |           |                 |            |              |           |   |
| 14 |            |            |              |           |                 |            |              |           |   |

Figure D5. Unit Sheet.

### 1.D.9.2. Speed-Temp-Scen Sheet

This sheet contains the rest of the *edb.rsrc* file in Airviro. Three columns stating the labels to use in Airviro for **Speed**, **Temperature** and **Scenario**.

|    | A     | B     | C           | D        | E | F | G | H | I |
|----|-------|-------|-------------|----------|---|---|---|---|---|
| 1  | Index | Speed | Temperature | Scenario |   |   |   |   |   |
| 2  | 1     | 20    | -30--28     | 1993     |   |   |   |   |   |
| 3  | 2     | 30    | -28--26     | 1994     |   |   |   |   |   |
| 4  | 3     | 40    | -26--24     | 1995     |   |   |   |   |   |
| 5  | 4     | 50    | -24--22     | 1996     |   |   |   |   |   |
| 6  | 5     | 60    | -22--20     | 1997     |   |   |   |   |   |
| 7  | 6     | 70    | -20--18     | 1998     |   |   |   |   |   |
| 8  | 7     | 80    | -18--16     | 1999     |   |   |   |   |   |
| 9  | 8     | 90    | -16--14     | 2000     |   |   |   |   |   |
| 10 | 9     | 100   | -14--12     | 2001     |   |   |   |   |   |
| 11 | 10    | 110   | -12--10     | 2002     |   |   |   |   |   |
| 12 | 11    | 120   | -10--8      |          |   |   |   |   |   |
| 13 | 12    |       | -8--3       |          |   |   |   |   |   |
| 14 | 13    |       | -6--4       |          |   |   |   |   |   |

Figure D6 Speed-Temp-Scen Sheet.

### 1.D.9.3. Rsrc Sheet

This sheet contains the contents of the edb.rsrc file. The format of the contents in edb.rsrc is label and value. Here are the activity and geographical codes stored as well as noise factors. Other variables can be stored here when the Airviro EDB is used for special applications such as the MODEM emission model.

| A                       | B                                              |
|-------------------------|------------------------------------------------|
| 1 Tag                   | Value                                          |
| 2 ac.1.kind             | 1                                              |
| 3 ac.1.entity           | SNAP                                           |
| 4 ac.1.01.entity        | COMBUSTION IN ENERGY AND TRANSFORMATION INDUS  |
| 5 ac.1.01.01.entity     | Public power                                   |
| 6 ac.1.01.01.00.entity  | Public power                                   |
| 7 ac.1.01.01.01.entity  | Combustion plants >= 300 MW (boilers)          |
| 8 ac.1.01.01.02.entity  | Combustion plants >= 50 and < 300 MW (boilers) |
| 9 ac.1.01.01.03.entity  | Combustion plants < 50 MW (boilers)            |
| 10 ac.1.01.01.04.entity | Gas turbines                                   |
| 11 ac.1.01.01.05.entity | Stationary engines                             |
| 12 ac.1.01.02.entity    | District heating plants                        |
| 13 ac.1.01.02.00.entity | District heating plants                        |
| 14 ac.1.01.02.01.entity | Combustion plants >= 300 MW (boilers)          |
| 15 ac.1.01.02.02.entity | Combustion plants >= 50 and < 300 MW (boilers) |
| 16 ac.1.01.02.03.entity | Combustion plants < 50 MW (boilers)            |
| 17 ac.1.01.02.04.entity | Gas turbines                                   |
| 18 ac.1.01.02.05.entity | Stationary engines                             |
| 19 ac.1.01.03.entity    | Petroleum refining plants                      |
| 20 ac.1.01.03.00.entity | Petroleum refining plants                      |
| 21 ac.1.01.03.01.entity | Combustion plants >= 300 MW (boilers)          |
| 22 ac.1.01.03.02.entity | Combustion plants >= 50 and < 300 MW (boilers) |
| 23 ac.1.01.03.03.entity | Combustion plants < 50 MW (boilers)            |
| 24 ac.1.01.03.04.entity | Gas turbines                                   |
| 25 ac.1.01.03.05.entity | Stationary engines                             |
| 26 ac.1.01.03.06.entity | Process furnaces                               |
| 27 ac.1.01.04.entity    | Solid fuel transformation plants               |
| 28 ac.1.01.04.00.entity | Solid fuel transformation plants               |
| 29 ac.1.01.04.01.entity | Combustion plants >= 300 MW (boilers)          |
| 30 ac.1.01.04.02.entity | Combustion plants >= 50 and < 300 MW (boilers) |
| 31 ac.1.01.04.03.entity | Combustion plants < 50 MW (boilers)            |
| 32 ac.1.01.04.04.entity | Gas turbines                                   |
| 33 ac.1.01.04.05.entity | Stationary engines                             |
| 34 ac.1.01.04.06.entity | Coke oven furnaces                             |
| 35 ac.1.01.04.07.entity | Other (coal gasification, liquefaction,...)    |
| 36 ac.1.01.05.entity    | Coal mining, oil / gas extraction, pipeline c  |
| 37 ac.1.01.05.00.entity | Coal mining, oil / gas extraction, pipeline c  |
| 38 ac.1.01.05.01.entity | Combustion plants >= 300 MW (boilers)          |
| 39 ac.1.01.05.02.entity | Combustion plants >= 50 and < 300 MW (boilers) |

Figure D7. Rsrc Sheet.

### 1.D.9.4. Substance Sheet

This sheet corresponds to the substance table of the Airviro EDB. No changes are allowed since this information only persists in the global EDB of Airviro.

|    | A            | B                | C | D | E | F | G | H | I |
|----|--------------|------------------|---|---|---|---|---|---|---|
| 1  | <b>Index</b> | <b>Substance</b> |   |   |   |   |   |   |   |
| 2  | 1            | NO               |   |   |   |   |   |   |   |
| 3  | 2            | NO2              |   |   |   |   |   |   |   |
| 4  | 3            | NOx              |   |   |   |   |   |   |   |
| 5  | 4            | HNO3             |   |   |   |   |   |   |   |
| 6  | 5            | HNO2             |   |   |   |   |   |   |   |
| 7  | 6            | PAN              |   |   |   |   |   |   |   |
| 8  | 7            | NH3              |   |   |   |   |   |   |   |
| 9  | 8            | N2O              |   |   |   |   |   |   |   |
| 10 | 9            | -                |   |   |   |   |   |   |   |
| 11 | 10           | -                |   |   |   |   |   |   |   |
| 12 | 11           | -                |   |   |   |   |   |   |   |

Figure D8. Substance Sheet.

### 1.D.9.5. Sheet Searchkey

This sheet contains the searchkey table of the Airviro EDB. Search keys may be empty (not used) but duplicates should be avoided.

|    | A            | B                 | C                 | D                 | E                 | F                 | G |
|----|--------------|-------------------|-------------------|-------------------|-------------------|-------------------|---|
| 1  | <b>Index</b> | <b>Searchkey1</b> | <b>Searchkey2</b> | <b>Searchkey3</b> | <b>Searchkey4</b> | <b>Searchkey5</b> |   |
| 2  | 1            | Botkyrka 27       | 27                | Individ. uppv     | Tillverkning      |                   |   |
| 3  | 2            | Danderyd 62       | 27                | Pannc. uppvärmm   | Lagring           |                   |   |
| 4  | 3            | Ekerö 25          | 27                | Energianlägg.     | Konsumtion        |                   |   |
| 5  | 4            | Haninge 36        | 27                | Ind. energianl    | Avfall, sopförbr  |                   |   |
| 6  | 5            | Huddinge 26       | 27                | Bensinstat ej 6   | Förbr. fossilt    |                   |   |
| 7  | 6            | Järfälla 23       | 62                | Biltvättar        | Förbr. övrigt     |                   |   |
| 8  | 7            | Lidingö 86        | 62                | Depå petroleum    | Naturliga ursl.   |                   |   |
| 9  | 8            | Nacka 82          | 62                | Kemtvättar        |                   |                   |   |
| 10 | 9            | Norrälje 88       | 62                | Verkst ind ej10   |                   |                   |   |
| 11 | 10           | Nynäshamn 92      | 62                | Lackeringsind     |                   |                   |   |
| 12 | 11           | Salem 28          | 25 Ekerö          | Graf ind ej 12    |                   |                   |   |

Figure D9. Searchkey Sheet.

### 1.D.9.6. Emission Factor Sheet

This sheet corresponds to the emission factor table of the Airviro EDB. There is one emission factor per row. Names and indices must be unique, including names and indices for the emission factors. After the **Name** and **Index** columns, pairs of *substance* and **Unit** columns follow. Add a substance/unit pair by adding them after the last existing substance/unit pair. To delete a substance remove the substance/unit columns. The order of substances is not significant.

|    | A                   | B     | C        | D | E    | F       | G | H    | I       | J | K    | L              | M | N    | O        | P | Q    | R | S | T | U |
|----|---------------------|-------|----------|---|------|---------|---|------|---------|---|------|----------------|---|------|----------|---|------|---|---|---|---|
| 1  | Name                | Index | NOx      | m | Unit | Benzene | m | Unit | Toluene | m | Unit | Xylene (total) | m | Unit | SO2      | m | Unit |   |   |   |   |
| 2  | HC from car fuel    | 3     | 100      | 0 | %    | 4       | 0 | %    | 12      | 0 | %    | 13             | 0 | %    |          |   |      |   |   |   |   |
| 3  | Chalmers_oil        | 15    | 0.100668 | 0 | %    |         |   |      |         |   |      |                |   |      | 0.400345 | 0 | %    |   |   |   |   |
| 4  | Rosenlund_HP1-5_oil | 16    | 0.1      | 0 | %    |         |   |      |         |   |      |                |   |      | 0.4      | 0 | %    |   |   |   |   |
| 5  | Rosenlund_MT_gas    | 17    | 0.1      | 0 | %    |         |   |      |         |   |      |                |   |      |          |   |      |   |   |   |   |
| 6  | Rosenlund_MT_oil    | 18    | 0.1      | 0 | %    |         |   |      |         |   |      |                |   |      | 0.4      | 0 | %    |   |   |   |   |
| 7  | Rya_VC_gas          | 19    | 0.05     | 0 | %    |         |   |      |         |   |      |                |   |      |          |   |      |   |   |   |   |
| 8  | Rya_VC_oil          | 20    | 0.05     | 0 | %    |         |   |      |         |   |      |                |   |      | 0.42     | 0 | %    |   |   |   |   |
| 9  | Savenäs_HP3_coal    | 21    | 0.1      | 0 | %    |         |   |      |         |   |      |                |   |      | 0.1      | 0 | %    |   |   |   |   |
| 10 | Savenäs_HVP1/P2_oil | 22    | 0.1      | 0 | %    |         |   |      |         |   |      |                |   |      | 0.4      | 0 | %    |   |   |   |   |

Figure D10. Emission factor Sheet

### 1.D.9.7. Emission Function Sheet

This sheet corresponds to the Airviro emission function table. There is one emission function per row. Names and indices must be unique. For each emission function a number of variables are defined. These can either be CONST (Constant) or VAR (Variable). The variables are used in the Formula. The formula can contain arithmetical and logical expressions and uses the same syntax as the Indico interpreter.

|    | A              | B     | C         | D                                                                 | E         | F      | G           | H      | I             | J      | K   |
|----|----------------|-------|-----------|-------------------------------------------------------------------|-----------|--------|-------------|--------|---------------|--------|-----|
| 1  | Name           | Index | Substance | Formula                                                           | Var 1     | Type 1 | Var 2       | Type 2 | Var 3         | Type 3 | Var |
| 2  | MaxEffToEmiSO2 | 1     | SO2       | MaxEffect/EnergyValue*PercentageSO2/100*(365*24*3600/(1000*1000)) | MaxEffect | CONST  | EnergyValue | VAR    | PercentageSO2 | VAR    |     |
| 3  | MaxEffToEmiNOx | 2     | NOx       | MaxEffect*RelativeEmi*(365*24*3600/(1000*1000))                   | MaxEffect | CONST  | RelativeEmi | VAR    |               |        |     |
| 4  |                |       |           |                                                                   |           |        |             |        |               |        |     |
| 5  |                |       |           |                                                                   |           |        |             |        |               |        |     |
| 6  |                |       |           |                                                                   |           |        |             |        |               |        |     |
| 7  |                |       |           |                                                                   |           |        |             |        |               |        |     |
| 8  |                |       |           |                                                                   |           |        |             |        |               |        |     |
| 9  |                |       |           |                                                                   |           |        |             |        |               |        |     |
| 10 |                |       |           |                                                                   |           |        |             |        |               |        |     |

Figure D11. Emission Function Sheet.

### 1.D.9.8. Source TimeVar Sheet

This sheet corresponds to the Airviro Time Variation Point table in EDB. Each time variation spans over four rows. Names and indices must be unique. After the **Name** and **Index** columns, the following information follows:

- **H.1 to H.24** stating the hourly variations. The four rows correspond to type days Mon-Thu, Fri, Sat and Sun.
- **Jan to Dec** stating the monthly variations. Only first row of each formula.
- **Scenario1 to Scenario10** stating the scenario variations. Only first row for each formula.



|    | A                     | B   | C    | D                   | E                   | F              | G                   | H                   | I    | J |
|----|-----------------------|-----|------|---------------------|---------------------|----------------|---------------------|---------------------|------|---|
| 1  | Name                  | ID  | Info | Info2               | Address             | Postaddress    | Info. Supp.         | Misc                | ALOB |   |
| 2  | Scanraff              | 1   |      |                     |                     | 453 81 Lysekil | Isf/K-G Mattsson    | Krackerfackla       |      |   |
| 3  | Svenska Shell AB      | 10  |      |                     |                     |                |                     |                     |      |   |
| 4  | Scanfuel              | 100 |      |                     | Halmstad            |                | Isf/BA              |                     |      |   |
| 5  | Samhall Dalväst       | 101 |      | Box 24              | 662 00 Åmål         |                | Isf/Jonas Edin      | Panna, Eo1 0.1%/*   |      |   |
| 6  | Tre Kök Doggy         | 102 |      | Box 154             | 447 00 Vårgårda     |                | Isf/P-län           | Panna, Eo1 & Eo5    |      |   |
| 7  | Electrolux Åmål       | 103 |      | Box 127             | 662 00 Åmål         |                | Isf/Jonas Edin      | Panna, WRD 0.5%/*   |      |   |
| 8  | Boråstapeter          | 104 |      | Box 1               | 501 02 Borås        |                | Isf/U Samuelsson    | Panna, Eo1/*        |      |   |
| 9  | Viared 2              | 105 |      | Borås Energi,Box 49 | 501 02 Borås        |                | Isf/P-län           | Oljepanna/*         |      |   |
| 10 | H Kom Renhållning     | 106 |      |                     |                     |                | Isf/BA              |                     |      |   |
| 11 | Västsvenska Lantmän   | 107 |      | Box 93              | 447 00 Vårgårda     |                | Isf/Eva Bayard      | Pannan              |      |   |
| 12 | Viared 1              | 108 |      | Borås Energi,Box 49 | 501 02 Borås        |                | Isf/P-län           | Oljepanna/*         |      |   |
| 13 | Henrikssons Trädg     | 109 |      |                     |                     |                | Isf/MHN             | Panna, Koks/Kol     |      |   |
| 14 | Point_1_ExampleAermod | 11  |      |                     |                     |                |                     |                     |      |   |
| 15 | Pilkington            | 110 |      |                     |                     |                | Isf/JF              |                     |      |   |
| 16 | Kragelund Trädgård    | 111 |      |                     |                     |                | Isf/MHN             | Panna, Koks/Kol     |      |   |
| 17 | KP Trädgårds          | 112 |      |                     |                     |                | Isf/MHN             | Panna, Koks/Kol     |      |   |
| 18 | Statens Provanstalt   | 113 |      | Box 857             | 501 15 Borås        |                | Isf/P-län           | Panna, Nafta, Eo1/* |      |   |
| 19 | Rya Kraft             | 114 |      | Borås Energi,Box 49 | 501 02 Borås        |                | Isf/P-län           | Flis,Kol,Torv/*     |      |   |
| 20 | Göta Värme            | 115 |      | Borås Energi,Box 49 | 501 02 Borås        |                | Isf/P-län           | Oljepanna/*         |      |   |
| 21 | Sjöbo Värme           | 116 |      | Borås Energi,Box 49 | 501 02 Borås        |                | Isf/P-län           | Oljepanna/*         |      |   |
| 22 | Lasarettet Värme      | 117 |      | Borås Energi,Box 49 | 501 02 Borås        |                | Isf/P-län           | Oljepanna/*         |      |   |
| 23 | Hulta Värme           | 118 |      | Borås Energi,Box 49 | 501 02 Borås        |                | Isf/P-län           | Oljepanna/*         |      |   |
| 24 | Anderssons Sågverk    | 119 |      |                     | 513 02 Borgstena    |                | Isf/P-län           | Bark/Spån/Kutter/*  |      |   |
| 25 | Panncentr Tynnered    | 12  |      | Lia Grevegårdsv.2   | 421 44 V:a Frölunda |                | Isf/Paul Johansson  |                     |      |   |
| 26 | Västsv. Fotolab.      | 120 |      | Box 80              | 524 00 Herrljunga   |                | Isf/U Samuelsson    | Panna, Eo1 0.1%/*   |      |   |
| 27 | Herrljunga Sågverk    | 121 |      | Pl.5026             | 524 00 Herrljunga   |                | Isf/P-län           | Panna, Bark         |      |   |
| 28 | Svenljunga Värme      | 122 |      | Box 201             | 512 01 Svenljunga   |                | Isf/P-län           | Panna, flis/olja/*  |      |   |
| 29 | Almedahls-D           | 123 |      | Box 17              | 516 00 Dalsjöfors   |                | Isf/Birgitta Olsson | Ångpanna,Eo5 0.6%/* |      |   |
| 30 | Hylte Bruks AB        | 124 |      |                     | Hylte               |                | Isf/BA              | Lutpanna P1         |      |   |
| 31 | Vårdcentral Knäred    | 125 |      |                     |                     |                | Isf/MHN             | Panna, Biobr/Olja   |      |   |
| 32 | Panncentral Knäred    | 126 |      |                     |                     |                | Isf/MHN             | Panna, Biobr/Gasol  |      |   |
| 33 | Jabo Träprodukter     | 127 |      | Box 201             | 514 01 Tranemo      |                | Isf/P-län           | Panna 1,bark/spån/* |      |   |
| 34 | Limmareds Skogar      | 128 |      | Box 48              | 510 90 Limmared     |                | Isf/P-län           | Panna,Bark 70000m3  |      |   |
| 35 | PLM-Limmared          | 129 |      | Box 93              | 510 90 Limmared     |                | Isf/Sten Wolme      | Glasugnar           |      |   |
| 36 | Vattenfall Sten       | 13  |      | Kraftverksvägen     | 444 87 Stenungsund  |                | Isf/Kenneth Haglund | Block B1            |      |   |
| 37 | EBE Energibränsle     | 130 |      | Kvarngatan 22       | 502 44 Borås        |                | Isf/Mikael Suld     | Torkanläggningen    |      |   |
| 38 | Timmele Färgeri       | 131 |      | Box 2044            | Ulricehamn          |                | Isf/P-län           | Panna, olja/gasol/* |      |   |
| 39 | Neste Polyeten        | 14  |      |                     | 444 86 Stenungsund  |                | Isf/Ulf Gustavson   | Ångcentralen        |      |   |

Figure D13. Company Sheet.

### 1.D.9.10. Facility Sheet

This sheet corresponds to the Airviro facility table in EDB. After the **Name** and **XY** columns, the following information follows:

- Company: name of the associated company.
- Info, Info 2: string, additional information.
- Address and post address: string.
- Info. Supp.: the informant name.
- Misc and ALOB: string

|    | A                      | B       | C       | D                    | E    | F     | G                   | H                   | I                   | J                   | K    |
|----|------------------------|---------|---------|----------------------|------|-------|---------------------|---------------------|---------------------|---------------------|------|
| 1  | Name                   | X1      | Y1      | Company              | Info | Info2 | Address             | Postaddress         | Info. Supp.         | Misc                | ALOB |
| 2  | Scanraff               | 1243431 | 6477510 | Scanraff             |      |       |                     | 453 81 Lysekil      | Isf/K-G Mattsson    | Krackerfackla       |      |
| 3  | OK RAFFINADERI         | 1262920 | 6405070 | OK RAFFINADERI       |      |       | Box 23037           | 400 73 Göteborg     | Isf/Gösta Sjonell   | Fackla              |      |
| 4  | Volvo Torslanda        | 1264090 | 6406480 | Volvo Torslanda      |      |       |                     | 405 08 Göteborg     | Isf/S Johansson     | Byggnad TB1/*       |      |
| 5  | NYNÄS SUPPLY           | 1264120 | 6404110 | NYNÄS SUPPLY         |      |       | Oljevägen           | 417 91 Göteborg     | Isf/Björn Tisén     | DA-ugnen            |      |
| 6  | Hydro Plast            | 1264387 | 6446734 | Hydro Plast          |      |       | Hjalmarevägen       | 444 83 Stenungsund  | Isf/Rune Niklasson  | Ängpanna 2          |      |
| 7  | Statoil Petro          | 1265400 | 6446940 | Statoil Petro        |      |       |                     | 444 81 Stenungsund  | Isf/J Andersson     | S Skorsten (F-1601) |      |
| 8  | Point_2_ExampleAermord | 1265509 | 6405901 |                      |      |       |                     |                     | GIS                 |                     |      |
| 9  | Berol Nobel Sten       | 1265520 | 6447450 | Berol Nobel Sten     |      |       |                     | 444 85 Stenungsund  | Isf/Knut Andrén     | Destruktionsugn     |      |
| 10 | Svenska Shell AB       | 1265648 | 6404066 | Svenska Shell AB     |      |       |                     |                     |                     |                     |      |
| 11 | Point_1_ExampleAermord | 1265670 | 6405659 |                      |      |       |                     |                     |                     |                     |      |
| 12 | Shell Raffinad         | 1265951 | 6404101 | Shell Raffinad       |      |       | Box 8889            | 402 72 Göteborg     | Guillermo Silva     |                     |      |
| 13 | Panncentr Tynnered     | 1266050 | 6398150 | Panncentr Tynnered   |      |       | Lia Grevegårdsv.2   | 421 44 V:a Frölunda | Isf/Karin Jansson   | Facklan/*           |      |
| 14 | Vattenfall Sten        | 1266290 | 6447130 | Vattenfall Sten      |      |       | Kraftverksvägen     | 444 87 Stenungsund  | Isf/Paul Johansson  | Block B1            |      |
| 15 | Neste Polyeten         | 1266410 | 6446100 | Neste Polyeten       |      |       |                     | 444 86 Stenungsund  | Isf/Ulf Gustavson   | Ängcentralen        |      |
| 16 | Stenungs.Fjärrvärme    | 1266620 | 6445370 | Stenungs.Fjärrvärme  |      |       | Hantverkargatan 32  | 444 32 Stenungsund  | Isf/Monica Rundin   | Pannan              |      |
| 17 | ENERGIV. RYA_VC_OIL    | 1266693 | 6403402 | ENERGIV. RYA_VC_OIL  |      |       |                     |                     |                     |                     |      |
| 18 | ENERGIV. RYA_VC_GAS    | 1266700 | 6403400 | ENERGIV. RYA_VC_GAS  |      |       |                     | 401 20              | Tideström Birgitta  | Energianläggning    |      |
| 19 | Volvo Lundby           | 1266820 | 6405750 | Volvo Lundby         |      |       | Gropegårdsgatan     | 405 08 Göteborg     | Isf/Kerstin Sterner | U-byggn.Lastvagnar  |      |
| 20 | Volvo Tuveverken       | 1266900 | 6410460 | Volvo Tuveverken     |      |       |                     | 405 08 Göteborg     | Isf/Kerstin Sterner | Energicent.Lastvagn |      |
| 21 | Neste Oxo              | 1267630 | 6448140 | Neste Oxo            |      |       |                     | 444 84 Stenungsund  | Isf/Kjell Flodmark  | Ängpannor           |      |
| 22 | BOSTADS AB POSEIDON    | 1267727 | 6399749 | BOSTADS AB POSEIDON  |      |       | Musikvägen 1        | 421 44 VÄSTRA FRÖLU | Johansson Paul      | Panncentral Musikvä |      |
| 23 | PANNCENTR MUSIKV       | 1267900 | 6399770 | PANNCENTR MUSIKV     |      |       | Box 1               | 424 21 Angered      | Isf/Paul Johansson  |                     |      |
| 24 | MARCONICENTRALEN       | 1268550 | 6399350 | MARCONICENTRALEN     |      |       | Box 5044            | 402 21 Göteborg     | Isf/Leif Dahlquist  | Värmecentral        |      |
| 25 | GÖTEBORGS STADS BOS    | 1268600 | 6401600 | GÖTEBORGS STADS BOS  |      |       | N Dragspelsgatan 2  | 402 21 GÖTEBORG     | Hansson Fride       | Hetvattencentral    |      |
| 26 | Tuve Hetvattencent.    | 1268650 | 6409850 | Tuve Hetvattencent.  |      |       | Box 5044            | 402 21 Göteborg     | Isf/Leif Dahlquist  | Värmecentral        |      |
| 27 | WALCH CHARKUTERIFAB    | 1268817 | 6399089 | WALCH CHARKUTERIFAB  |      |       | Bildradiogatan 8    | 421 34 VÄSTRA FRÖLU | Walch Helmut        | Rökeri              |      |
| 28 | AGA GAS AB             | 1269303 | 6404816 | AGA GAS AB           |      |       | Polstjärnegatan 12  | 402 72 GÖTEBORG     | Lönnqvist Roy       | Verkstad            |      |
| 29 | MASTER OLOFS CHARKU    | 1269380 | 6399541 | MASTER OLOFS CHARKU  |      |       | Olof Askklunds G 20 | 421 30 VÄSTRA FRÖLU |                     | Rökeri              |      |
| 30 | PRIPPS                 | 1269400 | 6398500 | PRIPPS               |      |       | Box 121             | 421 22 V Frölunda   | Isf                 | Bryggeri/*          |      |
| 31 | RIBO-VERKEN AB         | 1269503 | 6398963 | RIBO-VERKEN AB       |      |       | Britta Sahlgrens G  | 421 02 VÄSTRA FRÖLU | Lindahl             | Verkstad            |      |
| 32 | Volvo Uddevalla        | 1270250 | 6476100 | Volvo Uddevalla      |      |       |                     | 451 84 Uddevalla    | Isf/S Johansson     | Panna/*             |      |
| 33 | HEDLUNDS PAPPER        | 1270430 | 6397410 | HEDLUNDS PAPPER      |      |       | Box 100             | 401 21 Göteborg     | Isf/Chr Tengstrand  | Pannan              |      |
| 34 | ENERGIV. ROSEN.L.GAS   | 1270490 | 6404094 | ENERGIV. ROSEN.L.GAS |      |       | Rosenlundsgatan 2   | 601 20 Göteborg     |                     |                     |      |
| 35 | ENERGIV. ROSEN.L.OIL   | 1270499 | 6404090 | ENERGIV. ROSEN.L.OIL |      |       | Rosenlundsgatan 2   | 401 20 GÖTEBORG     | Tideström Birgitta  | Energianläggning    |      |
| 36 | ENERGIV.ROSEN.HP1-5    | 1270582 | 6404108 | ENERGIV.ROSEN.HP1-5  |      |       |                     |                     |                     |                     |      |
| 37 | WENNERGRENS KITTFAB    | 1270767 | 6407283 | WENNERGRENS KITTFAB  |      |       | Aröds Industriväg 1 | 422 43 HISINGS BACK | Wennergren Th       | Kittfabrik          |      |
| 38 | Volvo Röllsbo          | 1271250 | 6423750 | Volvo Röllsbo        |      |       |                     | 442 40 Kungälv      | Isf/S Johansson     | *                   |      |
| 39 | B A S F SVENSKA AB     | 1271550 | 6405859 | B A S F SVENSKA AB   |      |       | Stenkolsgatan 5     | 400 14 GÖTEBORG     | Björnsson B-å       | Kem-teknik, enbart  |      |

Figure D14. Sheet Facility.

### 1.D.9.11. Source Sheet

This sheet corresponds to the Airviro point and area sources in EDB. One point or area source per row. Below is a description of the columns:

1• **Name** Name of the point or area source.

• **X1** X coordinate for point sources and left X coordinate for area sources.

• **Y1** Y coordinate for point sources and lower Y coordinate for area sources.

• **X2** Empty for point sources and right X coordinate for area sources.

• **Y2** Empty for point sources and upper Y coordinate for area sources.

• **Facility** String

- **Info** String.
- **Info2** String.
- **Date**
- **Changed**
- **Chimney hgt.** Number.
- **Gas temp.** Number.
- **Gas Flow** Number.
- **Chimney out** Number.
- **Chimney in** Number.
- **House Width** Number.
- **House hgt.** Number.
- **No. seg.**
- **Build width.**
- **Build hgt.**
- **Build len.**

- **Build dist far wall.**
- **Build dist center.**
- **S1, S2, S3, S4 and S5 (Searchkeys)**
- **Timevar macro**
- **Geographical code**
- **ALOB**

There are three different ways to specify the Emissions for a Source: Using Substance (Emission sub), Emission factor (Emission fac) and Emission function (Emission func). The three can be used at the same time.

- **Emission sub 1:** Substance
- **Emission sub 1:** Timevar
- **Emission sub 1:** Emission
- **Emission sub 1:** Unit
- **Emission sub 1:** Macro
- **Emission sub 1:** Actcode
- **Emission sub 1:** ALOB

- **Emission fac 1: Factor**
- **Emission fac 1: Timevar**
- **Emission fac 1:Activity**
- **Emission fac 1: Unit**
- **Emission fac : Actcode**
- **Emission fac 1: ALOB**
- **Emission func 1: Function**
- **Emission func 1: Timevar**
- **Emission func Activity**
- **Emission func 1: Unit**
- **Emission func : Actcode**
- **Emission func 1: ALOB**

|    | A            | B       | C        | D  | E  | F                    | G    | H     | I          | J          | K            | L         | M        | N           | O          | P           | Q          | R       | S           | T          | U          | V                   | W                 | X  | Y  | Z  | AA | AB |
|----|--------------|---------|----------|----|----|----------------------|------|-------|------------|------------|--------------|-----------|----------|-------------|------------|-------------|------------|---------|-------------|------------|------------|---------------------|-------------------|----|----|----|----|----|
| 1  | Name         | X1      | Y1       | X2 | Y2 | Facility             | Info | Info2 | Date       | Changed    | Chimney hgt. | Gas temp. | Gas Flow | Chimney Out | Chimney In | House Width | House hgt. | No. seg | Build width | Build hgt. | Build len. | Build dist far wall | Build dist center | S1 | S2 | S3 | S4 | S5 |
| 54 | Shell Raffin | 1266070 | 6404210  |    |    | Shell Raffinad       |      |       | 1992/06/16 | 1994/09/07 | 40           | 260       | 2        | 1.45        | 1.45       | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 55 | Shell Raffin | 1266100 | 6404190  |    |    | Shell Raffinad       |      |       | 1992/06/16 | 1994/09/07 | 38           | 210       | 2        | 1.3         | 1.3        | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 56 | Vattenfall   | 1266290 | 6447130  |    |    | Vattenfall Sten      |      |       | 1992/06/16 |            | 150          | 140       | 13       | 7.5         | 5.65       | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 57 | Vattenfall   | 1266350 | 6447130  |    |    | Vattenfall Sten      |      |       | 1992/06/16 |            | 150          | 140       | 13       | 7.5         | 5.65       | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 58 | Neste Poly   | 1266410 | 6446100  |    |    | Neste Polyeten       |      |       | 1992/06/16 |            | 53           | 150       | 9        | 0.99        | 0.7        | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 59 | Stenungs F   | 1266520 | 6445370  |    |    | Stenungs Fjärrvärme  |      |       |            |            | 58           | 250       | 20       | 0           | 0.52       | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 60 | Neste Poly   | 1266680 | 6446250  |    |    | Neste Polyeten       |      |       | 1992/06/16 |            | 40           | 450       | 0        | 0.61        | 0.51       | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 61 | ENERGIV. R   | 1266993 | 6403402  |    |    | ENERGIV. RYA_VC_OIL  |      |       | 2014/09/10 | 2014/12/15 | 100          | 160       | 24       | 5.8         | 1.7        | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 62 | ENERGIV. R   | 1266700 | 6403400  |    |    | ENERGIV. RYA_VC_GAS  |      |       | 2014/09/10 | 2014/12/15 | 100          | 160       | 24       | 5.8         | 1.7        | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 63 | Neste Poly   | 1266760 | 6446140  |    |    | Neste Polyeten       |      |       | 1992/06/16 |            | 52           | 450       | 0        | 0.76        | 0.66       | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 64 | Volvo Lund   | 1266820 | 6405750  |    |    | Volvo Lundby         |      |       | 1992/08/26 | 1993/09/09 | 40           | 125       | 8        | 3.3         | 1.22       | 50          | 6          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 65 | Volvo Tuve   | 1266900 | 6410460  |    |    | Volvo Tuveverken     |      |       | 1992/08/26 |            | 37           | 175       | 0        | 0.8         | 0.6        | 200         | 13         | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 66 | Neste Oxo    | 1267480 | 6448330  |    |    | Neste Oxo            |      |       | 1992/06/16 |            | 45           | 175       | 4        | 3.26        | 1.47       | 38          | 21         | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 67 | Neste Oxo    | 1267510 | 6448270  |    |    | Neste Oxo            |      |       | 1992/06/16 |            | 12           | 100       | 9        | 0.25        | 0.25       | 22          | 10         | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 68 | Neste Oxo    | 1267630 | 6448140  |    |    | Neste Oxo            |      |       | 1992/06/16 |            | 45           | 0         | 0        | 1.28        | 1.2        | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 69 | BOSTADS A    | 1267727 | 6399749  |    |    | BOSTADS AB POSEIDON  |      |       | 2014/09/09 | 2014/09/10 | 0            | 0         | 0        | 0           | 0          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 70 | PANNCENTR    | 1267900 | 6399770  |    |    | PANNCENTR MUSIKV     |      |       | 1992/06/16 | 1993/12/21 | 50           | 200       | 25       | 3           | 0.47       | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 71 | GÖTEBORGS    | 1268000 | 63997800 |    |    | GÖTEBORGS STADS BOS  |      |       |            |            | 0            | 0         | 0        | 0           | 0          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 72 | MARCONIC     | 1268550 | 6399350  |    |    | MARCONICENTRALEN     |      |       |            |            | 50           | 100       | 4        | 2.5         | 1.4        | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 73 | GÖTEBORGS    | 1268600 | 6401600  |    |    | GÖTEBORGS STADS BOS  |      |       | 1992/06/16 | 1993/12/21 | 65           | 175       | 15       | 0           | 0          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 74 | Tuve Hetta   | 1268650 | 6409850  |    |    | Tuve Hettaväntcent.  |      |       | 1992/06/16 |            | 50           | 100       | 4        | 2           | 0.69       | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 75 | Volvo Lund   | 1268670 | 6405850  |    |    | Volvo Lundby         |      |       | 1992/08/26 |            | 50           | 40        | 14       | 0.95        | 0.64       | 100         | 6          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 76 | WALCH CH     | 1268817 | 6399089  |    |    | WALCH CHARKUTERIFAB  |      |       |            |            | 0            | 0         | 0        | 0           | 0          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 77 | AGA GAS AB   | 1269303 | 6404816  |    |    | AGA GAS AB           |      |       | 2014/09/09 | 2014/10/01 | 0            | 0         | 0        | 0           | 0          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 78 | MASTER O     | 1269380 | 6399541  |    |    | MASTER OLOFS CHARKU  |      |       |            |            | 0            | 0         | 0        | 0           | 0          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 79 | PRIPPS       | 1269400 | 6398500  |    |    | PRIPPS               |      |       | 1992/06/16 | 1993/12/21 | 10           | 200       | 0        | 1           | 1          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 80 | RIBO-VERK    | 1269503 | 6398963  |    |    | RIBO-VERKEN AB       |      |       |            |            | 0            | 0         | 0        | 0           | 0          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 81 | Volvo Uddev  | 1270250 | 6476100  |    |    | Volvo Uddevalla      |      |       | 1992/07/01 |            | 20           | 200       | 0        | 1           | 1          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 82 | HEDLUNDS     | 1270430 | 6397410  |    |    | HEDLUNDS PAPPER      |      |       | 1992/06/16 | 1993/12/21 | 9            | 0         | 0        | 0           | 0          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 83 | ENERGIV. R   | 1270490 | 6404094  |    |    | ENERGIV. ROSEN.GAS   |      |       | 2014/09/09 | 2014/09/10 | 60           | 110       | 25       | 4           | 1.6        | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 84 | ENERGIV. R   | 1270499 | 6404090  |    |    | ENERGIV. ROSEN.OIL   |      |       | 2014/09/10 | 2014/09/10 | 60           | 150       | 25       | 4           | 1.6        | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 85 | ENERGIV. R   | 1270582 | 6404108  |    |    | ENERGIV.ROSEN.HP1-5  |      |       | 2014/09/10 | 2014/09/10 | 100          | 200       | 30       | 6           | 2          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 86 | WENNERGR     | 1270767 | 6407283  |    |    | WENNERGREN'S KITTFAB |      |       |            |            | 0            | 0         | 0        | 0           | 0          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 87 | Volvo Rollb  | 1271250 | 6423750  |    |    | Volvo Rollsbo        |      |       | 1992/06/15 |            | 10           | 200       | 0        | 1           | 1          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 88 | B A S SVE    | 1271550 | 6405859  |    |    | B A S F SVENSKA AB   |      |       | 2014/09/09 |            | 0            | 0         | 0        | 0           | 0          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 89 | CHALMERS     | 1271750 | 6402500  |    |    | CHALMERS VARMEC      |      |       | 1992/06/16 | 2014/09/10 | 51           | 150       | 4        | 1.2         | 1          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 90 | CHALMERS     | 1271751 | 6402501  |    |    | CHALMERS VARMEC      |      |       | 1992/06/16 | 2014/09/10 | 51           | 150       | 4        | 1.2         | 1          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 91 | CHALMERS     | 1271761 | 6402605  |    |    | CHALMERS TEKNISKA H  |      |       | 2014/09/09 | 2014/09/10 | 52           | 160       | 10       | 1.5         | 1.2        | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 92 | Nössemark    | 1272000 | 6562890  |    |    | Nössemarks Trä       |      |       | 1992/06/17 |            | 23           | 130       | 7        | 1           | 0.5        | 60          | 14         | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 93 | GÖTEBORGS    | 1272018 | 6406255  |    |    | GÖTEBORGS TERMOMETE  |      |       |            |            | 0            | 0         | 0        | 0           | 0          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 94 | Brattåverke  | 1272300 | 6477000  |    |    | Brattåverket         |      |       | 1992/06/16 |            | 60           | 140       | 6        | 2.4         | 1.98       | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 95 | ALPUS AB     | 1272378 | 6405716  |    |    | ALPUS AB             |      |       | 2014/09/09 | 2014/09/10 | 0            | 0         | 0        | 0           | 0          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 96 | Riskullaver  | 1272660 | 6396900  |    |    | Riskullaverket       |      |       | 1992/06/16 |            | 100          | 126       | 5        | 0           | 1.56       | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 97 | GÄRDA FAB    | 1272702 | 6404304  |    |    | GÄRDA FABRIKERS AB   |      |       |            |            | 0            | 0         | 0        | 0           | 0          | 0           | 0          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |
| 98 | Skansverke   | 1272750 | 6476200  |    |    | Skansverket ARV      |      |       | 1992/08/24 |            | 13           | 0         | 0        | 0.3         | 0.2        | 25          | 7          | 1       | 1           | 2          | 3          | 4                   | 5                 |    |    |    |    |    |

Figure D15. Sources Sheet.

|    | A                | AC            | AD                | AE  | AF                        | AG                      | AH                       | AI                   | AI                    | AK                      | AL                   | AM                        | AN                      | AO                       | AP                   | En |
|----|------------------|---------------|-------------------|-----|---------------------------|-------------------------|--------------------------|----------------------|-----------------------|-------------------------|----------------------|---------------------------|-------------------------|--------------------------|----------------------|----|
| 1  | Name             | Timevar macro | Geographical code | ALO | Emission sub 1: Substance | Emission sub 1: Timevar | Emission sub 1: Emission | Emission sub 1: Unit | Emission sub 1: Macro | Emission sub 1: Actcode | Emission sub 1: ALOB | Emission sub 2: Substance | Emission sub 2: Timevar | Emission sub 2: Emission | Emission sub 2: Unit | En |
| 47 | Shell Raffinad.1 |               |                   |     | NOK                       | STANDARD                | 1                        | ton/year             |                       |                         |                      | S02                       | STANDARD                | 0.04                     |                      |    |
| 48 | Shell Raffinad.2 |               |                   |     | NOK                       | STANDARD                | 2                        | ton/year             |                       |                         |                      | S02                       | STANDARD                | 6.2                      |                      |    |
| 49 | Shell Raffinad.3 |               |                   |     | NOK                       | STANDARD                | 3                        | ton/year             |                       |                         |                      | S02                       | STANDARD                | 1                        |                      |    |
| 50 | Shell Raffinad.4 |               |                   |     | NOK                       | STANDARD                | 4                        | ton/year             |                       |                         |                      | S02                       | STANDARD                | 214                      |                      |    |
| 51 | Shell Raffinad.5 |               |                   |     | S02                       | STANDARD                | 5                        | ton/year             |                       |                         |                      | S02                       | STANDARD                | 15.81                    |                      |    |
| 52 | Panncentr Tynt   |               |                   |     | NOK                       | STANDARD                | 6                        | ton/year             |                       |                         |                      | S02                       | STANDARD                | 0.8                      |                      |    |
| 53 | Shell Raffinad.6 |               |                   |     | NOK                       | STANDARD                | 7                        | ton/year             |                       |                         |                      | S02                       | STANDARD                | 0.6                      |                      |    |
| 54 | Shell Raffinad.7 |               |                   |     | NOK                       | STANDARD                | 8                        | ton/year             |                       |                         |                      | S02                       | STANDARD                | 6.4                      |                      |    |
| 55 | Shell Raffinad.8 |               |                   |     | NOK                       | STANDARD                | 9                        | ton/year             |                       |                         |                      | S02                       | STANDARD                | 5.3                      |                      |    |
| 56 | Vattenfall Sten  |               |                   |     | NOK                       | STANDARD                | 10                       | ton/year             |                       |                         |                      | S02                       | STANDARD                | 4.3                      |                      |    |
| 57 | Vattenfall Sten  |               |                   |     | NOK                       | STANDARD                | 11                       | ton/year             |                       |                         |                      | S02                       | STANDARD                | 16                       |                      |    |
| 58 | Neste Polyeten   |               |                   |     | NOK                       | STANDARD                | 12                       | ton/year             |                       |                         |                      | S02                       | STANDARD                |                          |                      |    |
| 59 | Stenungs Fjärr   |               |                   |     | NOK                       | STANDARD                | 13                       | ton/year             |                       |                         |                      | S02                       | STANDARD                |                          |                      |    |

Figure D16. Sources Sheet. Emission sub.

|    | A               | AO                       | AP                   | AQ                    | AR                      | AS                   | AT                     | AU                      | AV                       | AW                   | AX                 |
|----|-----------------|--------------------------|----------------------|-----------------------|-------------------------|----------------------|------------------------|-------------------------|--------------------------|----------------------|--------------------|
| 1  | Name            | Emission sub 2: Emission | Emission sub 2: Unit | Emission sub 2: Macro | Emission sub 2: Actcode | Emission sub 2: ALOB | Emission fac 1: Factor | Emission fac 1: Timevar | Emission fac 1: Activity | Emission fac 1: Unit | Emission fac 1: En |
| 82 | HEDLUNDS PAP    |                          |                      |                       |                         |                      | Rosenlund_MT_gas       | Industry_2_turns        | 0                        | ton/year             | 01.01.00           |
| 83 | ENERGIV. ROSE   |                          |                      |                       |                         |                      | Rosenlund_HP1-5_oil    | STANDARD                | 1                        | ton/year             | 01.01.00           |
| 84 | ENERGIV. ROSE   |                          |                      |                       |                         |                      |                        |                         |                          |                      |                    |
| 85 | ENERGIV. ROSE   |                          |                      |                       |                         |                      |                        |                         |                          |                      |                    |
| 86 | WENNERGREN'S    |                          |                      |                       |                         |                      |                        |                         |                          |                      |                    |
| 87 | Volvo Rollsbo   | 0.2                      | ton/year             |                       |                         |                      |                        |                         |                          |                      |                    |
| 88 | B A S F SVENSKA |                          |                      |                       |                         |                      |                        |                         |                          |                      |                    |
| 89 | CHALMERS VU     | 5                        | ton/year             |                       | 01.01.00                |                      |                        |                         |                          |                      |                    |
| 90 | CHALMERS VU     | 12                       | ton/year             |                       | 01.01.00                |                      |                        |                         |                          |                      |                    |
| 91 | CHALMERS TEKN   |                          |                      |                       |                         | Chalmers_oil         | Industry_2_turns       | 1                       | ton/year                 | 01.02.00             |                    |
| 92 | Nössemarks Trä  | 1.8                      | ton/year             |                       |                         |                      |                        |                         |                          |                      |                    |
| 93 | GÖTEBORGS TER   |                          |                      |                       |                         |                      |                        |                         |                          |                      |                    |
| 94 | Brattåverket    | 30                       | ton/year             |                       |                         |                      |                        |                         |                          |                      |                    |

Figure D17. Sources Sheet. Emission factor.

|    | A               | AX                      | AY                   | AZ                        | BA                       | BB                     | BC                     | BD                     | BE                       | BF                    |          |
|----|-----------------|-------------------------|----------------------|---------------------------|--------------------------|------------------------|------------------------|------------------------|--------------------------|-----------------------|----------|
| 1  | Name            | Emission fac 1: Actcode | Emission fac 1: ALOB | Emission func 1: Function | Emission func 1: Timevar | Emission func 1: Var 1 | Emission func 1: Var 2 | Emission func 1: Var 3 | Emission func 1: Actcode | Emission func 1: ALOB | Emission |
| 78 | MASTER OLOFS    |                         |                      |                           |                          |                        |                        |                        |                          |                       |          |
| 79 | PRIPPS          |                         |                      |                           |                          |                        |                        |                        |                          |                       |          |
| 80 | RIBO-VERKEN A   |                         |                      |                           |                          |                        |                        |                        |                          |                       |          |
| 81 | Volvo Uddevalla |                         |                      |                           |                          |                        |                        |                        |                          |                       |          |
| 82 | HEDLUNDS PAPI   |                         |                      |                           |                          |                        |                        |                        |                          |                       |          |
| 83 | ENERGIV. ROSE   | 01.01.00                |                      |                           |                          |                        |                        |                        |                          |                       |          |
| 84 | ENERGIV. ROSE   |                         |                      | MaxEffToEmsI02            | STANDARD                 | 20                     | 42.7                   | 0.4                    |                          | 01.01.00              | MaxEffTo |
| 85 | ENERGIV. ROSE   | 01.01.00                |                      |                           |                          |                        |                        |                        |                          |                       |          |
| 86 | WENNERGREN      |                         |                      |                           |                          |                        |                        |                        |                          |                       |          |
| 87 | Volvo Rollabo   |                         |                      |                           |                          |                        |                        |                        |                          |                       |          |
| 88 | B A S F SVENSKA |                         |                      |                           |                          |                        |                        |                        |                          |                       |          |

Figure D18. Sources Sheet. Emission function.

### 1.D.9.12. Vehicle Sheet

This sheet corresponds to the Airviro vehicle table in EDB. Each vehicle spans over eleven rows. Names and indices must be unique. The speed column must contain the eleven speed labels ordered as in the Speed-Temperature-Scen sheet. After the **Name**, **Index** and **Speed** columns, substance columns follow. Add a substance by adding it after the last existing substance. To delete a substance remove the column of the substance. The order of substances is not significant.

|    | A               | B     | C             | D     | E           | F            | G           |
|----|-----------------|-------|---------------|-------|-------------|--------------|-------------|
| 1  | Name            | Index | Activity code | Speed | NOx         | CO           | VOC         |
| 2  | Lv th 50 5s     | 21    |               | 20    | 2056.000000 | 11575.000000 | 1395.000000 |
| 3  |                 |       |               | 30    | 2390.000000 | 12525.000000 | 1299.000000 |
| 4  |                 |       |               | 40    | 2990.000000 | 13141.000000 | 1280.000000 |
| 5  |                 |       |               | 50    | 2828.000000 | 14773.000000 | 1402.000000 |
| 6  |                 |       |               | 60    | 2828.000000 | 14773.000000 | 1402.000000 |
| 7  |                 |       |               | 70    | 2828.000000 | 14773.000000 | 1402.000000 |
| 8  |                 |       |               | 80    | 2828.000000 | 14773.000000 | 1402.000000 |
| 9  |                 |       |               | 90    | 2828.000000 | 14773.000000 | 1402.000000 |
| 10 |                 |       |               | 100   | 2828.000000 | 14773.000000 | 1402.000000 |
| 11 |                 |       |               | 110   | 2828.000000 | 14773.000000 | 1402.000000 |
| 12 |                 |       |               | 120   | 2828.000000 | 14773.000000 | 1402.000000 |
| 13 | Lv cat th 70 1s | 23    |               | 20    | 1877.000000 | 10843.000000 | 1279.000000 |
| 14 |                 |       |               | 30    | 2178.000000 | 10529.000000 | 1234.000000 |
| 15 |                 |       |               | 40    | 2845.000000 | 11631.000000 | 1103.000000 |
| 16 |                 |       |               | 50    | 2826.000000 | 11556.000000 | 1235.000000 |
| 17 |                 |       |               | 60    | 1994.000000 | 11901.000000 | 1079.000000 |
| 18 |                 |       |               | 70    | 1755.000000 | 11072.000000 | 981.000000  |
| 19 |                 |       |               | 80    | 1755.000000 | 11072.000000 | 981.000000  |
| 20 |                 |       |               | 90    | 1755.000000 | 11072.000000 | 981.000000  |
| 21 |                 |       |               | 100   | 1755.000000 | 11072.000000 | 981.000000  |
| 22 |                 |       |               | 110   | 1755.000000 | 11072.000000 | 981.000000  |
| 23 |                 |       |               | 120   | 1755.000000 | 11072.000000 | 981.000000  |
| 24 | Lv th 50 3s     | 26    |               | 20    | 1967.000000 | 11209.000000 | 1337.000000 |
| 25 |                 |       |               | 30    | 2190.000000 | 11527.000000 | 1165.000000 |
| 26 |                 |       |               | 40    | 2392.000000 | 11359.000000 | 1068.000000 |
| 27 |                 |       |               | 50    | 1940.000000 | 11801.000000 | 1063.000000 |
| 28 |                 |       |               | 60    | 1686.000000 | 11801.000000 | 1064.000000 |
| 29 |                 |       |               | 70    | 1940.000000 | 11801.000000 | 1064.000000 |
| 30 |                 |       |               | 80    | 1940.000000 | 11801.000000 | 1064.000000 |
| 31 |                 |       |               | 90    | 1940.000000 | 11801.000000 | 1064.000000 |
| 32 |                 |       |               | 100   | 1940.000000 | 11801.000000 | 1064.000000 |
| 33 |                 |       |               | 110   | 1940.000000 | 11801.000000 | 1064.000000 |
| 34 |                 |       |               | 120   | 1940.000000 | 11801.000000 | 1064.000000 |
| 35 | Lv hig          | 29    |               | 20    | 1051.000000 | 8014.000000  | 650.000000  |
| 36 |                 |       |               | 30    | 1051.000000 | 8014.000000  | 650.000000  |
| 37 |                 |       |               | 40    | 1051.000000 | 8014.000000  | 650.000000  |
| 38 |                 |       |               | 50    | 1051.000000 | 8014.000000  | 650.000000  |
| 39 |                 |       |               | 60    | 1216.000000 | 8729.000000  | 721.000000  |

Figure D19 Sheet Vehicle.

### 1.D.9.13. Road Vehicle Def Sheet

This sheet corresponds to the Airviro road vehicle definitions table.

|   | A         | B                  | C                   | D                            | E                            | F                           | G                     | H                        | I        | J         | K         | L                  |
|---|-----------|--------------------|---------------------|------------------------------|------------------------------|-----------------------------|-----------------------|--------------------------|----------|-----------|-----------|--------------------|
| 1 | Name      | Label 1            | Label 2             | Label 3                      | Label 4                      | Label 5                     | Label 6               | Label 7                  | Label 8  | Label 9   | Label 10  | Label 11           |
| 2 | Road type | Urban-Motorway-Nat | Urban-Motorway-City | Urban-TrunkRoad/Primary-Nat. | Urban-TrunkRoad/Primary-City | Urban-Distributor/Secondary | Urban-Local/Collector | Urban-Access-residential | Not_used | Not_used1 | Not_used2 | Rural-Motorway-Nat |
| 3 | Speed     | 30                 | 40                  | 50                           | 60                           | 70                          | 80                    | 90                       | 100      | 110       | 120       | 130                |
| 4 | Gradient  | 6                  | 4                   | 2                            | 1                            | 0                           | 1                     | 2                        | 4        | 6         |           |                    |

Figure D20 Vehicle Def. Sheet.

### 1.D.9.14. Road Vehicle Sheet

This sheet corresponds to the Airviro road vehicles sub table in EDB. Firstly the name, Index, Activity Code, Ls heavy, Ls traffic, Weight, Emission model, Flow equiv, and Info, are defined.

For each substance that the vehicle emits and for each combination of variables in the emission model, we can specify emission factors for four different kind of traffic: Free Flowing, Heavy Traffic, Congested and Stop and go.

In the example below we have defined, in Road Vehicle Def., three variables. The variables appear as columns: Road Type, Speed and Gradient, For each combination of values for the variables emission factors are defined.

|    | A               | B     | C             | D        | E          | F      | G              | H           | I    | J         | K                                | L     | M        | N            | O             | P         | Q           |
|----|-----------------|-------|---------------|----------|------------|--------|----------------|-------------|------|-----------|----------------------------------|-------|----------|--------------|---------------|-----------|-------------|
| 1  | Name            | Index | Activity code | Is heavy | Is traffic | Weight | Emission model | Flow equiv. | Info | Substance | Road type                        | Speed | Gradient | Free flowing | Heavy traffic | Congested | Stop and go |
| 2  | car_cold_petrol | 5     |               | 0        | 0          | 0      |                | 0.000000    |      | NOx       | Urban-Motorway-Nat               | 90    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 3  |                 |       |               |          |            |        |                |             |      | NOx       | Urban-Motorway-Nat               | 110   | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 4  |                 |       |               |          |            |        |                |             |      | NOx       | Urban-Motorway-Nat               | 120   | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 5  |                 |       |               |          |            |        |                |             |      | NOx       | Urban-Motorway-City              | 60    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 6  |                 |       |               |          |            |        |                |             |      | NOx       | Urban-Motorway-City              | 70    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 7  |                 |       |               |          |            |        |                |             |      | NOx       | Urban-Motorway-City              | 90    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 8  |                 |       |               |          |            |        |                |             |      | NOx       | Urban-Motorway-City              | 110   | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 9  |                 |       |               |          |            |        |                |             |      | NOx       | Urban-TrunkRoad/Primary-Nat.     | 70    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 10 |                 |       |               |          |            |        |                |             |      | NOx       | Urban-TrunkRoad/Primary-Nat.     | 90    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 11 |                 |       |               |          |            |        |                |             |      | NOx       | Urban-TrunkRoad/Primary-Nat.     | 110   | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 12 |                 |       |               |          |            |        |                |             |      | NOx       | Urban-TrunkRoad/Primary-City     | 50    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 13 |                 |       |               |          |            |        |                |             |      | NOx       | Urban-TrunkRoad/Primary-City     | 70    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 14 |                 |       |               |          |            |        |                |             |      | NOx       | Urban-TrunkRoad/Primary-City     | 90    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 15 |                 |       |               |          |            |        |                |             |      | NOx       | Urban-Distributor/Secondary      | 50    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 16 |                 |       |               |          |            |        |                |             |      | NOx       | Urban-Distributor/Secondary      | 70    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 17 |                 |       |               |          |            |        |                |             |      | NOx       | Urban-Local/Collector            | 50    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 18 |                 |       |               |          |            |        |                |             |      | NOx       | Urban-Local/Collector            | 60    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 19 |                 |       |               |          |            |        |                |             |      | NOx       | Urban-Access-residential         | 50    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 20 |                 |       |               |          |            |        |                |             |      | NOx       | Urban-Access-residential         | 50    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 21 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-Motorway-Nat               | 90    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 22 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-Motorway-Nat               | 110   | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 23 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-Motorway-Nat               | 120   | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 24 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-Semi-Motorway              | 90    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 25 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-Semi-Motorway              | 110   | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 26 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-TrunkRoad/Primary-Nat      | 60    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 27 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-TrunkRoad/Primary-Nat      | 70    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 28 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-TrunkRoad/Primary-Nat      | 90    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 29 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-TrunkRoad/Primary-Nat      | 110   | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 30 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-Distributor/Secondary      | 50    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 31 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-Distributor/Secondary      | 70    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 32 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-Distributor/Secondary      | 90    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 33 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-Local/Collector            | 50    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 34 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-Local/Collector            | 70    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 35 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-Local/Collector(sinusuous) | 50    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 36 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-Local/Collector(sinusuous) | 70    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 37 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-Access-residential         | 30    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |
| 38 |                 |       |               |          |            |        |                |             |      | NOx       | Rural-Access-residential         | 50    | 0        | 553.543      | 553.543       | 553.543   | 553.543     |

Figure D21 Road Vehicle Sheet.

### 1.D.9.15. Roadtypes Sheet

This sheet corresponds to the Airviro roadtype table in EDB. Names and indices must be unique. Each roadtype may contain up to ten vehicle variations. Each vehicle variation spans over four rows. In the first line of each vehicle variation, the **Vehicle**, **Min vel** and **Max vel** must be specified. The **Vehicle** column contains reference to the Vehicle sub table. The **Min vel** and **Max vel** columns contain references to the **Speed** sub table. After the **Name**, **Index**, **Vehicle**, **Min vel** and **Max vel** columns, the following columns follow:

- **H.1** to **H.24** stating the hourly variations. The four rows correspond to type days Mon-Thu, Fri, Sat and Sun.
- **Jan** to **Dec** stating the monthly variations. Only first row of each vehicle variation.
- **Scenario1** to **Scenario10** stating the scenario variations. Only first row of each vehicle variation.

|    | A                  | B     | C             | D        | E        | F   | G   | H   | I   | J   | K   |
|----|--------------------|-------|---------------|----------|----------|-----|-----|-----|-----|-----|-----|
| 1  | Name               | Index | Vehicle       | Min vel. | Max vel. | H.1 | H.2 | H.3 | H.4 | H.5 | H.6 |
| 2  | A 70 07 reg hv SSS | 1     | pb A 70/ 3VTI | 20       | 120      | 166 | 104 | 73  | 73  | 93  | 35  |
| 3  |                    |       |               |          |          | 230 | 161 | 115 | 104 | 115 | 35  |
| 4  |                    |       |               |          |          | 328 | 248 | 200 | 168 | 112 | 12  |
| 5  |                    |       |               |          |          | 459 | 378 | 306 | 243 | 153 | 11  |
| 6  |                    |       | pb B 70/ 3VTI | 20       | 120      | 166 | 104 | 73  | 73  | 93  | 35  |
| 7  |                    |       |               |          |          | 230 | 161 | 115 | 104 | 115 | 35  |
| 8  |                    |       |               |          |          | 328 | 248 | 200 | 168 | 112 | 12  |
| 9  |                    |       |               |          |          | 459 | 378 | 306 | 243 | 153 | 11  |
| 10 |                    |       | pb C 70/ 3VTI | 20       | 120      | 166 | 104 | 73  | 73  | 93  | 35  |
| 11 |                    |       |               |          |          | 230 | 161 | 115 | 104 | 115 | 35  |
| 12 |                    |       |               |          |          | 328 | 248 | 200 | 168 | 112 | 12  |
| 13 |                    |       |               |          |          | 459 | 378 | 306 | 243 | 153 | 11  |
| 14 |                    |       | lb A 70/ 3VTI | 20       | 120      | 166 | 104 | 73  | 73  | 93  | 35  |
| 15 |                    |       |               |          |          | 230 | 161 | 115 | 104 | 115 | 35  |
| 16 |                    |       |               |          |          | 328 | 248 | 200 | 168 | 112 | 12  |
| 17 |                    |       |               |          |          | 459 | 378 | 306 | 243 | 153 | 11  |
| 18 |                    |       | lb B 70/ 3VTI | 20       | 120      | 166 | 104 | 73  | 73  | 93  | 35  |
| 19 |                    |       |               |          |          | 230 | 161 | 115 | 104 | 115 | 35  |
| 20 |                    |       |               |          |          | 328 | 248 | 200 | 168 | 112 | 12  |
| 21 |                    |       |               |          |          | 459 | 378 | 306 | 243 | 153 | 11  |
| 22 | A 70 10 reg hv SSS | 3     | pb A 70/ 3VTI | 20       | 120      | 166 | 104 | 73  | 73  | 93  | 35  |
| 23 |                    |       |               |          |          | 230 | 161 | 115 | 104 | 115 | 35  |
| 24 |                    |       |               |          |          | 328 | 248 | 200 | 168 | 112 | 12  |

Figure D22. Sheet Road types.

### 1.D.9.16. Road Sheet

This sheet corresponds to the Airviro road database in EDB. One road source per row. Below is a description of the columns:

- **Name** Name of the point or area source.
- **Info** String.
- **Info2** String.
- **Vehicles** Number.
- Macro
- **Corr** Number.
- **Lanes** Number.
- **Speed** Reference to **Speed** sub table.
- **Roadtype** Reference to **Roadtype** sub table.
- Emifac: The values that specify which emission factor to use for road vehicles. There is one number per dimension specified in the road vehicle definition.
- **Cong. Limit, Cong. speed and Cong, veh**: References to congestion data ( limit, speed and vehicles ).
- **S1 to S5** References to **Searchkey** sub tables.
- **Geographical code**
- Width
- Dist Houses
- Slope

- Build heights
- Noise

Then follow coordinate pairs: **X0, Y0, X1, Y1, ... X100, Y100**

|    | A                   | B    | C     | D        | E     | F    | G     | H                  | I        | J      | K           | L           | M          | N            | O            | P          | Q            | R            | S          | T  | U  | V  | W  | X  | Y                 |      |
|----|---------------------|------|-------|----------|-------|------|-------|--------------------|----------|--------|-------------|-------------|------------|--------------|--------------|------------|--------------|--------------|------------|----|----|----|----|----|-------------------|------|
| 1  | Name                | Info | Info2 | Vehicles | Macro | Corr | Lanes | Speed              | Roadtype | Emifac | Cong. limit | Cong. speed | Cong. veh. | Cong. limit2 | Cong. speed2 | Cong. veh2 | Cong. limit3 | Cong. speed3 | Cong. veh3 | S1 | S2 | S3 | S4 | S5 | Geographical code | Wild |
| 2  | Hjunksvägen         |      |       | 8000     | 1     | 2    | 70    | Highway 10%        |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 3  | Torslandavägen      |      |       | 17000    | 1     | 2    | 70    | Through 70 10% 1s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 4  | Kongahallavägen     |      |       | 11000    | 1     | 2    | 60    | Highway 10%        |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 5  | Kongahallavägen     |      |       | 10000    | 1     | 2    | 60    | Highway 10%        |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 6  | Torslandavägen      |      |       | 21400    | 1     | 4    | 60    | Through 70 10% 1s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 7  | City_road           |      |       | 5005     | 1     | 2    | 60    | City centre 5% 10s |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 50                |      |
| 8  | Oljevägen           |      |       | 2800     | 1     | 2    | 60    | Through 50 15% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 9  | Raffinaderigatan    |      |       | 1800     | 1     | 2    | 60    | Through 50 10% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 10 | Nordatlanten        |      |       | 2500     | 1     | 2    | 60    | Through 70 10% 1s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 11 | Arendalsvägen       |      |       | 5700     | 1     | 2    | 60    | Through 50 15% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 12 | Torgny Segerstedts  |      |       | 6700     | 1     | 2    | 60    | Through 50 10% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 13 | Kongahallavägen     |      |       | 5000     | 1     | 2    | 60    | Highway 10%        |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 14 | Sörredsvägen        |      |       | 9500     | 1     | 2    | 60    | Through 50 10% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 15 | Björlandavägen      |      |       | 11000    | 1     | 2    | 70    | Through 50 10% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 16 | Assar Gabrielsonsv  |      |       | 17200    | 1     | 4    | 50    | Through 50 10% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 17 | Önnereds Bryggväg   |      |       | 2000     | 1     | 2    | 40    | Through 50 10% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 18 | Edsån Norr          |      |       | 25000    | 1     | 2    | 100   | Highway 15%        |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 19 | Skagerack           |      |       | 6000     | 1     | 2    | 50    | Through 70 10% 1s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 20 | Långedragvägen      |      |       | 1000     | 1     | 2    | 40    | Resident 50 1% 5s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 21 | Nordatlanten        |      |       | 7800     | 1     | 2    | 60    | Through 70 10% 1s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 22 | Stora Fiskebäcksväg |      |       | 5000     | 1     | 2    | 70    | Through 50 10% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 23 | Skattegårdsvägen    |      |       | 6500     | 1     | 2    | 70    | Through 50 10% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 24 | Tankigatan          |      |       | 1700     | 1     | 2    | 60    | Through 70 10% 1s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 25 | Hisingaleden        |      |       | 17400    | 1     | 2    | 60    | Highway 10%        |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 26 | Hästeviksgatan      |      |       | 1300     | 1     | 2    | 50    | Resident 50 1% 5s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 27 | Ångkärrsvägen       |      |       | 3000     | 1     | 2    | 60    | Through 50 10% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 28 | Hisingaleden        |      |       | 7700     | 1     | 2    | 90    | Highway 10%        |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 29 | Ångkärrsvägen       |      |       | 7000     | 1     | 2    | 60    | Through 50 10% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 30 | Torgny Segerstedts  |      |       | 13000    | 1     | 2    | 60    | Through 50 10% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 31 | Traneredsvägen      |      |       | 4500     | 1     | 2    | 50    | Through 50 10% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 32 | Oljevägen           |      |       | 11200    | 1     | 2    | 60    | Through 50 15% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 33 | Åkeredsvägen        |      |       | 3500     | 1     | 2    | 60    | Through 50 10% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 34 | Önneredsvägen       |      |       | 3400     | 1     | 2    | 60    | Through 50 10% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 35 | Västermotet         |      |       | 10000    | 1     | 2    | 50    | Through 70 10% 1s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 36 | Långedragvägen      |      |       | 5000     | 1     | 2    | 40    | Resident 50 1% 5s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 37 | Fågelvägen          |      |       | 3900     | 1     | 2    | 60    | Through 50 10% 3s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 38 | Norrliden           |      |       | 6400     | 1     | 2    | 80    | Highway 10%        |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |
| 39 | Västerleden         |      |       | 33000    | 1     | 4    | 70    | Through 70 10% 1s  |          | 0      | 20          | 0           | 0          | 20           | 0            | 0          | 20           | 0            | 0          |    |    |    |    |    | 0                 |      |

Figure D23. Road Sheet.

|                  |    |   |   |                  |         |                |          |           |         |         |         |         |
|------------------|----|---|---|------------------|---------|----------------|----------|-----------|---------|---------|---------|---------|
| Högsboleden      | 0  | 0 | 0 | 000000000000     | 1111    | 1269280        | 6400254  | 1269406   | 6400490 | 1269414 | 6400695 | 1269244 |
| Röda Stensmotet  | 0  | 0 | 0 | 000000000000     | 1111    | 1267586        | 6402544  | 1267445   | 6402343 | 1267288 | 6402256 | 1267402 |
| City_OSPM        | 50 | 0 | 0 | 0201000001000060 |         | 1267367        | 6398992  | 1268942   | 6401739 |         |         |         |
|                  |    |   |   |                  | TRAFFIC | car CNG/petrol | STANDARD | 10.000000 |         |         |         |         |
| Karl Johansgatan | 0  | 0 | 0 | 000000000000     | 1111    | 1268058        | 6402930  | 1267576   | 6402453 | 1267401 | 6401993 |         |
| Fridhemsgatan    | 0  | 0 | 0 | 000000000000     | 1111    | 1267425        | 6401928  | 1268059   | 6402044 |         |         |         |
| Långströmsgatan  | 0  | 0 | 0 | 000000000000     | 1111    | 1268052        | 6407528  | 1267884   | 6407469 | 1267710 | 6407359 | 1267593 |
| Oscarsleden      | 0  | 0 | 0 | 000000000000     | 1111    | 1269230        | 6403846  | 1269017   | 6403776 | 1268445 | 6403493 | 1268048 |
| Soterusgatan     | 0  | 0 | 0 | 000000000000     | 1111    | 1267614        | 6404914  | 1267689   | 6405309 | 1267760 | 6405547 | 1267874 |
| Björlandavägen   | 0  | 0 | 0 | 000000000000     | 1111    | 1267673        | 6408531  | 1268133   | 6408149 | 1268332 | 6407754 | 1268653 |

Figure D24. Road using Road Vehicles.

When a road is using Road Vehicles for the emissions, the road vehicles are referenced on a new row under the main one. A label TRAFFIC is shown under the “Noise” column, and then follows the Road Vehicle name (i.e. car CNG/petrol), then the Time Variation Road (i.e. Standard) and then the percentage of the vehicle of the total traffic, then the next road vehicle name and so on. There is no limitation of the number of road vehicles that a road can refer. The Emifac column must specify the values of the variables used for the Road vehicles.

### 1.D.9.18. Grid Sheet

Since there can be any number of grids in an Airviro EDB, each grid corresponds to a sheet in **Wedbed**. This sheet is named **Grid.gridname**. In a grid, there can exist both static and dynamic information. Below the title row, a row follows that states if the information in that column is static or dynamic. Static is indicated by a value (or empty) and dynamic is indicated by the string DYNAMIC. The following rows correspond to one grid cell each. Below is a description of the columns:

- **X** First row contains X coordinate for left side of whole grid. The following lines contain the left side coordinate for that grid cell. This information must be specified.
- **Y** First row contains Y coordinate for lower side of whole grid. The following lines contain the lower side coordinate for that grid cell. This information must be specified.
- **NX** Number of grid cells on the X-axis. Only on first row.
- **NY** Number of grid cells on the Y-axis. Only on first row.
- **DX** Width of each grid cell. Only on first row.
- **DY** Height of each grid cell. Only on first row.
- **Name** String.
- **Info** String.
- **Info2** String.
- **Address** String.
- Post Address String.
- **Info. supp.** String.
- **Created** Date.

- **Changed Date.**
- **Misc String.**
- **Time var** References to **Time variarion** sub table.
- **S1 to S5** References to **Searchkey** sub tables.
- **Activity Code**
- **Geographical Code**

If an emission factor is not used, then the name of the substances follow in the header row. Any number of substances are allowed.

- **Sub grp.** Reference to **Emission factor** sub table.
- **Sub grp emission.** Here the activity for the emission factor is specified. It must be specified for each cell of the grid is referring emission factors.

|    | A       | B       | C  | D  | E    | F    | G    | H       | I     | J       | K           | L           | M       | N       | O    | P        | Q  | R  | S  | T  | U  | V             | W                 | X       | Y        |
|----|---------|---------|----|----|------|------|------|---------|-------|---------|-------------|-------------|---------|---------|------|----------|----|----|----|----|----|---------------|-------------------|---------|----------|
| 1  | X       | Y       | Nx | Ny | Dx   | Dy   | Name | Info    | Info2 | Address | Postaddress | Info. Supp. | Created | Changed | Misc | Timevar  | S1 | S2 | S3 | S4 | S5 | Activity code | Geographical code | Sub grp | NOx      |
| 2  | 1230000 | 6245000 | 30 | 66 | 5000 | 5000 | Test | DYNAMIC |       |         |             | Energidata  |         |         |      | STANDARD |    |    |    |    |    |               |                   |         |          |
| 3  | 1335000 | 6245000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 1.06211  |
| 4  | 1340000 | 6245000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 3.53231  |
| 5  | 1325000 | 6250000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 3.50698  |
| 6  | 1330000 | 6250000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 8.70191  |
| 7  | 1335000 | 6250000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 14.6385  |
| 8  | 1340000 | 6250000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 16.7574  |
| 9  | 1345000 | 6250000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 0.984515 |
| 10 | 1320000 | 6255000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 8.4358   |
| 11 | 1325000 | 6255000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 37.1107  |
| 12 | 1330000 | 6255000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 52.8527  |
| 13 | 1335000 | 6255000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 17.2177  |
| 14 | 1340000 | 6255000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 21.3651  |
| 15 | 1345000 | 6255000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 7.75927  |
| 16 | 1350000 | 6255000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 6.13652  |
| 17 | 1320000 | 6260000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 11.6059  |
| 18 | 1325000 | 6260000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 59.8357  |
| 19 | 1330000 | 6260000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 102.241  |
| 20 | 1335000 | 6260000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 47.5739  |
| 21 | 1340000 | 6260000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 28.0727  |
| 22 | 1345000 | 6260000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 8.70895  |
| 23 | 1350000 | 6260000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 1.22119  |
| 24 | 1325000 | 6265000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 70.774   |
| 25 | 1330000 | 6265000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 44.9148  |
| 26 | 1335000 | 6265000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 27.582   |
| 27 | 1340000 | 6265000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 3.95639  |
| 28 | 1345000 | 6265000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 39.9731  |
| 29 | 1350000 | 6265000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 21.145   |
| 30 | 1325000 | 6270000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 22.2027  |
| 31 | 1330000 | 6270000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 61.8916  |
| 32 | 1335000 | 6270000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 33.6586  |
| 33 | 1340000 | 6270000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 0.850215 |
| 34 | 1345000 | 6270000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 3.72117  |
| 35 | 1350000 | 6270000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 1.47912  |
| 36 | 1320000 | 6275000 |    |    |      |      |      | X1380/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 5.52396  |
| 37 | 1325000 | 6275000 |    |    |      |      |      | X1380/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 72.6968  |
| 38 | 1330000 | 6275000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 39.19    |
| 39 | 1335000 | 6275000 |    |    |      |      |      | X1381/N |       |         |             |             |         |         |      |          |    |    |    |    |    |               |                   |         | 17.7931  |

Figure D25. Sheet Grid.