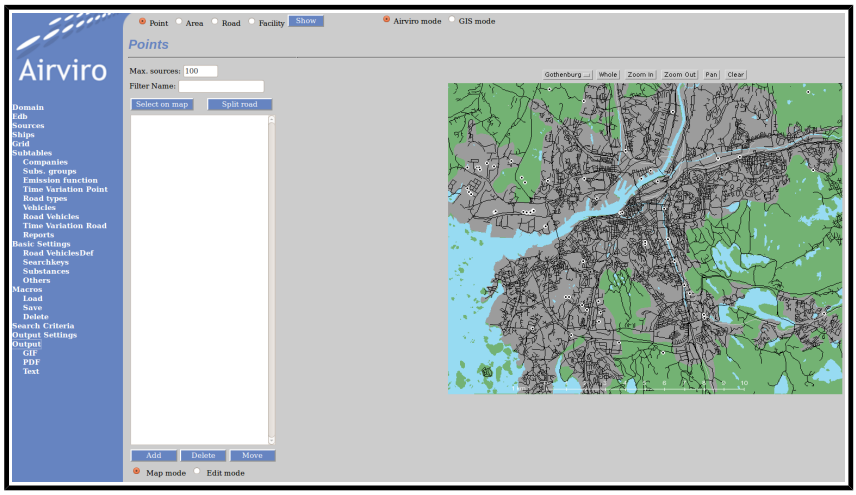
Volume 1

Airviro User´s Reference



Working with the Emission DataBase (EDB)

How to construct a dynamic emission database and simulate emission scenarios

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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
3.13	Jan 2009	Upgrade to Airviro version 3.13	GS
3.20	April 2010	Upgrade to Airviro version 3.20	GS
3.21	Dec 2010	Upgrade to Airviro version 3.21	GS
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

Contents

1.1 Introduction: What it is All About

A Database, Which Also Includes a Sophisticated Simulation Tool

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. A diagram explaining the structure of the EDB can be found in *Appendix 1C: Structure of an EDB*.

How does EDB client work?

Airviro has is a web based user interface. Airviro can be used from a PC or any other device running Internet Explorer 6 or later and Firefox.

After logging in on Airviro the EDB module can be selected. All data processing is made on the Airviro server and the results are transferred to the web browser.

Please note that JAVA JRE (run time plug-in) must be installed and enabled in the web browser.

The EDB includes tools for management and administration of the emission sources.

A Structured Way of Storing Emission Data

The tables provided enable you to describe:

- Emission from
    - Point sources - all the emission is 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 - emission is evenly distributed over a rectangular area and is assumed to leak out.
  - 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 - the emission is assumed to be evenly distributed over a line. This is normally used as an approximation for road traffic.
  - Grid layers - background emission levels can be defined in the form of grids.
  - Information from ships are gathered using IAS radio messages from the ships. This includes coordinates, velocity and a unique ship identifier. With this information the emission can be calculated from each ship individually.
- 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

Once you have started filling in your EDB with data, you will appreciate the ability to search for emission. The search facility allows you to specify exactly what sources you are interested in finding out the emission from, especially if you have created your EDB in a structured way. You can search using combinations of the following restrictions:

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

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

Using the search keys you will be able to find out emission figures such as:

- The total emission of SO_2 from heating plants at 6 o'clock in the morning
- The contribution to the total NO_x emission of heavy vehicles in the city centre at rush hour
- The 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 software will be presented. If you follow the recommendations you can easily 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?
- What reduction of emission could be expected if low sulphur oil was introduced?

Integration with Dispersion Models

Within the Airviro environment, the dynamic EDB is directly linked to the 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.

In the *Airviro User's Reference, Volume 2: Working with the Dispersion Module*, you will find examples on how to utilise the EDB for dispersion simulations.

The Report Generator

The report generator or Output can be used to extract information from the EDB for presentation on the screen, storage in a file or as a printout. You can obtain selected static data such as source locations and emission factors, as well as time dependent information concerning emission loads for a given period and area. Also, you can obtain a standardized output for road noise emission levels (colour-coded range).

This output can be configured for source, grid, noise and report (only ASCII Text). You can produce reports in different formats (GIF, PDF and ASCII Text) for being used with other applications.

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

Normally when you work with the EDB we recommend that you initially collect information directly from industry, local authorities, etc. and store the information in the EDB. If you work 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 for historical periods and compare the results with measured ambient data. By simulating different wind directions and weather conditions you 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 that you use the Receptor Model to estimate emissions (Dispersion Module)

When 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 the application by entering a username and password (*Figure 1.2.1*), the user is presented with a list of all available Domains (if none has being previously selected and stored), By selecting a Domain the top menu list will be refreshed to show all available Airviro Modules. See *Figure 1.2.2*

- Time variation of emissions depending day type, month and scenario.

Figure 1.2.1 Logging Airviro

Figure 1.2.2 Select Domains

In this section you will learn how to set up the EDB module so that it is ready to use. 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 Substance Groups
- Working with the map

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

1.2.2 Selecting the EDB to Work with

After EDB is selected among the available modules on the top list, the EDB module will be opened and a new list of options or submenus will appear on the left side of the window.

When working with **Edb,** you will be able to make new emission databases or to edit existing ones. If you decide to make a new one, then it may be convenient to copy and rename an existing database and then making the necessary changes.

Start your session by selecting an **Edb, c**licking the option **User&Edb** in order to open this menu (*Figure 1.2.2.1)***.** There are two list boxes labelled **User** and **Edb**. If you click on **global** in the list box to the left and then press the **Apply** button, it means that you have chosen to work with the global EDB.

The following optional functions can be used:

Check edb: Checks the consistency of the EDB and displays the errors found.

Repair edb: Repair a corrupted EDB.

Assign Geo codes: Geographical codes can be assigned to all sources if a shape file exist with the codes and geographical areas.

Import GEO codes: Import a shape file containing geographical codes.

The **Description** text box can be used to describe the contents of the database. You can add a description to the Edb 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 formulae, emission factors and emission figures 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 examine the contents of the global EDB or make a copy, rename it and then edit and change its content.

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. It should be the task of the system administrator 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

Normally, you are not allowed to edit the global EDB, so we suggest that you make your own copy. Click on **Edb** again under **Copy** and click in the left box on your user identity. Your user identity is the same name as you typed when you logged in to the computer. Your personal Edb will be shown in the list box on the right hand side.

You create your own copy of the global EDB by clicking on the push-button Copy to the right. A subwindow named **New Edb** appears. *See Figure 1.2.2.2*. Type a suitable name in this subwindow**.** Confirm by clicking **OK**.

You now have a new copy of the global EDB. The new name appears in the right list box.

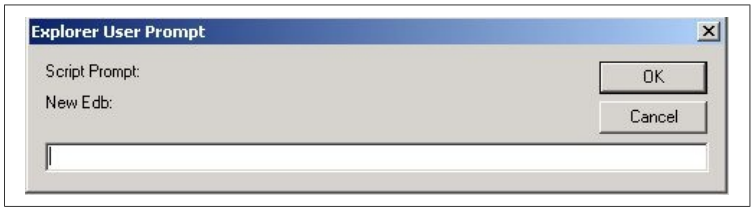


Figure 1.2.2.2 Add new Edb and Copy

Creating a Copy of Someone Else's Personal EDB

The **Edb** subwindow:

- Select the Edb you want to copy by clicking on it, and then clicking on **Copy**

- The **New EDB** subwindow will appear. Enter a name for your copy in the text field. *See Figure 1.2.2.2.*
- Click on **OK**.

Check that you have received a copy under your own user identity, with the name that you typed.

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 a Edb

You can easily delete any one of your own personal Edb

Within the **User & Edb** subwindow:

- Click on the personal Edb that you want to delete and then click on **Delete**
- The **Question** sub-window will appear. Confirm or cancel your order.

Note: It is usually only possible to delete your own personal Edb. If you choose a personal EDB owned by any other user, or the global EDB, then the **Delete** button will be disabled. The ability to be able to delete other Edb´s can however be configured in the privilege level file which should be maintained by the system administrator.

Creating a New Empty EDB

Within the **User & EDB** subwindow:

- Click on **Add new empty**

- The **New EDB** subwindow will appear. Type the desired name for your copy beside **Name.** See *Figure 1.2.2.2.*
- Click on **OK**.

You have now created an empty Edb.

Exercise 1.2.2.2

Create an empty personal EDB with the name: **My_first_EDB**.

Check and repair EDB

Click on **Check edb** if you want the system to check the consistency of a personal EDB.
Click on **Repair edb** if you want the system to repair a personal EDB.

1.2.3 Altering Basic Settings Texts

Select your personal Edb: **My_first_EDB**, which should be empty. This EDB has been created with default texts but it is possible to alter some of them. You should only alter texts in an empty EDB, that is before you start entering data, because these texts will apply to every single source in the EDB.

For looking at the currently defined texts, select **Basic Setting** under the **Subtables** menu. Here you will see a list of texts that can be defined by the user: **Scenario** texts, **Speed** texts, **Temperature** texts, Searchkeys, activity codes, geographical codes and Units.. Choose one of them, for example **Scenario....** A subwindow appears showing the default scenario definitions - 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.

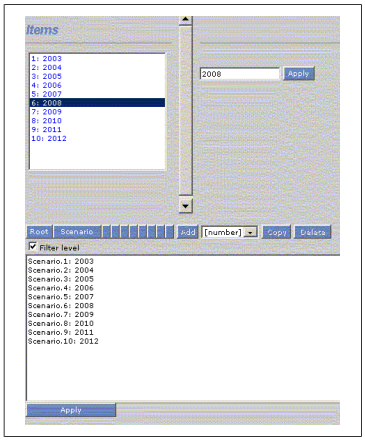


Figure 1.2.3.1.Basic Setting

You can alter 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 EDB. This contains the default list of substances, which is also used for all local Edb. To examine the substance list:

- Click on **Basic Settings**
- Select **Substances**

A list of substances will be presented as in the figure, and are also included in the appendix. If the scroll bar to the right is used you will find out that there are 1023 positions for different substances. These can be grouped in categories depending on the type of chemical substance. We recommend that you do not change the positions of existing substances, but you may introduce any new substances at free positions in the substance list.

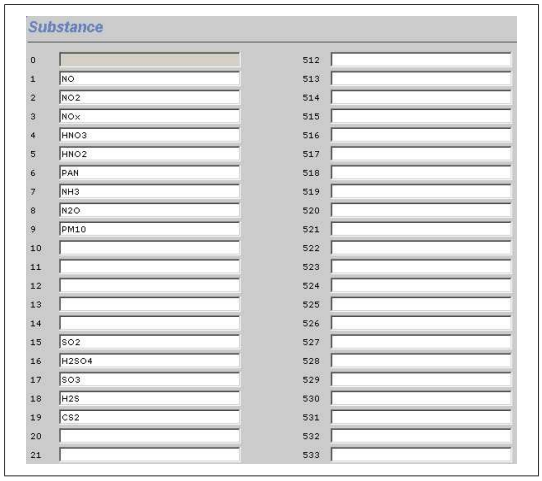


Figure 1.2.4.1 Substances

Note: There is only one substance list shared by the global EDB and all local Edb´s. The list can only be changed in the global EDB, so you must have edit privileges for the global EDB if you want to make changes to the substance list.

WARNING: The Edb does not recognise the substance name that you write in the substance list. It looks for the position, which means that there are 1023 substances with internal names: 1 to 1023. Later, when you define a source of emission you have to define what substances are emitted from that source by pointing in the substance list at the position where you have written the desired substance name. If you then change substance names between positions in the substance list, you have to redirect the pointer from all sources 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 Substance Groups in the EDB

In several applications it would be convenient to define *substance groups* as a specific mixture of substances defined in the substance list. If you define a substance group called **standard petrol**, and define the percentage of different hydrocarbons, lead, etc. this would simplify and structure your work later on when you are to define all sources emitting gases from **standard petrol** or if the composition of **standard petrol** needs to be changed.

To define a substance group:

Select the **Subs. Group** submenu in the **Subtables** menu to the left

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

- The **Emission Factor** subwindow appears, then press the **Add button.**
- From the substance list, choose the individual substances by clicking on them. (Keep Shift or Ctrl key pressed to select more than one item). Then confirm your choice by clicking on the arrow button.
- The emission for a substance is calculated using a linear equation (Emission = k * activity + m). The values for k and m, must be specified for each substance. The activity is specified when a point or area source id defined.
- Confirm your choice by clicking **Apply**. The choice is saved when the legend “setting saved” appears.

The example above shows an emission factor that has been created to describe hydrocarbon emission from vehicles and 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 one of the individual hydrocarbons.

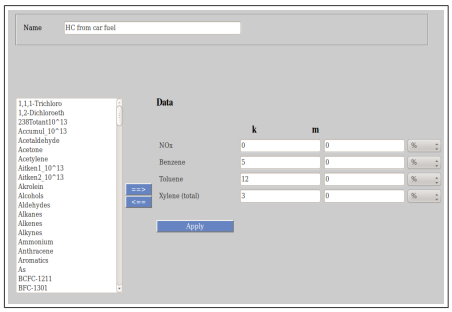


Figure 1.2.5.1 The emission factor subwindow.

Exercise 1.2.5.2

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

1.2.6 Choosing a Geographical Area

Selecting a Map

Some systems have several maps within Airviro. You can choose between maps in the Source subwindow by using the option button the *Figure 1.2.6.1.* Some systems have several maps within Airviro. You can choose between maps. For example in this figure is select Gothenburg.

Figure 1.2.6.1. Map

Selecting a Geographical Subarea Within a Map

When you have selected a map, it is possible to zoom in the map:

Click on the **Zoom In** button in the map area. (*Figure 1.2.6.1*.) . A white hair cross will appear when you move the mouse pointer onto the map.

Move the hair cross to a geographical point that you want to define as a corner in the zoomed 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 marked area.

The chosen sub area will be redrawn on the screen.

Note: As the map is vector based, you can zoom again in the zoomed area. However the resolution in the zoomed area will usually not be better than in the original map. There are two exceptions: the road network and the visual effects of having more picture elements on the screen per square metre of the geographical area. There is also a limit of how small an area can be zoomed into.

To Restore the Maximum Area Map

If you have zoomed in your map and would like to display the original (maximum) size of the map, then click on the push button **Whole** in the map dialogue area (button up the map)

To restore the last Zoom Area Map

If you have zoomed in your map and would like to display the last size of the map, then click on the push button **Zoom Out** in the map dialogue area.

Pan

I you have zoomed in your map and would like to display the other area map with the same scale, then click on the push button **Pan** in the map dialogue area.

To Clear a Map

If you have displayed emission information on top of the map you can always clear the map area (displaying only the map) by clicking on the push button **Clear** in the map dialogue area.

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

In this section you will learn the basic ideas behind entering point sources in the Edb. The emission from a point source can be defined in one of three 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 time variation.
- Static information needed for dispersion modelling.
- Using the search conditions to calculate emission figures from your source.
- 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 given:

- **Name information** gives the name of the source plus two information strings. These strings can be used as search conditions when searching in the EDB.
- **Dynamic information** is the information that directly controls the emission, such as formulae that describe the emission as a function of outdoor temperature or as a function of day type and hour.
- **Static information** such as chimney height, exhaust gas temperature, house width/height, etc. These figures 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.
- **Emission** from the source either directly in terms of the substances emitted, or linked to a substance group 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 it is possible to select a macro. A macro must be previously defined in *Indico Presentation*. The unit of the resulting time series from the macro must be g/s.

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

- **Search keys** it is possible to define five groups of search keys in order to structure the pollution sources into groups that can be used to separate the total emissions. The first two groups have space for 128 search keys each and the other three groups have space for 32 search keys.

1.3.3 Time variation for a point source

Before giving any general or static information it is important to create a time variation that describes how the emission varies with time. In most cases, we know that emissions variation within a large city have the same order of magnitude as long-term average emission. If you start with an empty Edb there is one default time variation in the system, the so-called **STANDARD** time variation that 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 the **Time Variation Point** under **Subtables** in the EDB menu, and then the Time variation Point sub window will appear.

- 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 variations by clicking on **Day type**, or **Scenario & Month.**

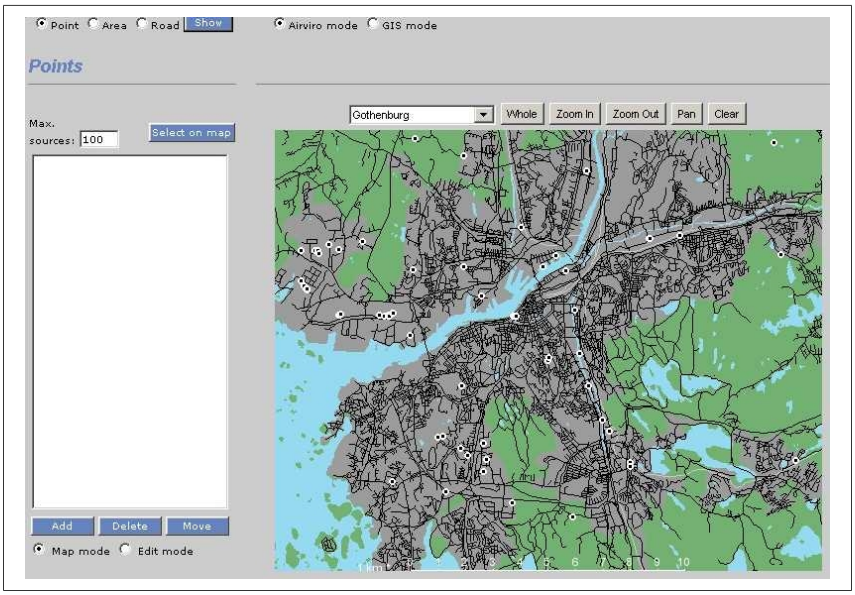


Figure 1.3.3.1. The Point subwindow

The **Scenario & Month** sub window will appear showing 10 text fields marked with yearly figures. In these text fields you can describe the absolute variation of emission in percentage over the years.

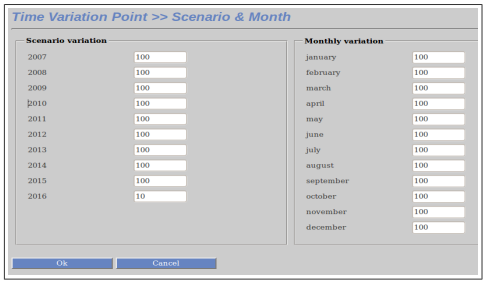


Figure 1.3.3.2. Scenario and Month

Normally 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.

Confirm the table (**OK**) and leave the sub window.

- Define the monthly variation by clicking on **Scenario & Month**

The **Scenario & Month** subwindow will appear containing 10 Scenario variations, and 12 Monthly variation text fields labelled for each month of the year. In these text fields you can describe the relative variation of emission during the year. The figures entered here will be normalized 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 put June and July = 0 then no pollutants will be 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 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 1.3.3.1

Create a Time Variation named **industry_2shift** where there is 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...The Day type subwindow will appear and 4 columns with 24 text fields marked with the day types: Monday-Thursday, Friday, Saturday and Sunday are displayed. There are 24 text fields in each column defining the hours during the days. In these text fields you can describe the relative variation of emissions during the week. The figures you enter will be normalised at the same moment EDB uses them to estimate the emissions. This is explained mathematically in **Appendix 1B**, and you can see the effects and understand the principles later on when you perform simulations.

Example3: If you write 100 for all hours during Monday-Thursday and Friday but 0 over the weekend then no pollutants will be emitted during Saturday and Sunday but 7/5 of the weekly average emissions will be emitted during workdays. When you are ready, click on **OK** and leave the subwindow.

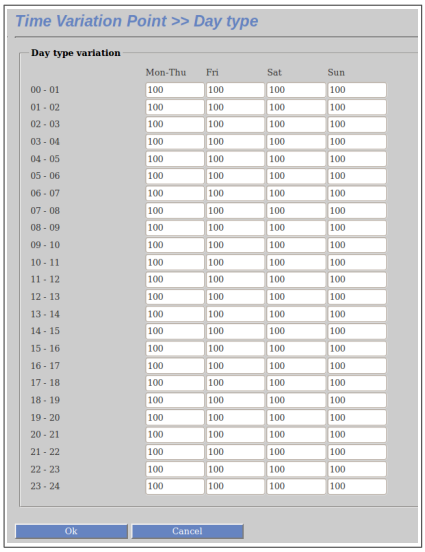


Figure 1.3.3.3. Day type variation

1.3.4 Static Emission Information

There are important emission characteristics that do not affect the emission strength, but must be known in order to utilise the emission information in a dispersion model so that the effect of emissions in the ambient air can be determined.

The static information is defined as:

- **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 compute 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 figures to compute the so-called *effective stack height.*

It is also important to know the **Exhaust gas temperature** when we want 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.

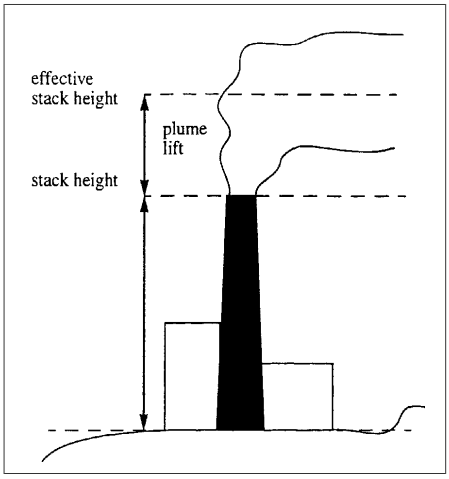


Figure 1.3.4.1. Effective stack height

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.

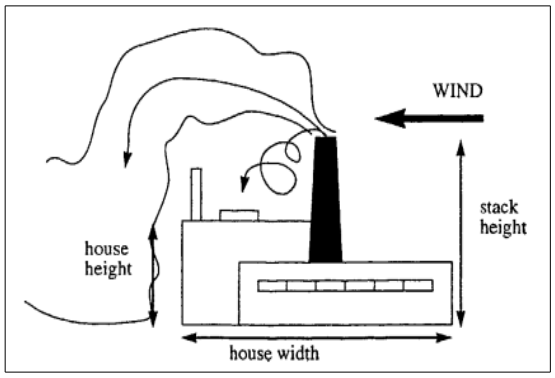


Figure 1.3.4.2. Buildings

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

Note: The static information is not necessary in order to simulate emissions in the EDB but it is vital if you want to simulate the air quality effects using the dispersion models in the Dispersion module. Therefore we recommend that you always document the static information as soon as you add 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 NO_x.

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

Company name: Cement and Son Ltd.
Total yearly emission of 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[1] 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 Specify your First Point Source in the EDB

Click on **Source** in the EDB main window and then click **Select on the map**. A hair cross will appear when you move the mouse pointer over the map area and the computer waits for you to select an area. Press the right mouse button to enter the **Point** subwindow without having to select a sub area.

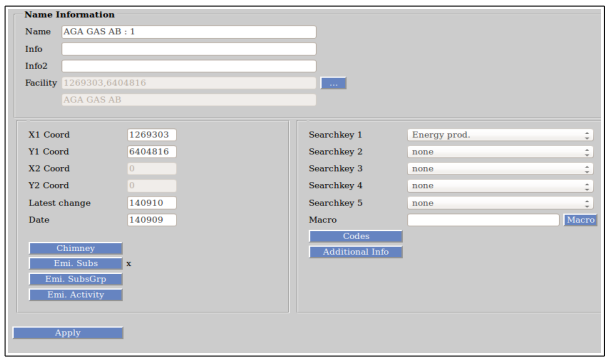


Figure 1.3.5.1. Point source

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 source. To select an area, hold down the left mouse button and drag it over the area you want to choose, then release it.

The **Points** subwindow appears, and in the list box to the left all existing sources in the selected area are shown. In this case, working with the personal EDB: **My_first_EDB**, there should not be any existing sources.

Click on **Add** and the hair cross appears in the map area. Select the desired location of the source by positioning the hair cross and clicking on the left mouse button. The **Point** subwindow appears again and then click on **Edit mode** for you can start to fill in information.

- Start to fill in the name of the company in the upper text field **Name**
- Continue to 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*).
- If you want to change the location of the source you can manually enter the **X Coord and Y Coord**
- Fill in the emission figure by clicking on **Emi.Subs.** The substance emission sub window appears. Select NO_x from the list box and fill in the total yearly emission (tons/year) in the relevant text field. Select the proper **Time Var** (time variation) by clicking on **industry_2shift.** Select the available **Additional information**, **Code** or **Time series** . Confirm by clicking on **OK**.
- Select the available **Codes** and **Additional info.**

  Codes are used to categorize 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 impossible to store in the other fields of the point source. If the text in an **Additional information** is in tag = value format, these can be used as search criteria. Example:

NO_CARS=12
FUEL_CONSUMPTION=1000

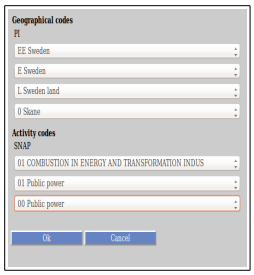


Figure 1.3.5.2. Codes

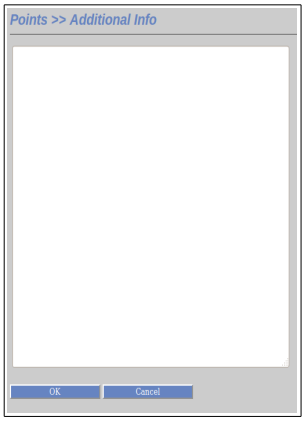


Figure 1.3.5.3. Additional info

Fill in the **Aermod** menu, with the emission characteristics. They 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 meters.

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

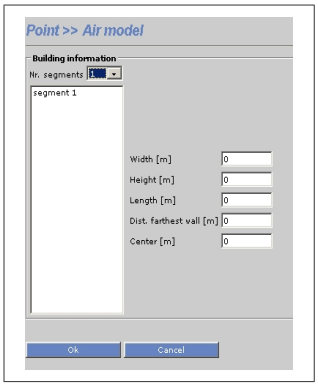


Figure 1.3.5.4. Air Model

- Finally, save the information by clicking on **Apply**.

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. The search is carried out over the map area that you see on the screen, so that if you have zoomed into a sub area then only that sub area will be searched.

Click on **Search Criteria** in the EDB main window. The **Search criteria** subwindow will appear on the screen. See *Figure 1.3.6.1.*

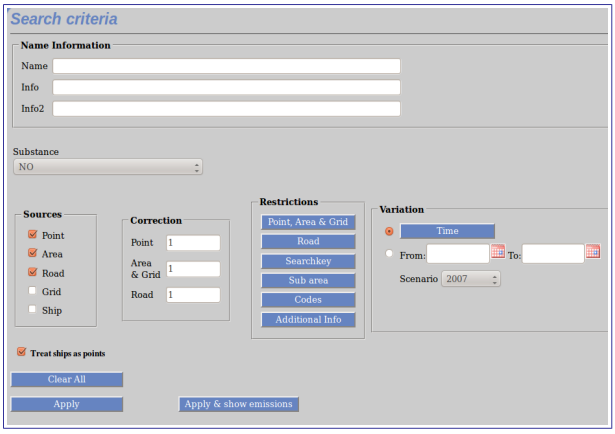


Figure 1.3.6.1. Search criteria

The **Search Criteria** subwindow **Name Information:** The three text fields **Name, Info** and **Info2** gives you the possibility to write the characters you want to match when searching for sources in the Edb. If you write **Cement and Son Ltd**. in the **Name** text field then the sources with exactly that name will be found, and no other sources. There is the possibility to use so-called ”wild cards” in connection with the strings. For example: If you write **Cem*** then all sources with a name starting with **Cem** will be selected. For further information see *1.3.8 Using Search Keys and Pattern Matching Facilities as Search Conditions.*

- **Substance**: You must select a substance from the substance list.

- **Sources**: You can select any combination of point, area and road sources. For example,

if you enable the **Point** and **Area** toggle buttons then only point and area sources will be included in the search.

- **Correction:** this consists of three choices: **Correction** gives you the possibility to multiply the emission from point, area and road sources with an arbitrary factor.

- **Variation**: **Scenario** allows you to change to a different time (hours, day types and months) and scenario (years).

- **From/To:** is used when calculating the emission from 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.

- **Restrictions** consist of four subwindows.

    - **Point, Area & Grid** restrictions give you the possibility to select point/area/grid sources that are defined with a specific **emission factor, Emission function** and/or **Time Variation**. A maximum of 10 selections can be made in each list.

    - Restrictions can be define according to the number of vehicles per day (minimum and maximum) and road length (minimum and maximum).

    - **Codes and Additional info** restrictions, gives you the possibility to filter sources according to the codes that were previously defined or to filter sources depending on the additional info.

    - **Apply**, save all settings.

Output Setting emission rates are usually expressed as grams per second (g/s) or the other units. There are four different output functions:

1. **Sources** output means that all sources that fulfil the search criteria will be displayed on the map (on the screen), both location and emission strength. You can use the option *Show emission sources with nr of decimals*. A maximum of 8 decimals can be select in each list.

2. **Grid** output means that 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** is the EDB Report Generator, only in 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** output means that all road noise emission levels will be displayed with different colours on the map. This is standardized with colour-coded range.

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

- **Road** restrictions give you the possibility to select 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 in each list.

- **Search key** restrictions give you the possibility to estimate 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.

- **Sub area** restrictions allow you to define a geographical area in which to perform the search for emission sources.

Search strings:	Name: Cem*				
Substance:	NOx				
Sources:	Point				
Restrictions:	-				
Variation: Corr. Factors	Point: 1	Area: 1	Road: 1		

Click on **Output** (GIF or PDF).The position of the source Cement and Son Ltd. will be displayed and the emission estimation is 19 g/s. That is exactly what will be emitted as an average during the period you have selected. If you instead ask for the figure expressed as tons/year, you will be given the answer 600 tons, i.e. the yearly emission figure that you gave when the source was defined.. Click on **Output** (GIF or PDF) 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 would represent what the total emission would be during a year if the factory were running all hours and days during the year with that emission rate.

Exercise 1.3.6.1

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

Simulate the yearly mean emission at 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.

Exercise 1.3.6.2

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 made using **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:

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 = Production * Emission Factor => 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 >= 15) ? 20 : ((x1 < 15 & x1 >= 10) ? 40 : ((x1 < 10 & x1 >= 5) ? 60 : ((x1 < 5 & x1 >= 0) ? 80 : ((x1 < 0 & x1 >= -5) ? 100 : ((x1 < -5) ? 120) : 120)))))

3- Save the 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 with use Search Criteria and Output in the menu. 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. These can for example be 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 **Emi. Activity** 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 normalized. All figures are percentages.

After this we can define the emission functions. The emission functions are defined for one substance only. So we will have to add two: One for NOX and one for SO2. Clicking on **Emission function** (Sub tables) displays a window where new emission functions can be added. The needed information is: the name of the function, the function (equation), the name of the variables used in the function and the type of time variation.

In our example:

The emission function for SO2 has three variables (Effect, Energy value, and the emission factor for the fuel for SO2 [%]). The emission function for NOx has two variables (Effect [MJ/kg] and emission factor for NOX in [g/MJ].

1. For NO_x (the emission factor is specified in g/MJ) the emission function is

Total Emission [ton/year] = f_a [g/MJ] x Effect [MJ/s] x (1000 x 1000 / (3600 x 24 x 365)

where f_a is the emission factor for NOx. The factor (1000*1000/(3600*24*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.

2. For SO_2 (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 SO2. The factor (1000*1000/(3600*24*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 EneryValue constant.

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

- Click on **Source**. The **Point** subwindow will appear. Click on **Add** and select a position on the map. Then, type in the **Name** (name_VC_OIL)of the source and complete the **Additional info…**

  - 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

- Click on **Emi. Activ.** and then input the following values for the variables used in the emission functions, (*Figure 1.3.7.1 Emission Activity).*

  Fuel NOX, Fuel S02 (two different):

  Maximum effect: 20 MW

  Energy value: Oil (42.7 MJ/kg)

Emission factor SO2: 0.40 %

Emission factor NOx: 0.1 [g/MJ]

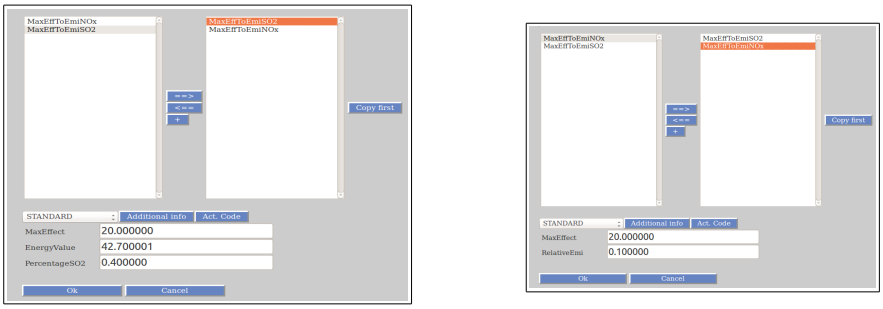


Figure 1.3.7.1 Emission Activity

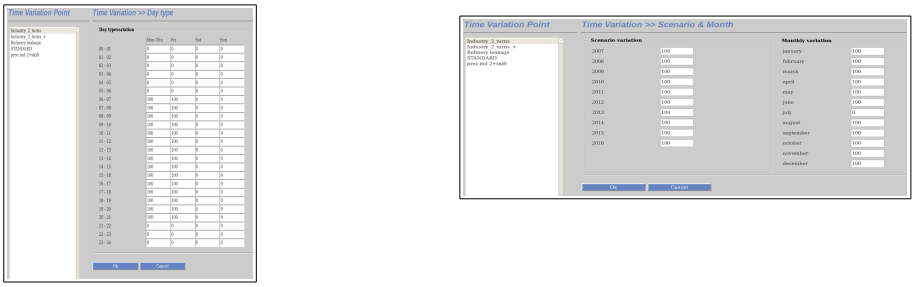


Figure 1.3.7.2 Time variation

Note: Use the Search Criteria Subwindow to verify the emission. Observe that the time variation is NOT normalized.

1.3.8 Using Search Keys and Pattern Matching Facilities as Search Conditions

The Search Keys

All emission sources in the EDB can be classified using five groups of search keys. In the first two groups there are 128 individual search keys and in the last three there are 32 in each group. 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. Utilize the first group of search keys by defining all districts by name in the first search key list. In the second search key list you may group different activities that contribute to pollution, such as **Petrochemical industry, Automotive industry, Traffic, Lawn mowers**, etc. In the third search key list you can categorize your emitters into classes such as: **Private industry, State owned industry, Public sector, Private consumption**, etc. In the forth you may categorise the area in which the emitter is located, such as: **rural, sub-urban, residential, inner city**, etc.

Later on when you want to estimate the total emission from lawn mowers in a certain district in the residential areas you can have your answers very quickly. If, before filling the emission database with figures and time variations, you analyse your future needs concerning emission estimation, you will find that the search keys can play an important role, giving you a convenient emission database handler.

You will benefit from constructing and utilising good search key lists. They provide a very efficient way of searching in the database for certain groups of pollution sources. You can search using unlimited combinations of search keys from the different searchkey lists.

The Search Strings

The **Search strings** (**Name, Info1** and **Info2**) that can be given for all sources can be extremely valuable as a complement to search keys. The first string (**Name**) consists of 47 characters. It is the intention that you should include the name of the source in this string (such as **Oxford street** or **Shell**, etc.). In addition you are free to fill the whole string with characters and numbers that can be valuable to classify the source in a convenient way. As an example you can provide a national identification code, property code, etc. If you provide unique characters as separator between the information, it will be easy (as demonstrated in next paragraph) to use matching facilities when searching for emissions in subsets of the database.

The two extra strings Info and Info2 consists of 47 characters and can be used in the same way as **Name t**o input information related to the emission source.

Matching Search Keys

When simulating emissions using the **Search Criteria** subwindow you can restrict your search in the database by clicking on **Searchkeys**. In this subwindow you can select more than one search key for each one of the five groups.

If you have chosen more than one search key in a group, all sources belonging to any key in the selected subset will be extracted from the database (*or-criteria*). If you have chosen combinations in two search key groups, then sources belonging to any key in the selected subset in the first group and any key in the selected subset in the second group will be extracted from 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 be extracted from the database:

Sources with 5 search key definitions such as:

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

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

c) District3, Traffic, -, -, Yellow

The following sources will **not** be extracted from the database:

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

e) -, -, -, -, Brown

f) District3, -, -, -, -

The **-** indicates that no search key definition has been made.

Matching Search Strings

In the **Search Criteria** subwindow, you are free to select a specific source by defining the **Search** strings so they match a specific source. But if you want to match all the sources that have some characters or numbers in common in the search string definition you can apply the following pattern matching possibilities:

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

Examining the matching capabilities, you will realise that a carefully prepared strategy concerning search string definitions will allow the user to have unlimited possibilities of selection criteria.

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

1.3.9 Saving your search criteria and output settings

When you have defined all search criteria, you may save the query as an EDB macro. The EDB macro saves all settings in the user interface, so they can be used at a later stage.

When **Load Macro** menu is selected, a new window appears that allows the user to load a macro previously defined and saved in any of the groups created. Individual groups can be created for each user using the same name, or a common group for all users. **Save Macro**, allows you to save macros, and **Delete Macro**, allows you to remove existing macros.

This concept is the same for output settings. The macro saves all defined restrictions on **Search criteria** and **Output settings**.

It is recommended that you save your Macro with a meaningful file name so that you can

easily recognize the content.

1.3.10 Companies and Facilities

Various point sources can be grouped in a Facility, for example point sources belonging to the same plant. A facility can also be associated with a company defined in **Sub tables**. For each Facility several point sources can be defined. A facility is typically an industrial plant that contains several sources.

1.3.10.1 Company

A facility can be linked to a company. A company can be linked to more than one facility.

Each company contains administrative information and an ID that is unique for the company.

To create a Company:

- Click on the **Companies** under **Subtables** in the EDB menu, and then the Company subwindow will appear.
- Click on **Add**.
- The user must define a unique ID, that will be used for identifying the company. The ID is a string with up to 31 characters. i.e.: The Tax Office ID (RUT) can be used for a Company.
- Type the company name in the **Name** text field.

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

- Continue to fill in the Info, info2, Address, Post address, Informant and Miscellaneous.

- Click on **Additional Info** if you want add complementary information.

- Click on **Apply** to save the company.

1.3.10.2 Adding a facility

When adding a facility, the following information must be input:

- The name in the text field **Name**

- Continue to fill in the Additional Information **(Add Inf)**

- If you want to change the location of the source on X Coordinate, Y Coordinate.

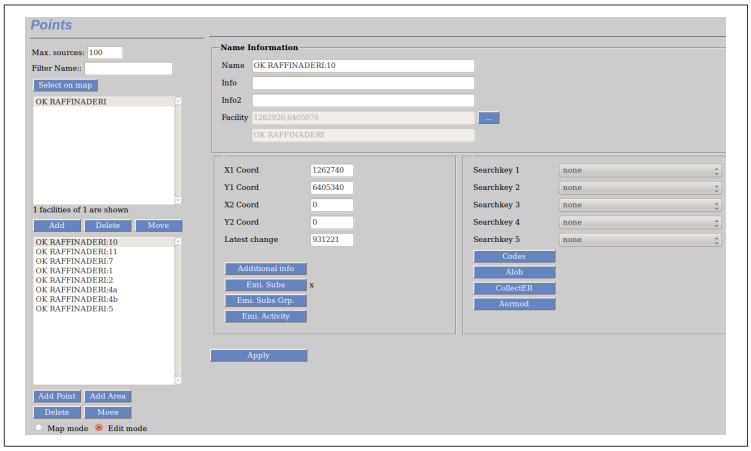


Figure 1.30.10.1 Facility

Sources can be added to a facility, either using the facility interface or using the interface for sources.

By using the Facility Interface, Point Sources can be linked to a Facility (Company) by pressing the … button in the Point Source window besides the facility label. (*Figure 1.30.10.2*)

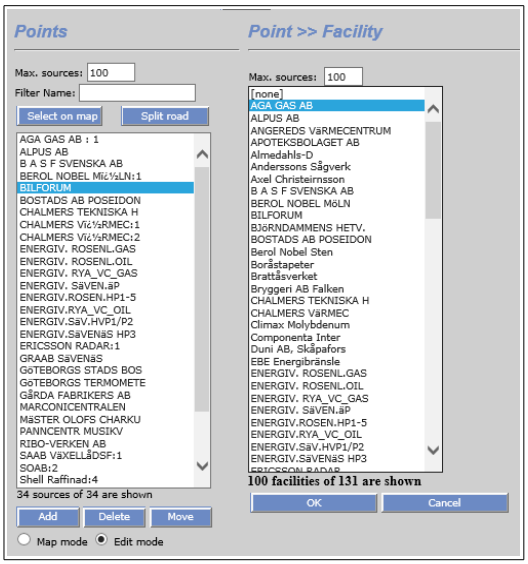


Figure 1.30.10.2 Linking a Facility to a Point Source

Also the sources interface can be used as shown in *Figure 1.30.10.3*, to link a Point/Area source to facility

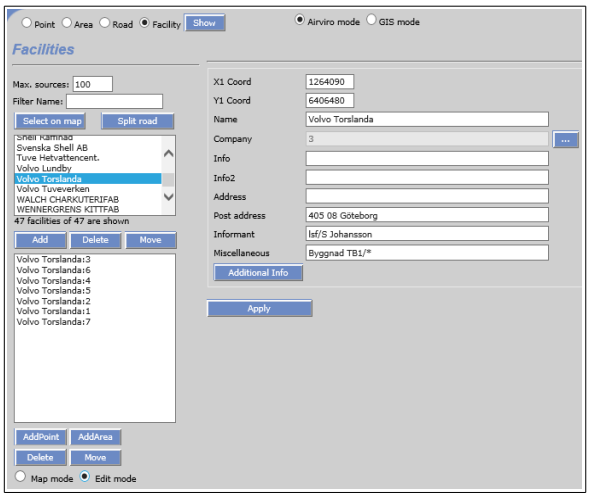


Figure 1.30.10.3 Facilities.

1.4 Ships

Shipping emits considerable amounts of different air pollutants and are included as a source type with user interface for editing. Example ships: boats, ferries, merchant ships and other ships (cargo ships, sightseeing boats, ships belonging to the marine and

customs, ice-breakers etc.).

With Airviro EDB module to describe ships as mobile point sources. Normally Airviro is connected to an AIS receiver. AIS is a radio protocol that is standard for all ship above 50 tons. AIS messages are sent from the boat every 30 seconds. The message contains the coordinate of the ship as well as a unique identifier for the ship. All ship coordinates for the ship is stored in the Time Series Database with a time resolution of 5 minutes.

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

To create a ship:

- Click on the **Ships** in the EDB menu, and then the Ships subwindow will appear. *Figure 1.4.1*
- Click on **Add** and select the position on the map.
- Type in a timeout the Time to call (in seconds). For example, 30.
- Type in a name in the **Name** text field.
- Input the number IMO and transport number MMSI .
- Select the ship type in the list (searchkeys). For example, fishing, sailing, medical transport and passenger ship.

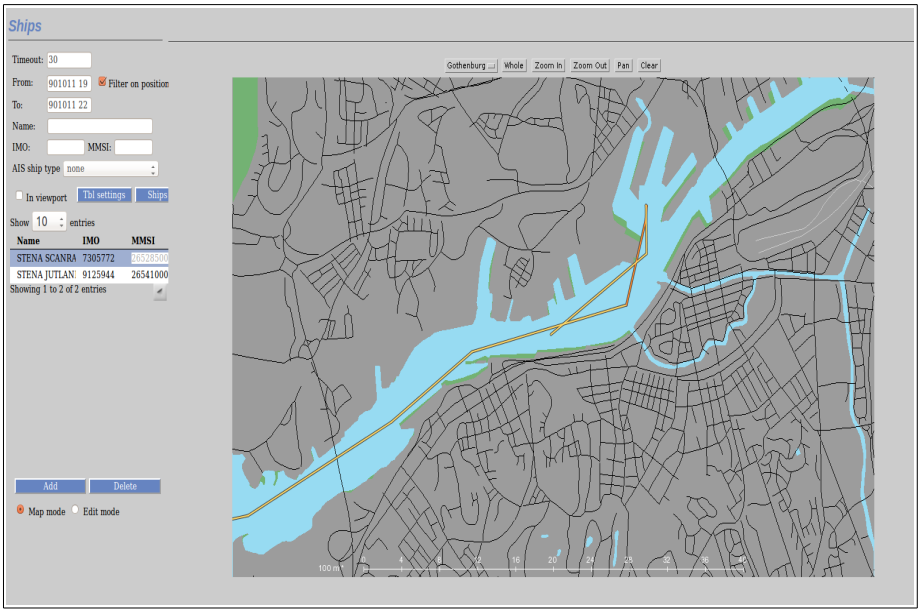


Figure 1.4.1 Ships.

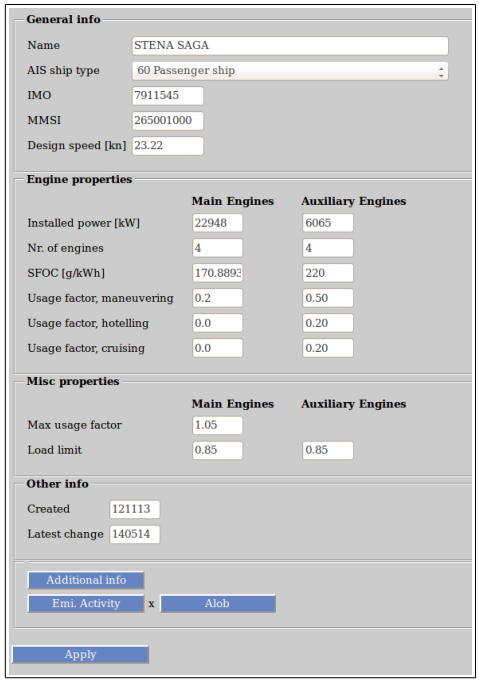


Figure 1.4.2 Edit mode . Ships.

Click on **Edit mode** and sub windows will appear. *Figure 1.4.2.*

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 1.4.3.*

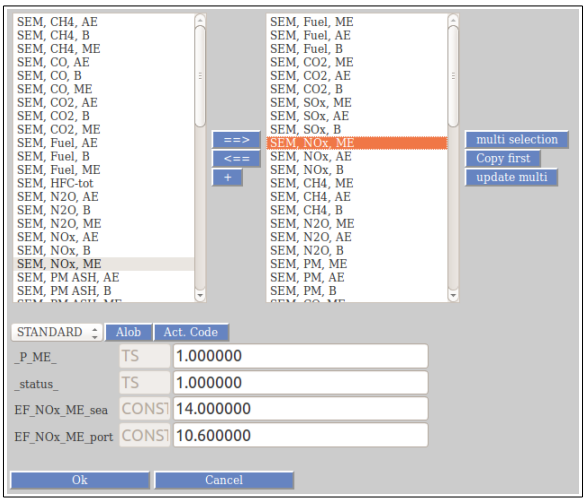


Figure 1.4.3. Emission Activity

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 exactly the locations of emission, so we treat the whole area as a source and assume that the emission is evenly distributed.

The static information that is used for point sources is not included in the 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 simulation time so that it can happen that an area source simulation runs quicker than a point source simulation, if there are many small point sources. In a simulation, the area source emission will take place 2 m above the ground and there is no emission velocity.

1.4.2 General Principles

In the EDB you can define an area source as a rectangle. To include an area source in the EDB is very similar to the inclusion of a point source, but instead of clicking on a point you must define an area by dragging the mouse on the map.

Emissions can be defined using an Indico macro. The macro must be previously defined using Indico Presentation.

The general principles are the same as for point sources. You can save the search and output settings. You can use **Time variations, Substance groups**, 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 area sources spread over a large area. These sources are grouped into a grid layer. A typical example is household heating: is it often possible to estimate the amount of fuel that is consumed in each area of a city. From this information is it 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 is stored for each grid cell. The emission from each grid cell is always stored.

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:

- Increased computation speed.
- Disc space requirements will decrease, often quite dramatically.
- The import format for grid sources is simpler than the format for area sources.

1.5.2 General Principles

A grid layer can only be created with the grid ASCII interface, a shape file or **Wedbed**. The geographical information about the grid, the data that is specific for each grid cell and the common information is used as input at creation time.

The menus for the grid layers are exactly the same as for area sources but only the common

information of the grid layer can be modified. Another difference is that the emission from a grid layer must be specified as substances or Emission Factor. The grid can use only the option **Codes**.

Click on **Grid** in the menu bar, and when pressing the **Grid Source** option, the following window appear, and allow input the grid source (*Figure 1.5.2.1. Grid Sources).* When pressing the **Grid Import** option, the following window appear, and allow import the grid source (*Figure 1.5.2.2. Grid Import).*

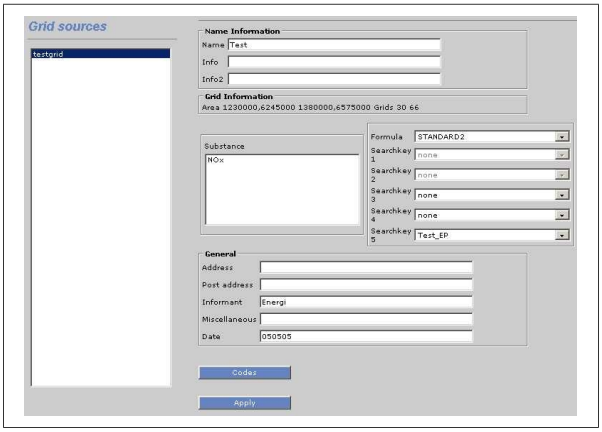


Figure 1.5.2.1. Grid Sources

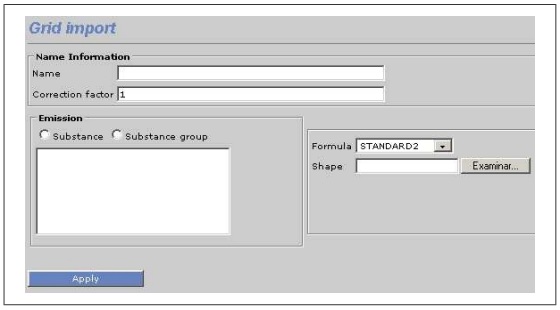


Figure 1.5.2.2 Grid Import

1.6 Traffic Emissions in the EDB

1.6.1 What is a Road source?

A road source is a mathematical idealisation that does not exist in reality. When we talk about road sources we generally mean emission from road traffic. Every car moving on the road is more or less a point source, although we can never locate or follow any individual car. For the EDB user it is quite convenient to define the road traffic (or may be shipping route traffic, etc.) by drawing a line on the map.

In urban areas, the dominant part of the air pollution can be derived from road traffic emissions. Consequently, the quality of the work concerning traffic emission data is the most crucial part in the construction of an EDB. However, the number of roads and cars in a large city are so numerous that we need to simplify the handling of the data. Below you will find a description of the principles of the Airviro traffic emission data processing. The method described can be refined but is still very efficient in terms of manpower needed to set up a traffic emission database for a large urban region.

1.6.2 General Principles

You can, in an interactive way, define the positions of a road graphically on the map/screen. When the position of the road is fixed, you have to give information on traffic speed, traffic intensity and variation as well as information on the types and proportions of vehicles operating on that road.

There is two ways of defining the traffic on a road. With **Road Vehicles**, the proportion 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. With Road types,

the traffic variation as well as proportions of different vehicles on a road can be defined and reused for any number of roads. The 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 simplify the work by addressing the information to be found in the **Road type** sub table.

When using road types the emission factors from different vehicles are found in the **Vehicle** sub table. The emission factors in the **Vehicle** sub table are referred in the **Road type** definitions in the **Road type** sub table. To be able to simulate traffic emissions it is likely that you have to define 5-25 different emission tables in the Roads **Vehicle** sub table.

The typical amount of traffic information that you have to supply in order to describe the 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.

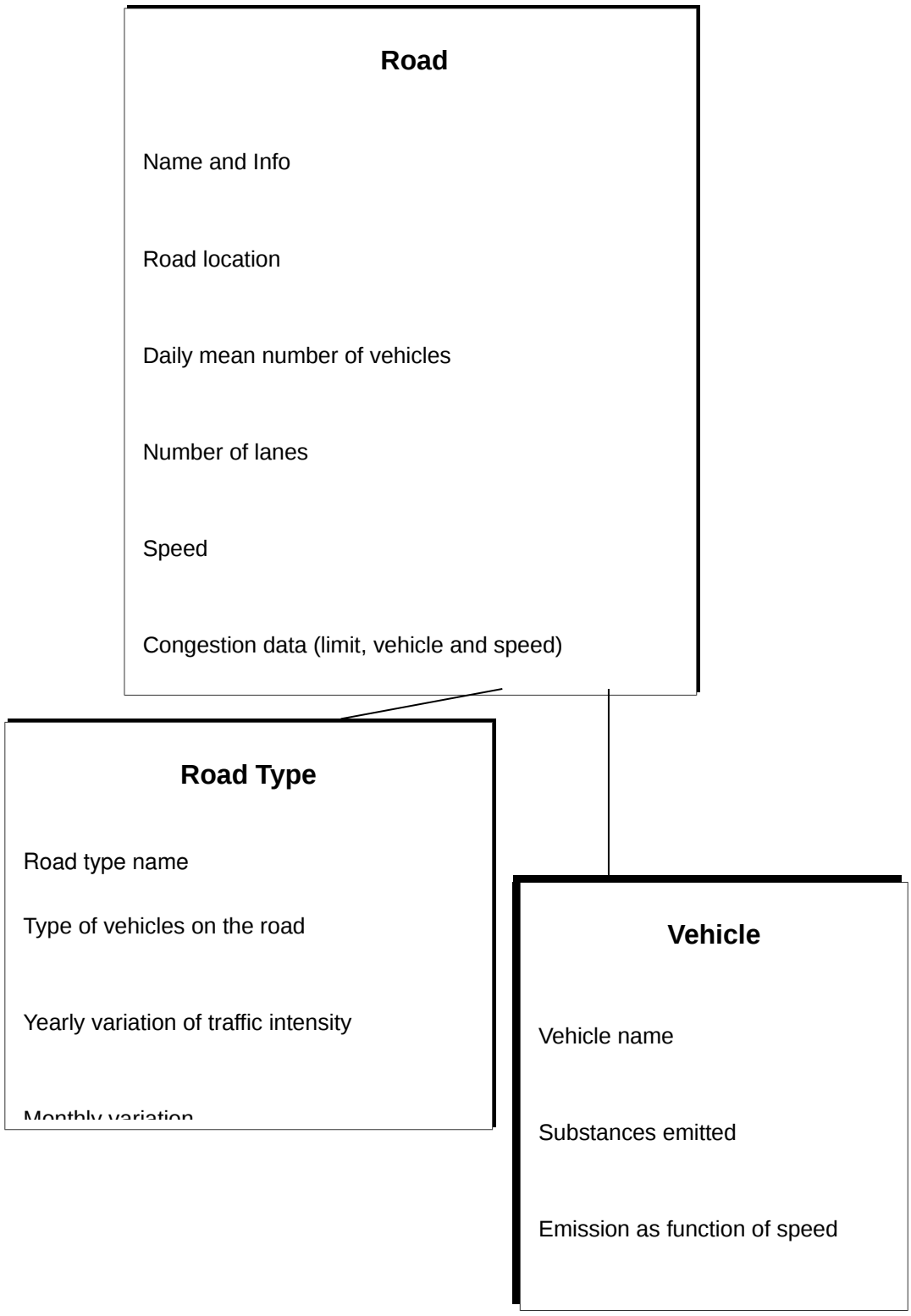


Figure 1.6.2.1 Relation between Road, Road Type and Vehicle.

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 factors such as road type, traffic situation, slope, sinuosity etc. When using Road Vehicles the factors and the possible values for the factors are specified. Then the emission factors are specified for all possible combination of the factors 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 factors. The vehicles on a road are referred directly from the road and the percentage of each vehicle on that road is specified as well as time variations. The value of the factors are specified directly on the road.

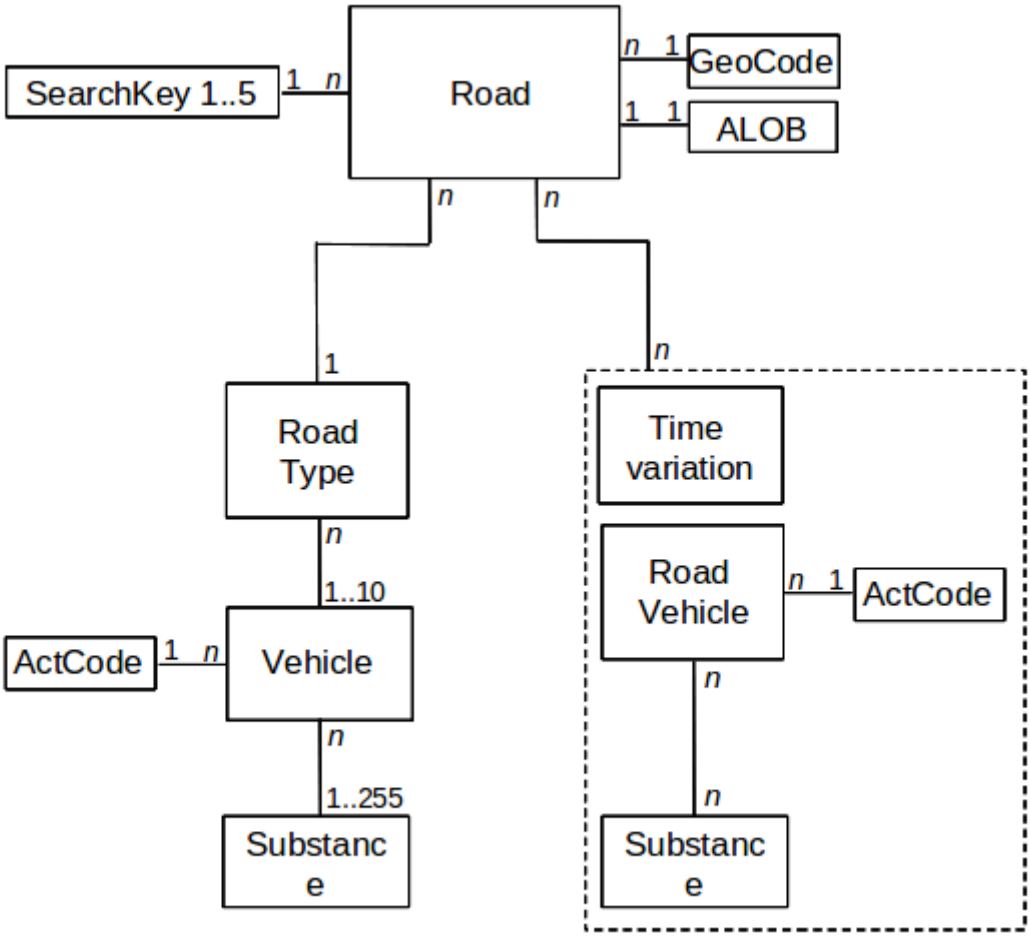


Figure 1.6.2.2 The road database structure, describing the two emission models.

1.6.3 Introducing Emission Factors for Vehicles

Emission from vehicles is mainly dependent on:

- The type of vehicle, classified depending on the engine type, fuel used, weight class, ambient temperature and pavement types.
- The driving behaviour and the general traffic environment.
- The speed the vehicle is travelling at.

In many countries, emission factors have been derived based on the factors above. You are able to include these in the EDB. Sets of emission factors are included in the **Vehicle** sub table in the Airviro Reference database. The emission factors are basically derived as functions of:

- **Substance** NO_x, CO and total HCe
- **Speed** 0-120 km/hour
- **Type of vehicle** Light vehicles and Heavy vehicles (>3.5 ton)

To include the driving pattern, separate emission factors are given in various traffic situations. Consequently, vehicles that are driving in the center of a city tend to accelerate and slow down more than vehicles on a highway. The name: **Lv cat tho 50 10s** represents the emission factors for light vehicles (**lv**) equipped with catalytic converters (**cat**), driving on a through-road (**tho**), signed maximum speed: 50 km/hour (**50**), and the vehicles have to make 10 stops or turns/km (**10s**).

The way in which it has been chosen to structure the road types and vehicle types is based on a Swedish model, the VETO model, and this model is used here as a typical example. Other models exist that are not quite the same but you should be able to adapt the EDB to these other traffic models when you define 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 emission due to low temperatures in the combustion process (cold start), etc.

If you click on **Subtables** and then on **Vehicle...** in the EDB main window the **Vehicle** subwindow will appear.

In the left list box you can see all the different emission factors that are given in the Reference database. If you would like to define a new vehicle type and the corresponding emission factors, you simply click on **Add** in the lower left corner. To edit an existing vehicle, click on the proper vehicle in the left list box. If it is a new vehicle, you have to name it by typing it in the upper right text field. You can define or add a substance by clicking in the list box named Substances.

To edit or add the emission factors as a function of the vehicle speed. You can see the substances, which are defined to be emitted from the vehicle type. The **Speed table** to the right, is disabled until you have clicked on a specific substance. As soon as you have chosen a substance the **Speed table** will be enabled and you can add or edit the emission factors as a function of the vehicle speed.

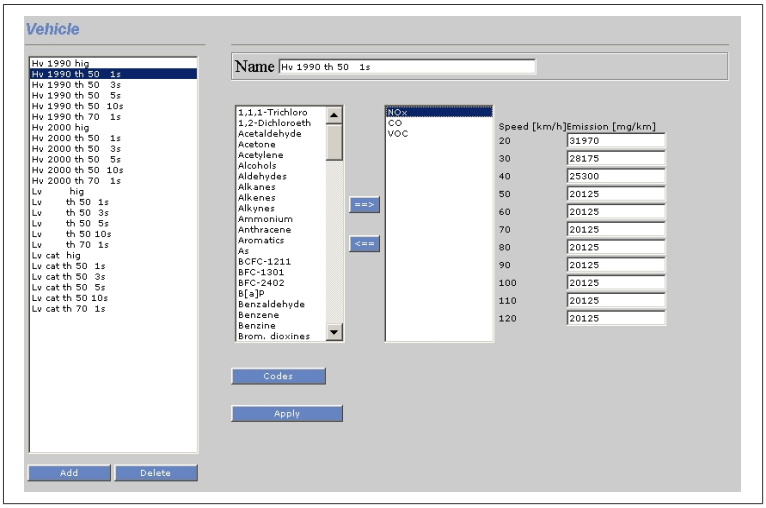


Figure 1.6.3.1 Vehicles

In the example shown the vehicle **Hv 1990 tho 50 1s** and substance nitrogen oxides

(NOx) have been chosen. A table of emissions as a function of speed will appear as illustrated in the figure. You can edit the table and save your modified emissions by clicking on **Apply**.

1.6.4 Naming Standard for Emission Factors

There are several reasons why you should name your different emission factors in a structured way. As soon as you start to work with the **Road types**, you will recognise an obvious reason to have a corresponding name convention in order to link different emission factors to the corresponding **Road types**. In the model used in the Airviro Reference database, the name of the emission factors is defined by the characteristics: vehicle type and traffic environment, i.e. the emission factors are constructed in the following way:

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

To be able to simulate the emissions at a specific hour caused by the traffic, 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 every road and street

in an urban region. In the EDB it is assumed that typical traffic behaviour can be categorised in classes. These classes are called Road types and 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

In order to define a road type, click on **Subtables** and then click on **Road type...** in the main window. The **Road type** subwindow will appear; now, in order to edit an existing road type selects one in the list box to the left. To create a new **Road type**, click on the **Add** button, at the bottom of the list and enter a name for the new road type in the **Name** text field. The next step is to define the type of vehicles that operates on this road type. Select the proper vehicles in the **Vehicles** list box on the right side. To define the rates of vehicles you have to click on **Scenario...**.

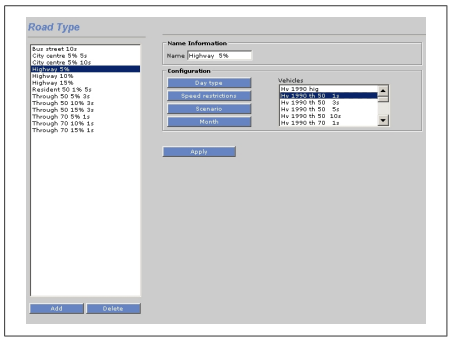


Figure 1.6.5.1 Road Type

The **Scenario** subwindow appears and you are able to fill in the percentage of the different vehicle types. You can define the expected rates 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. the figures 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 figures in the **Road type** definition can be used to forecast future changes in the traffic intensity, vehicle rates and accordingly the future emissions caused by traffic. Save your figures and leave the subwindow by clicking on **OK**.

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 yearly variation, you can define monthly variations by clicking on **Month...**. 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 normalized when used. Save your monthly figures and leave the subwindow by clicking on **OK**.

You can define hourly traffic variation by clicking on **Day type...** . The **Day type** subwindow will appear, and the principles here are similar to the **Day type** table in the **Time Variation Point** sub table.

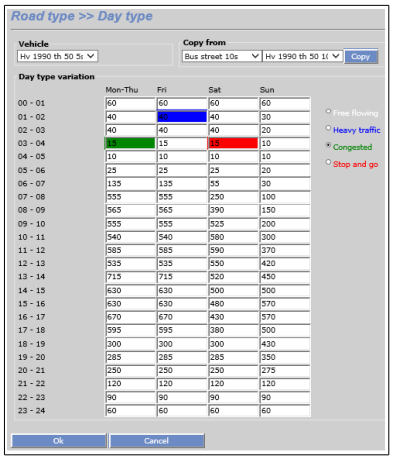


Figure 1.6.5.2 Road type Day type

By selecting on one of the vehicles (*Figure 1.6.5.2*) in the **Vehicles** combo box in the left hand corner, one can fill in the hourly traffic variations in the text area. Please note that the figures are relative, i.e. they will be normalized as described in *1.3.3 Dynamic Emission: Formula for Time Variation*.

It is also possible to define what kind of traffic an hours has. The kind of traffic is used to select alternative emission factors. When a text input is selected for a specific hour the kind of traffic is indicated by the colour of the text box. The radio buttons to the left of the matrix are used to change the kind of traffic. White indicates Free flowing, Blue Heavy traffic, Green Congested and Red Stop and Go.

Save your daily figures and leave the subwindow by clicking on **OK**

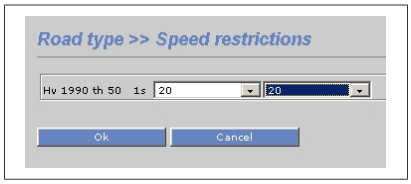


Figure 1.6.5.3 Speed restrictions

Finally, you can define speed restrictions for the different types of vehicles operating on the Road type. Click on **Speed rest...** and the **Speed restriction** subwindow will appear. Click on the desired vehicle in the left list box (**Vehicles**). Now you can prescribe a minimum and a maximum speed for that type of vehicle. This feature is very useful if you want to define speed differences between heavy and light vehicles. Save your speed restrictions and leave the subwindow by clicking on **OK**.

1.6.6 Introducing Time Variations for Roads

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

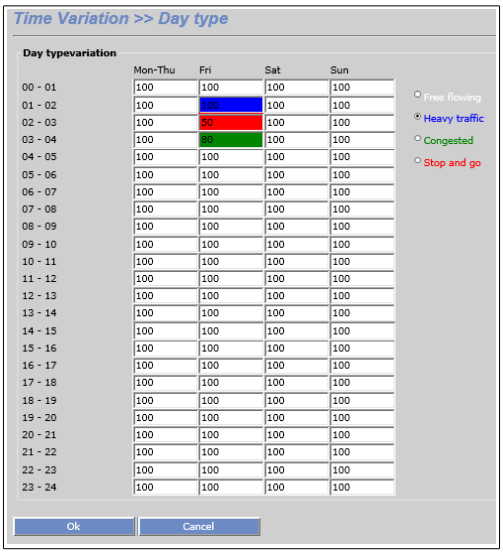


Figure 1.6.6.1 Day type for Time Variation Road

1.6.7 Introducing Emission Factors for Road Vehicles

When using ordinary vehicles the emission factor in the vehicle is only depending on the speed. In a Road Vehicle the emission factor can be depending on up to 11 different factors.

These factors are defined in Basic Settings Road Vehicle Def. For each factor the possible values for the factor is defined.

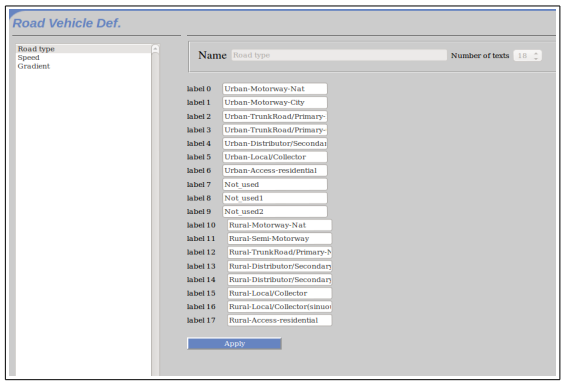


Figure 1.6.7.1 Road Vehicle Def.

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 3 dimensional cube.

In the Subtables Road Vehicles emission factors are defined for each cell in the cube, that is for different combinations of the factors.

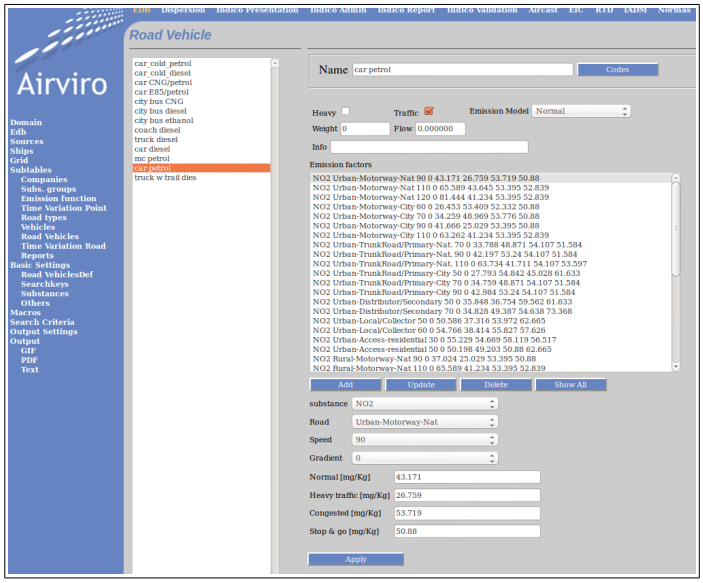


Figure 1.6.7.2 Road Vehicles

Factors are defined for 4 types of traffic. Normal, Heavy traffic, Congested and Stop and go. Which factor that is used is defined in the hourly time variation in Time Variation Road.

Activity codes are defined in the Codes sub window. It is possible to define if the vehicle is heavy or not. This is used by the OSPM model. Some vehicles does not generate traffic. Normally the extra emission from cold started vehicles is defined as an extra, fictitious vehicle. This is set using the Traffic tick box. Airviro implements a number of alternative emission models. These are not described here and the traffic model selected should be Normal. The weight of the vehicle can be specified and some alternative emission models uses the Factor to adjust the flow. For each combination of factors and substance emission factors are entered for the four types of traffic.

1.6.7 Introducing Traffic Information in the EDB

After 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. In the main window, select **Road...** . Click on **Select on map**, a hair cross will appear in the map area and the computer waits for you to select an area. To select an area, hold down the left mouse button and drag it over the area that you want to choose, then release it. The subwindow **Road** appears and in the list box to the left all existing roads within the chosen area are displayed. If you click on any of the existing roads the location of it will be displayed on the map. To introduce a new road, click on **Add** in the lower left corner. The subwindow disappears and a hair cross appears on the map. Position the hair cross on the map at the start of your new road. Click on the left mouse button. Move the hair cross to the next position of your road. A rubber band will be stretched between the last position and the hair cross. Find your new position and click on the left mouse button. Continue in this way until you have defined the whole road extension. Then click the middle mouse button (escape) or right mouse button to return to the subwindow.

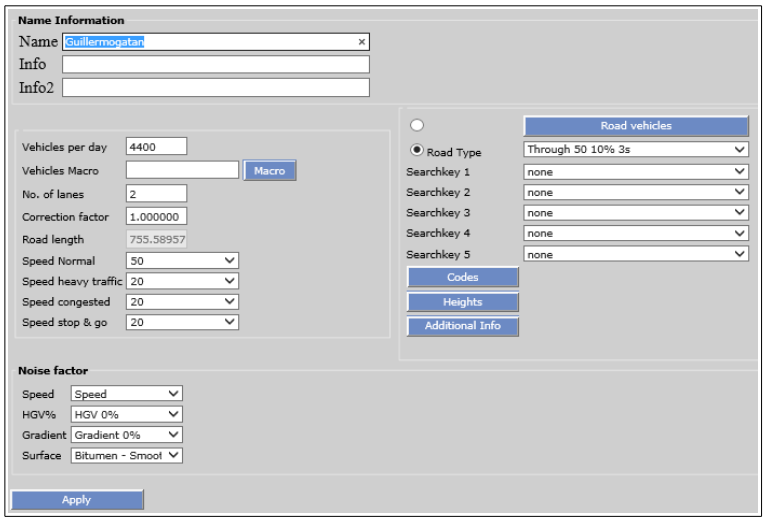


Figure 1.6.7.1 Roads

Now you have to fill in the characteristics of the road. Start with the road name in the **Name** text field, and a code definition in the **Info** text field. The next step is to fill in the traffic information. Fill in the total number of **Vehicles per day** (this should be the yearly mean

traffic for a day). Also enter **Number of lanes** (in total), although this field is currently not used. You may also give a **Correction factor**, by which the **Vehicles per day** is always multiplied. This should be 1 if you do not want any correction effects. If it exist traffic flows as time series data these can be stored in the time series database and linked to the road using a Indico macro. The flow will then be read from the time series database, hour by hour and the static number entered in **Vehicles per day** will not be used.

There are two different ways of describing emissions for road sources. If Road Types are used select the typical speed for the road. The emission factors to use for heavy traffic, congested and stop and go are defined as alternative speeds. Which hours that has alternative driving patterns is defined in Road Type. Select a proper road type from the **Road type** list box in the lower right corner.

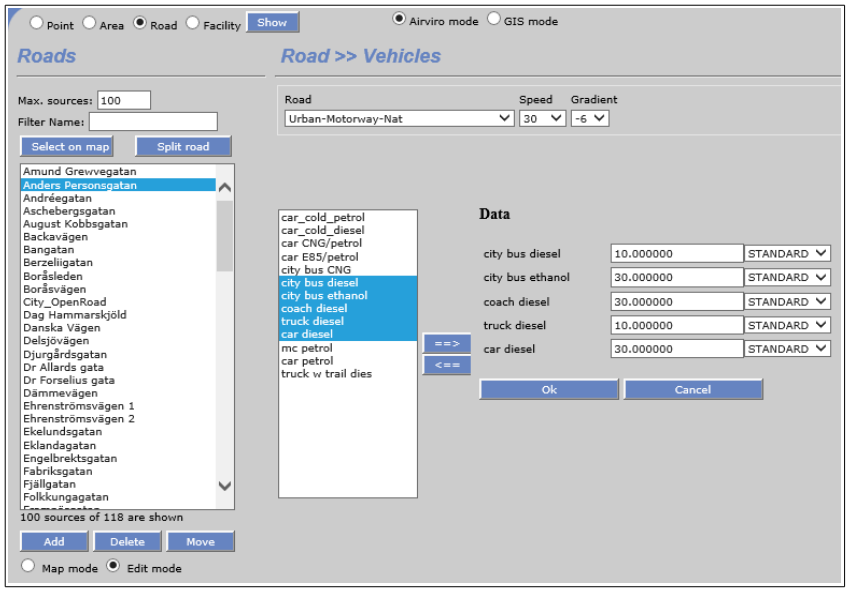


Figure 1.6.7.2 Road using Road vehicles.

If Road vehicles are used, pressing the **Road vehicle** button the *Figure 1.6.7.2* is shown. Specify the values for the road vehicles factors. Select the road vehicles that are appropriate for the road and the vehicles you have input: the percentage of traffic and the monthly/daily distribution.

Select suitable search keys. Select a geographic or activity code from **Codes**. It is the

same concept used for point sources. Remember these codes are defined on **Basic Settings**.

You can input complementary information about surrounding buildings (slope, distance to house, house width and house height). For this you must use the button **Height**.

In **Additional Info** you input information extra for use in search in database.

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

Save your road definition by clicking on **Apply.**

1.6.8 Emission Calculation with Road Sources and Restrictions

Simulation of emissions based on road sources are identical to point sources as described in *1.3.6 Emission Simulation from a Point Source*. However, there are certain features unique for the road emission as can be seen in the **Search Criteria** subwindow below.

If you want to simulate road emissions exclusively, you have to put the toggle button **Road** on and both **Point** and **Area** off.

Clicking on **Road**... can see restrictions that are specific for road emissions.

Figure 1.6.7.1 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 you can select. (see *1.3.8 Using Search Keys and Pattern Matching Facilities as Search Conditions*).

In addition you can alter the speed by prescribing a **New Speed**. For example: If you have selected all roads having a signed speed 90 and then select a new speed of 70, then all roads defined as 90-roads will be selected and the emission will be calculated after reducing the speed on the roads to 70.

You can use other restrictions like vehicles per day (minimum and maximum) and road length (minimum and maximum).

Congested traffic situations are managed specifying a congested threshold on the link. If the threshold is passed for any hour of the emission simulation, the simulation will use an alternative congested speed when calculating the emission for that link and hour.

1.6.9 Examples: traffic emission.

Example 1 Traffic Emission – Road vehicles

Using the EDB menu, check that the globcopy Edb, containing a number of road vehicles already exist. The 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 thereafter add a road that uses the road vehicles.

Steps:

1. First create a new empty EDB, called RoadV

   Using the menu Edb….select the edb called globcopy under the Airviro user, and press the button **Add new empty**… type the name of the new Edb and press **Apply**. The new empty EDB has been created.

2. Use the Wedbed to copy the road vehicles existing in the edb "globcopy" from the Domain REF.

   Open an excel empty sheet and from the control panel select the menu "Complements". Then choose the **Wedbed** menu and after setting the correct IP address to the Airviro server in the **Host** menu, select the menu **Import EDB to Excel**, 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 the edb called RoadV.

3 .Then we need to create a Road Time Variation:

   Using the menu **Subtables**…. **Road variation point** add 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 the Road source and Add one called “TrainingRoad” pressing the button **Road Vehicles**… add the following vehicles to the created road.

92% cars-petrol

1% Motorcycles

7% Buses.

Questions:

5 a) What is the average NOx emission during the week days?

Enter the following:

Substance: NOx

Time: Hours: (All)

Day type: (All)

Months: All months

Click on Apply and select the Output option you desire (GIF, PDF, Text). The answer should be 7.03 Ton/Year

4b) What is the average for NOx during 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 a car emits more NOx when they stop more frequently.

1.7 Grid Presentation of Emissions

In previous examples, the emissions have been estimated and presented as figures located at each individual source and summed for the entire displayed map area. In several applications, you might be interested to see the spatial distribution of the emissions indicating hot spots. The EDB provides you with the possibility of defining a grid in which all sources located in each grid square are summed and represented with a colour code.

For displaying emissions as a coloured grid you have to select the **Output Settings** subwindow. Then, choose **Grid** as Output.

The values for **Intensity** goes from -100 (black) to +100 (white), moving in the values RGB. You can use **Color Fade** to reduce the colours in scale of grey. The values for colour fade goes from -100 (grey) to +100 (very grey).

Now, you are free to decide the resolution of the grid. There are two different ways for doing this. If you have toggled for **Grid size**, then you just have 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. Your second choice is to toggle for **grid number**. In this case you have to define the numbers of grid squares in the east-west direction (**nX**) and north-south direction. The grid size will now be determined depending on the size of the map area that you have chosen.

Now define the colour table and the emissions intervals corresponding to the emissions per area unit by choosing colours and levels . Colour intervals values can be integer or float numbers and by clicking on the coloured square you will be able to choose a colour from a palette. See *Figure 1.7.1.*

In this window, the user can use the buttons **Colour and Level auto range**, to automatically set the scale for both items and **Colour rainbow range t**o automatically set the rainbow scale.

When ready, you click on **Apply**.

It is worthwhile mentioning that if you define your resolution as 50*50 m and search for road emissions, then you will see a nice road map, presenting the roads in different colours classifying them depending on the traffic emissions.

Figure 1.7.1 Output Settings: Grid

1.8 Creating EDB Reports and displaying the Database Structures

The EDB contains many different tables. It is possible to print out summaries of these tables, along with the substance and searchkey lists.

Also, it is possible to create reports containing different information about the sources stored in the EDB.

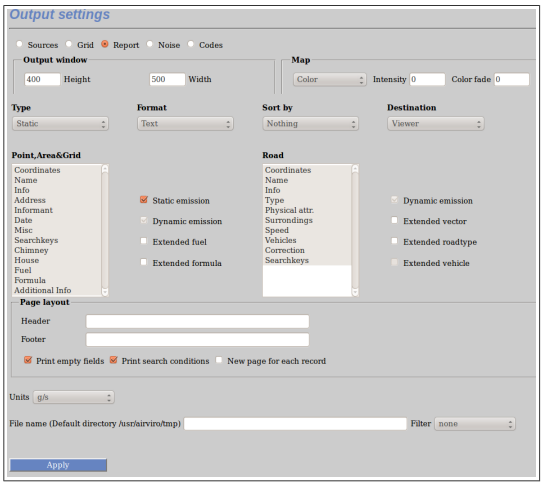


Figure 1.8.1 Output Settings: Report.

Choose Reports under the **Output Settings**. The report subwindow will appear. Select the characteristics of the sources (point, area, grid and road) to be included in the report.

There are two different types of report: **static** and **dynamic**. The **static** reports can only be in **Text** format. The **dynamic** reports also include the calculated emission. This can be 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).

If text or SKV format is selected it is possible to select what information that should be inlcuded in the report for the sources. That is made in the lists in the middle of the page.

Under **Destination** you have three choices of where to send the output. If you choose **File** then you type on **File name...** and specify the name of the file to save to.

Under **Page layout...** to specify a header and footer to print on each page and to choose whether to print each record on a new page. You can also choose whether or not to print empty fields or to print the specified search conditions.

If you have chosen **Text**, **SKV, GIS, GRID, Shape** or **Esri Grid** format then you can choose what point, area and road attributes that you would like to be included in the report.

There is also a possibility of applying a **Filter** to the output that can for example alter the format of the output or send it somewhere else such as directly to a floppy disk, or to another computer.

The following is an example of the more compact SKV output, and is usually quite suitable to export to other database programs.

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

Figure 1.8.2 SKV output.

1.9 Creating Noise Reports

From the Output settings sub window select **Noise** as Output.

The **Intensity** values goes from -100 (black) to +100 (white), moving in the values RGB. You can use **Color Fade** to reduce the colours in the scale of grey. The colour fade value goes from (grey) to +100 (very grey).

You must define the colour table and the emission intervals that will be used to display the information. You do that by choosing the colour and levels. Colour intervals values can be integer or float numbers and by clicking on the coloured square you will be able to choose the desired colour from a palette.

In this window, the user can use the buttons **Level and Colour auto range** to automatically set the intervals for these two items and **Colour rainbow range t**o automatically set the rainbow scale.

You can also define your own colour palette by pressing the button **change palette**.

When ready, click on **Apply to save changes**.

Then use the **Output** option (menu Module EDB) to visualize the result in GIF or PDF format.

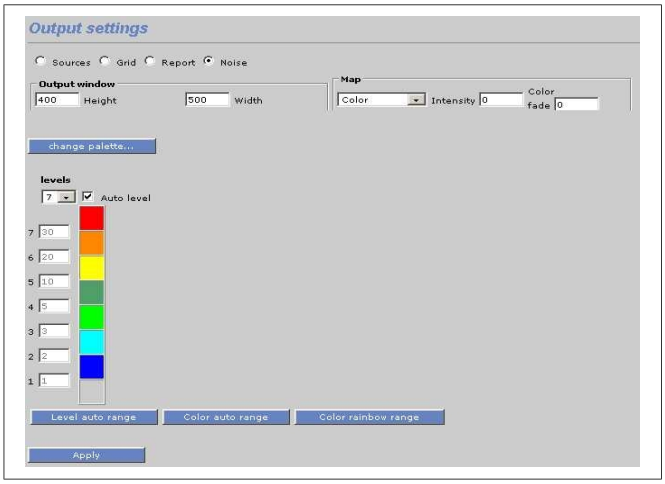


Figure 1.9.1 Output Settings: Noise

1.10 Creating Code Reports

From the Output settings sub window select **Codes** as Output.

Select the activity and geographic codes.

When ready, click on **Apply** .

Then use the **Output** option (menu Module EDB) to visualize the result in Txt format.

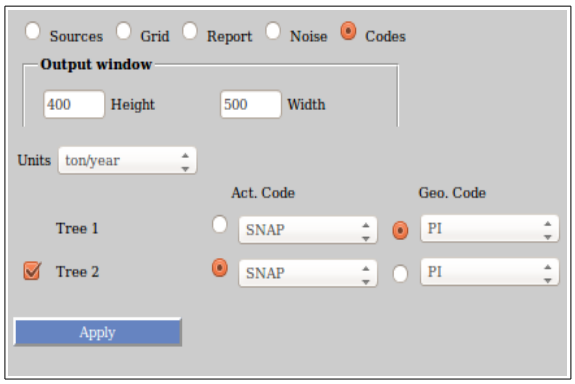


Figure 1.9.2 Output Settings: Codes

Appendix 1A: Suggested Substance List

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

	Symbol	Position
Gaseous Nitrogen Compounds		
Nitrogen oxide	NO	1
Nitrogen dioxide	NO_2	2
(NO_2 003+ NO)	NO_x	3
Nitric acid	HNO_3	4
Nitrous acid	HNO_2	5
Peroxyacetylnitrate	PAN	6
Ammonia	NH_3	7
Nitrous oxide (laughing gas)	N_2O	8
Gaseous Sulphur Compounds		
Sulphur dioxide	SO_2	15
Sulphuric acid	H_2SO_4	16
Sulphur trioxide	SO_3	17
Hydrogen sulphide	H_2S	18
Carbon sulphide	CS_2	19
Gaseous Carbon Compounds		
Carbon monoxide	CO	25
Carbon dioxide	CO_2	26
Other Inorganic Gaseous Substances		
Ozone	O_3	30
Hydrochloric acid	HCl	31
Hydrogen peroxide	H_2O_2	32

1A.2 Particulate (Inorganic, Nonmetallic) Substances (40-49)

	Symbol	Position
Particulate Matter	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
Alkanes		
	Alkanes	80
	Methane	81
	Ethane	82
	Propane	83
	Butane	84
Alkenes		
	Alkenes	90
	Ethene	91
	Propene	92
	Butene	93
Alkynes		
	Alkynes	100
	Acetylene	101
Aldehydes		
	Aldehydes	110
	Formaldehyde	111
	Acetaldehyde	112
	Butanal	113
	Benzaldehyde	114
Ketones		
	Ketones	120
	Acetone	121
Alcohols		
	Alcohols	125
	Methanol	126
	Ethanol	127
	Propanol	128

	Butanol	129	
	Phenol	132	
Glycols			
	Glycols	135	
	Etheneglycol	136	
	Propeneglycol	137	
Aromatic Substances			
	Aromatics	140	
	Benzene	141	
(= methylbenzene)	Toluene	142	
(= dimethylbenzene)	Xylene (total)	143	
(= vinylbenzene)	Styrene	144	
Toluenediisocyanater	TDI	145	
Polycyclic Aromatic Compounds			
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	
Complex Solvents (Petroleum Based, not Chlorides)			
	Solvent HC total	160	
	Benzine	161	
	Petroleum spirit	162	
	Vanolene	163	
Naturally Emitted Hydrocarbons			
	VOC nat. total	170	
	Isoprene	171	
	Terpenes	172	

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

	Symbol	Position
Chlorinated Solvents		
	Solvent Cl total	180
(= Dichloromethane)	Methylene Chloride	181
(= Trichloromethane)	Chloroform	182
(= CCl_4)	Carbon tetrachloride	183
	Vinyl chloride	184
	1,2-Dichloroethane	185
	1,1,1-Trichloroethane	186
(= trichloroethylene, Tri)	Trichloroethene	187
(= Perchloroethylene)	Tetrachloroethene	188
Chlorine-Fluorine-Bromine-Alkanes		
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:		
($C_2H_2F_2$)	HFC-134a	203
Bromium-chlorine-fluorine carbons (Halons):		
Completely halogenated halons	Halons total	210
(= CF_2ClBr)	BCFC-1211	211
(= CF_3Br)	BFC-1301	212
(=$C_2F_2Br_2$)	BFC-2402	213
Incompletely halogenated halons (=CHF_2Br)	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 the Airviro EDB, emissions are normally calculated as a function of the hour, day, weekday, month. Emission can also be calculated using a 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_0 = 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 normalised.

TabM(m) and TabD(dty,h) are the tables defined in the EDB Time Variation Point giving the variation for months, for all hours and all day types TabS(s) is the table defining the variation with scenario and is not normalised.

A normalisation constant k is calculated so that the following condition is fulfilled:

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

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

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

$$E(h,dty,m,s,V1,...,Vx)=func(V1\times Amp,...,Vx\times Amp)$$ (B1.3)

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

The variables V1,...Vx might or might nor be variable with time. This is decided when the function is defined. The Time Variation is not normalized, all the numbers in the Time Variation are treated as percentages.

Equation B1.3 can represent an upper limit restricted emission. If you describe the emission as originating from an oil-burning power plant, then the energy production rate and consequently the emissions would depend on the load. There is however an upper limit in the production rate, restricted 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 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 **T**abM, 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 Substance group****) and yearly emission figures.*

Consequently, equation B1.2 permits the user to prescribe a scenario in which all pollutants coming from a source are concentrated to a few hours.

1B.2 Road Source Emissions

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
L	= length of the road
N	= average number of vehicles per day on the road
corr	= correction factor for the road
E(speed,h,dty,m, s)	= estimated emission for any speed, hour, day-type and month for the scenario **s**
TabS(s,v)	Is the table defining the variation with different scenarios and is not normalised
TabR(speed,v)	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 giving 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 so that the following condition is fulfilled:

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

The emission for a road is then calculated as:

$$E(speed,h,dty,m,s)=corr\times n\times 1\times\sum_{v}(TabS(s,v))\,TabR(speed,v)\times k(v)TabM(m,v)\times TabD(dty,h,v)$$

(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 that should be used.

1B.3 Normalisation of Time variations in an EDB

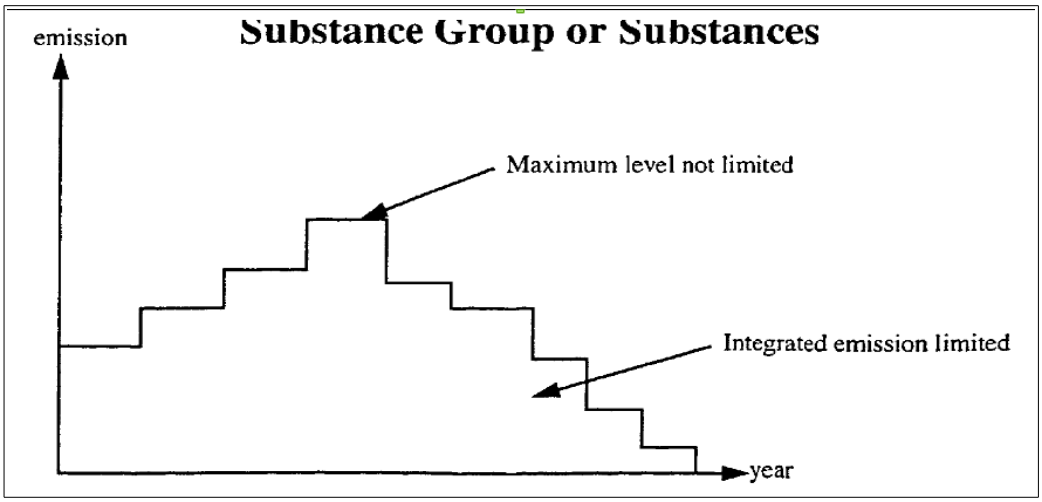
Normalisation is needed whenever emission data is given as a total yearly emission, that is for substance groups and for substances emitted from point and area sources and for traffic exhaust emissions. The normalisation guarantees that the yearly emission will always be exactly the one specified, in spite of emission variations in 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 emitted evenly

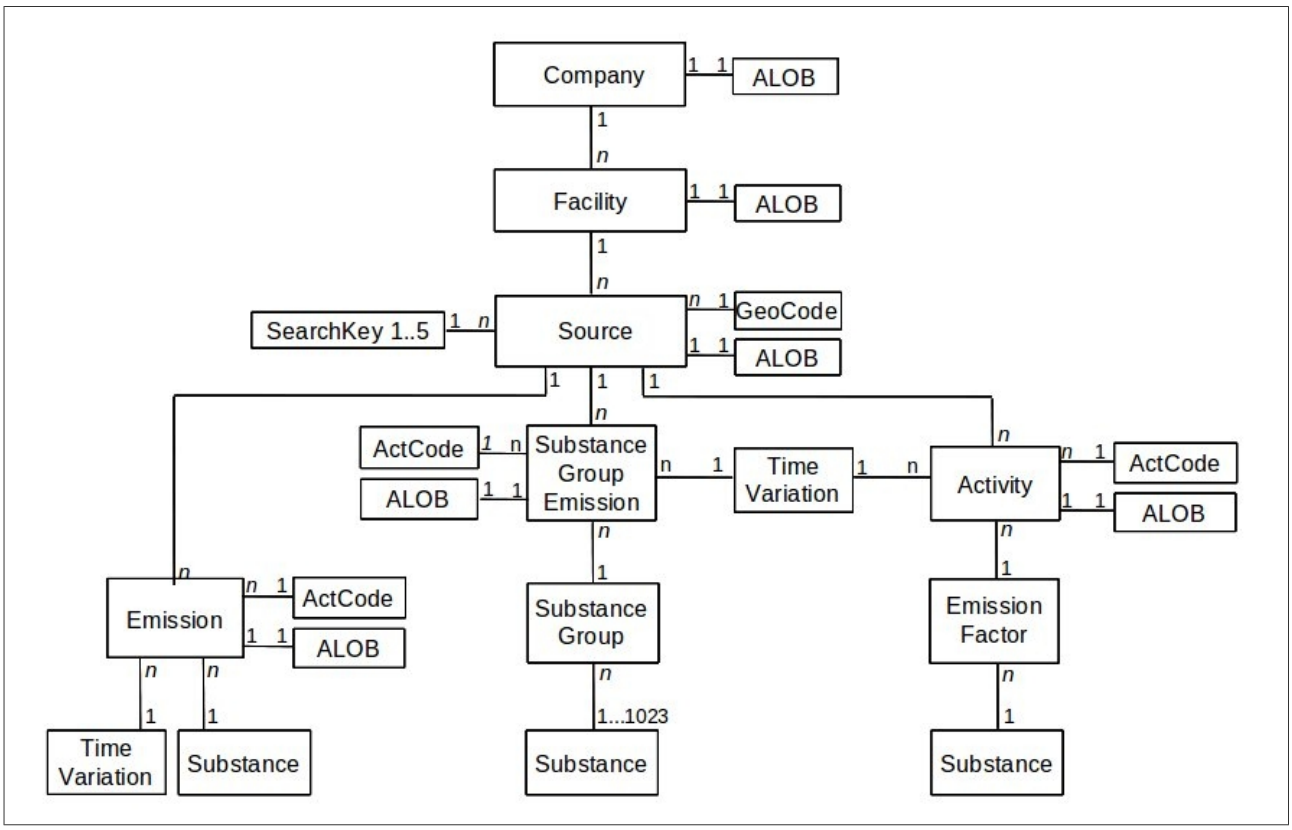
throughout the whole year then the emission per second will be E_0. However if the emission is emitted evenly for just 12 hours every day then the emission for those hours will be twice as much while the emission outside those hours will be zero.



The most common emission specification is 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?

Dialogs 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® end 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 the SMHI Airviro web site: www.airviro.smhi.se. 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 adress 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** dialog 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 items are available:

1. Import EDB to Excel: Displays the import dialog.
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** dialog 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 chosen.

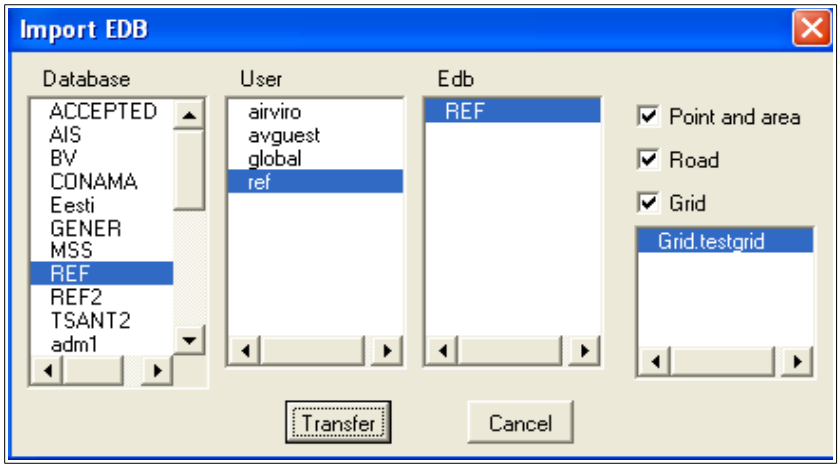


Figure D1. Import EDB

When 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, 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 checked, a certain grid layer can be selected in the grid layer list. By pressing *Ctrl* on the keyboard and clicking on a grid layer it is possible to select more than one.

When the *Transfer* button is pushed 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 version will allow possibility 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, Substance group, Emission factor, 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. Normally, 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

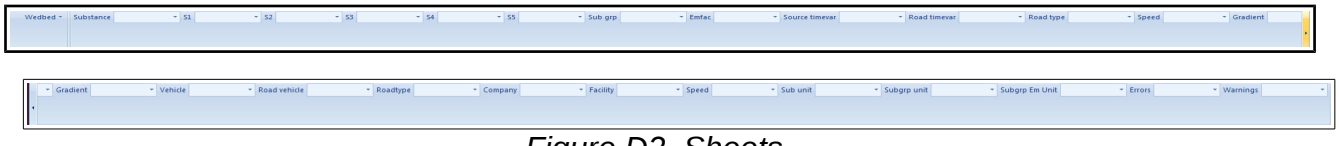


Figure D2. Sheets.

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.

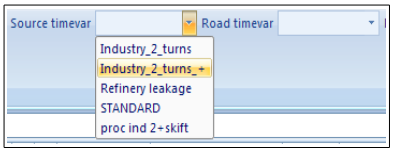


Figure D3. Toolbar: Source timevar Sheet.

1.D.8. Export EDB from Excel

In the **Export EDB from EXCEL** dialog 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.

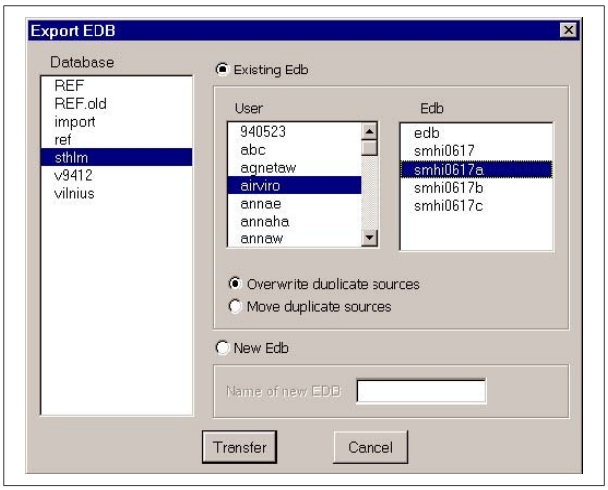


Figure D4 Export EDB Sheet.

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* is pushed 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.

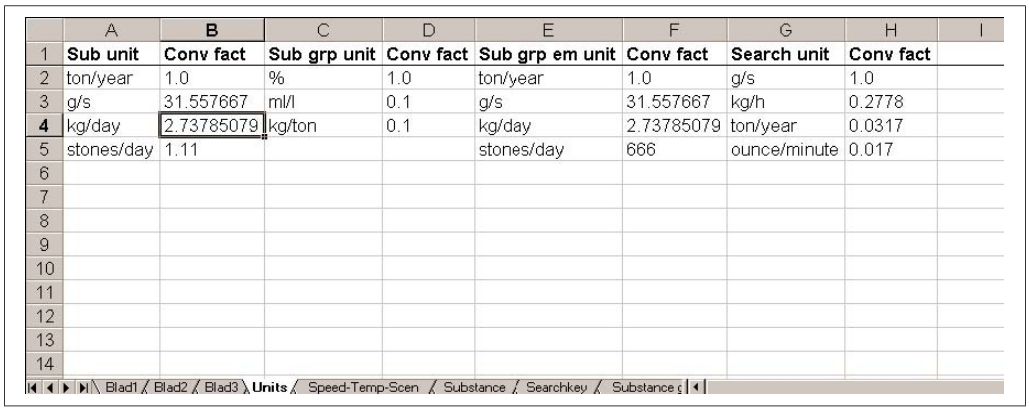
1.D.8.2. Setting up privileges for export from Excel

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.



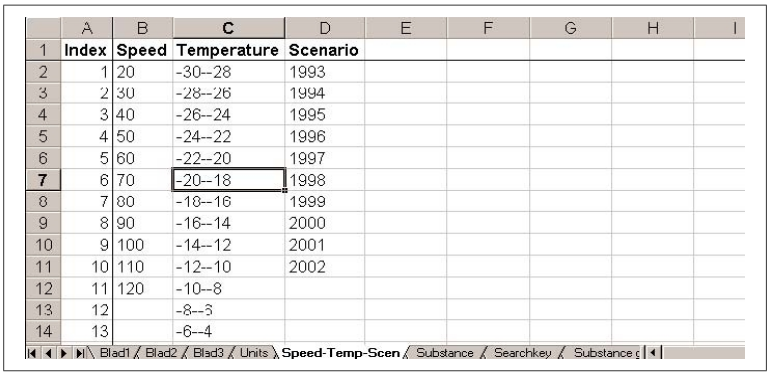
	A	B	C	D	E	F	G	H	I
1	**Sub unit**	**Conv fact**	**Sub grp unit**	**Conv fact**	**Sub grp em unit**	**Conv fact**	**Search unit**	**Conv fact**	
2	ton/year	1.0	%	1.0	ton/year	1.0	g/s	1.0	
3	g/s	31.557667	ml/l	0.1	g/s	31.557667	kg/h	0.2778	
4	kg/day	2.73785079	kg/ton	0.1	kg/day	2.73785079	ton/year	0.0317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

Blad1 / Blad2 / Blad3 / **Units** / Speed-Temp-Scen / Substance / Searchkey / Substance

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**.



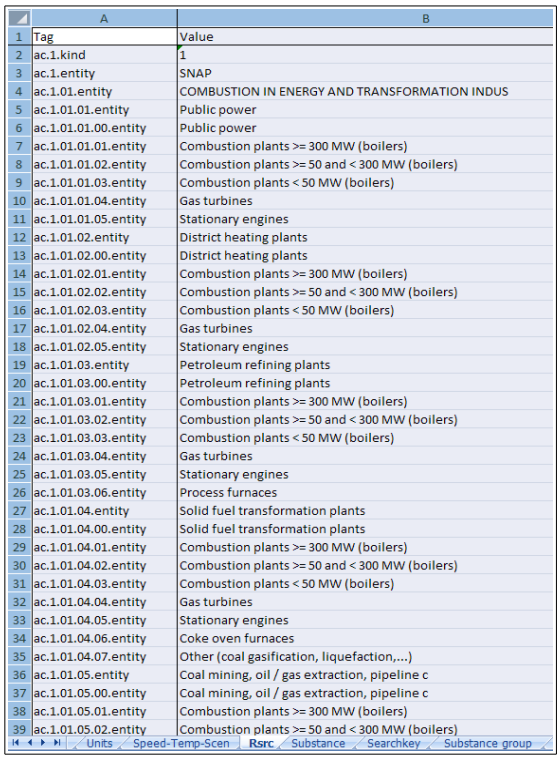
	A	B	C	D	E	F	G	H	I
1	**Index**	**Speed**	**Temperature**	**Scenario**					
2	1	20	-30--28	1993					
3	2	30	-28--26	1994					
4	3	40	-26--24	1995					
5	4	50	-24--22	1996					
6	5	60	-22--20	1997					
7	6	70	-20--18	1998					
8	7	80	-18--16	1999					
9	8	90	-16--14	2000					
10	9	100	-14--12	2001					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

Blad1 / Blad2 / Blad3 / Units / **Speed-Temp-Scen** / Substance / Searchkey / Substance

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 conents 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.



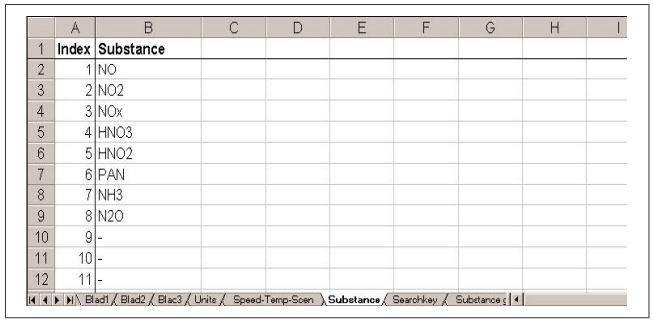
	A	B
1	Tag	Value
2	ac.1.kind	1
3	ac.1.entity	SNAP
4	ac.1.01.entity	COMBUSTION IN ENERGY AND TRANSFORMATION INDUS
5	ac.1.01.01.entity	Public power
6	ac.1.01.01.00.entity	Public power
7	ac.1.01.01.01.entity	Combustion plants >= 300 MW (boilers)
8	ac.1.01.01.02.entity	Combustion plants >= 50 and < 300 MW (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)

Units | Speed-Temp-Scen | Rsrc | Substance | Searchkey | Substance group

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	Index	Substance							
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	-							

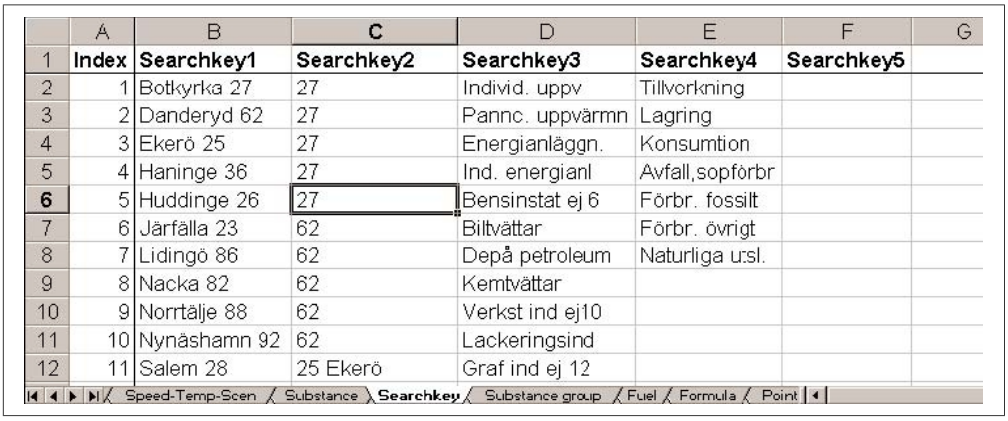
Blad1 | Blad2 | Blad3 | Units | Speed-Temp-Scen | Substance | Searchkey | Substance g

Figure D8. Substance Sheet.

1.D.9.5. Sheet Searchkey

This sheet contains the searchkey table of the Airviro EDB. Searchkeys may be empty (not

used) but duplicates should be avoided.



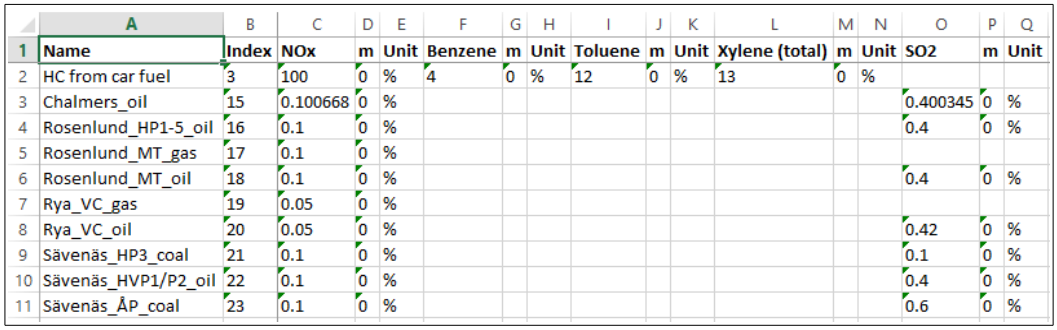
	A	B	C	D	E	F	G
1	**Index**	**Searchkey1**	**Searchkey2**	**Searchkey3**	**Searchkey4**	**Searchkey5**	
2	1	Botkyrka 27	27	Individ. uppv	Tillvorkning		
3	2	Danderyd 62	27	Pannc. uppvärmn	Lagring		
4	3	Ekerö 25	27	Energianläggn.	Konsumtion		
5	4	Haninge 36	27	Ind. energianl	Avfall,sopförbr		
6	5	Huddinge 26	27	Bensinstat ej 6	Förbr. fossilt		
7	6	Järfälla 23	62	Biltvättar	Förbr. övrigt		
8	7	Lidingö 86	62	Depå petroleum	Naturliga u:sl.		
9	8	Nacka 82	62	Kemtvättar			
10	9	Norrtälje 88	62	Verkst ind ej10			
11	10	Nynäshamn 92	62	Lackeringsind			
12	11	Salem 28	25 Ekerö	Graf ind ej 12			

Speed-Temp-Scen / Substance / Searchkey / Substance group / Fuel / Formula / Point

Figure D9. Searchkey Sheet.

1.D.9.6. Substance group Sheet

This sheet corresponds to the substance group table of the Airviro EDB. There is substance group per row. Names and indices must be unique, including names and indices for the substance groups. 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
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	Sävenäs_HP3_coal	21	0.1	0	%										0.1	0	%
10	Sävenäs_HVP1/P2_oil	22	0.1	0	%										0.4	0	%
11	Sävenäs_ÅP_coal	23	0.1	0	%										0.6	0	%

Figure D10. Substance group Sheet

1.D.9.7. Emission factor Sheet

This sheet corresponds to the Airviro emission factor table. There is one emission factor per row. Names and indices must be unique. For each emission factor a number of

variables are defined. These can either be CONST (Constant) or VAR (Variable).The varibales are used in the Formula. The formula can contain a arithmatical and logical expressions and uses the same syntax as the Indico interpreter.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Name	Index	Substance	Formula	Var 1	Type 1	Var 2	Type 2	Var 3	Type 3	Var 4	Type 4	Var 5	Type 5	Var 6	Type 6	Var 7	Type 7
2	MaxEffToEmiSO2	1	SO2	MaxEffect/EnergyValue*PercentageSO2/100*1000	MaxEffect	CONST	EnergyValue	VAR	PercentageSO2	VAR								
3	MaxEffToEmiNOx	2	NOx	MaxEffect*RelativeEmi	MaxEffect	CONST	RelativeEmi	VAR										
4																		

Figure D11. Emission Factor 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.

1• *Temperature1* to *Temperature30* stating the temperature dependency. Only first row for each formula.

2• **100-95** to **5-0** stating the gas flow dependency. Only first row for each formula.

	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	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU
1	Name	Index	H.1	H.2	H.3	H.4	H.5	H.6	H.7	H.8	H.9	H.10	H.11	H.12	H.13	H.14	H.15	H.16	H.17	H.18	H.19	H.20	H.21	H.22	H.23	H.24	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2007	2008	2009	2010	2011	2012	2013	2014	2015
2	STANDARD	1	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	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
3			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100																						
4			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100																						
5			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100																						
6	Industry_2_turns	11	0	0	0	0	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	0	100	100	100	100	100	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100
7			0	0	0	0	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	0																						
8			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																						
9			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																						
10	Industry_2_turns_+	12	0	0	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
11			0	0	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0																						
12			0	0	0	0	100	100	100	100	100	100	100	100	100	100	0	0	0	0	0	0	0	0	0	0																						
13			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																						
14	Refinery leakage	15	100	100	100	100	100	100	120	120	130	130	140	120	140	140	140	120	100	100	100	100	100	100	100	100	100	100	100	100	100	80	100	100	100	100	90	100	100	100	100	100	100	100	100	100
15			100	100	100	100	100	100	120	120	130	130	140	120	140	140	140	120	100	100	100	100	100	100	100	100																						
16			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100																						
17			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100																						
18	proc ind 2+skift	19	0	0	0	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	100	100	100	100	100	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100
19			0	0	0	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0																						
20			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																						
21			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																						
22																																														

Figure D12. Source TimeVar Sheet

1.D.9.9. Company Sheet

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

- Info, Info 2: string, additional information.
- Address and post address : string.
- Info. Supp.: the informant name.
- Misc: string
- Alob: string

	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			L:a 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 Süld	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		

Units | Speed-Temp-Scen | Rsrc | Substance | Searchkey | Substance group | Emission factor | Source timevar | Road timevar | Company

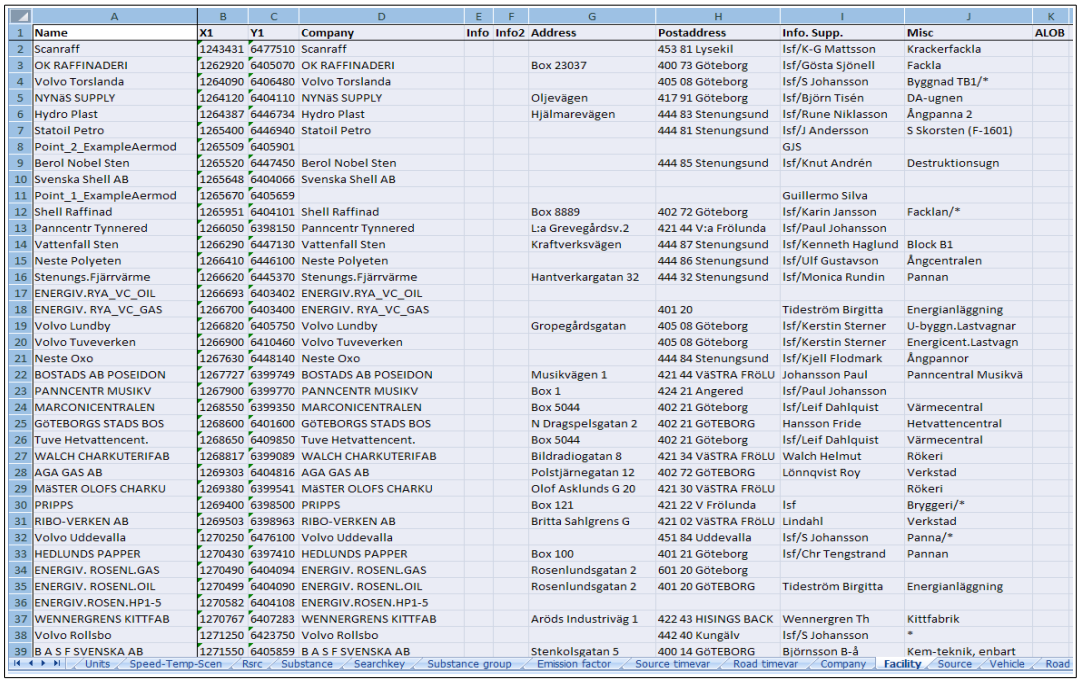
Figure D13. Company Sheet.

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 accosciated 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 Sjönell	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			Hjälmarevägen	444 83 Stenungsund	Isf/Rune Niklasson	Ångpanna 2	
7	Statoil Petro	1265400	6446940	Statoil Petro				444 81 Stenungsund	Isf/J Andersson	S Skorsten (F-1601)	
8	Point_2_ExampleAermod	1265509	6405901						GJS		
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_ExampleAermod	1265670	6405659						Guillermo Silva		
12	Shell Raffinad	1265951	6404101	Shell Raffinad			Box 8889	402 72 Göteborg	Isf/Karin Jansson	Facklan/*	
13	Panncentr Tynnered	1266050	6398150	Panncentr Tynnered			L:a Grevegårdsv.2	421 44 V:a Frölunda	Isf/Paul Johansson		
14	Vattenfall Sten	1266290	6447130	Vattenfall Sten			Kraftverksvägen	444 87 Stenungsund	Isf/Kenneth Haglund	Block B1	
15	Neste Polyeten	1266410	6446100	Neste Polyeten				444 86 Stenungsund	Isf/Ulf Gustavson	Ångcentralen	
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	Tidström 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	Ångpannor	
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	MäSTER OLOFS CHARKU	1269380	6399541	MäSTER OLOFS CHARKU			Olof Asklunds 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. ROSENL.GAS	1270490	6404094	ENERGIV. ROSENL.GAS			Rosenlundsgatan 2	601 20 Göteborg			
35	ENERGIV. ROSENL.OIL	1270499	6404090	ENERGIV. ROSENL.OIL			Rosenlundsgatan 2	401 20 GöTEBORG	Tidström 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 Rollsbo	1271250	6423750	Volvo Rollsbo				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	

Units | Speed-Temp-Scen | Rsrc | Substance | Searchkey | Substance group | Emission factor | Source timevar | Road timevar | Company | Facility | Source | Vehicle | Road

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**

It exist three different ways to specify the Emissions for a Source: Using Substance, Substance Group and Activity. The three can be used in the same time.

• **Emission 1:** Substance

• **Emission 1:** Timevar

• **Emission 1:** Emission

• **Emission 1:** Unit

• **Emission 1:** Macro

• **Emission 1:** Actcode

• **Emission 1**: ALOB

• **SubGrp 1:** SubGrp Reference to **Substance group** sub table.

• **SubGrp 1:** Timevar

• **SubGrp 1**: Activity

• **SubGrp 1:** Unit

• **SubGrp 1**: Actcode

• **SubGrp 1**: ALOB

• **Activity 1**: Activity Reference to **Emission factor** sub table.

• **Activity 1**: Timevar

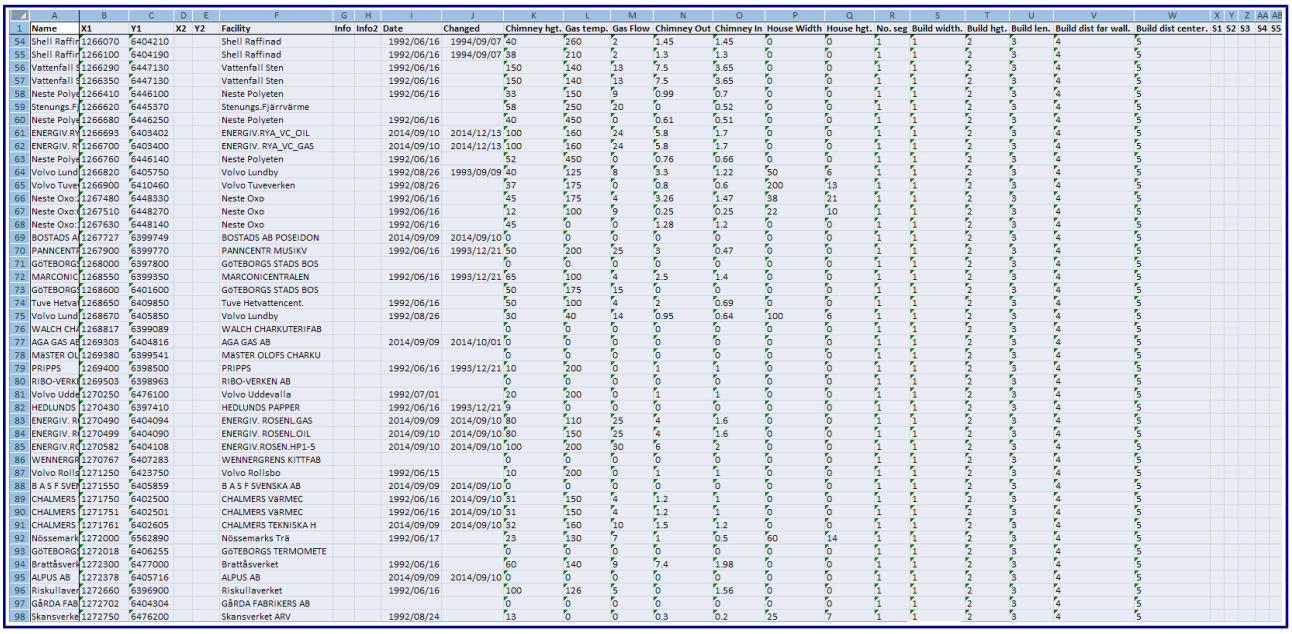
• **Activity 1**: Var 1

• **Activity 1**: Var 2

- **Activity 1**: Var 3

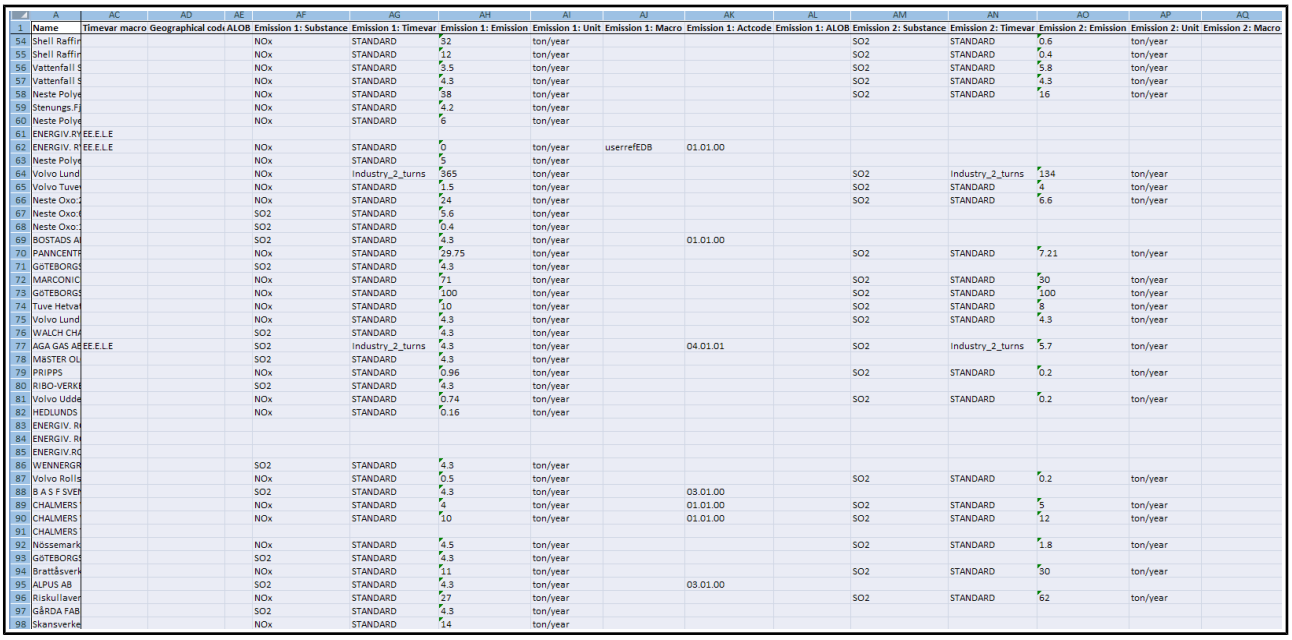
- **Activity 1**: Actcode

- **Activity 1**: ALOB



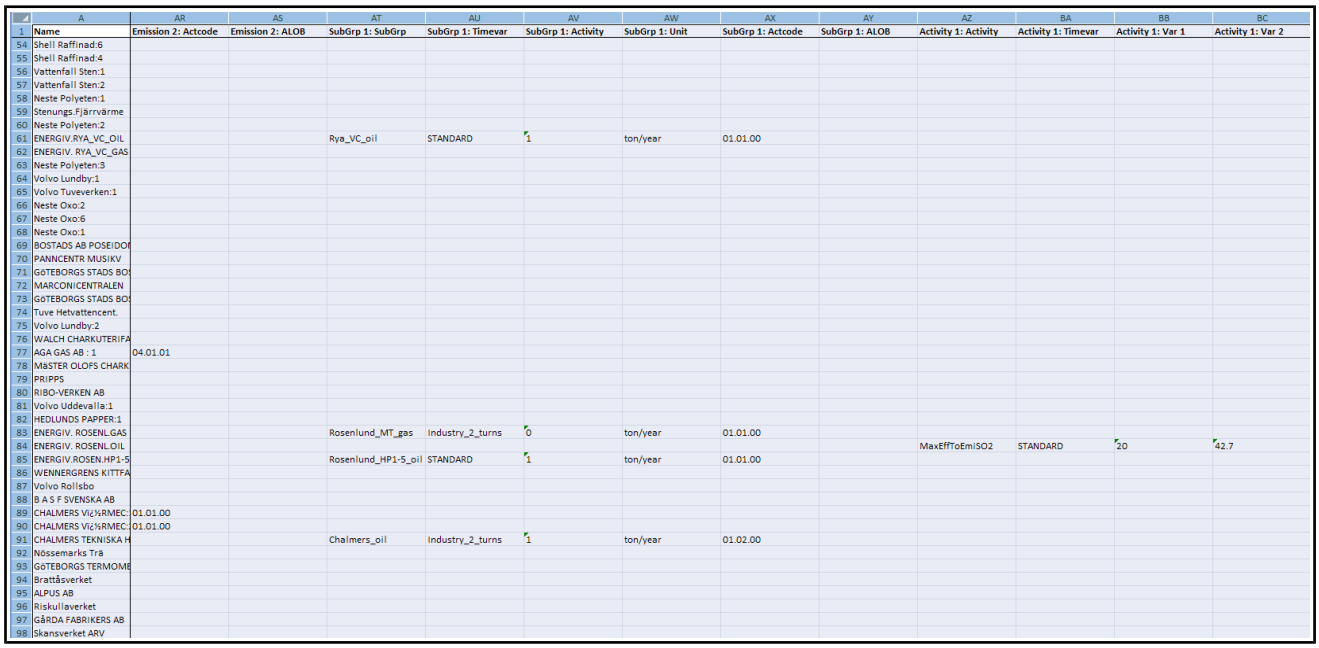
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB
1	Name	X1	Y1	X2	Y2	Facility	Info	Info2	Date	Changed	Chimney hgt.	Gas temp.	Gas Flow	Chimney Out	Chimney In	House Width	House hgt.	No. seg	Build width.	Build hgt.	Build len.	Build dist far wall.	Build dist center.	S1	S2	S3	S4	S5
54	Shell Raffir	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 Raffir	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 S	1266290	6447130			Vattenfall Sten			1992/06/16		150	140	13	7.5	3.65	0	0	1	1	2	3	4	5					
57	Vattenfall S	1266350	6447130			Vattenfall Sten			1992/06/16		150	140	13	7.5	3.65	0	0	1	1	2	3	4	5					
58	Neste Polye	1266410	6446100			Neste Polyeten			1992/06/16		33	150	9	0.99	0.7	0	0	1	1	2	3	4	5					
59	Stenungs.F	1266620	6445370			Stenungs.Fjärrvärme					58	250	20	0	0.52	0	0	1	1	2	3	4	5					
60	Neste Polye	1266680	6446250			Neste Polyeten			1992/06/16		40	450	0	0.61	0.51	0	0	1	1	2	3	4	5					
61	ENERGIV.RY	1266693	6403402			ENERGIV.RYA_VC_OIL			2014/09/10	2014/12/13	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	2014/12/13	100	160	24	5.8	1.7	0	0	1	1	2	3	4	5					
63	Neste Polye	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	PANNCENTI	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	GöTEBORG	1268000	6397800			GöTEBORGS STADS BOS					0	0	0	0	0	0	0	1	1	2	3	4	5					
72	MARCONIC	1268550	6399350			MARCONICENTRALEN			1992/06/16	1993/12/21	55	100	4	2.5	1.4	0	0	1	1	2	3	4	5					
73	GöTEBORG	1268600	6401600			GöTEBORGS STADS BOS					50	175	15	0	0	0	0	1	1	2	3	4	5					
74	Tuve Hetvat	1268650	6409850			Tuve Hetvattencent.			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		30	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 AE	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	MäSTER OL	1269380	6399541			MäSTER 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 Udde	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. ROSENL.GAS			2014/09/09	2014/09/10	80	110	25	4	1.6	0	0	1	1	2	3	4	5					
84	ENERGIV. R	1270499	6404090			ENERGIV. ROSENL.OIL			2014/09/10	2014/09/10	80	150	25	4	1.6	0	0	1	1	2	3	4	5					
85	ENERGIV.RO	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			WENNERGRENS KITTFAB					0	0	0	0	0	0	0	1	1	2	3	4	5					
87	Volvo Rolls	1271250	6423750			Volvo Rollsbo			1992/06/15		10	200	0	1	1	0	0	1	1	2	3	4	5					
88	B A S F SVE	1271550	6405859			B A S F SVENSKA AB			2014/09/09	2014/09/10	0	0	0	0	0	0	0	1	1	2	3	4	5					
89	CHALMERS	1271750	6402500			CHALMERS VäRMEC			1992/06/16	2014/09/10	31	150	4	1.2	1	0	0	1	1	2	3	4	5					
90	CHALMERS	1271751	6402501			CHALMERS VäRMEC			1992/06/16	2014/09/10	31	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	32	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	GöTEBORG	1272018	6406255			GöTEBORGS TERMOMETE					0	0	0	0	0	0	0	1	1	2	3	4	5					
94	Brattåsverk	1272300	6477000			Brattåsverket			1992/06/16		60	140	9	7.4	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	GÅRDA FAB	1272702	6404304			GÅRDA 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.



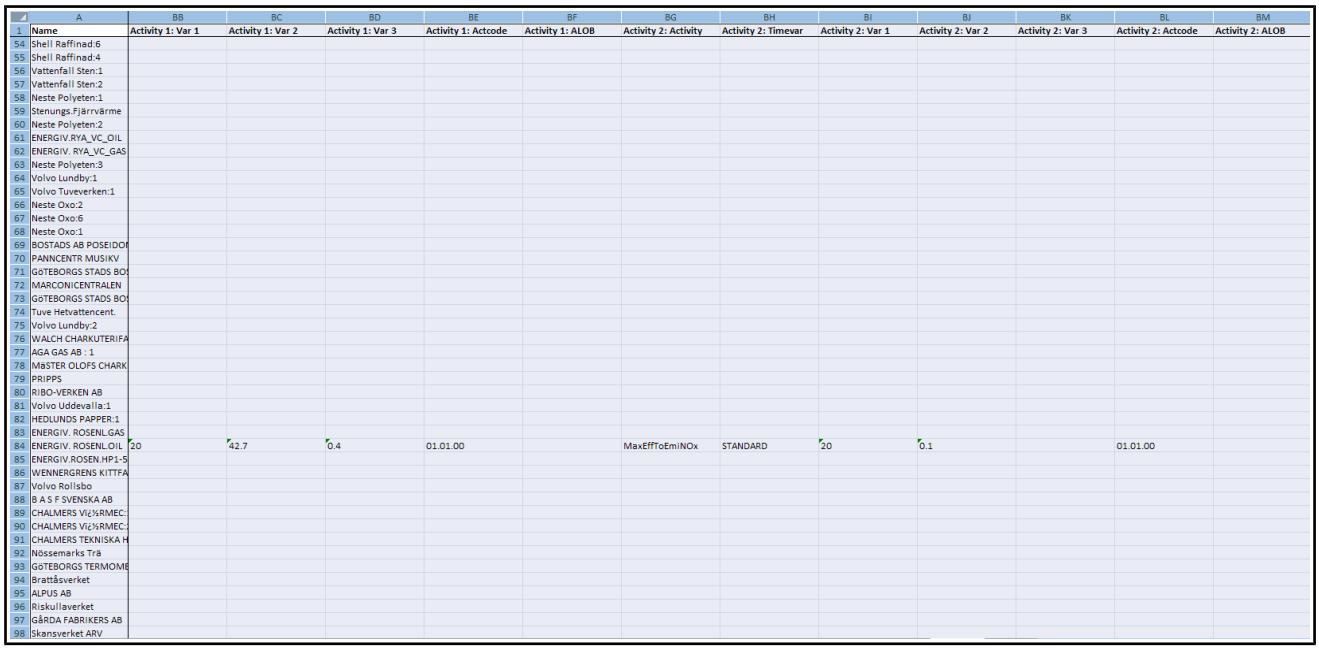
	A	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1	Name	Timevar macro	Geographical cod	ALOB	Emission 1: Substance	Emission 1: Timevar	Emission 1: Emission	Emission 1: Unit	Emission 1: Macro	Emission 1: Actcode	Emission 1: ALOB	Emission 2: Substance	Emission 2: Timevar	Emission 2: Emission	Emission 2: Unit	Emission 2: Macro
54	Shell Raffir				NOx	STANDARD	32	ton/year				SO2	STANDARD	0.6	ton/year	
55	Shell Raffir				NOx	STANDARD	12	ton/year				SO2	STANDARD	0.4	ton/year	
56	Vattenfall S				NOx	STANDARD	3.5	ton/year				SO2	STANDARD	5.8	ton/year	
57	Vattenfall S				NOx	STANDARD	4.3	ton/year				SO2	STANDARD	4.3	ton/year	
58	Neste Polye				NOx	STANDARD	38	ton/year				SO2	STANDARD	16	ton/year	
59	Stenungs.F				NOx	STANDARD	4.2	ton/year								
60	Neste Polye				NOx	STANDARD	6	ton/year								
61	ENERGIV.RY	EE.E.L.E														
62	ENERGIV. R	EE.E.L.E			NOx	STANDARD	0	ton/year	userrefEDB	01.01.00						
63	Neste Polye				NOx	STANDARD	5	ton/year								
64	Volvo Lund				NOx	Industry_2_turns	365	ton/year				SO2	Industry_2_turns	134	ton/year	
65	Volvo Tuve				NOx	STANDARD	1.5	ton/year				SO2	STANDARD	4	ton/year	
66	Neste Oxo.:				NOx	STANDARD	24	ton/year				SO2	STANDARD	6.6	ton/year	
67	Neste Oxo.:				SO2	STANDARD	5.6	ton/year								
68	Neste Oxo.:				SO2	STANDARD	0.4	ton/year								
69	BOSTADS A				SO2	STANDARD	4.3	ton/year		01.01.00						
70	PANNCENTR				NOx	STANDARD	29.75	ton/year				SO2	STANDARD	7.21	ton/year	
71	GöTEBORG				SO2	STANDARD	4.3	ton/year								
72	MARCONIC				NOx	STANDARD	71	ton/year				SO2	STANDARD	30	ton/year	
73	GöTEBORG				NOx	STANDARD	100	ton/year				SO2	STANDARD	100	ton/year	
74	Tuve Hetvat				NOx	STANDARD	10	ton/year				SO2	STANDARD	8	ton/year	
75	Volvo Lund				NOx	STANDARD	4.3	ton/year				SO2	STANDARD	4.3	ton/year	
76	WALCH CH/				SO2	STANDARD	4.3	ton/year								
77	AGA GAS AE	EE.E.L.E			SO2	Industry_2_turns	4.3	ton/year		04.01.01		SO2	Industry_2_turns	5.7	ton/year	
78	MäSTER OL				SO2	STANDARD	4.3	ton/year								
79	PRIPPS				NOx	STANDARD	0.96	ton/year				SO2	STANDARD	0.2	ton/year	
80	RIBO-VERK				SO2	STANDARD	4.3	ton/year								
81	Volvo Udde				NOx	STANDARD	0.74	ton/year				SO2	STANDARD	0.2	ton/year	
82	HEDLUNDS				NOx	STANDARD	0.16	ton/year								
83	ENERGIV. R															
84	ENERGIV. R															
85	ENERGIV.RO															
86	WENNERGR				SO2	STANDARD	4.3	ton/year								
87	Volvo Rolls				NOx	STANDARD	0.5	ton/year				SO2	STANDARD	0.2	ton/year	
88	B A S F SVE				SO2	STANDARD	4.3	ton/year		03.01.00						
89	CHALMERS				NOx	STANDARD	4	ton/year		01.01.00		SO2	STANDARD	5	ton/year	
90	CHALMERS				NOx	STANDARD	10	ton/year		01.01.00		SO2	STANDARD	12	ton/year	
91	CHALMERS															
92	Nössemark				NOx	STANDARD	4.5	ton/year				SO2	STANDARD	1.8	ton/year	
93	GöTEBORG				SO2	STANDARD	4.3	ton/year								
94	Brattåsverk				NOx	STANDARD	11	ton/year				SO2	STANDARD	30	ton/year	
95	ALPUS AB				SO2	STANDARD	4.3	ton/year		03.01.00						
96	Riskullaver				NOx	STANDARD	27	ton/year				SO2	STANDARD	62	ton/year	
97	GÅRDA FAB				SO2	STANDARD	4.3	ton/year								
98	Skansverke				NOx	STANDARD	14	ton/year								

Figure D16. Sources. Emissions Sheet.



	A	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC
1	Name	Emission 2: Actcode	Emission 2: ALOB	SubGrp 1: SubGrp	SubGrp 1: Timevar	SubGrp 1: Activity	SubGrp 1: Unit	SubGrp 1: Actcode	SubGrp 1: ALOB	Activity 1: Activity	Activity 1: Timevar	Activity 1: Var 1	Activity 1: Var 2
54	Shell Raffinad:6												
55	Shell Raffinad:4												
56	Vattenfall Sten:1												
57	Vattenfall Sten:2												
58	Neste Polyeten:1												
59	Stenungs.Fjärrvärme												
60	Neste Polyeten:2												
61	ENERGIV.RYA_VC_OIL			Rya_VC_oil	STANDARD	1	ton/year	01.01.00					
62	ENERGIV. RYA_VC_GAS												
63	Neste Polyeten:3												
64	Volvo Lundby:1												
65	Volvo Tuveverken:1												
66	Neste Oxo:2												
67	Neste Oxo:6												
68	Neste Oxo:1												
69	BOSTADS AB POSEIDON												
70	PANNCENTR MUSIKV												
71	GöTEBORGS STADS BO												
72	MARCONICENTRALEN												
73	GöTEBORGS STADS BO												
74	Tuve Hetvattencent.												
75	Volvo Lundby:2												
76	WALCH CHARKUTERIFA												
77	AGA GAS AB : 1	04.01.01											
78	MäSTER OLOFS CHARK												
79	PRIPPS												
80	RIBO-VERKEN AB												
81	Volvo Uddevalla:1												
82	HEDLUNDS PAPPER:1												
83	ENERGIV. ROSENL.GAS			Rosenlund_MT_gas	Industry_2_turns	0	ton/year	01.01.00					
84	ENERGIV. ROSENL.OIL									MaxEffToEmiSO2	STANDARD	20	42.7
85	ENERGIV.ROSEN.HP1-5			Rosenlund_HP1-5_oil	STANDARD	1	ton/year	01.01.00					
86	WENNERGRENS KITTFA												
87	Volvo Rollsbo												
88	B A S F SVENSKA AB												
89	CHALMERS Vi¿½RMEC:	01.01.00											
90	CHALMERS Vi¿½RMEC:	01.01.00											
91	CHALMERS TEKNISKA H			Chalmers_oil	Industry_2_turns	1	ton/year	01.02.00					
92	Nössemarks Trä												
93	GöTEBORGS TERMOME												
94	Brattåsverket												
95	ALPUS AB												
96	Riskullaverket												
97	GÅRDA FABRIKERS AB												
98	Skansverket ARV												

Figure D17. Sources. SubGrp Sheet.



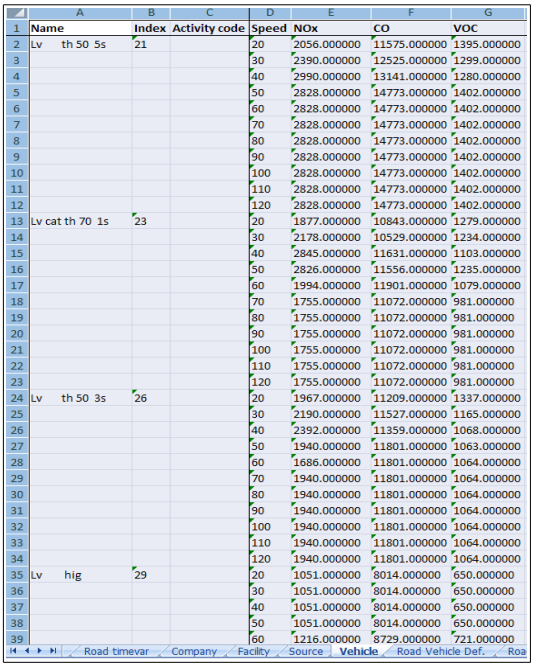
	A	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM
1	Name	Activity 1: Var 1	Activity 1: Var 2	Activity 1: Var 3	Activity 1: Actcode	Activity 1: ALOB	Activity 2: Activity	Activity 2: Timevar	Activity 2: Var 1	Activity 2: Var 2	Activity 2: Var 3	Activity 2: Actcode	Activity 2: ALOB
54	Shell Raffinad:6												
55	Shell Raffinad:4												
56	Vattenfall Sten:1												
57	Vattenfall Sten:2												
58	Neste Polyeten:1												
59	Stenungs.Fjärrvärme												
60	Neste Polyeten:2												
61	ENERGIV.RYA_VC_OIL												
62	ENERGIV. RYA_VC_GAS												
63	Neste Polyeten:3												
64	Volvo Lundby:1												
65	Volvo Tuveverken:1												
66	Neste Oxo:2												
67	Neste Oxo:6												
68	Neste Oxo:1												
69	BOSTADS AB POSEIDON												
70	PANNCENTR MUSIKV												
71	GöTEBORGS STADS BO												
72	MARCONICENTRALEN												
73	GöTEBORGS STADS BO												
74	Tuve Hetvattencent.												
75	Volvo Lundby:2												
76	WALCH CHARKUTERIFA												
77	AGA GAS AB : 1												
78	MäSTER OLOFS CHARK												
79	PRIPPS												
80	RIBO-VERKEN AB												
81	Volvo Uddevalla:1												
82	HEDLUNDS PAPPER:1												
83	ENERGIV. ROSENL.GAS												
84	ENERGIV. ROSENL.OIL	20	42.7	0.4	01.01.00		MaxEffToEmiNOx	STANDARD	20	0.1		01.01.00	
85	ENERGIV.ROSEN.HP1-5												
86	WENNERGRENS KITTFA												
87	Volvo Rollsbo												
88	B A S F SVENSKA AB												
89	CHALMERS Vi¿½RMEC:												
90	CHALMERS Vi¿½RMEC:												
91	CHALMERS TEKNISKA H												
92	Nössemarks Trä												
93	GöTEBORGS TERMOME												
94	Brattåsverket												
95	ALPUS AB												
96	Riskullaverket												
97	GÅRDA FABRIKERS AB												
98	Skansverket ARV												

Figure D18. Sources. Activity Sheet.

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.



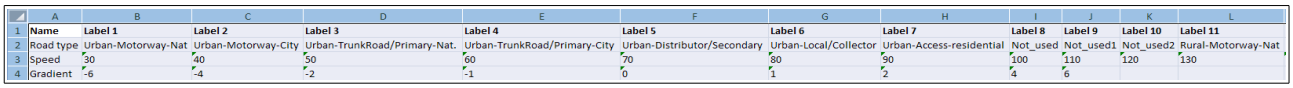
	A	B	C	D	E	F	G
1	Name	Index	Activity code	Speed	NOx	CO	VOC
2	Lv th 50 5s	21		20	2056.000000	11575.000000	1395.000000
3				30	2390.000000	12525.000000	1299.000000
4				40	2990.000000	13141.000000	1280.000000
5				50	2828.000000	14773.000000	1402.000000
6				60	2828.000000	14773.000000	1402.000000
7				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

Road timevar | Company | Facility | Source | Vehicle | Road Vehicle Def. | Roa

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 appears 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	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	30	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(sinuous)	50	0	553.543	553.543	553.543	553.543
36										NOx	Rural-Local/Collector(sinuous)	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.

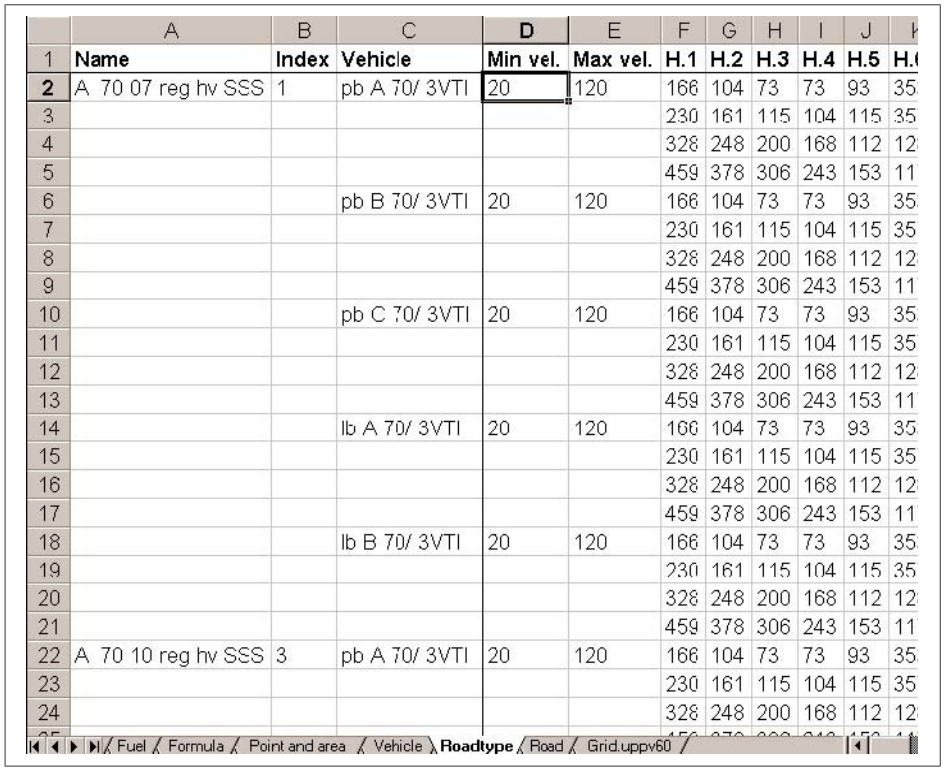
1.D.9.15. Roadtypes Sheet

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 contains 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

Fuel | Formula | Point and area | Vehicle | **Roadtype** | Road | Grid.uppv60

Figure D22. Sheet Road types.

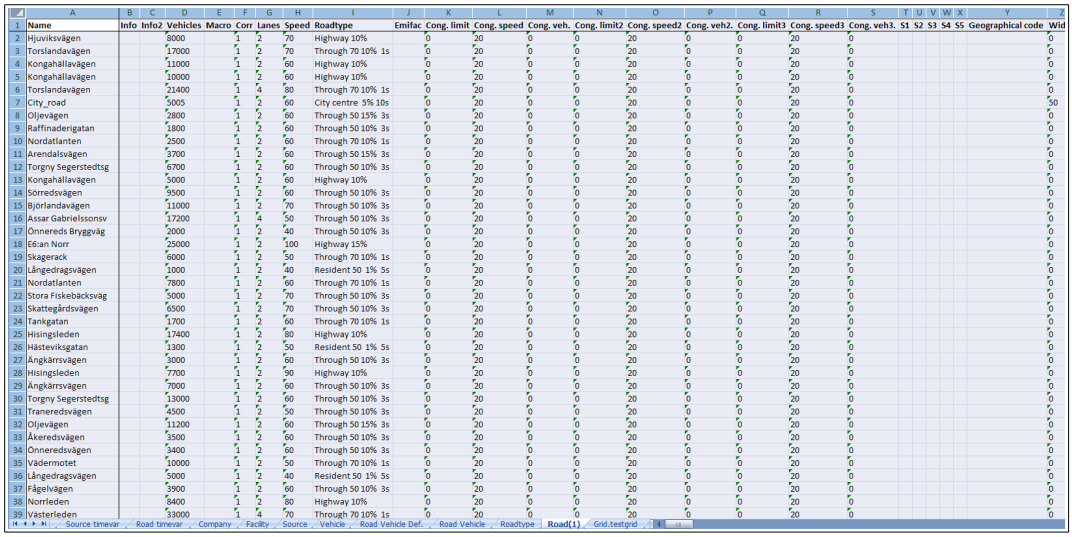
1.D.9.16. Road Sheet

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 specifies 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.
- **Geografical code**
- Width
- Dist Houses
- Slope
- Build heights
- Noise

Then follows 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	Z
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	Wid
2	Hjuviksvägen			8000		1	2	70	Highway 10%		0	20	0	0	20	0	0	20	0							0
3	Torslandavägen			17000		1	2	70	Through 70 10% 1s		0	20	0	0	20	0	0	20	0							0
4	Kongahällavägen			11000		1	2	60	Highway 10%		0	20	0	0	20	0	0	20	0							0
5	Kongahällavägen			10000		1	2	60	Highway 10%		0	20	0	0	20	0	0	20	0							0
6	Torslandavägen			21400		1	4	80	Through 70 10% 1s		0	20	0	0	20	0	0	20	0							0
7	City_road			5005		1	2	60	City centre 5% 10s		0	20	0	0	20	0	0	20	0							50
8	Oljevägen			2800		1	2	60	Through 50 15% 3s		0	20	0	0	20	0	0	20	0							0
9	Raffinaderigatan			1800		1	2	60	Through 50 10% 3s		0	20	0	0	20	0	0	20	0							0
10	Nordatlanten			2500		1	2	60	Through 70 10% 1s		0	20	0	0	20	0	0	20	0							0
11	Arendalsvägen			3700		1	2	60	Through 50 15% 3s		0	20	0	0	20	0	0	20	0							0
12	Torgny Segerstedtsg			6700		1	2	60	Through 50 10% 3s		0	20	0	0	20	0	0	20	0							0
13	Kongahällavägen			5000		1	2	60	Highway 10%		0	20	0	0	20	0	0	20	0							0
14	Sörredsvägen			9500		1	2	60	Through 50 10% 3s		0	20	0	0	20	0	0	20	0							0
15	Björlandavägen			11000		1	2	70	Through 50 10% 3s		0	20	0	0	20	0	0	20	0							0
16	Assar Gabrielssonsv			17200		1	4	50	Through 50 10% 3s		0	20	0	0	20	0	0	20	0							0
17	Önnereds Bryggväg			2000		1	2	40	Through 50 10% 3s		0	20	0	0	20	0	0	20	0							0
18	E6:an Norr			25000		1	2	100	Highway 15%		0	20	0	0	20	0	0	20	0							0
19	Skagerack			6000		1	2	50	Through 70 10% 1s		0	20	0	0	20	0	0	20	0							0
20	Långedragsvägen			1000		1	2	40	Resident 50 1% 5s		0	20	0	0	20	0	0	20	0							0
21	Nordatlanten			7800		1	2	60	Through 70 10% 1s		0	20	0	0	20	0	0	20	0							0
22	Stora Fiskebäcksväg			5000		1	2	70	Through 50 10% 3s		0	20	0	0	20	0	0	20	0							0
23	Skattegårdsvägen			6500		1	2	70	Through 50 10% 3s		0	20	0	0	20	0	0	20	0							0
24	Tankgatan			1700		1	2	60	Through 70 10% 1s		0	20	0	0	20	0	0	20	0							0
25	Hisingsleden			17400		1	2	90	Highway 10%		0	20	0	0	20	0	0	20	0							0
26	Hästeviksgatan			1300		1	2	50	Resident 50 1% 5s		0	20	0	0	20	0	0	20	0							0
27	Ångkärrsvägen			3000		1	2	60	Through 50 10% 3s		0	20	0	0	20	0	0	20	0							0
28	Hisingsleden			7700		1	2	90	Highway 10%		0	20	0	0	20	0	0	20	0							0
29	Ångkärrsvägen			7000		1	2	60	Through 50 10% 3s		0	20	0	0	20	0	0	20	0							0
30	Torgny Segerstedtsg			13000		1	2	60	Through 50 10% 3s		0	20	0	0	20	0	0	20	0							0
31	Traneredsvägen			4500		1	2	50	Through 50 10% 3s		0	20	0	0	20	0	0	20	0							0
32	Oljevägen			11200		1	2	60	Through 50 15% 3s		0	20	0	0	20	0	0	20	0							0
33	Åkeredsvägen			3500		1	2	60	Through 50 10% 3s		0	20	0	0	20	0	0	20	0							0
34	Önneredsvägen			3400		1	2	60	Through 50 10% 3s		0	20	0	0	20	0	0	20	0							0
35	Vädermotet			10000		1	2	50	Through 70 10% 1s		0	20	0	0	20	0	0	20	0							0
36	Långedragsvägen			5000		1	2	40	Resident 50 1% 5s		0	20	0	0	20	0	0	20	0							0
37	Fågelvägen			3900		1	2	60	Through 50 10% 3s		0	20	0	0	20	0	0	20	0							0
38	Norrleden			9400		1	2	80	Highway 10%		0	20	0	0	20	0	0	20	0							0
39	Västerleden			33000		1	4	70	Through 70 10% 1s		0	20	0	0	20	0	0	20	0							0

Source timevar | Road timevar | Company | Facility | Source | Vehicle | Road Vehicle Def. | Road Vehicle | Roadtype | Road(1) | Grid.testgrid

Figure D23. Road Sheet.

Högsboleden	0	0	0	0 0 0 0 0 0 0 0 0 0 0 0	1 1 1 1	1269280	6400254	1269406	6400490	1269414	6400695	1269244
Röda Stensmotet	0	0	0	0 0 0 0 0 0 0 0 0 0 0 0	1 1 1 1	1267586	6402544	1267445	6402343	1267288	6402256	1267402
City_OSPM	50	0	0	0 20 10 0 0 0 0 0 10 0 0 0 0 60		1267367	6398992	1268942	6401739			
					TRAFFIC	car CNG/petrol	STANDARD	10.000000				
Karl Johansgatan	0	0	0	0 0 0 0 0 0 0 0 0 0 0 0	1 1 1 1	1268058	6402930	1267576	6402453	1267401	6401993	
Fridhemsgatan	0	0	0	0 0 0 0 0 0 0 0 0 0 0 0	1 1 1 1	1267425	6401928	1268059	6402044			
Långströmsgatan	0	0	0	0 0 0 0 0 0 0 0 0 0 0 0	1 1 1 1	1268052	6407528	1267884	6407469	1267710	6407359	1267593
Oscarsleden	0	0	0	0 0 0 0 0 0 0 0 0 0 0 0	1 1 1 1	1269230	6403846	1269017	6403776	1268445	6403493	1268048
Soterusgatan	0	0	0	0 0 0 0 0 0 0 0 0 0 0 0	1 1 1 1	1267614	6404914	1267689	6405309	1267760	6405547	1267874
Björlandavägen	0	0	0	0 0 0 0 0 0 0 0 0 0 0 0	1 1 1 1	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

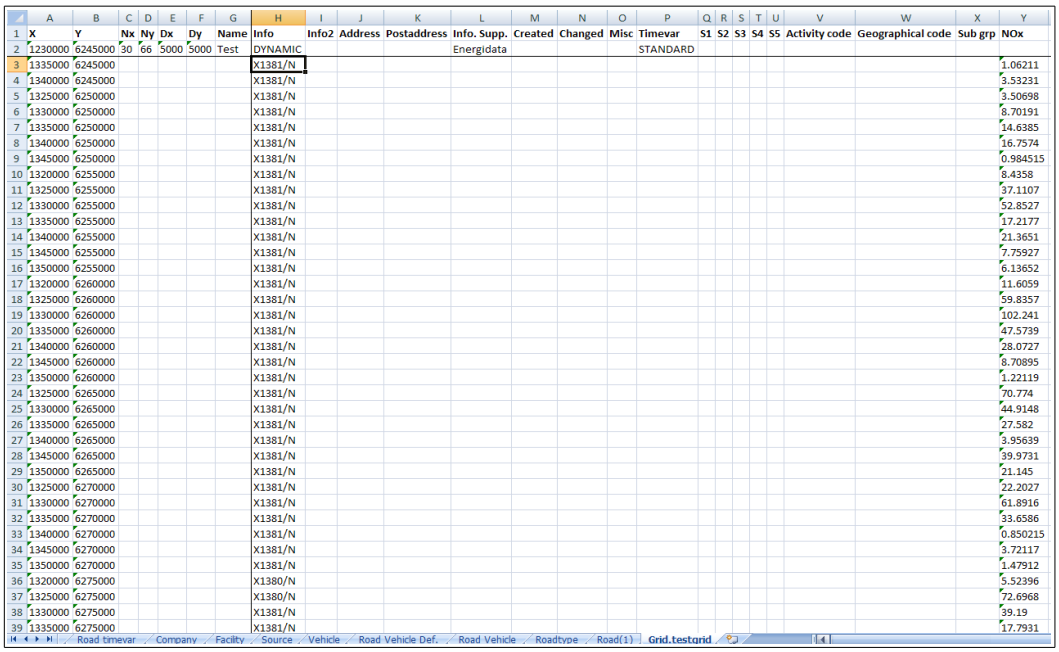
Since there can be any number of grids in an Airviro EDB, each grid corresponds to a sheet

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 contains 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 contains 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** Reference to **Time variarion** sub table.
- **S1** to **S5** References to **Searchkey** sub tables.
- **Activity Code**
- **Geographical Code**
- **Sub grp** Reference to **Substance group** sub table.
- **Sub grp emission** Number. This column only exists if Substance group is used.

If Substance group is not used, then *Substance* and **Unit** pairs follow. They can be added and deleted in the same way as for Substance groups.



	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

Road timevar | Company | Facility | Source | Vehicle | Road Vehicle Def. | Road Vehicle | Roadtype | Road(1) | Grid.testgrid

Figure D25. Sheet Grid.