

Knowledgebase

**Using Pollutant Sources in
ENVI-met**

INTRODUCTION

Simulation the dispersion of passive and active pollutants is one of the most complex tasks when using ENVI-met. The calculation of the transport and deposition of pollutants requires everything a full microclimate simulation needs to be run successfully plus additional information concerning the pollutant emissions.

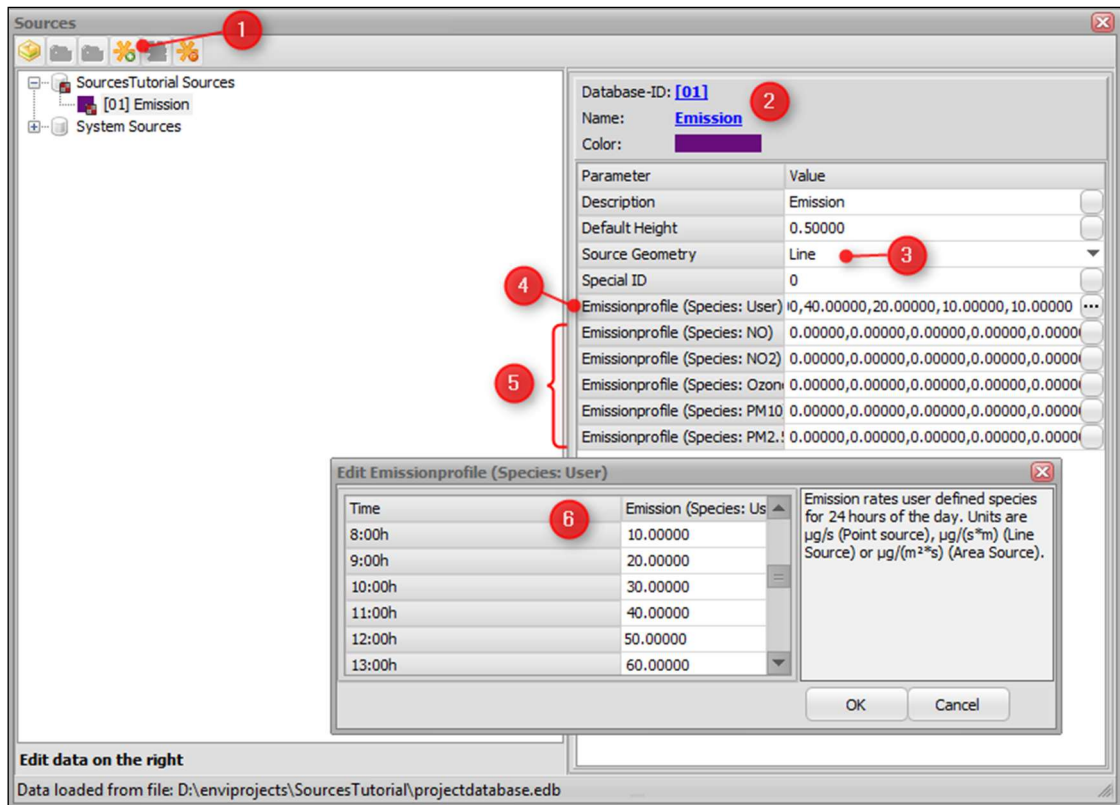
This Knowledgebase should help you to find your way in this process.

STEP 1: CREATE AN EMISSION SOURCE

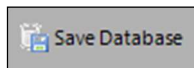
To include pollutant dispersion into your simulation there are several steps which have to be followed. First of all, the Source has to be created and defined in the *DatabaseManager*.

1. Open the DatabaseManager and create a new user-defined pollutant source ①.
Remember, in your project you might use the global User Database or you can decide to use an individual project database (see the base tutorials on our website).
2. Give the Source a unique ID ②
3. Set the Source Geometry ③.
ENVI-met distinguishes between point, line or area sources. Which type you select depends on the nature of your objects. For example, chimneys are typical point sources while street lanes are line sources. Area sources are more seldom but can be imagined e.g. as type of landcover that emits pollutants.
4. Define emission the rates for the selected species (④, ⑤):
Important: If you decide to use the **Single Pollutant Mode** in your simulation, you need to insert the hourly emission data in the **Species: User** database.
Even if your species is one of the defined species in the rows below ⑤, e.g. PM10 you still need to enter your data in the Species: User row.
The physical or chemical properties of the User pollutant will be set in the .SIM configuration file.
The rows for NO, NO2, Ozone, PM10 and PM2.5 ⑤ are only used in Multi Pollutant Mode.
5. If you want to use **Multi Pollutant Mode** you can enter the hourly emission data for the predefined 5 pollutants in the assigned rows ⑤.
You still can use a 6th User-Defined pollutant in the simulation.

Note, that Multi Pollutant Mode is only available in the full versions of ENVI-met.



Save your edits in the used database (User Database or Project Database).



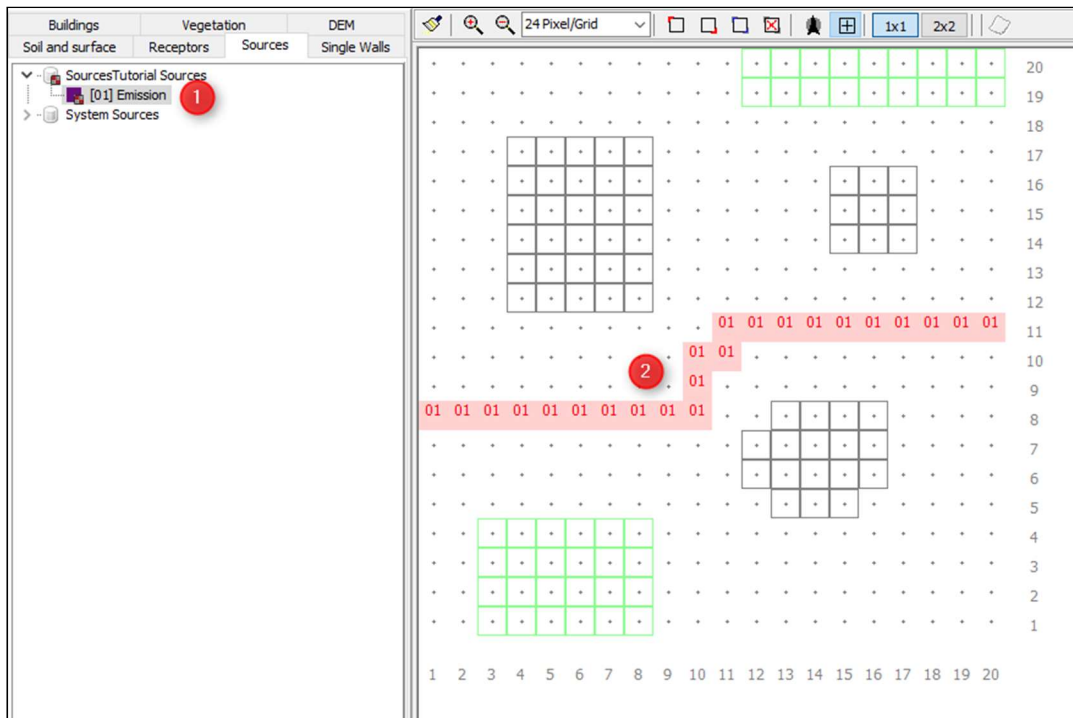
STEP2: LOCATING YOUR SOURCE IN SPACES

After adding one or more pollutant sources to your system, they are available for selection in SPACES ①.

Make sure that you have selected the right project in SPACES in order to have the right sources available. If you have changed or added new sources, just re-select the project in SPACES to reload your recent data.

The pollutants are located under the topic Sources and the chosen database ①.

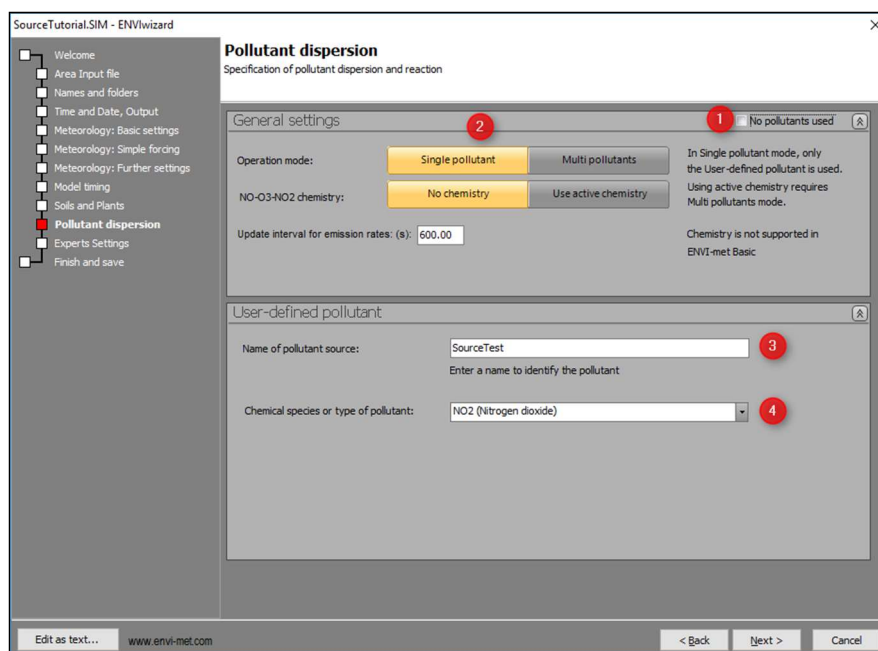
Now you can select your source and digitize it at those grid cells, where the pollutants shall be emitted ②.



STEP 3: CREATE THE CONFIGURATION FILE (.SIM)

When creating the SIM-File with the *ProjectWizard*, follow the usual steps for each simulation (refer to our homepage for various video tutorials on this).

Then, go to the pollutant Dispersion section to adjust the pollutant settings.



1. Uncheck the button "No pollutants used" ① to make the settings visible.

2. Choose the operation mode for the simulation: **Single Pollutant** or **Multi Pollutants**
Also, define if you want to use **Active Chemistry** or not.
Obviously, active chemistry will only be available if you have *Multiple Pollutants* selected.
If Chemistry is activated, the released pollutants can react with each other and create new products. At the moment, this is limited to the NO-NO₂-Ozone reaction cycle.
3. Define the User-defined pollutant.
If you use **Single Pollutant Mode** the **only pollutant present in your simulation** will be the User-Defined pollutant. It is therefore essential that you specify its properties here (③) and (④) and provide hourly emission data in the Database Manger.
4. If you use **Multi Pollutant Mode**, you can specify an additional 6th pollutant adding to the 5 fixed pollutants in ENVI-met.
Do not specify a pollutant that is already included in the 5 pre-defined pollutants (NO, NO₂, PM₁₀, PM_{2.5} and Ozone) because ENVI-met will treat this pollutant independently of the others and will not understand that e.g. PM₁₀ is defined in the fixed pollutants AND in the user defined pollutants.
5. Give your user defined pollutant a name (③)
6. Define the chemical species or type of pollutant to be emitted as User Source (④).
If particulate matter is selected as type of pollutant, you also need to give the particle diameter and density.

Save the .SIM file as usual.

RUNNING THE SIMULATION

The simulation will be executed as usual.

VISUALIZE THE RESULTS

The pollutant specific data are all stored in the **Pollutants** folder of your simulation output folder.

In *Leonardo*, use the DataNavigator to select a file from the pollutant output folder (①).

Then, select the information you want to visualize (②). Depending whether you have run a Single Pollutant mode simulation or a Multiple Pollutants mode simulation, you have different data for one or 6 different species in your file.

File Set A (checked) | 2D Map | 3D Map | Options

File Set B

File map Set A

D:\...\SourceTutorial_Multi_output\pollutants\ **1**

23.06.2017

00:00	02:00	04:00	06:00	08:00	10:00
█	█	█	█	█	█
12:00	14:00	16:00	18:00	20:00	22:00
█	█	█	█	█	█

SourceTutorialMulti_POLU_12.00.01 23.06.2017.EDX

Double-Click: (no action)

Data File A

SourceTutorialMulti_POLU_12.00.01 23.06.2017.EDT

20 x 20 x 19 grids

File type: Pollutant Data

File Set A (checked) | 2D Map | 3D Map | Options

File Set B

Assign Map Layers and Elements

Source: File Set A | File Set B

Data: <unchanged>

Contour: Pot. Temperature (K), Spec. Humidity (g/kg), Relative Humidity (%)

Symbol: Vertical Exchange Coef. Impuls (m²/s), Horizontal Exchange Coef. Impuls (m), **SourceTest Concentration (µg/m³)** **2**

Vector: SourceTest Source (µg/s), SourceTest Deposition velocity (mm), SourceTest Total Deposited Mass (µg), SourceTest Reaction Term ()

Special: NO Concentration (µg/m³), NO Source (µg/s), NO Deposition velocity (mm/s)

Arrows: NO Total Deposited Mass (µg/m²), NO Reaction Term (), NO₂ Concentration (µg/m³), NO₂ Source (µg/s), NO₂ Deposition velocity (mm/s), NO₂ Total Deposited Mass (µg/m²), NO₂ Reaction Term ()

Define T

Type of 2D view: X-Y (checked) | X-Z | Y-Z

Handle topography: (No topography in file)

Position of view plane: k= 0

Then follow the usual steps for preparing a LEONARDO 2D or 3D map

