

# Users manual

## Delta\_Emis Tool v3.0

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## 1. Introduction

The Delta\_Emis analysis/visualization tool is an IDL-based tool developed in the framework of FAIRMODE – Working Group 2 on Emissions. It is designed to screen and benchmark emission inventories, especially to compare bottom-up and top-down estimates at the country, regional and city scale.

For general information we refer to the JRC DELTA website:

<http://aqm.jrc.ec.europa.eu/DELTA/>

and the FAIRMODE website:

<http://fairmode.jrc.ec.europa.eu/>

## 2. Download and installation - The Delta\_Emis folder structure

Goto the Delta website:

<http://aqm.jrc.ec.europa.eu/DELTA/>

Register or log in, follow the instructions for the download of the Delta\_Emis Tool  
The folder structure is as follows, where 'Emis\_Benchmark' stands for the 'Home' directory:

..\Emis\_Benchmark\delta\_emis.sav

..\Emis\_Benchmark\EBInput\

..\Emis\_Benchmark\Help\

..\Emis\_Benchmark\Output\

..\Emis\_Benchmark\UserInput\

Here 'delta\_emis.sav' is the IDL executable file that is run using the icon on the desktop.

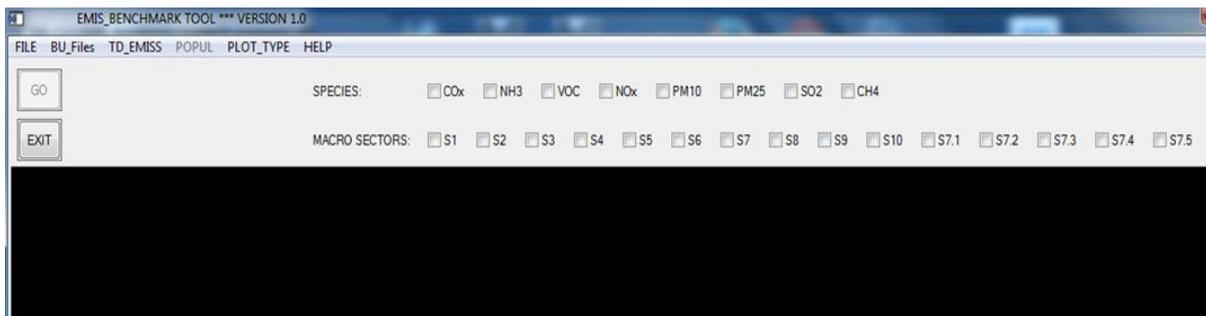
The directory 'EBInput' contains all the Delta\_Emis fixed input data (see Section 3).

The directory 'Help' contains specific options - both input and output (see Section 10).

The directory 'Output' contains all the output files.

The directory 'UserInput' contains all user defined input regarding emissions and shapefiles, and User defined MyTOD inventories (see Sections 4 and 8).

A double click on the icon and a 'Continue' will start the Tool's opening window. Click on 'ENTER' and the Tool is ready for use. A snapshot of part of the opening window is shown here, where we see the 8 admissible pollutants (see Section 3.a), and the 15 admissible SNAP emission sectors (see Section 3.a):



### 3. Delta\_Emis input data:

#### a. Emission inventories

6 European TopDown emission inventories (5 'SNAP'-type inventories and 1 of 'GNFR'-type) are available in the Tool for comparison with the user defined BottomUp information for Countries, Regions and Cities. The SNAP-type inventories consider the following pollutants:

CO<sub>x</sub>, NH<sub>3</sub>, VOC, NO<sub>x</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, CH<sub>4</sub>

The GNFR-type inventory contains

CO, NH<sub>3</sub>, NMVOC, NO<sub>x</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>x</sub>,

but are referred to as for the SNAP-type.

SNAP-type inventories consider the sectors

- S1 - Combustion in energy and transformation industries
- S2 - Non-industrial combustion plants
- S3 - Combustion in manufacturing industry
- S4 - Production processes
- S5 - Extraction and distribution of fossil fuels and geothermal energy
- S6 - Solvent use and other product use
- S7 - Road transport
- S8 - Other mobile sources and machinery
- S9 - Waste treatment and disposal
- S10 – Agriculture.

For the TNO-MACC, and the JRC7km inventory the SNAP sector S7 is disaggregated into

- S7.1 – Exhaust emission of Gasoline road transport
- S7.2 – Exhaust emissions of Diesel road transport
- S7.3 – Exhaust emissions of LPG transport
- S7.4 – non-Exhaust volatilization (Only VOC emissions)
- S7.5 – non-Exhaust Brake wear, Tyre wear, Road wear.

The JRC1km inventory has at present only NO<sub>x</sub>.

GNFR-type inventories have the following sectors:

- A\_PublicPower
- B\_Industry
- C\_OtherStationaryComb

D\_Fugitive  
 E\_Solvents  
 F\_RoadTransport  
 G\_Shipping  
 H\_Aviation  
 I\_Offroad  
 J\_Waste  
 K\_AgriLivestock  
 L\_AgriOther  
 M\_Other  
 N\_Natural

In order to distinguish these sectors from the SNAP sectors, we call them GA, GB,..., GN.

EC4MACS inventory (<http://www.ec4macs.eu/>)

This inventory is defined on a regular 842 x 779 cell longitude-latitude grid with resolution of 0.125° x 0.0625° and origin (-44.375°, 29.875°) (Centre of lower left cell). Emissions are available for the SNAP sectors S1,S2,...,S10. Emissions of CH<sub>4</sub> are not available and emissions in the sectors S7.1,...,S7.5 are set equal to zero. The reference year for EC4MACS is 2009.

TNO-MACC2 and TNO-MACC3 inventories (ref: Kuenen et al. (2014))

This inventory is defined on a regular 720 x 672 cell longitude-latitude grid with resolution of 0.125° x 0.0625° and origin (-29.7395°, 30.0313°) (Centre of lower left cell).

Emissions for CH<sub>4</sub> are available as well as emissions for the sectors S7.1,...,S7.5. These are subsectors of S7 and defined as follows:

TNO-MACC2 is implemented for the years 2003,...,2009, TNO-MACC3 for the years 2000, ..., 2011. After selection of the user input file, the TNO-MACC inventory is selected which is closest in years to the user reference year.

TNO-MACC has a combined SNAP sector 3 and 4: TNO-MACC sector S3 is equal to SNAP S3+S4, and TNO-MACC sector S4 is empty.

JRC7km inventory (ref.: <http://> )

This inventory is defined on a regular 782 x 592 cell longitude-latitude grid with resolution of 0.0625° x 0.0625° and origin (-10.4063°, 34.0625°) (Centre of lower left cell). The reference year for this inventory is 2010. Emissions for CH<sub>4</sub> are not available. In Sector 6 there are only VOC emissions; no emissions for CO<sub>x</sub>, NH<sub>3</sub>, NO<sub>x</sub>, SO<sub>2</sub> in Sector 5. As for the TNO-MACC inventories, JRC7km has a combined SNAP sector 3 and 4: the JRC7km sector S3 is equal to SNAP S3+S4, and JRC7km sector S4 is empty.

See following Table:

	CO <sub>x</sub>	NH <sub>3</sub>	VOC	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	CH <sub>4</sub>
<b>S1</b>	x	x	x	x	x	x	x	
<b>S2</b>	x	x	x	x	x	x	x	

<b>S34</b>	x	x	x	x	x	x	x	
<b>S5</b>			x		x	x		
<b>S6</b>			x					
<b>S8</b>	x	x	x	x	x	x	x	
<b>S9</b>	x	x	x	x	x	x	x	
<b>S10</b>	x	x	x	x	x	x	x	

Sector 7 is the sum of the subsectors 7.1, ..., 7.5 (see above for definitions). The subsector S7.6, which is not used in the Tool, consists of emissions from Natural Gas and H2 fueled vehicles. Within these subsectors the available emissions are indicated in the following Table:

	CO <sub>x</sub>	NH <sub>3</sub>	VOC	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	CH <sub>4</sub>
<b>S7.1</b>	x	x	x	x	x	x	x	
<b>S7.2</b>	x	x	x	x	x	x	x	
<b>S7.3</b>	x	x	x	x	x	x		
<b>S7.4</b>			x					
<b>S7.5</b>					x	x		
<b>S7.6</b>	x	x	x	x	x	x	x	

#### JRC1km inventory (ref.: <http://> )

This inventory is defined on a regular 3910 x 2960 cell longitude-latitude grid with resolution of 0.0125° x 0.0125° and origin (-10.4937°, 34.0188°) (Centre of lower left cell). The reference year for this inventory is 2010. Data is available only for NO<sub>x</sub>. Contrary to the JRC7km inventory, JRC1km has no combined SNAP sector 3 and 4: they are treated separately.

#### EMEP-GNFR inventory (<http://> )

This inventory is defined on a regular 1200 x 520 cell longitude-latitude grid with resolution of 0.1° x 0.1° and origin (-30°, 30°) (Centre of lower left cell). Emissions are available for the GNFR sectors GA,GB,...,GN. Emissions of CH<sub>4</sub> are not available. The reference year for EMEP-GNFR is 2015.

#### MyTOD:

User defined MyTOD inventories should be placed in '...\Emis\_Benchmark\ UserInput' (see chapter 8)

### **b. Shapefiles**

For 39 Countries, 428 Regions, and 477 Cities, default shape files have been defined, each consisting of a set of polygonal vertices (longitude, latitude) defining the sub areas. The shape files have the following generic names:

shape\_CntrC.dat (example: shape\_FRA.dat)

shape\_CntrC-Region-RegC.dat (example: shape\_FRA-Region-IDF.dat)

shape\_CntrC-City-CityC.dat (example: shape\_FRA-City-Paris.dat)

For the Country, Region, and City codes we refer to section 3.c.

Country/Region/City shape files have the following structure:

Example: shape\_FRA.dat

Line 1: Country Code

Line 2: The shape consists of Nparts (6) subshapes

Line 3 and on: For each subshape the polygonal vertices are given by

lon number of vertices (898 for 1<sup>st</sup> subshape)

lat number of vertices

Example: shape\_FRA-Region-IDF.dat

Line 1: Region Code [FRA-IDF] (Nparts=1, 74 vertices)

etc

Example: shape\_FRA-City-Paris.dat

Line 1: City Code [FRA-Paris] (Nparts=53; Nvertices=7 for 1<sup>st</sup> subshape)

etc

### **c. Country, Region, City codes and names**

CRC Codes.dat:

This file contains all the Country/Region/City codes of type:

FRANCE FRA

FRA-Region-IDF

FRA-City-Paris

CRC Names.dat

This file contains information on available Countries, for each Country the available regions, and for each Country the available cities

Example (see above): IDF -> Ile de France

### **d. Population Files**

One of the diagrams (TD\_BU\_emisCap) shows emission quantities per capita. Two population files are used – one on the EC4MACS inventory grid, the other on the TNO-MACC grid. Both population files are based on the INERIS 1x1 km<sup>2</sup> European Population density file (ref XXX).

The INERIS file can be replaced by the 1x1 km<sup>2</sup> EEA population densities (ref XXX), but Balkan states and some others are missing [Should be complemented with a 5x5 km<sup>2</sup> population grid. [to be done]

### **e. Ranking Files**

One of the diagrams (TD\_BU\_emisCap) shows for each (user) pollutant and for each (user) macro sector the position of its emissions per capita (on the user shape) with respect to all type (Country, Region, City) related geographical default shapes available in the EBInput directory (see Section 3.b). In a preprocessing phase emissions for all pollutants, for all 15 SNAP sectors, were calculated on all the default shapes (Country, Region, City). These files are available from the EBInput directory and are named 'emisAllxxx\_type.dat, where xxx stands for EC4macs, or MACC\*\_2006, etc, and type for Country, Region, or City. The corresponding pop files contain the population numbers on each of the Country, Region, and City default shapes.

#### 4. Delta\_Emis User input: csv input files, shapefiles, MyTOD

All user bottom-up emission information is contained in an excel (csv format) file of the following structure:

Name of the file must start with 'BU\_' and be of csv type  
(example: BU\_Fra-Paris\_info.csv)

##### First section (first line):

- The number of sub-shape files ( $\geq 0$ ). Equal to  $n$  ( $n > 1$ ) if the emission domain under consideration is composed of  $n$  sub-shape files; Equal to 0 if the region is defined by a sequence of longitude-latitude coordinates.
- The type of domain. The domain can be of Country, Region, or City type
- Identifier whether the shape file(s) are of default type 'dat' (i.e. if taken from the Delta\_Emis data base, see section 3.b), or of type 'shp' (i.e. defined by the user). A user defined shape file (of type 'shp') should be an ESRI standard shape file in a longitude-latitude coordinate system (e.g. wgs84).

##### Second section (n lines):

- The first line is followed by  $n$  lines with the  $n$  sub-shape file names (e.g. 'FRA-City-Paris') which form together the emission domain.  
In the case of a 'dat' type shape file, the sub-shape name is completed to shape\_NAME.dat (e.g. 'shape\_FRA-City-Paris.dat'). Shape files of this type must exist in the EB Input data – Shapefiles directory (see section 3.b).  
In the case of a 'shp' type shape file the name of the sub-shape is completed to 'shape\_NAME.shp' and should be provided by the user and put into the User Input directory together with the provided csv (excel) file. The shape\_NAME.shp file goes together with the corresponding shx, dbf, prj files (ESRI conventions).
- If the domain is defined by longitude and latitude values (number of shape files equal to 0 in first line), the second line contains the Country Code (see example 4 below).

##### Third section (one line):

- This line contains the reference year of the user bottom-up emissions.

Forth section:

- Lines with: Species, User defined short name of the emission macro sector; User defined long name of the emission macro sector; Correspondance of the macro SNAP sectors (S1, S2,..., S10, S7.1, S7.2,..., S7.5 ), or to the macro GNFR sectors (GA, GB, ..., GN); The emissions in kTon/year.

Keep the abbreviation of the macro sector short, because this identification will appear on the diagrams.

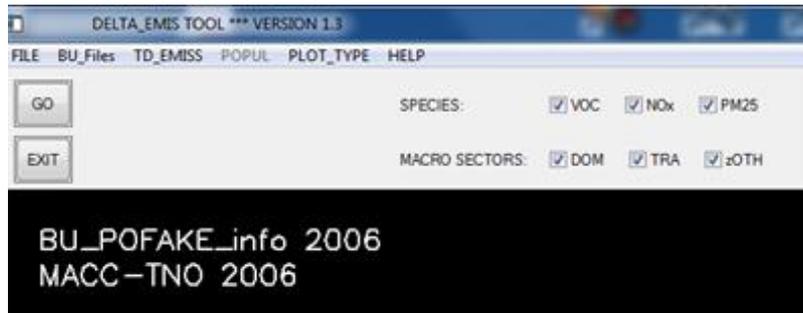
The correspondance to the SNAP (or GNFR) sectors can be of arithmetic type, like  $S1+0.5*S2+0.75*S10+0.5*S7.1$  (or  $GA+0.5*GB+0.75*GH$ ). The minus sign is not allowed, nor other multiplication factors than decimal numbers, nor other arithmetic operations.

Last line:

- END

After selection of the (user) BU input file, the list of species and the list of (user) macro sectors on the screen will adapt themselves. The user can make his own choice by unchecking or checking the desired species and the desired macro sectors. But before, a number of checks will be performed to ensure the correctness of the input file. If an error is detected in the input file, a window is opened with the error information, and a way is shown for correction.

Example of BU\_POFAKE\_info.csv



Some (fictive) examples of user input files (see also the UserInput directory of the Tool)

Example 1: BU\_Fra-Paris\_info.csv

Shape	1	City	Dat	Shape Nr of shapes Country/Region/City: Type of shape shp or dat: ESRI type or dat type shape
FRA-City-Paris		# Name of the shape files. See list of Country/Region/City identifiers		

2006		# Reference year		
#Species	BU sectors abbreviation	BU sectors nomenclature	Correspondance with SNAP	Domain Total kTon/year
NOx	DOM	Domestic	S2	30
NOx	TRA	Traffic	S7	300
NOx	zOTH	Others	S1+S4+S5+S6+S3+S8+S9+S10	116
PM25	DOM	Domestic	S2	10
PM25	TRA	Traffic	S7	11
PM25	zOTH	Others	S1+S4+S5+S6+S3+S8+S9+S10	12
VOC	DOM	Domestic	S2	25
VOC	TRA	Traffic	S7	140
VOC	zOTH	Others	S1+S4+S5+S6+S3+S8+S9+S10	350
END				

**Example 2:** BU\_PoValley\_info.csv

Shape	7	Region	Dat	
ITA-Region-VDA				
ITA-Region-PMN				
ITA-Region-LMB				
ITA-Region-TAA				
ITA-Region-VEN				
ITA-Region-FVG				
ITA-Region-ERM				
2006				
#Species	BU sectors abbreviation	BU sectors nomenclature	Correspondance with SNAP	Domain Total kTon/year
NOx	DOM	Domestic	S2	30
NOx	TRA	Traffic	S7	300
NOx	zOTH	Others	S1+S4+S5+S6+S3+S8+S9+S10	116
PM25	DOM	Domestic	S2	10
PM25	TRA	Traffic	S7	11
PM25	zOTH	Others	S1+S4+S5+S6+S3+S8+S9+S10	12
VOC	DOM	Domestic	S2	25
VOC	TRA	Traffic	S7	140
VOC	zOTH	Others	S1+S4+S5+S6+S3+S8+S9+S10	350
END				

**Example 3:** BU\_France\_info.csv

Shape	1	Country	Dat	
FRA				
2006				
#Species	BU sectors abbreviation	BU sectors nomenclature	Correspondance with SNAP	Domain Total kTon/year

NOx	S2	Domest	S2	5
NOx	S7	Traffic	S7	60
NOx	S1	Others	S1	12
PM25	S2	Domest	S2	2
PM25	S7	Traffic	S7	2
PM25	S1	Others	S1	1
VOC	S2	Domest	S2	5
VOC	S7	Traffic	S7	45
VOC	S1	Others	S1	0.5
END				

Example 4: BU\_FakeSpanishDomain\_info.csv

Shape	0	Region	Dat	
ESP		If nr shapes = 0 then give Country Code		
lon	-5.,-3.,-3.,-5.	If nr shapes = 0 then # longitudes of polygonal vertices		
lat	39.,39.,41.,41.	If nr shapes = 0 then # latitudes of polygonal vertices		
1999				
#Species	BU sectors abbreviation	BU sectors nomenclature	Correspondance with SNAP	Domain Total kTon/year
NOx	TRAc	TrafficCars	S7.1+S7.2	10
NOx	DOM	Domestic	S2	1
NOx	PTS	PointSources	0.5*S3+S1	40
NOx	OTH	Others	0.5*S3+S4+S5	9
VOC	TRAc	TrafficCars	S7.1+S7.2	14
VOC	DOM	Domestic	S2	8
VOC	PTS	PointSources	0.5*S3+S1	0.5
VOC	OTH	Others	0.5*S3+S4+S5	2
END				

Example 5: BU\_Flanders\_info.csv

Shape	2	Region	Shp	
FlandersWest_LL		# refers to ESRI shapefile: FlandersWest_LL.shp		
FlandersEast_LL		# refers to ESRI shapefile: FlandersEast_LL.shp		
2006				
#Species	BU sectors abbreviation	BU sectors nomenclature	Correspondance with SNAP	Domain Total kTon/year
NOx	DOM	Domestic	S2	30
NOx	TRA	Traffic	S7	300
NOx	zOTH	Others	S1+S4+S5+S6+S3+S8+S9+S10	116
PM25	DOM	Domestic	S2	10
PM25	TRA	Traffic	S7	11
PM25	zOTH	Others	S1+S4+S5+S6+S3+S8+S9+S10	12

Example 6: BU\_PoValley\_New\_info.csv (GNFR type)

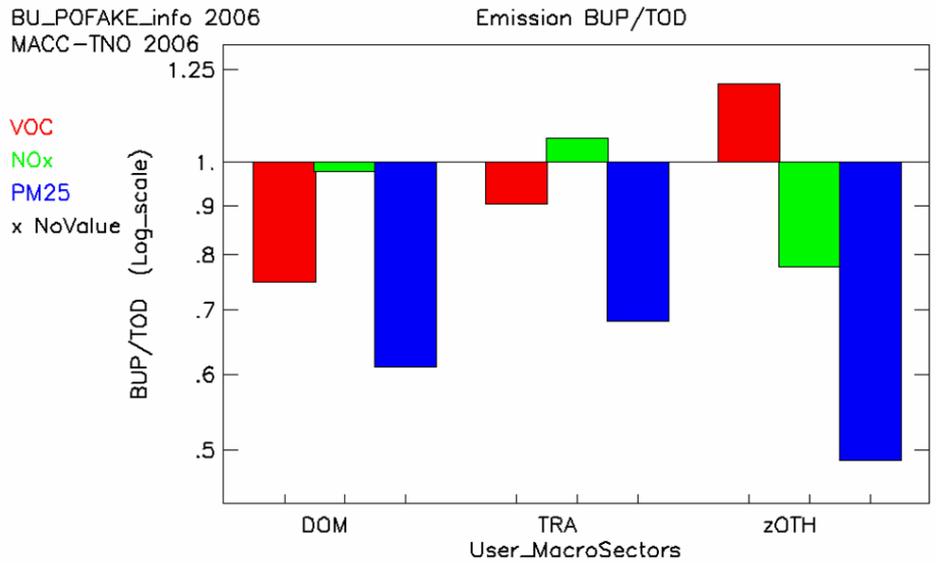
Shape	7	Region	Dat	
ITA-Region-VDA				
ITA-Region-PMN				
ITA-Region-LMB				
ITA-Region-TAA				
ITA-Region-VEN				
ITA-Region-FVG				
ITA-Region-ERM				
2006				
<b>#Species</b>	<b>BU sectors abbreviation</b>	<b>BU sectors nomenclature</b>	<b>Correspondance with SNAP</b>	<b>Domain Total kTon/year</b>
NOx	DOM	Domestic	GA	30
NOx	TRA	Traffic	GF	300
NOx	zOTH	Others	GB+GC+GD+GE+GG+GH+GI+GJ+GK+GL+GM+GN	116
PM25	DOM	Domestic	GA	10
PM25	TRA	Traffic	GF	11
PM25	zOTH	Others	GB+GC+GD+GE+GG+GH+GI+GJ+GK+GL+GM+GN	12
VOC	DOM	Domestic	GA	25
VOC	TRA	Traffic	GF	140
VOC	zOTH	Others	GB+GC+GD+GE+GG+GH+GI+GJ+GK+GL+GM+GN	350
END				

From the line of correspondences in the BU file, the Tool automatically detects the use of SNAP-type or GNFR-type top down emission inventories

## 5. Delta\_Emis diagrams

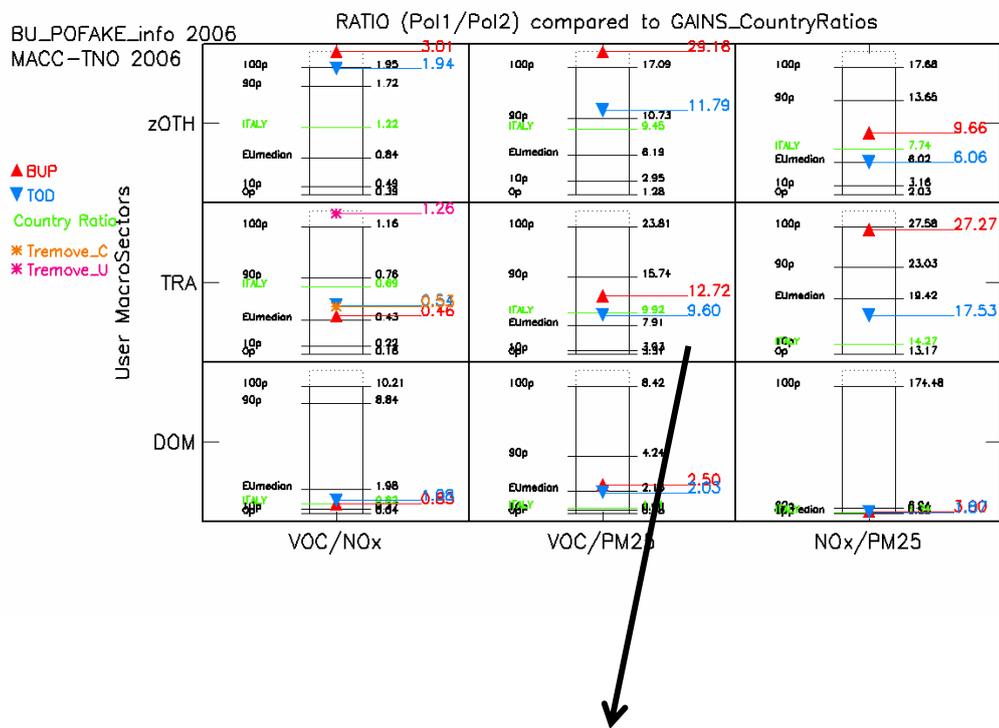
Diagrams for BU\_POFAKE\_info are now shown with short explanation

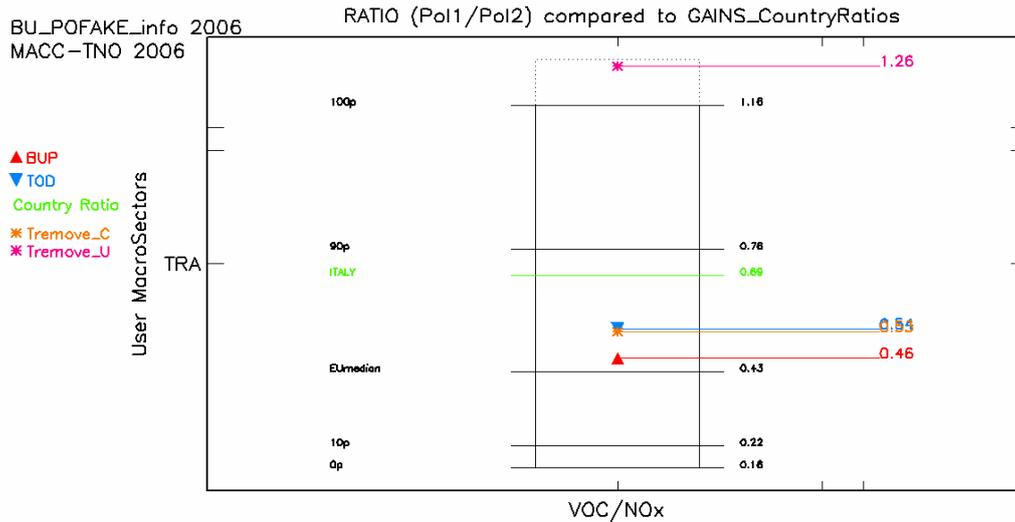
### a. TD\_BU\_bar



For the selected species and for the selected (user) macro sectors, this plot shows the ratios of BottomUp emissions to TopDown emissions. Note that the vertical scale is logarithmic.

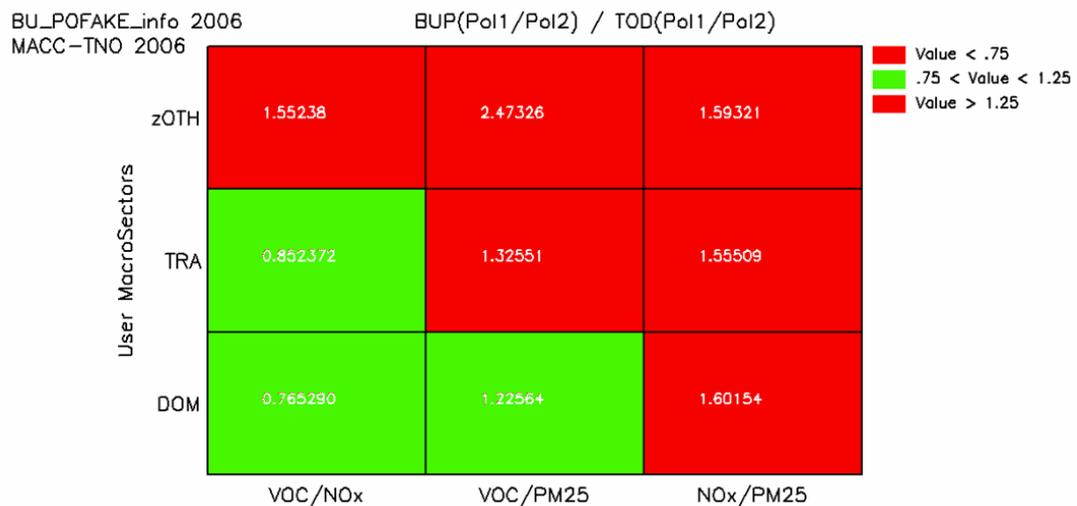
**b. TD\_BU\_ratio (SNAP-type inventories only)**





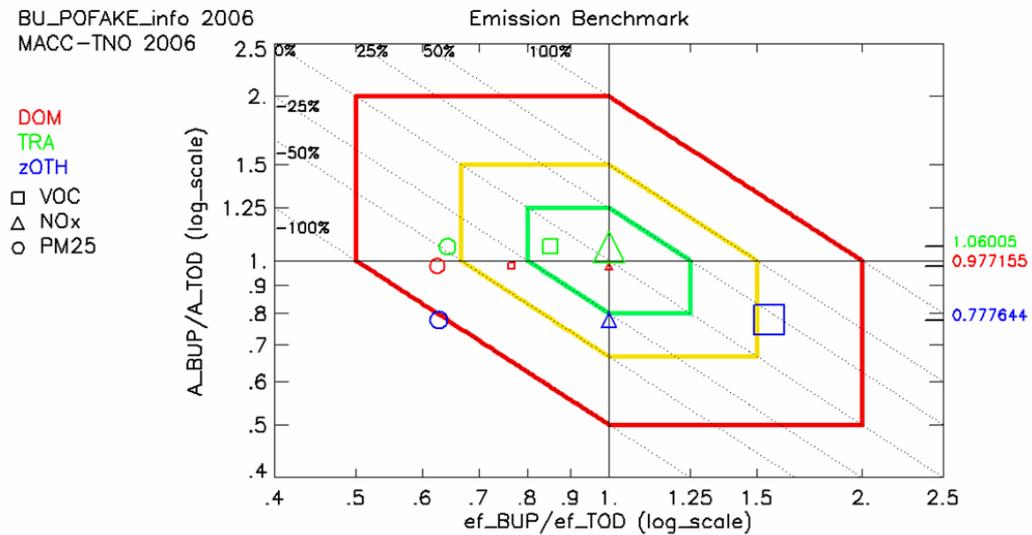
For the selected species and for the selected (user) macro sectors, this plot shows the ratios of Pollutant1 to pollutant2 (Pol1/Pol2). The red triangle represents the (user) BottomUp value, while the blue triangle shows the TopDown value of the ratio. Besides these triangles, the diagram also shows the range of GAINS Country values for the ratio ranging from the Country with the lowest value (0 percentile) to the Country with the largest value (100 percentile), as well as the EU median value and the value for the Country for the shape under consideration.

### c. TD\_BU\_ratio2



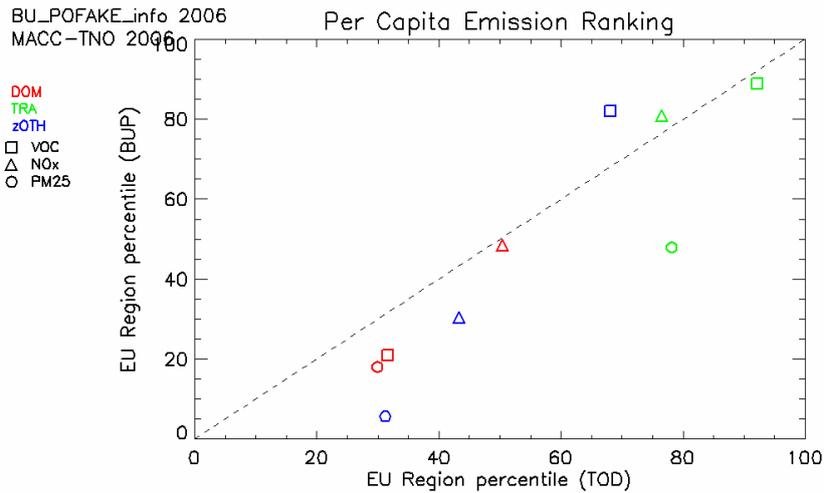
For the selected species and for the selected (user) macro sectors, this plot shows the ratio of ratios for Pollutant1 to pollutant2 (i.e. BottomUp(Pol1/Pol2)/TopDown(Pol1/Pol2)). Values between 0.75 and 1.25 are coloured in green; outside this range in red. [value 0.75, 1.25 to be discussed]

#### d. TD\_BU-diamond

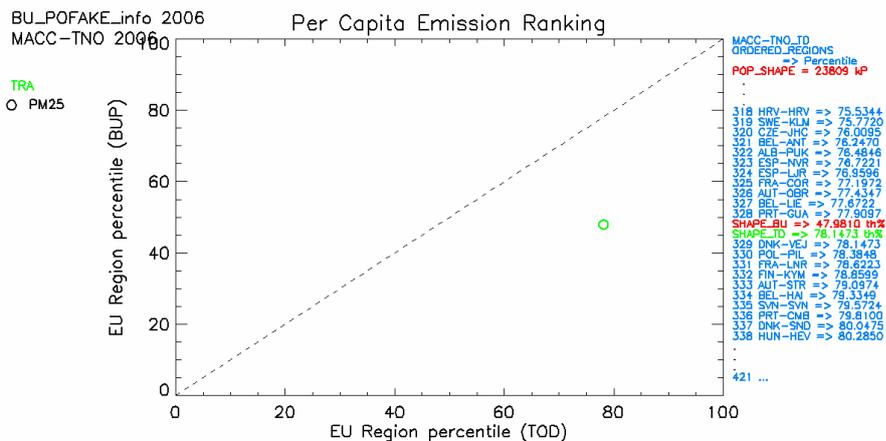


Activity- vs Emission Factor diagram. The X and Y axis indicate the discrepancies between the BottomUp and TopDown inventories in terms of emission factor and activity rate, respectively. The diagonal isolines are indicative of discrepancies in terms of total emissions. The coloured isolines delimitate the areas where the three factors: emission totals, activity rate and emission factors are all fulfilling a given threshold (e.g. red one for a factor 2 threshold). The shape and color of the symbols refer to the pollutant and to the (user) macro sector, respectively. The size of the symbols (which is scaled between 1 and 5) is, for each pollutant and each user sector, a measure of the relative contribution of the BUP emissions to the total of the BUP in all the setors. Through the Help droplist, the sizes of the symbols can be changed to refer to TOD emissions (see section 10.j) Ref XXX.

#### e. TD\_BU\_emisCap

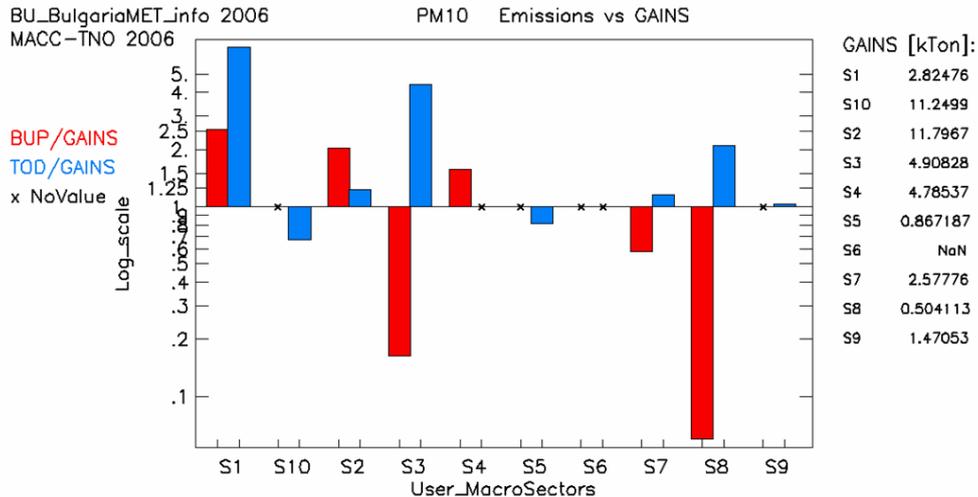


Depending on the geographical type (Country, Region, City), the x and y axis represent the sequence of emissions per capita for the (user) macro sectors, for the selected species, and for all the default shapes of the same type – running from 0 percentile to 100 percentile. The axis always run from 0 to 100, but the underlying ranking of geographical shapes is species and macro sector dependent. The x-axis gives the TOD percentile, the y-axis the BUP percentile.



This diagram is the same as the previous one, but for one species ( $PM_{25}$ ) and for one sector (TRA). The corresponding ranking of shapes ordered by emissions per capita on the default shapes is partly shown on the right-hand side of the picture, with the (user BU) shape percentile in red, and the TD percentile in green. The total population (in kPers) on the (user) shape is indicated above in red. The full ranking of default shapes can be edited from the 'PercOrderShapes' option in the 'HELP' droplist (see Section 10.e).

## f. TD\_BU\_GAINS



This diagram shows, for one selected species, the ratios of BottomUp and TopDown to GAINS country values. BUP/GAINS and TOD/GAINS are shown in red and blue bars on a logarithmic scale, while the absolute GAINS country values for the (user) macro sectors are tabled on the right. GAINS values are available every 5 years from 2000 until 2030; for intermediate years the GAINS values are linearly interpolated.

## 6. 'FILE' droplist

- SaveImage\_Wbgr: Saves the diagram (with White background) into a tiff file in the 'Output' directory. File name is 'PICT\_ED\_n.tif', with n equal to 1,2,3,...
- SaveImage\_Bbgr: Same as before with Black background
- DumpData: Dumps all information and the numeric data of the diagram into the dumpfile, named 'DumpData.dat' in the 'Output' directory. Subsequent calls to 'DumpData' will add new info/data to the dumpfile (i.e. no overwrite). The contents of the dumpfile can be edited from the 'EditDump' option in the 'HELP' droplist (see Section 10.f).
- DumpTOD: Part of the TOD emission inventory is dumped into the file 'dumpTOD.dat' in the 'Output' directory. The part of the TOD inventory is a rectangle (longitude – latitude) containing all the shapes which constitute the domain. Longitude values, Latitude values are dumped as well as all the cell emissions for all the active pollutants and all the user macro sectors.
- Save TOD as BU: This option will save the selected TOD emission inventory as a 'user' BU input file in the UserInput folder. The structure of the newly created file is exactly the same as the user City/Region/Country BU file. File naming is the same with BU changed into BU\_'TODemissionInventory'.

Example: The user input file BU\_MadridBSC.csv will be called BU\_EC4MACS\_MadridBSC.csv or BU\_TNO-MACC2\_MadridBSC.csv. This allows the intercomparison of two TOD emission inventories on the shape defined by the City/Region/Country with its corresponding (user) macro sectors.

## 7. 'BU\_Files' droplist

User BU\* files can be selected from the BU\_Files droplist. These files are grouped by type: Country, Region, City. At any time the selected BU file can be edited from the 'BU\_UserInput' option in the 'HELP' droplist (see Section 10.a)

## 8. 'TD\_EMISS' droplist

6 European TopDown emission inventories are available in the Tool: EC4MACS (reference year 2009), TNO-MACC2 (for reference years 2003,...,2009), TNO-MACC3 (for reference years 2000,...,2011), JRC7km (with reference year 2010), JRC1km (reference year 2015), and EMEP-GNFR (reference year 2015). Switching between these inventories is done in the TD\_Emiss droplist.

Remember that EC4MACS does not have CH<sub>4</sub> and no sectors S71,...,S7.5; TNO-MACC does have CH<sub>4</sub> as well as the subsectors of S7, but has a combined sector 3 and 4, where TNO-MACC sector S3 is equal to SNAP S3+S4, and TNO-MACC sector S4 is empty. JRC7km does not have CH<sub>4</sub>, and a combined sector S3+S4, while JRC1km has no CH<sub>4</sub> and separate S3 and S4 sectors. EMEP-GNFR has 14 sectors.

The 'MyTOD' option under the TD\_EMISS droplist gives the possibility to insert a user defined TOD emission inventory over the whole or part of Europe. The name of such a file is EMIS\_MyTOD\_xxx\_yyyy\_info.nc, where 'info' stands for user information, 'yyyy' for the reference year, and 'xxx' stands for 'N34', 'Y34' or 'GNFR' depending on whether SNAP sectors are used with combined sectors 3 and 4 (Y34), not combined sectors 3 and 4 (N34), or GNFR sectors.

Examples:

'EMIS\_MyTOD\_Y34\_2005\_info1.nc',  
'EMIS\_MyTOD\_N34\_2009\_info2.nc'  
'EMIS\_MyTOD\_GNFR\_2015\_info3.nc'.

The MyTOD emission file is of netcdf type with variables:

- 'lon', and 'lat' defined at the cell centres of a (not necessarily regular) longitude/latitude grid with nx cells in one direction and ny cell in the other direction.

- 'EMISS', the emissions variable (in units Ton/cell) with dimensions (Nspec,nx,ny,Nsect), with nx and ny equal to the number of cells in the 2 coordinate direction. Nspec and Nsect depend on the identifiers N34/Y34/GNFR.

- For N34 (SNAP-type): Nspec is equal to 8 (CO<sub>x</sub>, NH<sub>3</sub>, VOC, NO<sub>x</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, CH<sub>4</sub>); Nsect is equal to 10 (S1,...,S10) if the Traffic subsectors S7.1,...,S7.5 are not included, and equal to 15 if they are included.
- For Y34 (SNAP-type): Nspec is equal to 8 (CO<sub>x</sub>, NH<sub>3</sub>, VOC, NO<sub>x</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, CH<sub>4</sub>); Nsect is equal to 9 (S1,S2,S34,S5,...,S10) if the Traffic subsectors S7.1,...,S7.5 are not included, and equal to 14 if they are included.
- For GNFR (GNFR-type): Nspec is equal to 7 (CO<sub>x</sub>, NH<sub>3</sub>, VOC, NO<sub>x</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>); Nsect is equal to 14 (GA, GB,...,GN)

The array EMISS\_MyTOD must be complete; if no emissions are available a '0' should be given.

When a MyTOD inventory is selected, a test is performed to check whether or not the user defined domain/shape (defined in the BU input file, see chapter 4) is included in the MyTOD emission domain. If this is not the case, the MyTOD inventory will be reset to the EC4MACS inventory.

## 9. 'PLOT\_TYPE' droplist

In this droplist a choice can be made for the various diagrams (see Section 5):

- a. TD\_BU\_bar
- b. TD\_BU\_ratio
- c. TD\_BU\_ratio2
- d. TD\_BU\_diamond
- e. TD\_BU\_emisCap
- f. TD\_BU\_GAINS (only for Country type)

## 10. 'HELP' droplist

- a. BU UserInput: Edit the user BU file (see Section 3) using 'notepad'. On exit of the editor a new diagram will automatically be created.
- b. Macro=> SNAP/GNFR: Correspondance between the User defined macrosectors and the SNAP/GNFR sectors.
- c. CRC Codes: Edit Country/Region/City codes for which default shapefile are available (see Sections 3.b, 3.c).

- d. CRC Names: Edit full names of Country/Region/City codes (see Section 3.c)
- e. PercOrderShapes: Edit the full ranking of default shapes with the corresponding percentiles produces by the TD\_BU\_emisCap diagram in the case of one species and one sector (see the second diagram in Section 5.e). For the situation of diagram 5.e (TRA sector, PM<sub>25</sub>) the file contains the following quantities for the 421 Region shapes:

Ranking number -- Percentile -- TopDown Emissions [Tons] -- Population [kPers]

```

Ranking EMIS_Benchmark
Fri Nov 28 16:42:06 2014
EB Input File = BU_POFAKE_info 2006 (type=Region)
Emission Inventory = MACC-TNO 2006
Spec=PM25 Sector=TRA
*****
Nr  SHAPE =>                %                Emiss [Ton]      Pop [kP]
   Region =>                47.9810         11000.0          23809
1   MDA-Region-MDA =>       0.237530        413.336         4219.95
2   CHE-Region-BST =>       0.475059        20.9256         193.132
3   CHE-Region-GLR =>       0.712589        7.48687         60.2000
4   GRC-Region-IIS =>       0.950119        30.5256         212.657
5   ROM-Region-BTS =>       1.18765         66.1176         446.670
6   ROM-Region-IAS =>       1.42518         120.652         798.398
7   DEU-Region-BER =>       1.66271         494.504         3266.93
8   ROM-Region-BAC =>       1.90024         118.907         775.928
9   GRC-Region-AIS =>       2.13777         67.0570         436.144
10  ROM-Region-GOR =>       2.37530         59.1113         377.977
11  ....
12  ....
-
-
-
421 .....

```

The considered region has a percentile of 47.9810 .

- f. Edit Dump: Edit the dumpfile. For the bar plot, the ratio plot and the diamond plot, and for the example (BU\_POFAKE\_info) above, the contents of the dumpfile looks like:

```

DumpFile EMIS_BENCHMARK TOOL

Tue Nov 25 12:09:02 2014
*****

EB Input File = BU_POFAKE_info 2006 (type=Region)
Emission Inventory = MACC-TNO 2006
Diagram = BarPlot: BUP, TOD, BUP/TOD

Sector= DOM:
VOC: BUP=25.0000 TOD=33.3779 BUP/TOD=0.748998
NOx: BUP=30.0000 TOD=30.6526 BUP/TOD=0.978710
PM25: BUP=10.0000 TOD=16.3638 BUP/TOD=0.611106
Sector= TRA:
VOC: BUP=140.000 TOD=154.722 BUP/TOD=0.904849
NOx: BUP=300.000 TOD=282.601 BUP/TOD=1.06157
PM25: BUP=11.0000 TOD=16.1139 BUP/TOD=0.682640
Sector= zOTH:
VOC: BUP=350.000 TOD=289.496 BUP/TOD=1.20900
NOx: BUP=116.000 TOD=148.946 BUP/TOD=0.778803
PM25: BUP=12.0000 TOD=24.5486 BUP/TOD=0.488826
*****

EB Input File = BU_POFAKE_info 2006 (type=Region)
Emission Inventory = MACC-TNO 2006
Diagram = Poll/Pol2: BUP TOD GAINS_Country_Ratio p0 p100

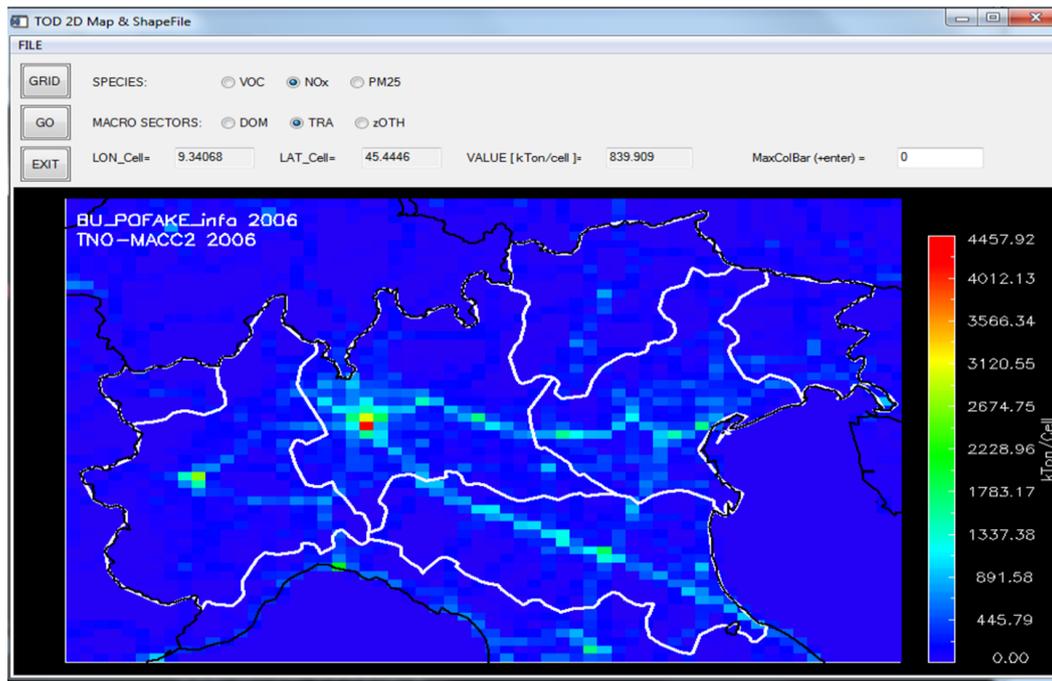
Sector= DOM:
VOC/NOx: BUP=0.833333 TOD=1.08891 GAINS=0.827507 p0=0.048 p100=10.215
VOC/PM25: BUP=2.50000 TOD=2.03975 GAINS=1.11261 p0=0.786 p100=8.428
NOx/PM25: BUP=3.00000 TOD=1.87320 GAINS=1.34453 p0=0.189 p100=174.488
Sector= TRA:
VOC/NOx: BUP=0.466667 TOD=0.547492 GAINS=0.694876 p0=0.165 p100=1.162
VOC/PM25: BUP=12.7273 TOD=9.60176 GAINS=9.92169 p0=3.311 p100=23.817
NOx/PM25: BUP=27.2727 TOD=17.5377 GAINS=14.2784 p0=13.176 p100=27.583
Sector= zOTH:
VOC/NOx: BUP=3.01724 TOD=1.94363 GAINS=1.22064 p0=0.394 p100=1.956
VOC/PM25: BUP=29.1667 TOD=11.7928 GAINS=9.45307 p0=1.285 p100=17.091
NOx/PM25: BUP=9.66667 TOD=6.06741 GAINS=7.74434 p0=2.037 p100=17.689
*****

EB Input File = BU_POFAKE_info 2006 (type=Region)
Emission Inventory = MACC-TNO 2006
Diagram = Diamond: E_BUP/E_TOD A_BUP/A_TOD SymSize(1-5)

Sector= DOM:
VOC: E_BUP/E_TOD=0.765290 A_BUP/A_TOD=0.978710 SymSize=1.00000
NOx: E_BUP/E_TOD=1.00000 A_BUP/A_TOD=0.978710 SymSize=1.11866
PM25: E_BUP/E_TOD=0.624400 A_BUP/A_TOD=0.978710 SymSize=2.61305
Sector= TRA:
VOC: E_BUP/E_TOD=0.852372 A_BUP/A_TOD=1.06157 SymSize=2.41538
NOx: E_BUP/E_TOD=1.00000 A_BUP/A_TOD=1.06157 SymSize=4.95585
PM25: E_BUP/E_TOD=0.643050 A_BUP/A_TOD=1.06157 SymSize=2.80513
Sector= zOTH:
VOC: E_BUP/E_TOD=1.55238 A_BUP/A_TOD=0.778803 SymSize=5.00000
NOx: E_BUP/E_TOD=1.00000 A_BUP/A_TOD=0.778803 SymSize=2.34088
PM25: E_BUP/E_TOD=0.627664 A_BUP/A_TOD=0.778803 SymSize=2.99720
*****

```

- g. Edit dumpTOD: Edit the dump of the TOD inventory (see Section 6.d).
- h. Map2dTOD: This option produces a 2d map of the domain, and a visualization of the TOD inventory for a selected user macro sector and a selected pollutant. A new window will be opened, and the 'GO' button will produce the 2d visualization.



When moving the cursor of the domain, the values for Longitude and Latitude are shown as well as the cell-emission in kTon (ie kTon/cell). The scale of the color bar can be changed using the editable MaxColBar field (+ enter). This option can be used to see more detail in the 2d map. A value of 0 gives the max cell-value of the inventory in question. The TOD grid can be superimposed by the 'GRID' button (toggle button). An example shown in the picture above is for the TNO-MACC2 inventory, user input BU\_POFAKE\_infa, pollutant NOx, and the traffic sector TRA. The 7 subshapes of POFAKE with white borders can be distinguished. Under FILE/Save on this window, the image can be saved using a black or a white background. Going back to the window with the original diagram, another choice (diagram, TOD inventory, etc) can be made. When a new BU\* input file is selected or another TOD inventory, the TOD 2d map will disappear.

- i. Diamond-Settings: There are 6 choices for the normalization of the ratios in the Diamond diagram (see section 5.d).

i.1: Which Normalisation to use.

# 1 Normalisation by NOx (or another species if NOx is not present).

# 2 Sector specific normalization:

if Usect2Snap <-> Snap1 then normalisation by SO2

if Usect2Snap <-> Snap5 then normalisation by PM10

if Usect2Snap <-> Snap6 then normalisation by VOC

if Usect2Snap <-> Snap9 then normalisation by PM10

if Usect2Snap <-> Snap10 then normalisation by NH3

else

normalisation by NOx (or other species if NOx not present).

For GNFR-type inventories: only NOx normalization.

# 3 Normalisation over Total TOD :

$$Yratio(is)=total(BUP(*,is))/total(TOD(*,is),/nan)$$

# 4 Normalisation of (total TOD + total BUP)/2:

$$Yratio(is) = 2.*total(BUP(*,is),/nan)/(total(TOD(*,is),/nan)+total(BUP(*,is),/nan) )$$

# 5 Sector specific normalisation with respect to the species with the best relative BUP to TOD estimate ( |BUP-TOD|/TOD ).

# 6 Normalisation with respect to the mean of two pollutants with smallest relative X (ie emission factor) distance.

i.2: Selection of the Normalisation.

i.3: Symbol size is defined by

$$BUP(spec,sect) / \sum BUP(spec,*)$$

scaled between 1. and 5.

The reference for the symbol sizes can be changed from BUP to TOD.

j. User Guide: Opens the pdf version of the User Guide.

On a Windows operating system, the program searches for the Acrobat executable under 'c:\', 'd:\', and executable names 'Acrobat.exe' and 'acroRd32.exe'. For future use, the full path to the executable is then saved into the file 'Paths.ini' in the directory 'UserInput'. If the executable is located at a different place from the ones mentioned above, the user can create a 'Paths.ini' file in 'UserInput' and set the first line to

PDFreader = 'Full Path To Executable' (without ' ').

Example:

PDFreader = C:\Program Files (x86)\Adobe\Reader 11.0\Reader\Acrobat.exe

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