

# Introduction to SHERPA



**SHERPA**  
Screening for High Emission  
Reduction Potential on Air



Input data provided by INERIS



**A. Clappier**

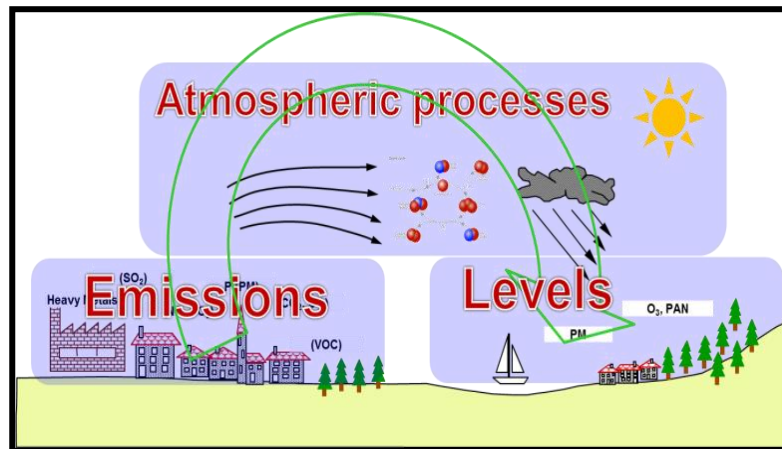


Software developed by TerrAria  
under the Contract Procedure  
no. JRC/IPR/2014/H.2/0023/NC

# SHERPA

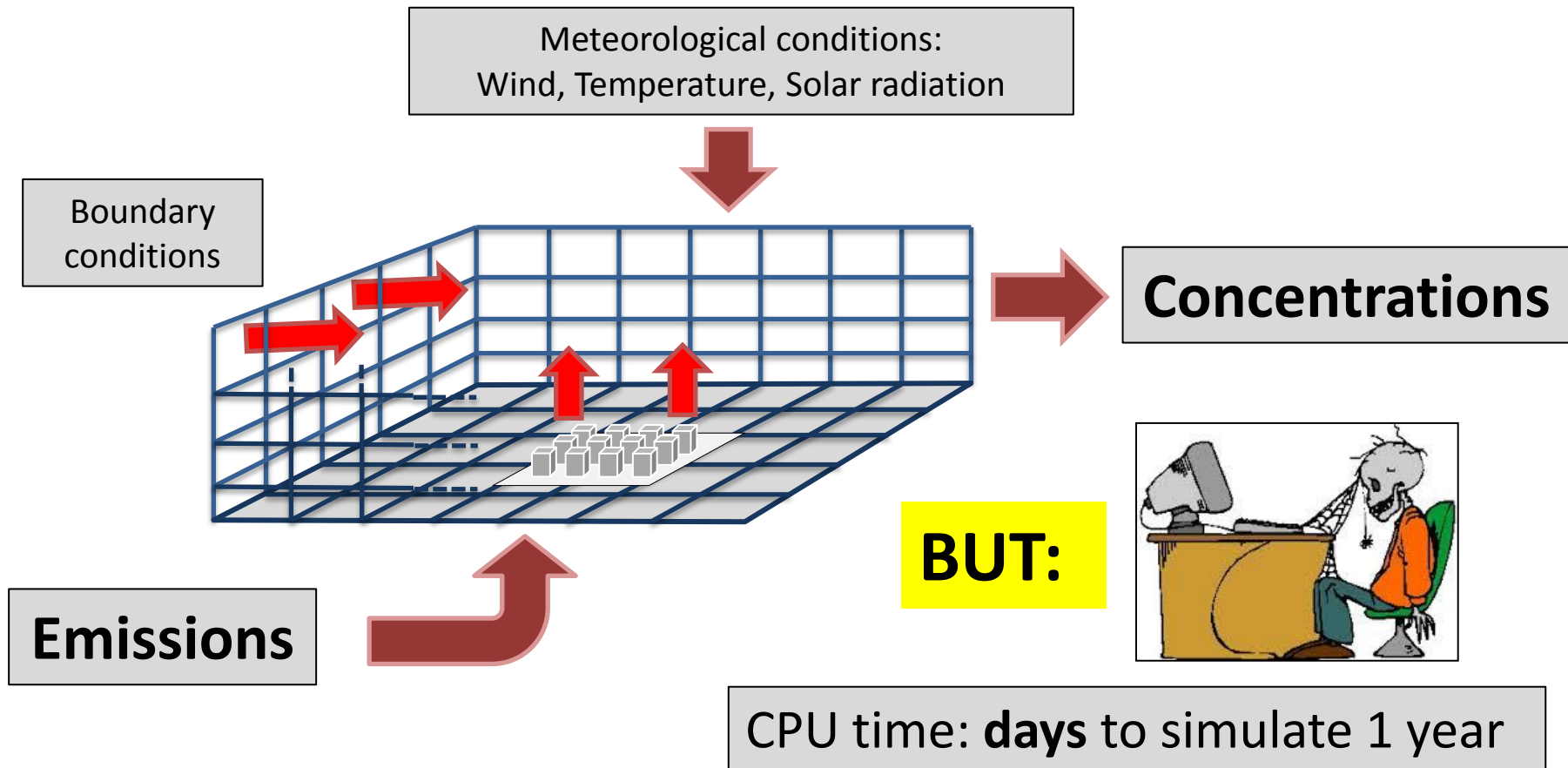
**SHERPA** means, **S**creening for **H**igh **E**mission **R**eduction **P**otentials on **A**ir quality.

**SHERPA** aims to screen the space of all possible emission abatement scenarios.

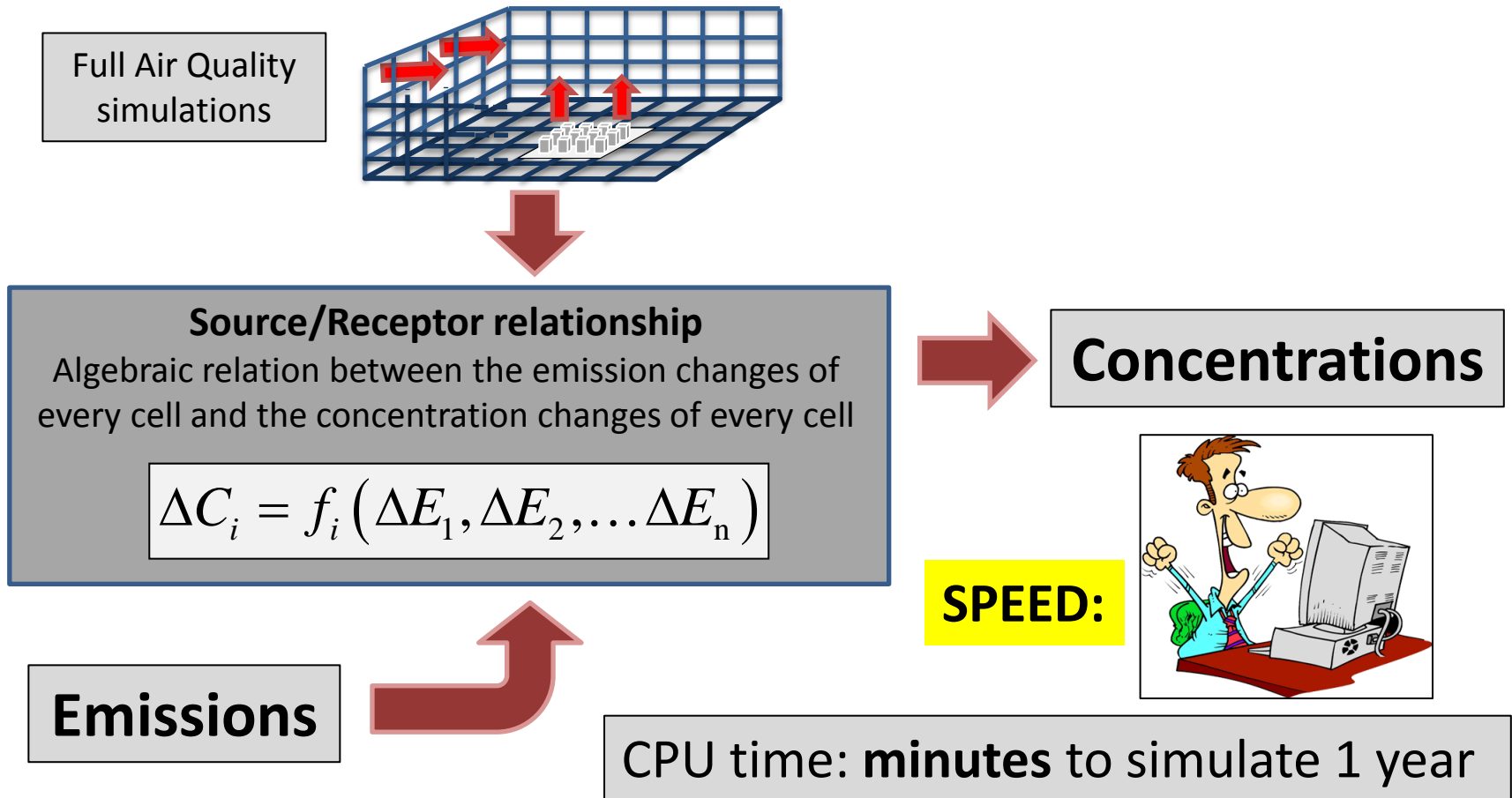


# Air Quality Model

Air Quality Models can screen all possible abatement scenarios,



# SHERPA Features

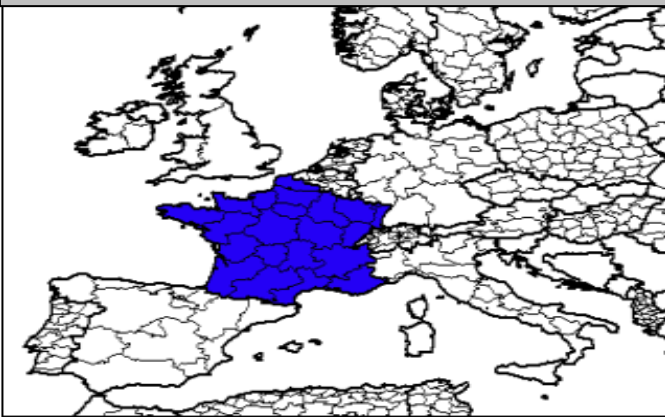


# SHERPA Features

Training simulations (10)



Application



$\Delta E$  Europe wide  $\Rightarrow \Delta C$

**EASY SET UP**

Source/Receptor relationship

$$\Delta C_i = f_i(\Delta E_1, \Delta E_2, \dots, \Delta E_n)$$

$\Delta E$  Country / region  $\Rightarrow \Delta C$

**SPATIAL FLEXIBILITY**

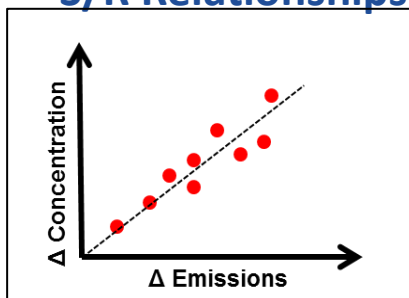
# SHERPA Features

## Input SHERPA

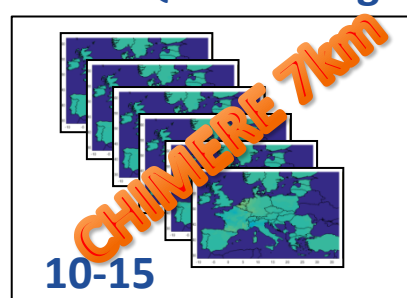
### Shapes



### S/R Relationships



### AQ Modelling



**ADAPTABILITY**

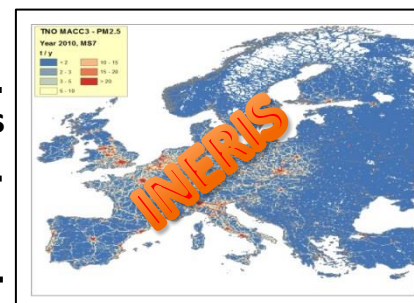
The screenshot shows the SHERPA software interface. On the left is a list of countries with checkboxes. In the center is a map of Europe. Below the map is a "Reduction table" with columns for "ALL", "MS1" through "MS10", and "ALL". The table contains numerical values for various pollutants.

	ALL	MS1	MS2	MS3	MS4	MS5	MS6	MS7	MS8	MS9	MS10
ALL	0	0	0	0	0	0	0	0	0	0	0
NOx	0	0	0	0	0	0	0	0	0	0	0
NMVO	0	0	0	0	0	0	0	0	0	0	0
NH3	0	0	0	0	0	0	0	0	0	0	0
PM25	0	0	0	0	0	0	0	0	0	0	0
SOx	0	0	0	0	0	0	0	0	0	0	0

← Gridded emissions

← SNAP

← Precursors



Emission Inventory

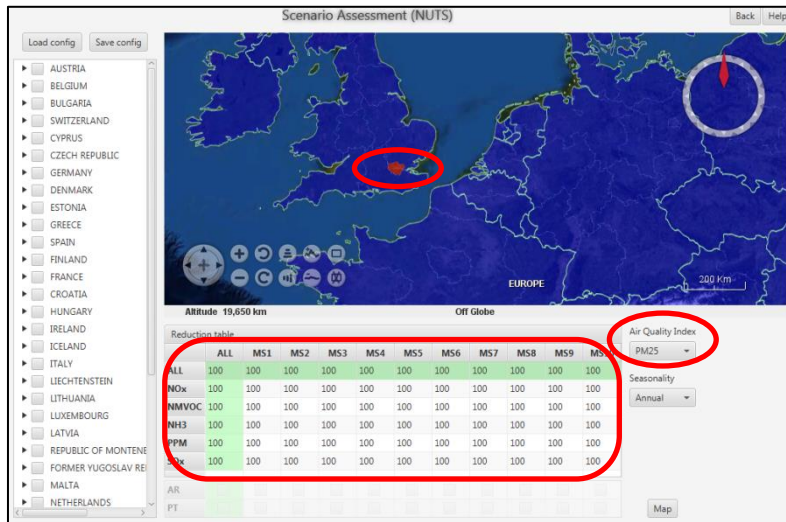


# SHERPA Options

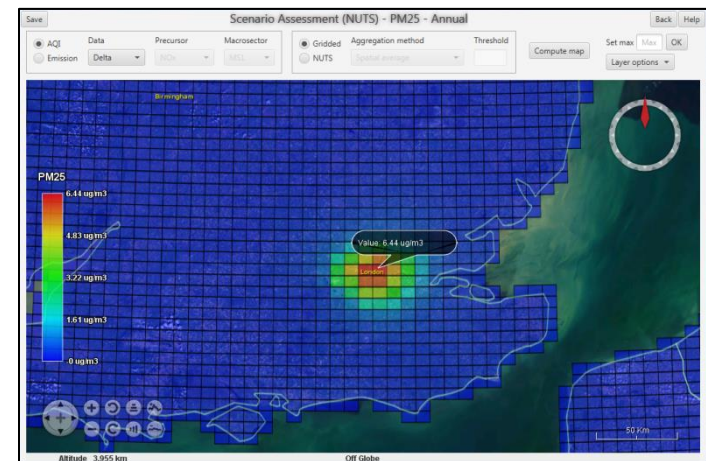
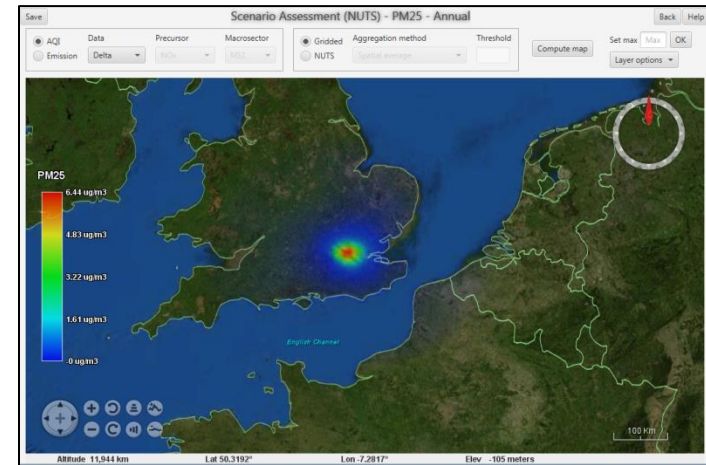
## Scenario Assessment

### Selection of:

- a region
- an Air Quality Index
- activity sectors or precursors



### Concentration changes (i. e. Delta values)



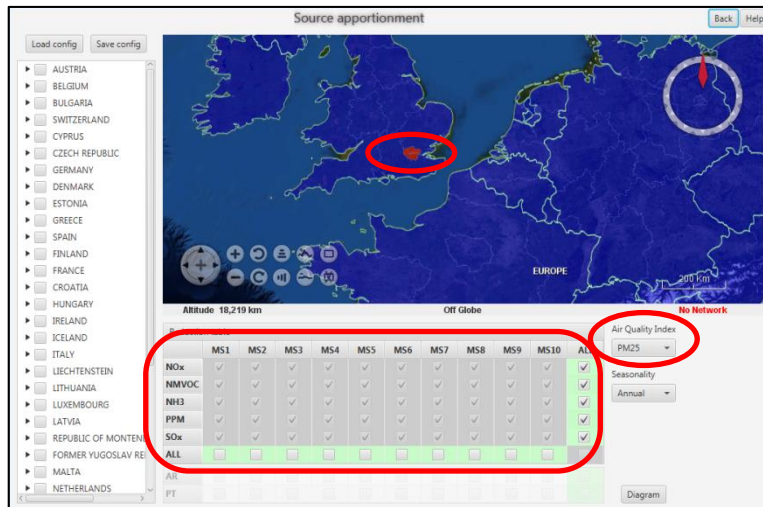
**HOW MUCH** impacts?

# SHERPA Options

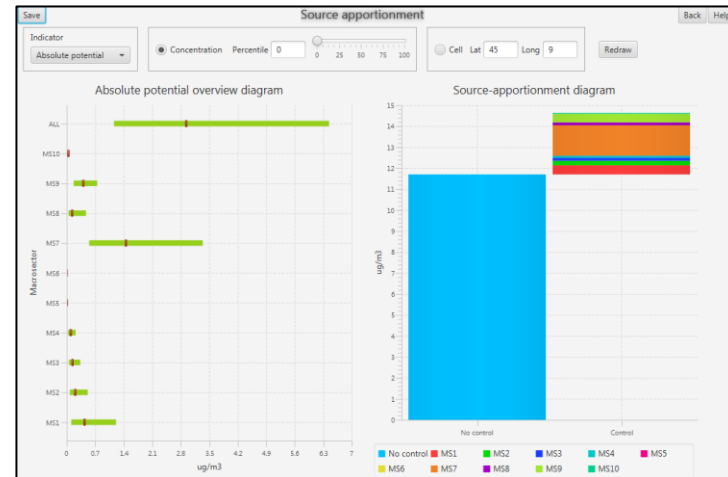
## Source Apportionment

### Selection of:

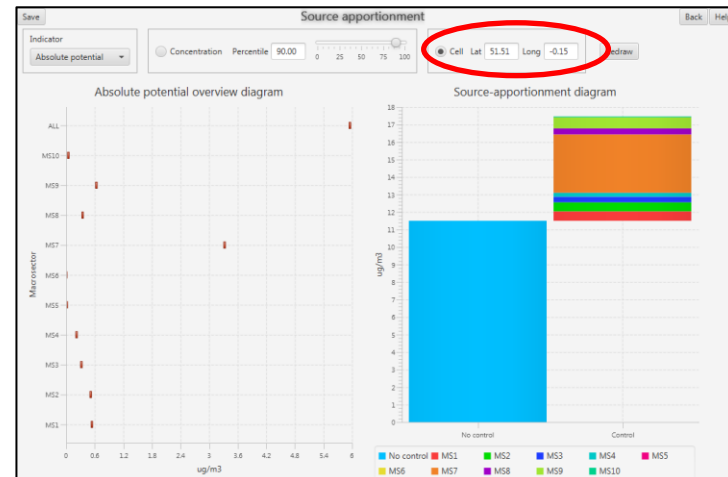
- a region
- an Air Quality Index
- activity sectors or precursors



### Average source apportionment for the selected region



### Average source apportionment for a selected point



**WHAT** can I influence?  
**WHICH** sectors/pollutants?

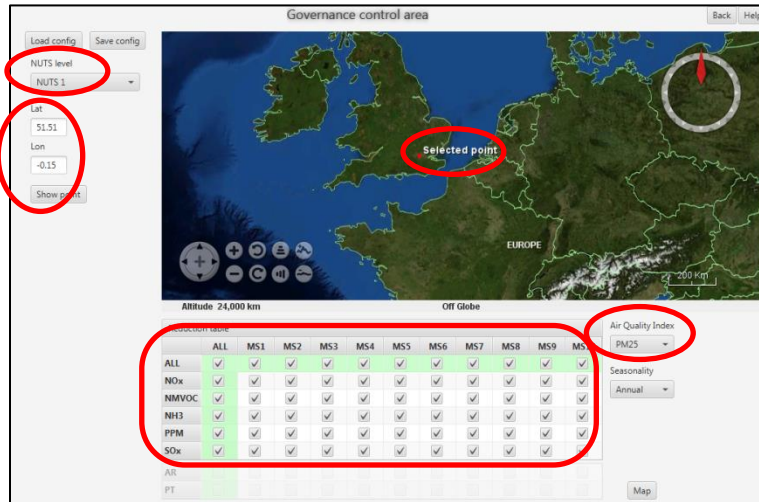


# SHERPA Options

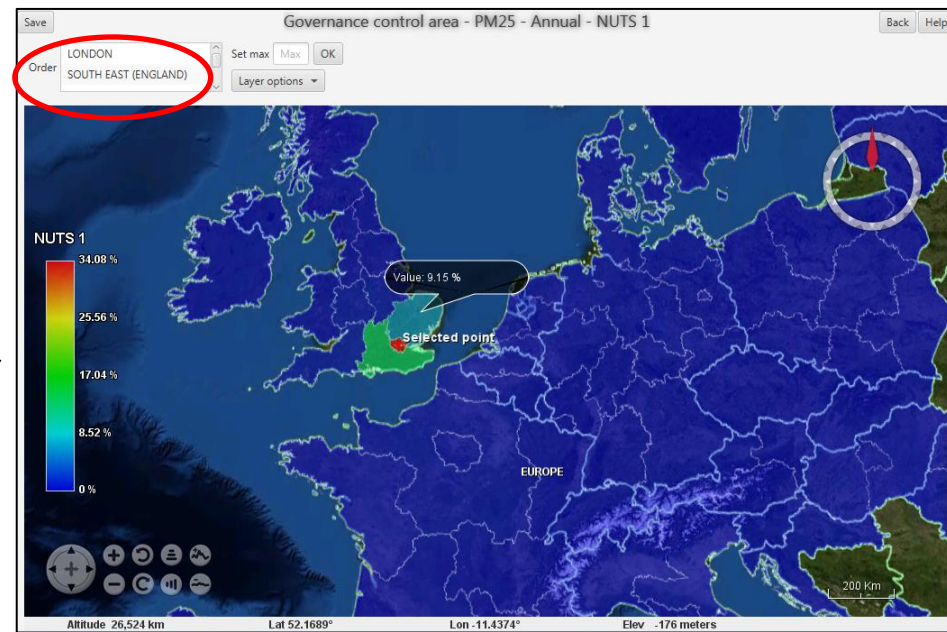
## Governance control area

### Selection of:

- a NUTS level
- a point
- an Air Quality Index
- activity sectors or precursors



## Contribution per regions (the selected NUTS level)

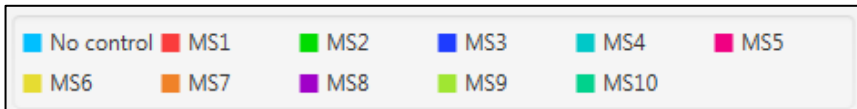
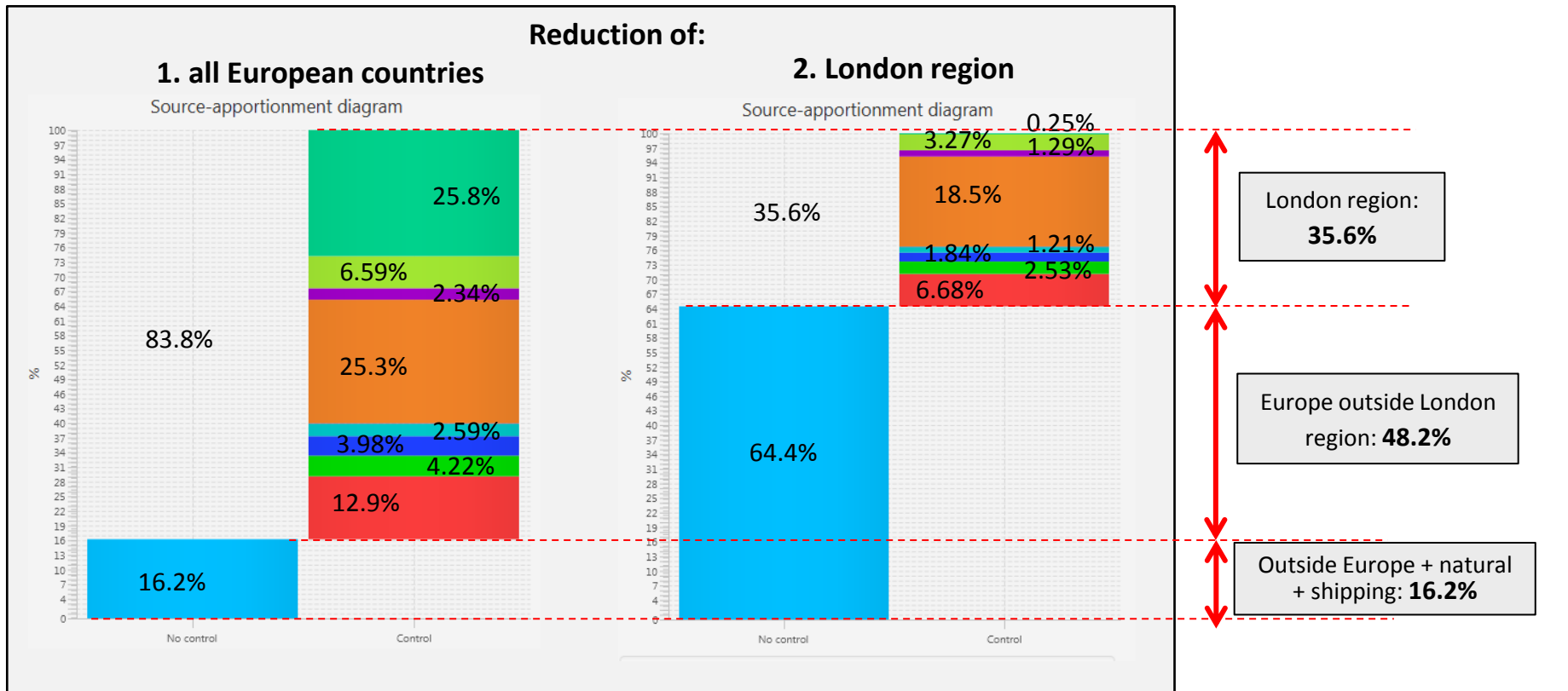


**WITH WHOM** should I coordinate actions?

# Example: London

## Source Apportionment

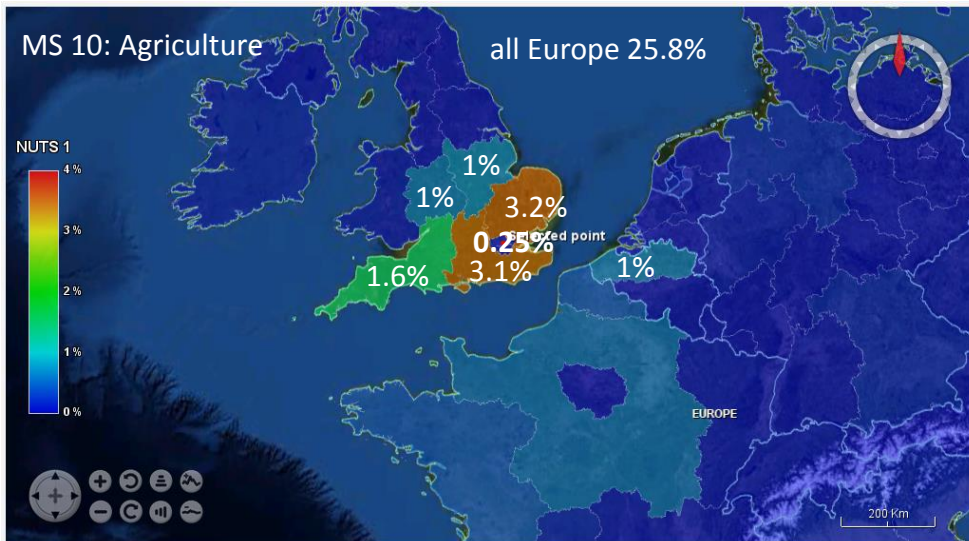
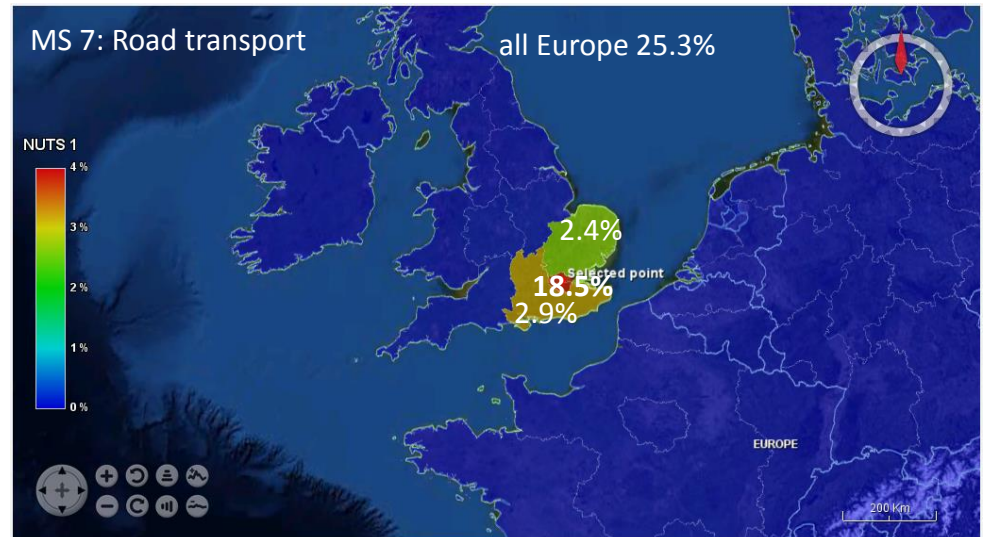
7x7 km<sup>2</sup> cell over London (51.53° ; -0.073°), concentration: 18 µg.m<sup>-3</sup>.



MS1: Energy production	MS7: Road transport
MS2: Residential	MS8: Other mobile sources
MS3 and 4: Industrial production	MS9: Waste
MS5: Energy extraction and transport	MS10: Agriculture
MS6: Solvent	

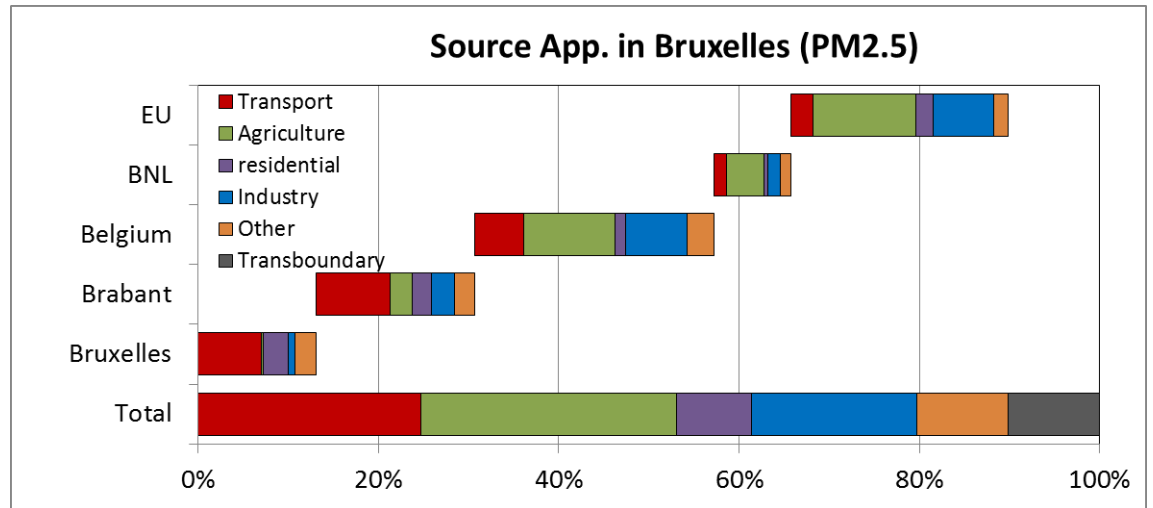
# Example: London

Governance control area

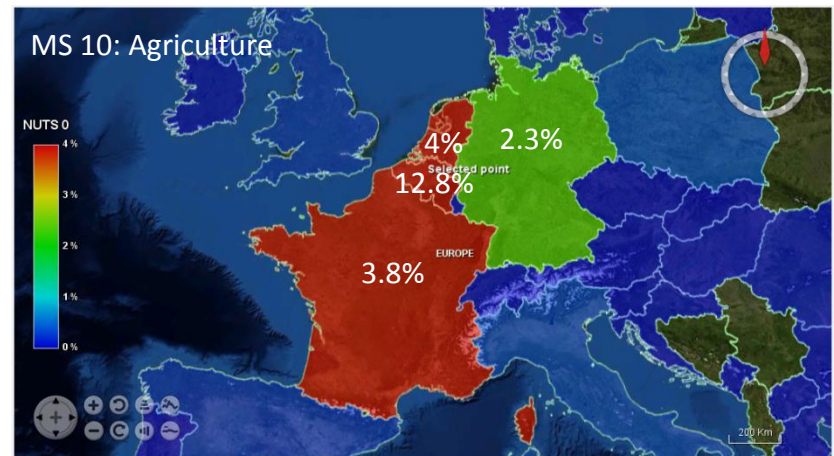
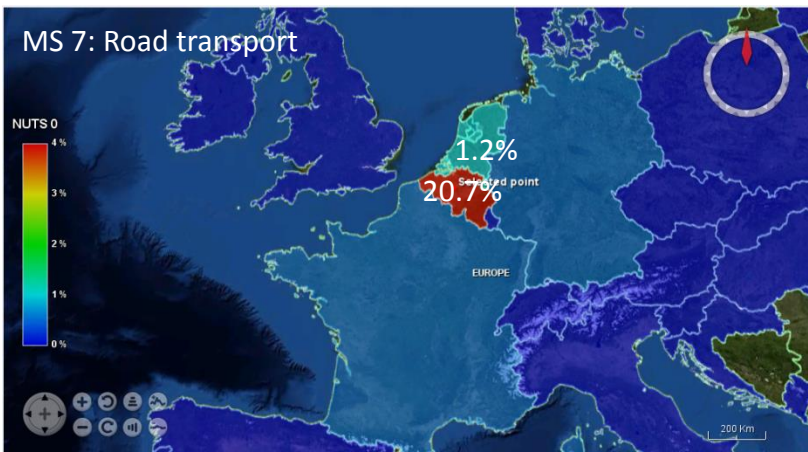


# Example: Bruxelles

## Source Apportionment



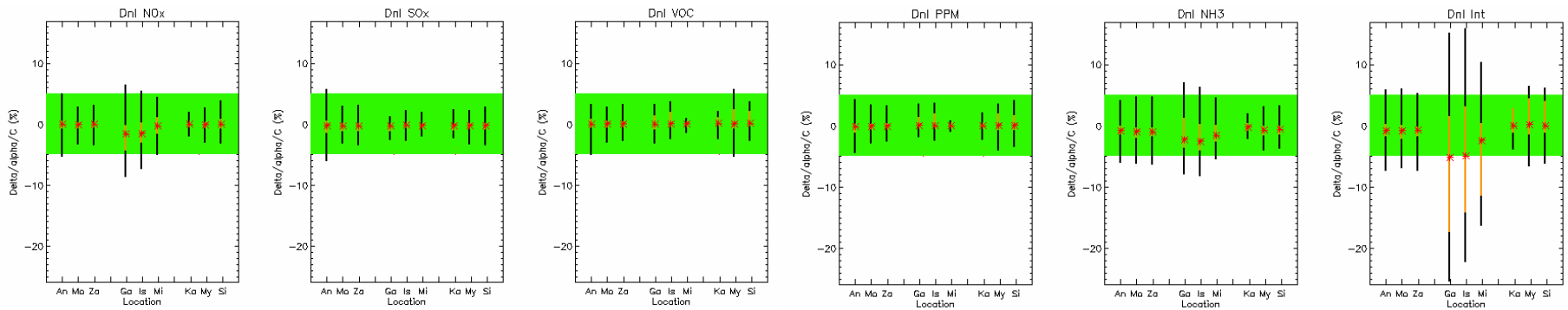
## Governance control area



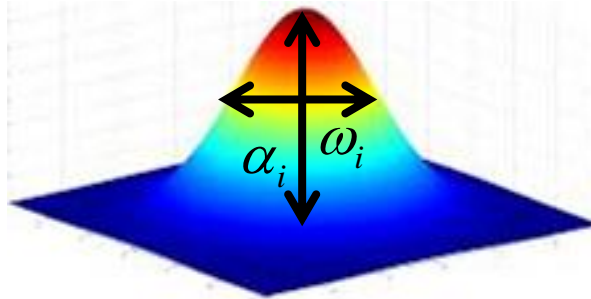


# SHERPA's Assumptions

- Annual or seasonal average concentration
- Linear relationship between emissions and concentrations



- Isotropic relationship between emissions and concentrations



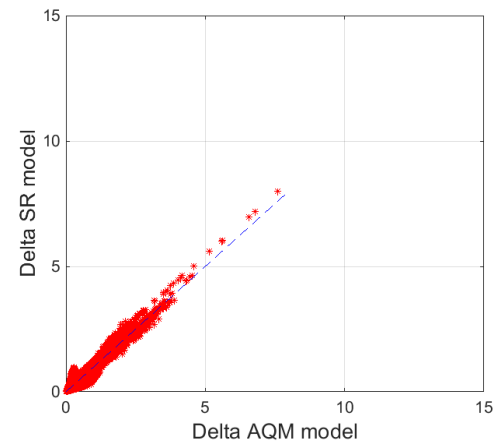
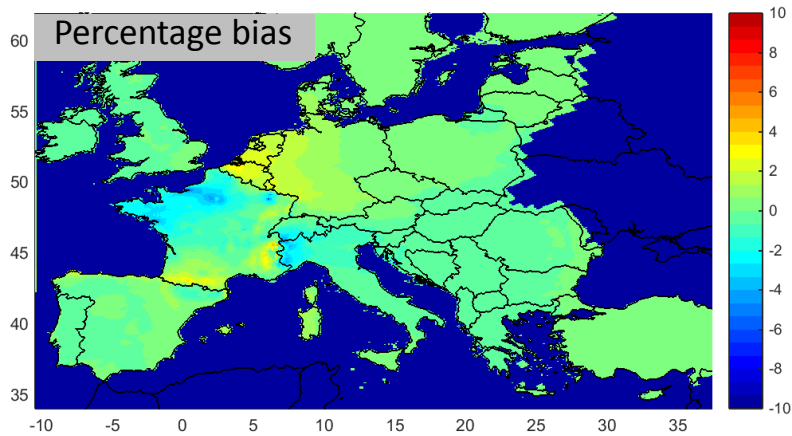
$$\Delta C_i = \sum_{p=1}^{n_p} \alpha_{i,p} \sum_{j=1}^n (1 + d_{ij})^{-\omega_{i,p}} \Delta E_{j,p}$$



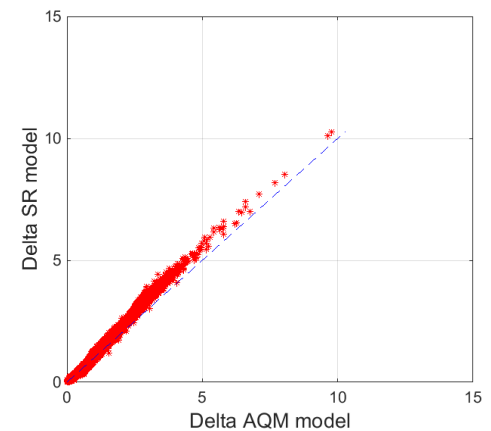
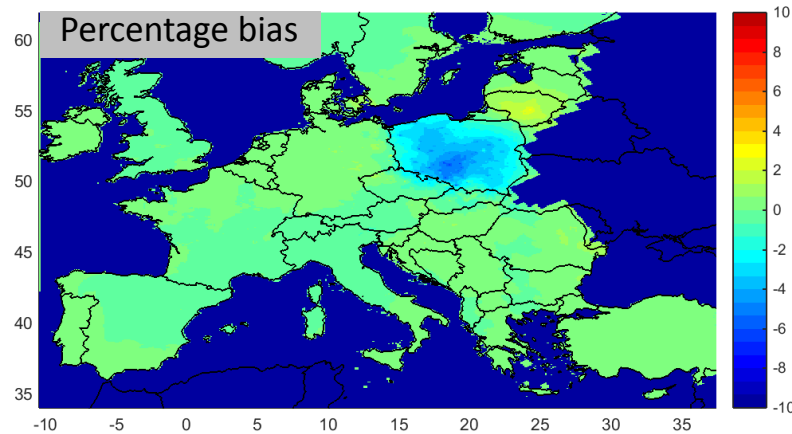
# SHERPA's Assumptions

## Reduction over countries

France

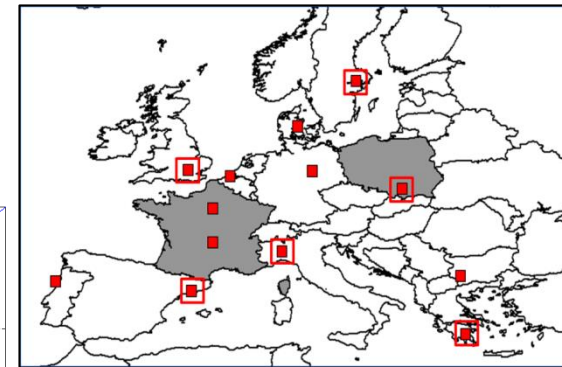
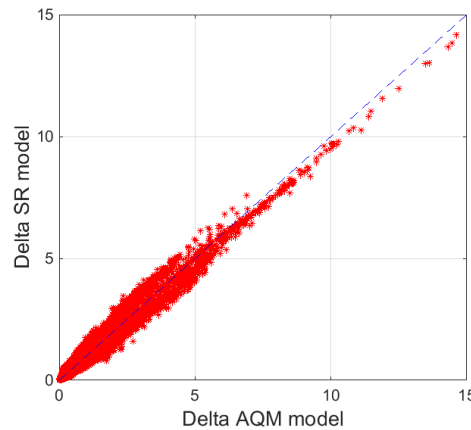
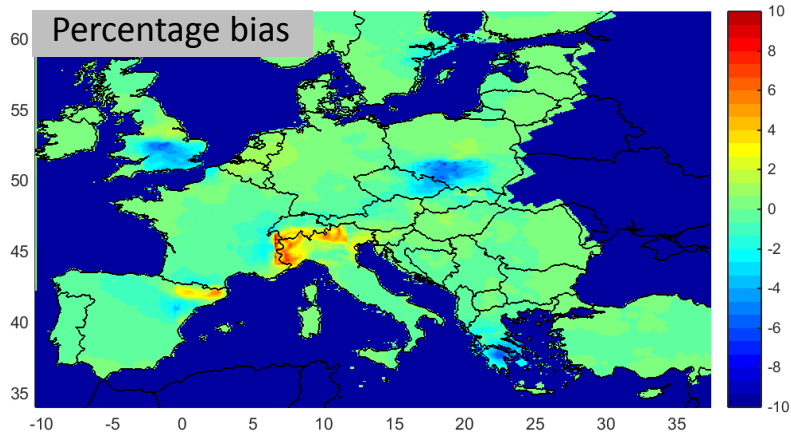


Poland



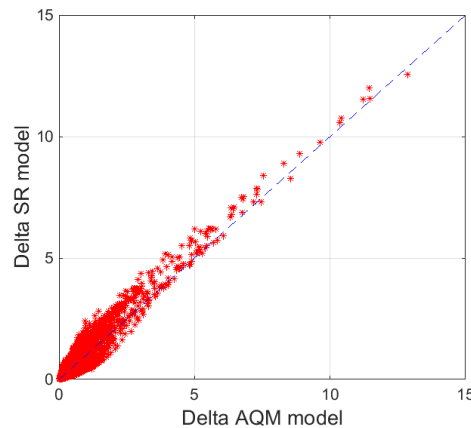
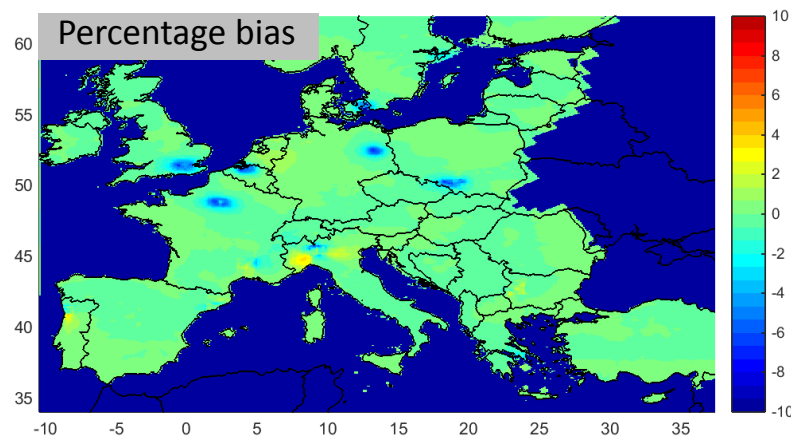
# SHERPA's Assumptions

Reduction over small regions

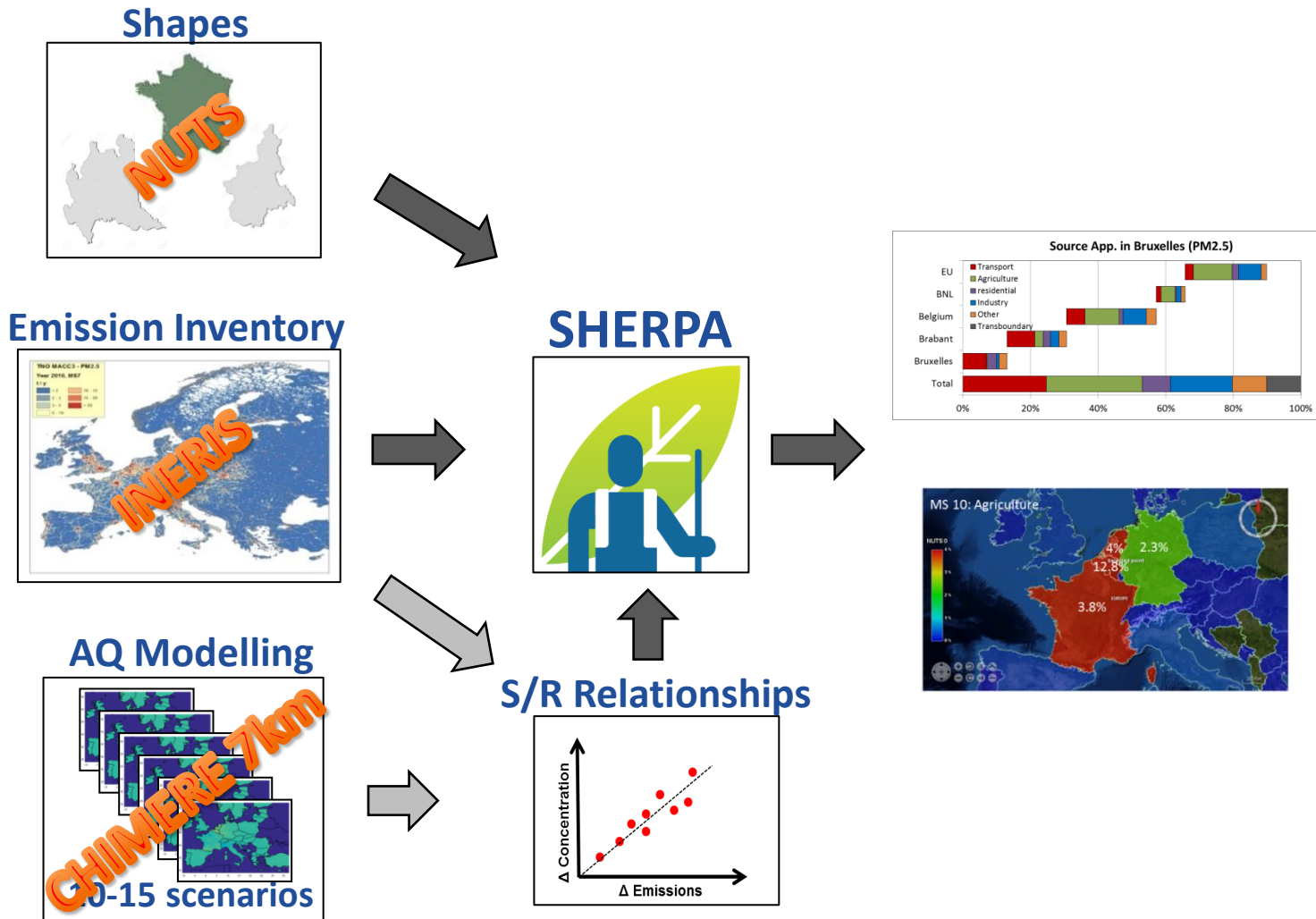


**ACCURACY: 90%**

i.e. 10% bias



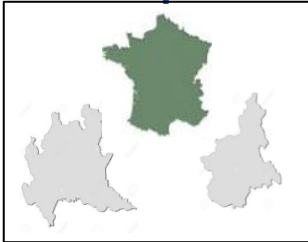
# Overview



# Adaptability

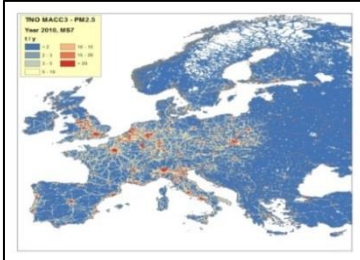
Other

Shapes



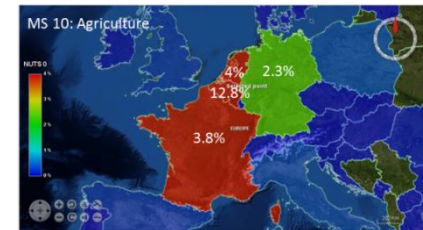
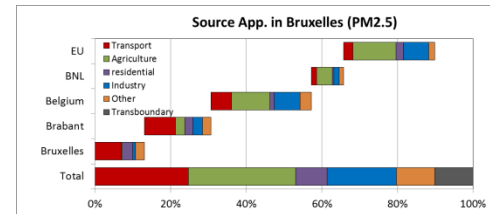
domain

Emission Inventory

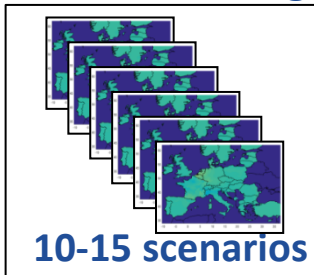


emissions

SHERPA

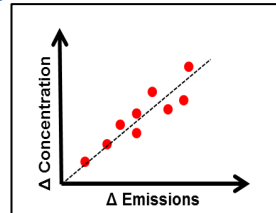


AQ Modelling



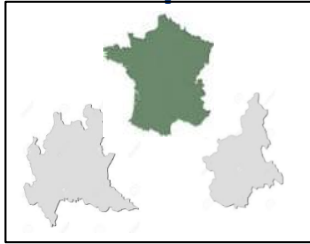
AQ model

S/R Relationships

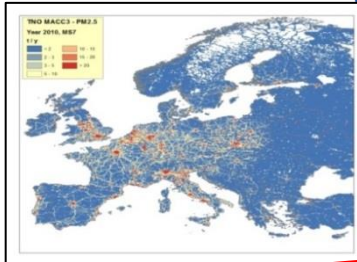


# Quality Assessment

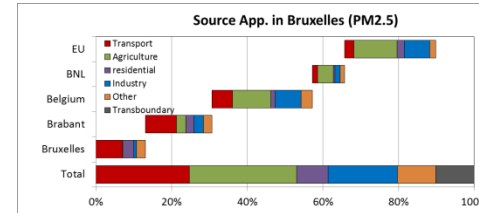
Shapes



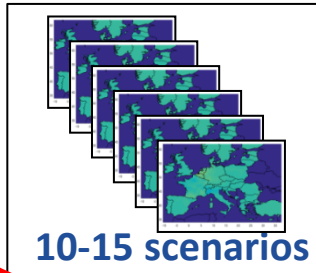
Emission Inventory



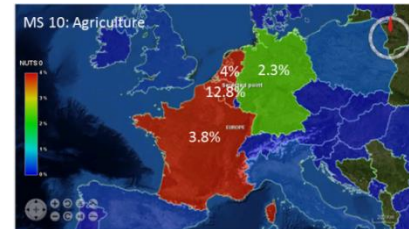
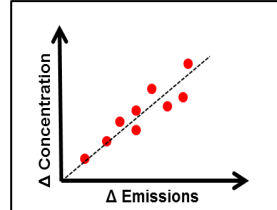
SHERPA



AQ Modelling



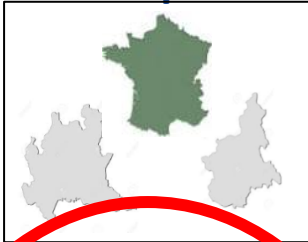
S/R Relationships



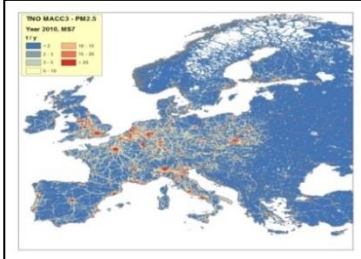


# Quality Assessment

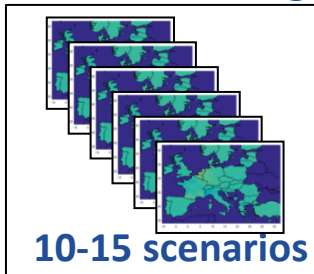
Shapes



Emission Inventory



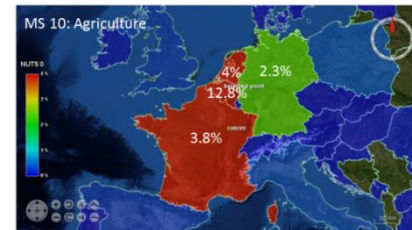
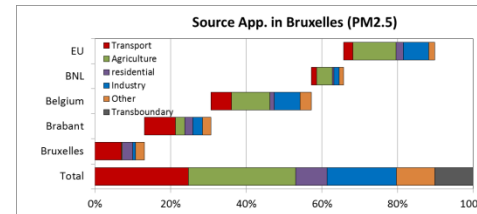
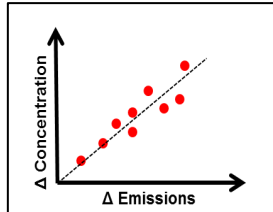
AQ Modelling



SHERPA

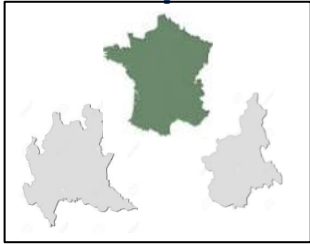


S/R Relationships

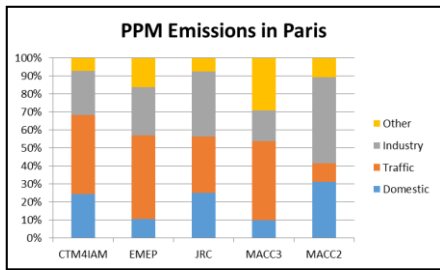


# Quality Assessment

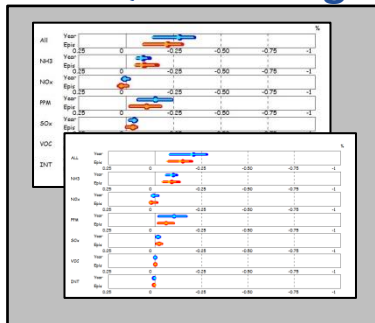
## Shapes



## Emission Inventory



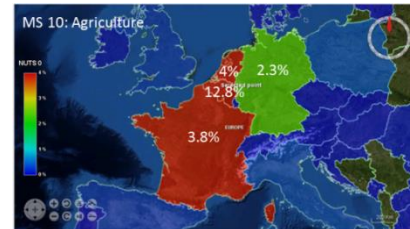
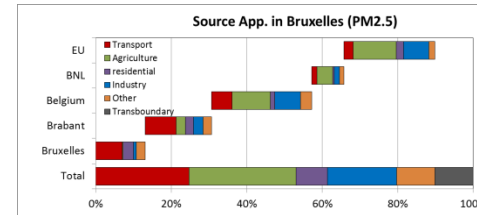
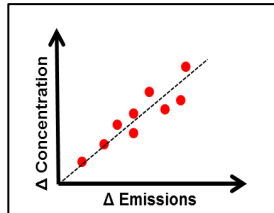
## AQ Modelling



## SHERPA



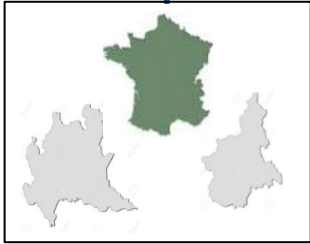
## S/R Relationships



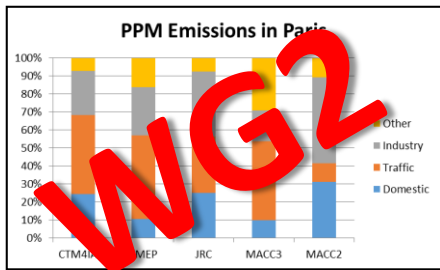
Measurements

# Quality Assessment

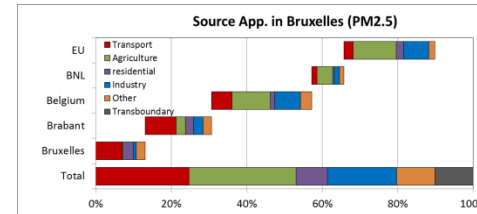
## Shapes



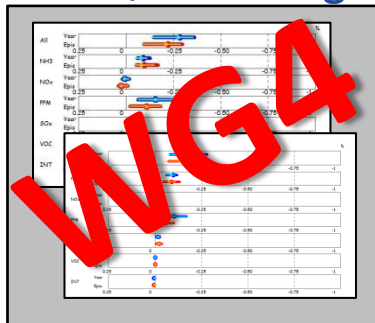
## Emission Inventory



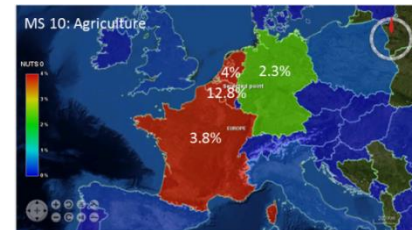
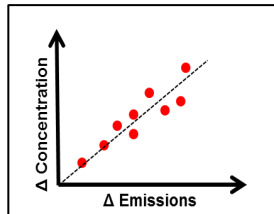
## SHERPA



## AQ Modelling



## S/R Relationships



Measurements

WNG2

WNG4

WNG3

# Next

***14:00-14:30***      **Discussion** (questions, remarks, comments)

SHERPA, a useful tool for AQ planning in European regions?

SHERPA, a useful tool for FAIRMODE WG?

***14:30-16:00***      **Exercise** (Example SHERPA Practice)

A large, ornate yellow building with a green dome and a Hungarian flag on top, with the word 'Hvala' overlaid in red. The building features classical architectural elements like columns and arches. The sky is blue with some clouds. In the foreground, there are some people walking and a flower bed.

**Hvala**