

# Quality Assessment of SHERPA



SHERPA  
Screening for High Emission  
Reduction Potential on Air



Input data provided by INERIS

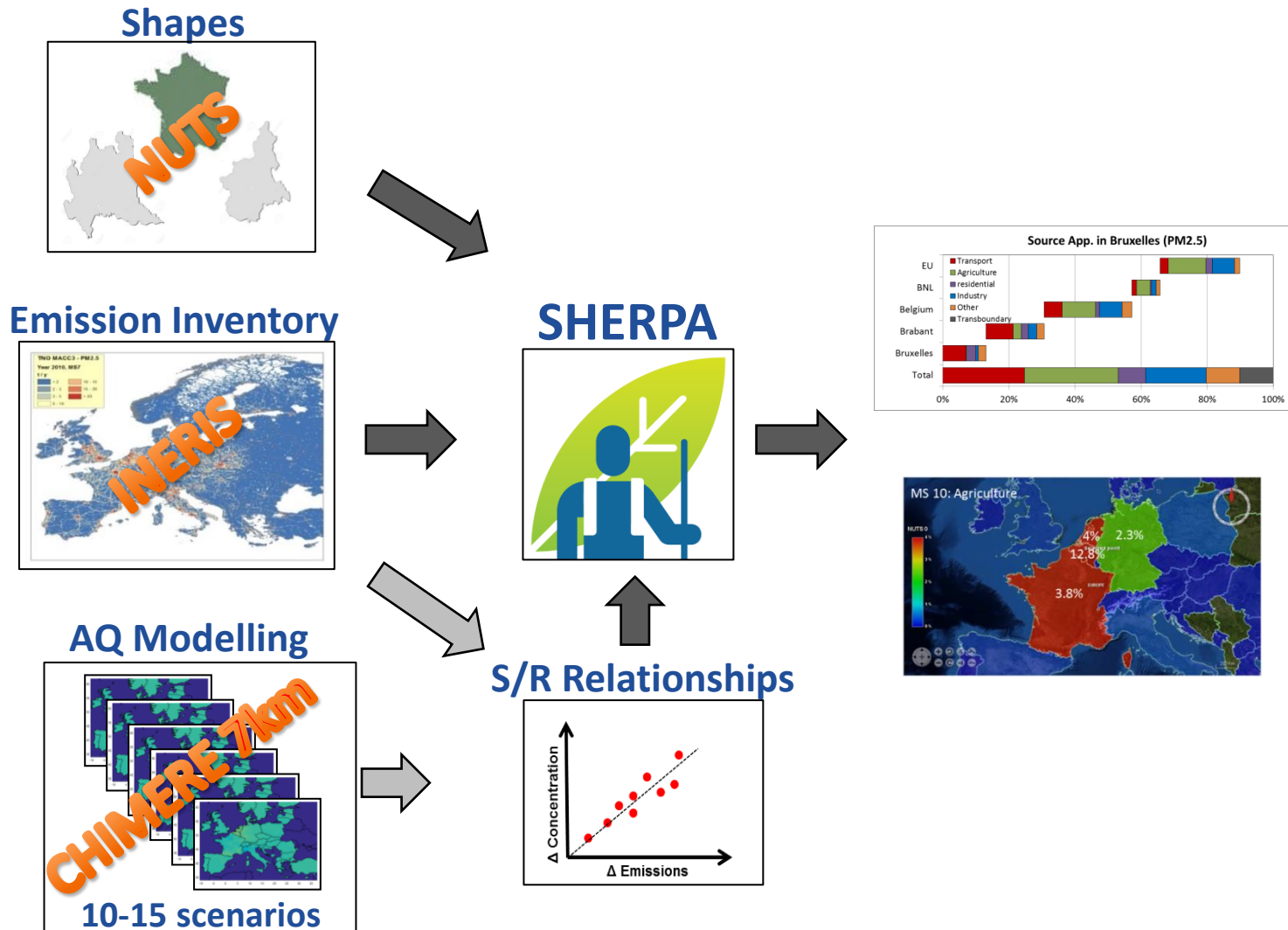


A. Clappier



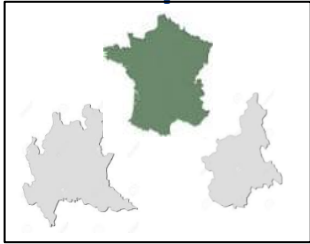
Software developed by TerrAria  
under the Contract Procedure  
no. JRC/IPR/2014/H.2/0023/NC

# SHERPA Overview

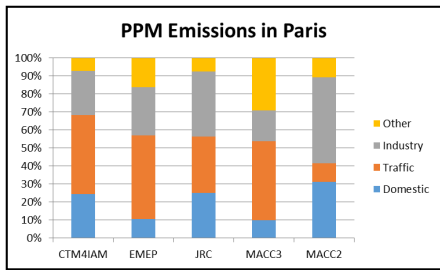


# Quality Assessment

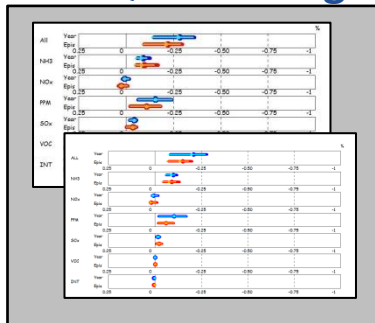
## Shapes



## Emission Inventory



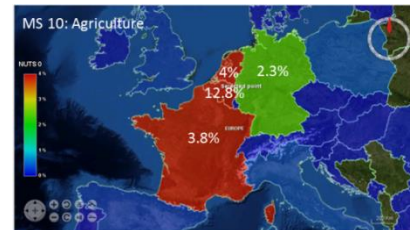
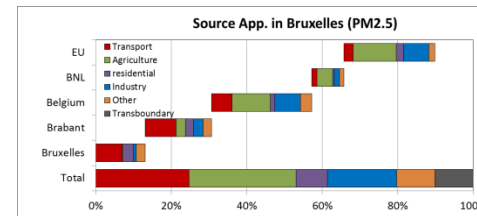
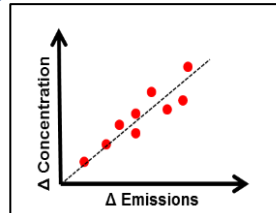
## AQ Modelling



## SHERPA



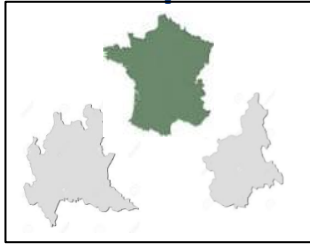
## S/R Relationships



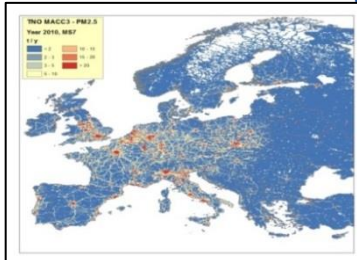
Measurements

# Quality Assessment

Shapes



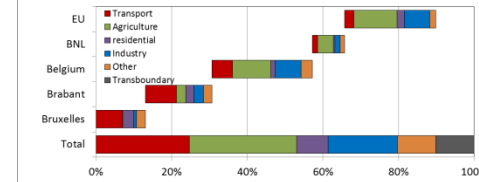
Emission Inventory



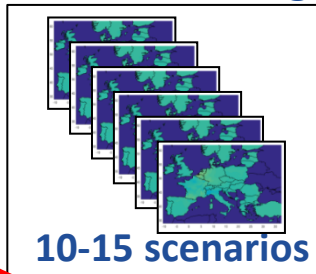
SHERPA



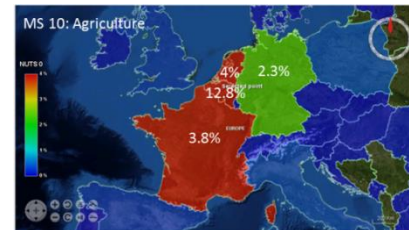
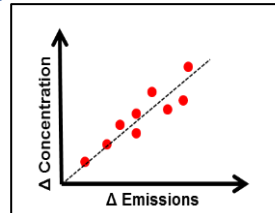
Source App. in Bruxelles (PM2.5)



AQ Modelling

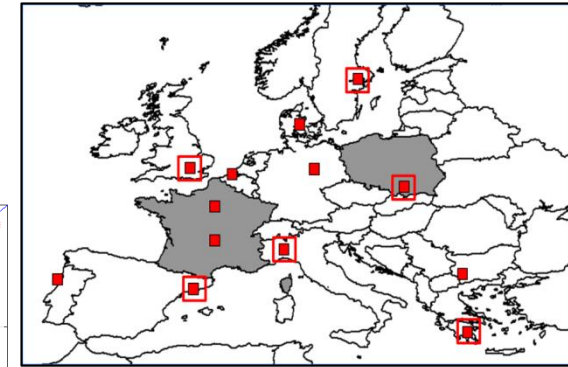
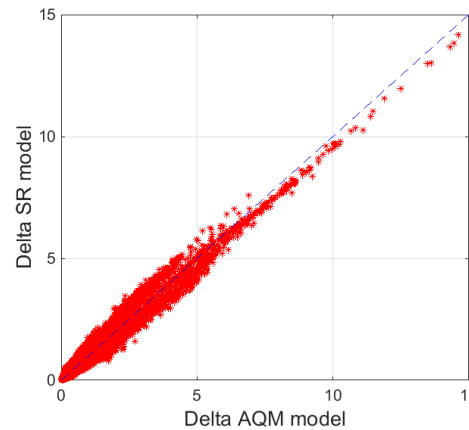
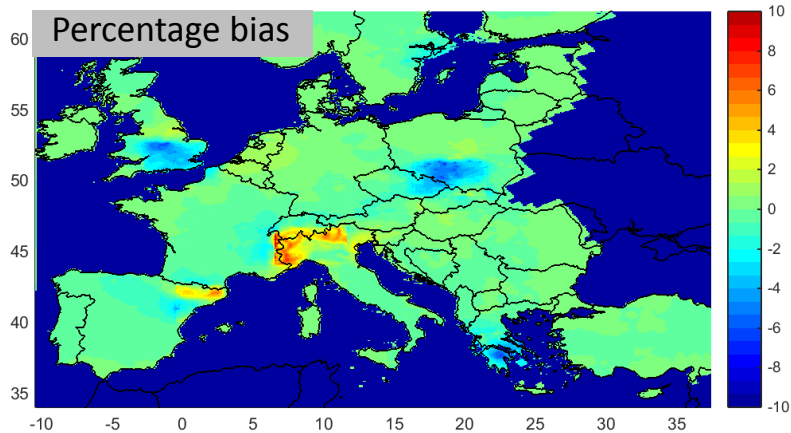


S/R Relationships

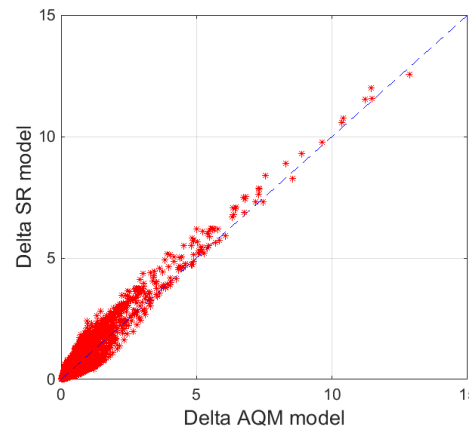
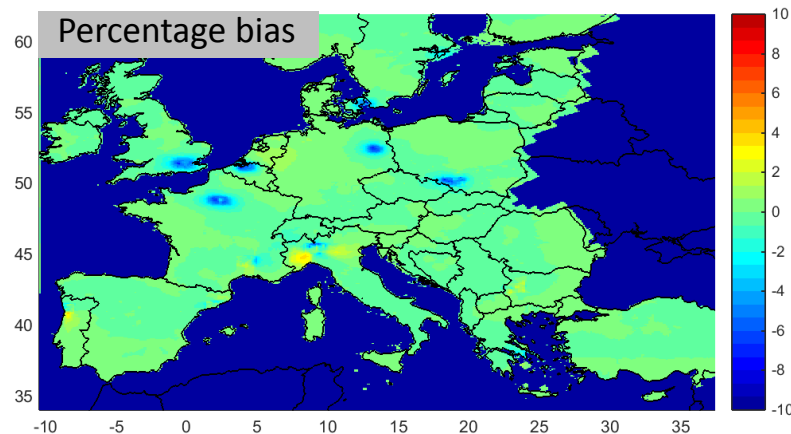


# Quality Assessment

Reduction over small regions



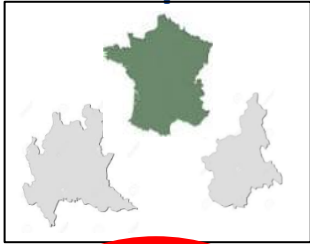
**ACCURACY: 90%**



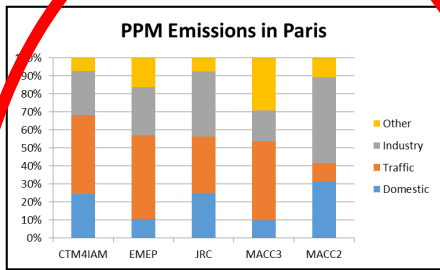
i.e. 10% bias

# Quality Assessment

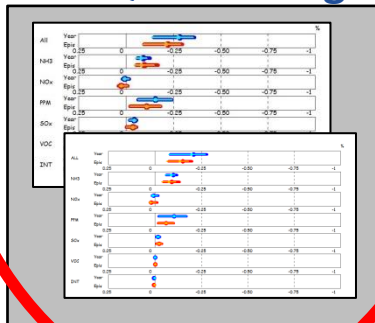
## Shapes



## Emission Inventory



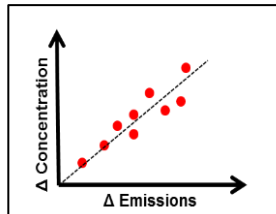
## AQ Modelling



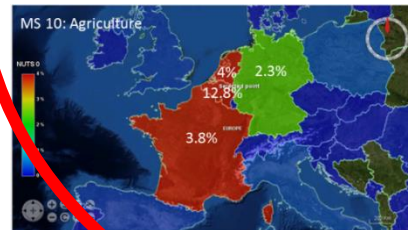
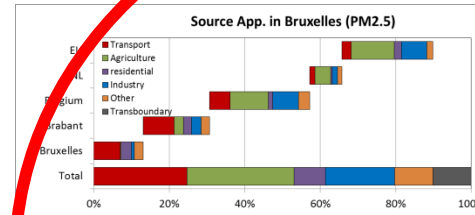
## SHERPA



## S/R Relationships



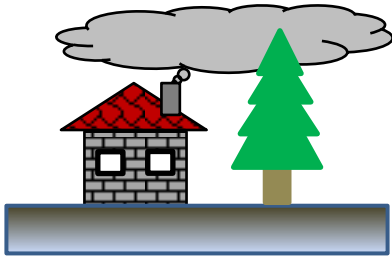
## Source App. in Bruxelles (PM2.5)



Measurements

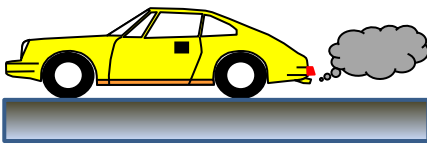
# Sensitivity vs. Apportionment

$$E_A^{PPM}, E_A^{NO_x}, E_A^{VOC}, E_A^{SO_2}, E_A^{NH_3}$$



Source A

$$E_B^{PPM}, E_B^{NO_x}, E_B^{VOC}, E_B^{SO_2}, E_B^{NH_3}$$



Source B

$\Delta C$  : PM concentrations increment resulting from source A and B

$\Delta C_A$  : PM concentrations increment resulting from source A

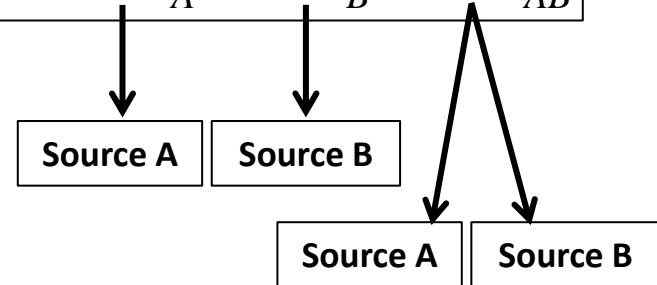
$\Delta C_B$  : PM concentrations increment resulting from source B

$\Delta C_{AB}$  : PM concentrations resulting increment from the interaction between sources A and B

Sensitivity:

$$\Delta C = \Delta C_A + \Delta C_B + \Delta C_{AB}$$

Apportionment:

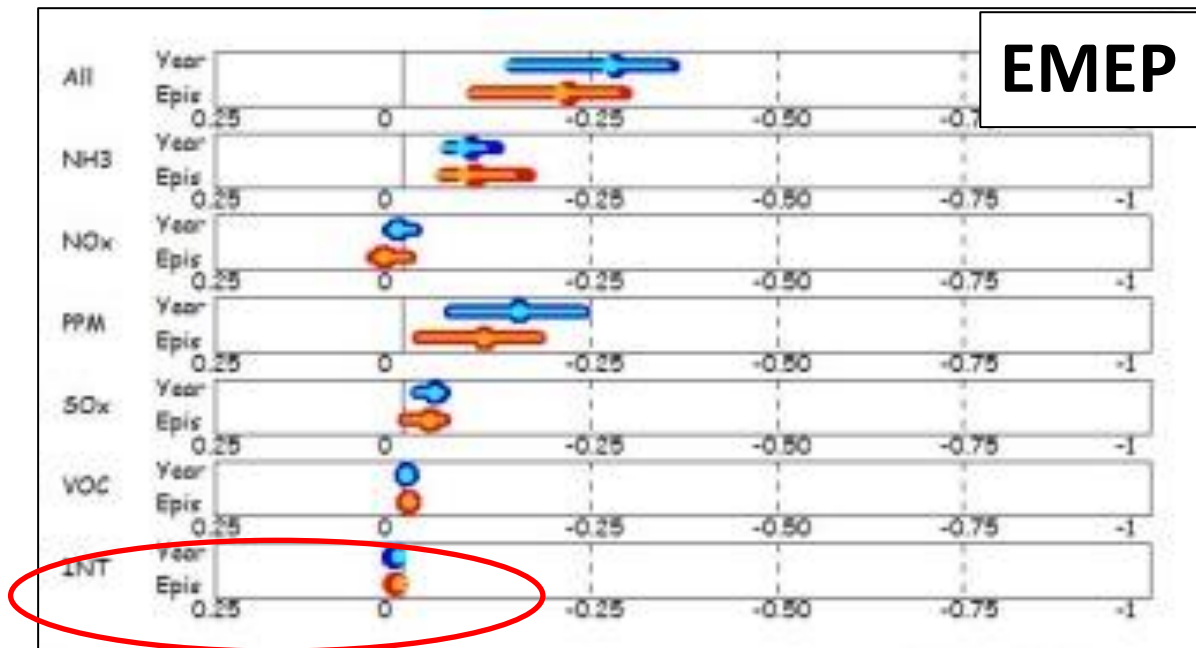


# Sensitivity vs. Apportionment

$$\Delta C = \Delta C_A + \Delta C_B + \Delta C_{AB}$$



$$\Delta C = \Delta C_{PPM} + \Delta C_{NO_x} + \Delta C_{VOC} + \Delta C_{SO_2} + \Delta C_{NH_3} + \Delta C_{int}$$



$$\Delta C_{int} \approx 0$$

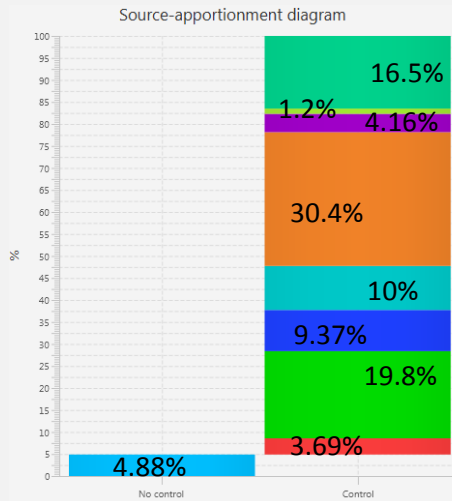
for seasonal or yearly average **Sensitivity = Apportionment**



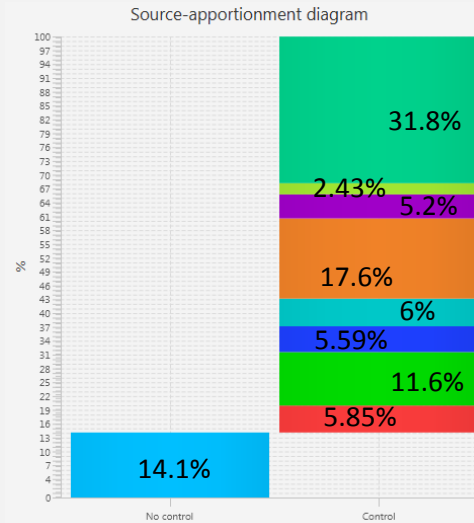
# Reduction (or Tagged) Areas

## Source apportionment

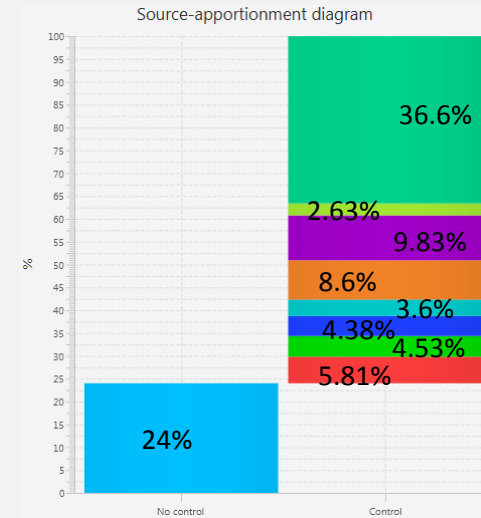
### 1. over Paris



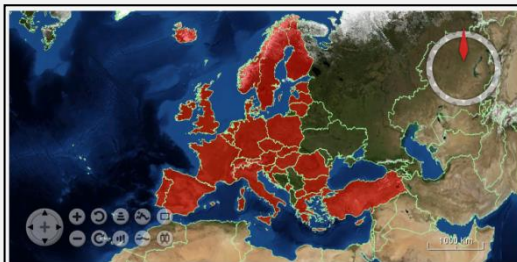
### 2. over Lens



### 3. over Calais



## Reduction over all Europe



MS1: Energy production

MS2: Residential

MS3 and 4: Industrial production

MS5: Energy extraction and transport

MS6: Solvent

MS7: Road transport

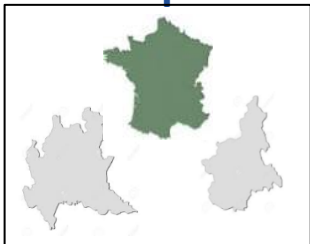
MS8: Other mobile sources

MS9: Waste

MS10: Agriculture

# AQM and Emission Inventory

## Shapes



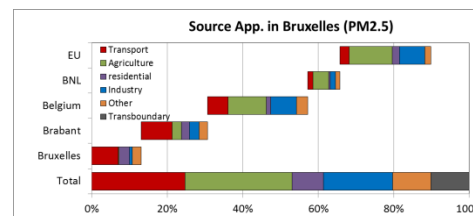
## Emission Inventory

PPM Emissions in Paris



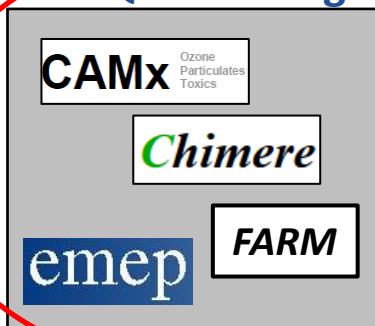
**WNG2**

## SHERPA

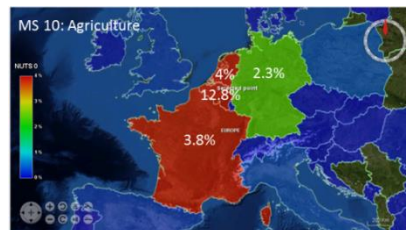
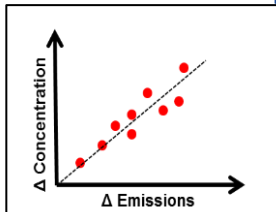


**WNG3**

## AQ Modelling



## S/R Relationships



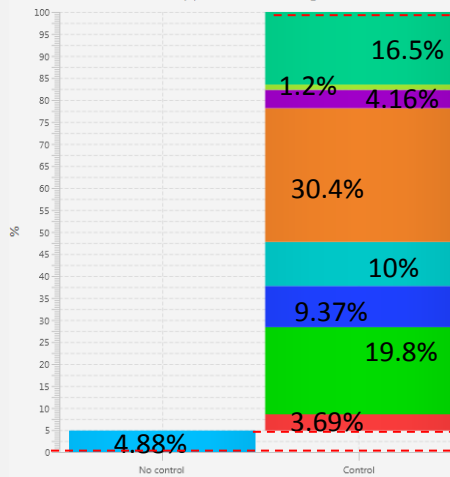
Measurements

# Reduction (or Tagged) Areas

Reduction of:

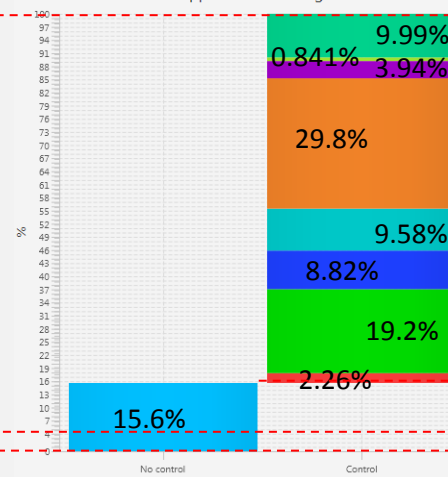
## 1. all European countries

Source-apportionment diagram



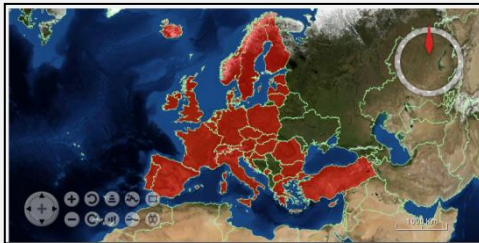
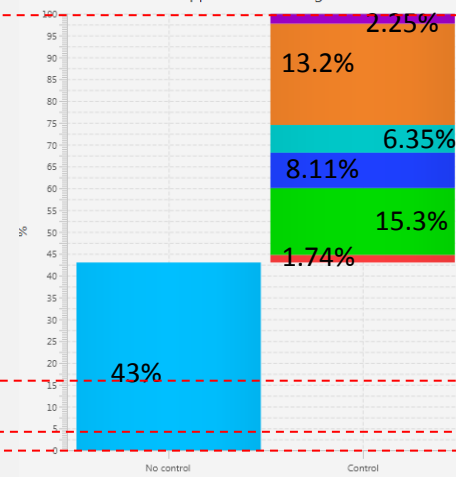
## 2. France

Source-apportionment diagram



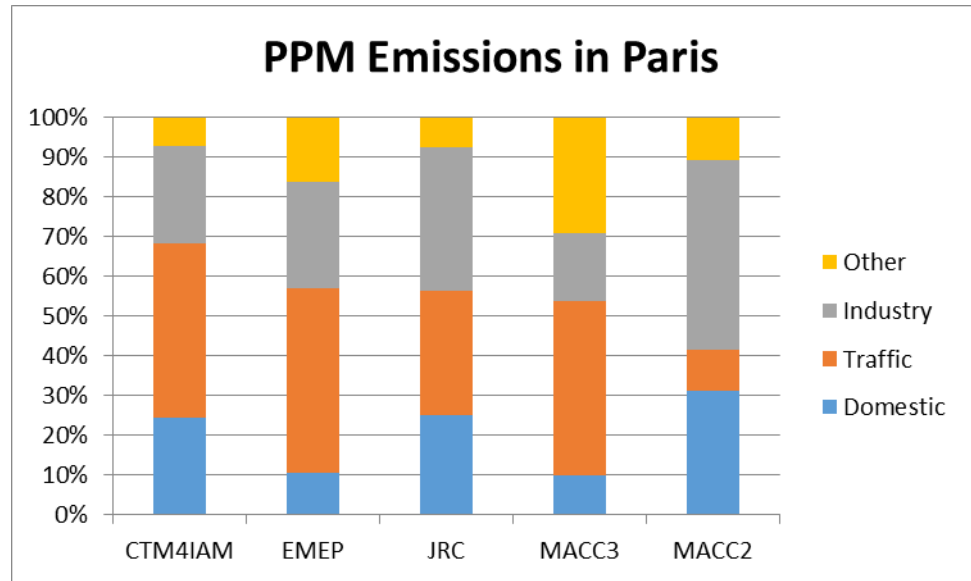
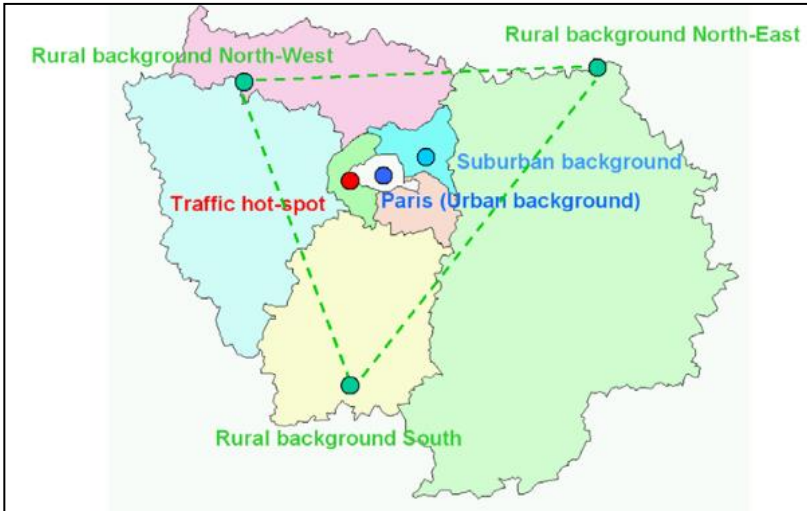
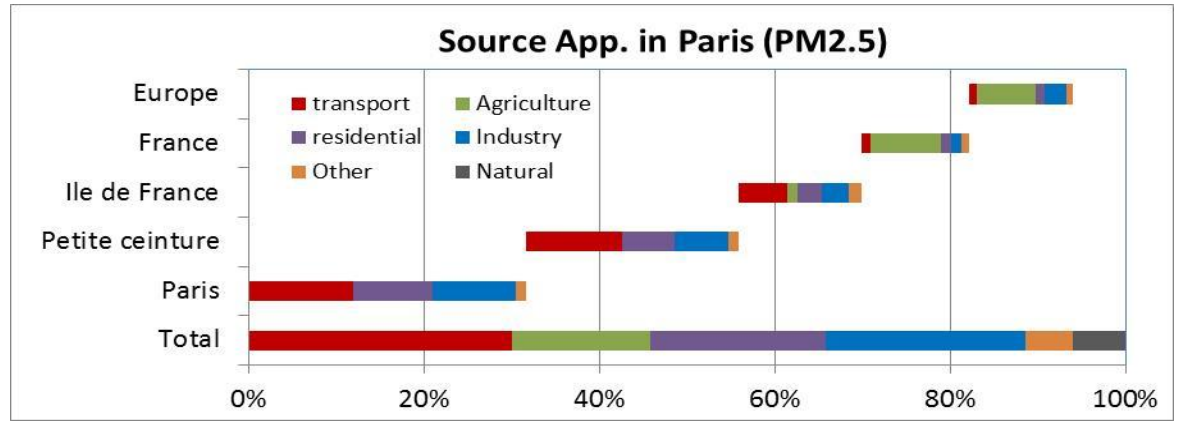
## 3. Paris

Source-apportionment diagram



# Example: Paris

## Source Apportionment

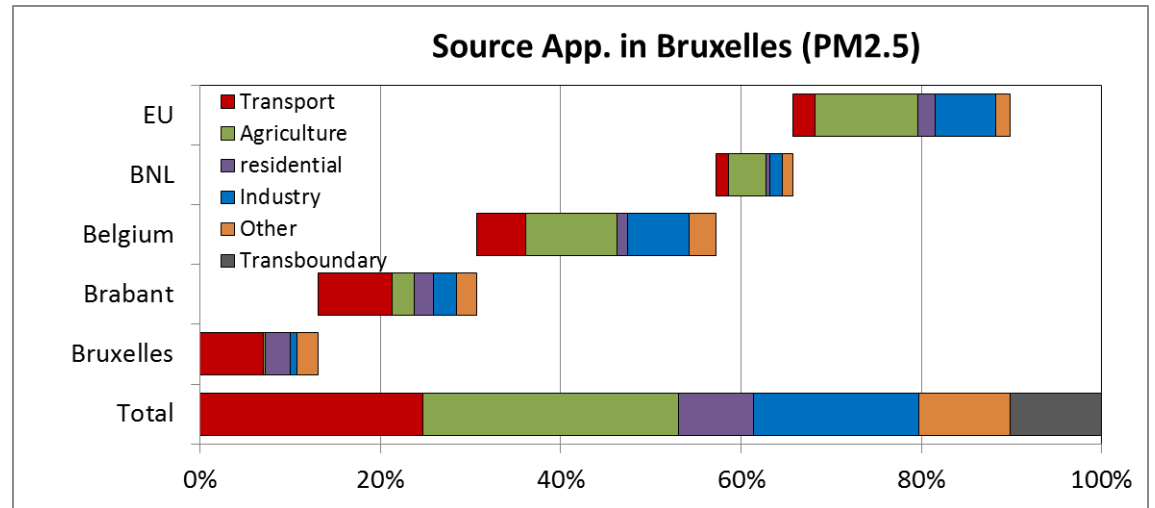


A large, ornate yellow building with a green dome and a Hungarian flag on top, with the word 'Hvala' overlaid in red. The building features classical architectural elements like columns and arches. People are visible walking in front of the building. The sky is blue with some clouds.

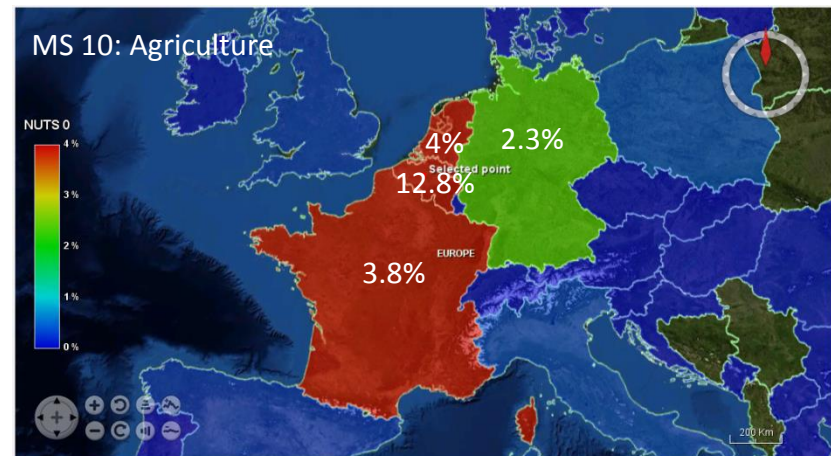
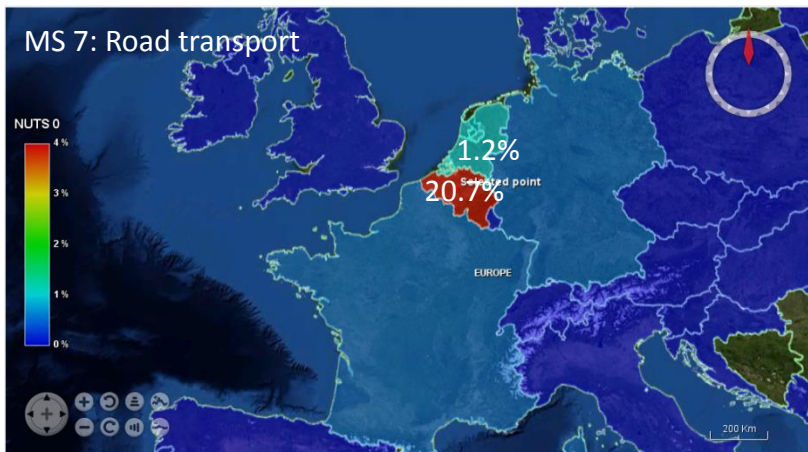
**Hvala**

# Example: Bruxelles

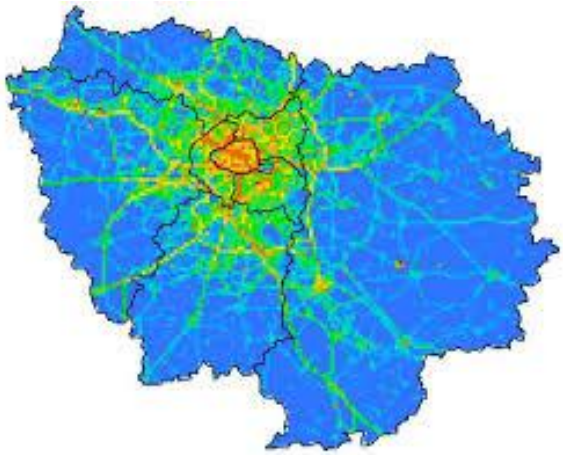
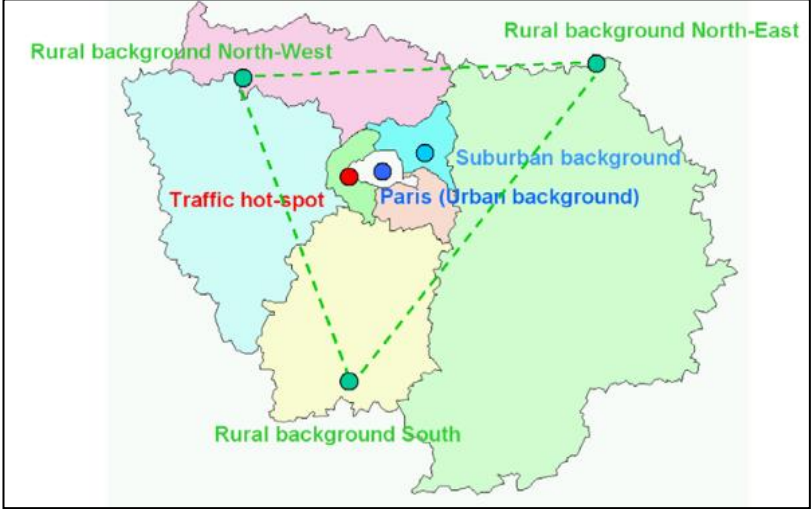
## Source Apportionment



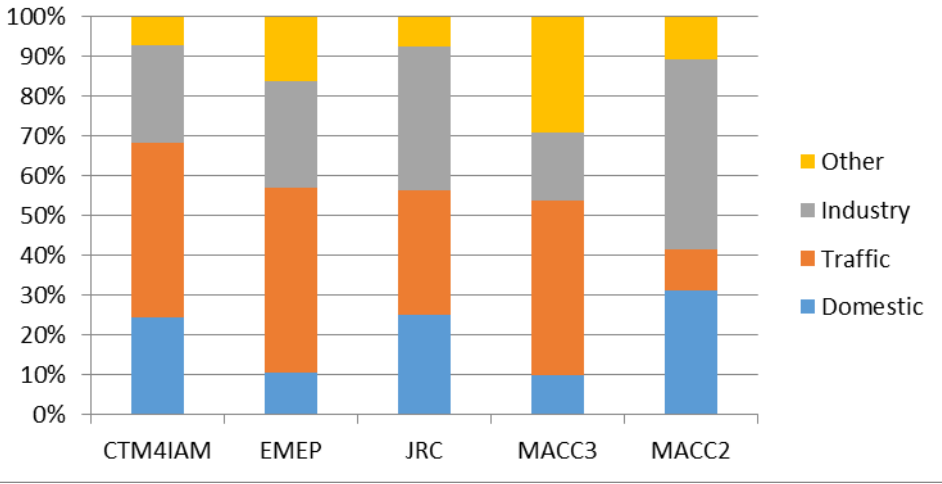
## Governance control area



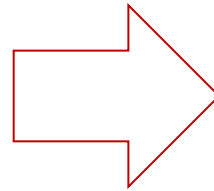
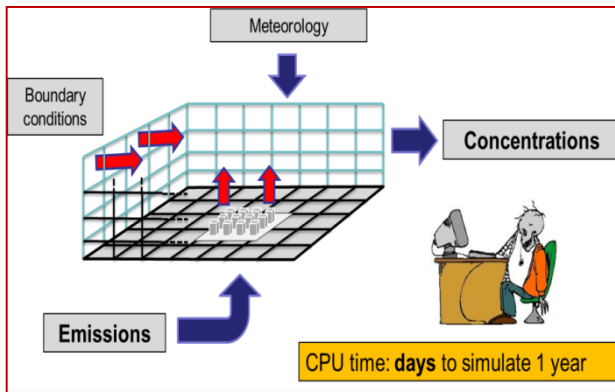
<b>Urban site far from traffic (Paris)</b>	Particles produced in Ile-de-France By the agglomeration	Imported particles
Particle matters PM2.5	<b>32%</b>	<b>68%</b>
Primary sources	<ul style="list-style-type: none"> <li>• <b>Chemical reaction in the air</b> (7%)</li> <li>• <b>Wood fired heating</b> (7%)</li> <li>• <b>Road traffic</b> (8%)</li> <li>• <b>Industry</b> (3%)</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Chemical reaction in the air</b> (34%)</li> <li>• Residential and industrial <b>heating</b> (16%)</li> <li>• <b>Road traffic</b> (6%)</li> <li>• <b>Other transports</b> including naval (5%)</li> <li>• <b>Industry</b> (3%)</li> <li>• <b>Natural sources</b> (2%)</li> </ul>



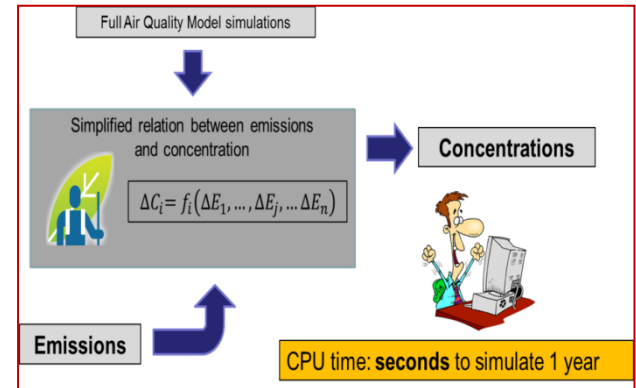
**PPM Emissions in Paris**



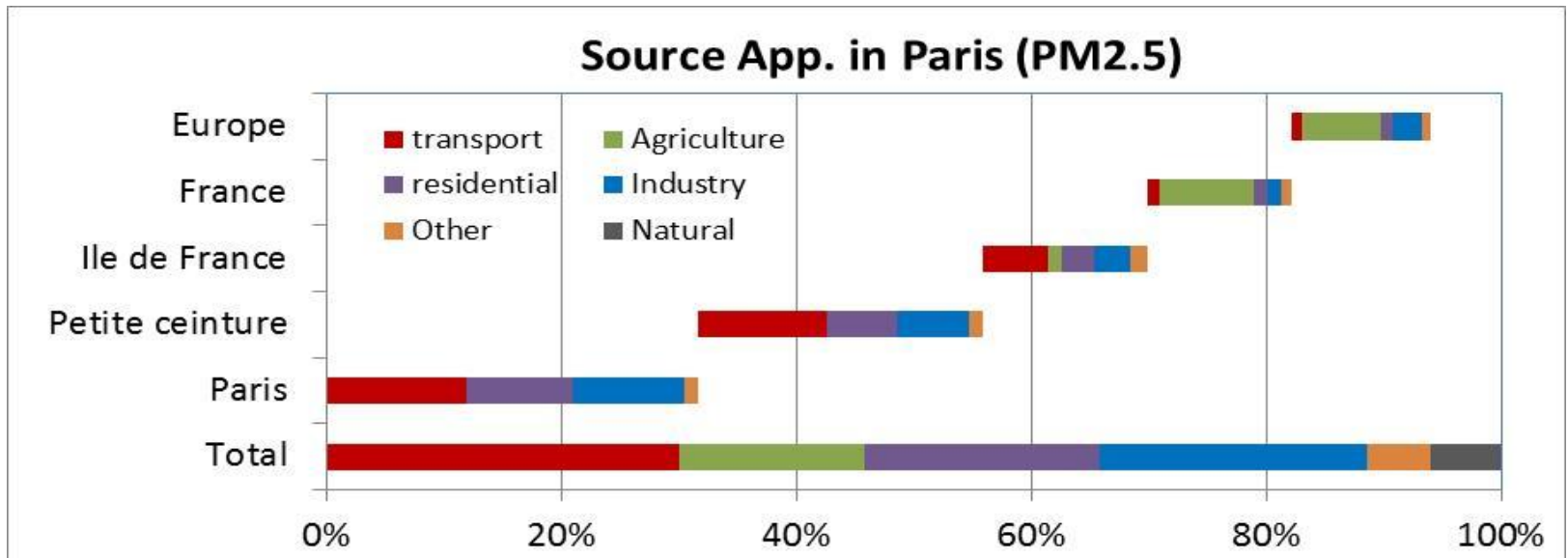
## Complex Air quality models



## Simplified relationships

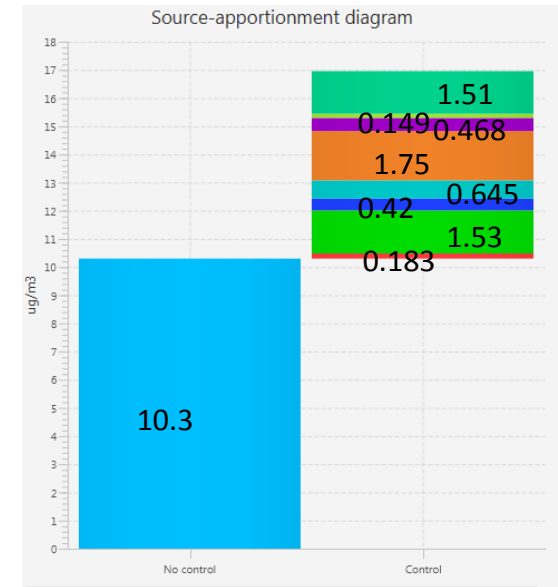
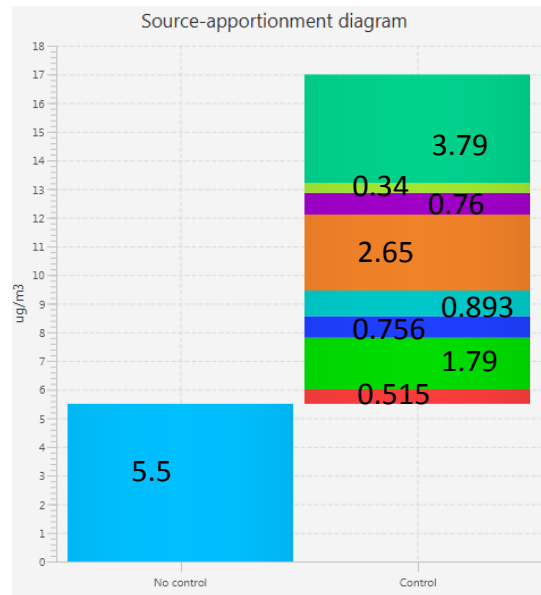
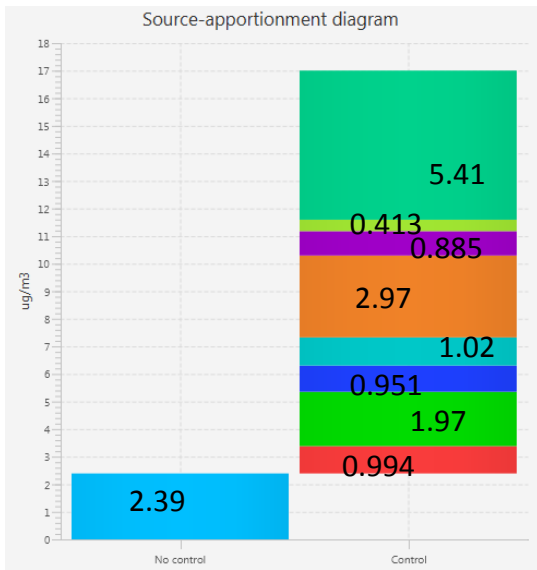


## Source App. in Paris (PM2.5)





# Source Contributions



# Source Contributions

Reduction of:

## 1. all European countries

## 2. regional area

## 3. Pas de Calais

