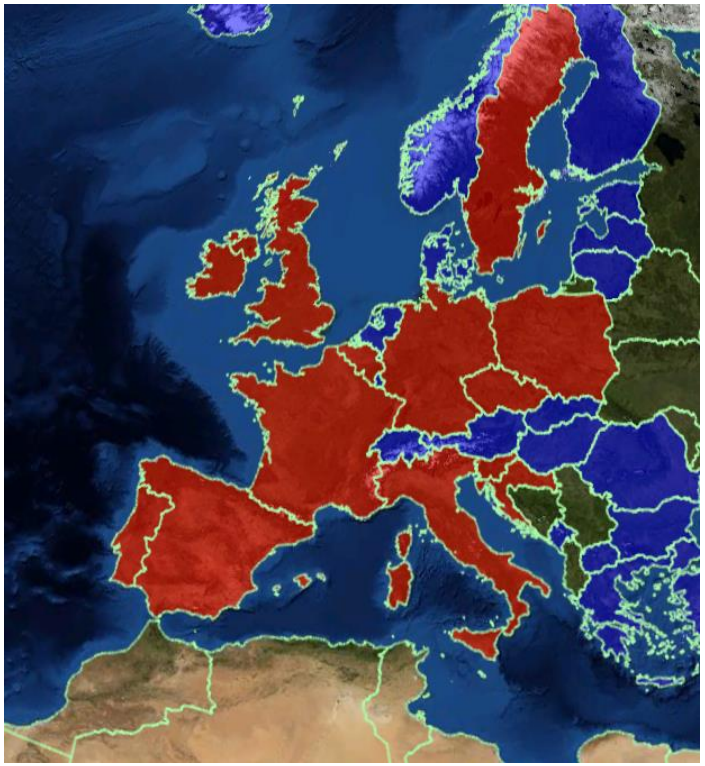
European Commission

SHERPA/RIAT+ training

9-10 June 2016, Ispra



Joint Research Centre

Updated agenda

European Commission

Bld. 100 – 1st Floor, Room Acqua – 9th June

SHERPA methodology, implementation and application

14:00 – 14:30
SHERPA and RIAT+ integrated approach
SHERPA Methodology

14:30 – 15:30
SHERPA application: guided exercise

15:30 – 16:00
Coffee Break

16:00 – 18:00
SHERPA application: work on your own region

Bld. 100 – 1st Floor, Room Acqua – 10th June

RIAT+ methodology, implementation and application

09:00 – 10:00
RIAT+ Methodology
SHERPA – RIAT+ connection

10:00 – 11:00
RIAT+ application: guided exercise

11:00 – 11:30
Coffee Break

11:30 – 12:45
RIAT+ application: work on your own region

12:45 – 14:00
Networking Lunch

Feedback

14:00 – 15:00: SHERPA feedback
15:00 – 16:00 RIAT+ feedback

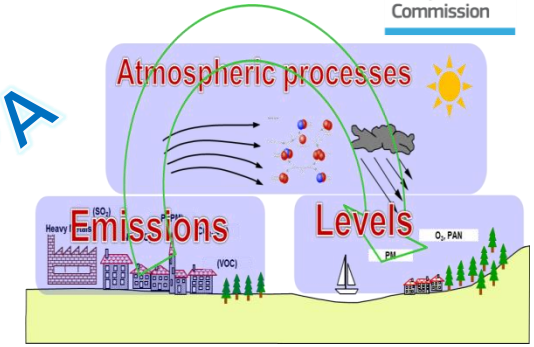
Joint Research Centre

Why SHERPA and RIAT+ ?

SHERPA and RIAT integrated approach

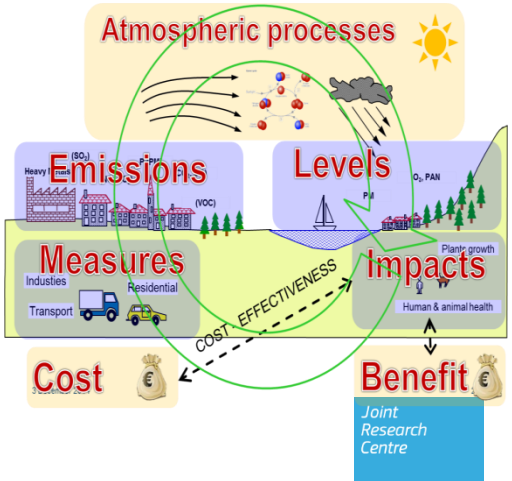
European Commission

SHERPA

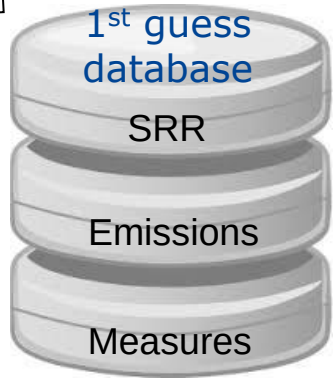


- Impact of regional emission reduction
- Key sector/pollutants
- Optimal region for control

RIAT



- Optimal policies
- Costs



European

SHERPA

A screening tool to support air quality plans

P. Thunis, E. Pisoni, B. Degraeuwe, A. Clappier, G. Maffeis

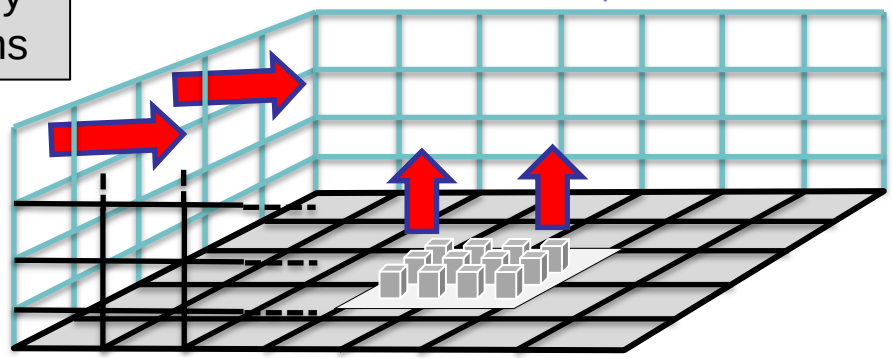
SHERPA
Screening for High Emission Reduction Potential on Air

European Commission
Joint Research Centre

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

Joint Research Centre

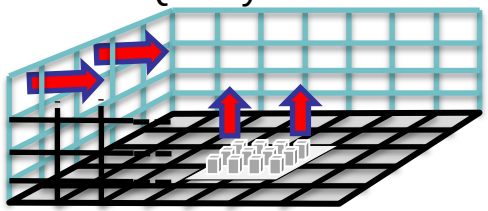
Air Quality Models



CPU time: **days** to simulate 1 year

Methodology: Simplified S/R Relationship

Full Air Quality Model simulations



Simplified relation between emissions and concentration

$$\Delta C_i = f_i(\Delta E_1, \ldots, \Delta E_j, \ldots \Delta E_n)$$

Concentrations

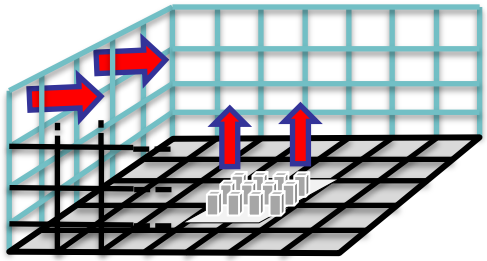
Emissions

CPU time: **minutes** to simulate 1 year

Methodology: Simplified S/R Relationship

European Commission

Air Quality Model → CHIMERE 7x7 km ECMWF 2010



SRR

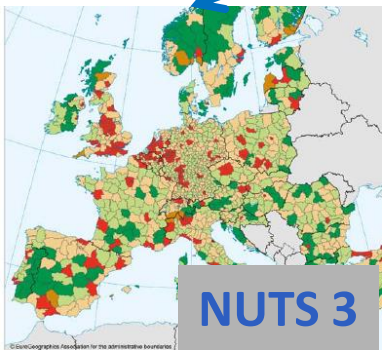
$$\Delta C_i = f_i(\Delta E_1, \ldots, \Delta E_j, \ldots \Delta E_n)$$

Concentrations

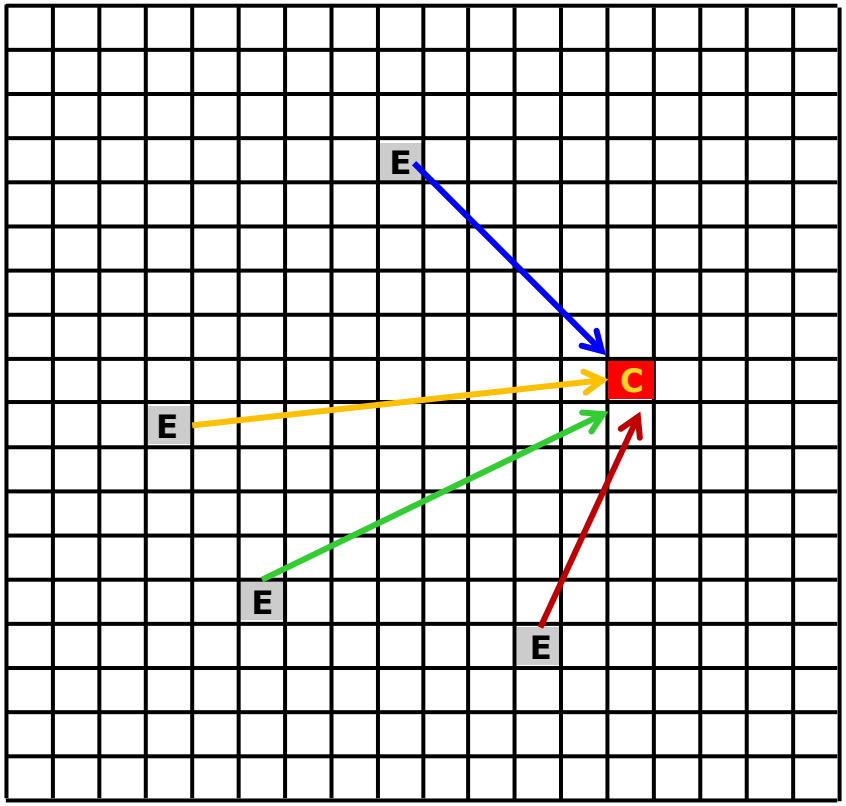
Yearly averaged NO_2, PM_{10}, $PM_{2.5}$

Emissions

EC4MACS



Methodology: Simplified S/R Relationship



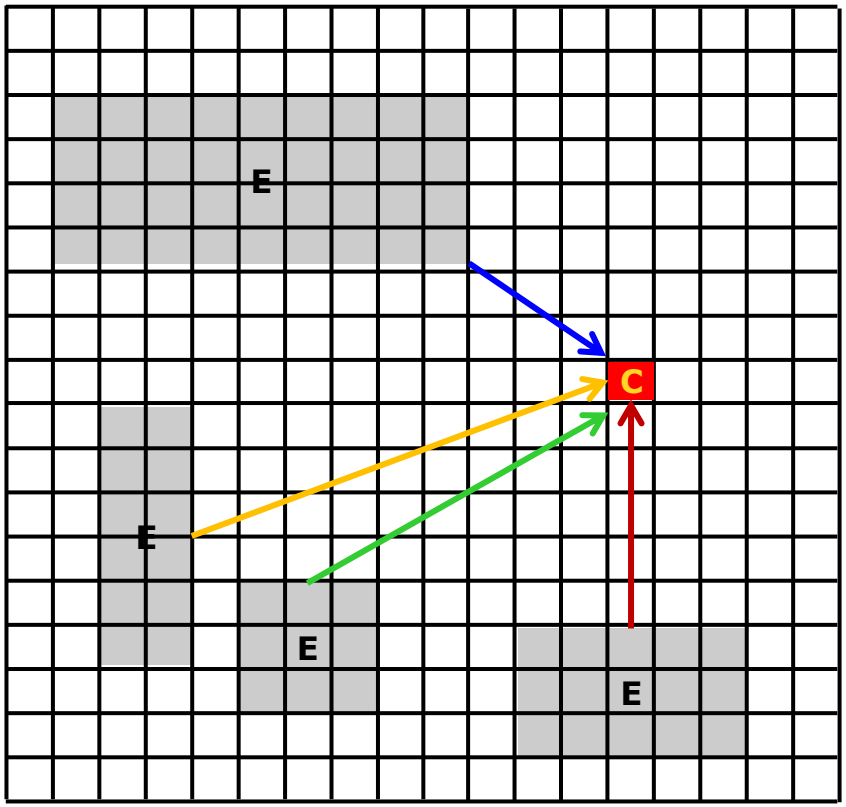
One receptor cell concentration depends on every grid cell emissions within the domain

The Number of links (i.e. unknowns) to identify equals the number of cells within the domain (for one precursor).

$$N_{Scenarios} = N_{cells}$$

The number of scenarios is prohibitive

Methodology: Simplified S/R Relationship



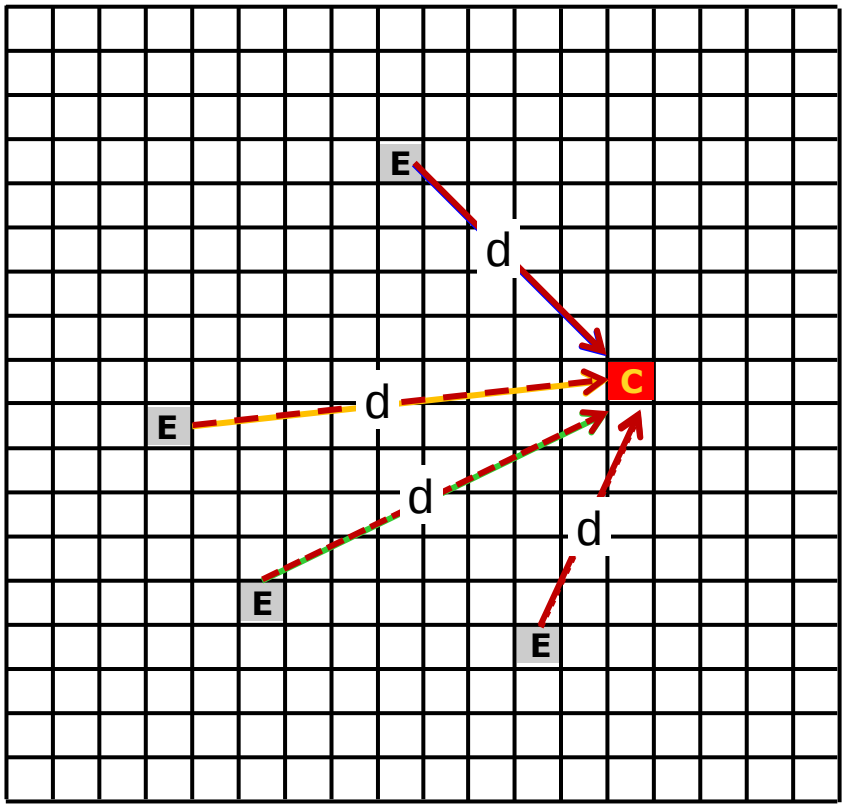
One receptor cell concentration depends on every emission aggregations in the domain

The Number of links (i.e. unknowns) to identify equals the number of emission aggregations.

$$N_{Scenarios} = N_{aggregations}$$

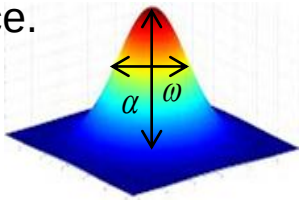
- The number of scenarios becomes prohibitive for a regional focus at EU scale (Nb of scenarios = Nb of regions ~ 300 per precursor)
- Future analysis are bound to the initial choice of the emission aggregations

Methodology: Simplified S/R Relationship



One receptor cell concentration depends on every grid cell emissions within the domain

But each emission-concentration link is a simple function of distance.

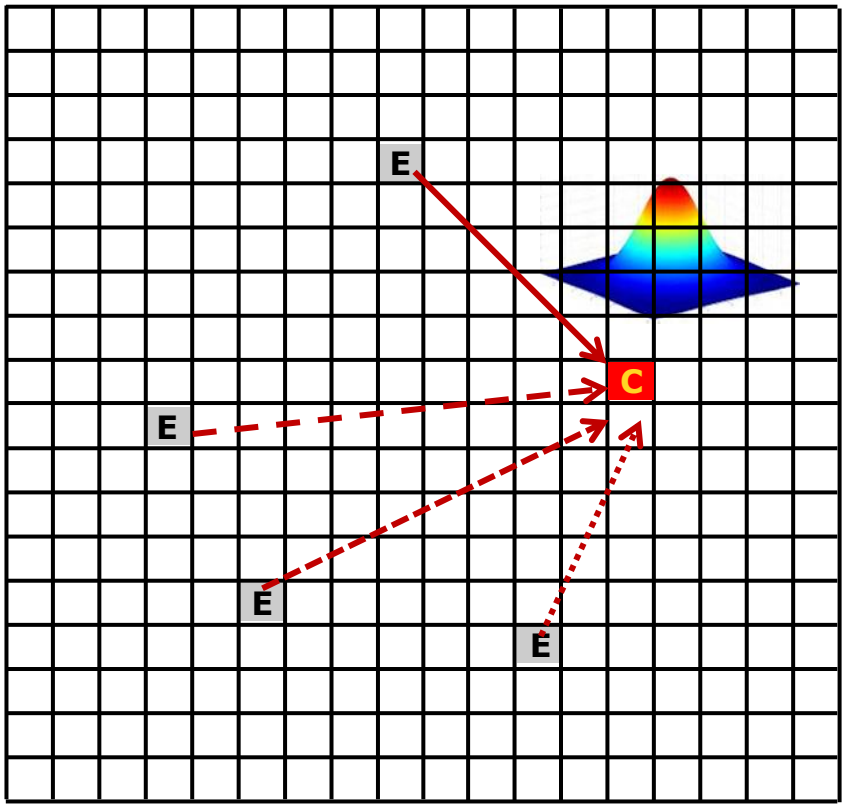


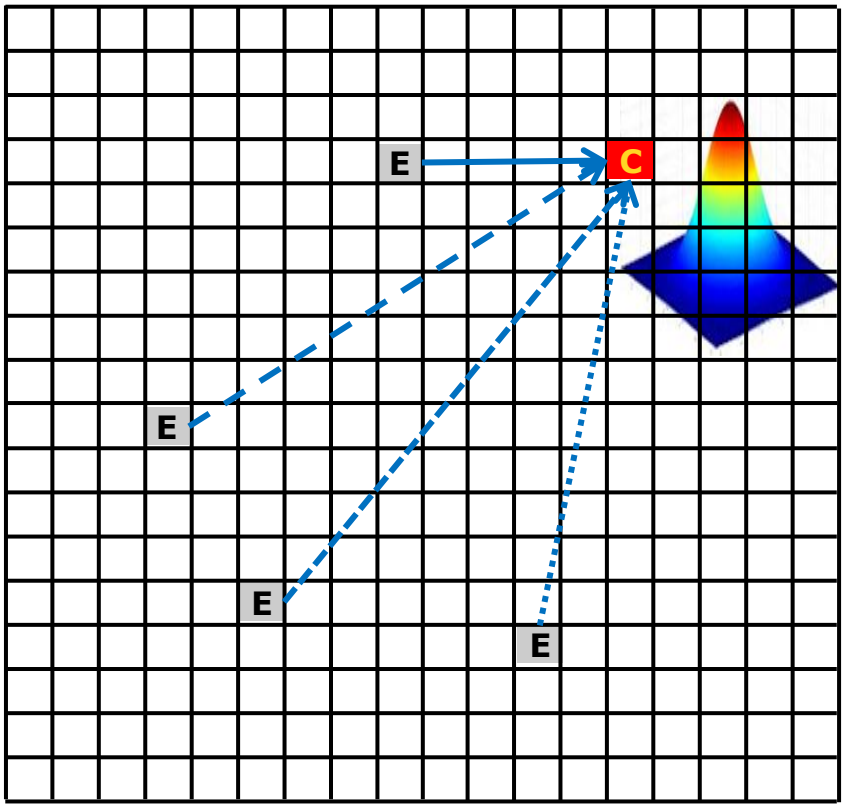
$$f = \alpha(1+d)^{-\omega}$$

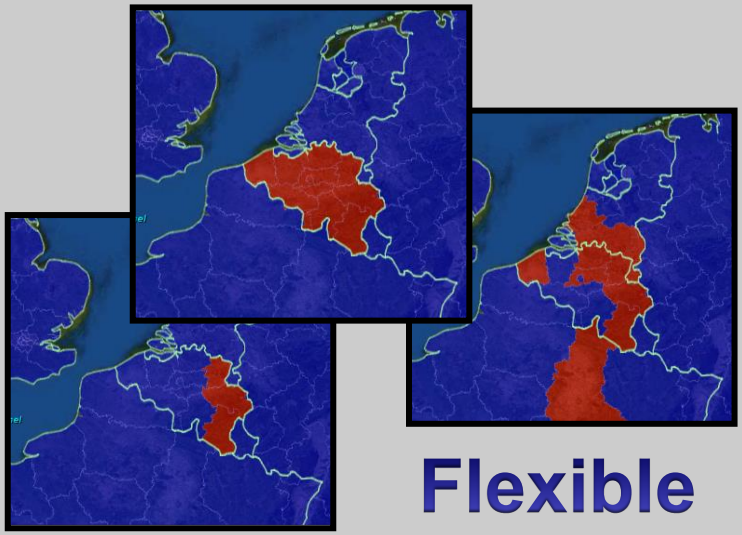
$$N_{Scenarios} = 2$$

- The number of scenarios is reduced to 2 per precusor → low-cost set-up
- The cell to cell relationship ensures spatial flexibility

Methodology: Simplified S/R Relationship



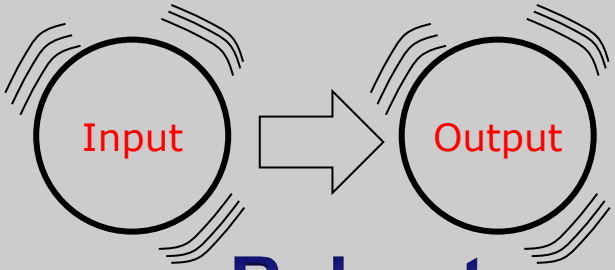




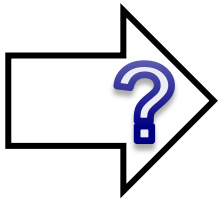
Flexible

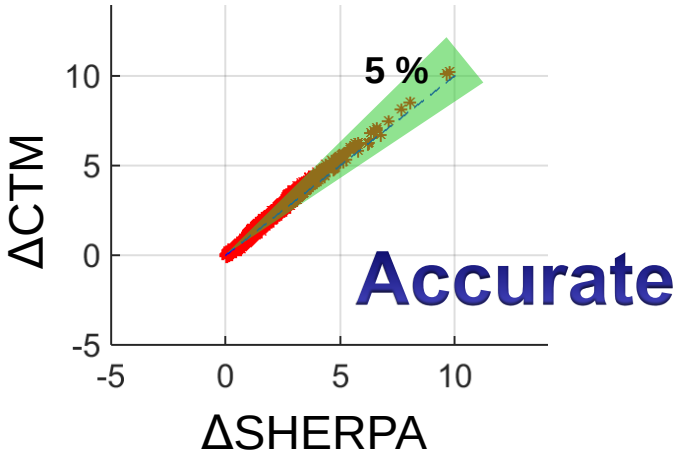
Easy set-up

Fast



Robust





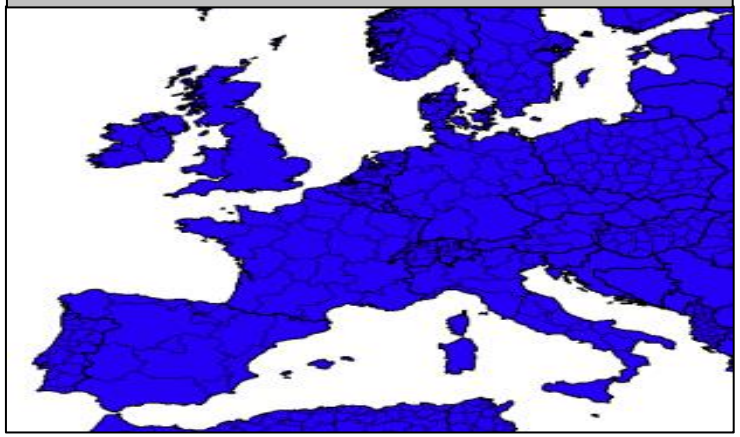
Accurate

Joint Research Centre

Validation: CHIMERE 7x7 km

European Commission

Training simulations (10)

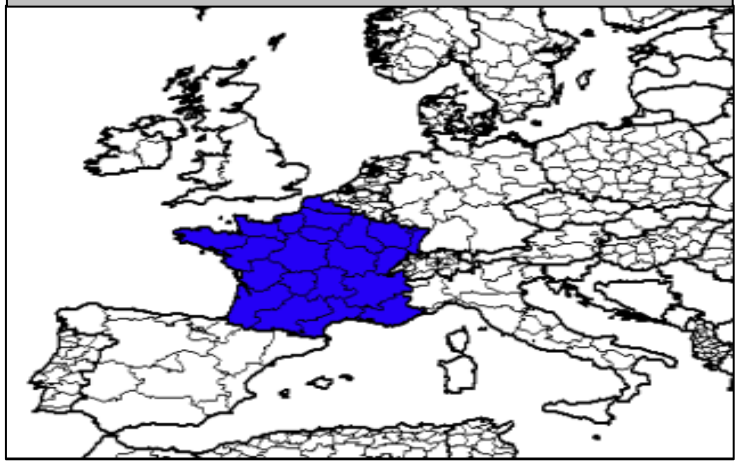


ΔE Europe wide $\Rightarrow \Delta C$

S/R simplified relation

$$\Delta C_i = f(\Delta E^{p}_{dom})$$

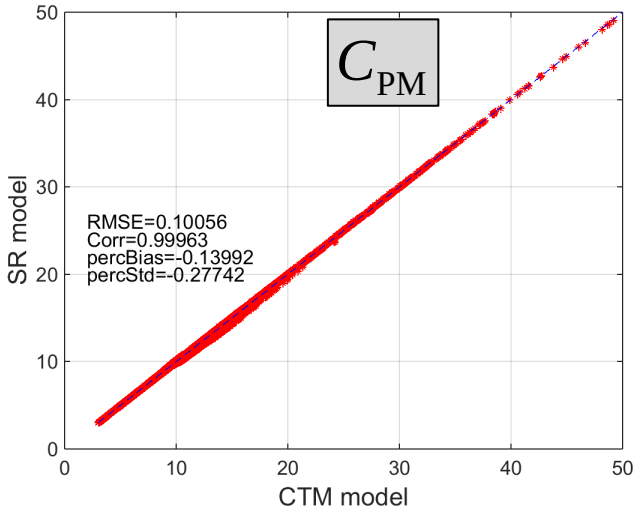
Validation / Application

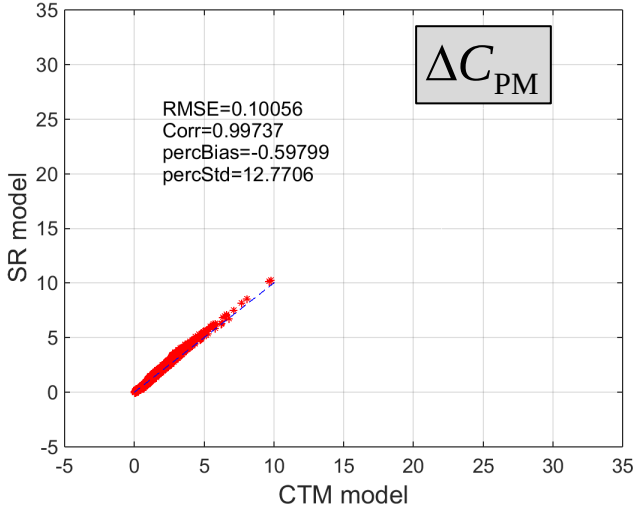


ΔE Country / region $\Rightarrow \Delta C$

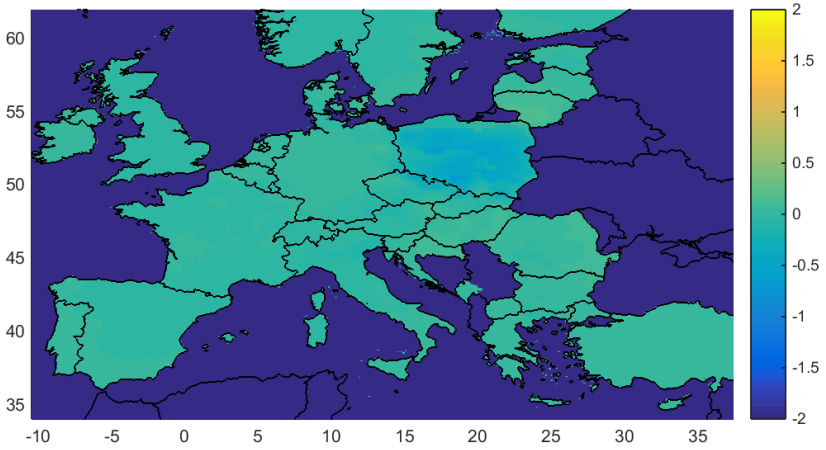
Joint Research Centre

Validation: Poland

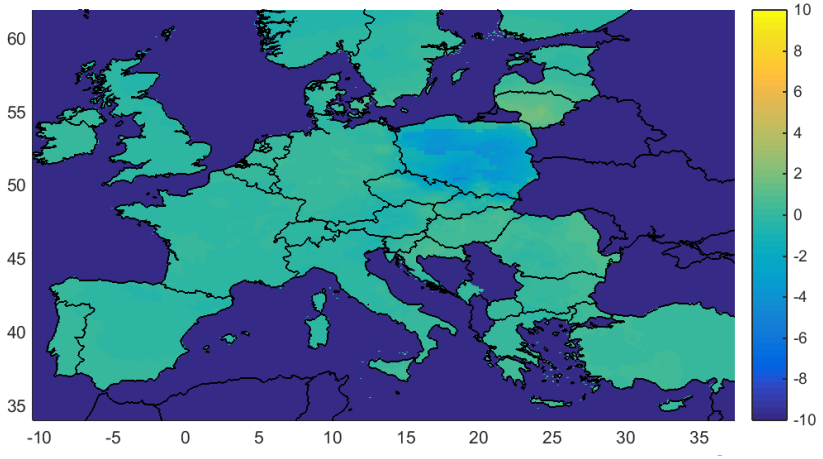




$C_{PM}^{S/R} - C_{PM}^{CTM}$



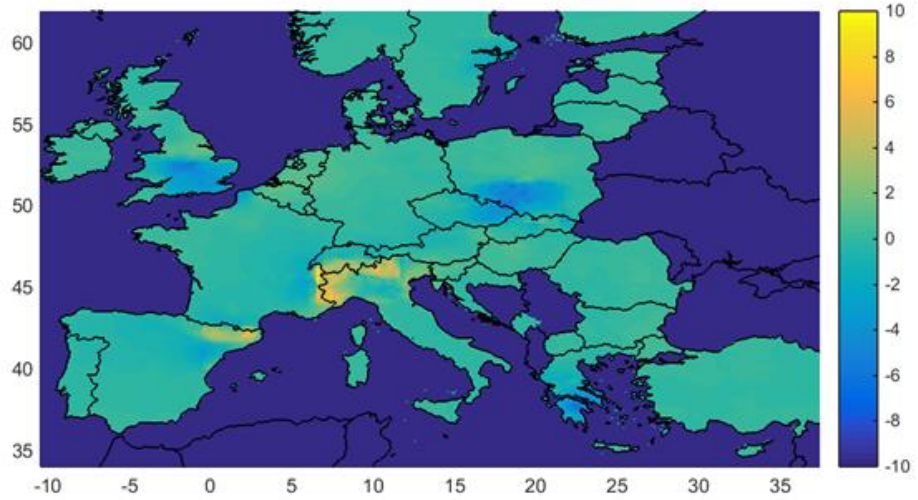
$\left(C_{PM}^{S/R} - C_{PM}^{CTM}\right) / C_{PM}^{CTM} \times 100$



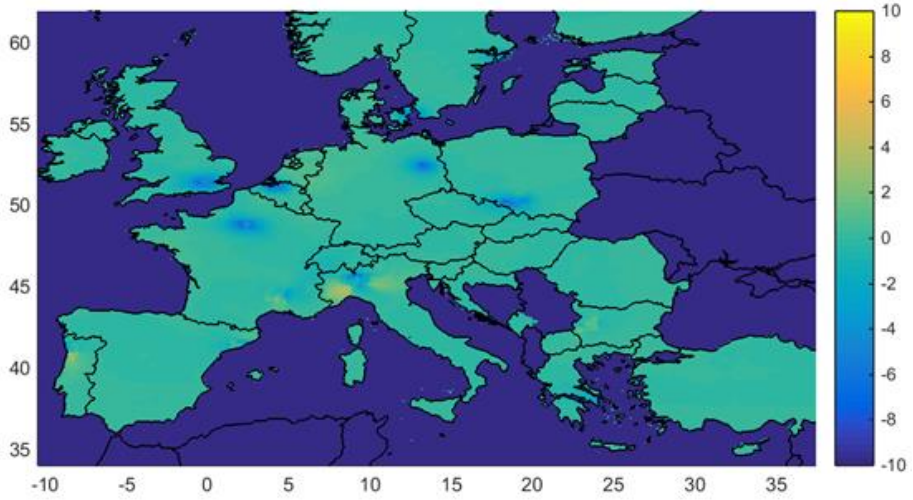
Validation: Reduction over small regions

European Commission

$$\left(C_{PM}^{S/R} - C_{PM}^{CTM}\right) / C_{PM}^{CTM} \times 100$$



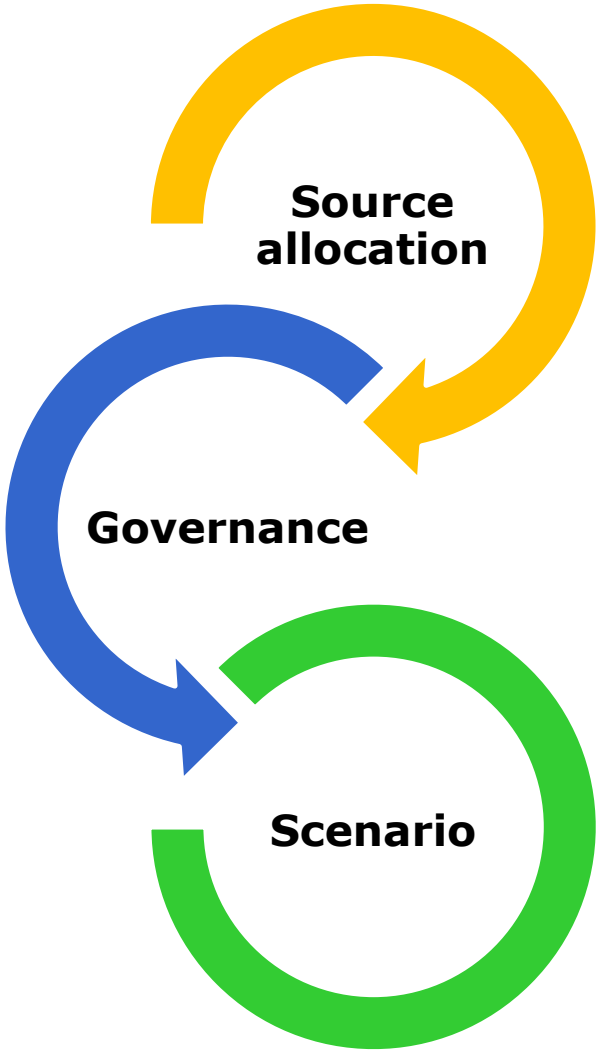
Emission reduction over 140x140 km squares centered on Katovice, Lombardy, London, Barcelona, Athens, Stockholm



Emission reduction over 35x35 km squares centered on Katowice, Lombardy, London, Barcelona, Athens, Stockholm, Antwerp, Porto, Paris, Clermont-Ferrand, Berlin, Copenhagen, Sofia

Joint Research Centre

SHERPA application



WHAT can I influence?
WHICH sectors/pollutants?

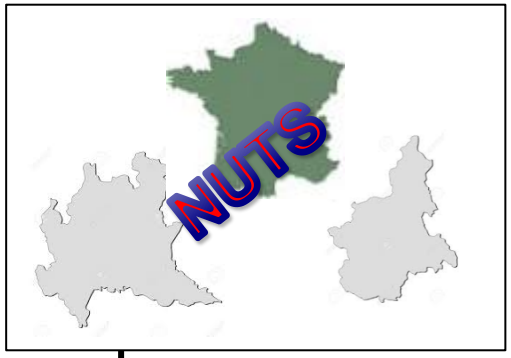
WITH WHOM should I coordinate actions?

HOW MUCH impacts (scenario analysis)

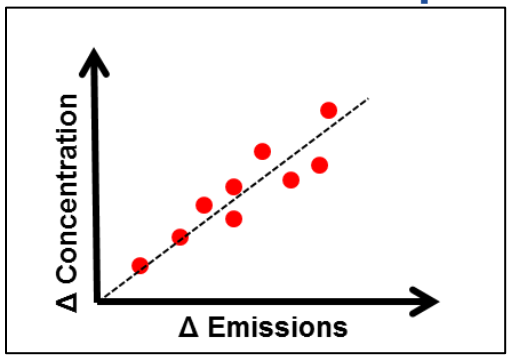
Flexibility and adaptability

European Commission

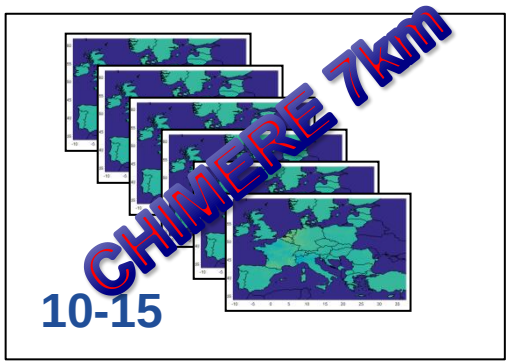
Shapes

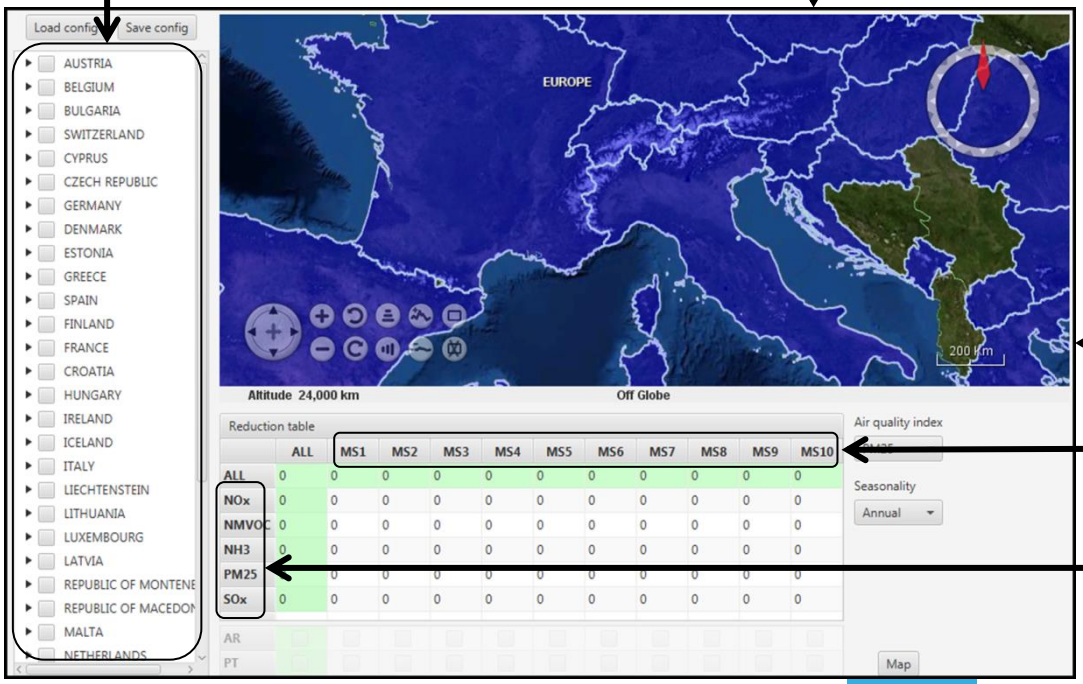


S/R Relationships



AQ Modelling

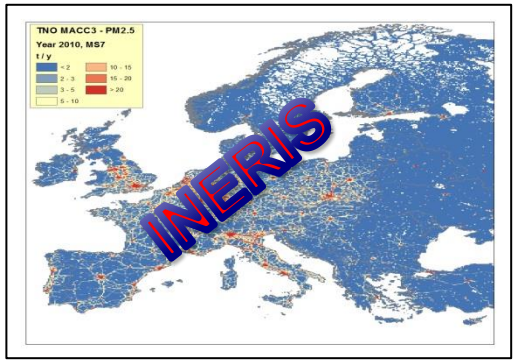




Gridded emissions

SNAP

Precursors

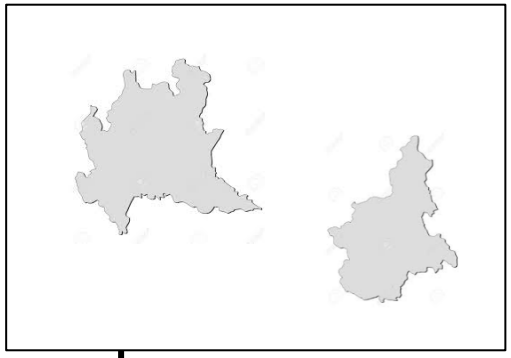


Emission Inventory

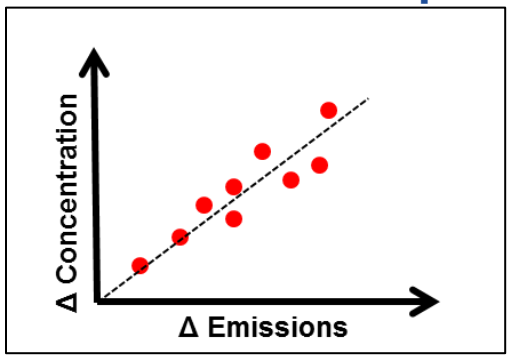
Flexibility and adaptability: Regional

European Commission

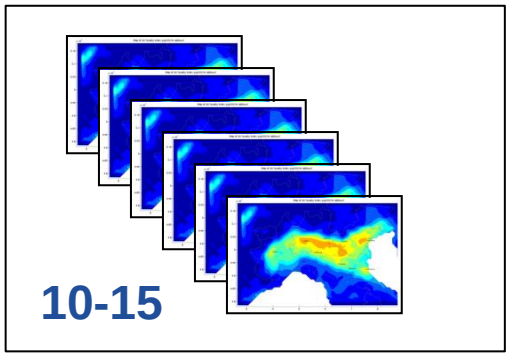
Shapes

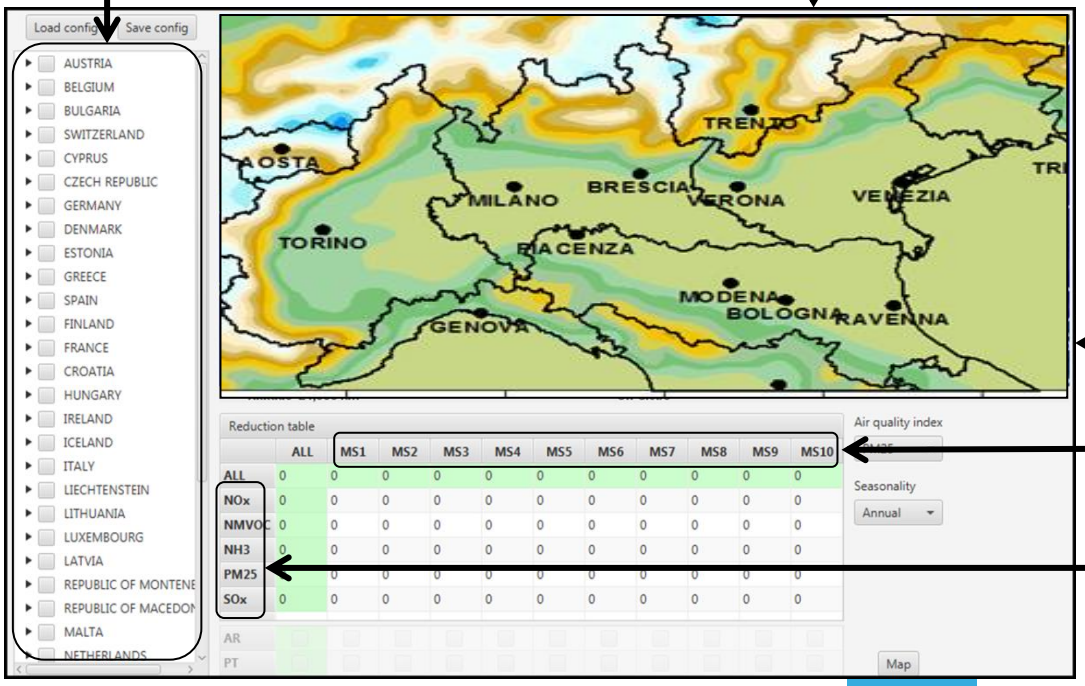


S/R Relationships



AQ Modelling

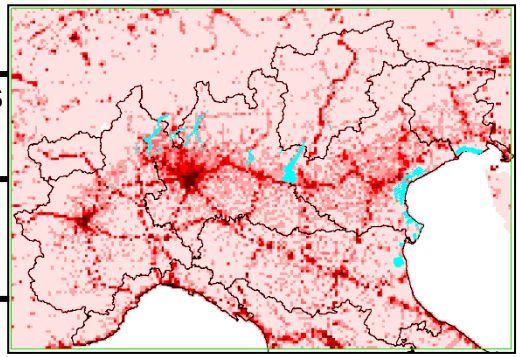




Gridded emissions

Sectors

Precursors



Emission Inventory

Conclusions

- SHERPA covers the entire EU at 7km resolution (CHIMERE based) but it can be fed by other AQ model / emissions /resolutions, provided that 10 full AQ simulations are performed.

- It currently works for yearly averaged PM_{10}, $PM_{2.5}$ and NO_2 concentrations. Extension to summer O_3 are planned.

- SHERPA also provides "first-guess" data (emissions, S/R relationships, GAINS technologies) to $RIAT_+$ and run cost-effectiveness analysis