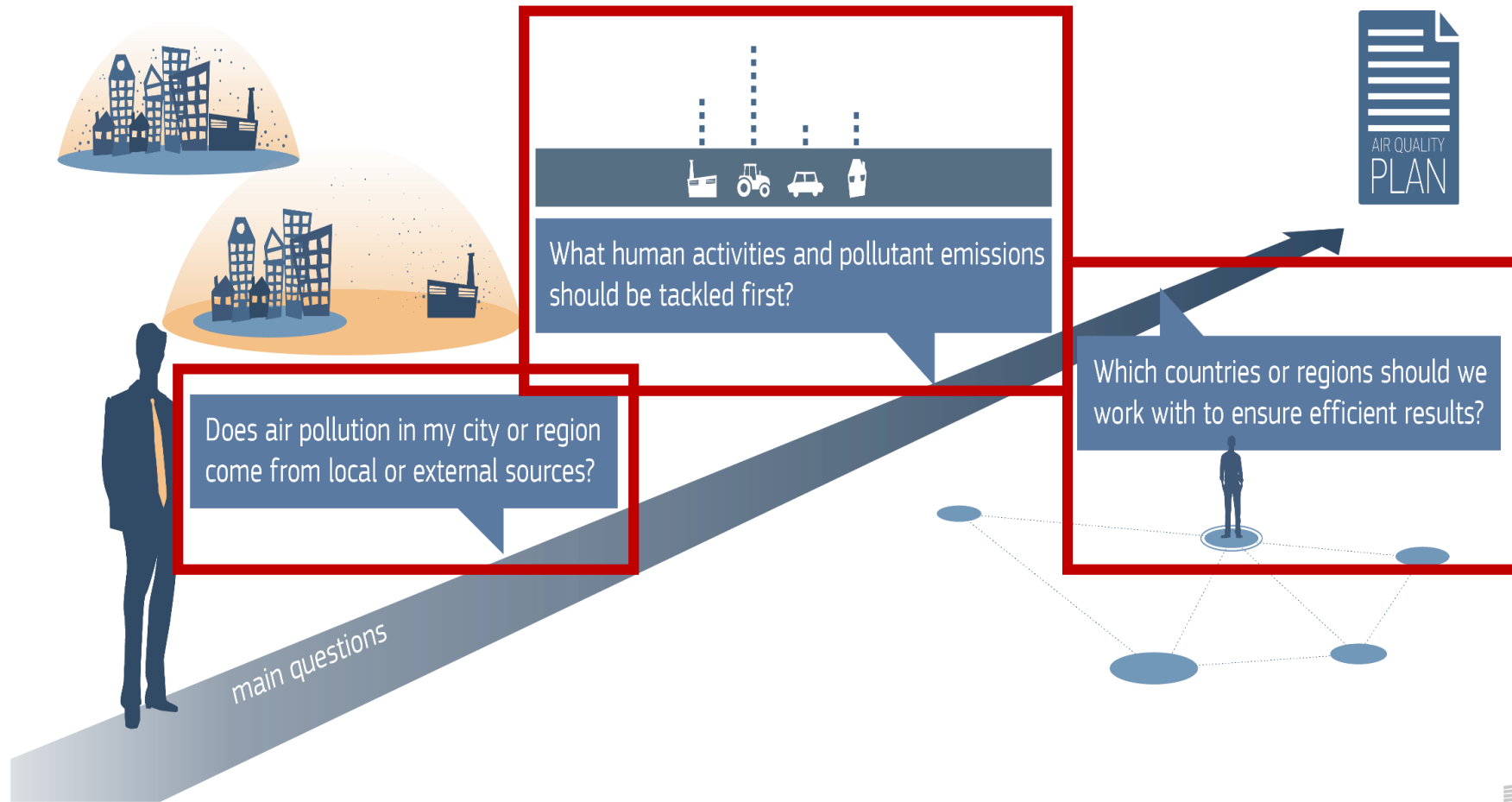




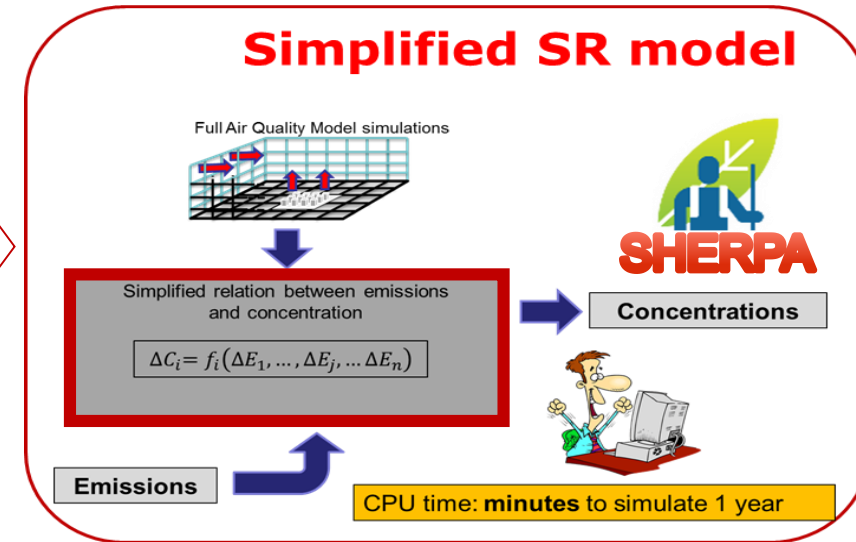
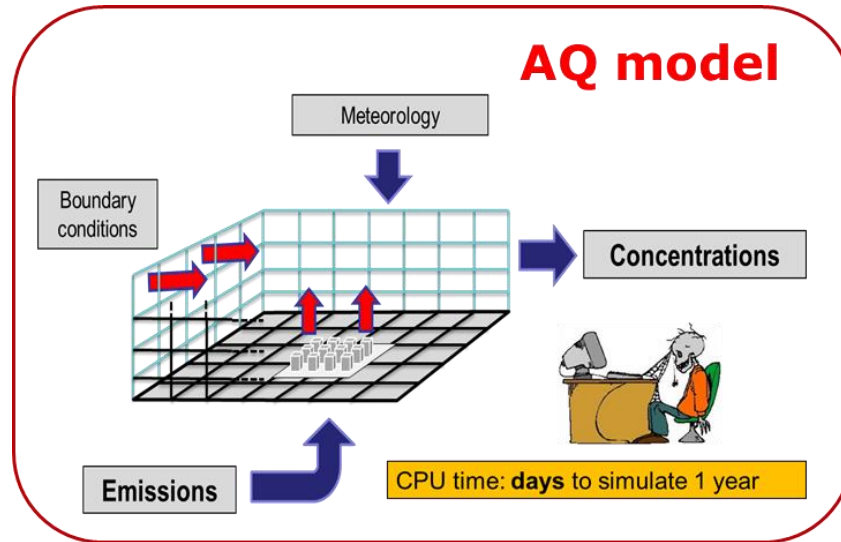
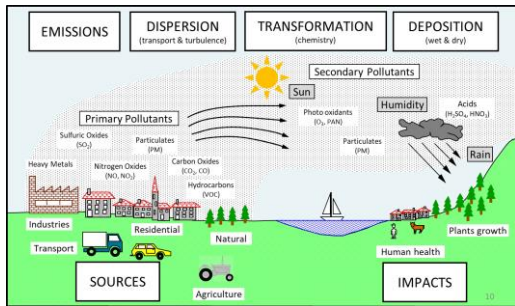
# Simulating air quality management policies in Europe with the SHERPA-Cloud model

*Enrico Pisoni, Davide De Marchi, Alberto di Taranto, Bertrand Bessagnet, Stefano Zauli Sajani, Alexander De Meij, **Fabio Monforti-Ferrario**, Philippe Thunis*

# Why: main questions to be addressed



# How: from real world to models



## Screening for High Emission Reduction Potentials on Air quality

# How: technical details

- Underlying Air Quality Model:
  - EMEP version 4.45
- Emissions:
  - 2019, CAMS 6.1
- Spatial resolution:
  - 0.1 x 0.05 degrees (around 6 km resolution)
- Meteorology:
  - IFS (ECMWF)

# SHERPA in practice

## Air Quality Modeling

Home   Δ Assessment   Δ Emissions   **Sherpa**   Others

Home > About the European Commission > EC Science Hub > AQM

### SHERPA

SHERPA is now available at:

[SHERPA Dashboard](#)

To use SHERPA the **EU Login** is required

### EU Academy

The SHERPA training is now on 'EU Academy' and available at:

[SHERPA: A tool to support the design of urban/regional air quality plans](#)

### PM2.5 Urban Atlas

The 2021 PM2.5 Urban Atlas has been published. More details here:

[Atlas maps main sources of air pollution for 150 European cities](#)

[Data used to produce the 2021 PM2.5 Atlas](#)

Scenario Analysis

This module answers the following question: What is the impact of a given emission reduction scenario (e.g. a specific air quality plan) on air quality in my region? Based on a user selected control area where specific emission reductions are applied, SHERPA produces an air quality impact map over the selected region and surrounding areas. Emission reduction percentages can freely be introduced by the user in terms of sectors and precursors. This module also computes costs of the end-of-pipe technologies needed to reach the required emission reductions. The computation is based on the GAINS database of measures.

SCENARIO ANALYSIS

Sectoral

This module answers the following question: What is the relative contribution of the various emission sectors to the overall impact of an emission reduction strategy? Based on a user selected control area where emission reductions are applied, SHERPA produces source apportionment estimates in terms of sectors.

SECTORAL ALLOCATION

Precursors

This module answers the following question: What is the relative contribution of the various emission precursors to the overall impact of an emission reduction strategy? Based on a user selected control area where emission reductions are applied, SHERPA produces apportionment estimates in terms of precursors.

PRECURSORS ALLOCATION



<https://aqm.jrc.ec.europa.eu/Section/Sherpa>



# Scenario analysis

SHERPA: Scenario Analysis

EEA stations: **None** NO2 PM10 PM25

Search:

**NUTS** FUA CNC

- AUSTRIA
- BELGIUM
- BULGARIA
- SWITZERLAND
- CYPRUS
- CZECH REPUBLIC
- GERMANY
- DENMARK
- ESTONIA
- GREECE
- SPAIN
- FINLAND
- FRANCE
- CROATIA
- HUNGARY
- IRELAND
- ICELAND
- ITALY
- LIECHTENSTEIN
- LITHUANIA
- LUXEMBOURG
- LATVIA
- REPUBLIC OF MONTENEGRO
- FORMER YUGOSLAV REPUBLIC OF
- MALTA
- NETHERLANDS

Reduction table [%]

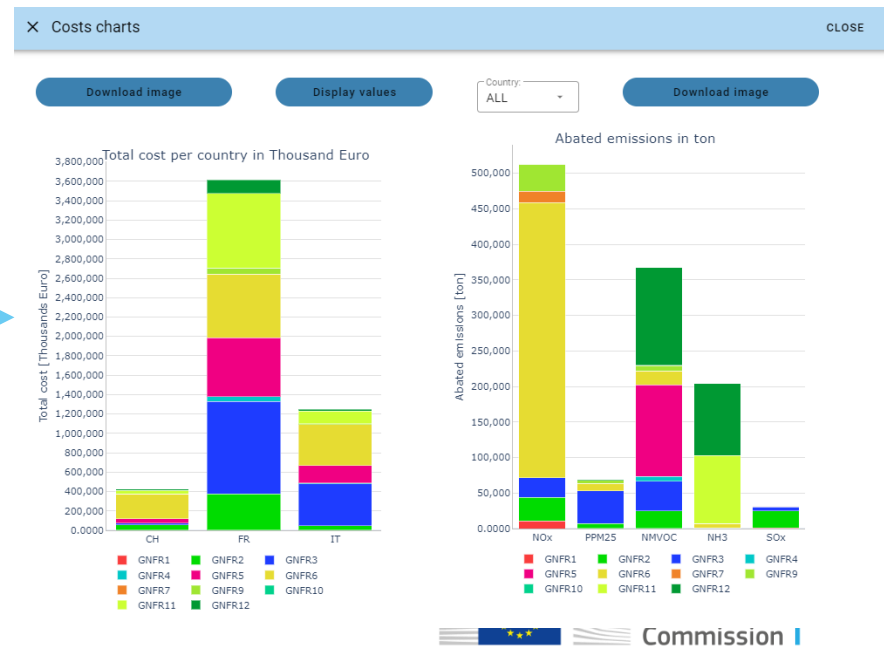
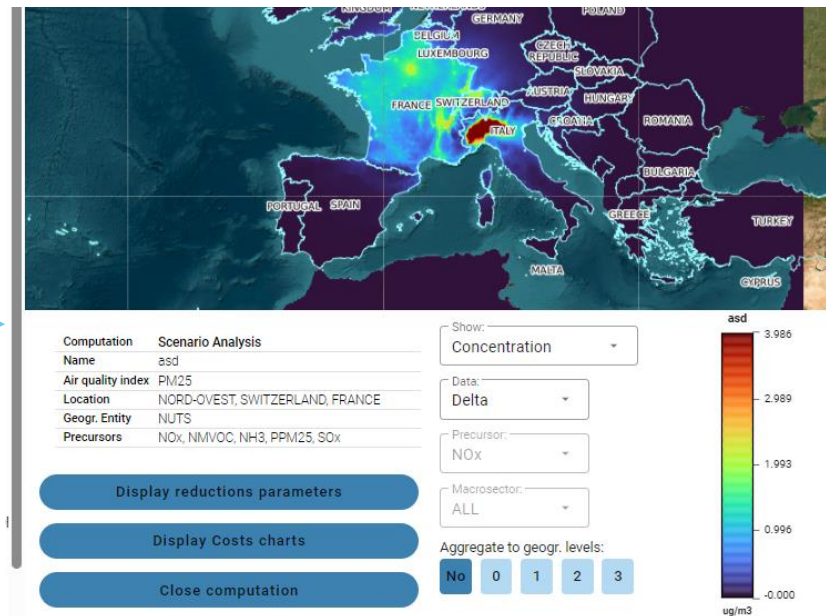
	ALL	GNFR1	GNFR2	GNFR3	GNFR4	GNFR5	GNFR6	GNFR7	GNFR8	GNFR9	GNFR10	GNFR11	GNFR12
ALL	30	30	30	30	30	30	30	30	30	30	30	30	30
NOx	30	30	30	30	30	30	30	30	30	30	30	30	30
NMVOG	30	30	30	30	30	30	30	30	30	30	30	30	30
NH3	30	30	30	30	30	30	30	30	30	30	30	30	30
PPM25	30	30	30	30	30	30	30	30	30	30	30	30	30
SOx	30	30	30	30	30	30	30	30	30	30	30	30	30

Air Quality Index: PM25

Local calculation

Compute map

Load computation



# Source allocation: default view

SHERPA: Source Allocation - Sectoral

EEA stations: **None** NO2 PM10 PM25

Display City Fiches

Search:

NUTS FUA CNC

- NUTS
  - AUSTRIA
  - BELGIUM
  - BULGARIA
  - SWITZERLAND
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  - LATVIA
  - REPUBLIC OF MONTENEGRO
  - FORMER YUGOSLAV REPUBLIC OF
  - MALTA
  - NETHERLANDS
  - NORWAY

Legend

- city area and FUA area > 300 km<sup>2</sup>
- FUA area > 300 km<sup>2</sup>
- FUA area <= 300 km<sup>2</sup>

Search city by name:

Reduction table

	ALL	GNFR1	GNFR2	GNFR3	GNFR4	GNFR5	GNFR6	GNFR7	GNFR8	GNFR9	GNFR10	GNFR11	GNFR12
ALL	<input type="checkbox"/>												
NOx	<input type="checkbox"/>												
NMVOc	<input type="checkbox"/>												
NH3	<input type="checkbox"/>												
PPM10	<input type="checkbox"/>												
PPM25	<input type="checkbox"/>												
SOx	<input type="checkbox"/>												

Milano.pdf

Italy, Milano

Urban monitoring stations (2019)

PM<sub>2.5</sub> PM<sub>10</sub>

Yearly average concentration (µg/m<sup>3</sup>)

Urban background levels and WHO Guideline Values

City area: 1333 km<sup>2</sup> Pop: 3.74 millions inhab.  
Greater City area: 3254 km<sup>2</sup> Pop: 5.69 millions inhab.  
City area: 1333 km<sup>2</sup> Pop: 3.74 millions inhab.

PM<sub>2.5</sub> Spatial and sectoral allocation

Sectors

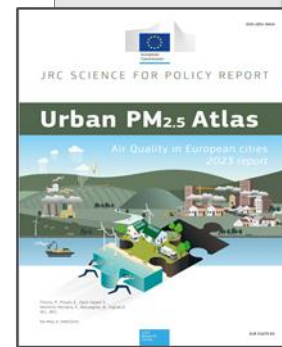
- T - Transport
- I - Industry
- A - Agriculture
- R - Residential
- S - Shipping
- O - Other
- N - Natural
- E - External

Emissions (kt/year)

PPM<sub>2.5</sub>

City emissions Greater City emissions

Percentage of total mass



[EGU24-2812](#)

Wed, 17 Apr, 08:35–08:45



# Scientific references

## [SHERPA-Cloud: An open-source online model to simulate air quality management policies in Europe](#)



Environmental Modelling & Software

Available online 27 March 2024, 106031

In Press, Journal Pre-proof What's this?



Position Paper

### SHERPA-Cloud: An open-source online model to simulate air quality management policies in Europe

[Enrico Pisoni](#)<sup>a</sup> , [Davide De Marchi](#)<sup>a</sup>, [Alberto di Taranto](#)<sup>b</sup>, [Bertrand Bessagnet](#)<sup>a</sup>,  
[Stefano Zauli Sajani](#)<sup>a</sup>, [Alexander De Meij](#)<sup>c</sup>, [Philippe Thunis](#)<sup>a</sup>

## [AQM - Air Quality Modeling Platform \(europa.eu\)](#) Full list of methodological and Application papers



Atmospheric Environment: X

Volume 4, October 2019, 100047



Journal of Environmental Management

Volume 317, 1 September 2022, 115486



Research article

### Design and implementation of a new module to evaluate the cost of air pollutant abatement measures

[Bertrand Bessagnet](#)<sup>a</sup> , [Enrico Pisoni](#)<sup>a</sup>, [Philippe Thunis](#)<sup>a</sup>, [Alessandro Mascherpa](#)<sup>b</sup>

### Application of the SHERPA source-receptor relationships, based on the EMEP MSC-W model, for the assessment of air quality policy scenarios

[E. Pisoni](#)<sup>a</sup> , [P. Thunis](#)<sup>a</sup>, [A. Clappier](#)<sup>b</sup>

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ARTICLES | VOLUME 8, ISSUE 7, E546-E558, JULY 2023

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### Spatial and sector-specific contributions of emissions to ambient air pollution and mortality in European cities: a health impact assessment

[Sasha Khomenko](#), MSc • [Enrico Pisoni](#), PhD • [Philippe Thunis](#), PhD • [Bertrand Bessagnet](#), PhD Habil •  
[Marta Cirach](#), MSc • [Tamara lungman](#), MPH • et al. [Show all authors](#)

[Open Access](#) • Published: July, 2023 • DOI: [https://doi.org/10.1016/S2468-2667\(23\)00106-8](https://doi.org/10.1016/S2468-2667(23)00106-8)



# Conclusions

- The new SHERPA-Cloud model can be used to perform ‘scenarios analysis’ and ‘source allocation studies’
- It is based on 2019 base emissions, including condensables
- It comes with a set of pre-computed results covering all Europe
- It is also possible to build a SHERPA version based on your own data

# Thanks!



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