

# Qualità dell'aria: dalle sorgenti agli impatti sulla salute

**The European Commission's  
science and knowledge service  
Joint Research Centre**

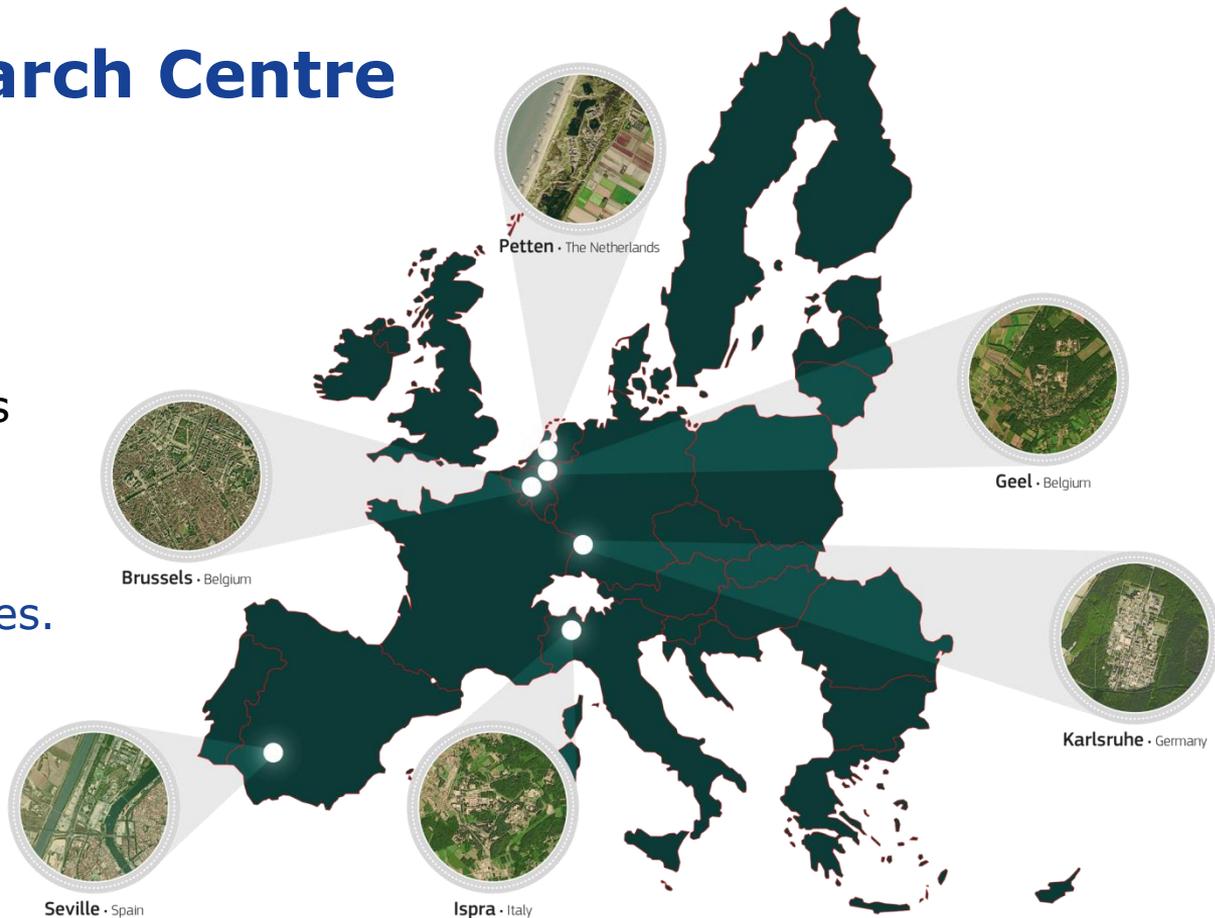


# The Joint Research Centre at a glance

## 3000 staff

Almost 75% are scientists  
and researchers.

Headquarters in Brussels  
and research facilities  
located in 5 Member States.



# Contesto normativo

# Air pollution in Europe - Overview

**Europe's air quality** is slowly improving, but fine particulate matter and nitrogen dioxide in particular continue to cause serious impacts on health.

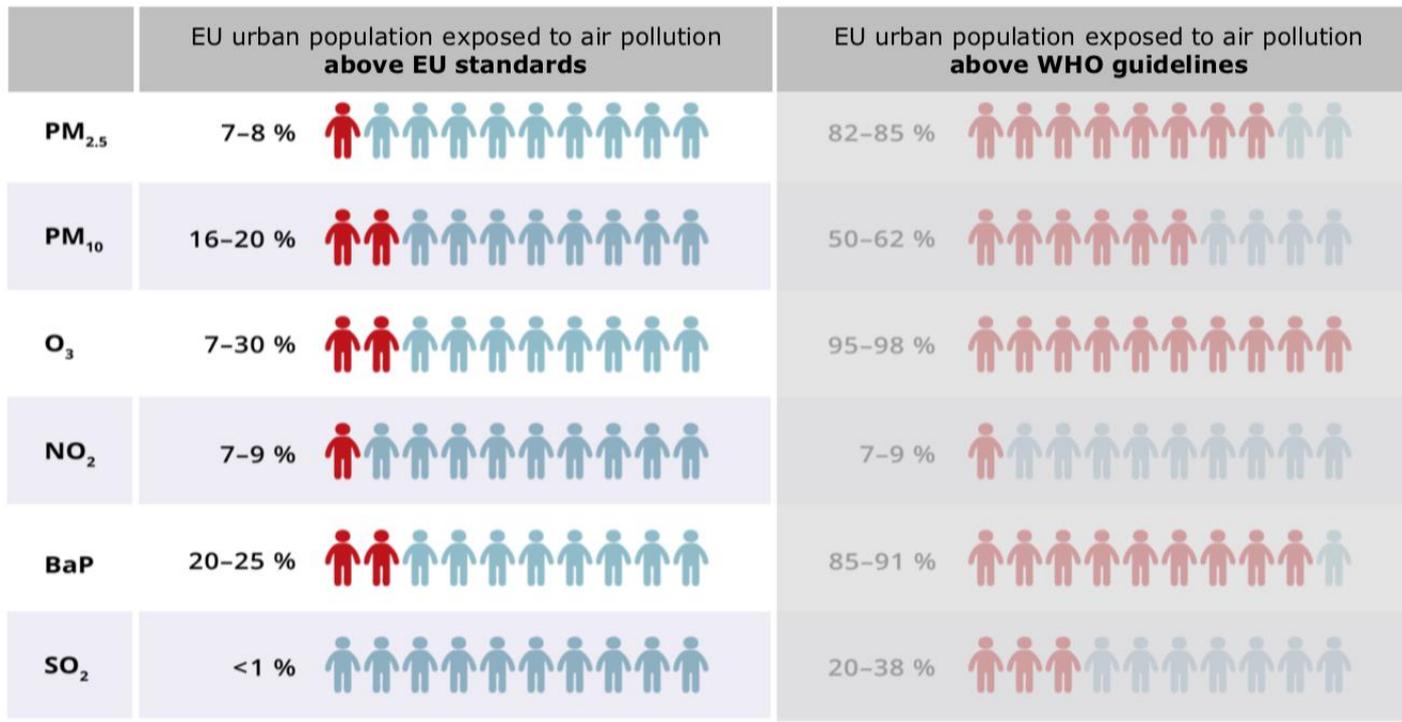
Estimates point to about **400.000 premature deaths** in EU-28 each year due to particulate matter and 75.000 due to nitrogen dioxide

Air pollution is estimated to causes at least **€ 24 billion per year** in direct costs; add to this estimates of €330 billion to € 940 billion per year in indirect costs (e.g. related to reduced life expectancy or broader societal impacts).

**63%**

Air pollution exceeds **eutrophication limits** in 63% of ecosystem area, and in 73% of Natura2000 area.

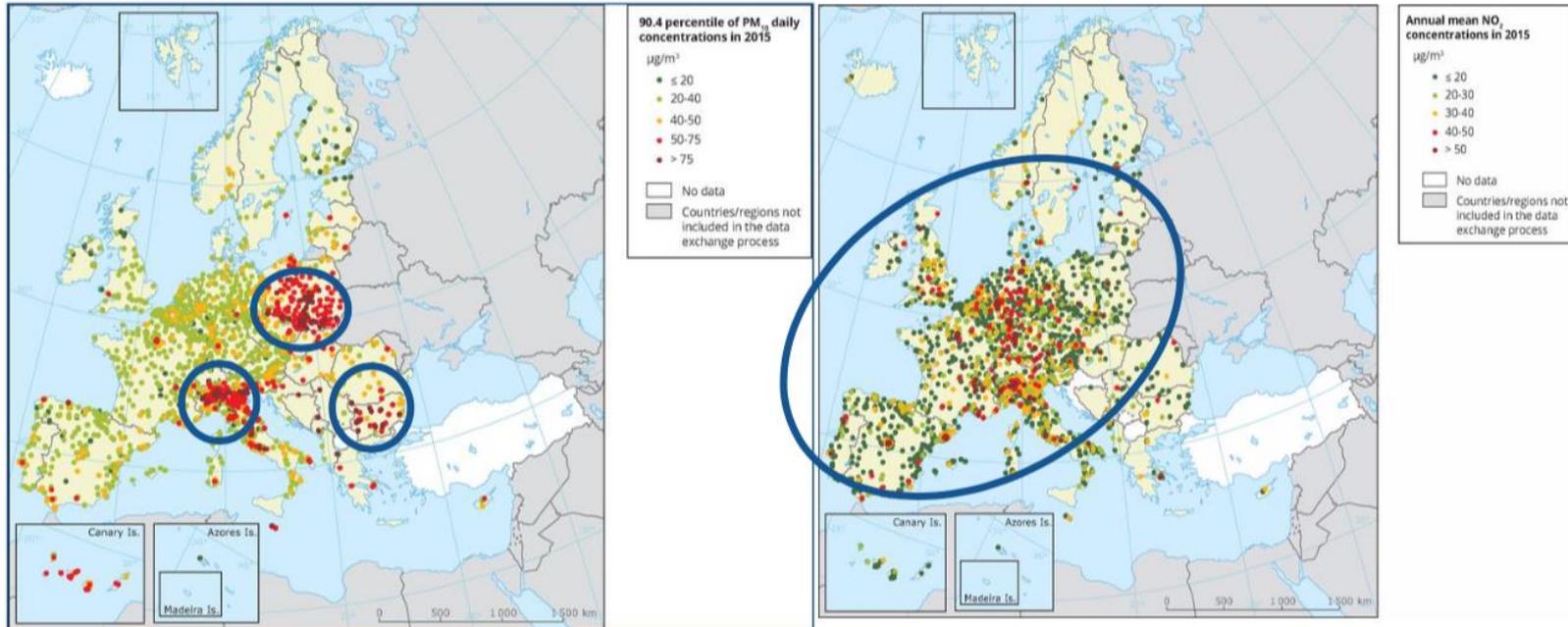
# Air pollution in Europe



# Air pollution in Europe

**PM10 exceedances:** often linked to fuel combustion (i.e. energy, heating)

**NO2 exceedances:** often linked to traffic, in more than 130 cities in EU.



# EU Clean Air Policy – The policy framework



## Air Quality Directives

Maximum concentrations of air polluting substances

## CONCENTRATIONS

## EMISSIONS



## National Emission Ceilings Directive

National emission totals  
(SO<sub>2</sub>, NO<sub>x</sub>, VOC, PM<sub>2.5</sub>, NH<sub>3</sub>)

## Source-specific emission standards

- IED Directive
- MCP Directive
- Eco-design Directive
- Energy efficiency
- Euro and fuel standards

# EU Clean Air Policy – Links with other policies

**Climate and energy** policies ... e.g. by promoting the use of renewable energy, by reducing use of coal, by fostering low emission mobility;

**Industry** policies ... e.g. by agreeing and promoting best available techniques;

**Agriculture** policies ... e.g. by using low-emission fertilisers, by focusing on better livestock and manure management practices;

**Transport** policies ... e.g. by reducing emissions from vehicles, by setting standards to improve fuel quality, by encouraging sustainable mobility options;

**Fiscal** policies ... e.g. by taxing air pollution, by aligning fuel taxation;

**Urban** policies ... e.g. by investing in cleaner mobility and public transport.



# Contesto scientifico

# air pollutants

## What are the main air pollutants?

### Primary air pollutants

are directly emitted into the atmosphere e.g. from vehicle exhausts or chimneys.

*Click on the images to find out more about each air pollutant.*



air pollutants

### Secondary air pollutants

are formed in the atmosphere through oxidation and reactions between primary air pollutants.



### Important

Other air pollutants can also cause severe damage to human health and the environment. These include heavy metals (such as mercury, arsenic, lead, cadmium and nickel) and polycyclic aromatic hydrocarbons (such as benzoapyrene). The existing legislation has already helped to significantly reduce the emissions of these pollutants, resulting in a greatly reduced health risk.

Source: [Air pollution, European Environment Agency](#).



# air pollutants

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PM  
Particulate matter (secondary)

Formed in the atmosphere from SO<sub>2</sub>, NO<sub>x</sub>, NH<sub>3</sub> and VOC.

NH<sub>3</sub>, SO<sub>2</sub> and NO<sub>x</sub> react in the atmosphere to form compounds.

These compounds form new particles in the air or condense onto pre-existing particles to form inorganic aerosols.

Combination of NH<sub>3</sub> and SO<sub>2</sub> forms ammonium sulphate.

Combination of NH<sub>3</sub> and NO<sub>x</sub> forms ammonium nitrate.

Some VOC are oxidised to form compounds, which then form secondary organic aerosols.

These secondary particulates and organic aerosols also effect health, materials, agriculture and the environment.

[Clean Environment Agency.](#)

# effects

## Why are air pollutants a problem?

Click on the air pollutants to see some of their effects on health and the environment.



Affects the central nervous system

Can lead to birth defects

Can lead to childhood respiratory diseases

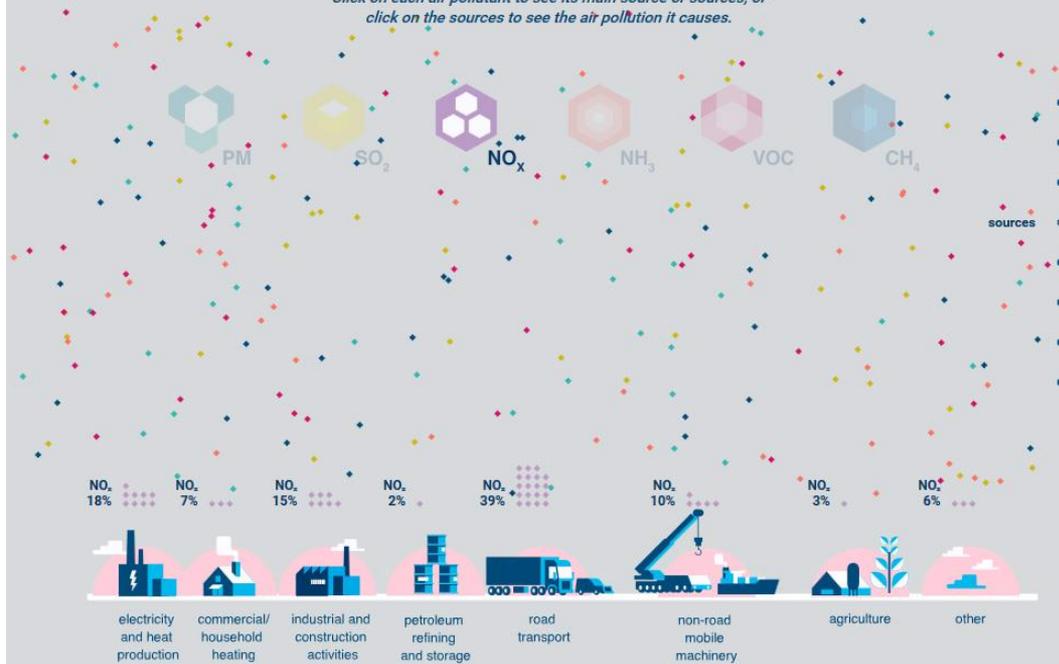
Can get deep into the lungs and cause serious health problems, such as aggravated asthma, bronchitis, decreased lung function...

Long-term exposure is linked with cardiovascular diseases, ...

# sources of air pollution

What are the main sources of primary air pollutants?

Click on each air pollutant to see its main source or sources; or click on the sources to see the air pollution it causes.



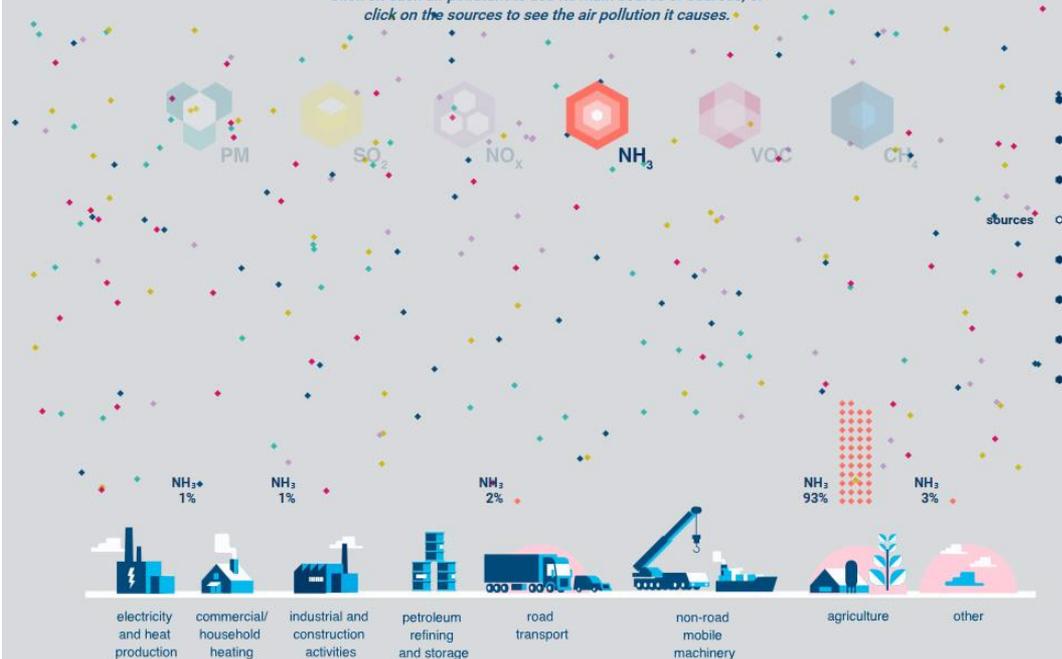
% = EU average amount in the atmosphere emitted by source.

Sources: [European Union emission inventory report 1990–2013](#), [European Environment Agency Sector split of emissions of ozone precursor pollutants](#), [European Environment Agency](#).

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# action to reduce air pollution

## What are the means to reduce air emissions over the next 15 years?

In 2013, the EU proposed a Clean Air Policy Package to further reduce emissions of air pollutants until 2030. Slide the buttons to see how these reductions might be achieved.

*Slide the buttons to see how these reductions might be achieved.*

- through anticipated change in social and economic patterns
- through existing air pollution legislation
- through additional measures to control air pollution

Current EU and national anti-pollution laws and policies have done (and still do) much to reduce air pollution. Changes in our energy systems, such as the decline in the use of solid fuels like wood and coal, also help. The current trends, however, are not sufficient to safeguard human health and the environment. We have to take further action.



Why is methane not part of this infographic? 

Source: [Air quality in Europe – 2014 report](#), European Environment Agency.

action

# benefits of taking action

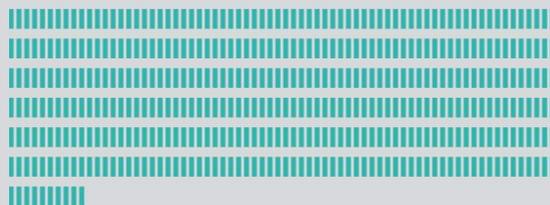
## How would the proposed Clean Air Policy Package improve health, the economy and the environment?

The total cost to implement the Clean Air Policy Package is estimated at about €2.2 billion a year by the time we reach 2030. However, about €3.3 billion a year could be saved in direct costs otherwise caused by air pollution, plus a further €40 to €140 billion in indirect costs (for example, related to improvements in people's health). This means that the expected benefits to society are more than 20 times the cost of implementing the legislation.

Slide the button to see what could happen in 2030.

Now  2030  2030: If the new Clean Air Policy Package becomes EU rules

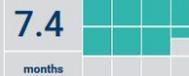
### Health



430 000 Premature deaths

1 bar = 1000 Lives

Life expectancy shortened by:



months

benefits

### Economic costs of air pollution



### Environment



Find out more [here](#).

# benefits of taking action

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### Health



1 bar = 1000 Lives

### Life expectancy shortened by:



Life expectancy extended by 3.3 months

benefits

### Economic costs of air pollution



Find out more [here](#).

### Environment



# Le banche dati disponibili

# Due principali fonti di informazioni

## Misure

- **EEA**
- **Banche dati regionali**

## Modelli

- **Modelli a scala regionale**
- **Modelli a scala locale**

## Air quality statistics calculated by the EEA (F)

Information on air quality statistics, calculated by the EEA based on data delivered within data flow E1a

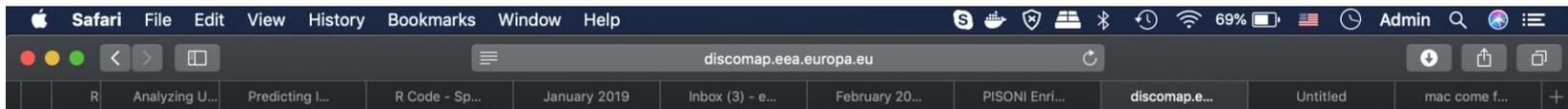
Search term

Results 1 – 10 of 1044047

Order **Relevance** Download TSV Download CSV

Country Or Te...	Reporting Year	Namespace	Station LocalId	Sampling Point LocalId	Sampling Point Latitude	Sampling Point Longitude
United Kingdom	2014	http://environment.data.gov.uk/air-quality/so	Station_GB0048R	GB_SamplingPoint_64635	55.792159999501166	-3.2429000000000006
United Kingdom	2014	http://environment.data.gov.uk/air-quality/so	Station_GB0645A	GB_SamplingPoint_248	51.47706999947706	0.317969
United Kingdom	2014	http://environment.data.gov.uk/air-quality/so	Station_GB0921A	GB_SamplingPoint_64683	51.63809399947746	-2.6787309999999995
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United Kingdom	2014	http://environment.data.gov.uk/air-quality/so	Station_GB0048R	GB_SamplingPoint_72941	55.792159999501166	-3.2429000000000006

- Country Or Territory <
- Reporting Year <
- Pollutant <
- Aggregation Type <
- AQ Value <
- Validity <
- Verification <
- Data Coverage <
- Data Capture <
- Time Coverage <
- Station LocalId <
- Sampling Point LocalId <



## Download of air quality data

### Download service for E1a and E2a data

**Update 20.11.2018:** Update frequency; E2a (UTD) files are now recreated every night (starts at 01:00 AM finished around 05:30 AM)

**Update 14.08.2018:** Measurement method added to metadata file

**Update 17.05.2018:** Notice that we have changed the pollutant parameter to use the pollutant id (e.g. 5, see <http://dd.eionet.europa.eu/vocabulary/aq/pollutant/view>) instead of the pollutant notation (e.g. PM10). This is to overcome the problems with pollutant containing blanks and '+' in the notation. The change have been made backward compatibly so a request using pollutant=PM10 will still work. The form below uses the pollutant id.

The download service is based on access to pre-prepared csv files and the service helps you to extract the list of files to be downloaded matching your search criteria.

Data available in this service comes from two dataflows: E1a and E2a. The E1a data are reported to EEA by memberstates every September and covers the year before the delivery. This means that data delivered in September 2017 covers 2016. EEA also receives up-to-date (E2a) data on hourly basis from most of its member states. Because E1a data are validated and considered an official delivery, all E2a data are deleted before E1a data are imported. This is to ensure that no E2a data are mixed with E1a data.

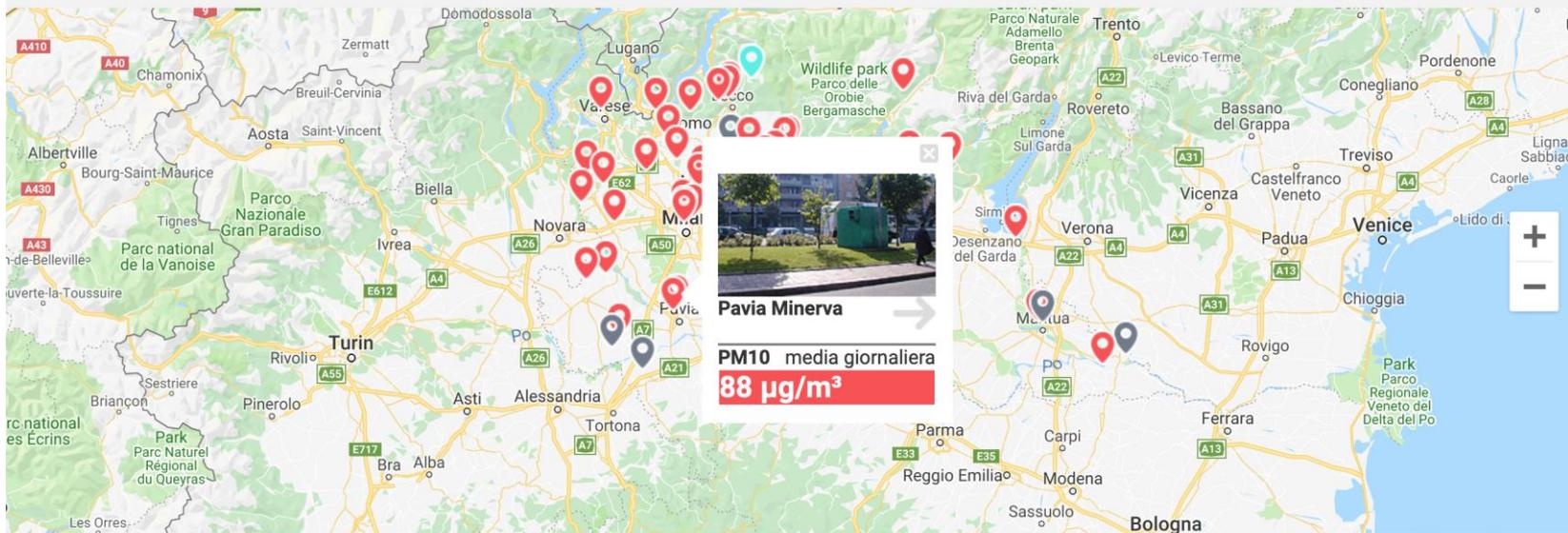
#### Download form

The form below will help you to build the request URL to get the list of files to download matching your criteria.

Before executing the URL it is possible to refine the request, e.g. by adding a specific station or leaving a parameter blank.

Note: Country, City and Pollutant are interlinked and changing the country will cause the others to change.





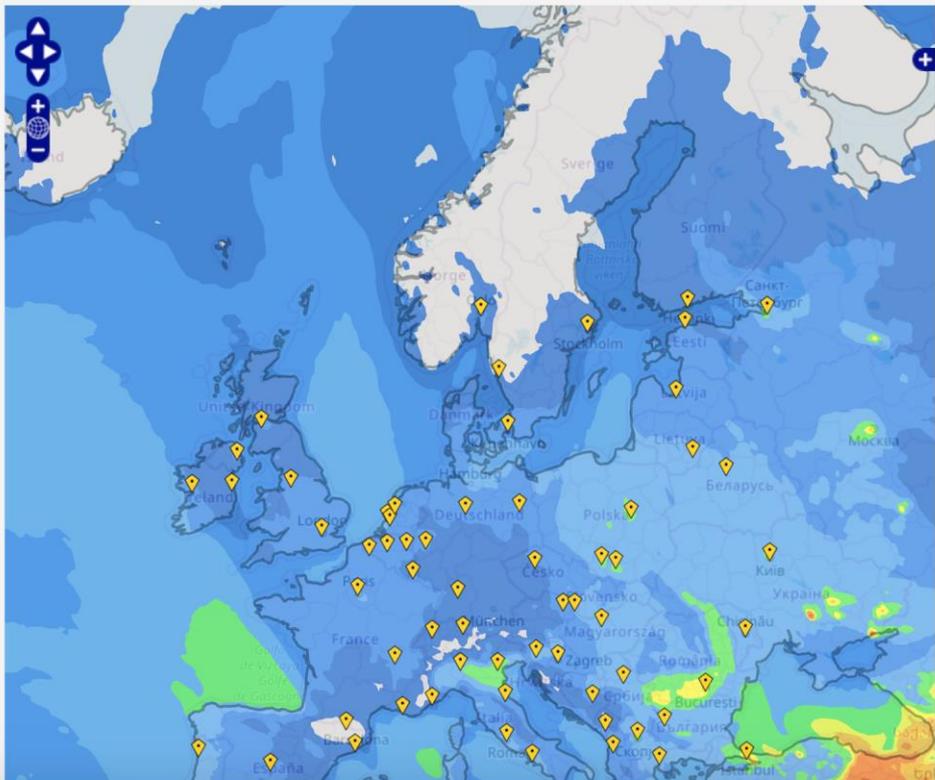
# Due principali fonti di informazioni

## Misure

- **EEA**
- **Banche dati regionali**

## Modelli

- **Modelli a scala regionale**
- **Modelli a scala locale**



### OTHER AIR QUALITY MAPS

- ENSEMBLE MODEL
  - HOURLY FORECASTS & ANALYSES
  - EPSGRAMS
- PARTNER MODELS
  - HOURLY FORECASTS
  - HOURLY ANALYSES
- ENSEMBLE VS PARTNER MODELS
  - DAILY MEAN AND MAXIMUM
- REANALYSES
  - ENSEMBLE REANALYSIS
  - SIGNIFICANT EVENTS
- NRT OBSERVATIONS

### DATA DOWNLOAD

- ONLINE DATA
- ARCHIVES
- REANALYSIS DATA
- OGC WEB SERVICES
- DATA SERVER FACILITIES

Safari File Edit View History Bookmarks Window Help regional.atmosphere.copernicus.eu

Li R-Package: Analyzing U... Predicting I... R Code - Sp... January 2019 Inbox (4) - February 20... PISONI Enri... European ai... European ai...

## EUROPEAN AIR QUALITY - REANALYSIS DATA

### CAMS Regional Air Quality - Reanalysis data

Select a model :  ENSEMBLE

Select a type for your data :  Hourly reanalysis - one year d.

Select a species :  PM2.5

Select a year :  2017-Interim data  
2016-Validated data  
2015-Validated data  
2014-Validated data  
2013-Validated data  
2012-Validated data  
2011-Validated data  
2010-Validated data

Select a format for your data : 

Get data :  In order to download CAMS data prod available [here](#) must be accepted



## Catalog [http://thredds.met.no/thredds/catalog/data/EMEP/2018\\_Reporting/catalog.html](http://thredds.met.no/thredds/catalog/data/EMEP/2018_Reporting/catalog.html)

### Terms of service

This is a shared public service which may experience overload in traffic from time to time. If you require these datasets for your own operational service please contact us at [servicedesk@met.no](mailto:servicedesk@met.no).

[MET Norway's Privacy Policy](#)

Get messages about planned maintenance and incidents from our [status page](#).

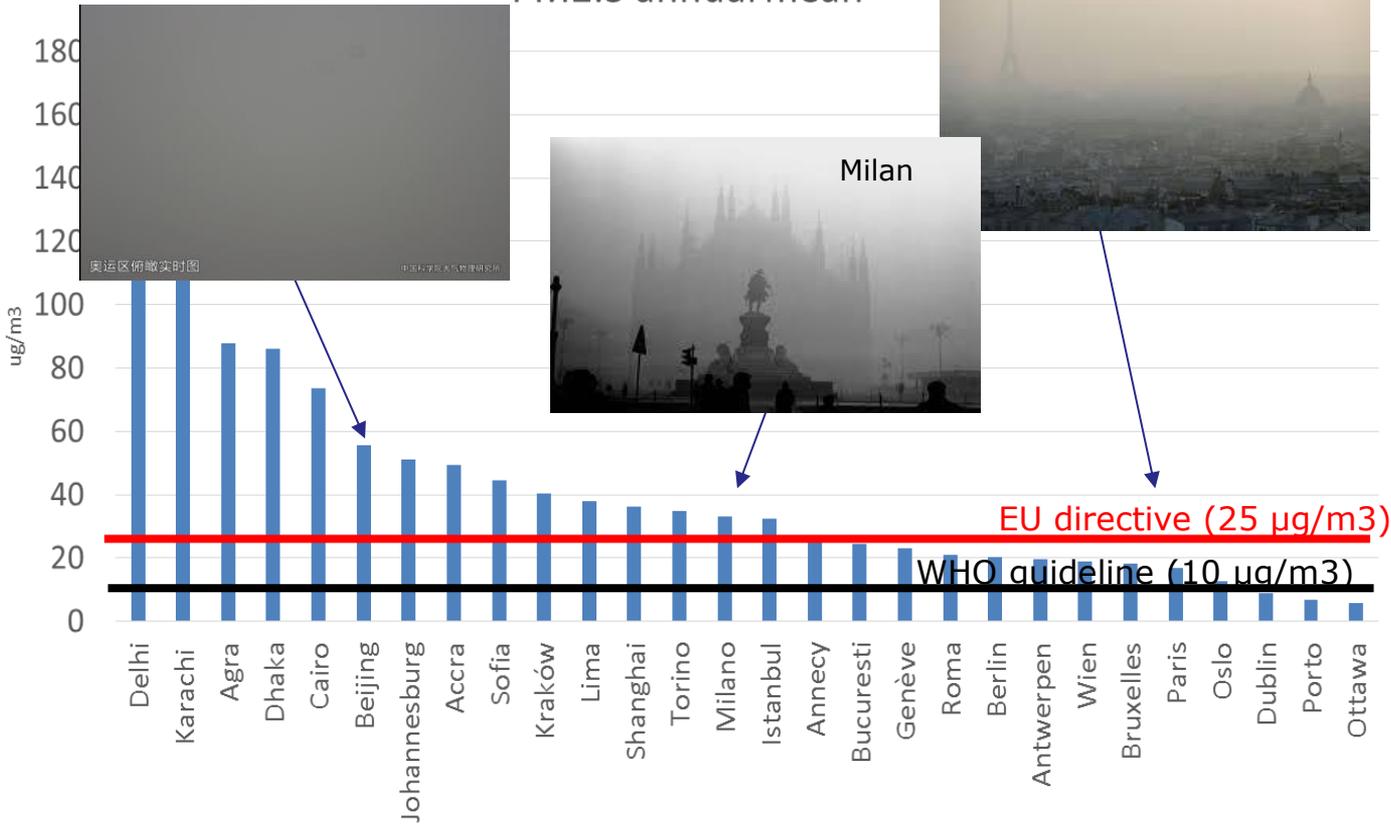
Dal 2010 al 2017

Dataset	Size	Last Modified
EMEP/2018_Reporting		--
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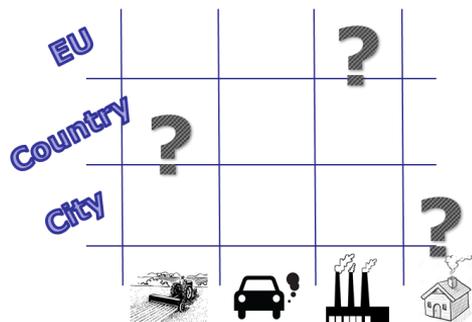


# Attivita' di ricerca

# PM2.5 annual mean



# Main challenges and dedicated tools



## Screening for High Emission Reduction Potentials on Air quality

Journal of Environmental Management 183 (2016) 952–958

Contents lists available at ScienceDirect

Journal of Environmental Management

journal homepage: [www.elsevier.com/locate/jenvman](http://www.elsevier.com/locate/jenvman)



Research article

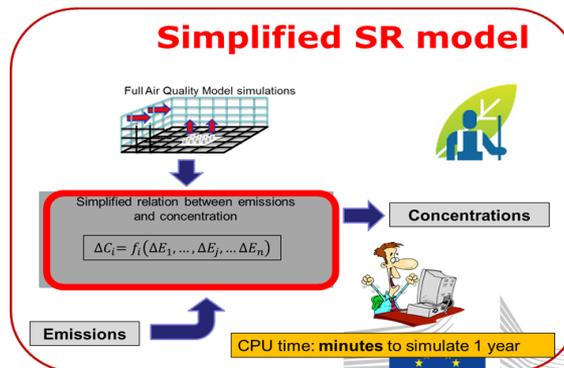
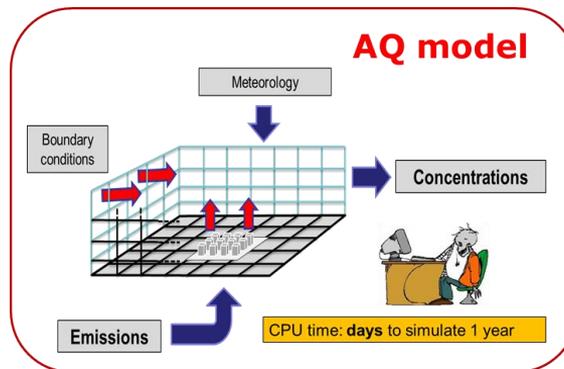
On the design and assessment of regional air quality plans: The SHERPA approach

P. Thunis <sup>a,\*</sup>, B. Degraeuwe <sup>a</sup>, E. Pisoni <sup>a</sup>, F. Ferrari <sup>b</sup>, A. Clappier <sup>c</sup>

<sup>a</sup> European Commission, Directorate for Energy, Transport and Climate, Ispira, Italy

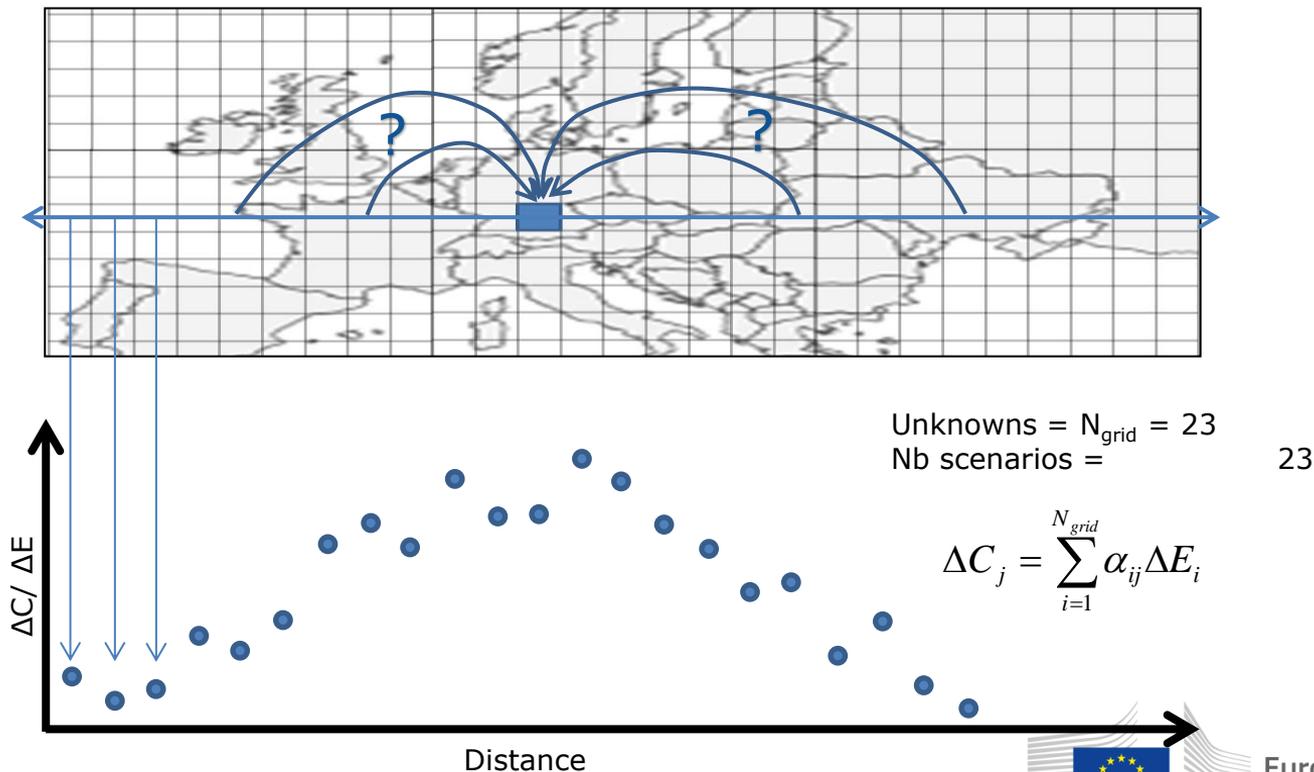
<sup>b</sup> Ferrara srl, Via M. Gallo 132 20125 Milan, Italy

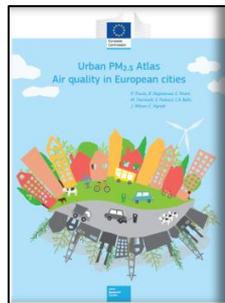
<sup>c</sup> Université de Strasbourg, Laboratoire Image Ville Environnement, Strasbourg, France



# Source receptor relationships (I)

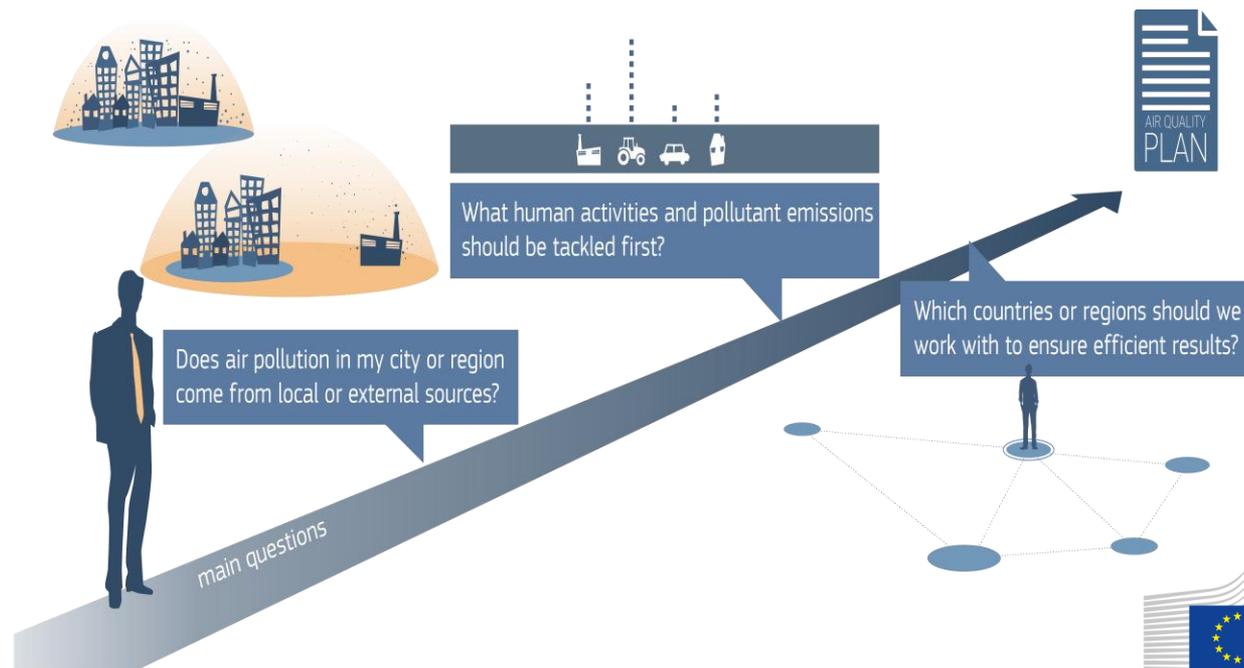
## Grid-to-grid SRR

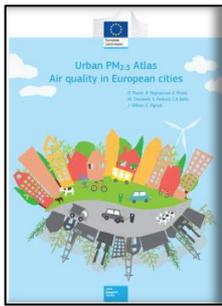




# The JRC PM2.5 urban atlas

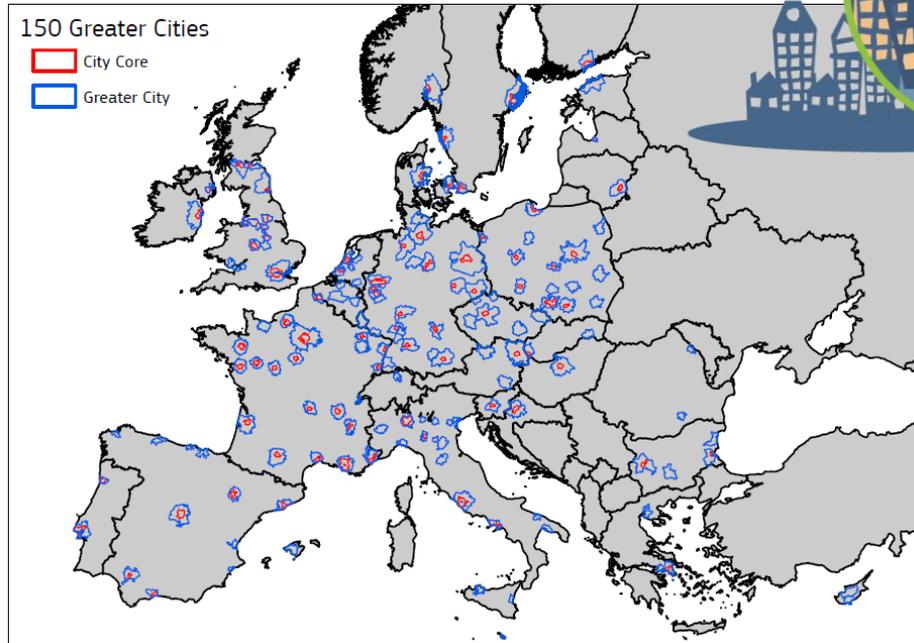
The JRC recently published the Urban PM2.5 Atlas to help local/regional policy makers design their air quality plans





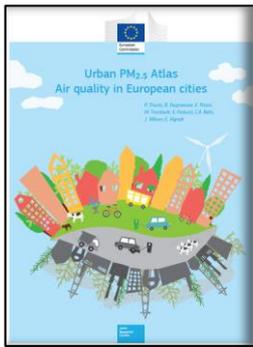
# Mapping the source of PM<sub>2.5</sub> in the EU

(Urban Air Quality Atlas, JRC-C05)



Atlas results are based on:

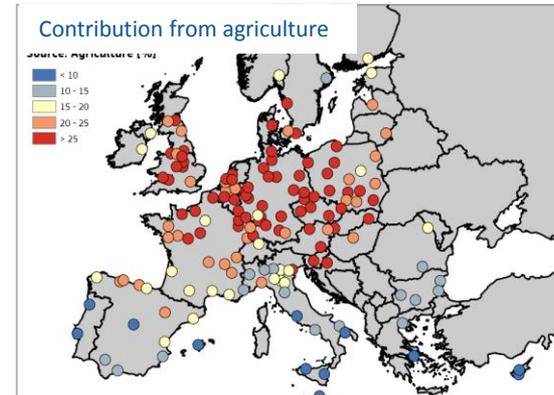
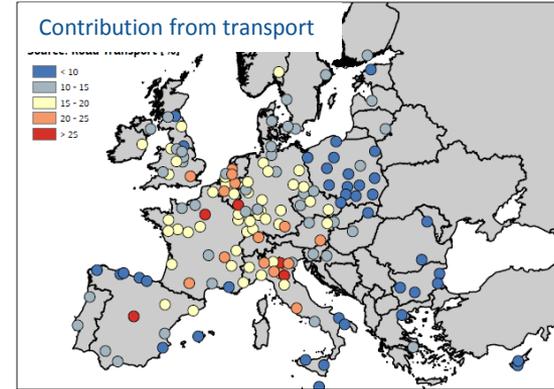
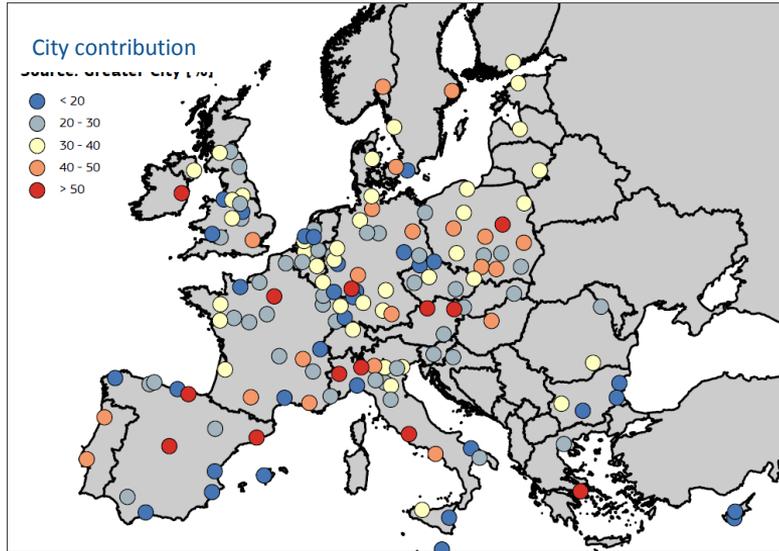
- CHIMERE Model
- MACC-TNO emissions
- ECMWF 2009 Meteorology



# Mapping the source of PM<sub>2.5</sub> in the EU

(Urban Air Quality Atlas, JRC-C05)

## Overview maps



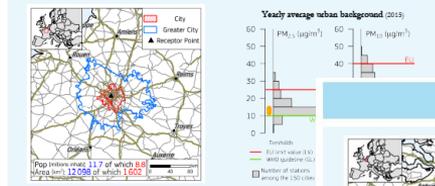


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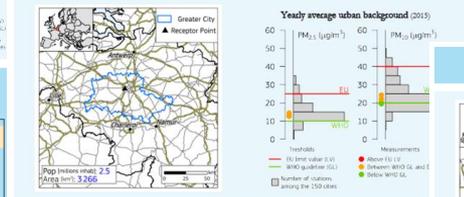
(Urban Air Quality Atlas, JRC-C05)

## Cities ID data-sheet

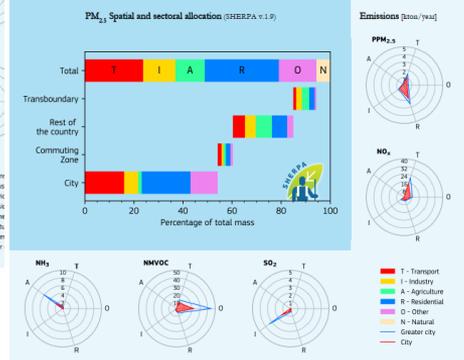
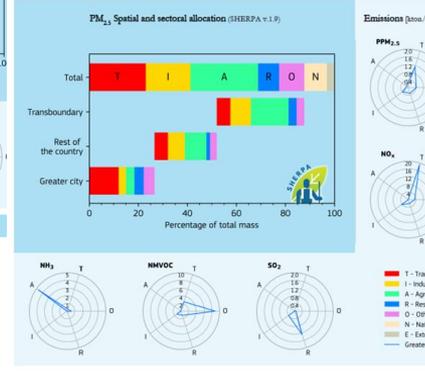
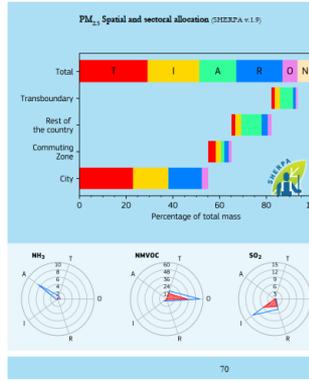
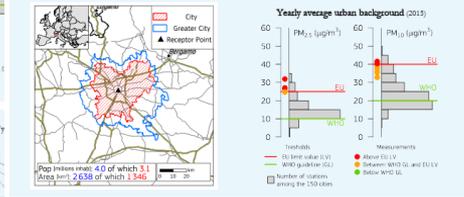
### France, Paris



### Belgium, Brussels



### Italy, Milan

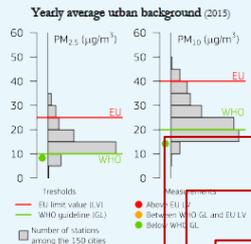
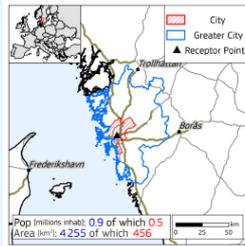




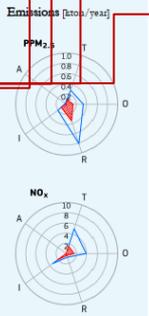
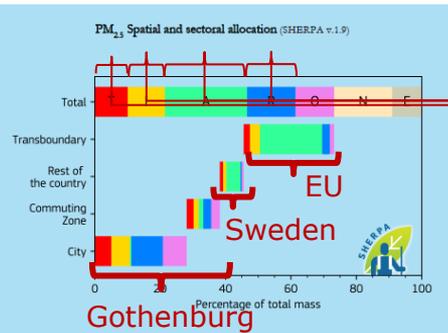
# Mapping the source of PM<sub>2.5</sub> in the EU

(Urban Air Quality Atlas, JRC-C05)

## Sweden, Gothenburg



- Transport
- Industry
- Agriculture
- Residential



Information for additional cities & regions can be produced with the JRC SHERPA air quality integrated tool (freely available)

The urban Air Quality PM2.5 Atlas is available at:

<https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/urban-pm25-atlas-air-quality-european-cities>

The SHERPA Air Quality integrated tool is available at:

<http://aqm.jrc.ec.europa.eu/sherpa.aspx>

# Conclusions

We discussed

- Legislative context
- Scientific context
- Available data
- Main research activity

Thanks

# Stay in touch



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