



MAJOR AIR POLLUTANT SOURCES IN EUROPE AND SOURCE IDENTIFICATION

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Outline of the presentation

- Why is important to identify pollution sources?
- How can we identify and quantify the contribution of sources to atmospheric pollution?
- What are the most common sources and how much they contribute to atmospheric pollution in Europe?

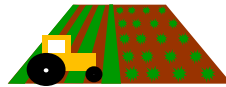


ANTHROPOGENIC

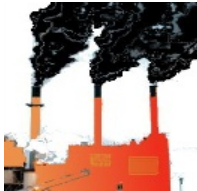
AGRICULTURE

SEA SALT

BIOMASS BURNING AND DOMESTIC HEATING



INDUSTRY AND POWER GENERATION



ATMOSPHERIC CHEMISTRY

VEHICLES



DUST RESUSPENSION

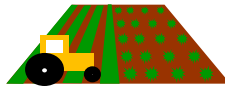
BIOGENIC EMISSIONS



NATURAL



AGRICULTURE



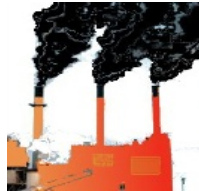
SEA SALT



BIOMASS BURNING AND DOMESTIC HEATING



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VEHICLES

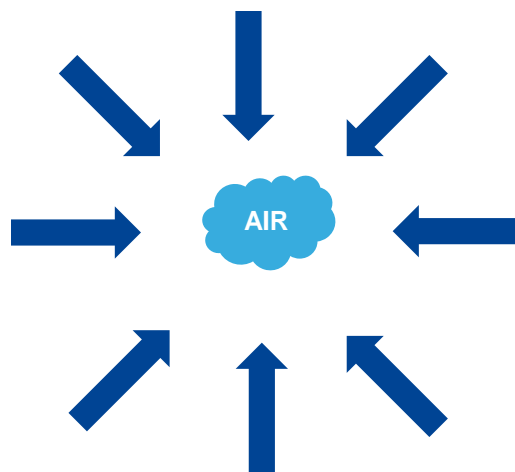


DUST RESUSPENSION



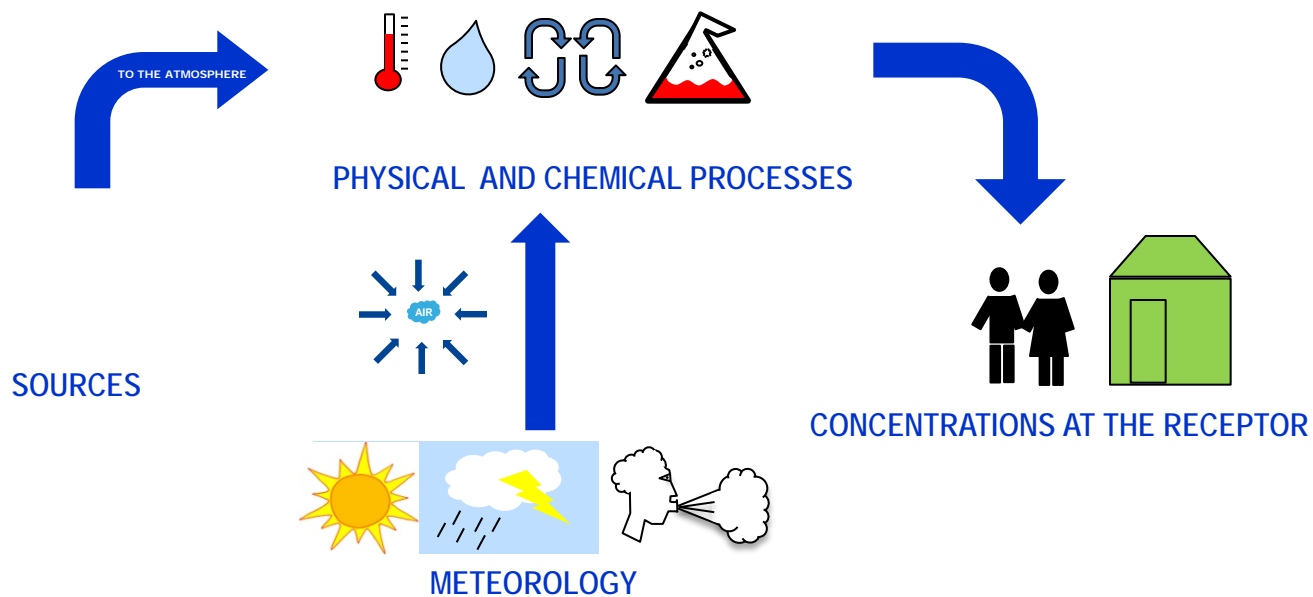
BIOGENIC EMISSIONS





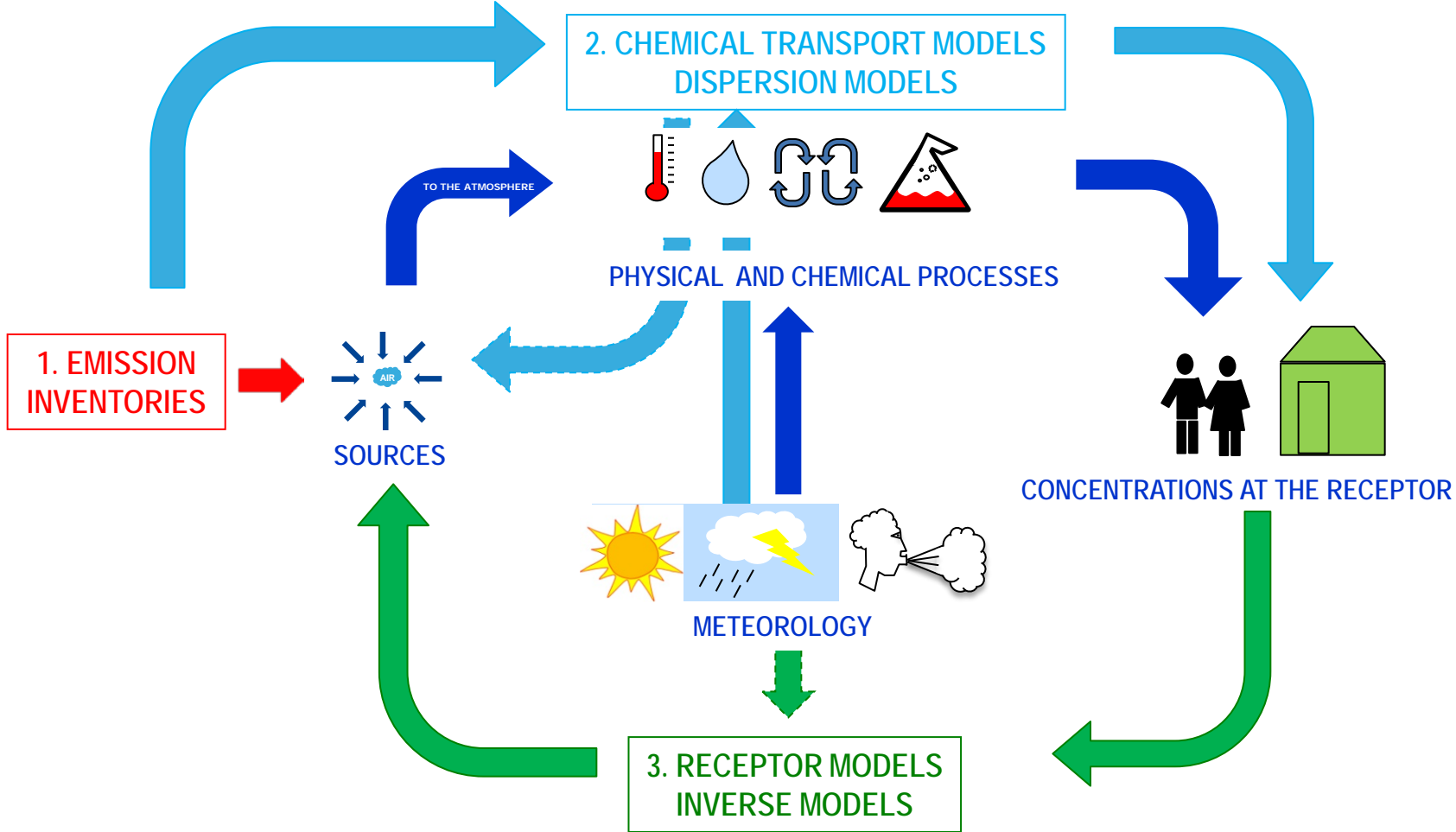


Emissions of atmospheric pollutants



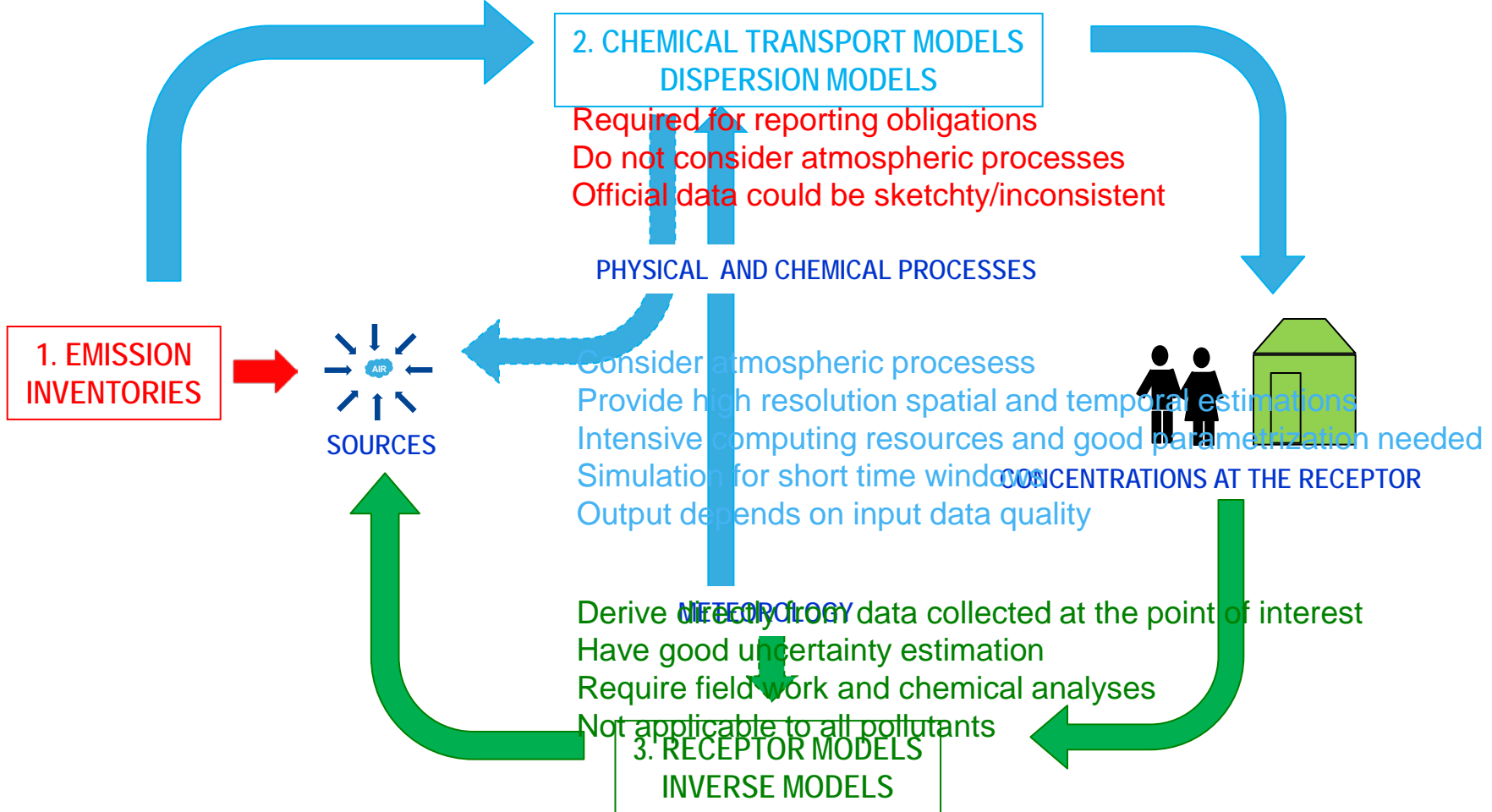


Source estimation methods





Source estimation methods





What do AQ Directives say about pollution sources ?

Reduction of emissions at source (Preamble point 16)

One of the **overarching principles** of the Thematic Strategy on Air Pollution.

Local, regional and national air quality plans

Emitted quantities and transboundary sources responsible for pollution are to be listed when drafting air quality plans.

(Annex XV A item 5)

Background measurements

To judge the enhanced levels in more polluted areas, assess **long-range transport**, support **source apportionment analysis** and understanding of **specific pollutants**.

(Annex IV A)

Ozone precursors

Measurements to monitor the **efficiency of emission reduction strategies**, to check the consistency of emission inventories and to help **attribute emission sources**.

(Annex X A)

Natural sources, road salting and sanding

To provide evidence of **exceedances** attributable to natural sources or winter sanding or salting of roads.

(Articles 20 and 21)

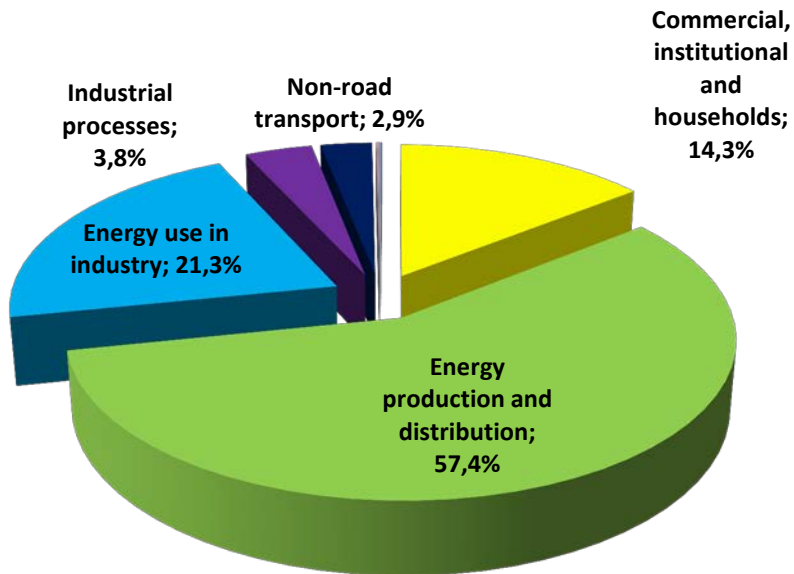
Public information

Information about exceedances of alert thresholds including indication of **main source sectors or categories** and recommendations for action to reduce emissions.

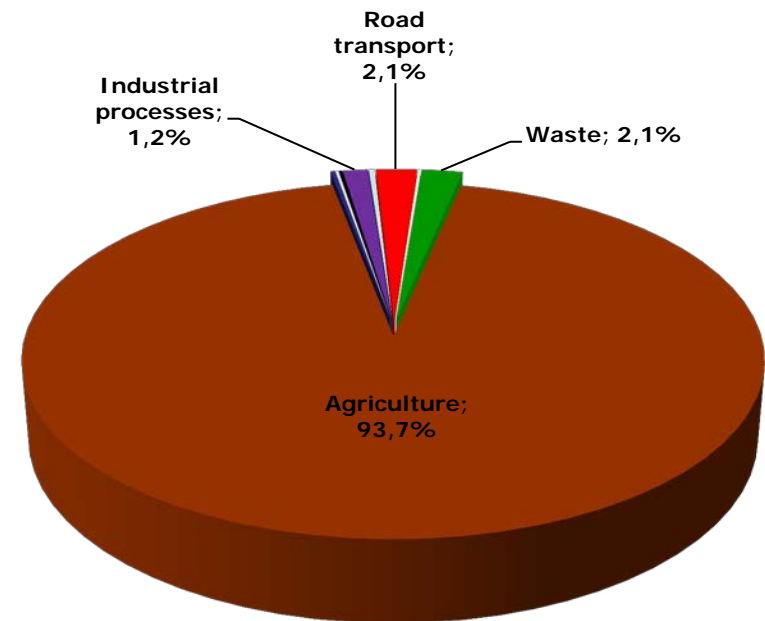
(Annex XVI item 4)



Sources of sulphur oxides and ammonia in Europe



sulphur oxides (4,574 Gg in 2010)

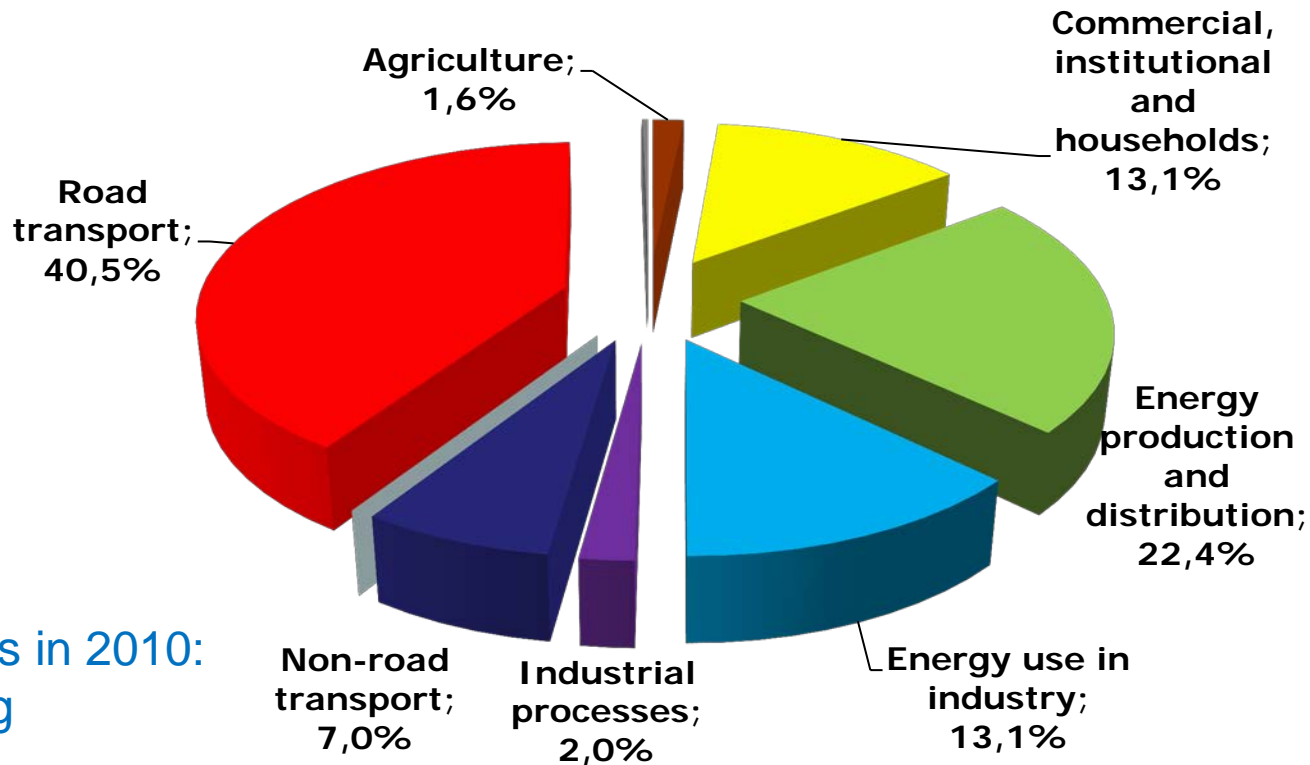


ammonia (3,591 Gg in 2010)

Data source: EEA aggregated and gap-filled air emission dataset, based on 2012 officially reported national total and sectoral emissions to UNECE LRTAP Convention, the EU NEC Directive and EU-MM/UNFCCC.



Sources of nitrogen oxides in Europe

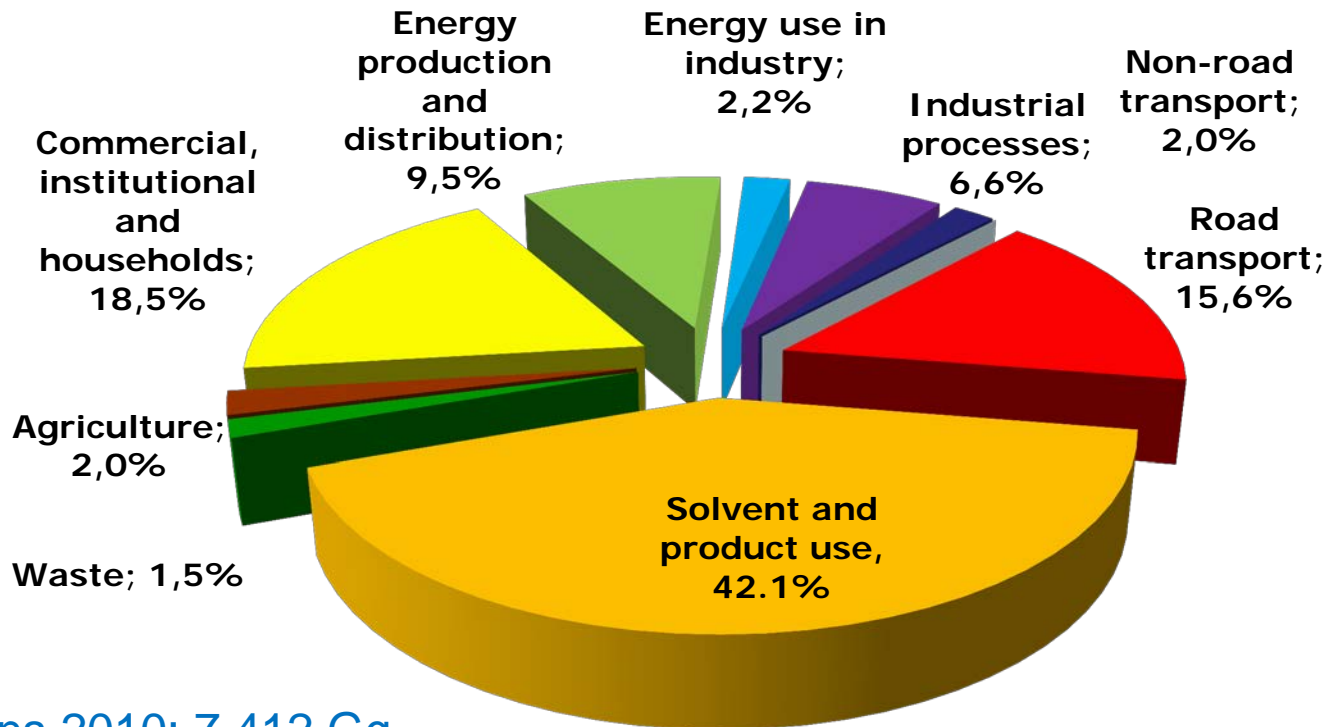


Emissions in 2010:
9,162 Gg

Data source: EEA aggregated and gap-filled air emission dataset, based on 2012 officially reported national total and sectoral emissions to UNECE LRTAP Convention, the EU NEC Directive and EU-MM/UNFCCC.



Sources of non methane volatile organic compounds (NM-VOC) in Europe



Emissions 2010: 7,412 Gg

Data source: EEA aggregated and gap-filled air emission dataset, based on 2012 officially reported national total and sectoral emissions to UNECE LRTAP Convention, the EU NEC Directive and EU-MM/UNFCCC.

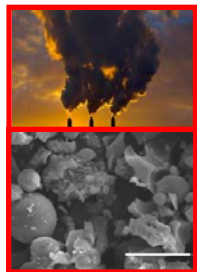
Sources of Particulate Matter in Urban Areas in Europe



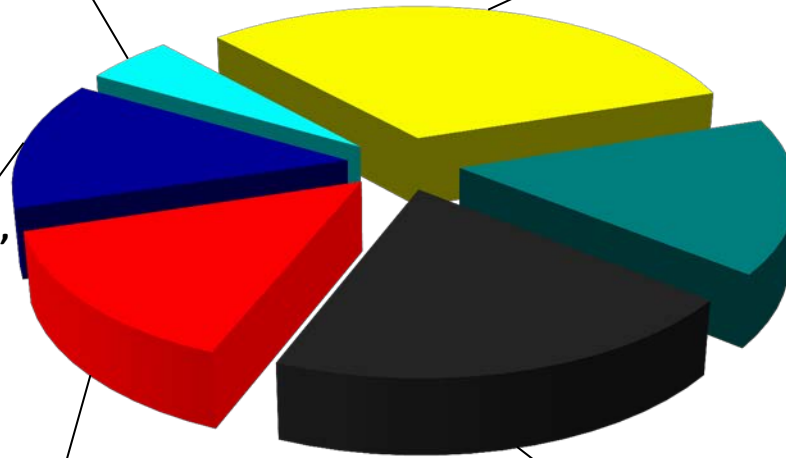
Sea/road salt;
5%



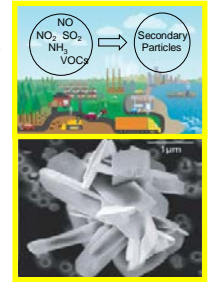
Biomass -
wood burning,
14%



Point sources,
15%



Secondary
inorganic, 33%



Crustal, 17%

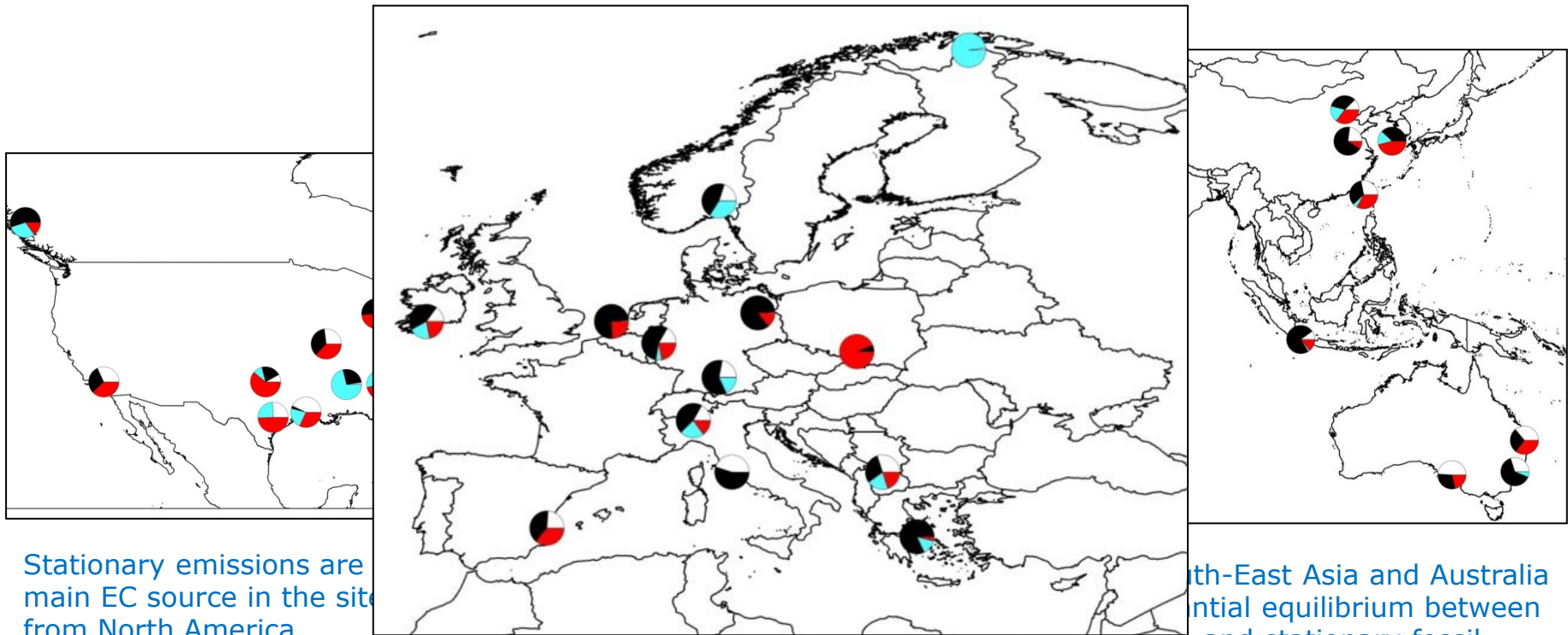


Traffic, 19%



Sources of Elemental Carbon (Black Carbon) in PM

Apportionment of the elemental carbon fraction in the PM to the three main primary source categories in selected sites using receptor models



Stationary emissions are the main EC source in the sites from North America

Mobile sources are the main responsible for EC in many European urban areas

South-East Asia and Australia show a potential equilibrium between mobile and stationary fossil fuelled sources in some urban areas, while mobile sources dominate in others

- Mobile Sources (Fossil Fuel)
- Stationary Sources (Fossil Fuel)
- Biomass Burning
- Other



Conclusions

- Identification of pollution sources is the basis for understanding atmospheric pollution and developing reduction plans.
- There are different methodologies to study sources each of which has strengths and limitations.
 - Emission Inventories
 - CTM and Dispersion models
 - Receptor models / Inverse models

Combination of techniques provide more robust results.

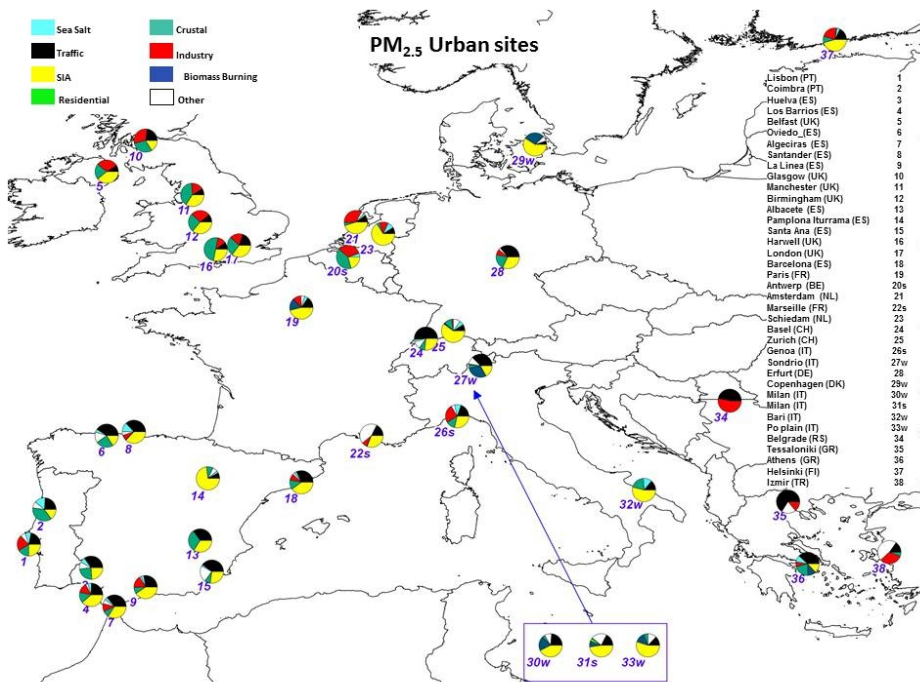
- The relevance of sources changes among pollutants. The key categories are: energy production (SO_x, NO_x), transport (NO_x, PM), agriculture (NH₃), use of solvents (VOC), and secondary (PM, O₃) for the most critical pollutants.



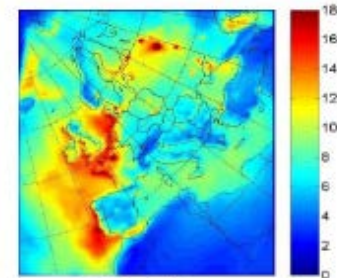
Thank you for your
attention!

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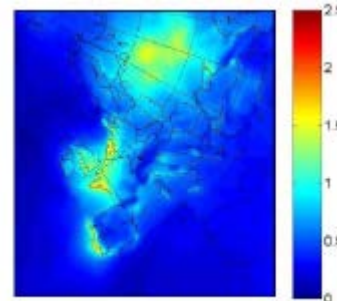
<http://source-apportionment.jrc.ec.europa.eu>



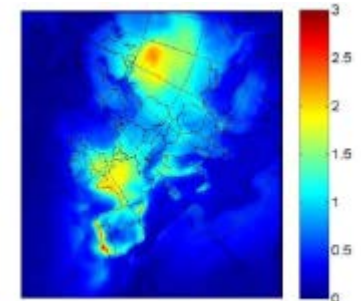
Receptor Models studies 1998-2012
Belis et al., 2013



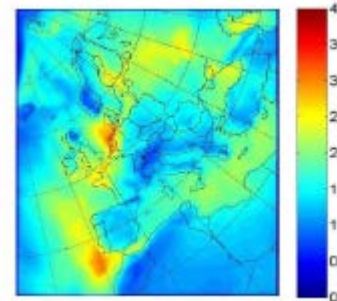
(b) PM_{2.5} - Winter



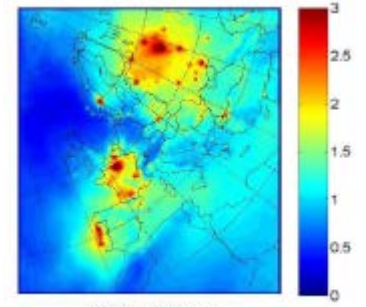
(d) Ammonium - Winter



(f) Nitrate - Winter



(h) Sulfate - Winter

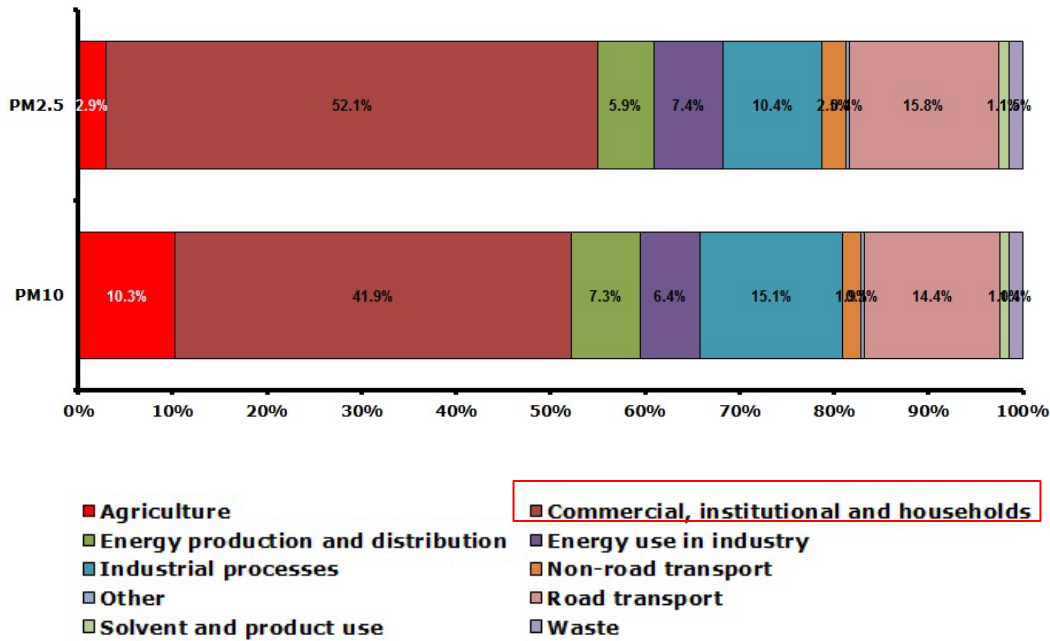


(j) OA - Winter

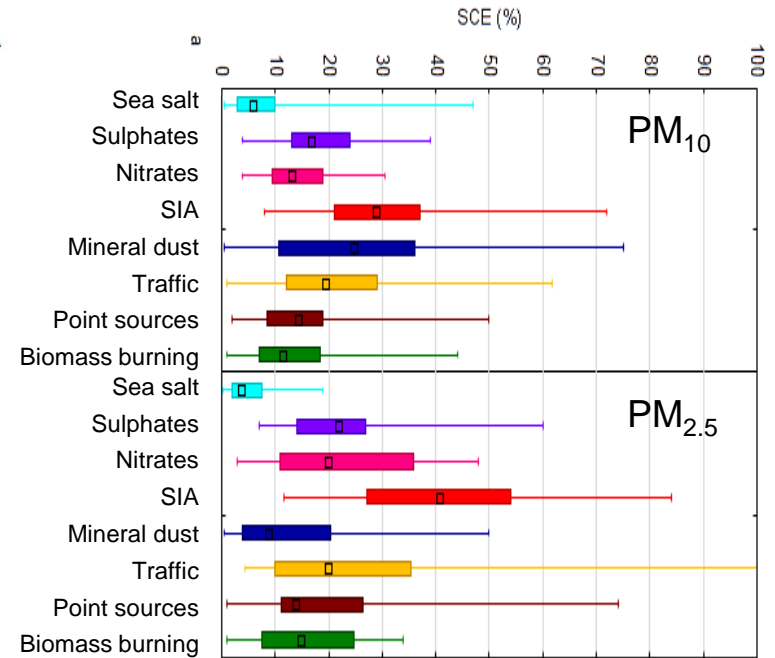
PMCAMX (one month) winter 2009
Megaritis et al., 2013



Sector contributions of emissions of primary particulate matter and secondary precursors (EEA member countries)



Emission Inventory 32 EEA countries
National Emissions 2010 CLRTAP
EEA, 2012



Receptor Models
studies 1998-2012
Belis et al., 2013