

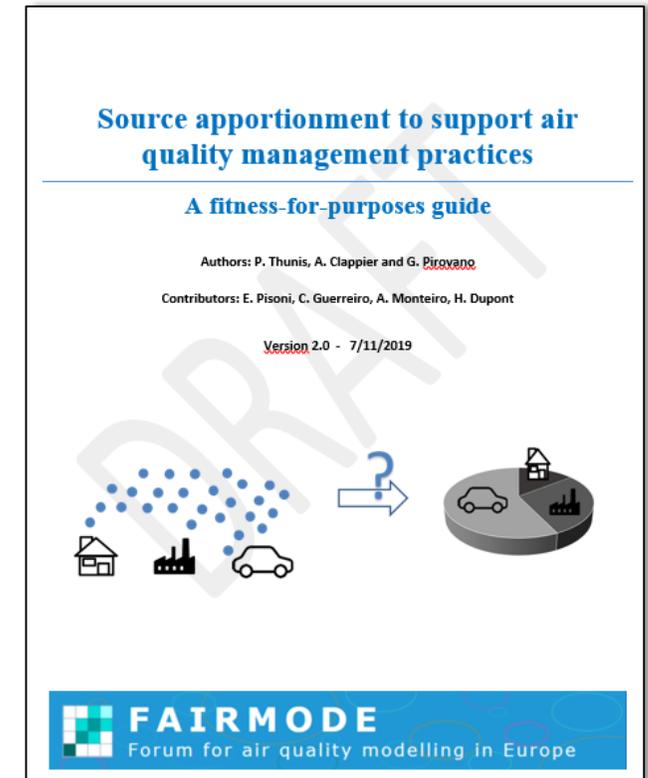
# CT1 - Source apportionment in support AQ management

G. Pirovano, A. Clappier

# CT1 – Src. Apport. to support AQ management



- Consolidate the fitness for purpose source apportionment guide
- Support the e-reporting process
- Support regions and cities in their SA estimates.
- Interact with CEN

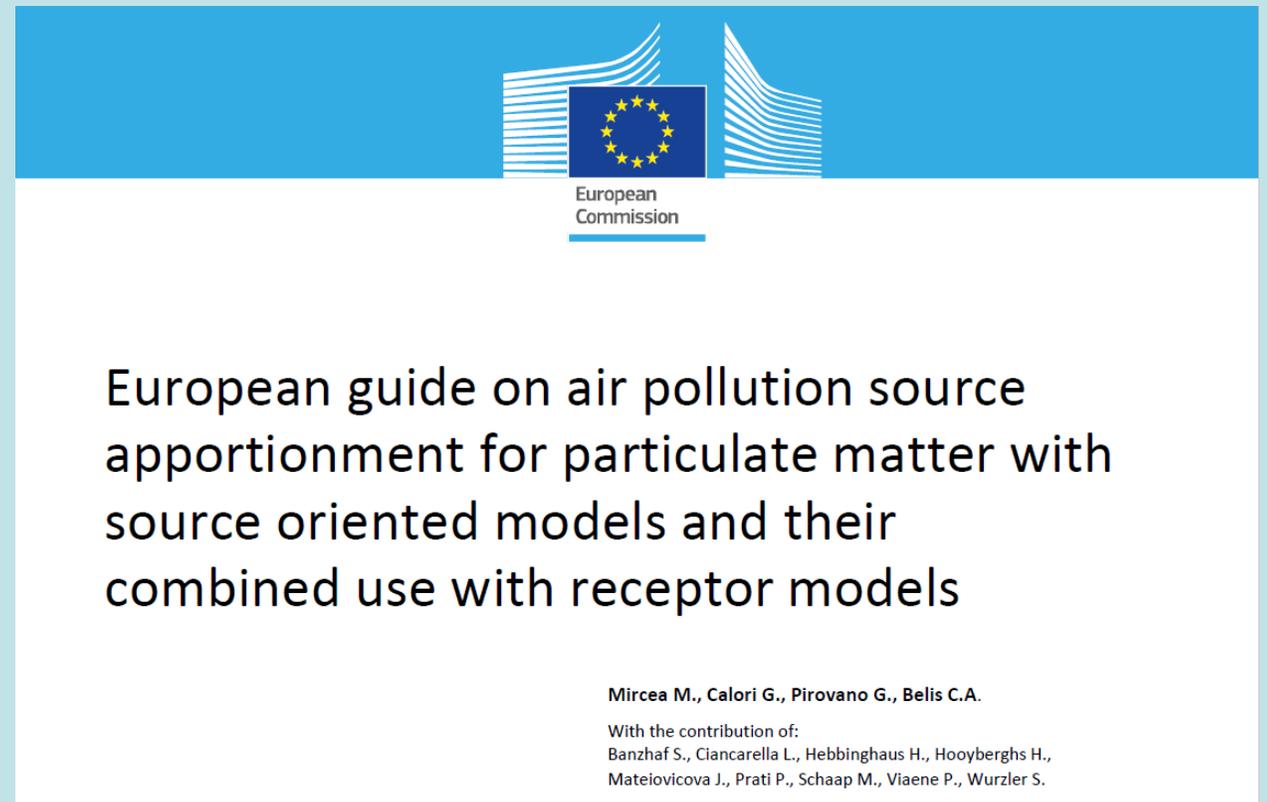


# Guidance on source apportionment

## Where are we...?

### Guidance - I

- Published February 2020
- Available on JRC web site



[https://source-apportionment.jrc.ec.europa.eu/Docu/european\\_guide\\_SA\\_SMs\\_2019.pdf](https://source-apportionment.jrc.ec.europa.eu/Docu/european_guide_SA_SMs_2019.pdf)

# Guidance on source apportionment

## Where are we...?

### Guidance II - Version 3.0

- 1. Introduction
- **Part I: Methods and Concepts**
- 2. Which methods to use for source apportionment?
- 3. Types of atmospheric pollutants: linear vs. non-linear
- 4. Which are the properties of source apportionment methods?
- **Part II: An illustrative (theoretical) example**
- 5. Sectorial apportionment
- 6. Spatial apportionment
- **Part III: Which source apportionment method for which purpose?**
- 7. Support to the design of AQ Plans
- 8. Support to the quality assurance of AQ modelling

# Guidance on source apportionment

## Where are we...?

### Guidance II - Version 3.0

- **PART IV: OPEN ISSUES**

- 9. Extension to other pollutants
- 10. Distinction between linear and non-linear pollutants
- 11. Use of RM to improve model based approaches: the case of OA
- 12. Distinction between source identification and apportionment
- 13. Combined source allocation / tagging approach to support planning
- 14. Source apportionment to support the ex-post assessment of AQP

- **Technical Annex**

- A. Incremental assumptions
- Glossary
- References

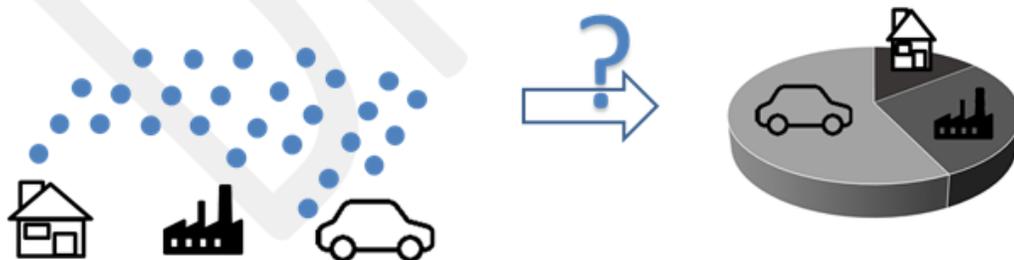
# Source apportionment to support air quality management practices

## A fitness-for-purpose guide

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Version 3.0 - 2/6/2020



**Commento [VR1]:** Thanks for this valuable effort to compile the existing knowledge (and remaining issues/open questions) on that topic.

**Commento [EW2]:** In general, I think this document is very well structured, and the detailed and colorful schematic figures and tables are very helpful for understanding the concepts and the strengths and limitations of each source apportionment approach

**Commento [SH3]:** It is a very nice document, with excellent illustrations

**Commento [JS4]:** I found the source apportionment exercise at the meeting in Madrid interesting and useful, hence my enthusiasm to offer to review the document.

**Commento [JM5]:** For whom this document is intended? I assumed e.g. people from the municipalities, making AQ plans)

**Commento [MM6]:** Very nice structured document and pleasant to read

**Commento [MM7]:** I would like to congratulate you and your colleagues on this huge job

**Commento [MM8]:** I send you attached only few comments on the fitness for purposes guide for SA approaches guide since in the present form I do not see enough bases to make the recommendations shown in Table 5 and introduce new terminology.

**Commento [GP9]:** Mihaela to be confirmed as contributor after the Berlin meeting

# Reviewers -> Contributors (12/11 so far)

- Veronique Riffault
- Eivind Waersted
- Stig Hellebust
- Mihaela Mircea (to be confirmed)
- Jenny Stocker
- Jana Matejovica
- Stefania Gilardoni
- Angyal Aniko
- Giovanni Bonafe
- Francesco Montanari
- John Bartzis
- A. Enriksson

- ***Do you agree with the revised version?***
- ***Any additional comment?***
- ***Something missing or misinterpreted?***

***DEADLINE: End of February***

# Overview

- All very constructive comments that highlight possible sources of confusion. Most comments addressed **issues that go deep in the** understanding of the concepts presented in the document
- Most comments addressed the need to include additional details (sentences and footnotes) for clarify, e.g.
  - Use of the linear/non-linear concept before discussing them → changed wording
  - Chemical notations (electric charges in ions)
  - Additional blue boxes (e.g. direct / indirect effects)
  - Simplification of the increment (Figure 6)
  - Remind that SA approaches are discussed in isolation (a RM coupled with a wind regression might allow apportioning the local from the background)
  - Glossary
- Some comments are more challenging and will require more time (e.g. add an introduction to models...)

# General points

- Need for overall information on modelling
  - ✓ What is an air quality model (Lagrangian, Eulerian...)
  - ✓ What is a receptor model?
  - ✓ What is a tagging algorithm?

How can we address these questions?

1. Detailed reference to existing literature?
2. "Dummy's guide → annex?
3. Can we design simple examples as those used in the guide to describe these aspects?

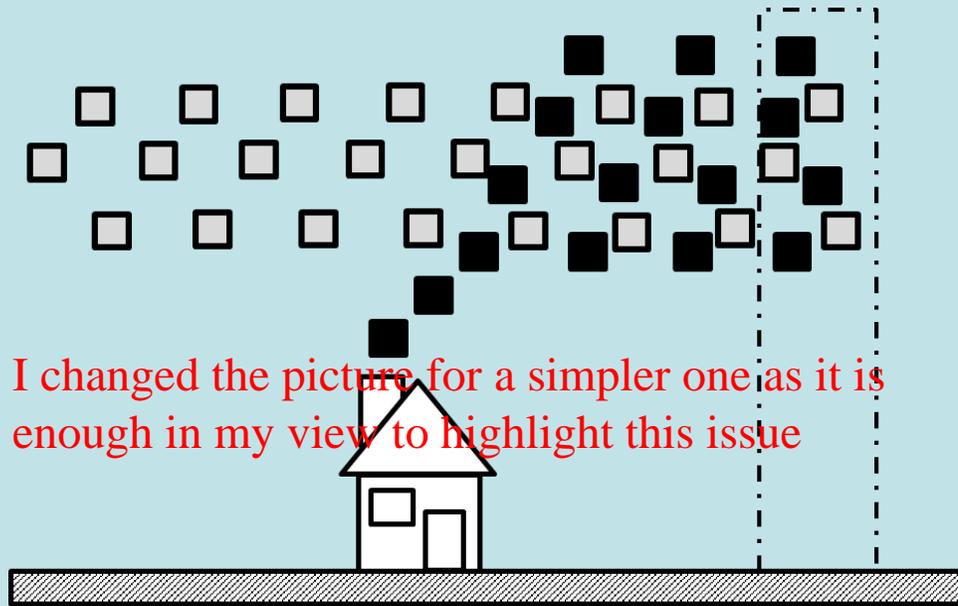
- Need for an executive summary?
- Need for a real-world examples (based on peer-review publications)

# 6 Some examples of specific points

- I. Figures are misleading because they do not include the complexity of the real world.
- II. Receptor models apportion secondary anyway!
- III. Need to clarify the concept of linearity (method vs phenomena)
- IV. Proposed open issue: Can RM be used to improve source allocation, e.g. for SOA?

# Specific point I

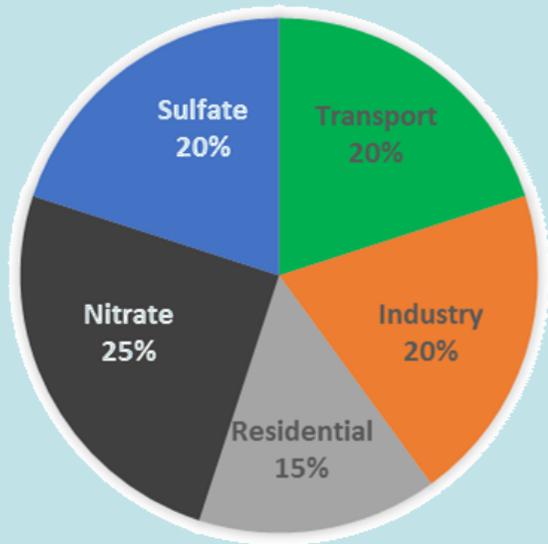
I. Figures are misleading because they do not include the complexity of the real world.



- The figures are based on cases that are as simple as possible to highlight the desired characteristics / concepts.
- They are however complex enough to represent possible atmospheric processes.
- If different source apportionment methods lead to different results for simple cases, they are likely to do so for more complex ones. Although compensations might occur for more complex cases and limit the differences, the WG3 inter-comparison clearly showed this was not the case!

# Specific point II

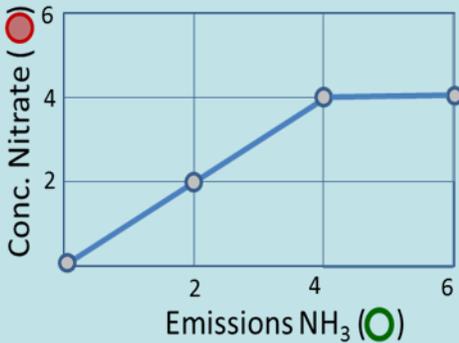
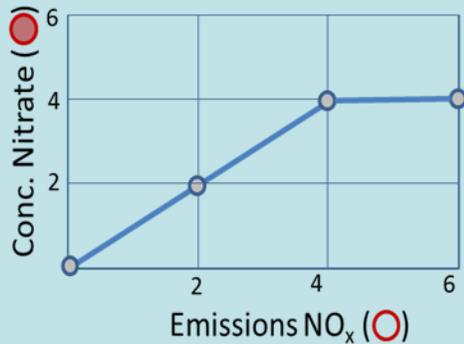
## II. Receptor models apportion secondary anyway!.



- Definition of source apportionment: technique used to relate emissions from various pollution **sources** to air pollution **concentrations** at a given location and for a given time period.
- Although non-linear components (e.g. nitrate) are provided as results, receptor models cannot apportion them to a given source.

# Specific point IV

## III. Need to clarify the concept of linearity (method vs phenomena) ?



- Simplification: only pollutants are involved in linear or in non-linear processes
- Non-linearity is a challenge for source apportionment. It is addressed in different ways by different methods
  - Receptor models → not addressed
  - Tagging models →  $NO_3^- = f(NO_x, NH_3) \cong f(NO_x)$
  - Source allocation → reduced range of application (local linearity)
  - Zero-out → no assumption but loss of additivity!

# OPEN ISSUES

## 9. Extension to other pollutants

- *Can we and do we have experience in using receptor models for NO<sub>2</sub> and/or O<sub>3</sub>?*
- *Are there examples of using incremental methods for NO<sub>2</sub> and/or O<sub>3</sub>?*
- *How can we translate our current recommendations on PM for O<sub>3</sub> or NO<sub>2</sub> for tagging methods?*
- *What are the linearity/additivity limits for source allocation for NO<sub>2</sub> and/or O<sub>3</sub>?*
- *Can we extend the e-reporting table to O<sub>3</sub> and or NO<sub>2</sub>?*

# OPEN ISSUES

## 10. Distinction between linear and non-linear pollutants

- *Can we provide a list of compounds that behave linearly (for which no issue arises) and a list of compounds that behave non-linearly?*
- *Can we provide additional information on aspects that will impact the linear/non-linear boundary, e.g. the averaging time considered for the indicators ?*

# OPEN ISSUES

## **11. Use of RM to improve model based approaches: the case of OA**

- *Can RM results be used to validate/improve SA results with SMs?*
- *Can RM results be used to improve OA description in SAL for air quality plans?*

# OPEN ISSUES

## 13. Combined source allocation / tagging approach to support planning

- *Impacts are dynamic but are very resource-demanding. On the other side, tagging methods are not dynamic but are extremely efficient from the computational point of view.*
- *Can we use tagged contributions as complementary information to the impacts to support planning?*
- *Would then impacts be used to provide dynamic information up to a threshold emission reduction while tagged contribution provide information beyond that threshold?*

# OPEN ISSUES

## 14. Source apportionment to support the ex-post assessment of AQP

- *Can we provide some examples and guidance on which methods to use for this particular purpose?*
- *How can we apply a de-trending to remove the impact of external factors like meteorology, yearly emission evolution?*

# Timing

- Mid-March: Consolidated version 3 based on 12 contributions
- March → June: second round of review
- September: technical meeting

# Discussion..

- Difference between Authors and Contributors ?
- Planning of next steps
  - Focus on open issues?
  - How to proceed?
    - ❖ Which “issues”?
    - ❖ Who does what?
    - ❖ Timing?