

CT1 - Source apportionment

Exercise SA Protocol – Results analysis



FAIRMODE

Forum for air quality modelling in Europe

Yesterday

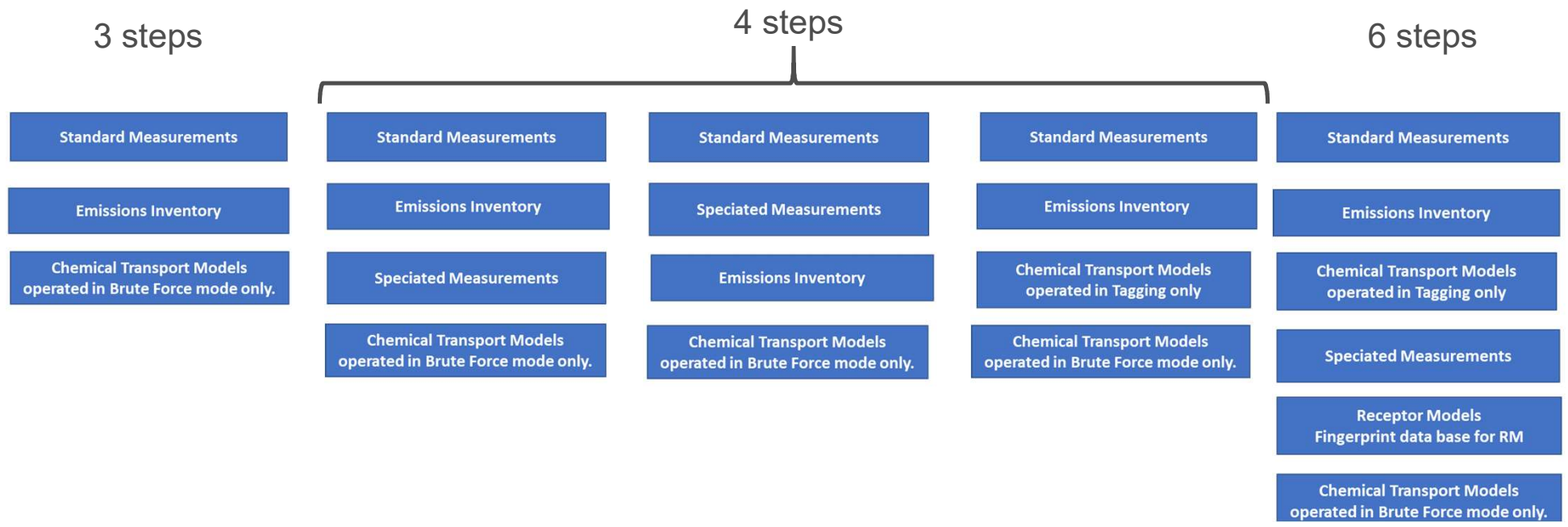
Philippe and me



A warning: science is not a democratic process...



Necessary Steps



Necessary Steps

perfect consensus for all groups:

- « Low Cost Sensor » and « Down Scale Models » are never necessary
- « Standard Measurements », « Emission Inventory » and « CTM operated with Brute Force » are always necessary

Low Cost Sensors

Down Scale Models

Standard Measurements

Emissions Inventory

Chemical Transport Models
operated in Brute Force mode only.

CTM using Brute Force computes **impacts** which are needed to evaluate the efficiency of the planning scenarios.

They require an emission inventory and, at least, standard measurements to validate their results.

Specific Sequences are Required for Some Steps

perfect consensus for all groups

Emission inventories
before CTM

Emissions Inventory

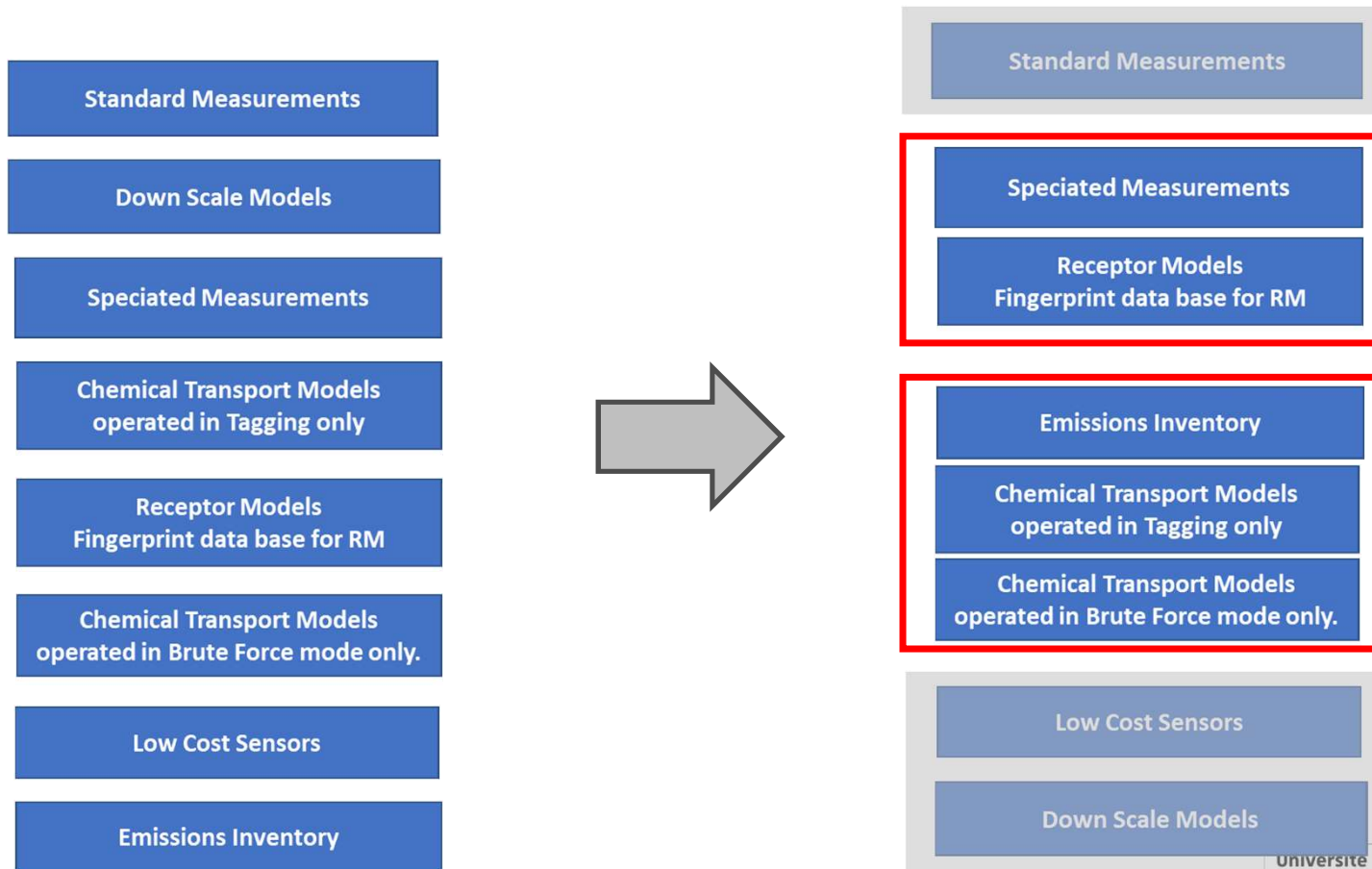
Chemical Transport Models

Speciated measurements before
receptor models

Speciated Measurements

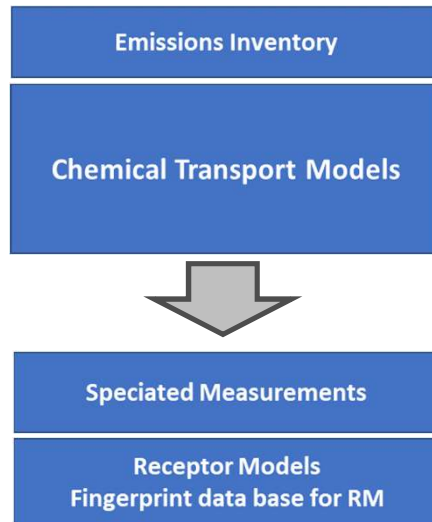
**Receptor Models
Fingerprint data base for RM**

Specific Sequences are Required for Some Steps



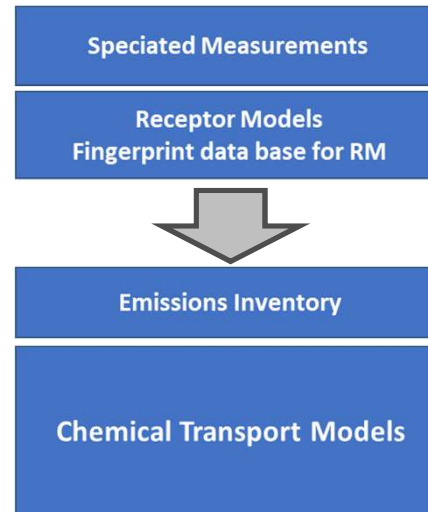
Ranking

3 options:

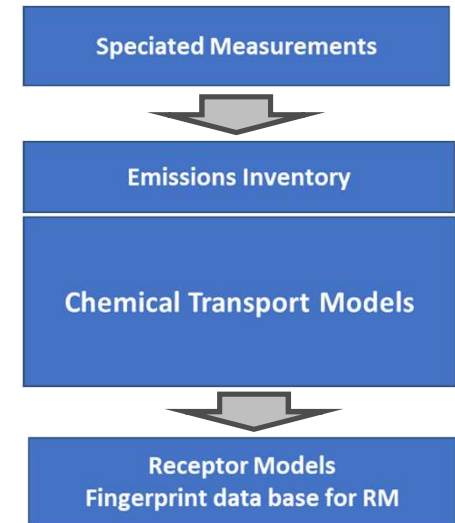


Receptor models are used to validate models

Source identification relies on the emission inventory

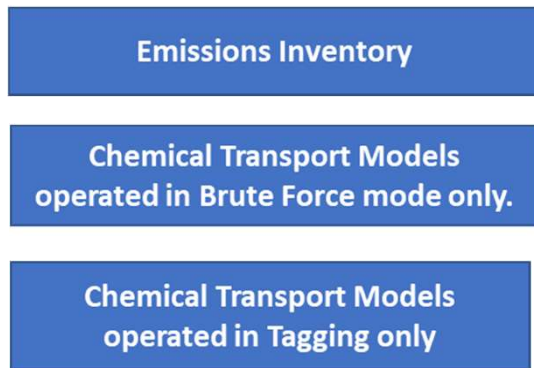


Speciated measurements and receptor models are used for source identification and boundary level evaluation

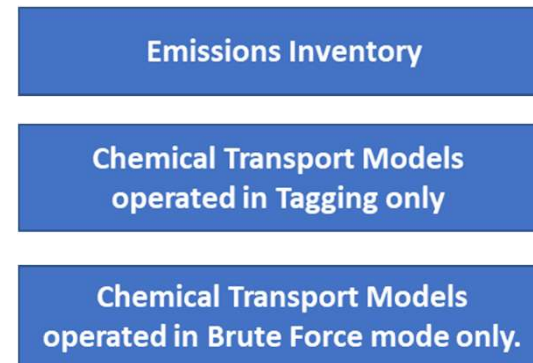


Ranking

2 other options:



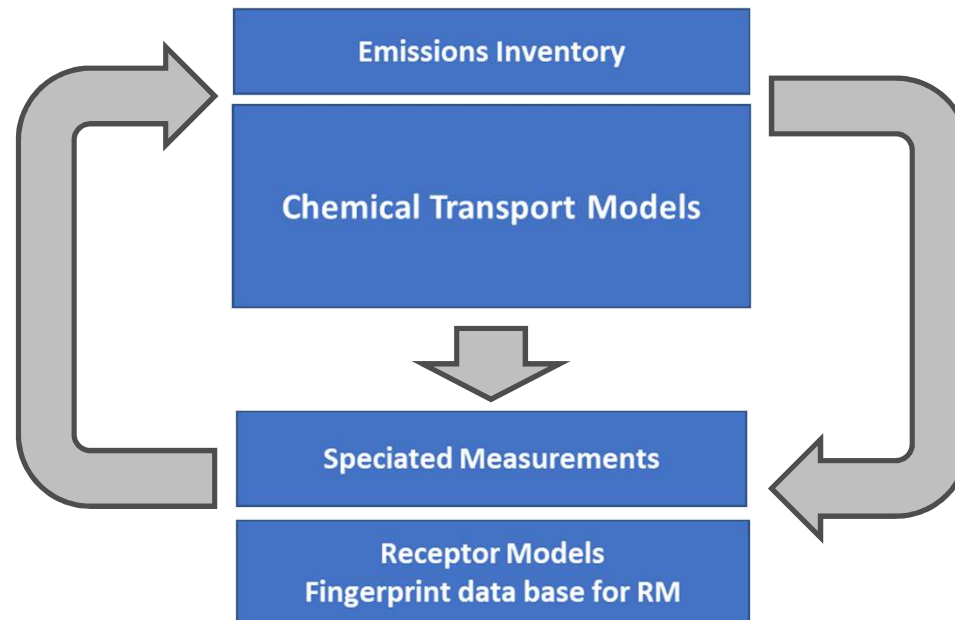
CTM-Tagging are used to validate the model (with receptor model) and to help understand their results



CTM-Tagging are used for source identification

Iterative Process

in practice simulation results are improved progressively...



Ambiguities

Emissions Inventory

“Emission Inventory” is used to:

- simulate the base case
- design and simulate the planning scenarios

“Emission inventory” is implicitly identifying the sources

Speciated Measurements

Receptor Models Fingerprint data base for RM

“Speciated Measurements” and “Receptor Models” can be used for:

- model validation
- source identification and boundary evaluation

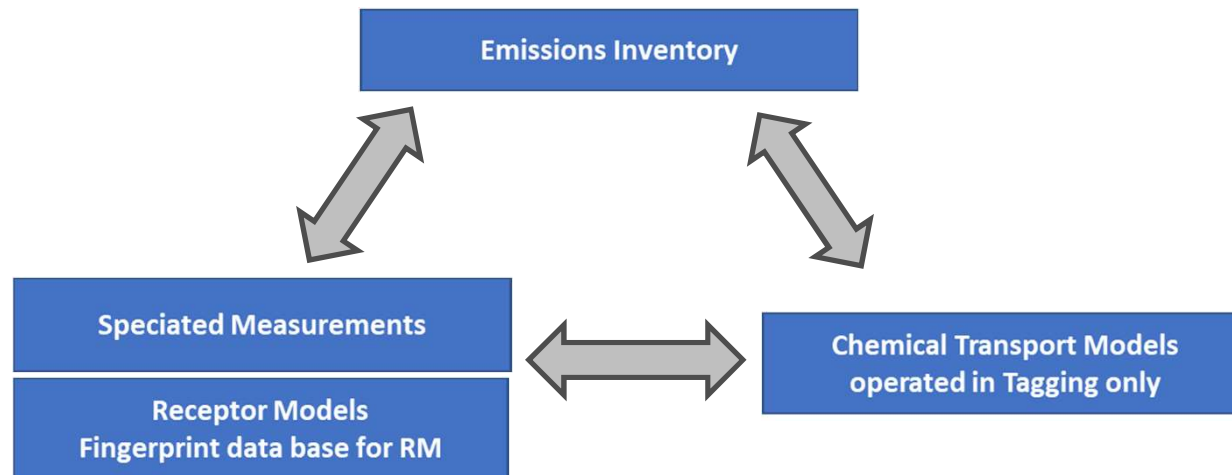
Chemical Transport Models operated in Tagging only

“CTM-with Tagging” can be used for:

- model validation
- source identification

Clarifications Are Needed

Better specify the purpose of the different steps, better distinguish between source identification and validation especially concerning the following steps:



Thank you for your attention

Bart	Air quality plan elements/steps	Argumentation (why?)	Priority: Necessary – Optional – Useless
1	Standard Measurements	to quantify the PM2.5 levels and identify the exceedances locations.	Necessary
2	Emissions Inventory	The basis for modelling and a good start for a plan in combination with measurements	Necessary
3	Chemical Transport Models operated in Brute Force mode only.	Check if there are no gaps in the network, make plans	Necessary
4	Low Cost Sensors	Check hotspots from model that are not covered by the network, validation of the model	Optional
5	Speciated Measurements	For next step	Optional
6	Receptor Models Fingerprint data base for RM	Confirm and complement source apportionemetrn of model	Optional
7	Chemical Transport Models operated in Tagging only	“ “	Optional
8	Down Scale Models	Not very useful for PM2.5	Useless

Bertrand	Air quality plan elements/steps	Argumentation (why?)	Priority: Necessary – Optional – Useless
1	Standard Measurements	to quantify the PM2.5 levels and identify the exceedances locations Knowledge of what coming from outside (stations close to the borders)	Necessary
2	Emissions Inventory	What are the main expecting activity sector contributors	Necessary
3	Speciated Measurements	Understanding Natural versus Anthropogenic	Necessary
4	Chemical Transport Models operated in Brute Force mode only.	Checks and verification of the model first	Necessary
5	Receptor Models Fingerprint data base for RM	independent source of information	Optional
6	Down Scale Models	not necessary for PM	Optional
7	Chemical Transport Models operated in Tagging only	Difficulty to handle secondary species	Optional
8	Low Cost Sensors	Not yet robust enough	Useless/Optional

Elena	Air quality plan elements/steps	Argumentation (why?)	Priority: Necessary – Optional – Useless
1	Standard Measurements	to quantify the PM2.5 levels and identify the exceedances locations.	Necessary
2	Speciated Measurements	<ul style="list-style-type: none"> - Measures in the exceeding locations and background <ul style="list-style-type: none"> - Basis for receptor modeling - Better understand most important sectors/processes in the area 	Necessary
3	Receptor Models Fingerprint data base for RM	<ul style="list-style-type: none"> - Identify main exceedances sources - Understand sources mix/fuel use - Contribution of natural sources 	Optional
4	Emissions Inventory	<ul style="list-style-type: none"> - Estimate emissions - Spatial patterns - Needed for CTMs/local modelling 	Necessary
5	Chemical Transport Models operated in Tagging only	<ul style="list-style-type: none"> - Define main contributing emission sectors 	Optional
6	Chemical Transport Models operated in Brute Force mode only.	<ul style="list-style-type: none"> - Quantify the impacts of defined policy (emission reduction) 	Necessary
7	Down Scale Models	<p style="text-align: center;">Understand spatial patterns Define local processes</p>	Optional
8	Low Cost Sensors	<ul style="list-style-type: none"> -Help to validate modelling results on larger area -If there is no budget limit we would increment the standard 	Optional

Jenny	Air quality plan elements/steps	Argumentation (why?)	Priority: Necessary – Optional – Useless
1	Standard Measurements	to quantify the PM2.5 levels and identify the exceedances locations.	Necessary
2	Emissions Inventory	Takes a long time, and is required as input to all models.	Necessary
3	Chemical Transport Models operated in Tagging only	To provide an idea of the important sources and to decide where to place the monitors and develop scenarios	Necessary
4	Chemical Transport Models operated in Brute Force mode only.	To assess impact of emissions scenarios	Necessary
5	Speciated Measurements	In support of model detailed emissions scenarios	Optional
6	Receptor Models Fingerprint data base for RM	To validate tagging & in support of EI	Optional
7	Low Cost Sensors	To identify hotspot of pollution	Optional
8	Down Scale Models	Understand impact of traffic	Optional

Karo I	Air quality plan elements/steps	Argumentation (why?)	Priority: Necessary – Optional – Useless
1	Standard Measurements	to quantify the PM2.5 levels and identify the exceedances locations.	Necessary
2	Emissions Inventory	Without emission you can't do nothing	Necessary
3	Chemical Transport Models operated in Tagging only	First evaluation to decide where we can put speciated sensors, and to evaluate contribution. We have't got an option of simple simulation.	Necessary
4	Speciated Measurements	Necessary to evaluate model performance, to investigate new sources and double-check the emissions.	Necessary
5	Receptor Models Fingerprint data base for RM	Necessary to check the emission if we not missing something. At this step we can also check if our model is correct.	Necessary
6	Chemical Transport Models operated in Brute Force mode only.	To have information about specific sources impact to define mitigation strategies	Necessary
7	Down Scale Models	Could be useful in small scale. Not necessary in national scale assessment	Optional
8	Low Cost Sensors	Additional information. Could be valuable in couple of years	Optional

Philippe	Air quality plan elements/steps	Motivation
1	Standard Measurements	to quantify the PM2.5 levels (exceedences location)
2	Low Cost Sensors	to improve the spatialisation of the observations
3	Speciated Measurements	distinguish the PM2.5 origin primary (identification of the main sources)
4	Receptor Models Fingerprint data base for RM	distinguish the PM2.5 origin primary (identification of the main sources)
5	Emissions Inventory	Quantification of the pollutants fluxes to design the scenarios
6	Chemical Transport Models operated in Brute Force mode only (and meteo) (1km)	Simulation of the base case and of the different scenarios
7	Chemical Transport Models operated in Tagging only (and meteo) (1 km)	
8	Down Scale Models including meteo (until 50 m)	