FAIRMODE
Forum for air quality modelling in Europe

European Commission

Forum for Air quality Modelling

FAIRMODE

http://fairmode.ew.eea.europa.eu/

Joint response action of the European Environment Agency (EEA)

and the

European Commission Joint Research Centre (JRC):

- to bring together air quality modelers and users

- to promote and support the harmonised use of models by EU member states, with emphasis on their application to the European Air Quality Directive.

Joint Research Centre

European Environment Agency

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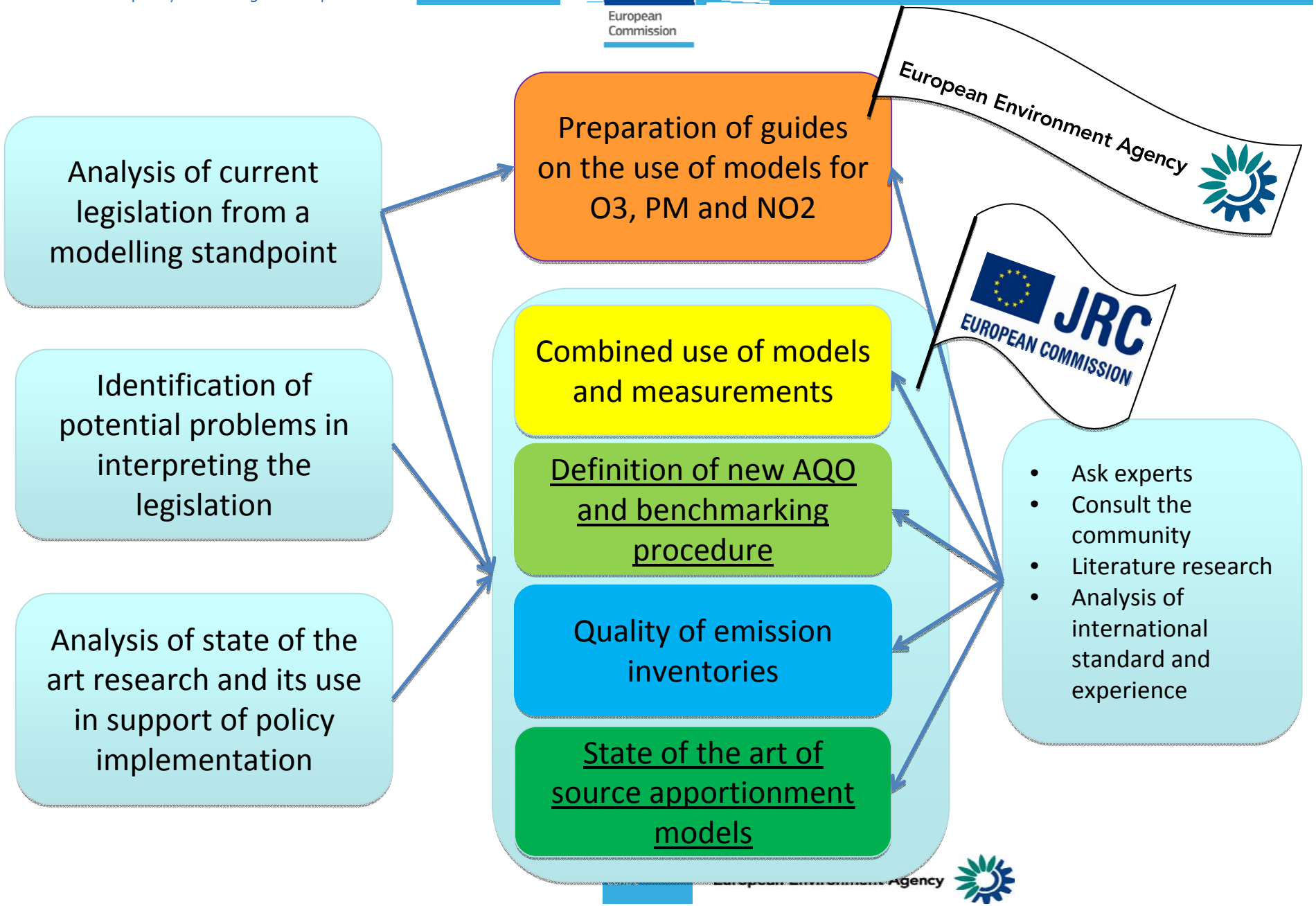

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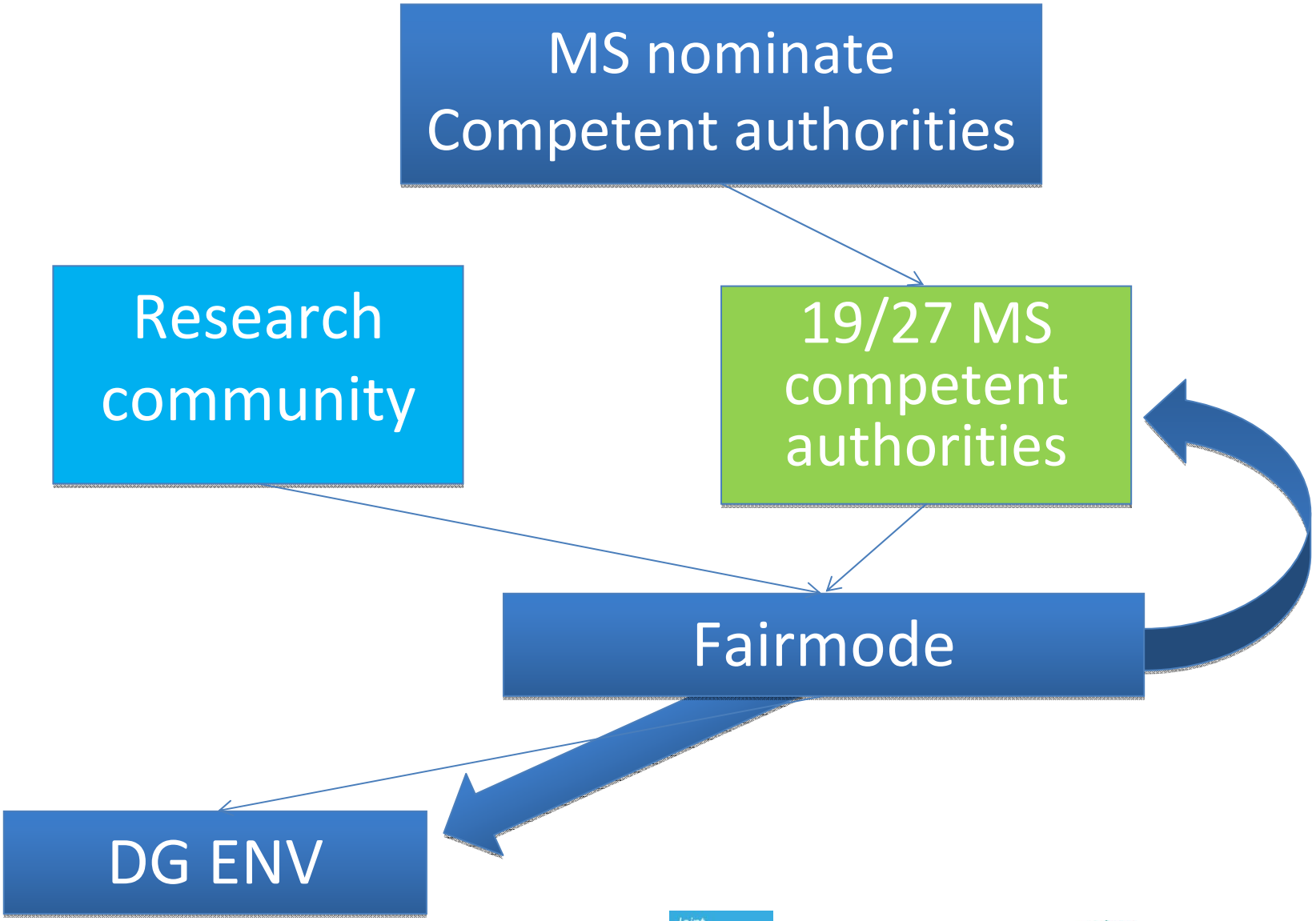

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Fairmode contribution to the AQD review process

- Development of recommendations for modifications of the current directive
- Stress the usefulness of models in the legislation, identify the applications in which it can be useful, convey the message that models, for some applications are sufficiently mature to be used in a regulatory context
- Recs developed in consultation with CA and research community

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Recommendation #1:

FAIRMODE strongly recommends the use of model for the following applications

1: Assessment of air quality levels to establish the extent of exceedances and establish the population exposure

2: Forecasting air quality levels for short term mitigation and public information and warnings

3: Source allocation to determine of the origin of exceedances and provide a knowledge basis for planning strategies

4: Assessment of plans and measures to control AQ exceedances

In addition to these applications is strongly recommended for:

- determining the number of fixed monitoring sites that are required
- designing monitoring network when models are used in combination with monitoring

Action: in all AQD articles where the four above-mentioned applications are mentioned the use of model should be strongly recommended.

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Recommendation #2:

FAIRMODE recommends a revision of the data quality objective for modelling

Action:

- Fairmode is developing new data quality objectives for modelling for ambient air quality assessment in collaboration with MS. This type of objective are expected to be useful as basis to investigate MQO for the other model applications
- We propose that subsequent to the work of Fairmode the Commission may initiates a process for the preparation of a Guidance document on the revision of model quality objective for assessment

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Recommendation #3:

FAIRMODE recommends that in parallel to what done for monitoring, competent authorities are nominated by MS for modeling activities (ref Article (3) and bullet d) quality assurance of modelling)

Action:

FAIRMODE will act as coordination forum of the modelling competent authorities in activities such as:

- Competence building
- Harmonization of modelling practices (model intercomp. activities)
- Combined use of model and monitoring data (Guide)
- Model benchmarking (Guide)
- **Source app. Modelling** (Guide, comp building, model benchmarking)
- **Monitoring station characterisation and meta data description for model applications** (Guide)
- **Support to optimisation of monitoring and network design** (Guide)

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Recommendation #4:

FAIRMODE recommends work to investigate and improve the compilation and quality assurance of emissions data suitable for AQ modeling under the directive

Action:

- Emissions are not mentioned in the AQD and work is needed to increase the quality of emission.
- Competence building initiatives to secure the consistency of detailed bottom-up emission inventories with those compiled for regulatory purposes at local, national and European scale
- The preparation of a guidance document for the compilations emission data for AQ models under the directive

FAIRMODE recommendations is just a set of many recommendations provided to the Commission

An economic impact assessment of the use of models should it be recommended by the legislation is being produced on behalf of the Commission

Models need to gain still a status of acceptance within the regulatory community and legislations as they can provide substantial support in space-time assessment planning practices and operations together with a reduction cost and rationalization of monitoring networks

FAIRMODE is the right context to disseminate the message to the policy realm we therefore encourage you to take part to the FAIRMODE plenaries and SGs workings

Coordination of activities may produce a stronger and more effective results, views, approaches

Coordinating networks like Aquila and Fairmode should collaborate closer to miximize the profit of interdisciplinary synergies

2 new activities are going to take place in WG2

1- **Combining two apparently un-reconcilable statistical supports** - models and monitors:

Representativity of a numerical grid node vs representativity of a monitoring point – in close collaboration with Aquila to bring in the monitoring point of view to interact with the modeling one

2- **Urban modeling issues of policy relevance** –

identification of existing approaches, limitations, reliability of primary information, exportability of success stories, costs and benefits in the implementation of a model chain for metropolitan application

Participation to the SG is open to anyone interested

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The next FAIRMODE plenary

10-12th April, 2013

The meeting will be hosted by Belgian Interregional Environment Agency (IRCEL), the Flemish Environment Agency (VMM) and the Flemish Institute for Technological Research (VITO). The agenda will soon be available.

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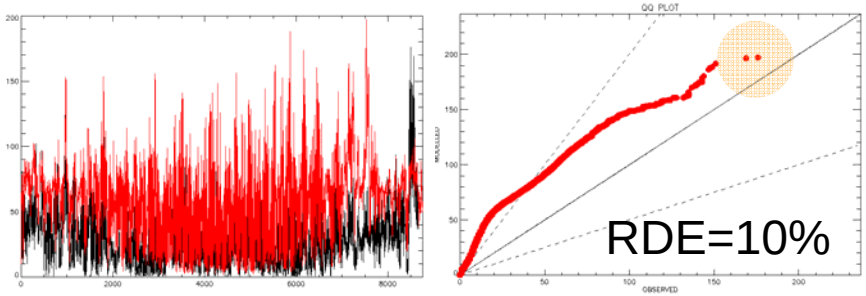
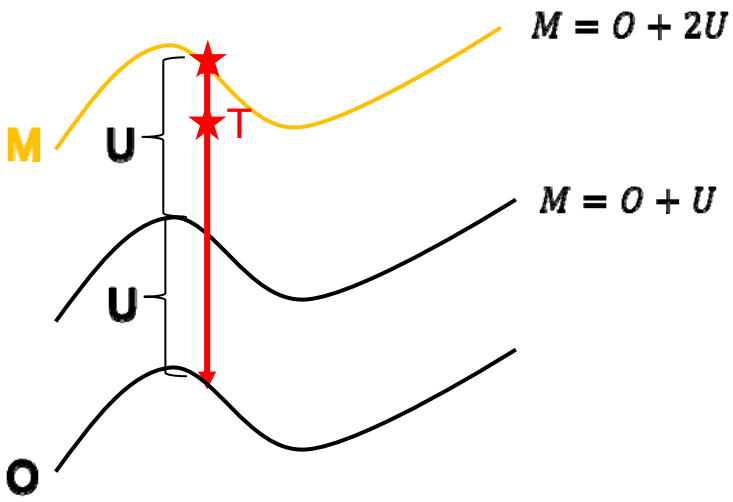
Current MQO (Guidance document)

$$RDE = \frac{|O_{LV} - M_{LV}|}{LV}$$



Alternative MQO (Target)



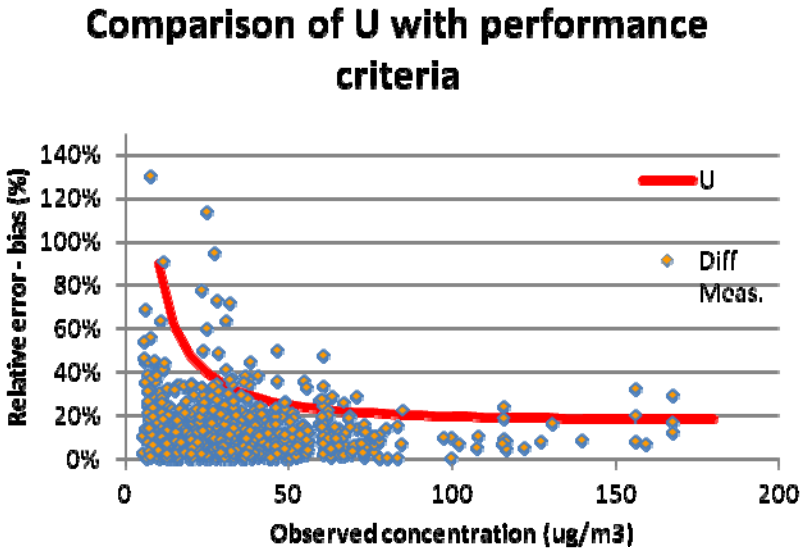
$$MQO = \frac{RMSE}{2U} < 1$$

Yearly

$$\frac{BIAS}{2U} = \frac{|M - O|}{2U} < 1$$

- *Use the DQO as a representative value for the observation uncertainty around the limit value (e.g. 25% for PM10)*
- *Split U into a random and systematic fractions ($U^2 = U^2_R + U^2_S$)*
- *Assign values for U_S and U_R around the daily/hourly limit values (based on measurement expert judgment, e.g. Us=30% for PM10)*

$$U(\frac{\mu g}{m^3}) = DQO_{LV}\sqrt{\frac{\alpha \bar{C}^2}{N} + (1-\alpha)LV^2}$$



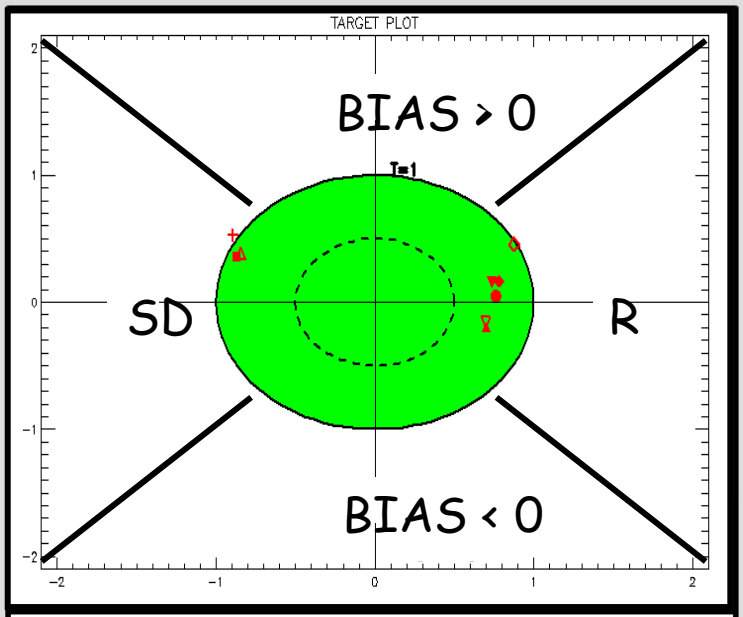
Advantages of the U approach

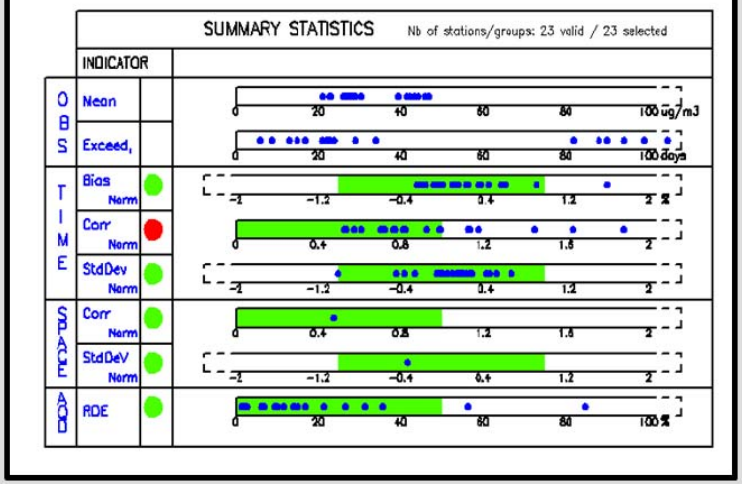
- Simple evaluation scale based on comparable weight to monitoring and modeling uncertainties which provides better insight in what model can deliver in terms of measurement accuracy (increased U at low concentrations)
- Few parameters (to be provided by the measurement community) allow to represent concentration dependency
- Consistency between hourly/daily and yearly averages in terms of MQO
- The approach would allow evaluating combined modeling-monitoring approaches
- Complementary criteria provide information on where and how to improve model performance (for hourly/daily time resolutions).

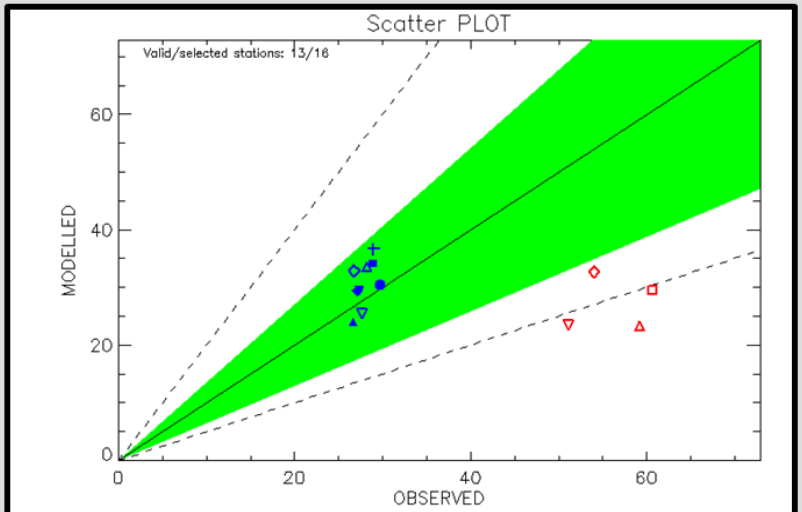
Generalization of the approach

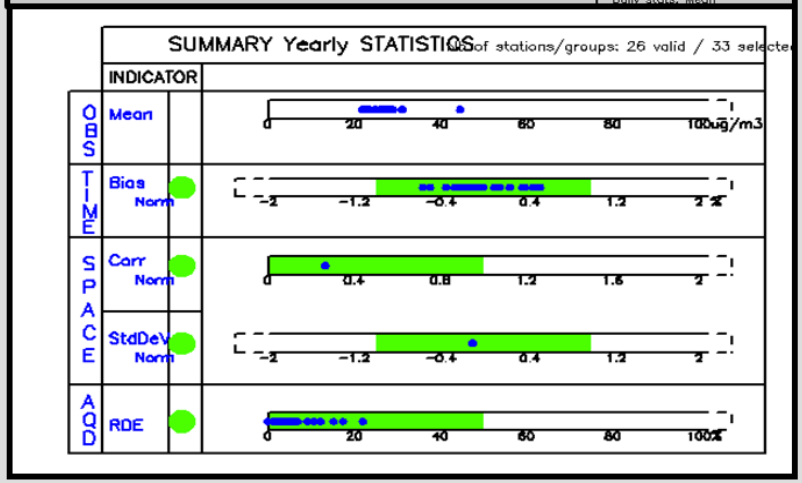
- For O_3 similar parameters could be used
- For $PM_{2.5}$ the assumed DQO (25%) probably needs to be increased
- For NO_2 there is a need to:
  - Account for a dependency on NO/NOx ratios. This will lead to larger uncertainties at high NO locations (e.g. traffic stations)
  - Account for station representativeness
- Other AQD pollutants (SO_2, Benzene…) still need to be investigated

Mod. Perf. Rep. URBAN PM10 OU









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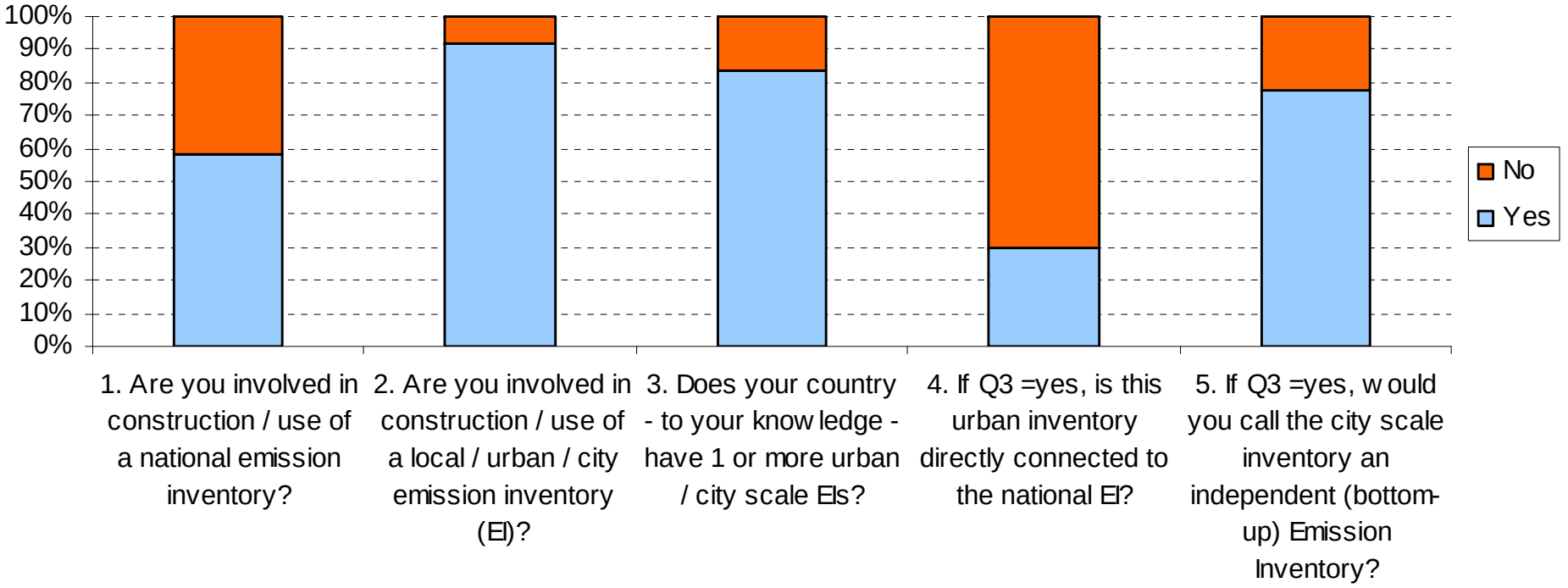
GENERAL ASPECTS

- SG3 Questionnaire sent to 30 people from 15 countries
- 12 people from 9 countries fulfilled the questionnaire
- Belgium, Finland, France, Germany, Ireland, Netherlands, Portugal, Spain (2), and UK (3)



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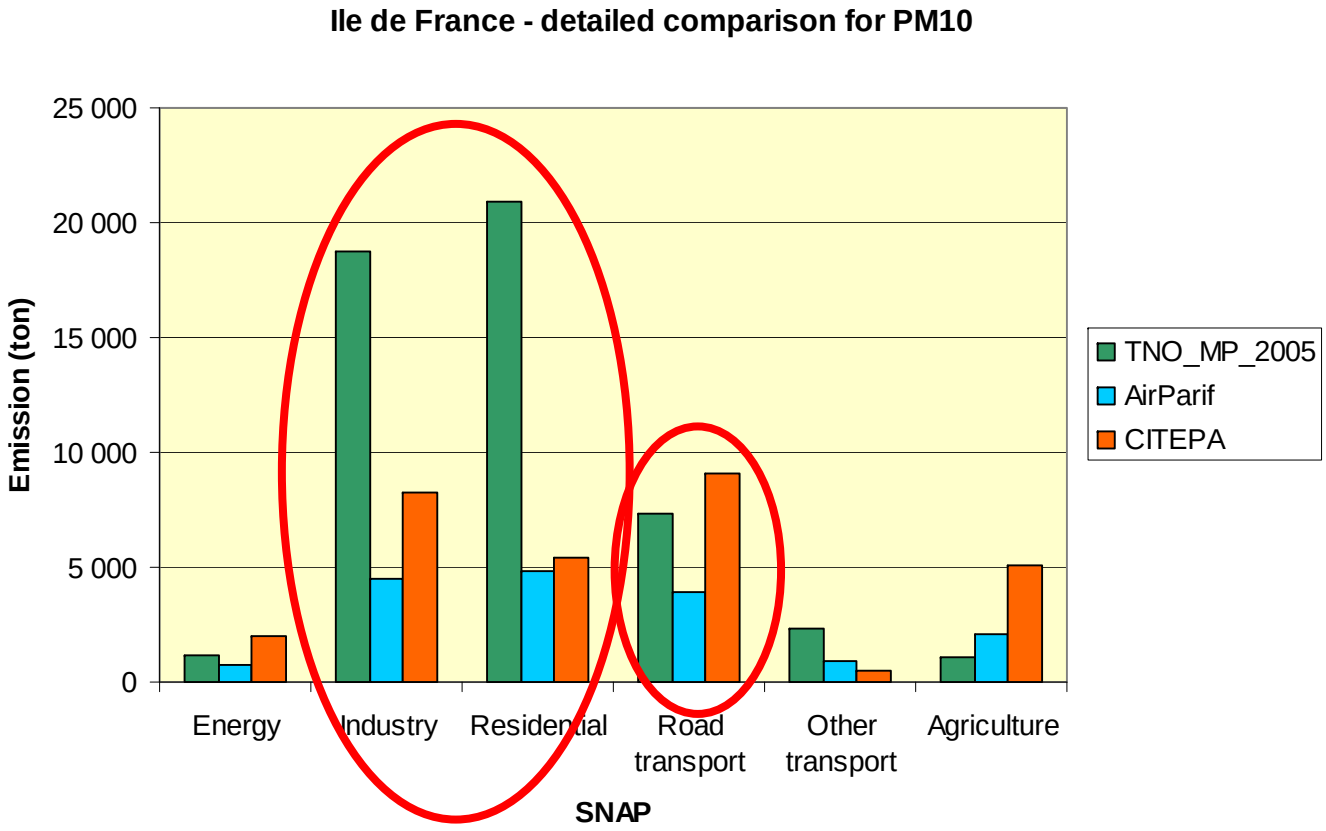
Case study 1: Paris

- Check Regional – National ***V***
- Comparison per source sector for domain made for all pollutants

- A problem of scale
- Sources wrongly distributed top-dowr
- Some sources may be missing locally
- Some sources???
- National to local is not consistent



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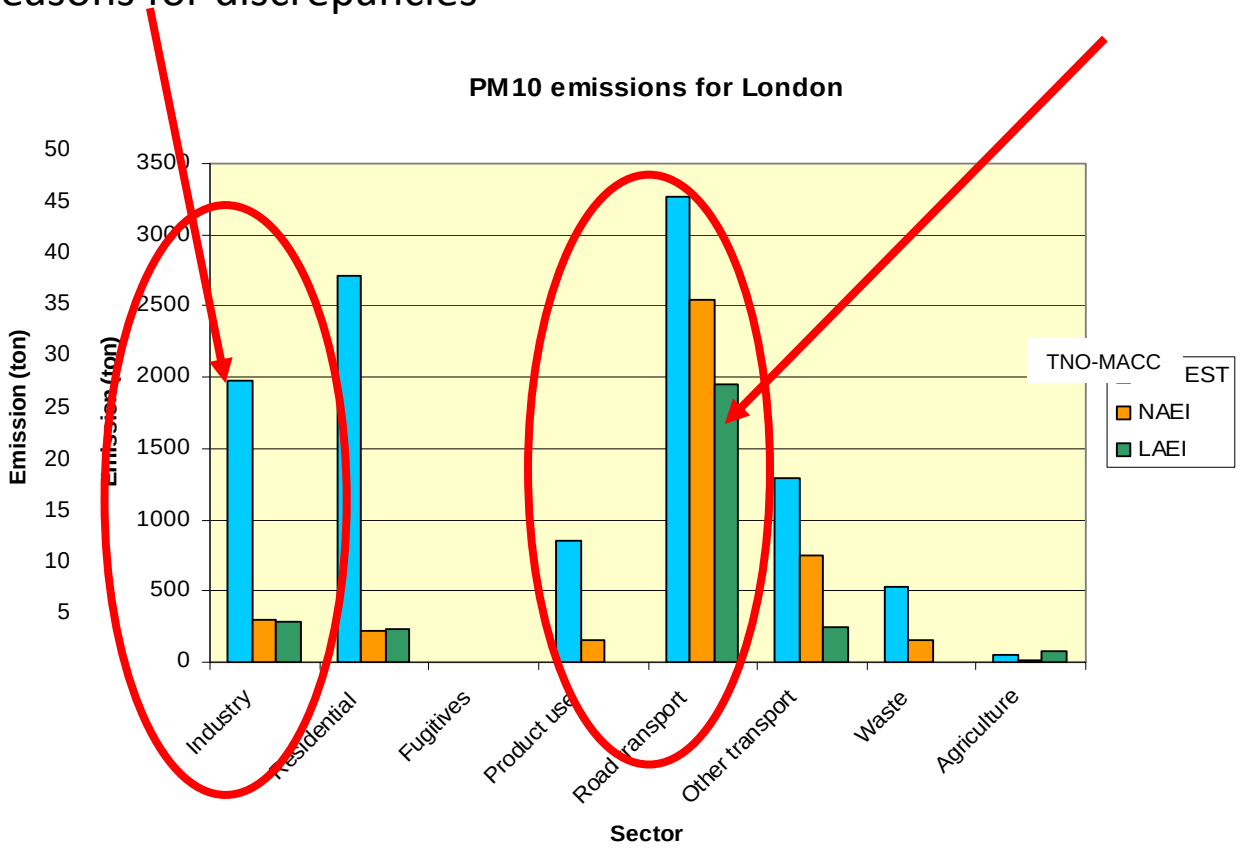
Case study 2: London

- The emissions for London from the Greater London Authority (GLA): the LAEI: London Atmospheric Emission Inventory). but for UK a gridded national inventory existed
- The NAEI connects better than the EU regional approach… but still
- Various reasons for discrepancies



1. ON THE USE OF MODELS FOR REGUALATORY PURPOSE

Motivation: *Models have long demonstrated to be good instruments for the investigation and assessment of the status of air quality at various scales. Models can be instrumental in combination with monitoring data (see point 6.) to a more complete assessment of a current situation as well as providing assessment in areas where monitoring is absent, of the causes and exploration of plans and programmes.One of the major advantages of models is their potential to provide detailed spatial distributions of concentrations. This means they can be applied for exposure assessments and to provide concentration fields where monitoring data is unavailable. Monitoring data is by its nature a small sample of the spatial distribution of the concentrations. An application of models would then allow a much broader assessment of the extent of the exceedances and would provide the required information for improved network design if further monitoring would be required.*

Recommendation: FAIRMODE strongly recommends the use of model for the following applications

1: Assessment of air quality levels to establish the extent of exceedances and establish the population exposure (see also point 5.)

2: Forecasting air quality levels for short term mitigation and public information and warnings

3: Source allocation to determine of the origin of exceedances and provide a knowledge basis for planning strategies (see also point 6.)

4: Assessment of plans and measures to control AQ exceedances

In addition to these applications is strongly recommended for:

- determining the number of fixed monitoring sites that are required (see also point 9.)

-designing monitoring network when models are used in combination with monitoring (see also point 9.)

Action: in all AQD articles where the four above-mentioned applications are mentioned the use of model should be strongly recommended.

FAIRMODE will provide list of AQD and IPR article

2. ON THE USE OF MODELS IN SUPPORT TO AQ POLICY

Motivation: *Currently the text of the AQD indicates that models may be used as 'supplementary data' in assessment and that models may be used to assess the level of exposure, but their role further to this is poorly defined. Text such as 'The results of modeling and/or indicative measurement shall be taken into account for the assessment of air quality with respect to the limit values' does not clarify what role the models will play in the assessment. Indeed, models are not named at all as the major tool for developing and assessing plans and measures, nor are they referred to in regard to short term forecasting. Their use in source apportionment is also not indicated within the AQD.*

Recommendation: FAIRMODE recommends clarifying the AQ Directive text on the use of models for the applications identified in Recommendation #1

Action: FAIRMODE will provide list of AQD and IPR articles where better definitions and clarifications are needed

4. FORUM OF EU AQ REGULATORY MODELLING

Motivation: *Air quality modeling in support to air quality policies in the EU context requires a constant level of communication among the various competent authorities and the organization of periodic model evaluation activities in order to assure harmonized practices and guaranteeing comparable quality levels across Member States.*

Recommendation: : **FAIRMODE recommends that in parallel to what done for the monitoring, compentent authorities are nominated by MS for modeling activities** (ref Article (3) and bullt d) quality assurance of modelling)

Proposed action:

Fairmode will act as coordination forum of the modelling competent authorities in activities such as:

Competence building

Harmonization of modelling practices

Combine use of model and monitoring data

Model benchmarking

Monitoring station characterisation and meta data description for model applications

Support to optimisazion of monitoring and network design

6. QUALITY ASSURANCE OF EMISSION INVENTORIES

Motivation: *Emissions inventories (EIs) play two important roles in assessing and improving AQ. First, EIs are input for (predictive) AQ modeling. The result is, further in the assessment chain, used to quantify exposure of the population and subsequently estimating AQ health impacts. Currently EIs are constructed at different scales (regional, national, city/urban), these EIs are often not consistent and may cause discrepancies in impact assessments at the different scales. Especially in support of point 5 this should be amended. Second, when consensus is reached about the need to improve AQ, EIs provide the link to the responsible emission sources, their relative shares and abatement potential.* ***[to be rephrased*** : ***please consider difference between inventories complying with requirements for national reporting and requirements for model running; to include definition of detailed BU and TD emissions]***

Recommendation: FAIRMODE recommends work to investigate and improve the compilation and quality assurance of emissions data suitable for AQ modeling under the directive

Proposed action:

•Emissions are not mentioned in the AQD and the need to work to increase the quality of emission inputs needs to be introduced in the revised text.
•A guidance document for the compilations emission data for AQ models under the directive
• competence building initiatives to secure the consistency of detailed bottom-up emission inventories with those compiled for regulatory purposes at local, national and European scale