FAIRMODE
Forum for air quality modelling in Europe

CCA3
Modeling & Monitoring

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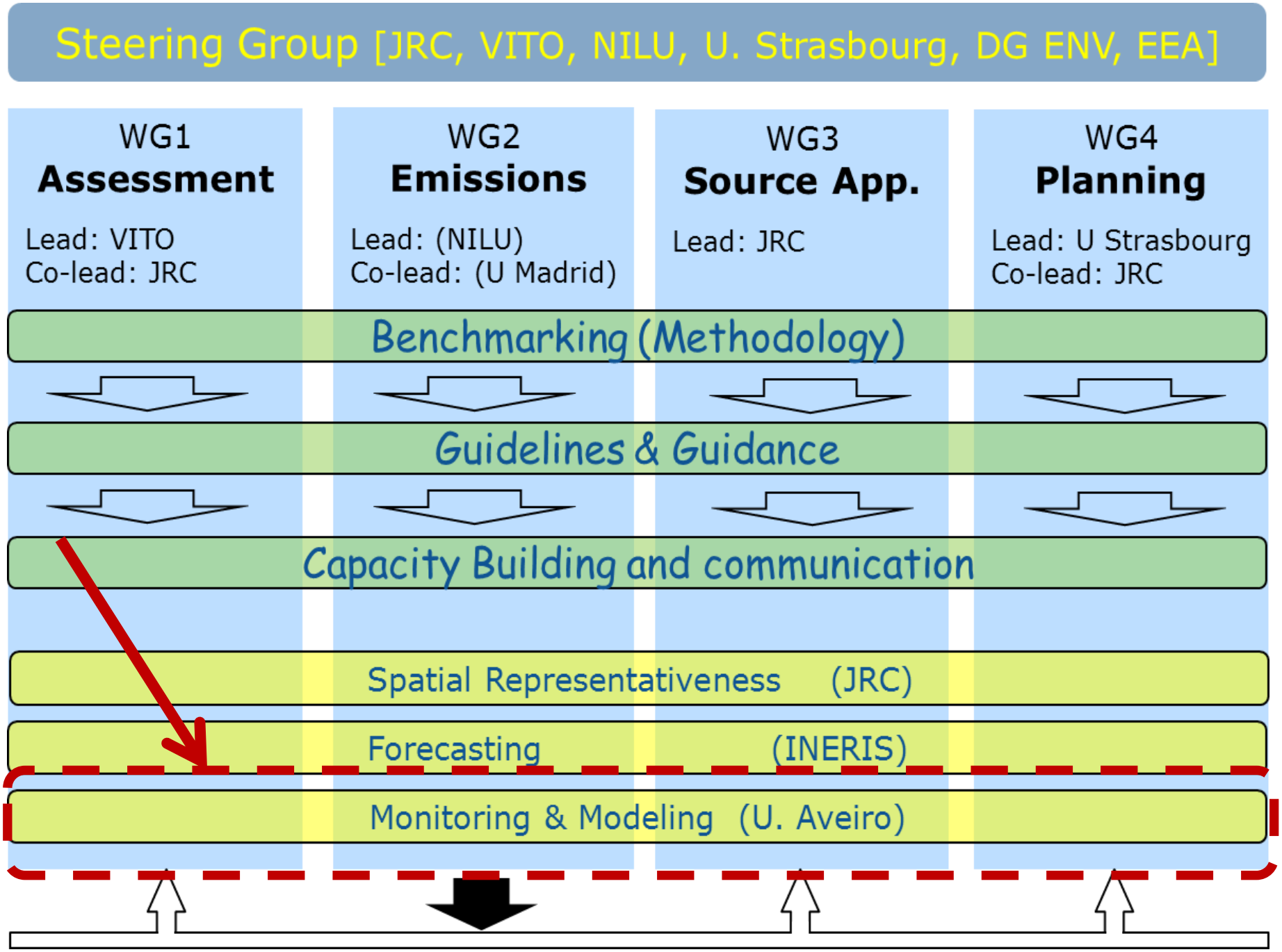
universidade de aveiro

FAIRMODE Plenary Meeting
Baveno 11-12 February 2014


Steering Group [JRC, VITO, NILU, U. Strasbourg, DG ENV, EEA]
WG1
Assessment
Lead: VITO
Co-lead: JRC
WG2
Emissions
Lead: (NILU)
Co-lead: (U Madrid)
WG3
Source App.
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WG4
Planning
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Benchmarking (Methodology)
Guidelines & Guidance
Capacity Building and communication
Spatial Representativeness (JRC)
Forecasting (INERIS)
Monitoring & Modeling (U. Aveiro)

… WG2-SG1 …

- To promote best practices on the combined use of models and monitoring for Directive related applications
- To develop and apply quality assurance practices when combining models and monitoring
- To provide guidance on station representativeness and station selection for the combined use of monitoring with modelling and for validation purposes

… WG2-SG1 …

‘combination of modelling and monitoring’ - any method that makes use of both models and monitoring to provide improved information on air quality.

… WG2-SG1 …

Monitoring & Modelling

Data integration X

It does not necessarily refer to any combined use of the same type of data for improved modelling.

Data fusion
(generally statistical in nature)

Can also be seen as post processing methods for modelling results ('passive data assimilation').

Data assimilation
(physical and chemical character of the problem, as described by the model, is followed

Monitoring data is used to guide models towards monitoring results during the model integration.

… WG2-SG1 …

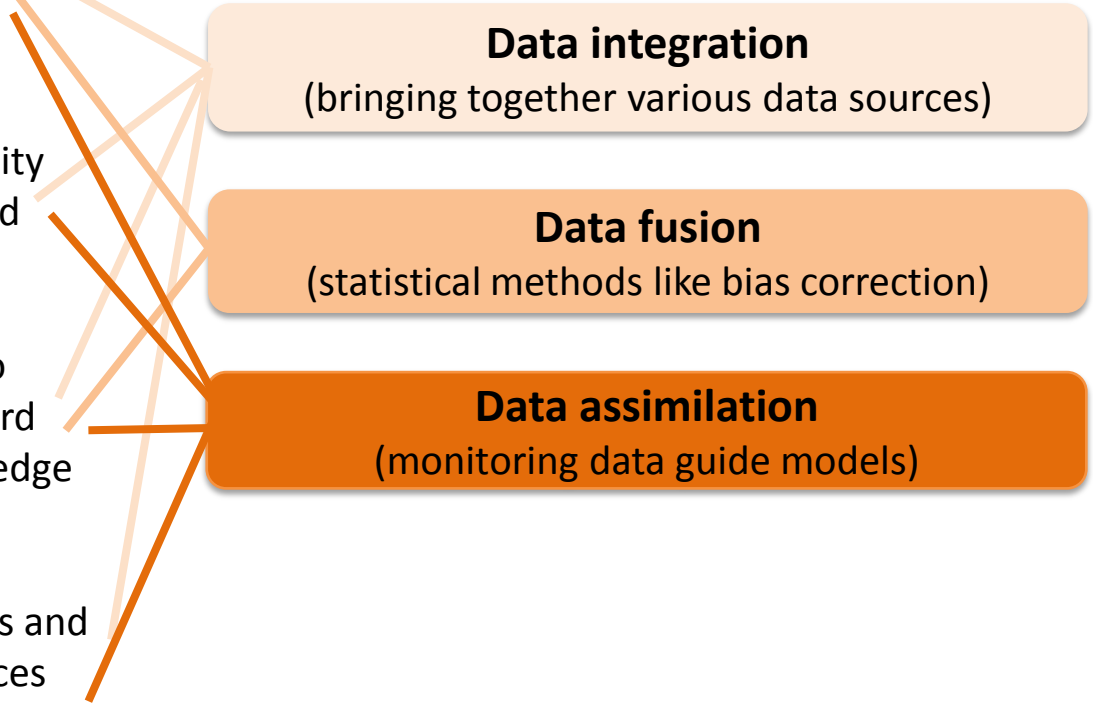
Monitoring & Modelling: examples

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

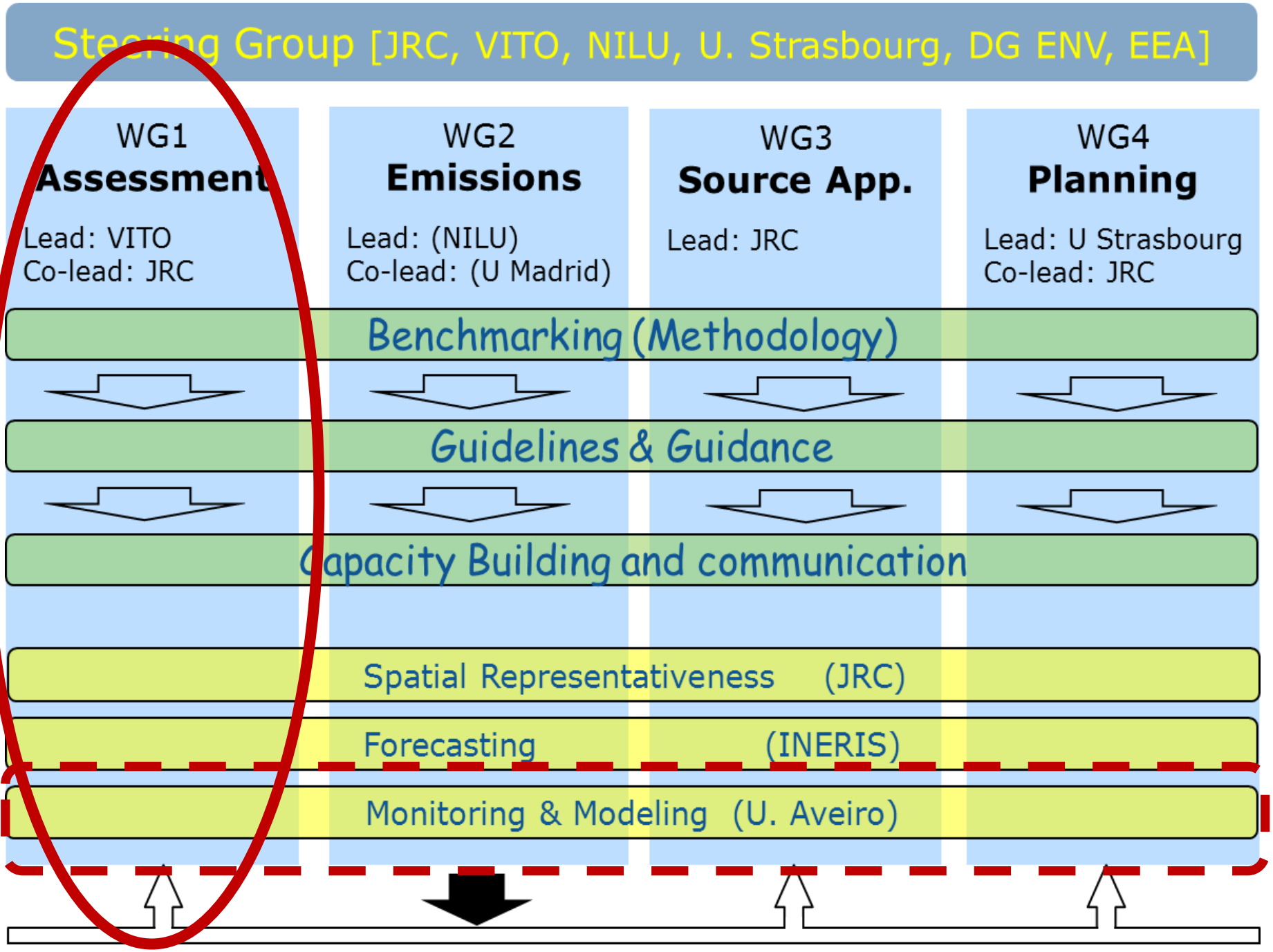
Application 2: Forecasting air quality levels for short term mitigation and public information and warnings

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

Application 4: Assessment of plans and measures to control AQ exceedances



Source:
Bruce and Spangl, 2010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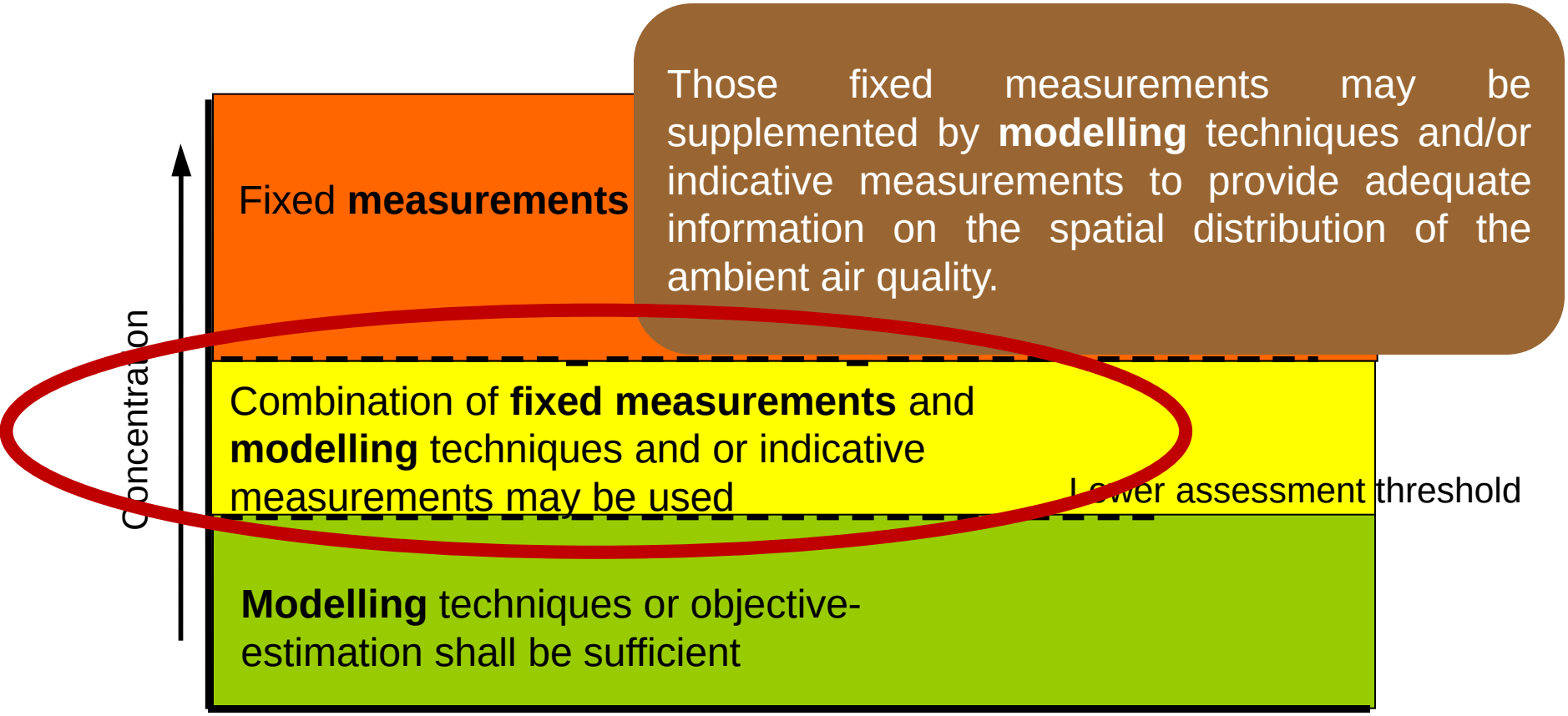
Air Quality Directive| assessment criteria

Assessment strategy depends on upper and lower assessment thresholds



SO_2, NO_2, NOx, PM10, PM2,5, Pb, C_6H_6, CO

The approach

Monitoring

1. Monitoring stations selection and data treatment, for the period 2006-2010
2. Comparison with the upper and lower thresholds, for every pollutant
3. 2010 data treatment for the model evaluation

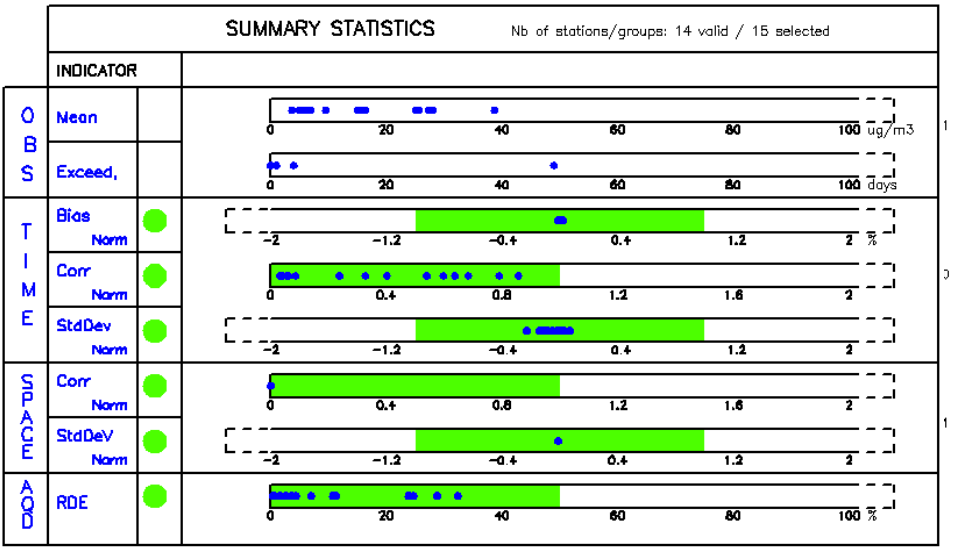
Modelling

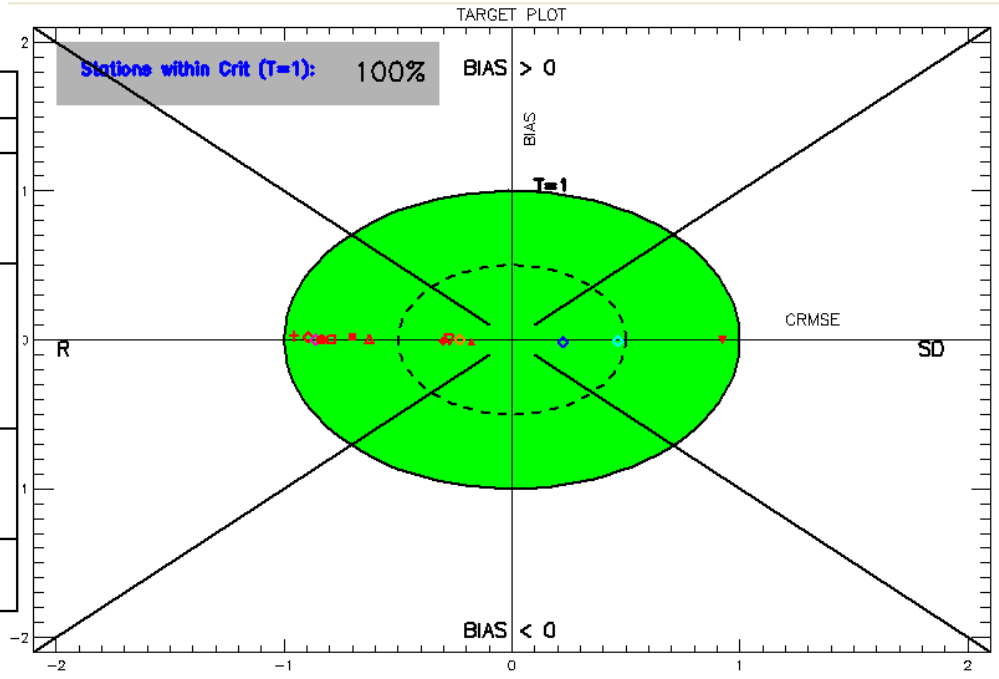
1. Model application to Portugal (5 km x 5 km), 2010 and 2011
2. Bias correction based on the multiplicative ratio adjustment technique
3. Evaluation (using the DELTA tool when possible)

AQ assessment based on a combination of Modelling and Measuring values

Delta Tool V3.3 application
Air quality for Portugal 2010 (5 km x 5 km resolution)

NO_2

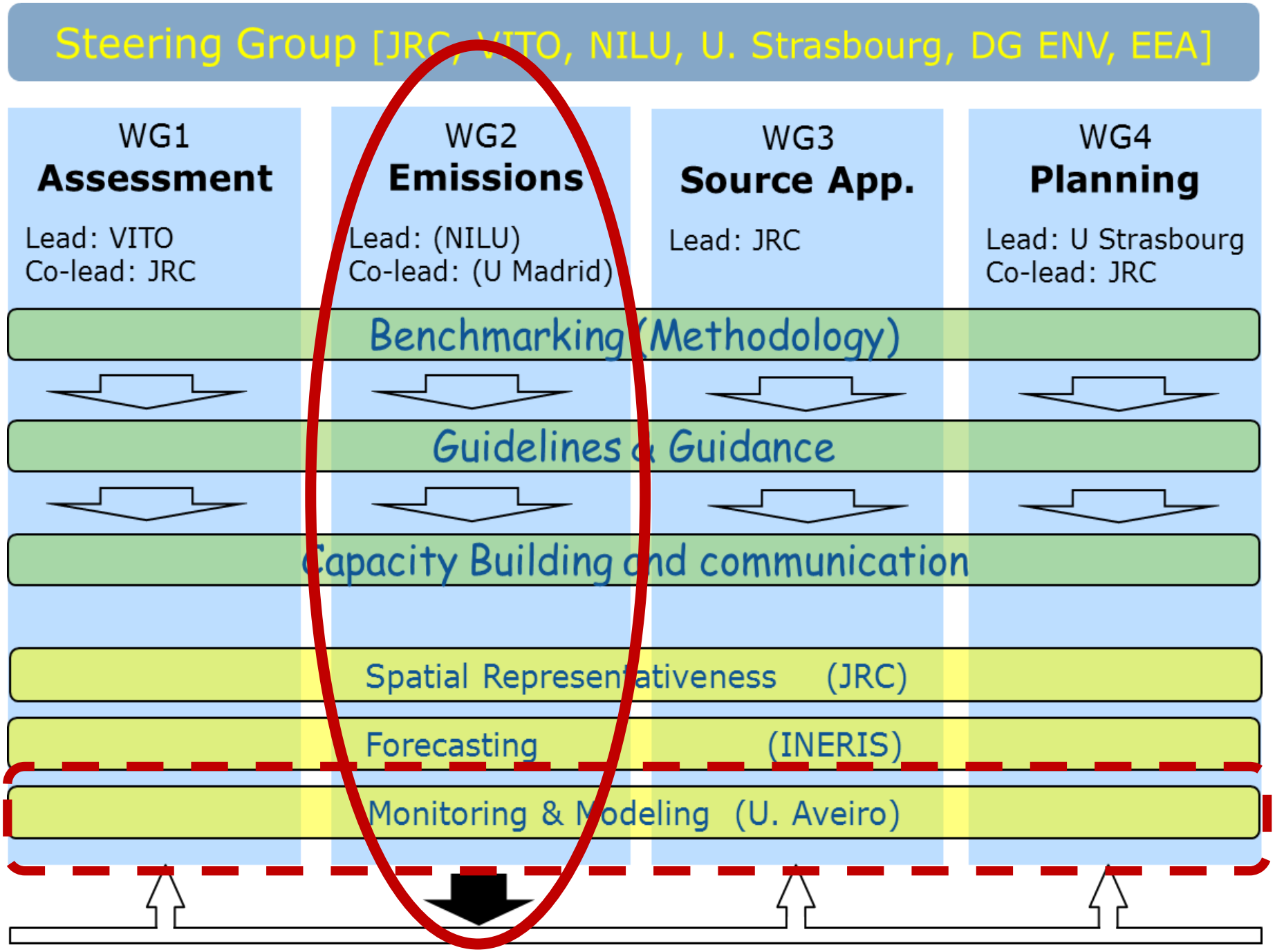




Should we change the MQO when combined modeling and monitoring data are used?

What is the current practice?

Does it make sense to compare evaluation results from combined modelling/monitoring results and from modelling results alone?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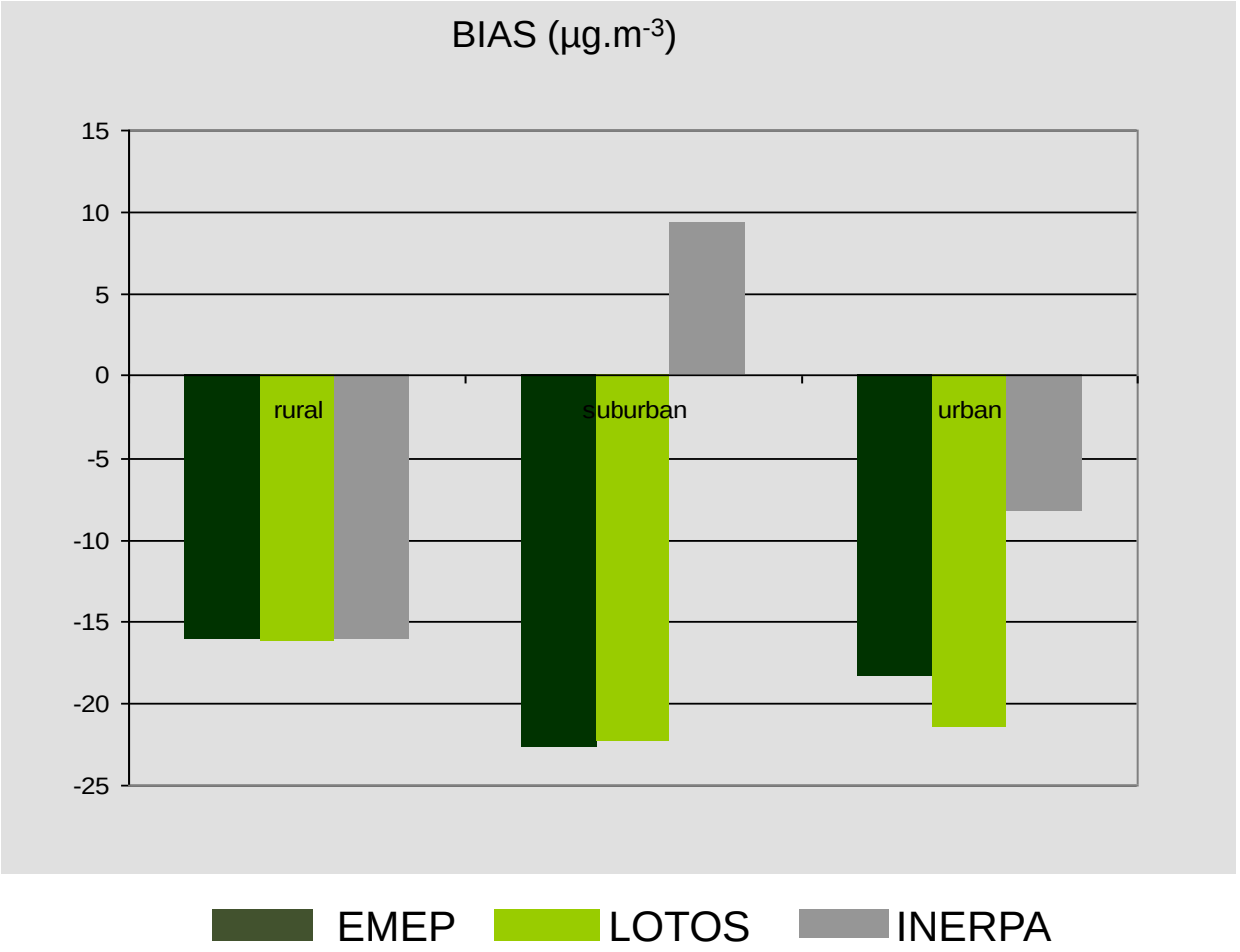
Can air quality modelling results contribute to the improvement of emission inventories?

Emission inventory comparison based on

PM10 model results



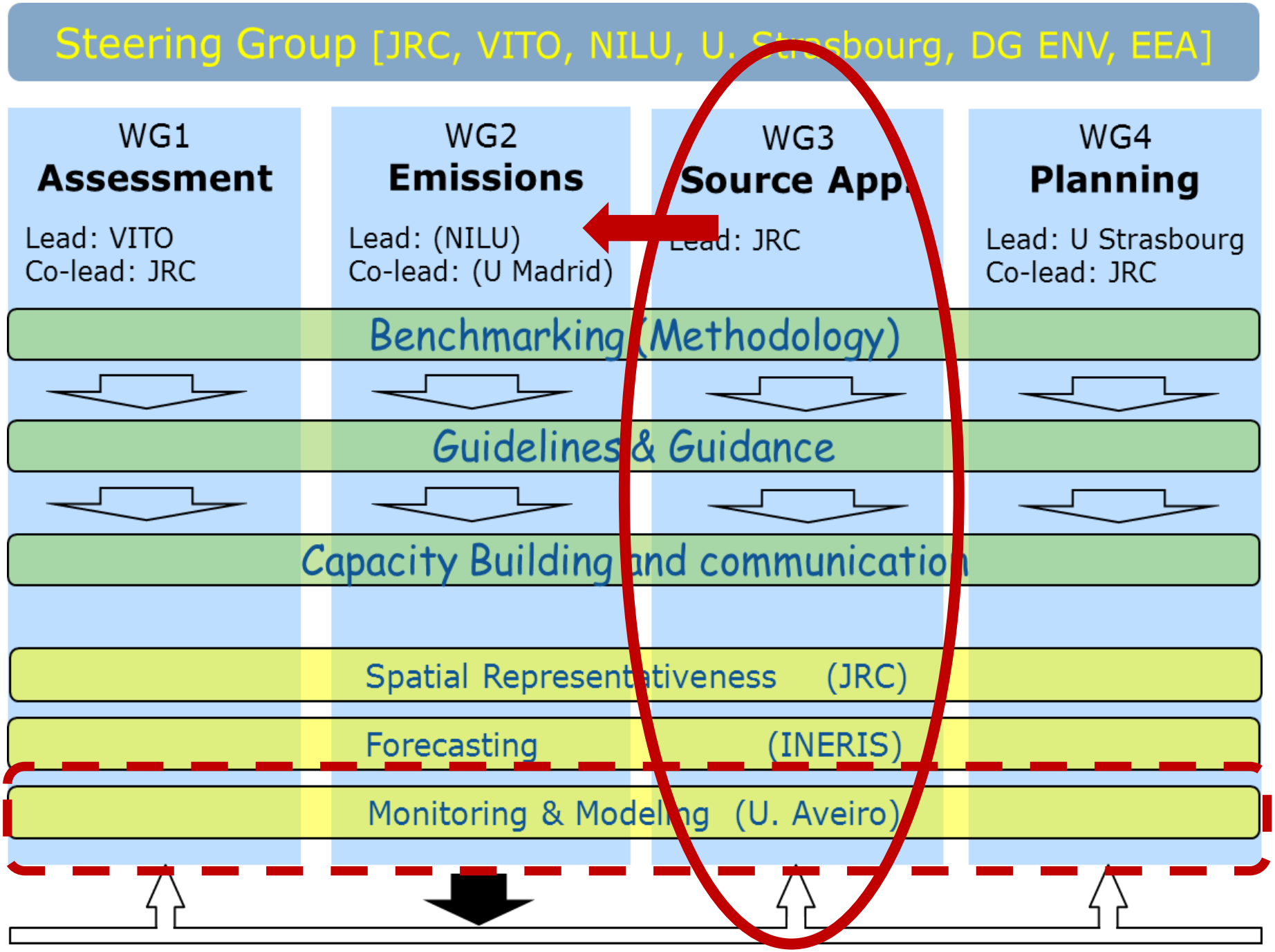
PM emissions overestimation by INERPA inventory... to verify and improve…

(Monteiro et al., 2006)

For urban areas and focusing on traffic road emissions, …

… does it make sense to use air quality monitored data from traffic stations to improve emissions?

Can we include emissions directly in models as a dynamic process?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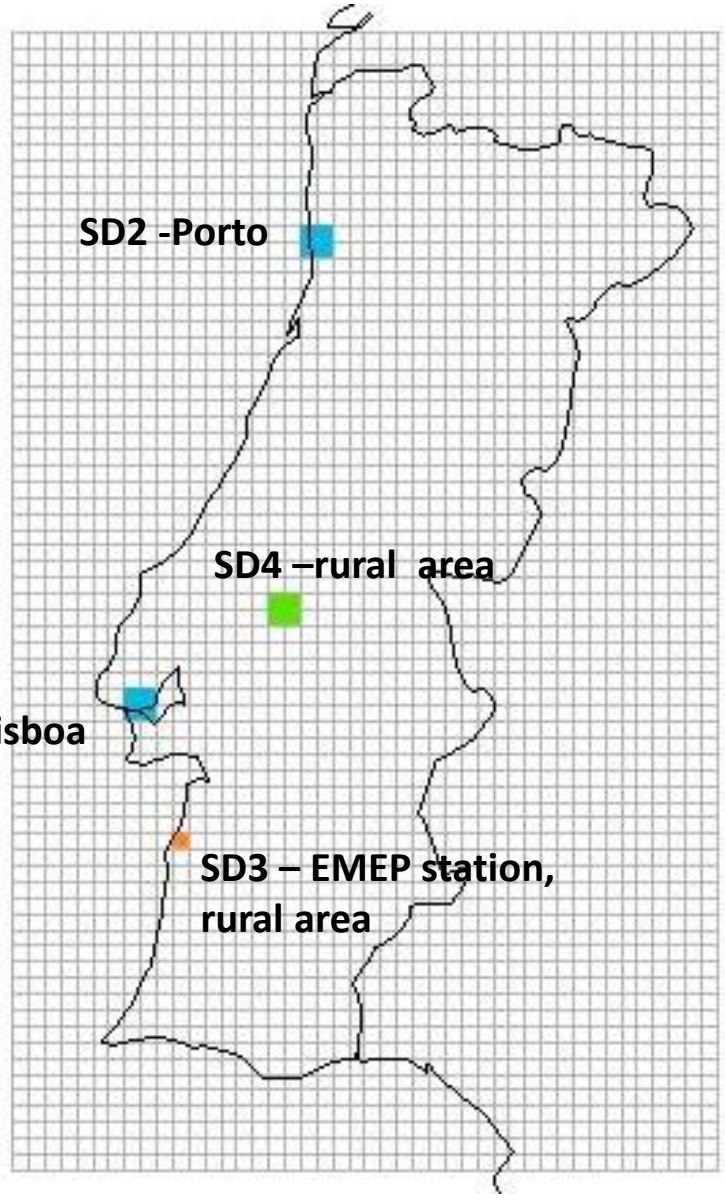
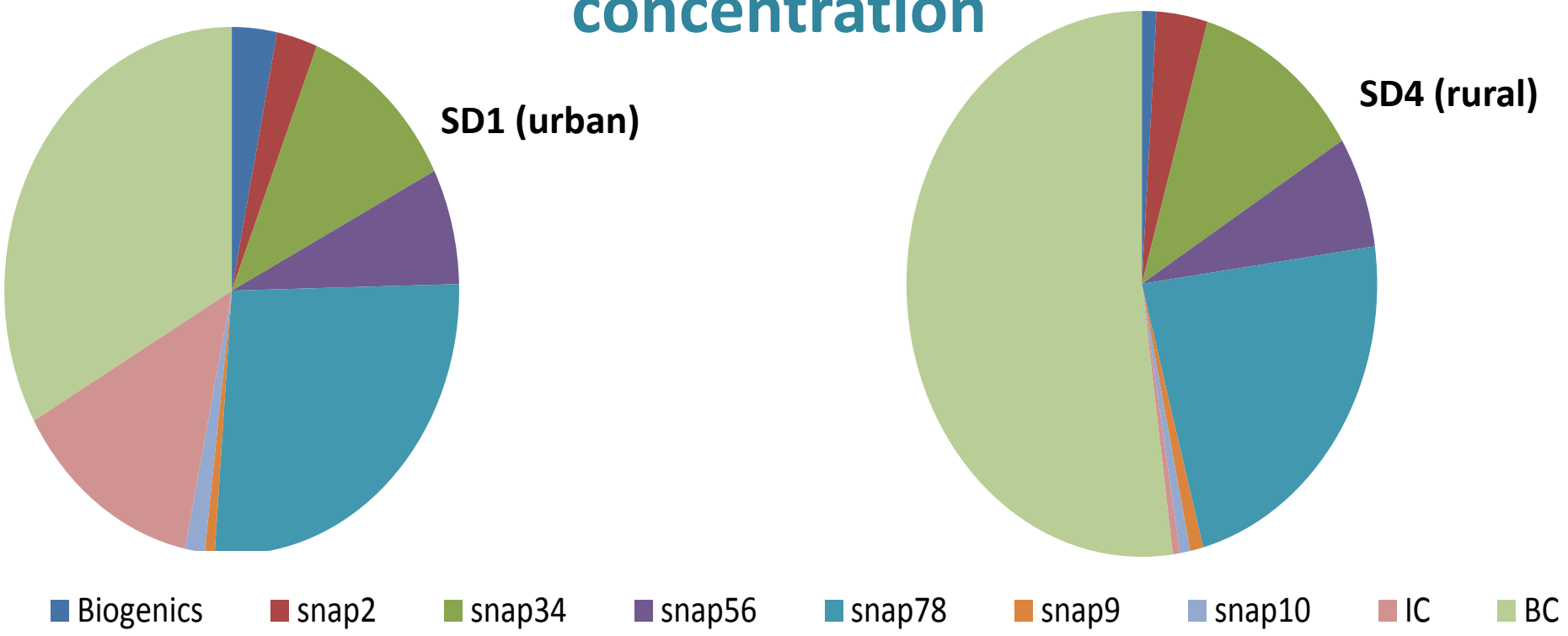
SOURCE APPORTIONMENT

- 4 receptor regions, corresponding to 4 SD
- 7 emission categories:
  - biogenic
  - non-industrial combustion (SNAP 2)
  - industry (SNAPs 3 and 4)
  - distribution of fossil fuels and solvent use (SNAPs 5 and 6)
  - transport (SNAPs 7 and 8)
  - waste treatment and disposal (SNAP9)
  - agriculture (SNAP10).



Contribution of emissions, initial and boundary condition to ozone 8h daily maximum concentration



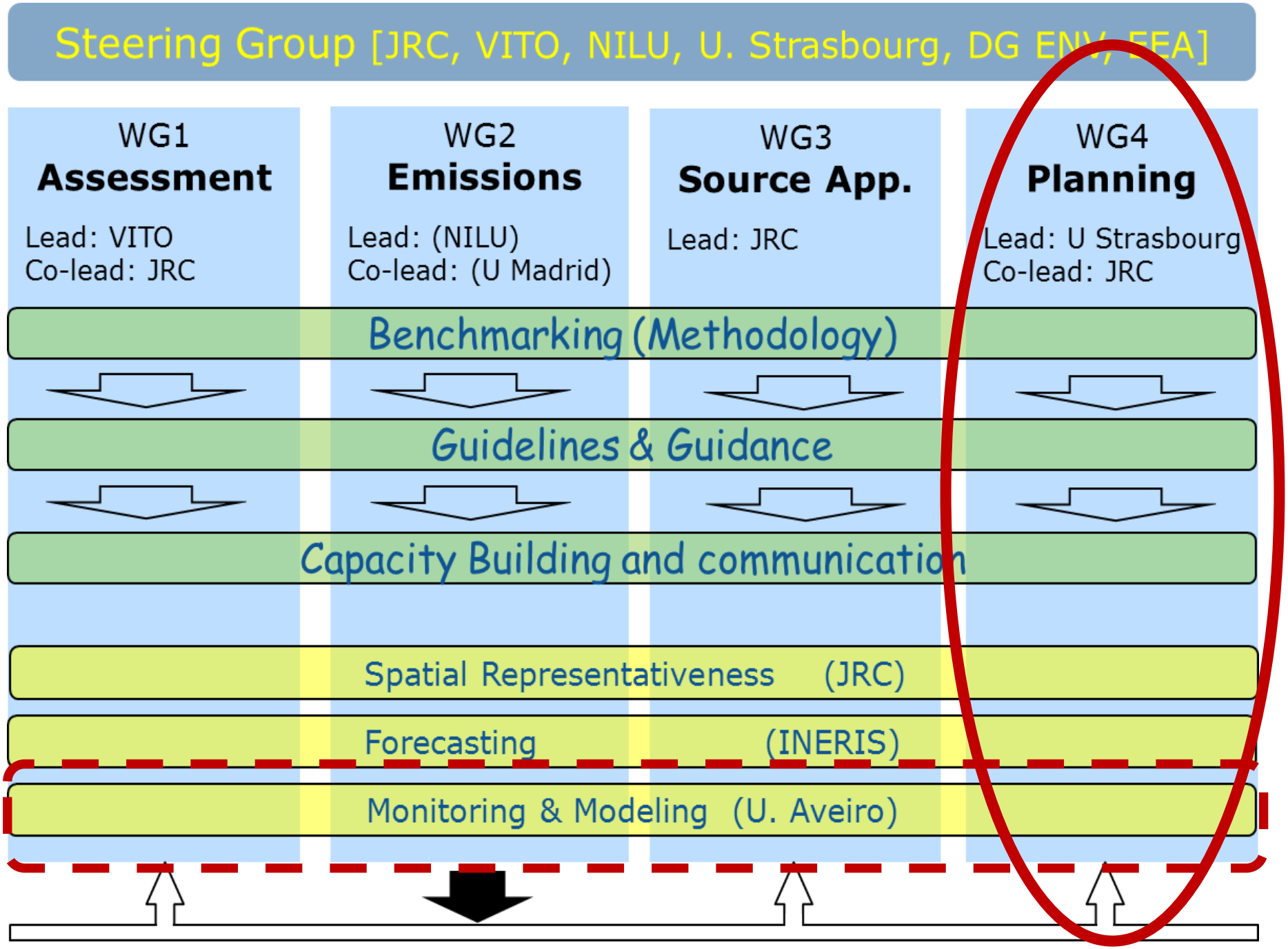
- **source contribution is different between subdomains: traffic (SNAPS 7 and 8) more important in the urban area, BC more important in the rural area**

(Tchepel et al., 2013)

Can we use source apportionment methods to improve emission estimates?

How can we better profit from source oriented models?

How to do the best use of monitored data to improve source apportionment (receptor and source oriented) results?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No reference technique is proposed so far to check the quality of the models used to quantify the impact of emission reduction scenarios in air quality plans.

Alain's proposal!

Dynamic evaluation

- **model's ability to predict changes in air quality concentrati… …er source emissi…**
- **r… c… …d be c…**
- **require… …mpact on air quality.**

Do we have historial case studies to benchmark?

WORK PLAN IDEAS 2014

1. REVIEWING METHODOLOGIES

How do we use monitoring data to assess the planning capabilities of our modelling tools?

What are best practices for the so called dynamical evaluation (or other methods)?

How do we use data fusion/assimilation techniques for planning? Is it possible?

3

- **How can this be incorporated into the model quality objectives and model evaluation tool?**

4

- Definition of relevant actors on the development and organization of monitoring networks to ensure high quality information.

Requests to participants | Meeting April 2014

1. REVIEWING METHODOLOGIES

- Update the compilation of monitoring & modelling practices/experiences

2. GUIDANCE ON MODEL VALIDATION WHEN USING M&M

- Common procedures to arrive at an independent model evaluation
- Quality control/quality assurance of the monitoring data

3. USE OF M&M FOR PLANNING PURPOSES

- List of planning exercises already applied and under study ("dynamic" evaluation)
- Experiences on using monitoring data for air quality management purposes

4. QUALITY OF MONITORING DATA: NETWORK QUALITY

- Criteria for the monitoring network
- Network design
- Problems and questions

In the meanwhile start thinking about emissions and SA