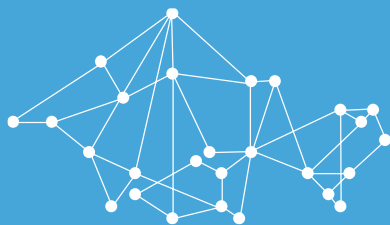




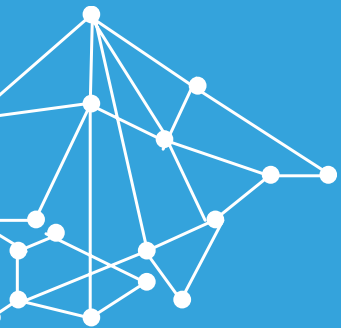
**FAIRMODE**

Forum for air quality modelling in Europe



# **WG1 ASSESSMENT: A SHORT INTRODUCTION**

**STIJN JANSSEN & JOOST WESSELING**



# Modelling Quality Objectives

# MODELLING QUALITY INDICATOR & OBJECTIVE

*When is a model “good enough”?*

- » **Modelling Quality Indicator (MQI)**: Statistical indicator calculated on the basis of measurements and modelling results.
- » **Modelling Quality Objective (MQO)**: Criteria for the value of the MQI. The MQO is said to be fulfilled if MQI is less than or equal to unity.

$$MQI = \frac{RMSE}{\beta RMS_U} \quad \text{and} \quad MQO: MQI \leq 1$$

with  $RMS_U$  the measurement uncertainty



**FAIRMODE**

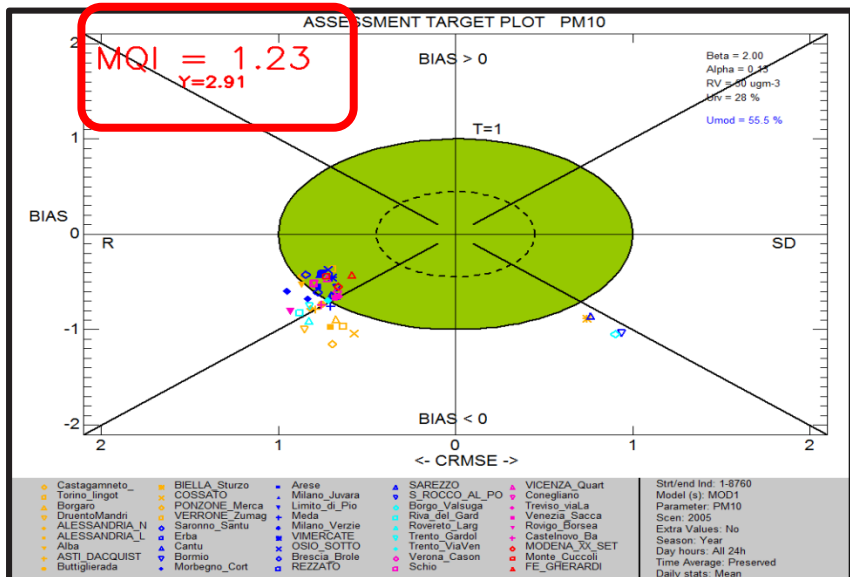
Forum for air quality modelling in Europe



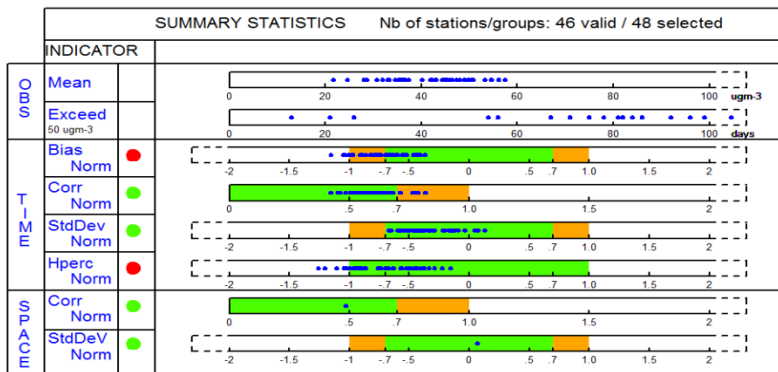
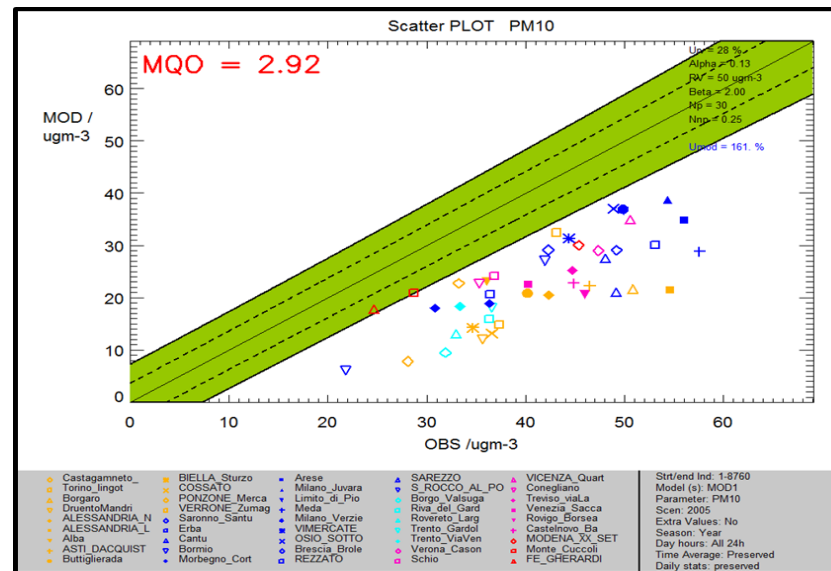
Rijksinstituut voor Volksgezondheid  
en Milieu  
Ministerie van Volksgezondheid,  
Welzijn en Sport

# REPORTING TEMPLATE

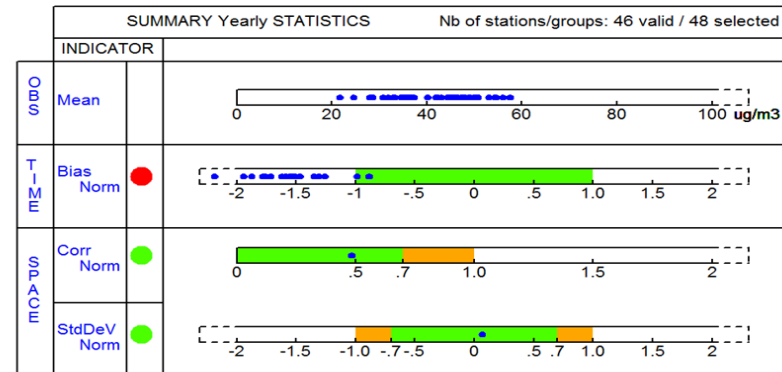
## Hourly/daily frequency



## Yearly frequency




Performance Criteria satisfied  
Performance Criteria satisfied; Error dominated by corresponding Indicator  
TIME: >90% of stations fulfills the Performance Criteria  
SPACE: Dot fulfills the Performance Criteria  
TIME: <90% of stations fulfills the Performance Criteria  
SPACE: Dot does not fulfill the Performance Criteria



Performance Criteria satisfied  
Performance Criteria satisfied; Error dominated by corresponding Indicator  
TIME: >90% of stations fulfills the Performance Criteria  
SPACE: Dot fulfills the Performance Criteria  
TIME: <90% of stations fulfills the Performance Criteria  
SPACE: Dot does not fulfill the Performance Criteria

Available via the FAIRMODE website

WG1 - Assessment



Assessment

[view website](#)

Current Activities

[EU Composite Maps](#)
[Source App. Intercomp.](#)
[Spat. Repr. Intercomp.](#)

[About FAIRMODE](#)
[Working groups](#)

Lead: VITO

Co-lead: JRC

Co-ordinator: S. Janssen

In this WG a methodology to benchmark model performances according to a common scale and common template has been the focus for several years.

In this context, model quality objectives (MQO) based on observation uncertainty have been discussed and the methodology is consolidated in the so-called DELTA tool. Currently the methodology is extensively tested by the FAIRMODE community.

## Related Documents

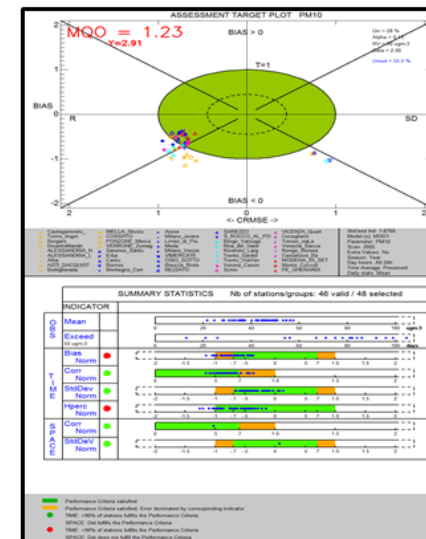
- [↓ Spatial representativeness of monitoring stations: Report on the outcome of the inter-comparison exercise \(February 2018\)](#)
- [↓ Guidance document on MQO and Benchmarking V2.1 \(February 2017\)](#)
- [↓ Updates on long and short term MQO and usage in the Delta tool \(May 2016\)](#)
- [↓ MQO in the framework of the FAIRMODE project \(Apr 2014\)](#)
- [↓ MQO Template performance report & DELTA updates \(Mar 2012\)](#)
- [↓ Delta User's guide V5.4 \(June 2016\)](#)

## Guidance Document on Modelling Quality Objectives and Benchmarking

Stijn Janssen, Cristina Guerreiro, Peter Viaene, Emilia Georgieva, Philippe Thunis

with contributions from: Kees Cuvelier, Elke Trimpeneers, Joost Wesseling, Alexandra Montero, Ana Miranda, Jenny Stocker, Helge Rørdam Olesen, Gabriela Sousa Santos, Keith Vincent, Claudio Carnevale, Michele Stortini, Giovanni Bonafè, Enrico Minguzzi, Laure Malherbe and Marco Deserti

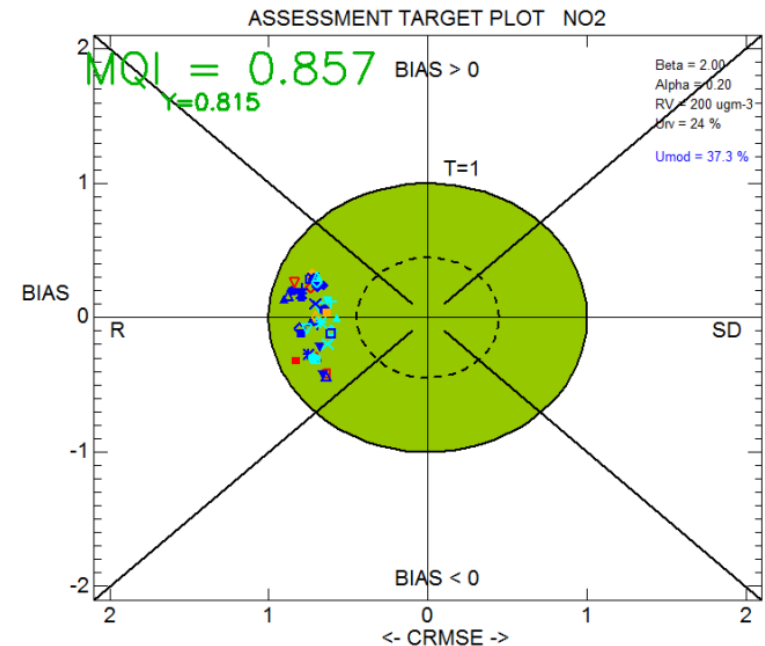
Version 2.1 – February 2017

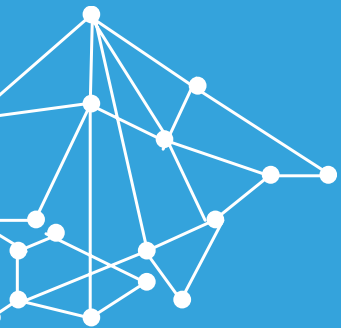


# MODELLING QUALITY OBJECTIVE

- » Open issues:
  - » MPC for high percentiles / exceedances
  - » Consistency between hourly/daily and annual MQI
  - » Model evaluation with limited monitoring stations (small to medium cities)
  - » Data assimilation (especially on-line DA)

→ CEN working group WG43



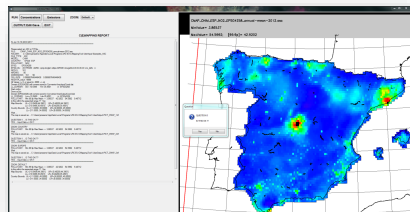


## Composite Mapping

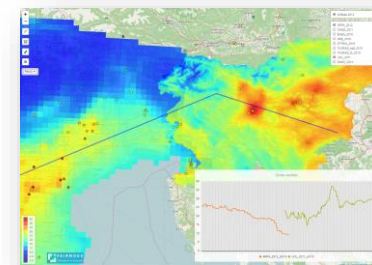
# THE PROCESS

manual step which  
takes some time

Data upload @  
JRC data base



QC check by  
participants



Visualization



**FAIRMODE**

Forum for air quality modelling in Europe

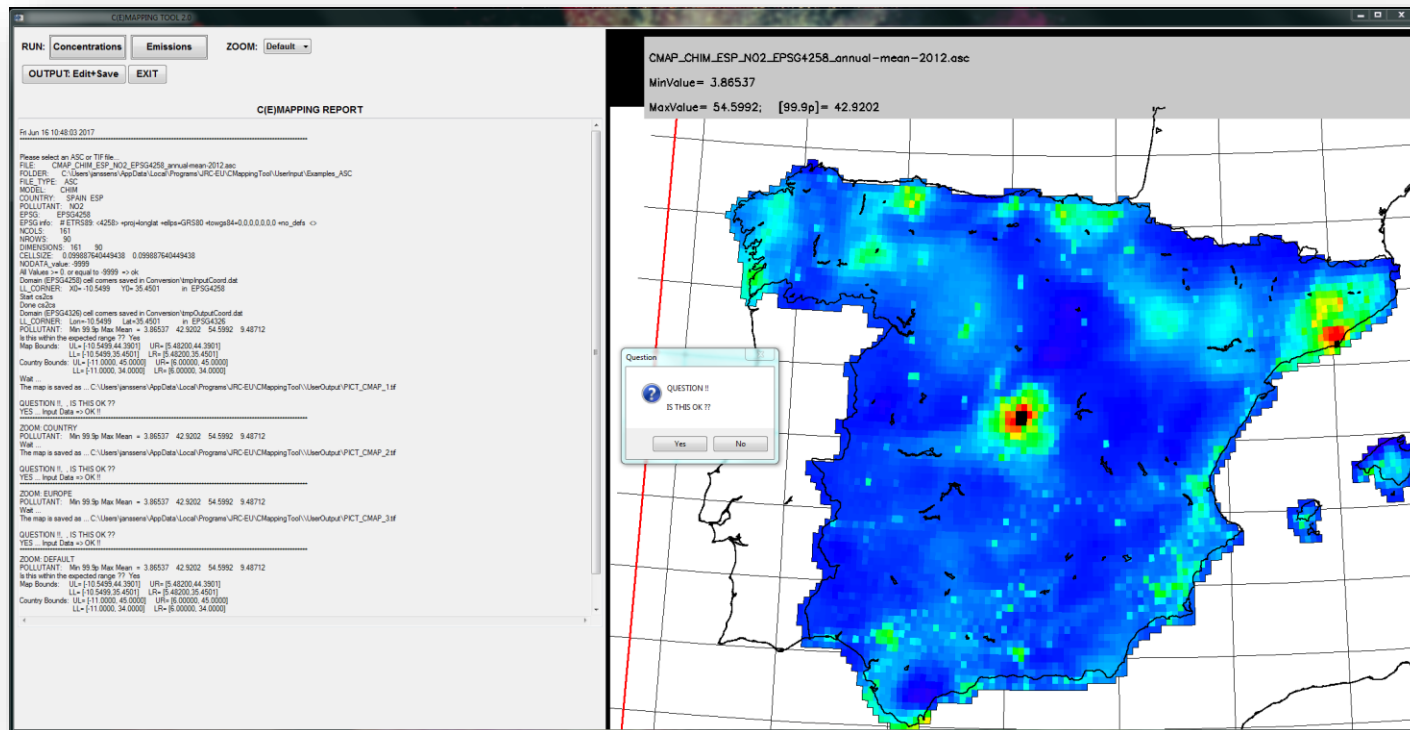


Rijksinstituut voor Volksgezondheid  
en Milieu  
Ministerie van Volksgezondheid,  
Welzijn en Sport



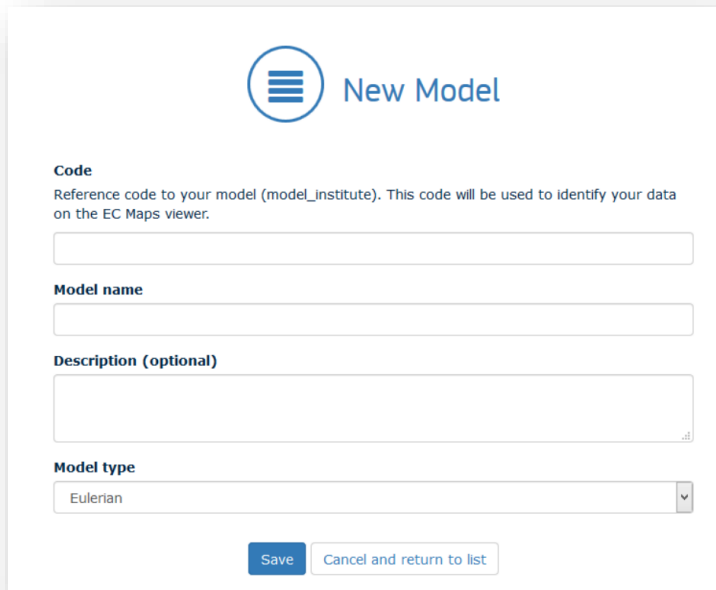
# QUALITY CHECK TOOL

- » QC tool developed by the JRC
- » Has to be installed locally on your computer to perform QC tests



# DATA BASE STRUCTURE @ JRC

- » Upload web-form to collect meta information and data files
- » 3-level structure: Model → Run → File(s)



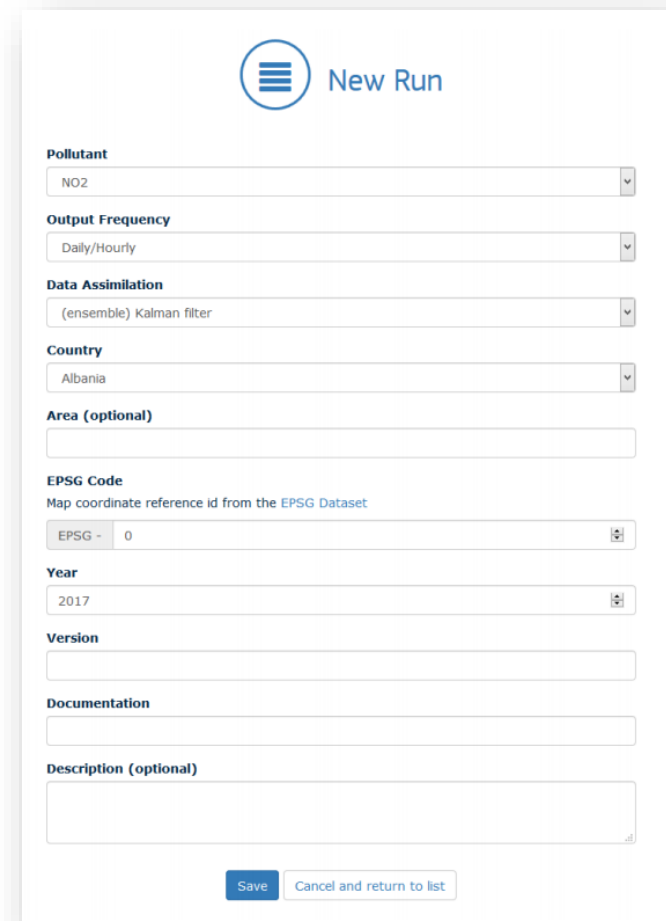
**New Model**

**Code**  
Reference code to your model (model\_institute). This code will be used to identify your data on the EC Maps viewer.

**Model name**

**Description (optional)**

**Model type**



**New Run**

**Pollutant**

**Output Frequency**

**Data Assimilation**

**Country**

**Area (optional)**

**EPSG Code**  
Map coordinate reference id from the [EPSG Dataset](#)

**Year**

**Version**

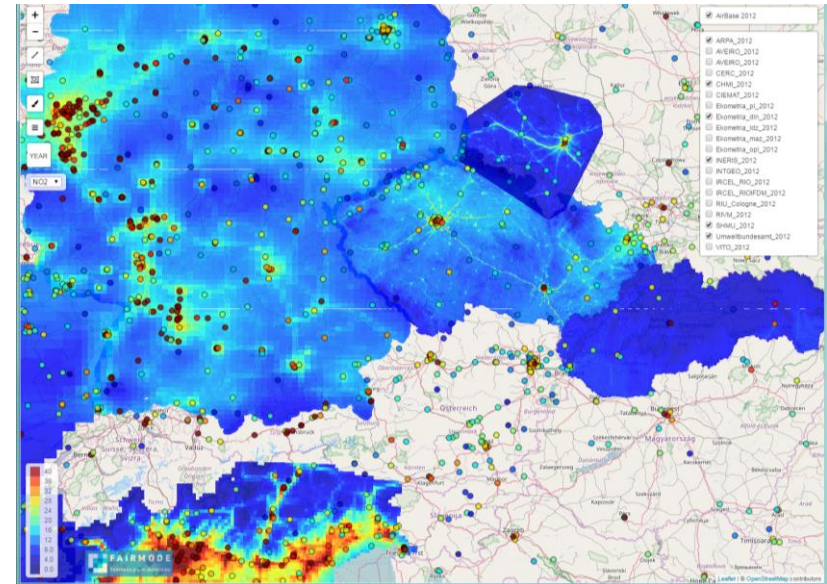
**Documentation**

**Description (optional)**

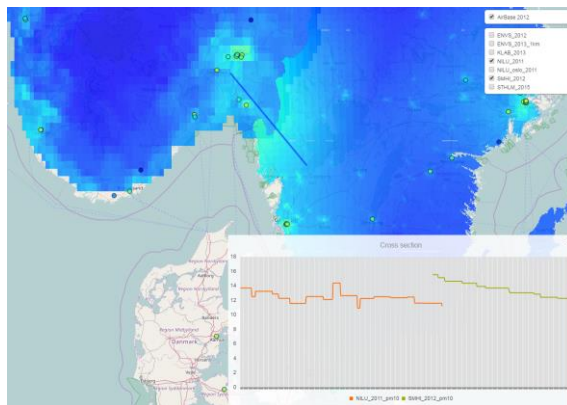
# VISUALIZATION PLATFORM

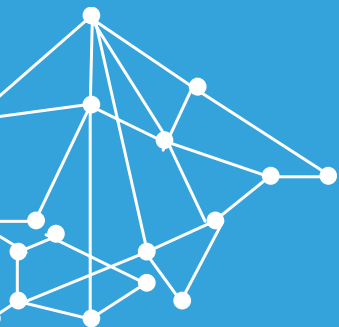
*Composite mapping platform → analysis of concentration maps*

- » Visualization of your map
- » Comparison with **measurement** data (2012 & 2015)
- » Comparison with modelled maps from your **neighbors**
- » Comparison with **other** modelled maps in your region
- » Comparison with the **EEA-ETC** map



» **Overall objective:  
improve the quality of  
your assessment maps!**



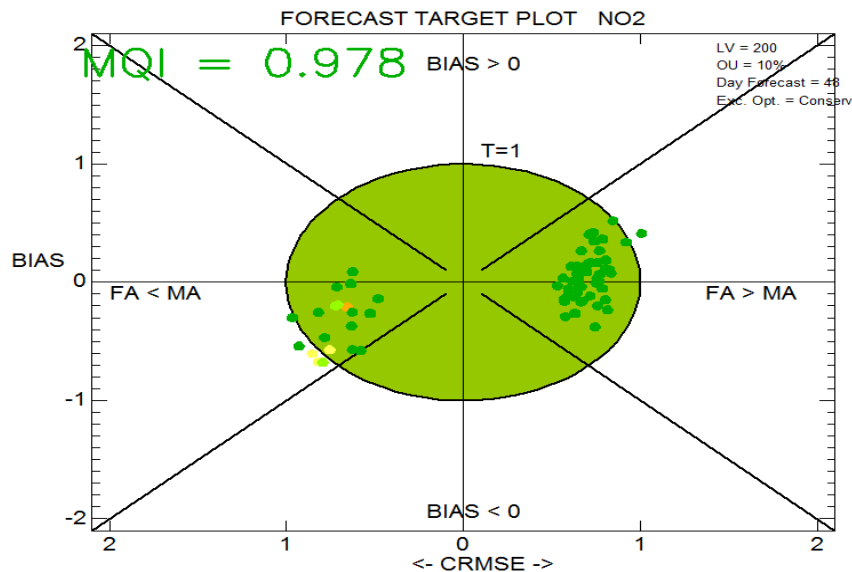


## Other WG1 activities

# FORECAST MODELLING QUALITY OBJECTIVE

*Do we need a benchmarking procedure for forecast models?*

- » DELTA-in-forecast mode
  - » Additional info for forecast models
  - » Is not replacing standard benchmarking process
- » Comparison with the persistence model:
  - » A forecast model should do better than using the monitoring data of yesterday to predict tomorrow's AQ levels



$$\text{Target}_{\text{forecast}} = \frac{\sqrt{\frac{1}{N} \sum_{i=1}^N (M_i^* - o_i)^2}}{\sqrt{\frac{1}{N} \sum_{i=1}^N (o_{i-j} - o_i)^2}}$$

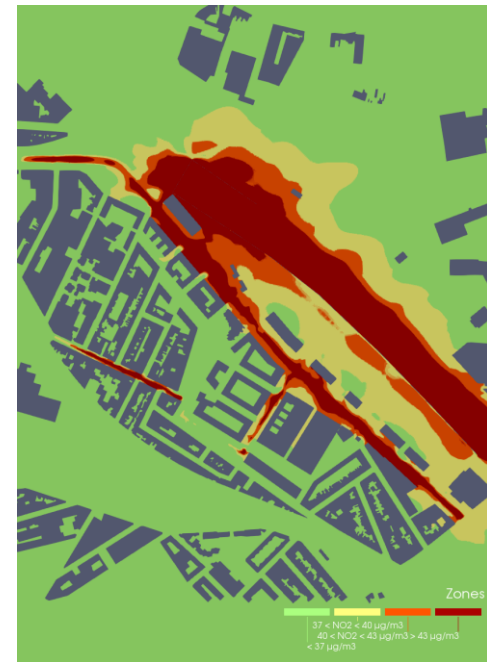


# CFD AND THE AQ DIRECTIVE

*Hot spots more and more occur at local level → need for obstacle resolving policy tools*

CFD could become a new activity in FAIRMODE to:

- » Collect feedback on application of CFD in ADQ context
- » Compare modelling methodologies
- » Compare modelled effects of canyons, vegetation, screens...
- » Exchange experience on strategies for dealing with complex geometries (e.g. road tunnels)





# SENSORS AND ASSESSMENT MODELLING

- » Low cost AQ sensors appear everywhere
- » How to deal with this new data in AQ assessment?
- » How to integrate this new information in AQ models?

