

FAIRMODE Update

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WARNING!

If you hear sirens sounding, do not panic!

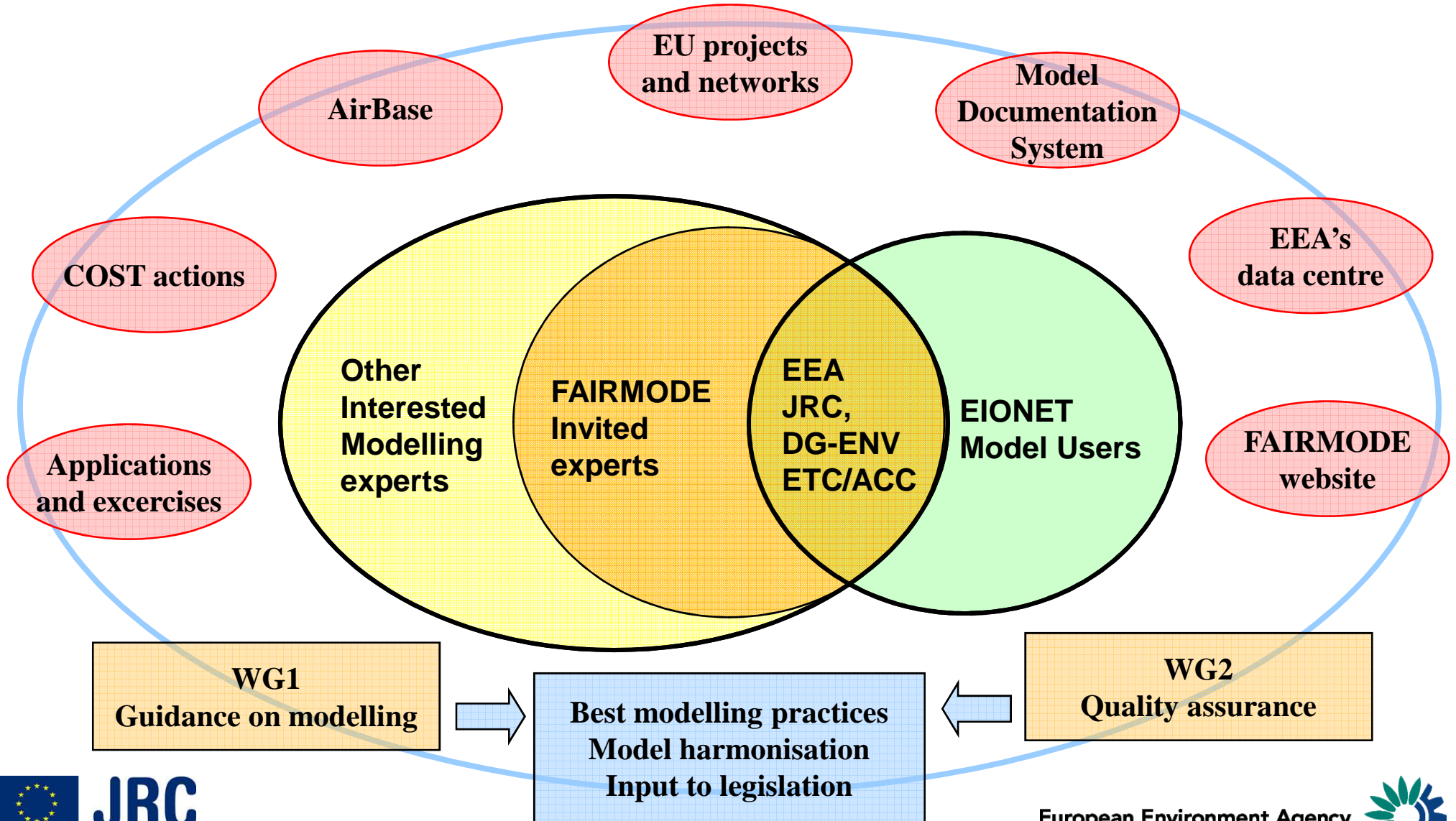
It is **NOT** a nuclear accident,
just a nuclear exercise!!

Terms of reference of FAIRMODE

TFMM Meeting 19-20 November 2009



- To provide a permanent European Forum for Air Quality Modellers and model users
- To produce guidance on the use of air quality models (including fitness for purpose) for assessing current and future air quality for the purposes of implementation of the Air Quality Directive and in preparation to the revision of this Directive **(WG1)**
- To study and set-up a system (protocols and tools) on the quality assurance and the continuous improvements of air quality models **(WG2)**
- To make recommendations and promote further research and other relevant improvements, such as on source apportionment, data assimilation, emission inventories, meteo, boundary conditions, temporal and geographic scale



Activities WG1 (lead by EEA -ETC/ACC)

- Provide guidance to present and future model users in EEA's EIONET partnership network (32 Member Countries plus West Balkan countries, cooperating).
- ***FAIRMODE tasks in the ETC/ACC 2009 and 2010 Implementation Plans.***
- ***Presentation of FAIRMODE activities at several international conferences and workshops (HARMO, AQ conf., EGU, ...).***
- ***“Guidance on the use of models for the European Air Quality Directive” report (Version 4.2)***
- ***FAIRMODE web side (hosted by EEA; ETC/ACC)***

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

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FAIRMODE

Forum for Air Quality Modelling in Europe

John Dorous – ETC/ACC
(Aristotle University of Thessaloniki)

ABOUT THE FORUM TOOLS & SERVICES DATA ARCHIVES CASE STUDIES EU LEGISLATION GUIDANCE PROJECTS INFO

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FORUM FOR AIR QUALITY MODELLING

The main aim of the Forum for AIR quality MODelling (FAIRMODE) is to bring together air quality modellers and users in order to promote and support the harmonised use of modelling practices for the assessment of air quality by EU member countries.

Within this scope, a main aspect of the Forum will focus on scientific research that will establish improved and validated modelling tools on which decision making will be based.

The forum is a joint response action of the European Environment Agency (EEA) and the European Commission Joint Research Centre (JRC) towards the new Air Quality Directive.

Latest news

[Description of activities of the Sub-Groups of WG2: SG2, SG3, SG4, SG5, SG7](#)

[Agenda of the WG2 meeting on Model Evaluation and Intercomparison Exercises](#)

[Invitation and Agenda of the 2nd Plenary Meeting of FAIRMODE](#)

RDF CALENDAR

<< November 2009 >>

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UPCOMING EVENTS

[The WG2 meeting on Model Evaluation and Intercomparison Exercises will take place on the 17th of November \(Agenda\)](#)

[The 2nd Plenary Meeting of the Forum for Air Quality Modelling will take place on the 18th of November \(Invitation, Agenda\)](#)

EL ?

FAIRMODE (WG1)

Guidance on the use of models for the European Air Quality Directive

Bruce Denby (ed.)

Contributing authors

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Contents AQ Modelling Guidance document (WG1)

1. Introduction
2. Summary of the 2008 AQ Directive
3. Interpretation of the AQ Directive in regard to modelling
4. Reporting and public information when using models
5. Model quality assurance and evaluation
6. Applications of models for assessment
7. Application of models for air quality planning
8. Special topics

Annexes 1 - 4

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1. Assessment of the existing air quality

- Models can be used to supplement or even replace monitoring data under specified conditions. These conditions are related to the various categories of pollutant levels and are described in section 3.2 of this document.
- Given adequate quality and resolution a model can be used to reduce the number of measurements by up to 50% (not including ozone, see *Annex IX*), unconditional on the pollutant levels (*Articles 7.3, 10.3 and 14.2*).
- Given adequate quality and resolution of the model it can be used to reduce the number of measurements of ozone by 1/3rd (*Annex IX*).

This topic will be described in more detail, and illustrated with examples, in chapter 6.

2. Management: mitigation and planning for future air quality

When preparing air quality plans and abatement measures, models will need to be used for a thorough analysis of the impact of these measures on the air quality. The use of models is not stated explicitly in the AQ Directive for this management activity, but it is not possible to do this analysis properly without the appropriate models. Such analysis includes short term air quality modelling of hours to days (air quality forecasting) as well as long term planning of several decades (emission scenarios and abatement measures) This topic will be described in more detail, and illustrated with examples, in chapter 7.

3. Source apportionment

Though not directly written into the AQ Directive, source apportionment studies will generally be required to assess the causes of exceedances of air quality thresholds, the contribution from natural sources, neighbouring countries and the contribution from resuspended road sand and salt. Monitoring of these source contributions everywhere in a zone or agglomeration would not be possible so modelling is the most likely methodology that can be used for this application. Though source apportionment is a part of any air quality assessment, this topic is of particular importance and will be described separately in more detail, and illustrated with examples, in chapter 8.

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3.5.1 Spatial resolution of the models

The AQ Directive specifies the placement of measurement sites (Annex III.B.1) related to health protection and points out that if modelling is used then the same type of criteria should apply (Annex III.A.1). From a modelling perspective the following points concerning resolution should be made:

- a) Assessment should occur at sites where the concentrations are highest, e.g. kerside or close to strong sources, as well as in areas representative of the exposure of the general public, i.e. urban background. However, in regard to traffic stations (Annex III.C) the AQ Directive states that concentrations should be assessed no closer than 1 m to the kerbside or 25 m from the edge of major junctions.
- b) For industrial areas concentrations should be representative of a 250 x 250 m area and for traffic emissions an assessment should be representative for a 100 m street segment.
- c) Urban background concentrations should be representative of several square kilometres

Frans Fierens

These statements concerning representativeness place limits on the modelling to be carried out. The following examples help to illustrate this:

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3.6.1 Mathematical formulation of the Directive quality objectives

As in the previous directives the wording of this text remains ambiguous. Since values are to be calculated, a mathematical formulae would have made the meaning much clearer. As such the term 'model uncertainty' remains open to interpretation. Despite this we suggest the following interpretation that we call, for want of another name, the Relative Directive Error (RDE) and define it mathematically at a single station as follows:

$$RDE = \frac{|O_{LV} - M_{LV}|}{LV} \quad (1)$$

where O_{LV} is the closest observed concentration to the limit value concentration (LV) and M_{LV} is the correspondingly ranked modelled concentration. The maximum of this value found at 90% of the available stations is then the Maximum Relative Directive Error (MRDE).

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Exceedance based on modelling			2004	2005	2006	2007
SO₂	Health	Hr	13.0%	12.1%	10.6%	10,3%
		Day	8.0%	8.8%	7.7%	9,7%
	Eco	Yr	21.0%	14.4%	7.2%	6,9%
		Winter	19.0%	19.4%	5.4%	7,1%
NO₂	Health	Hr	10.0%	10.3%	8.5%	6,1%
		Yr	12.0%	10.6%	4.4%	10,8%
NO_x	Veg	Yr	19.0%	2.8%	6.9%	7.0%
PM₁₀	Day		10.0%	9.3%	7.2%	8,1%
	Yr		9.0%	8.0%	6.0%	7,1%
Lead	Yr		15.0%	19.3%	17.9%	30,3%
Benzene	Yr		13.0%	12.5%	13.1%	21,7%
CO	Yr		14.0%	9.6%	11.9%	17,9%
O₃	Health		2.1%	3.3%	2.0%	7,1%
	Veg		2.2%	3.6%	2.9%	6,1%

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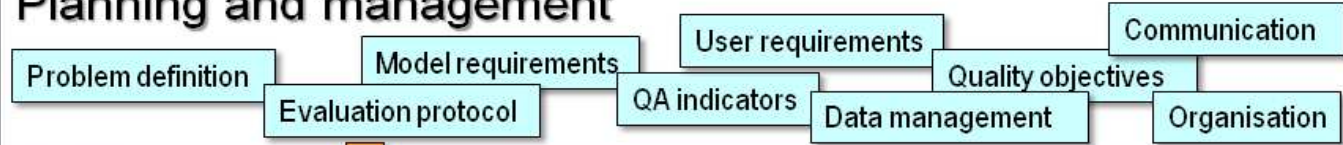
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Chapter 5

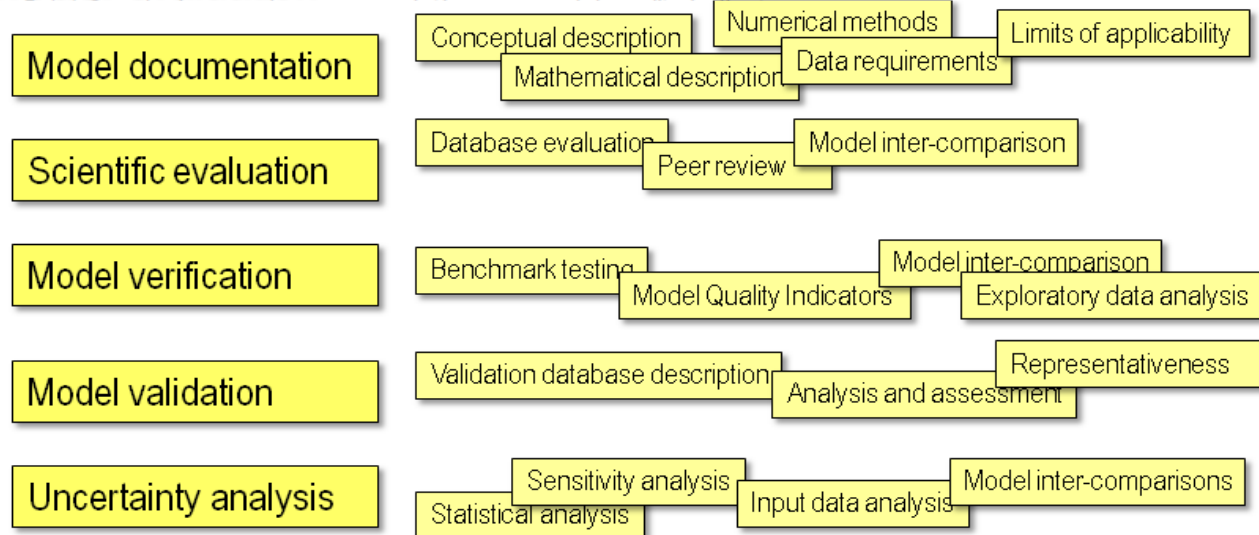
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Model quality assurance

Planning and management



Model evaluation



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8.2 Assessing the contribution of wind-blown and Saharan dust events to PM exceedances

Article 20 states that exceedances caused by natural contributions will not count as exceedances for the purpose of the AQ Directive. In article 2.15 one of the natural sources is described as being the “*atmospheric re-suspension or transport of natural particles from dry regions*”. This is generally understood to refer to Saharan dust events but may include any such event. It does not in principle include wind blown dust events caused by human activities such as agriculture or mining activities. As with road salting and sanding, wind blown dust events are most relevant for the PM₁₀ daily mean target values due to their episodic nature.

The Commission is currently developing a guidance document on natural contributions ‘Guidance on the quantification of the contribution of natural sources under the EU Air Quality Directive’ that will be available in 2010 through the Commission web site (<http://ec.europa.eu/environment/air/quality/>). This guidance document is based on a prior technical document (Marelli et al, 2007). For the particular case of Saharan dust episodes it is recommended in that document to use back trajectory modelling, Saharan dust forecasts, satellite data and ground based measurement data to identify such events. It is not recommended to use modelling alone as a method for *quantifying* Saharan dust outbreaks but rather to use monitoring methods for this, after the events have been identified using both models and monitoring data. A recent document (Querol et al., 2009) describes a comprehensive methodology that combines the above aspects and allows for a quantitative assessment of the contribution of Saharan dust outbreaks to PM₁₀ exceedances. This methodology is summarised in A1.2.6.

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Contributions are required for the following applications:

1. Where models are used in combination with measurements for Directive assessments
2. Where only models are used for Directive assessments
3. Where models are used to determine the risk of exceedance of the alert threshold and/or developing short term action plans to prevent this
4. Where models are used for special topics
5. Where models are used for special topics
 - a. Assessing the contribution of winter sanding or salting of roads to PM exceedances
 - b. Assessing the contribution of winter sanding or salting of roads to PM exceedances
 - c. Assessing the contribution of wind blown and Saharan dust events to PM exceedances
 - d. Assessing the contribution of sea salt to PM exceedances
 - e. Assessing the contribution of wild-land fires to PM exceedances
6. Examples of model validation or evaluation exercises and protocols

Contributions are still needed and welcome

Time table in 2009 – 2010 (WG1)

- Final update for 2009
 - Delivery to EEA on 11 December^(*)
- Incorporating and further selecting examples
- Updating in regard to other guidance documents and reporting requirements
- Promoting the document (e.g. Harmo13)
- Inclusion of results and activities of WG2
 - e.g. SG2 recommendations on data assimilation
- Guidance on local scale modelling of NO₂

^(*) *Bruce's birthday.*

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Thank you!

Flowers & berries...

