European Network on New Sensing Technologies for Air Pollution Control and Environmental Sustainability - *EuNetAir*

COST Action TD1105

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Research and Innovation Needs of SIG4: Expert Comments for the Revision of the Air Quality Directive

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Goal of the AQD

DIRECTIVE 2008/50/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 21 May 2008

on ambient air quality and cleaner air for Europe

- The AQD is designed to avoid, prevent or reduce harmful effects of air pollutants on human health and the environment.
- Setting limit or target values for each of the relevant pollutants

Principles of the AQD

- Monitoring of ambient air quality using harmonized methods to assess air quality.
- Elaboration of action plans in non-attainment areas.
- Informing the general public on the up-to-date levels of air pollutants and their health effects.

Data quality objectives

- Member States shall apply the reference measurement methods and criteria specified in the AQD.
- Other supplementary techniques may be used:
  - Air quality models
  - Indicative measurements

Supplementary techniques in AQD

*"**Information from fixed networks may be supplemented by modelling techniques and/or indicative measurements** to enable point data to be interpreted in terms of geographical distribution of concentration"*

Can low-cost sensor be used to complement the reference monitoring networks?

Assessment criteria in the AQD

- *Article 6* stipulates when and how **modelling and indicative measurement** may be used for AQ assessment (not including ozone):
  1. To supplement fixed data when a zone is in exceedance of the upper assessment threshold.
  2. In combination with monitoring when a zone is in exceedance of the lower assessment threshold.
  3. To replace monitoring when a zone is below the lower assessment threshold.
- *Annex IX*, supplementary assessment can be used to reduce the number of monitoring stations of ozone

Low-cost sensors in AQD

Micro-sensors are identified as emerging measuring devices for **indicative measurements** specified in the air quality directive, because they provide fast* results, are cheap** and allow good spatial coverage. (MACPOLL)

Comments based on other experiences:

* Fast results: Results need to be QA/QC. Signal post-processing to reduce interferences.

** Cheap: Require communication infrastructure that might increase the initial price

Data quality objectives in AQD

Sensors need to meet the uncertainty levels defined in the AQD

Uncertainty	SO_2, NO_2, NOx, CO	Benzene	PM ($PM_{2.5}$ and PM_{10})	O_3
Fixed measurements	15 %	25 %	25 %	15 %
Indicative measurements	**25 %**	**30 %**	**50 %**	**30 %**
Modelling	1-h: 50 % Annual: 30 %	Annual: 50 %	Annual: 50 %	50 %
Objective estimation (only in zones below lower assessment threshold)	75 %	100%	100%	75%

Current status of low-cost sensors

- High sensitivity and response at ppb levels in laboratory conditions.
- Cross-sensitivity with other gases and changes in response due to meteorological conditions in the field.
- What is the sensor **reproducibility**?
  - Need to assess **uncertainty** of the results
  - Need to define a QC/QA protocol depending on objective

Sensors can contribute to the AQD

Directive 2008/50/EC

Where possible modelling (**low-cost sensor**) techniques should be applied to enable point data to be interpreted in terms of geographical distribution of concentration. This could serve as a basis for calculating the collective exposure of the population living in the area (and **individual exposure**).

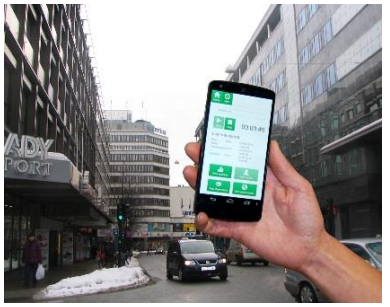
Necessary to ensure reproducibility and assess uncertainty

Possible roles of the low-cost sensors

- Mapping of air pollution.
  - Dense networks and mobile monitoring.
  - Capture the spatial variability.
  - Modelling improvement: data fusion and data assimilation.
- Assessing individual and collective exposure.
- Providing direct information to the public.
  - Participation, awareness, understanding.

Small, lower-cost sensors have challenges that need to be solved but they have the opportunity to improve air quality management and public health.





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