

Title: Metrology for outdoor air quality

Abstract

The quality of outdoor air is determined both by human activities and natural factors such as geographic location, terrain and biosphere. Construction, industry, electricity production, heating and traffic sources all contribute to the emission of gaseous and particulate-matter pollutants. Remediation of the existing situation, as well as the introduction of preventive measures, relies on metrologically sound sampling and testing via national laboratories regulated by respective EU directives. Expanded metrological capability is required in Europe to provide traceable calibration of equipment and certification of competence in order to support the national laboratories more effectively.

Keywords

Outdoor air quality; target pollutants; PM₁₀, PM_{2.5}, heavy metals in PM₁₀, benzene, PAHs, sampling, traceability of results

Background to the Metrological Challenges

The need to assess the scope of anthropogenic impact on the quality parameters of the environment continues to grow in relation to the propagation of human populations, the distribution of industry, the use of chemicals and the consumption of fossil fuels. These sources and others all contribute to the continuous emission of various gaseous and particulate matters in the outdoor air. As expected, the concentrations of the pollutants are higher in urban and industrial regions, but wind or other natural phenomena lead to migration and / or accumulation of pollutants and negative mutation thus affecting whole ecosystems.

European Directive 2008/50/EC on ambient air quality and cleaner air, along with many daughter directives, regulates the field of ambient / outdoor air in terms of prescribed parameters and permitted levels, as well as methods for performing air quality monitoring. The main air pollutants identified as a target in this Directive are SO₂, NO and NO₂, PM₁₀, PM_{2.5}, Benzene, CO, Ozone, heavy metals (Pb, Cd, As, Ni) in PM₁₀ and PAHs. Monitoring the sources, types and levels of pollution is important at national, regional and international levels. This is carried out through the exchange of monitoring data among European (and international) countries under the auspices of WMO and WHO, where the data monitoring is usually performed by national reference laboratories who are responsible for producing a detailed study on air quality according to the established rules in line with the EU legislation. Currently, not all European countries' national reference laboratories have the capability (equipment, knowledge and human resources) to allow the generation of valid air quality monitoring data. This results in an inability to implement corrective environmental measures as well as preventing those reference laboratories from participating actively in international comparisons which would be required to demonstrate competence and allow enhanced benefits, including the means to implement the relevant Directives. Work is required at the national metrology institute (NMI/DI) level to provide primary traceability by means of calibration of equipment, assistance in establishing reliable and traceable measurement capabilities at national air quality reference laboratories in order better to support the national laboratories in their tasks and confirmation of competence through comparisons of both (i) the new primary capabilities at the NMIs/DIs and (ii) the capabilities at the national laboratories responsible for the monitoring of outdoor air quality.

Objectives

Proposers should address the objectives stated below, which are based on the PRT submissions. Proposers may identify amendments to the objectives or choose to address a subset of them in order to maximise the overall impact, or address budgetary or scientific / technical constraints, but the reasons for this should be clearly stated in the protocol.

The JRP shall focus on the development of metrological capacity in the field of air quality monitoring.

The specific objectives are

1. To develop traceable primary measurement capabilities for selected pollutants (PM₁₀, PM_{2.5}, heavy metals in PM₁₀, benzene, PAHs) in outdoor air, in order to establish traceability for secondary level equipment and methods.
2. To establish reliable and traceable measurement capabilities at national reference laboratories for assessing outdoor air quality in terms of selected pollutants (PM₁₀, PM_{2.5}, heavy metals in PM₁₀, benzene, PAHs) on the basis of common standardised methods and criteria. Information provided by the new facilities should meet the data quality objective (DQO) for the regional database.
3. To develop a model for field measurements of air quality based on EU recommendations, to include the uncertainty, frequency (minimum data capture, minimum time coverage) for fixed measurements, the requirements for indicative measurements, modelling and objective assessment frequency, location and number of sampling/measurement sites.
4. To organise and conduct comparisons in order to (i) validate the new traceable primary measurement capabilities for selected pollutants and (ii) to demonstrate the competence of laboratories responsible for the monitoring of outdoor air quality.
5. For each participant, to develop an individual strategy for the long-term operation of the capacity developed, including regulatory support, research collaborations, quality schemes and accreditation. They should also develop a strategy for offering calibration services from the established facilities to their own country and neighbouring countries. The individual strategies should be discussed within the consortium and with other EURAMET NMIs/DIs, to ensure that a coordinated and optimised approach to the development of traceability in this field is developed for Europe as a whole.

Joint Research Proposals submitted against this SRT should identify

- the particular metrology needs of stakeholders in the region,
- the research capabilities that should be developed (as clear technical objectives),
- the impact this will have on the industrial competitiveness and societal needs of the region,
- how the research capability will be sustained and further developed after the project ends.

The development of the research potential should be to a level that would enable participation in other TPs.

Proposers should note that the programme funds the activity of researchers to develop the capability, not the required infrastructure and capital equipment, which must be provided from other sources.

EURAMET has defined an upper limit of 500 k€ for the EU Contribution to any project in this TP, and a minimum of 100 k€.

EURAMET also expects the EU Contribution to the external funded partners to not exceed 10 % of the total EU Contribution to the project.

Potential Impact

Proposals must demonstrate adequate and appropriate participation/links to the “end user” community, describing how the project partners will engage with relevant communities during the project to facilitate knowledge transfer and accelerate the uptake of project outputs. Evidence of support from the “end user” community (e.g. letters of support) is also encouraged.

You should detail how your JRP results are going to:

- Address the SRT objectives and deliver solutions to the documented needs,
- Provide a lasting improvement in the European metrological capability and infrastructure beyond the lifetime of the project,
- Facilitate improved industrial capability or improved quality of life for European citizens in terms of personal health or protection of the environment,
- Transfer knowledge to the environmental monitoring sector and the metrology community.

You should detail other impacts of your proposed JRP as specified in the document “Guide 4: Writing Joint Research Projects (JRPs)”

You should also detail how your approach to realising the objectives will further the aim of EMPIR to develop a coherent approach at the European level in the field of metrology and include the best available contributions from across the metrology community. Specifically the opportunities for:

- improvement of the efficiency of use of available resources to better meet metrological needs and to assure the traceability of national standards
- the metrology capacity of EURAMET Member States whose metrology programmes are at an early stage of development to be increased
- organisations other than NMIs and DIs to be involved in the work

Time-scale

The project should be of up to 3 years duration.