

# Title: Metrology for “emerging” pollutants and novel methods in European water policy

## Abstract

Comparable chemical and biological measurements in Europe are a requirement of the European Commission in the Water Framework Directive 2000/60/EC, QA/QC Directive 2009/90/EC, Marine Strategy Framework Directive 2008/56/EC and Mandate M/424. However, such measurements can only be achieved with traceable reference measurement standards. In addition, validated field and laboratory methodologies able to provide accurate, representative and comparable measurements are needed to support monitoring and decision making. Further to this, in coastal and marine waters, traditional sampling based on spot samples is ineffective in providing meaningful environmental concentrations. Passive samplers could provide an alternate technique, but the metrological validation of these devices is, as yet, unproven.

## Conformity with the Work Programme

This Call for JRP's conforms to the EMRP Outline 2008, section on “Grand Challenges” related to Energy and Environment on pages 8, 9, 24 and 25.

## Keywords

Water Framework Directive (WFD); Marine Strategy Framework Directive (MSFD); QA/QC Directive; chemical and biological monitoring; on-line monitoring; coastal and marine waters sampling; metrological traceability; standard operating procedure; reference materials.

## Background to the Metrological Challenges

The Water Framework Directive (WFD) specifies the ‘need to ensure comparability of assessment approaches and methods within and between marine regions and/or subregions’ and the ‘need to develop technical specifications and standardised methods for monitoring at Community level so as to allow comparability of information’. Similarly, the Marine Strategy Framework Directive (MSFD) aims to achieve good environmental status by 2020. As data measurements are the basis of the overall decision-making process the WFD and MSFD have been linked with complementary directives on Quality Assurance and Quality Control (QA/QC). The QA/QC Directive 2009/90/EC states that ‘in order to fulfil validation requirements, all methods of analysis applied by Member States for the purposes of chemical monitoring programmes of water status should meet certain minimum performance criteria, including rules on the uncertainty of measurements and on the limit of quantification of the methods.

In the context of the WFD and MSFD, chemical monitoring relies on the accuracy of successive steps: sampling, sample storage and preservation and pre-treatment, calibration, measurement, analysis of results, uncertainty estimation and final conclusions, and the comparability of results between laboratory and field measurements. However, the recommendations of the Chemical Monitoring and Emerging Pollutant working group E on chemical aspects under the Common Implementation Strategy of the WFD highlight the need for ‘for new analytical and alternative detection methods to increase efficiency and decrease costs of chemical monitoring’; ‘organisation of targeted laboratory inter-comparisons, provision of suitable reference materials and other tools of QC on the basis of the main standards (e.g. ISO 13528:2005) and guidelines and finally ‘comparability of compliance checking in the presence of measurement uncertainty’.

## Scientific and Technological 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 JRP-Protocol.

The JRP shall focus on the traceable measurement, comparability, accuracy and reliability of WFD measurements as described by the QA/QC directive 2009/90/EC.

The specific objectives are

1. Calibration of passive sampling devices in coastal and marine waters as well as production of SOP for their use. Sample preparation and detection techniques for the analysis of priority substances using multi-residue analysis and multi-technique approaches (e.g. C-MS/MS, LC-MS/MS, ICP-MS) should also be considered.
2. To develop metrological infrastructure for the accurate measurement of WFD priority substances in water and biota. Measurements should be traceable to the SI and include uncertainty analyses and purity assessment of targeted compound, development of reference methods and measurements on whole water samples.
3. Assessment of currently available matrix certified reference material and development of commutable matrix reference materials representative of European surface water species.
4. To develop the metrological system for accurate monitoring at ultra-low trace levels of contamination, beyond those required in the WFD. Focus should be on parameters such as priority pollutants (e.g. PAH, PBDE, metals) and ecological status (e.g. nutrients, turbidity).
5. Development of metrological infrastructure for the accurate and to the SI traceable determination of microbes (including pathogens) and key "stress-related" biomarkers present in an aquatic sample used as an indicator of good water quality. This should include the development of standardised procedures for in vitro microorganism-based assays.

These objectives will require large-scale approaches that are beyond the capabilities of single National Metrology Institutes and Designated Institutes. To enhance the impact of the R&D work, the involvement of the user community such as industry, and standardisation and regulatory bodies, as appropriate, is strongly recommended.

Proposers should establish the current state of the art, and explain how their proposed project goes beyond this and EMRP JRP ENV08 WFD 'Traceable measurements for monitoring critical pollutants under the European Water Framework Directive (WFD 2000/60/EC)'.

EURAMET expects the average size of JRPs in this call to be between 3.0 to 3.5 M€, and has defined an upper limit of 5 M€ for any project. The available budget for integral Research Excellence Grants is 30 months of effort.

## Potential Impact

Proposals must demonstrate adequate and appropriate participation/links to the "end user" community. This may be through the inclusion of unfunded JRP partners or collaborators, or by including links to industrial/policy advisory committees, standards committees or other bodies. Evidence of support from the "end user" community (eg letters of support) is encouraged.

You should detail how your JRP results are going to:

- feed into the development of urgent documentary standards through appropriate standards bodies
- transfer knowledge to the environmental sector.

You should detail other impacts of your proposed JRP as detailed in the document "Guide 4: Writing a Joint Research Project"

You should also detail how your approach to realising the objectives will further the aim of the EMRP to develop a coherent approach at the European level in the field of metrology and includes 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 Member States and countries associated with the Seventh Framework Programme whose metrology programmes are at an early stage of development to be increased
- outside researchers & research organisations other than NMIs and DIs to be involved in the work

### **Time-scale**

The project should be of up to 3 years duration.

### **Additional information**

The references were provided by PRT submitters; proposers should therefore establish the relevance of any references.

- [1] Water Framework Directive 2000/60/EC
- [2] QA/QC Directive 2009/90/EC
- [3] Marine Strategy Framework Directive 2008/56/EC
- [4] Mandate M/424 Mandate for standardization addressed to CEN for the development or improvement of standards in support of the Water Framework Directive
- [5] ISO 13528:2005 Statistical methods for use in proficiency testing by interlaboratory comparisons