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METROPOLIS: a thematic network in support of precautionary sciences and sustainable development policies

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1. ABSTRACT

Measurements play a very important role in modern society to define the quality of manufactured products, determining the safety of food, checking compliance with established limit values and quality standards, etc.

Environmental measurements, in particular, are fundamental to understand the environment in which we live, current trends and understand the causal relationships between the pollution produced by human activities and its effects on ecosystems.

Many environmental measurements are carried out in the various EU countries, mainly to meet requirements set by EU and national legislation. The data collected represent a great source of potentially valuable information in support of decision-making. Unfortunately, the quality of the data available is still highly variable: some of the collected data have to be critically examined to establish whether they provide a suitable basis for decision-making. Why is this so? The following critical areas can be identified:

- lack of **traceability**: it is impossible to base decisions on data that are not sufficiently documented (not traceable to well established references and therefore not reliable).
- lack of harmonisation of the procedures applied by laboratories (starting with the sampling procedure, but also including the approach adopted for the calculation of the uncertainty). This lack of harmonisation makes the data obtained from different sources difficult to compare
- lack of **representativeness**: data that do not reflect the reality that we want to represent are simply not fit for purpose.
- too high a level of uncertainty associated with the data collected makes the process of **decision-making** critical (on the other hand, in some cases the uncertainty is not expressed at **all!**)
- lack of metadata: information about the data (what, how and when measurements were made, who owns the data, and so on...) and the way they are reported / used is an essential requirement to allow the use of

the data for other purposes (e.g. compilation of databases).

All this emphasises the role of metrology (basic infrastructure for measurement sciences) as a means of ensuring the quality (traceability and therefore comparability) of the data obtained from the various EU monitoring programmes, throughout the whole "measurement cycle" (i.e. from the collection of the data to the delivery of the information to decision-makers).

2. METROPOLIS

The METROPOLIS [1,2] network was created in July 2002, under the 5th Framework Programme, to respond to the need for an overall, **cross-sectoral assessment** of the state of the art of measurements and monitoring systems in the environmental field in Europe. The objectives of Metropolis include:

- gathering information and knowledge about the **problems/** shortcomings that we face today in **environmental** monitoring
- identifying the fields where research and further work are needed in order to improve the quality and comparability of environmental data across Europe.

The Metropolis network is co-ordinated by INERIS (France) and brings together 38 participants from the most significant organisations and research institutes dealing with environmental metrology in 17 European countries, plus DG Environment itself in an advisory capacity.

The project started in July 2002 and will end at the end of June 2004. The work is organised in six scientific work packages co-ordinated by INERIS (7th work package). As illustrated in table 1.

	Leader
1: Bio-monitoring	University of Munich
2: Methods in analytical chemistry and Reference Materials	Josef Stefan Institute
3: On-line measurements and data-transfer	IVL
4: Quality Assurance and uncertainty assessment	LNE
5: Standardisation	IPQ
6: Communication of results - Support to decision-making	University of Cordoba

Table 1. Work packages organisation

Each work package deals with a different aspect of the "measuring cycle" as illustrated in the figure 1.

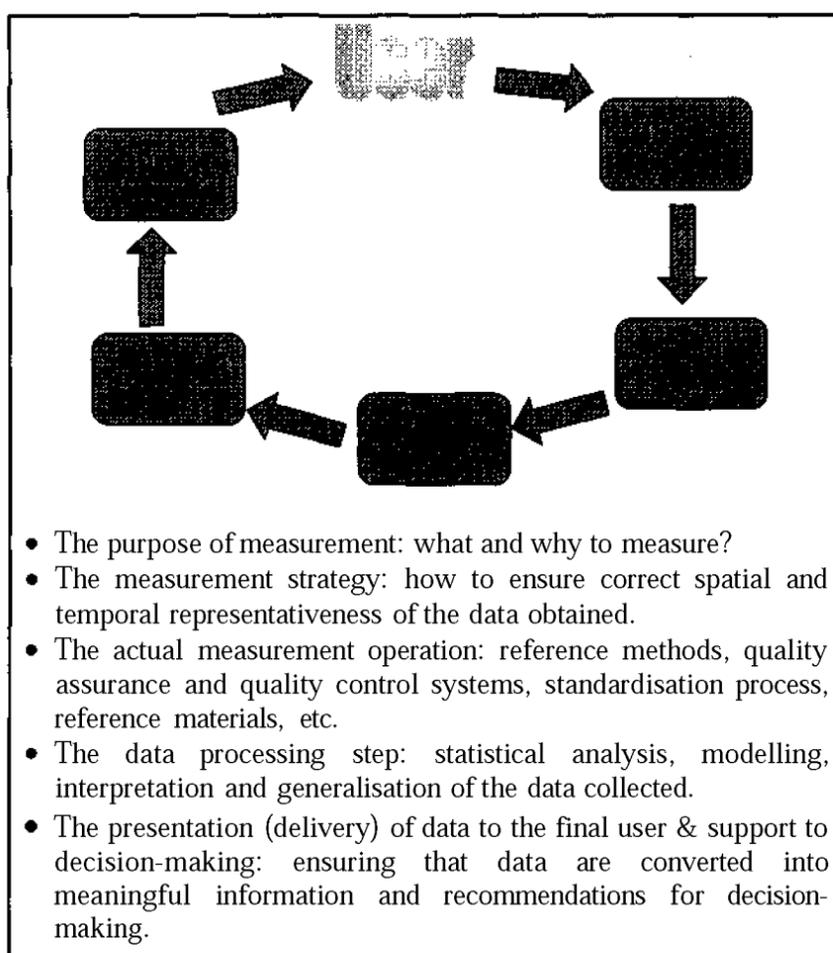


Figure 1. The measurement cycle

The Metropolis network explores the main areas of concern throughout the measurement cycle, from the definition of the measurement strategy for the collection of representative data, to the aspects relating to harmonisation of measurement data and the evaluation of uncertainty, down to the interpretation and presentation of the results to policy-makers. For each of these critical areas Metropolis proposes a number of actions which lead to the publication of reports and guidance documents, the organisation of workshops, seminars, internet discussion fora, etc.

In the area of QA/ QC, Metropolis will produce:

- a critical review of significant national and / or EU documents and standards for the calculation of uncertainty, with recommendations on new guidance material, at EU level

- a study of the status of PTS (Proficiency Testing Schemes) in the EU in the environmental field, as a follow-up to the **EPTIS** database
- a list of FAQs (Frequently Asked Questions) to help testing laboratories to work in accordance with ISO 17025
- a guide on the use of Reference Materials in the environmental field.

One of the outcomes of Metropolis in the field of measurements and measurement methods will be the development of the database on bio-monitoring assays and chemical analytical measurements. This is a database with a dynamic web interface to collect and make publicly available information about existing standard analytical chemical methods and bio-monitoring assays and alternative **methods/** assays that are not yet standardised. Information provided for each method entered in the database includes, for example: EU legislation regulating the substance, limitations of the **method/** assay, application range, QA/ QC information, links with other web-sites where more detailed information can be found, etc. Although there is always room for further improvement, this database can be considered a valuable resource for identifying available information and current knowledge & data gaps in measurement techniques. It will provide an opportunity for improving the exchange of information between the legislator and practitioners, including academic researchers, as regards the knowledge currently available and the appropriate analytical responses available today.

But Metropolis also deals with aspects such as the role of Geographic Information Systems (GIS) in environmental monitoring and the difficulties associated with the use of the measurement results in decision-making.

The outcomes of Metropolis regarding the role and gaps in the use of GIS in environmental monitoring today will be revealed in another presentation. As for the presentation of the measurement data in support of decision-making, Metropolis is exploring in particular, the role of expert judgements for measurements that cannot be measured (because of technical difficulties, ethical problems, etc.) and the use of measurement results in decision-making when dealing with data that are affected by large uncertainty. The report that will be produced by Metropolis in this area will provide a survey of the existing decision-making theories (focusing on non-conventional theories fitting into the so-called "precautionary principle") and will try to conclude whether the existing uncertainty models used in metrology can be harmonised with the existing decision-making theories.

A number of discussion fora have been opened on the Metropolis web-site on various items of environmental metrology and five workshops will have been organised during the project. Three of those workshops are:

- "Techniques for data presentation and data distribution" (Gothenburg, September 2003),
- "The State of the art and new trends in the use of reference materials in environmental monitoring and

analysis" (Paris, 13-14 April 2004), which will involve the participation of experts from **NIST**, **BAM**, **IRMM**, **ENEA**, etc..

- the one that will be organised by JRC-ISPRA on 3-4 June 2004 on "Practical experience from air quality legislation to effective local abatement and public awareness".

As a final outcome Metropolis would like to ensure that an overall consistent message is conveyed to the final users. To this purpose a tool illustrating how the tasks and the final outcomes of Metropolis interrelate and how they can respond to the needs of the different categories of users will be made available on the Metropolis web-site.

All final documents and reports will be available at the end of the project (June 2004) on the Metropolis web-site (<http://www.metropolis-network.net>). We hope that these two years of work and the results of this project will help to provide the basis for long-term opportunities for concerted actions in the field of environmental monitoring as a follow-up to the activities of Metropolis.

REFERENCES

- [1] Metropolis (Growth Programme - contract n° GTC2-2001-53008)
- [2] <http://www.metropolis-network.net/>

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