



European Metrology Research Programme

Environmental Data II

An overview of the set of projects funded under the Targeted Programme Environment II.

The aim of these projects is to improve data quality for policy making, underpin environmental research activities and stimulate technological innovation.

Focus is placed at both the local environmental level for air, water and soil quality and at the global level for challenges relating to climate change.

Improved mercury measurements

Tackling new requirements for mercury measurements

Mercury is highly toxic to humans, animals and the environment. Its long lifetime and ability to be transported in the air over large distances and accumulate in the ecosystem make it a pollutant of global concern.

Human activity has increased mercury levels in the environment over the past 100 years. For example, mercury concentrations in indoor air have increased due to the use of certain types of energy-saving light bulbs. The assessment of its effects depends on accurate measurements of concentrations and trends over time. However, traceable measurements are lacking and new technologies are needed for the next generation of advanced mercury measurements.

This project will develop a metrological infrastructure for mercury measurements in the environment to support European legislation as part of the treaty aimed at reducing global mercury emissions. New traceable measurements will enable better understanding of human and environmental exposure to mercury, trends in mercury concentrations and legislative requirements, improving human and economic health.

Project ENV51: Traceability for mercury measurements

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Greenhouse gas measurement

Measuring the critical gases for global monitoring of climate change

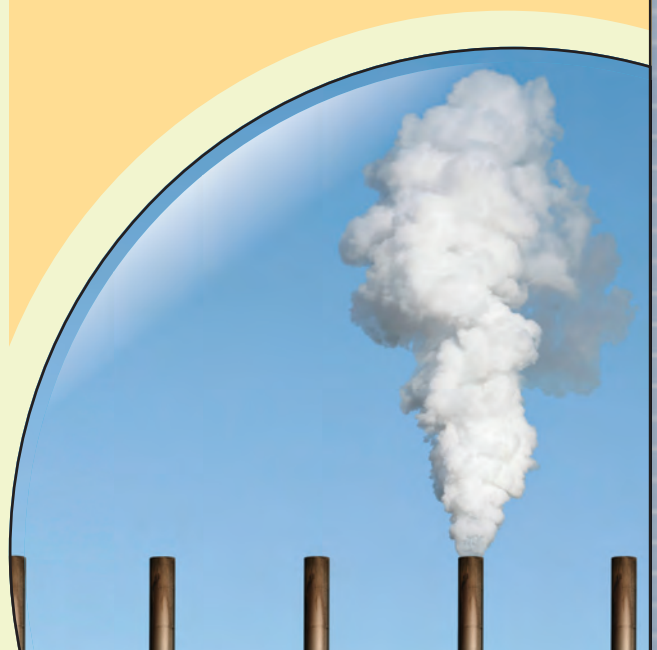
The measurement of greenhouse gases is pivotal to the understanding of changes to the Earth's climate and the influence of human activities. The World Meteorological Organisation (WMO) has identified a series of high impact greenhouse gases that are critical for global monitoring, which require measurements traceable to the SI units.

This project will develop high accuracy reference standards and novel methods for measuring the isotopic composition of the gases. This will improve the data used to compile national greenhouse gas inventories and help demonstrate compliance with legislation such as the Kyoto protocol and European air quality directives.

The results will also lead to a stronger understanding of how greenhouse gas emissions influence regional air quality and impact on public health. The stable and accurate data will provide a transparent basis on which to implement policies to help control greenhouse gas emissions.

Project ENV52: Metrology for high-impact greenhouse gases

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Observing the Earth from space

Improving satellite measurements for climate change monitoring

Remote sensing of the Earth from space is vital for obtaining the global data needed to underpin climate change research and identify potential environmental issues such as pollution and coastal erosion. Satellites need to detect changes in Essential Climate Variables, such as total solar energy and sea surface temperature, of a few tenths of a per cent per decade.

Satellite instruments vary in performance due to harshness of the launch and environmental conditions in space. They therefore need to be validated in orbit to guarantee the reliability of the data they collect.

This project will develop the outputs of ENV04 and build a strong message of continuity to the stakeholder community with a view that a sustainable virtual centre of excellence can be established to meet their needs. This will be achieved by establishing the tools, methods and infrastructure to help assign trustworthy confidence levels to climate change monitoring data. A network of test sites on the ground will help calibrate satellites once they are in orbit and help progress the development of a prototype climate and calibration satellite called TRUTHS – Traceable Radiometry Underpinning Terrestrial- and Helio- Studies.

Project ENV53: Metrology for earth observation and climate

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End of life support for nuclear power

Enabling the safe, timely and cost effective decommissioning of nuclear facilities

There is currently low public confidence in the nuclear industry and especially in its ability to comprehensively clear old nuclear sites and safely dispose of nuclear waste.

Reliable measurements of strict criteria are the only way to restore public trust in the decommissioning process and the wider nuclear industry. Measurements of nuclear waste need to be fast and precise to help categorise and dispose of it safely, and in a cost effective manner.

This project will extend the experimental methods and devices developed in ENV09 to the decommissioning of nuclear facilities. This will involve implementing and testing industrial prototypes on site under real conditions. The results will enable decommissioning measurements to be carried out using standard methods with traceability to national standards, improving uniformity and accuracy of measurements across Europe. This will help meet EU regulations and have a positive impact on the environment and public health.

Project ENV54: Metrology for decommissioning nuclear facilities

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Ammonia in air

Developing traceable measurements of ammonia in air for environmental policy makers

Ammonia contributes to problems such as eutrophication and acidification of land and water, leading to a reduction in soil and water quality, harm to animals and plants, and changes to the ecosystem. In humans it is associated with a high incidence of heart and lung diseases.

Ammonia emissions are estimated to have doubled across Europe over the last 100 years due to changing industrial and agricultural practices such as the use of urea-based fertilisers. While regulations are in place to limit ammonia emissions, there is a lack of guidance regarding the measurement techniques and analysis that should be used to obtain the emissions data.

This project will develop traceable measurements of ammonia in air and provide standards for the measurement of ammonia concentrations under ambient conditions. Validated high quality ammonia measurement data will help identify changes caused by environmental protection policies and provide independent verification of atmospheric models.

Project ENV55: Metrology for ammonia in ambient air

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Volatile Organic Compounds

Supporting air quality monitoring networks with new measurements of VOCs

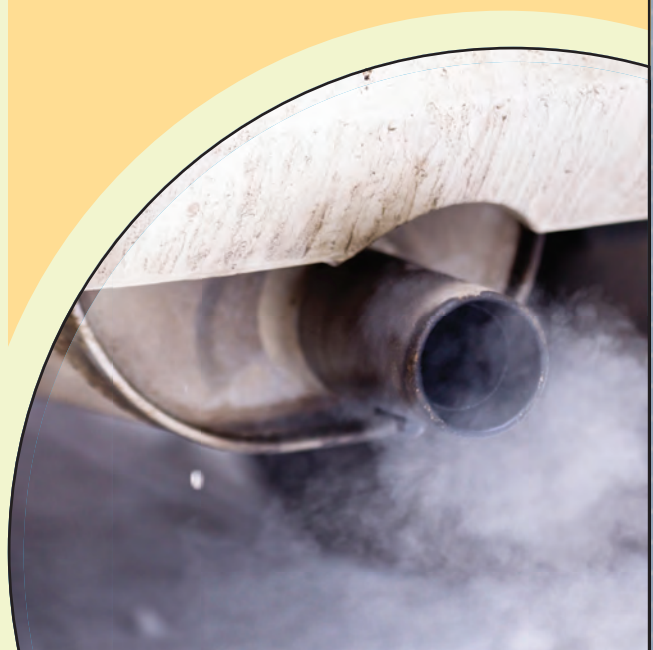
Volatile Organic Compounds (VOCs) can be dangerous to human health and cause damage to the environment by altering the chemistry of the atmosphere and contributing to the production of other pollutants.

Measurements of VOCs are complex because of their variety, different physical and chemical properties and very low concentration levels in the atmosphere – less than one part per billion. Stable gas reference standards are difficult to produce because of various physical and chemical interactions between VOCs and the surfaces of storage cylinders.

This project will build upon the results of ENV01, where an initial step in the improvement of the metrology infrastructure for indoor air VOCs was made, in order to develop traceable and comparable gas reference standards and validate new measurement systems to support atmospheric monitoring for key VOCs in Europe and the rest of the world. The project will focus on measurements of benzene, a harmful air pollutant and carcinogen regulated by the EU Air Quality directive.

Project ENV56: Metrology for VOC indicators in air pollution and climate change

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Early warning of nuclear accidents

Improving Europe's ability to detect and respond to radiological incidents

A major nuclear accident on the scale of Chernobyl or Fukushima would require early and reliable knowledge of radioactivity concentrations in the air, as well as any subsequent contamination of the land. The public needs to be protected from direct exposure as well as from the intake of radioactivity through breathing in contaminated air, or eating and drinking contaminated food and water.

All European countries operate early warning networks, with about 5 000 monitoring stations currently active. However, many of these stations are based on simple detector designs and require further data analysis before any decisive action can be taken.

This project will develop devices and methods to harmonise the data collected and improve comparisons between different stations and networks. It will also develop new measurement techniques that allow different types of measurements to be made simultaneously. This will result in the faster and more coordinated response of European authorities in the event of a nuclear emergency.

Project ENV57: Metrology for radiological early warning networks in Europe

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Essential measurements for climate monitoring

Improving measurements of key climate variables in water, land and air

Essential climate variables (ECVs) include water vapour in the atmosphere, surface and deep sea temperature, ocean salinity, air temperature, precipitation and soil moisture. Long-term, high-quality observations of these variables are vital as society becomes increasingly affected by climate change.

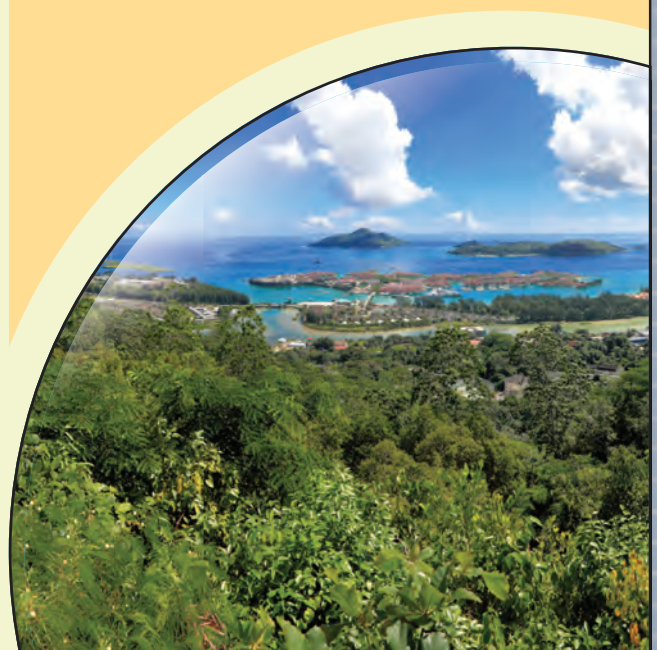
Metrological challenges in climate monitoring arise across water, land and air. For example, when measuring air humidity the water content in the atmosphere can vary by a factor of more than 10 000 and differences between laboratory and real conditions need to be solved.

This project builds upon ENV07, which developed devices and carried out investigations on sensor characteristics and calibration uncertainties, to improve devices for their use in field oriented activities, investigate the generation of higher quality climate data and extend atmospheric ECVs to include soil and oceanic variables. The results will benefit European industries such as agriculture, energy, and transport and reduce the threat to public health.

Project ENV58 Metrology for essential climate variables

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Ozone layer recovery

Updating the long-term monitoring systems for ozone in the atmosphere

The ozone layer protects humans from the adverse effects of ultraviolet radiation. Careful long-term monitoring of the ozone layer remains crucial to verifying the success of the Montreal Protocol, which regulates against destructive chlorofluorocarbons (CFCs).

Two main types of instrument are used to make ground-based measurements of atmospheric ozone. The older type of instrument needs to be phased out as it requires substantial manpower to operate and is no longer manufactured. However, a discrepancy of about 3 % in the measurement of atmospheric ozone produced by the two instruments is preventing this from happening.

This project will use the measurements taken and devices developed in ENV03 to characterise and calibrate the two instruments, disseminate improved ozone measurements with known uncertainties and eventually assist in the development of a replacement for the ageing instrument. The full recovery of the ozone layer would provide significant health benefits with respect to diseases such as melanoma skin cancers and eye cataracts.

Project ENV59: Traceability for atmospheric total column ozone

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Emissions from industry

Supporting future regulation to reduce industrial pollution and its climate impact

The cost of air pollution from the 10 000 largest polluting facilities in Europe is around 150 billion € each year and the European Climate Change Programme is targeting an 80-95 % reduction in pollution and greenhouse gases by 2050. Current evidence shows that Europe is not on track to meet this target and this means that more stringent emission limits are needed, along with new measurements to help with monitoring and enforcement.

This project will develop measurement and monitoring technologies, methodologies and guidance to support industry, regulators and standardisation committees. Issues such as traceable stack emission measurements and the challenges of lower emission limit values will be addressed. The results will remove many of the current obstacles in the way of emissions reporting and help control emissions within the framework of tighter regulation.

Project ENV60: Metrology to underpin future regulation of industrial emissions

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