

Environment



The ALMERA Network

Supporting Global Efforts to Reliably Measure Environmental Radioactivity

SUMMARY

1. The worldwide network of Analytical Laboratories for the Measurement of Environmental Radioactivity (ALMERA) aims at providing reliable and timely determination of radionuclides in samples, such as air, water, soil, sediment and vegetation, that are used for both routine and emergency environmental monitoring by Member States.
2. The IAEA supports ALMERA activities that help Member States to provide reliable, comparable and fit-for-purpose results, which are an essential requirement for any decision based on analytical measurements to protect people and the environment.
3. This includes the organization of annual proficiency tests (PTs) and interlaboratory comparisons (ILCs) for radionuclides in environmental and food samples, the provision of training and support for collaborative development, and the validation of radioanalytical methods.

INTRODUCTON

Terrestrial, atmospheric and aquatic environments are subject to a variety of pollutants resulting from human activities. Nuclear and isotopic techniques can be used to study the impact and movement of these pollutants, and specifically radionuclides in such environments.

Understanding the behaviour of radionuclides in the environment helps to estimate their distribution in case of accidental releases, for instance by nuclear facilities. This provides radiation safety specialists and



Proficiency Tests (PT) organised annually offer ALMERA member laboratories the possibility to check and improve their analytical performance. In this photo, a PT sample of diluted nuclear power plant primary coolant is being prepared at the Hungarian Radioanalytical Reference Laboratory in Budapest, which is an IAEA Collaborating Centre for Reference Products, May 2018.

(Photo: S. Tarjan/IAEA)

decision makers with the necessary information to better assess risks and potential impacts to humans and the environment, and to take steps toward environmental protection, radiation safety and remediation.

The ALMERA network helps Member States ensure the reliable and timely determination of radionuclides in the environment and brings together environmental radioanalytical laboratories worldwide.

This network was established in 1995 and is coordinated by the IAEA Environment Laboratories

in Austria and Monaco. In October 2018, it included 177 laboratories in 89 Member States, organized into five regional groups: Africa, Asia-Pacific, Europe, Middle-East, and North and Latin America. Regional coordinating laboratories nominated for periods of five years collaborate closely with the IAEA on the coordination of network activities. Member laboratories are nominated by their governments and are expected to provide reliable and timely analysis of environmental samples in the event of an accidental or intentional release of radioactivity.

HOW DOES ALMERA HELP?

The network helps to provide radioanalytical data that would be accepted internationally in support of the respective national authorities and IAEA activities. Such data would for instance serve as a basis for the radiological assessment of areas affected by an accidental or intentional release of radioactivity.

IAEA's support to the network covers the organization of PT and ILC exercises, the development and validation of analytical procedures for the measurement of environmental radioactivity, and the organization of training courses and workshops. The core goals are to enhance the capability and performance of participating laboratories in order to provide timely and reliable measurement results in routine monitoring and emergency situations.

ALMERA acts as a pool of expertise in research, assessment and capacity building.

BENEFITS OF JOINING ALMERA

For environmental radioanalytical laboratories worldwide, participation in the network's activities is important to:

- Demonstrate technical competence in measuring environmental radioactivity;
- Adopt the application of recommended validated methods leading to methodological harmonization and enhanced worldwide comparability of environmental radioactivity measurement results;

- Enhance the analytical capabilities of their personnel to meet global standards; and
- Develop collaboration with other similar laboratories in the region and elsewhere.

CHALLENGES ALMERA HELPS TO ADDRESS

Given that they do not use the same equipment and materials, not all laboratories have similar analytical procedures. Many laboratories prefer to retain analytical procedures which they have used for a long time and which have been proved to be reliable, unless there is a strong reason to change.

ALMERA provides member laboratories with a set of the PT samples every year, allowing them to extensively test their methods and analysts, and assess the accuracy and precision of their measurement results and their comparability worldwide.

The availability of tested and validated analytical procedures is extremely important to produce valid and reliable analytical measurements. Specific procedures and methods are developed in accordance with ISO guidelines. For maximum utility, procedures are developed to be comprehensive, clearly formulated, and readily available to both the analyst and the data end user for reference.

SCOPE OF ACTIVITIES

Analytical methods developed and validated within the ALMERA framework cover both natural and anthropogenic radionuclides in environmental (aerosol, soil/sediment, freshwater), food (milk) and technogenic (phosphogypsum) samples. For example, a rapid method for the measurement of radiostrontium in milk has been developed and validated. Milk, a vital component of the human diet, is an important indicator of the transfer of radionuclides from the environment to humans. This method rapidly identifies whether milk is contaminated with radioactive materials and if countermeasures and interventions are necessary to protect people.

Another rapid procedure has been developed and validated to measure radium isotopes in drinking water, which enables accurate screening of drinking water sources and quick implementation of protective measures by decision makers if a water source is found to be contaminated.

The PTs used for rapid assessment are designed to test rapid response in addition to the accuracy and precision of measurement results. The objective of the PTs is to enhance analytical performance among member laboratories.

PT results covering many years, radionuclides and sample types highlight the strengths of the network and allow the Agency to assess the gaps that need to be addressed by method development and training. The PT results are also useful indicators of the level of harmonization between the member laboratories and define environmental radioactivity levels that the network is able to reliably and timely measure, providing a benchmark for data used in environmental and radiological assessment.

Some industrial activities, for example oil extraction, phosphate production, and the mining of natural resources, such as uranium, copper, lead and gold, are potential sources of pollution. These may produce harmful concentration levels of natural radionuclides, also known as Naturally Occurring Radioactive Materials, which can cause serious pollution challenges if not managed properly. To respond to these monitoring needs, an analytical method has also been developed to measure natural radionuclides in phosphogypsum, a by-product of the phosphate industry that is often stockpiled near the production site. The method enables the national authorities to monitor the enhanced natural radioactivity content of the stockpiles and to take preventive measures where necessary to protect people and the environment.

After the accident at the Fukushima Daiichi nuclear power plant in March 2011, interest in improving rapid response capabilities increased considerably among network member laboratories. In response, the IAEA through ALMERA organized specific training, method



Knowledge sharing and exchange of expertise are central to the ALMERA Network. At a 2015 coordination meeting hosted by the IAEA's Environment Laboratories in Monaco, a participant from Japan Chemical Analysis Centre gives participants an insight into his laboratory's way of achieving and proving analytical excellence. (Photo: S. Tarjan/IAEA)

development and proficiency testing to assist member laboratories to prepare for and perform at a high level of reliability during radiological or nuclear emergency situations.

IAEA SUPPORT: CAPACITY BUILDING

The IAEA Environment Laboratories in Seibersdorf, Austria, and Monaco coordinate the ALMERA network, distribute IAEA reference materials, organize ILCs and PTs for the analysis of matrix samples, and develop procedures for the analysis of samples using radioanalytical techniques.

IAEA support includes train the trainer workshops, courses and seminars that are conducted in Member States or at the IAEA laboratories. Specific custom-developed training courses help to address methodological aspects of interest for the laboratories, such as rapid assessment methods.

Additionally, applied and adaptive research and development within the ALMERA network are linked to IAEA coordinated research projects and technical cooperation projects, which are two of the IAEA's main delivery mechanisms for transferring nuclear technologies to Member States.



Participants in an IAEA training course on in situ gamma-ray spectrometry organised in Hungary in 2017, use a novel simulation technique of a contaminated field for the practical exercises. The skills learned by the participants, such as instrument calibration, and recording, analysis and interpretation of gamma-ray spectra, are required in both routine and emergency situations and have broad applications. (Photo: S. Tarjan/IAEA)

THE ANNUAL FORUM: SHARING KNOWLEDGE

The annual ALMERA coordination meeting provides a forum for ALMERA laboratories' representatives to share their knowledge and expertise within this large network of expert laboratories. The meeting consists of plenary sessions and working sessions for the network's regional groups, as well as thematic task groups. Relevant areas such as developments in nuclear instrumentation, the monitoring of radioactivity in food, and emergency preparedness and response are also covered.

The core objectives are:

- Assessing planned and future ALMERA activities including proficiency testing, method development and training activities;
- Reviewing and recommending radioanalytical methods and procedures for routine and emergency environmental monitoring and radioecological assessment;
- Fostering discussions on the role of regional coordination centres in mobilizing the network's experience; and
- Exchanging expertise and supporting capacity building.

AREAS WHERE MEMBER STATES MAY BENEFIT FROM IAEA ASSISTANCE

- Enhancing knowledge of the ALMERA network and the support it can provide.
- Identifying the laboratories with key roles in monitoring environmental radioactivity that have the appropriate capabilities, and supporting their integration into the ALMERA network.
- Participating in capacity building laboratory activities to enhance research, monitoring and assessment in the field of environmental radioactivity, ensuring world-wide comparability of monitoring data and developing a reliable analytical basis for emergency preparedness.

Further information on the ALMERA network can be accessed at: nucleus.iaea.org/rpst/ReferenceProducts/ALMERA/index.htm
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IAEA Briefs are produced by the Office of Public Information and Communication

Editor: Aabha Dixit • Design and Layout: Ritu Kenn

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