Environment

Objective

To enhance the capabilities of Member States in understanding environmental dynamics and the identification and mitigation of marine and terrestrial environment problems caused by radioactive and non-radioactive pollutants using nuclear techniques.

Climate Change and Economic Aspects Related to Ocean Acidification

In 2009, the Agency used isotope studies and numerical models to better understand and project how ocean acidification will alter marine resources in the 21st century. For example, the Agency conducted a series of applied radioecological studies under expected levels of high carbon dioxide and low pH, using calcium-45 and other isotopes to help investigate the effects of ocean acidification on commercially important organisms such as fish larvae and molluscs and key species in marine food webs in polar and temperate waters. Calcium-45 is a key tool in measuring rates of calcification, such as in corals whose reefs provide a fish habitat and breeding grounds, a defence against storms and erosion, and as the foundation of a multibillion dollar tourism industry (Fig. 1).

Ocean acidification may affect entire marine food webs, impacting on natural biodiversity and aquaculture, as highlighted by the Intergovernmental Panel on Climate Change (IPCC) during the 15th Conference of the Parties to the UNFCCC, known as COP-15, in Copenhagen in December. This phenomenon may also strengthen the toxicity of pollutants, such as heavy metals, thereby affecting the safety of seafood. Results published by the Agency were incorporated into the Scientific Synthesis of the Impacts of Ocean Acidification on Marine Biodiversity prepared for COP-15.

Capacity Building and Networking

The IAEA Marine Environment Laboratory (IAEA-MEL), located in Monaco, acts as a focal point for collaborative initiatives in such areas as the certification of reference materials, marine radioactive and non-radioactive pollution monitoring and assessment, training, and methodological development and harmonization. In 2009, the Agency supported three CRPs and 34 technical cooperation projects involving approximately 100 Member States.

Several regional and interregional training courses, hosted both at IAEA-MEL and in Member State laboratories, supported the UNEP Regional Seas Programme in the implementation of various international conventions. The courses covered such topics as the applications of ecological risk assessment methodologies in the evaluation of the impact of radionuclides and other contaminants on marine organisms, and analytical techniques and

FIG. 1. Ocean acidification adversely affects many marine organisms such as corals, oysters, mussels and molluscs.

FIG. 2. Demonstration of the use of isotope techniques in the identification of the source of organic compounds during an Agency training course in Kuwait City.

quality assurance/quality control of data on trace metals, organochlorine pesticides, polychlorinated biphenyls and organotin compounds (Fig. 2).

ALMERA Network

Established by the Agency in 1995, the Analytical Laboratories for the Measurement of Environmental Radioactivity (ALMERA) network is a cooperative effort of radioanalytical laboratories worldwide. At the end of 2009, ALMERA consisted of 120 laboratories representing 75 different countries. The 6th Coordination Meeting of ALMERA was held in Budapest in November (Fig. 3). In addition, an Asia–Pacific regional ALMERA meeting was held in Daejeon, Republic of Korea, in April 2009, attended by 81 participants from 10 Member States.

As part of its role as convenor of the network, the IAEA organized two proficiency tests for members on the determination of naturally occurring radionuclides in phosphogypsum and water, and on the determination of gamma emitting radionuclides in simulated air filters (Fig. 4). To assist the members in assessing their capabilities in the event of an emergency, the tests incorporated a rapid reporting time limit utilizing on-line reporting of results directly to the Agency's reference material web site (*http://nucleus.iaea.org/rpst/index.htm*).

FIG. 3. Visit to the Paks nuclear power plant during the ALMERA Coordination Meeting in Hungary.

FIG. 4. Preparation of simulated air filter reference material for the ALMERA proficiency test.

Supporting Quality in Measurements for the Terrestrial Environment

Since 2006, the Agency has been organizing annual worldwide proficiency tests to help radioanalytical laboratories assess their performance. In the 2009 test, 1800 samples were prepared and distributed to 300 participants from 76 countries. A Latin American regional proficiency test on the determination of trace elements and radionuclides in algae, soil and spiked water was also performed as part of a technical cooperation project for Latin America.

As part of its cooperation with the International Bureau of Weights and Measures, the Agency conducted a comparison and pilot study with national metrology institutes on the measurement of radionuclides in naturally occurring radioactive material. A phosphogypsum material was characterized for naturally occurring radionuclides and was subsequently issued as a certified reference material (IAEA-434).

The in situ implementation of nuclear spectrometry techniques has reached a high level of performance in recent years, and offers certain advantages over more traditional characterization procedures of a contaminated site. In order to build Member State capacities in this area, an 'Advanced School' on in situ X ray fluorescence and gamma ray spectrometry was held at the ICTP in Trieste, Italy, in October.

Radionuclide Behaviour in the Terrestrial Environment

Electricity generation by nuclear power is expected to expand in the Asian region over the next decades, and appropriate tools and data are required to increase the rigour of environmental assessments. In this context, the Agency organized a seminar on the uptake of radionuclides into staple crops in the Asian region in Daejeon, Republic of Korea. The seminar summarized current radioecological research and identified existing gaps in this research area in the Asia–Pacific region.

The naturally occurring radionuclide radon-222, together with its radioactive progeny, has been widely used to study a variety of atmospheric processes and to test and validate comprehensive global chemical transport models. A technical meeting on sources and measurements of these radionuclides was held in Vienna in June, co-sponsored by WMO. A major focus of the meeting was on approaches for estimating radon flux from the ground, as well as for improving the quality assurance of measurements.

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Intentionally discharged tracers are widely used in environmental investigations because they allow detailed observations of individual components of complex systems. However, there is concern about the use of radioactive isotopes in environmental research, and decision makers generally favour the use of non-radioactive alternatives if they are available. A meeting on the use of tracers to study surface water processes was held to update and report on the recent advances in this area.