Environment

Objective

To identify environmental problems caused by radioactive and non-radioactive pollutants and climate change, using nuclear, isotopic and related techniques, and to propose mitigation/adaptation strategies and tools. To enhance the capability of Member States to develop strategies for the sustainable management of terrestrial, marine and atmospheric environments and their natural resources in order to address effectively and efficiently their environment related development priorities.

Assessing Marine Pollution

The Agency continued to support Member States in accurately monitoring contaminants and biotoxins in the marine environment. In collaboration with the United Nations Environment Programme Mediterranean Action Plan (UNEP/MAP), it conducted two training courses on analysis of contaminants for marine pollution monitoring studies. Held in Monaco in October–November, the courses were attended by ten scientists from eight Mediterranean Member States (Fig. 1). The Agency furthered the development of the receptor binding assay, a nuclear based technique for rapidly measuring harmful algal bloom (HAB) toxins in seafood, by validating a new ciguatoxin. It also completed more than ten experimental studies aimed at characterizing the transport and trophic transfer of contaminants and biotoxins, and assessing the impact of multiple stressors in the context of climate change. The results will be used to help Member States enhance the capacity of their national seafood safety programmes. During the year, the Agency conducted 14 training activities on these topics, involving 29 Member States. The training was aimed at improving the participating Member States' capacity to assess bioaccumulation, bioavailability and bioaccessibility of contaminants and biotoxins in marine organisms in order to enhance seafood safety.

The Agency has signed Practical Arrangements with three Regional Seas Conventions and Action Plans (RSCAPs): the Commission on the Protection of the Black Sea Against Pollution; the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA); and the Secretariat of the Pacific Regional Environment Programme (SPREP). Under these arrangements, the Agency is assisting Member States party to these RSCAPs in analysing radionuclides, trace elements, chlorinated pesticides, polychlorinated biphenyls, petroleum hydrocarbons and HAB related biotoxins in marine samples. In 2016, new Practical Arrangements were signed with the South Asia Co-operative Environment Programme for collaboration in the area of data quality assurance in the analysis of contaminants in the South Asia marine and terrestrial environment. At the end of 2016, the Agency had established cooperation agreements with 63 Member States to support capacity building for monitoring and assessing marine pollution.

FIG. 1. Participants in an IAEA–UNEP/MAP training course organized by the Agency in Monaco prepare fish samples for analysis.

Assessing the Impact of Multiple Stressors on Ecosystems

Agency research activities contribute to an improved understanding of the impacts of multiple concurrent stressors on ecosystems (Fig. 2). These include stressors that have direct and sometimes immediate deleterious effects — such as organic solvents, petroleum by-products, radioisotopes and heavy metals — as well as those that are potentially equally important but are more difficult to measure — such as habitat loss, rising air and water temperatures, ocean acidification, ocean deoxygenation and overfishing. In 2016, the Agency conducted research on the effects of multiple stressors on coastal and marine ecosystems using nuclear tracer techniques developed to provide essential information to resource managers. This included field surveys to evaluate the role of various stressors in wholescale ecosystem degradation; laboratory experiments focused on the trophic transfer and bioaccumulation of diverse contaminants and biotoxins; and studies of the effects of ocean acidification on the physiology and metabolic function of key marine species.

To support accurate analyses of short-lived radionuclides in the terrestrial environment, the Agency provided analytical laboratories with milk powder and water samples to simulate conditions after an unexpected release of radionuclides to the environment. These samples were used in proficiency tests to strengthen the analytical techniques needed for decision making by the responsible authorities.

In 2016, the Agency released a new carbonate reference material that will constitute the basis for proper calibration of all carbon isotope measurements worldwide. Such calibration is particularly important in the framework of climate change studies. These isotope measurements are performed by global networks to improve the assessment of carbon sources and sinks in the global carbon cycle.

In close cooperation with the affected countries, the Agency finalized recommendations

FIG. 2. Agency research is contributing to improved understanding of the impacts of multiple concurrent environmental stressors, such as widespread coral bleaching near the Marshall Islands.

for environmental management and supported ongoing environmental monitoring of areas abandoned after the Chernobyl accident.

Performance of Analytical Laboratories

In 2016, the Agency supported more than 450 laboratories in over 80 Member States in efforts to test and improve their analytical performance through comprehensive proficiency tests for radionuclides, stable isotopes, trace elements and organic compounds in materials of terrestrial and marine origin. Two new proficiency tests for radionuclides were started for surface contamination, gross alpha/beta counting, short-lived radionuclides and aerosol filters. The Agency released ten new reference materials and began efforts to bring old reference materials in line with current quality standards. Over 2150 units of 96 different reference materials were provided to Member State laboratories through the Agency's on-line portal during the year.

"The global network of Analytical Laboratories for the Measurement of Environmental Radioactivity (ALMERA) grew to 160 members in 87 Member States in 2016."

The global network of Analytical Laboratories for the Measurement of Environmental Radioactivity (ALMERA) grew to 160 members in 87 Member States in 2016. Led by the Agency, the network's laboratories collaborated on the development and validation of rapid analytical methods for the measurement of strontium-89/strontium-90 in soil and seawater in 2016. An ALMERA Training Workshop on the Determination of Organically Bound Tritium in Food Samples Using Liquid Scintillation Counting was hosted by the Canadian Nuclear Safety Commission in Ottawa in September, with 13 participants from 13 Member States. In October, the network held its annual coordination meeting in Sydney, Australia, hosted by the Australian Nuclear Science and Technology Organisation, with 50 participants from 31 countries. Together with the Agency, ALMERA supports a regional African capacity building project entitled 'Promoting Technical Cooperation among Radio-Analytical Laboratories for the Measurement of Environmental Radioactivity'. Two training courses to support analytical quality were organized in 2016 within the framework of this project, with 46 participants from environmental radioactivity laboratories in over 20 African Member States.

FIG. 3. Seawater samples from five stations within a 10 km radius of the Fukushima Daiichi nuclear power plant have been collected regularly since 2014 for interlaboratory comparisons between Japanese laboratories and the IAEA Environment Laboratories in Monaco. In 2016, interlaboratory comparisons were also organized for radionuclides in sediment and fish collected from the same area.

In 2016, the Agency continued to assist the Government of Japan in ensuring the quality and reliability of data obtained as part of the sea area monitoring plan. Two sampling missions, involving experts from Japan and the Agency, were organized to collect seawater, sediment and fish samples for interlaboratory comparisons on radionuclides (Fig. 3). For the third consecutive year, a proficiency test for tritium, strontium-90, caesium-134 and caesium-137 in seawater was carried out in addition to the regular interlaboratory comparisons. The results obtained in both the interlaboratory comparisons and the proficiency tests demonstrate a high level of accuracy and competence on the part of the Japanese laboratories involved.