

# 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.*

## Coastal Marine Environments and the Sustainability of Fisheries and Biodiversity

There is growing concern about the likely effects on the ocean of climate change and increasing levels of contaminants and carbon dioxide, and about how these changes may impact the sustainability of fisheries and biodiversity. In 2008, IAEA-MEL completed a series of experimental radiotracer studies on the potential impact of ocean acidification on the biological processes of three species of commercial seafood. Sea bream, sea bass and cuttlefish were exposed to radiotracers to assess the incorporation into the tissues of these species of trace elements such as cadmium and zinc, which are commonly found in marine ecosystems. Studies suggest that levels of these contaminants may rise in the future owing to a combination of factors such as

industrial growth and greater use of nuclear power to mitigate carbon emissions. All three species are of increasing importance to commercial fisheries, given the steep decline of finfish catches in recent years.

The experimental parameters used in the studies were based on scenarios of seawater pH levels derived from various models of future carbon emissions developed by the Intergovernmental Panel on Climate Change (IPCC). Studies of the eggs and larvae of sea bream and cuttlefish showed both morphological and physiological impacts of ocean acidification, as well as increasing accumulation of some metal contaminants, and indicated negative effects on the potential viability or rates of increase of commercial species (Fig. 1). Data of this kind enable the monetary valuation of the costs of carbon dioxide emissions and their application to policy assessment, in the context of the aquaculture and fisheries industries.

In Africa, as part of the second phase of a technical cooperation project on coastal zone management, the Agency supported Angola, Kenya, Mauritius, Namibia and South Africa in applying isotope techniques in national phytoplankton monitoring programmes to address the adverse health and environmental effects of harmful algal blooms. In collaboration with the IOC, the Agency trained participating Member States in the use of the



*FIG. 1. An experimental system at IAEA-MEL to assess the impact of exposure of commercial seafood to seawater at the decreased pH levels predicted by climate change models.*

receptor binding assay for toxin quantification and in the identification of toxic algae. The aim was to increase levels of expertise in these countries, enabling them to contribute to the sustainable development and management of the marine coastal environment.

In Latin America, an Agency technical cooperation project on the use of nuclear techniques to address management problems of coastal zones in the Caribbean fostered collaboration between 12 Member States in the region as well as with UNEP's Caribbean Regional Coordinating Unit, and France, Italy and Spain. In 2008, samples were collected from the coastal zones of participating Member States, and a regional project was launched to study harmful algal blooms in these areas. Potential sites and counterparts for a study of submarine groundwater discharge were also identified.

## The Monaco Declaration

In 2008, the Agency facilitated the signature by over 150 international marine specialists of the Monaco Declaration. The Declaration expresses concern about recent rapid changes in ocean chemistry and their potential, within decades, to severely affect marine organisms, food chains, biodiversity and fisheries. Through the Declaration, scientists urged policy makers to launch initiatives aimed at:

- Improving understanding of the impacts of ocean acidification by promoting research in this nascent field;
- Building links between economists and scientists to evaluate the socioeconomic impacts of ocean acidification and the potential costs of inaction;
- Improving communication between policy makers and scientists so that new policies are based on current findings and scientific studies address policy based questions;
- Preventing severe damage from ocean acidification by developing plans to rapidly and drastically cut emissions.

## Rapid Analysis of Radionuclides in Environmental Samples

As part of its programme on recommended procedures for the rapid analysis of radionuclides

in environmental samples, the Agency developed, tested and validated methods for the determination of polonium-210, lead-210 and plutonium isotopes. This work included the development, in cooperation with the Korea Institute of Nuclear Safety (KINS), of a system for the automated separation of radionuclides for radiochemical analysis.

## ALMERA Network

In 2008, 11 new laboratories joined the Analytical Laboratories for the Measurement of Environmental Radioactivity (ALMERA) network — which is coordinated by the Agency — bringing the total number of members to 117 from 72 Member States. The Agency continued to organize regular proficiency tests for the members of the network to help them improve their analytical performance. A comparison carried out in 2008 of results obtained from the 2006 and 2007 proficiency tests showed a significant improvement in the accuracy of the results for lead-210 (Fig. 2) and cadmium-107 in environmental samples reported by the laboratories taking part.

To facilitate regional integration of the ALMERA network, the 5th meeting of the network was held in

Rio de Janeiro in October 2008. The host institution — Brazil's National Nuclear Energy Commission, Institute of Radiation Protection and Dosimetry — was

nominated as the ALMERA focal point for the North American and Latin American regions for the period 2009–2013. KINS was nominated as the focal point for the Asia-Pacific region.

## Public Communication in the Uranium Mining Industry

A well conceived communication policy that responds effectively to public concerns regarding environmental issues involving uranium mining is an essential part of good business practices for the industry and is extremely useful for regulators. A report entitled *Communication Strategies in Uranium Mining* was published in 2008. Drafted by communications experts brought together by the Agency to consider best practices, the report provides guidance on stakeholder involvement, the development of a communications plan, and major communication issues that may arise during the life cycle of a mine, including remediation of sites.

## Radionuclide Transfer in Terrestrial and Freshwater Environments

Models of radionuclide transfer are widely used to assess the radiological impact of intentional or accidental releases of radionuclides to the environment. The current Agency publication in this field, the *Handbook of Parameter Values for the Prediction of Radionuclide Transfer in Temperate Environments* (Technical Reports Series No. 364) was published in 1994; since that time, a considerable body of data on radionuclide transfer has been collected, in particular from studies carried out

following the Chernobyl accident in 1986. These data and models were reviewed, leading to the preparation of two new publications in 2008. *The Quantification of Radionuclide Transfer in Terrestrial and Freshwater Environments for Radiological Assessments* contains the full collection of the reviewed data and the methods used to obtain the tabulated data values, while the updated *Handbook of Parameter Values for the Prediction of Radionuclide Transfer in Terrestrial and Freshwater Environments* provides summaries of parameter values in an easily accessible form for use by modellers and regulators.

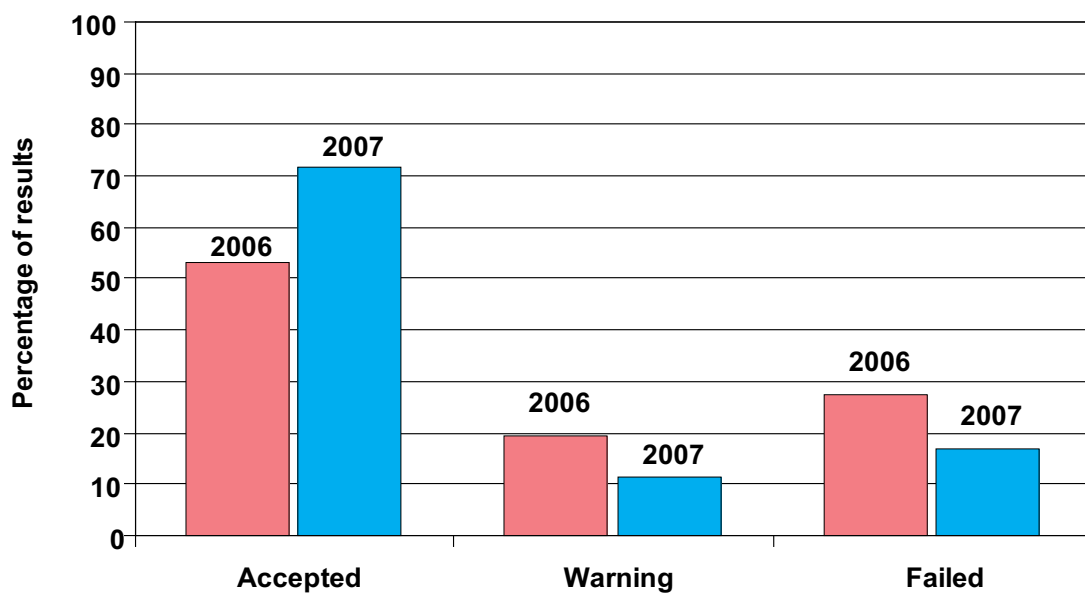


FIG. 2. Improvement in the accuracy of the analytical results for the determination of lead-210 in environmental samples analysed at laboratories participating in the 2006 and 2007 ALMERA proficiency tests.