International Conference on
Environmental Radioactivity : From Measurements and Assessments to Regulation

Vienna, Austria
23 – 27 April 2007

PRESIDENT'S SUMMARY

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The management and control of radiation fields and radionuclides in the environment for the optimum protection of the public or workers against health effects of ionizing radiation involves firstly sampling and/or measurement and then predictive modelling and radiological assessment to determine the significance of the measurements in relation to regulatory standards, followed by appropriate action when necessary. A number of technical and scientific disciplines are involved in these inter-disciplinary processes, and all of them were represented at this International Conference on Environmental Radioactivity. This conference was internationally very well attended and structured into 6 sessions dealing with 1) Regulation, 2) Sampling, 3) Measurements, 4) Monitoring, 5) Quality, and 6) Modelling and Assessment.

Measurement and assessment programmes have been carried out in the Member States of the IAEA for more than 50 years. However, there is an increasing need to demonstrate that radioactive materials in the environment are at safe levels, and so there remains a need for such programmes to be maintained and, where possible, improved with respect to sensitivity, specificity, costs, time-to-answer, etc. This conference has shown that there continue to be improvements in techniques for measurement. The new technologies of GPS, GIS and of ICP-MS have been used now in several radioecological measurements. The conference has also illustrated improvements in approaches for making measurement programmes more representative, and recent developments in the area of mathematical environmental assessment modelling.

A concern that emerged from the conference, and one which I personally feel is very important, is related to ensuring that there will be the competence to carry out environmental measurements and assessments also in the future. Of course, this issue has emerged in relation to many other disciplines associated with the nuclear industry. The lack of sufficient competence in the areas of environmental measurements and assessments was clearly seen in many countries in the period immediately after the Chernobyl accident. We and the responsible persons in the national administrations should have learned our lessons, and we should not allow a return to that situation. Each country should address this issue, for example, by creating attractive employment opportunities in the subject areas related to radioecology and providing arrangements for training in the different aspects of radioecology. There is also a role for the international organizations in facilitating the transfer of knowledge to future generations of scientists and to regional areas without sufficient teaching and/or research infrastructure in this highly inter-disciplinary field. In addition to organizing regional training courses in subjects related to radioecology, other mechanisms, such as international comparison

exercises regarding various types of measurements, of predictive computer modelling and for assessments and design of countermeasures of given contamination situations can be very valuable for introducing new persons to the disciplines.

The international efforts under way towards harmonizing sampling and measurement methodologies were described during the conference. The international guidance on a) gamma-ray spectrometry in the environment for determination of soil surface contamination (ICRU-Report 53), b) on definitions of terms, concepts and quantities and units to be used in radioecology (ICRU-Report 65), and c) on sampling of radionuclides in the environment (ICRU-Report 75) are not yet being widely applied. It was noted during this conference that there is an urgent need for realisation of this harmonization of methodologies in sampling, measurement, analysis and reporting of data, so that valid comparisons and interpretations can be made also by others than the original authors. This is especially important in the context of dose assessments that are needed for regulatory purposes. While recognizing that there may be difficulties in applying the guidance in all situations, ICRU 75 provides a very solid basis for designing optimal sampling strategies in many situations and should be used whenever possible.

There was a general acceptance that reference materials and their availability is an important factor for ensuring quality in environmental measurements. The IAEA provides matrix reference materials to Member State laboratories and organizes proficiency tests and other inter-laboratory exercises. In this context, it was felt that these activities should be intensified and there further developed with respect to reference materials for NORM and TENORM. International agreement should be reached on appropriate criteria for defining good, well-suited reference materials. In particular, whenever possible the assignment of property values (including associated uncertainties) should be carried out in a fashion which ensures metrological traceability to SI units. Performance testing also needs to be extended to more generic areas such as sampling design, software evaluation, and uncertainty budget. It was good to see that several papers at this conference were on such topics.

It was observed that some very large monitoring programmes have been established in Member States, some for compliance purposes, some for public dose assessment and some for public reassurance. However, it is not always apparent that such large programmes are justified. There is a need for those responsible in Member States to review the focus and objectives of their existing monitoring programmes to be sure that the programmes remain useful and cost-effective. In doing this, they should ensure that the most relevant sources of public exposure, including naturally occurring radioactive materials (NORM) and effluents from medical installations, are adequately addressed. The uncertainties of the reported numbers need to be reported, including uncertainties associated with steps such as sampling and sample preparation.

The conference showed that there is a wide diversity in the approaches for programme design, measurement, sampling and interpretation in relation to monitoring public exposure to the natural radioactive nobel gas radon, which has two main isotopes (Rn-220 and Rn-222) of different regional importance. With such diversity, the comparability between countries of results on population exposure to radon is brought seriously into question. There is, therefore, an important need to establish international, harmonized protocols and technical standards for designing, conducting and interpreting radon

surveys. Similarly, there is a wide diversity in the approaches used for monitoring and evaluating NORM with a view to assessing radiological impact and/or compliance with regulations. More guidance on interpreting international standards on regulating NORM would help in the design of efficient monitoring regimes and in appropriate interpretation of results by others.

The discussions during the conference emphasized the importance of assessing uncertainty in results of theoretical calculations and of measurements. The uncertainty associated with all aspects of a dose assessment should be better understood. This includes the accuracy of measurement, the representativeness of the monitoring programmes as well as the assumptions made in assessing dose - in order to avoid false conclusions being drawn. The famous GUM-Report should be followed more widely.

In the area of environmental assessment modeling (Session 6), the conference illustrated in particular the results of the latest of the IAEA's international comparison and testing programmes – the EMRAS programme. These programmes, which stretch back to the immediate post-Chernobyl era, have been consistently successful in attracting interest and commitment from Member States. At the same time, these programmes contributed to the resolution of some important environmental problems as well as providing essential 'training' for scientists new to the topic area. Two of the topics being addressed currently in the EMRAS programme are particularly important, not least because they have not had sufficient attention in the past: these are modelling and assessment associated with NORM and with the behaviour of and exposure by radionuclides in urban environments. This latter subject was of particular importance already in 1987, when a radiotherapy Cs-Source was opened in the 1.3 Mio. city of Goiania, Brasil, but it has taken on a particular potential importance in recent years with the thread of malevolent radiological detonation devices.

The conference drew attention to the existence of a comprehensive set of international safety standards covering radionuclides in the environment. It also revealed areas of the safety standards where some evolution and adaptation is needed to reflect experience gained and also to reflect the new directions indicated in the forthcoming Recommendations of the International Commission on Radiological Protection. However, it was apparent during the conference that some of the safety standards in the environmental area, which were developed with the help of experts from Member States and approved by senior committees of national delegates, are not necessarily well known among all persons in the field and, therefore, more attention needs to be given to publicizing and promoting them.

Some widely different disciplines – including regulation, assessment, monitoring, sampling and measurement – are involved in controlling radionuclides and their radiation fields in the environment. It is evident that strong links should exist between these various disciplines and the persons responsible for them. The conference showed that in some areas there is close cooperation and involvement but it is also clear that there is often limited contact and interaction between some disciplines that might be expected to be closely connected. This suggests that there is work to do in future (in particular for the IAEA) to achieve a greater degree of connection and interaction between the disciplines of the environmental radioactivity area.

Finally, I would like to reiterate what I said at the beginning of this summary; there is an urgent need to provide for the education and training of next generations of radioecologists. Even without a re-awakening of interest in nuclear energy in some countries there will continue to be a need for persons in all Member States capable of measuring radiation fields and radioactive materials in the natural and technologically-modified environment and capable of making sense of what they measure. We should do what we can at the national and international levels to make sure that these persons will exist and that knowledge will be efficiently transferred to them.