



International Conference on the Protection of the Environment from the Effects of Ionizing Radiation

**6–10 October 2003
Stockholm, Sweden**

THE PRESIDENT'S FINDINGS

Introduction

The International Conference on the Protection of the Environment from the Effects of Ionizing Radiation (the *Conference*) was held at the Stockholm City Conference Centre – Norra Latin – from 6 to 10 October 2003. It was organized by the International Atomic Energy Agency (IAEA), in co-operation with the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), the European Commission (EC) and the International Union of Radioecology (IUR), and was hosted by the Government of Sweden through the Swedish Radiation Protection Authority (SSI). It was attended by about 220 participants from 38 countries and 11 organizations.

Stockholm has an impressive history as the venue for meetings on radiation and environmental protection. In 1928 the International Commission on Radiological Protection (ICRP) was established in Stockholm. In 1972 the first United Nations Conference on the Human Environment was held there, and in 1996 the first international symposium on ionizing radiation and protection of the natural environment took place in Stockholm. The Conference continued this tradition.

The primary objective of the Conference was to promote the development of a coherent international policy on the protection of the environment from effects attributable to ionizing radiation exposure. It was the culmination of a series of meetings on the subject organized by, or held in co-operation with, the IAEA. The Conference reviewed recent developments and considered their implications for future work on developing guidance at the national and the international level.

The IAEA and the co-operating organizations have interrelated responsibilities with regard to environmental radiation protection. The IAEA has unique statutory responsibilities within the United Nations (UN) family for establishing standards of radiation safety – and by implication ones for environmental radiation protection – and for providing for the application

of those standards at the request of any State.¹ UNSCEAR's mandate within the UN system is to estimate sources and effects of exposure to ionizing radiation and to report its estimates to the UN General Assembly. UNSCEAR published a review of the effects of ionizing radiation on the environment in 1996, and it has recently embarked on a new programme of work in this area. For the establishment of its international radiation safety standards, the IAEA relies on the UNSCEAR's estimates and on the ICRP's radiation protection recommendations.

The EC has competence in radiation protection, under the 1957 Euratom Treaty, and issues basic safety standards through Directives that are binding on the Member States of the European Union. In view of the increasing awareness in many European States of the need for a system to demonstrate explicit protection of the environment, the EC has funded and continues to fund scientific research in this area – for example, the FASSET (Framework for Assessment of Environment Impact) and EPIC (Environmental Protection from Ionizing Contaminants in the Arctic) projects, the final results of which were presented at the Conference. The IUR is a non-governmental scientific organization for professional radioecologists that promotes information exchange among scientists involved in environmental research and the management of pollutants.²

The World Nuclear Association (WNA), representing the industry engaged in the peaceful applications of nuclear energy, welcomed the leadership shown by the IAEA and the ICRP in addressing how best to deal with the question of protecting non-human species. It underscored the widespread agreement among experts that the current system of radiation protection has in practice been protective of the environment. The WNA furthermore affirmed the nuclear industry's recognition of the supreme importance of environmental stewardship and the industry's continuing commitment to operating in accordance with high environmental standards.

WWF, a non-governmental environmental group, stressed the importance of adopting a long-term holistic approach to environmental management – an approach that takes account of cumulative impacts on ecosystems from radiation and other stressors. In the future, the total load of activities in an area or region may become an increasingly important issue in decision-making where the key issues for consideration are the conservation of biological diversity and sustainability.

¹ The IAEA has established a programme for developing standards that specifically address the protection of both humans and other species. The programme includes a number of mechanisms for providing for their application.

² The IUR is involved in recent development work on a framework for environmental radiation protection, has promoted information exchange and has identified relevant research priorities.

FINDINGS

General

Rigorous regulatory mechanisms are already in place to restrict both the release of radionuclides to the environment and their accumulation in the environment. Under the current system, environmental radiation protection is achieved through the restriction of discharges of radioactive substances into the environment. The discharge limits are currently set following a process of constrained optimization of protection. This ensures that members of the public receive radiation doses considerably below internationally established individual dose limits for humans. In setting discharge limits, it is currently assumed that, if human beings are adequately protected, other species will be protected at the population level. There are, however, situations in which this approach is insufficient for the protection of species other than humans, the most obvious example being environments where humans are not present. The explicit consideration of possible impacts on non-human species would therefore strengthen the conceptual basis of radiological protection. Furthermore, it would address the additional requirements arising from nature conservation legislation. These conclusions have led to the establishment of new work programmes by the ICRP and the IAEA, and to the recent appearance of ICRP Publication No. 91.

The main finding of the Conference was that the time is ripe for launching a number of international initiatives to consolidate the present approach to controlling radioactive discharges to the environment by taking explicit account of the protection of species other than humans. The process foreseen for achieving this is as follows:

1. UNSCEAR should continue to provide findings on the sources and effects of ionizing radiation that can be utilized as the authoritative scientific basis for the future international efforts in environmental radiation protection.
2. The ICRP should continue to issue recommendations on radiation protection, including specific recommendations for the protection of non-human species.
3. The IAEA should establish the appropriate international undertakings, including international standards and mechanisms for their worldwide application, to restrict releases of radioactive materials into the environment over time, in order that not only humans but also the non-human component of the environment is adequately protected. The IAEA should continue to foster information exchange by organizing international meetings on this subject.
4. The involvement of a broad stakeholder community – including intergovernmental organizations such as the Nuclear Energy Agency (NEA) of OECD and non-governmental organizations such as the IUR, the WNA and WWF – is essential for identifying possible gaps in the evolving environmental radiation protection system and for increasing the understanding and acceptance of relevant recommendations.
5. Regional organizations, such as the EC, and national competent bodies may then wish to incorporate those international undertakings into regional and national regulatory requirements as appropriate.

The Conference noted that the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, the IAEA system of international safety standards, and the various existing international mechanisms for the application of these instruments provide an appropriate framework for formalizing an international approach to restricting releases of radioactive materials into the environment.

The Conference recognized that the elements of such an approach should be practical and simple, avoid undue burdens on regulators and operators, allow for stakeholder involvement, and allow for harmonization of the ICRP's system for the radiological protection of humans with analogous approaches for other pollutants. Moreover, the approach should take account of current national and international initiatives aimed at the conservation of nature in general.

With the above considerations in mind, the Conference recommended that, under the aegis of the IAEA, an *international action plan on the protection of the environment against the detrimental effects attributable to radiation exposure* be prepared and submitted to governments for approval. All relevant international organizations and senior experts from States should be invited to contribute to the preparation of such an action plan.

Stakeholder Involvement

There were differing views about how stakeholders should be involved. The importance of ensuring legitimate stakeholder representation was emphasized. Stakeholder involvement is particularly valuable for taking account of the specificity of local conditions. A successful stakeholder process requires: well-defined procedures that are clear to all participants; a balance of representation; trust and open dialogue between the parties; and access to resources. A greater understanding of the other party's interests and motivations is valuable even when full agreement cannot be reached.

Case Studies

Case studies have particular value during the development of any framework for radiation protection. The results from case studies provide a concrete background for the more abstract consideration of principles, standards and methodologies. Three very different case studies were presented, but they displayed many common features as regards the approaches used: they were based on a body of existing monitoring data for abiotic and biotic ecosystem components; they considered the actual organisms present before selecting a range of representative organisms for assessment; and each referred to the dose rate values established by UNSCEAR in 1996 for comparison purposes. Although identifying some gaps in the data, all three studies showed that the controls being applied to past and current operations at the sites studied in most cases appear to have adequately protected the ecosystems at those sites. In one case, however, a potential discharge scenario for a uranium mine led to a situation in which protection of the environment, and not of humans, would determine the appropriate discharge level.

Coherence and Consistency with Approaches for Non-Radioactive Pollutants

Consistency between the approaches applied in regulating radioactive materials with those applied in the case of non-radioactive pollutants is important. The advantages include practicality, for the operator and regulator, and comprehensibility, for the public. The frameworks for the assessment of impacts of radionuclides in the environment that are

presently being developed are in many respects similar to those used for non-radioactive contaminants. Examples of regulatory approaches for non-radioactive pollutants were presented that take into account the bioaccumulation, persistence and toxicity of materials. The range of approaches applied in various countries was reviewed and categorized as follows: the risk-based approach; application of the precautionary principle; and the ecosystem approach.

Building on Current Knowledge

A review of recent scientific research and of its application in the development of an international framework for the protection of the environment from the effects of ionizing radiation suggests a number of priorities for further work:

- the application of existing environmental transfer models and parameters in estimating doses to non-human biota (the application of allometric relationships received particular attention), with the development of a relevant database in a transparent and consistent manner;
- the continued development of appropriate dosimetric quantities and units relating to biota that account for the interaction of ionizing radiation with tissue and for the different effects of different types of radiation for relevant biological endpoints;
- the development of dosimetric models for a number of exposure geometries applied to Reference Animals and Plants that take into account spatial and temporal averaging, as appropriate;
- the collection of additional information on the biological effects of radiation at environmentally significant chronic dose rates, particular attention being paid to data gaps concerning morbidity, mortality, reduced reproductive success and mutations, in the ICRP-defined Reference Animals and Plants;
- the development of methods that will allow the extrapolation of effects observed in individuals to populations and ecosystems;
- the development of an approach that takes account of the combined effects of radiation and other stressors, building on current knowledge presented in the UNSCEAR 2000 Report;
- the further development of the Reference Animals and Plants approach for assessing the impact of ionizing radiation on biota, so as to underpin the development of practical international radiation safety standards; and
- investigation of the possibility of defining environmental activity concentration levels, that would take account of both environmental and public protection.

ICRP Proposals and International Safety Standards

The Conference was made aware of the proposals for a framework for assessing the impact of ionizing radiation on non-human species being developed by the ICRP. This work is part of an overall revision of the ICRP's recommendations expected to be completed in 2005. It was agreed that natural background radiation levels provide a valuable basis for comparison.

The Conference supported the consultative manner in which the framework for environmental radiation protection and the overall revised recommendations were being developed. The Conference was informed about the approaches being considered within the IAEA for an action plan to develop the basis for safety standards specifically addressing radiation protection of the environment.

While accepting that there remain significant gaps in knowledge and that there needs to be continuing research, the Conference accepted that there was an adequate knowledge base to proceed and strongly supported the development of a framework for environmental radiation protection. The ICRP and the IAEA have important roles to play, and it is vital that the framework be developed in a consultative and inclusive manner. The Conference supported the approach based on the development of Reference Animals and Plants, and it noted that these may also serve as a basis for site-specific assessments.

The Conference supported the early development of a "road map" that would set out the objectives and expected components of the framework and describe the roles of the different organizations. It was agreed that the framework needs to be based on the best knowledge available at present, be flexible, be applicable in different contexts and be able to accommodate new scientific information. The need to communicate the basis of the system to decision-makers and the general public was emphasized.

The Conference recognized that, while it was important that there be an internationally consistent overall framework, decisions on the management of risks must be taken nationally and take into account the perceived environmental value of individual ecosystems. It was noted that such decisions may also be influenced by the nature of the environment, and not only by the biota present.

Communication with the Public and the Role of the Media

The role of the media in communicating with the public and the different interests of scientists and journalists were explored. Scientists are highly specialized and tend to deal with abstract concepts; they explain their work at some length and often seem to focus on what they do not know rather than what they know. Journalists tend to be generalists who are interested in a "good story" that has a direct impact on people; they work under intense time pressures and need to express themselves succinctly. The different priorities of the two groups frequently lead to misunderstandings. From the scientist's perspective the media tend to concentrate on bad rather than good news, but it was demonstrated that it is possible to "sell" good news if the issues are communicated clearly.

The action of "fright factors", such as the invisibility of ionizing radiation and the involuntary nature of exposures to it, on the public perception of radiation risk was discussed. The openness of communication has a positive influence on public perception and trust.