

Environmental Risk Assessment - A Practitioners Perspective

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Abstract

During the assessment of likely environmental impacts of a facility or an activity, it is no longer sufficient to assume that protection of humans ensures protection of all other components of the environment. The Ministers' Expert Advisory Panel recommended 25 'substances' for inclusion in the second priority substances list (PSL-2) in October 1995. Radioactivity released from nuclear facilities was one of the substances included in PSL-2. The focus of PSL-2 for radionuclides and this paper is the effects of radionuclides on non-human biota. The ecological risk assessment for PSL-2 is being carried out following the ERA guidance developed for environmental assessment of priority substances.

In addition, environmental protection is explicitly included in the new Nuclear Safety and Control Act and the Atomic Energy Control Board (AECB) has been quite active in developing an environmental protection policy. This policy, as currently described in C-223, requires the AECB (soon to be the CNSC) to develop environmental protection guidelines. Furthermore, the AECB has been active in ensuring that environmental assessments for nuclear facilities evaluate potential effects to non-human biota populations.

An international symposium on ionizing radiation in May 1999 explored various environmental protection issues. One outcome of this symposium was the suggestion that the ICRP develop guidance on the principles for protecting the environment from radiation. A further issue discussed at the symposium was that while national and international agencies are still wrestling with the development of a new framework for environmental protection, environmental assessments and studies in support of licencing activities are being carried out.

The 1999 symposium also suggested that the 1996 UNSCEAR report is a useful starting point to develop criteria for environmental effects of radiation. However, concern was expressed over the introduction of inappropriate or multiple safety factors, and in particular the potential misuse of the precautionary principle. Using (unduly) low criteria values for more detailed analyses was seen as threatening the credibility of assessments, and the lower screening values were likely to become the *de facto* limits. It was felt better to introduce safety factors into the analyses to reflect greater uncertainties at the screening level, rather than bury them in criteria.

A recent IAEA discussion report on the "*Protection of the Environment from the Effects of Ionizing Radiation*" (Tecdod 1091) reaches several conclusions, among them:

- *There is, as yet, no clear consensus on what guidelines, endpoints or targets may be used as a basis for environmental protection, but a number of ideas have been put forward in this report;*
- *The extent of knowledge on the effects of radiation on organisms other than man is considered to be sufficient to move forward on this subject;*

- *Approaches and criteria for the protection of the environment from the effects of ionizing radiation should be developed to take account of approaches taken for other environmental pollutants;*
- *In order to reduce uncertainties and achieve greater confidence that criteria will provide the desired level of protection, improved knowledge is required in certain areas.*

Some of the issues that currently face risk assessors (and regulators) include, among others:

- **Who are we trying to protect?**
 - the individual?
 - the local population of a most sensitive species?
 - the local population of a commercially useful species?
 - the local community of species?
 - the entire ecosystem?
- **What are we trying to protect them from?**
 - mortality
 - reduced reproductive capacity
 - measurable changes in biomarkers
- **What about combined effects of multiple stressors?**
 - radiation
 - chemicals
 - changes in the environment, e.g. drought, thermal plume
- **What is the correct RBE for alpha particles (e.g. Po-210 from uranium mining)?**
 - as low as 2
 - 10 or 20
 - up to 100 or more?
- **What is an appropriate criterion for radiation exposure for protection of the environment?** For example: UNSCEAR (1996) suggest:
 - 10 mGy/day aquatic organisms (para. 176)
 - 10 mGy/day terrestrial plants (para. 104)
 - 1 mGy/day terrestrial animals (para. 161)
- **What is an appropriate approach for dealing with natural background radiation and variability in background?**

The paper discusses each of these topics. Examples from recent environmental assessments are used to illustrate the practical implications.