

HOW ARE CURRENT BENCHMARKS USED IN RADIOLOGICAL ASSESSMENTS DERIVED?

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Abstract

The actions to be taken to adequately protect the environment against the detrimental effects of ionising radiation have to be commensurate with the overall level of risk to non-human biota. To judge the level of risk, the estimated dose rates received by animals and plants need to be compared with some form of numeric criteria, a benchmark (predefined dose rate value).

A variety of aspects can influence the final value of the derived benchmark, including: the aim of the application of the benchmark (i.e. application as screening value or as legally binding criteria or standards), the protection goals of the assessment (species, populations, communities, ecosystems, etc.), the data on radiation-induced biological effects considered (type of exposure, biological endpoints, etc.), and the derivation method used (expert judgement, assessment (safety) factor, statistical extrapolation techniques).

Benchmark values have been proposed by several international organizations (UNSCEAR, ICRP, IAEA), countries (UK, USA, Canada) and research projects (ERICA, PROTECT), although not all of them have used the same methodology, application purpose, interpretation of the data, and protection goals, to derive these values.

Regarding the methodologies used to derive benchmark values, these include from the use of varying degrees of expert judgement, to the application of formalized methodologies consistent with those used within chemical risk assessment^{1, 2, 3, 4}

The talk will describe the different approaches (methodology, protection goals, quality and quantity of the data, etc.) used by the different groups to derive benchmark values for the radiation protection of the environment. The strengths and weaknesses of the different approaches will be discussed.

The different numerical values proposed by different organizations, countries and scientific projects will be presented and, when possible, compared. The benchmark values derived will be collated with the natural background dose rate values and with the values of dose rates leading to observed effects in animals and plants.

¹ ICRP (International Commission on Radiological Protection) (2008) Environmental protection: the concept and use of reference animals and plants. Ann. ICRP 108 (4-6)

² Garnier-Laplace J and Gilbin R (ed) 2006 Derivation of predicted no effect dose rate values for ecosystems (and their sub-organisational levels) exposed to radioactive substances Deliverable D5. European Commission, 6th Framework Contract No FI6R-CT-2003-508847 (Cadarache: IRSN)

³ Andersson P, Barnett C L, Beresford N A, Coplestone D and Oughton D H 2008 Workshop: numerical benchmarks—proposed levels and underlying reasoning Report for the PROTECT Project (Aix-en-Provence, May 2008) EC Contract Number: 036425 (FI6R) (Lancaster: CEH)

⁴ EU (2003) Technical Guidance Document in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances, Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances and Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market. (Luxembourg: Office for Official Publication of the European Commission).