

THE ROLE OF ICRP AND STAKEHOLDERS IN THE FUTURE OF RP

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ICRP



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REGULATORS' PERSPECTIVE



Foro Iberoamericano de Organismos
Reguladores Radiológicos y Nucleares

How are the recommendations of the ICRP applied when regulating radiation protection?

- Since its foundation in 1928, the ICRP has regularly published its general recommendations aimed at protecting people and the environment from detrimental effects of exposure to ionizing radiation, without unjustifiably limiting its benefits.
- Protection of people is based on two safety goals: 1) keeping doses to organs and tissues below thresholds to avoid harmful tissue reactions (deterministic effects); and 2) management of effective dose to limit the probability of occurrence of stochastic effects.
- Since the first documents, the Commission has been reviewing the recommendations to adapt them to scientific advances and the lessons learned from their application.
- The doctrine established by the ICRP in its general recommendations serves as a basis for international organizations to establish the regulations that each country subsequently incorporates into its regulatory system. In addition to the general recommendations, the Commission also regularly publishes specific recommendations applicable to specific areas, such as medical interventionism, NORM industries, etc.
- **Regulators, and certainly the ones of FORO, rely on these specific recommendations when setting criteria in their technical assessments, in the development of guidelines or to inspire other regulatory actions.**

What does authorities need from ICRP? What are the priorities?

- There is a need to provide clear evidence, which demonstrates how any changes to the RP system would lead to proportionate overall improvement to the delivery of radiation safety, human health, and environmental protection.
- The system needs to be adaptable to future changes, e.g. new/advanced technologies, large accidents, wide-scale decommissioning, societal changes, climate change; ensuring the RP system can be applied in practice.
- Despite the fact that the radiation protection system is so well consolidated, from the different elements that make up the international community dedicated to radiation protection, it has been warned for some time that this RP system is tremendously complex, being in fact essential to know very deeply the philosophy that underpins the recommendations of the Commission so as not to err in their interpretation and in the requirement regarding compliance. This is not available to each and every one of the professionals who dedicate their professional activity to this field, but even less, at a time like the current one in which many of the "parents" of the system are no longer active.

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- The NEA from the OECD has been organizing the International Radiation Protection School at Stockholm University since 2018, so that "the parents" of the international PR system can explain to the following generations the philosophy and origin of the different principles and recommendations of the ICRP. Perhaps expanding the possibilities and/or options through which this knowledge can be extended would be a necessity of the regulatory authorities.
- The general perception of radiological risk has meant that the entire radiation protection system is most likely oversized, compared to the risks associated with other industries that are assumed with less concern.

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From the point of view of regulators there are two key aspects that need special attention:

- 1) The **review and revision of the detriment concept**: The impact of stochastic effects is reflected by the radiation detriment, which is based on the sum of lifetime risk from several cancers, weighted by the severity of these cancers, and integrates the possibility of heritable effects.

This detriment concept was elaborated in ICRP Publication 60 (ICRP, 1991), and needs to be revised and updated to reflect the evolution of scientific knowledge of risks and expert judgement concerning lethality, quality of life, and years of life lost.

Explicit recognition of differences in detriment with age at exposure and between males and females could improve the clarity of application of the System, showing, in particular, that risks to young children are greater than risks to adults.

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2) **The review and revision of the current system of quantities and units:** to suggest the necessary revisions to update it, by taking into account a number of lessons learned, particularly in the aftermath of nuclear accidents and in the protection of patients in the practices of radio-diagnosis, interventional radiology and radiotherapy.

The number of difficulties found included: the differences between the quantities (***effective dose*** and ***equivalent dose*** and ***absorbed dose***) are not well explained and are not well understood even by educated audiences; the distinction between the quantities used in the radiological protection system (equivalent dose and effective dose) and the operational quantities used for radiation measurement (the dose equivalent quantities, personal dose equivalent) is even more difficult to understand; the use of the same unit (Sievert) for the quantities equivalent dose of an organ and the effective dose over the body, without specifying the quantity, and for the operational quantity dose equivalent, enhances confusion and misunderstanding.

Many areas are identified for potential review including:

- classification of effects, with particular focus on tissue reactions;
- reformulation of detriment, potentially including non-cancer diseases;
- re-evaluation of the relationship between detriment and effective dose, and the possibility of defining detriments for males and females of different ages;
- individual variation in the response to radiation exposure;
- heritable effects;
- effects and risks in non-human biota and ecosystems;
- bringing together protection of people and the environment;
- incremental improvements to the fundamental principles of justification and optimisation;
- a broader approach to protection of individuals;
- clarification of the exposure situations;
- explicit incorporation of the ethical basis of the System;
- reflect the importance of communications and stakeholder involvement;
- further advice on education and training.

What does authorities need from ICRP? What are the priorities?

- The main international research platforms in radiation protection have defined the priorities in each of the sectors and have identified different challenges that will have to be faced in the coming years.
- It is intended that the RP System can benefit from incorporating all the possibilities offered by the scientific and technological advances currently available: artificial intelligence, simulation, etc. These innovative approaches often encounter considerable resistance among regulators. An example is dosimetric monitoring of workers using Monte Carlo simulation: models and software are available, but not generally accepted as an official method. This type of resistance is what should be tried to loosen through an adequate knowledge of the fundamentals of the PR system.
- Other priorities in the definition of radiation protection strategies are the incorporation of disciplines such as bioethics, sociology and communication sciences, and the development of specific recommendations for new therapies and medical technologies, veterinary applications, protection of biota and ecosystems, natural sources, etc.

Conclusions

- The FORO bases its projects on UNSCEAR scientific basis, ICRP recommendations and IAEA standards and guidance. The FORO identifies three main areas that need future developments:
- radiation risk assessment;
- dosimetry;
- and application/implementation of the System of Radiological Protection.

UNSCEAR provides evidence-based conclusions on the effects of ionizing radiation. ICRP uses these findings to issue/modify its recommendations. And the IAEA, as well as other standards bodies, define the rules to ensure compliance with the recommendations of the ICRP. That is, UNSCEAR would justify the *why*, ICRP would mark the *what* and the IAEA/EC would define the *how*.

We believe that the role played by each is perfectly recognized and well established.

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