

ICRP Review and Revision of the System of Radiological Protection: Where do we Stand?

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INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

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CEPN Director

Introduction

- Process of **reviewing and revising** the System of Radiological Protection initiated in 2021
- Preliminary consultations have proven that the **current system is robust**
- But some **clarifications and updates are needed** to facilitate its application
- On-going work largely developed in **consultation with the relevant organisations and stakeholders**
- Aim to provide recommendations in the **early 2030s** addressing changes in science and society to remain fit for purpose.
- This presentation summarizes the **on-going work 5 years after** the beginning of the reviewing and revising process, with a focus on occupational exposure.

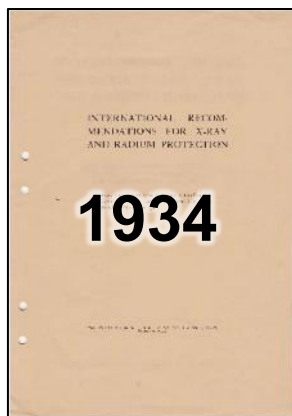
General Recommendations



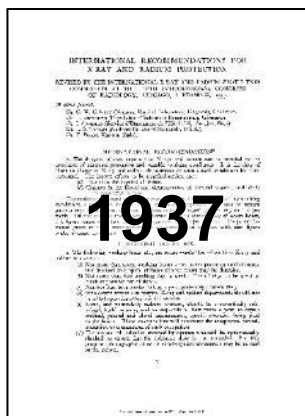
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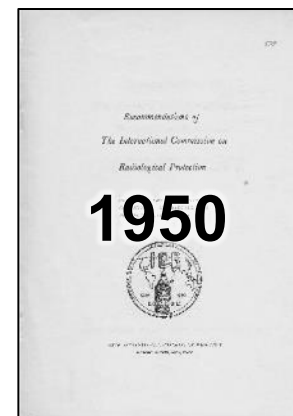
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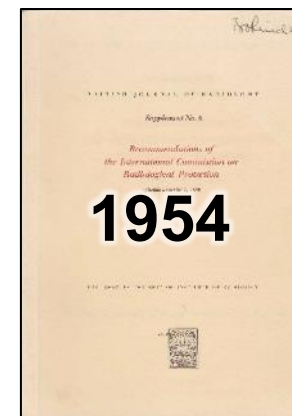
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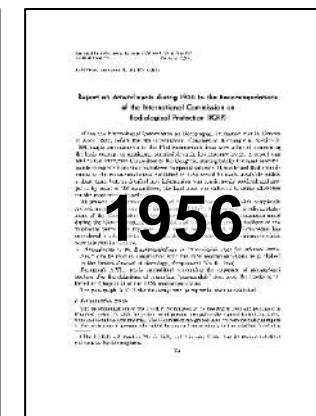
World War II



13y

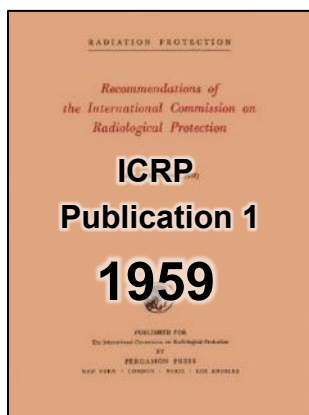


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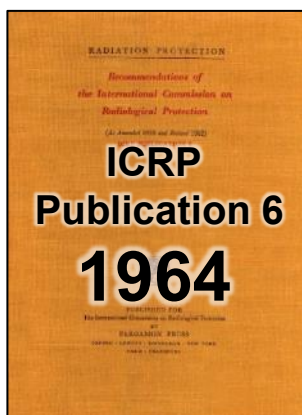


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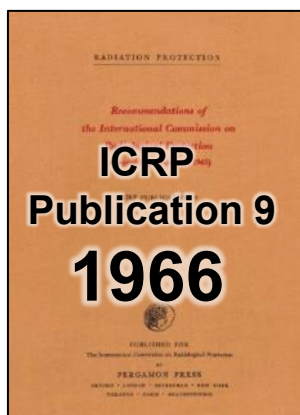
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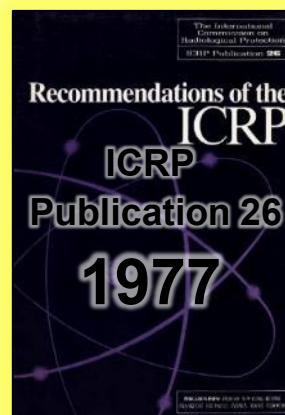
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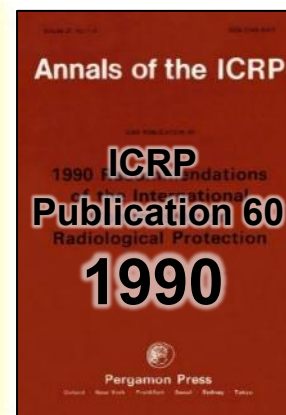
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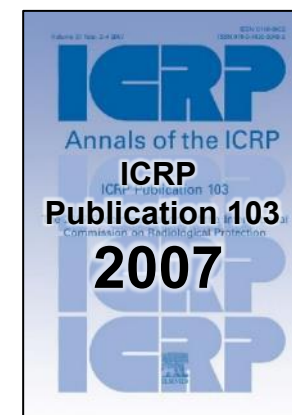
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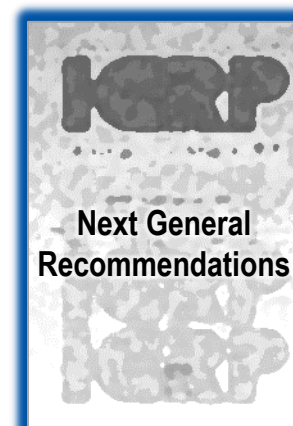
13y



17y



>20y



Review & Revision of the System of Radiological Protection

**The System of RP is robust and
has performed well**

however

**it must adapt to changes in
science and society to remain fit
for purpose**

A quarter century has passed
since the last review was initiated

Initial Key Milestones (open access papers)

Keeping the ICRP recommendations fit for purpose

Clement et al 2021 JRP, www.doi.org/10.1088/1361-6498/ac1611

Areas of research to support the system of radiological protection

Laurier et al 2021 REB, www.doi.org/10.1007/s00411-021-00947-1

Summary of the 2021 ICRP workshop on the future of radiological protection

Rühm et al 2022 JRP, www.doi.org/10.1088/1361-6498/ac670e

... A focus on research priorities - feedback from the international community

Rühm et al 2023 JRP, www.doi.org/10.1088/1361-6498/acf6ca

Thoughts
from ICRP &
invitation to
contribute

Summarises
feedback
from the
community



Active ICRP Task Groups

- TG36 Radiopharmaceutical Doses
- TG91 Low-dose and Low-dose Rate Exposure
- TG95 Internal Dose Coefficients EIR 2,* 3-5*
- TG98 RP in Areas Contaminated by Past Activities **
- TG99 Reference Animals and Plants Monographs**
- TG105 The Environment in the System of RP
- TG106 Mobile High Activity Sources
- TG108 Optimisation of RP in Digital Radiography, Fluoroscopy, and CT**
- TG111 Individual Response to Radiation
- TG112 Emergency Dosimetry
- TG113 Dose Coefficients for X-ray Imaging**
- TG113 Dose Coefficients for Fluoroscopy paed
- TG113 Dose Coeffs for Pregnant and non-reference
- TG114 Reasonableness and Tolerability
- TG115 Risk and Dose for Astronauts
- TG116 Imaging for Radiotherapy**
- TG117 Radiological Protection in Positron Emission Tomography **
- TG118 RBE, Q, and w_R
- TG119 Diseases of the Circulatory System
- TG120 Radiation Emergencies and Malicious Events
- TG121 Offspring and Next Generations
- TG122 Detriment Calculation for Cancer
- TG123 Classification Radiation-induced Effects
- TG124 The Principle of Justification
- TG125 Ecosystem Services
- TG126 Human Biomedical Research
- TG127 Exposure Situations and Categories of Exposure
- TG128 Individualisation and Stratification in RP
- TG 129 Practical implications of ethics in RP
- TG130 Doses from Radiopharmaceuticals During Pregnancy and Breastfeeding

** Approved to be Published*

Foundations of the RP System

- **Social and Ethical Principles/Values**

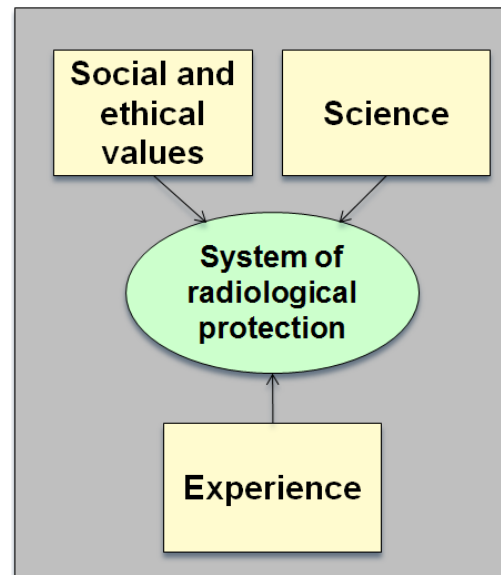
- Beneficence
- Non-maleficence
- Autonomy/Dignity
- Justice
- Prudence
- Transparency
- Accountability
- Inclusiveness

- **Science**

- Epidemiology
- Radiobiology
- Anatomy
- Physiology
- Metrology
-

- **Experience**

- Hiroshima/Nagasaki
- Nuclear Installations
- Industrial/Medical
- Chernobyl
- Fukushima
-



C1: Integration of TGs



TG 102 – Detriment Calculation

TG 91 – Dose and dose rate effects

TG 111 – Individual response

TG 115 – Risk and dose of astronauts

TG 119 – Circulatory diseases

Radiation-related effects in Humans and the Environment

TG 121 – Risks for next generations

TG 122 – Update of cancer detriment

TG 123 – Effects classification

TG 128 – Stratification of RP

TG 118 – RBE, Q, WR

TG 99 – RP of the Environment Part 1

Potential evolutions in support to the process of review and revision of the System

- Clarifying the classification of the health effects of radiation, with a specific attention to long-term non-cancer effects
- Updating the calculation of radiation detriment for cancers (risk models, effect of dose-rate, variations with age and sex, cancer severity)
- Improving the world representativeness of nominal cancer risk estimates
- Providing new parameters for w_R and w_T
- Clarifying the risk assessment method for non-human biota
- Improving quality control and transparency in the risk assessment process
- Making it easier to understand radiation-related risks

Dosimetry – ICRP C2: ICRP Pub 147 and ICRU Report 95

- **Simplification** of the dosimetry concept
 - all RP quantities derive from the **ICRP formalism**
 - with **anthropomorph phantoms** and w_R , w_T
- **Coherence** between **protection** quantities and **operational quantities**
 - numerical values become equal where it is naïvely expected
- **Reduction** of the **phantom zoo**
 - no more ICRU sphere
 - slab phantom only for calibration

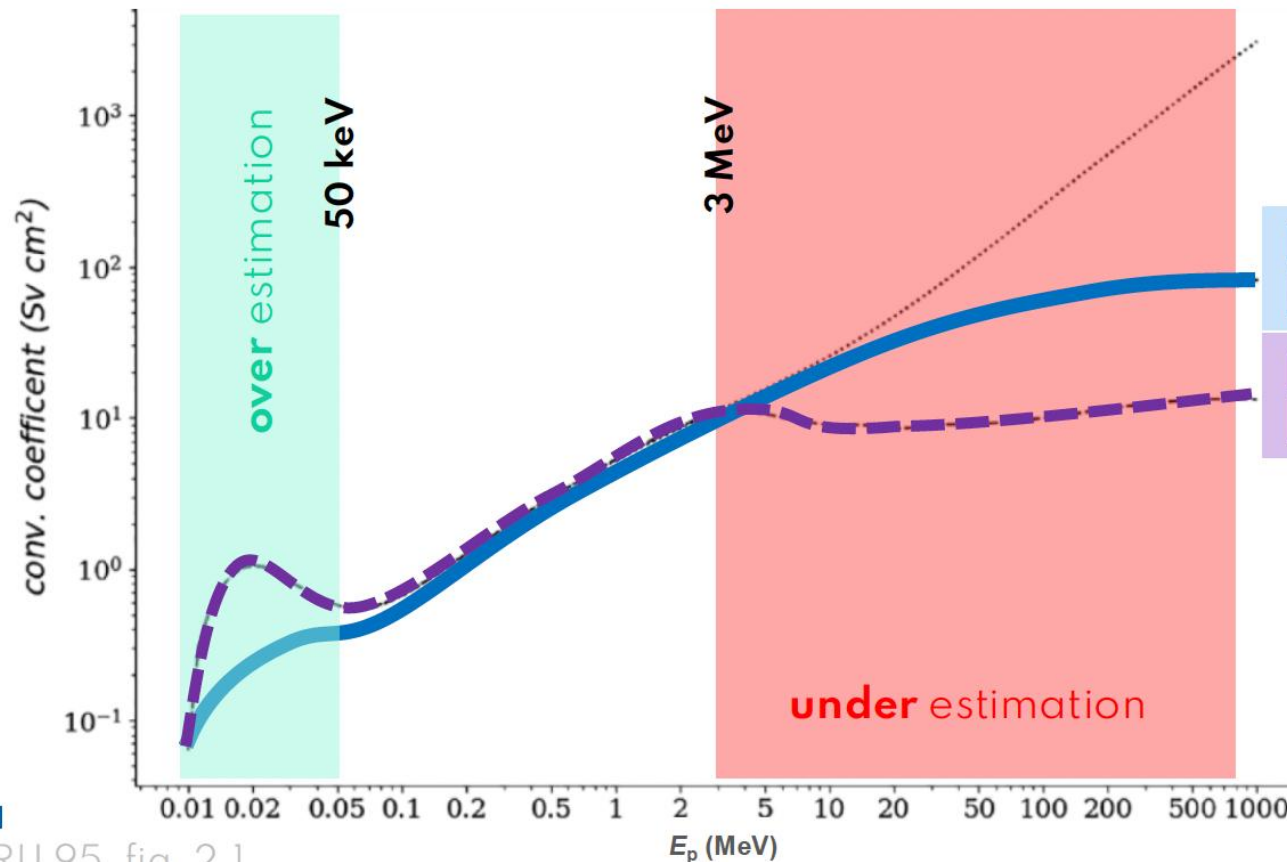
will be officially included
in the **next** ICRP
recommendations

update of ICRP/ICRU 95
will be synchronized with
ICRP recommendations

expected changes will
be **small** and instrument
manufacturers can start
working now



E and Hp(10) vs photon energy E_p



ICRU 95, fig. 2.1



$E (= H_p)$
[ICRP116]

Protection quantities

$H_p(10)$
[electron transport]

Operational quantities



Current programme of work of Committee 4

Fundamental concepts

- Application of the optimisation principle: **tolerability of risk and reasonableness (TG114)**
- Application of the **justification** principle **(TG124)**
- Reviewing the application of the approach in terms of **exposure situations and categories of exposure (TG127)**
- WP on **Sustainable development**

Radiological protection of the environment

- **Broadening reference animals and plants (RAPs)** approach (in press) **(TG99)**
- **Considering the environment** when applying the system of radiological protection **(TG105)**
- Considering the concept of **ecosystem services (TG125)**
- WP on **Environmental Radiological Protection**

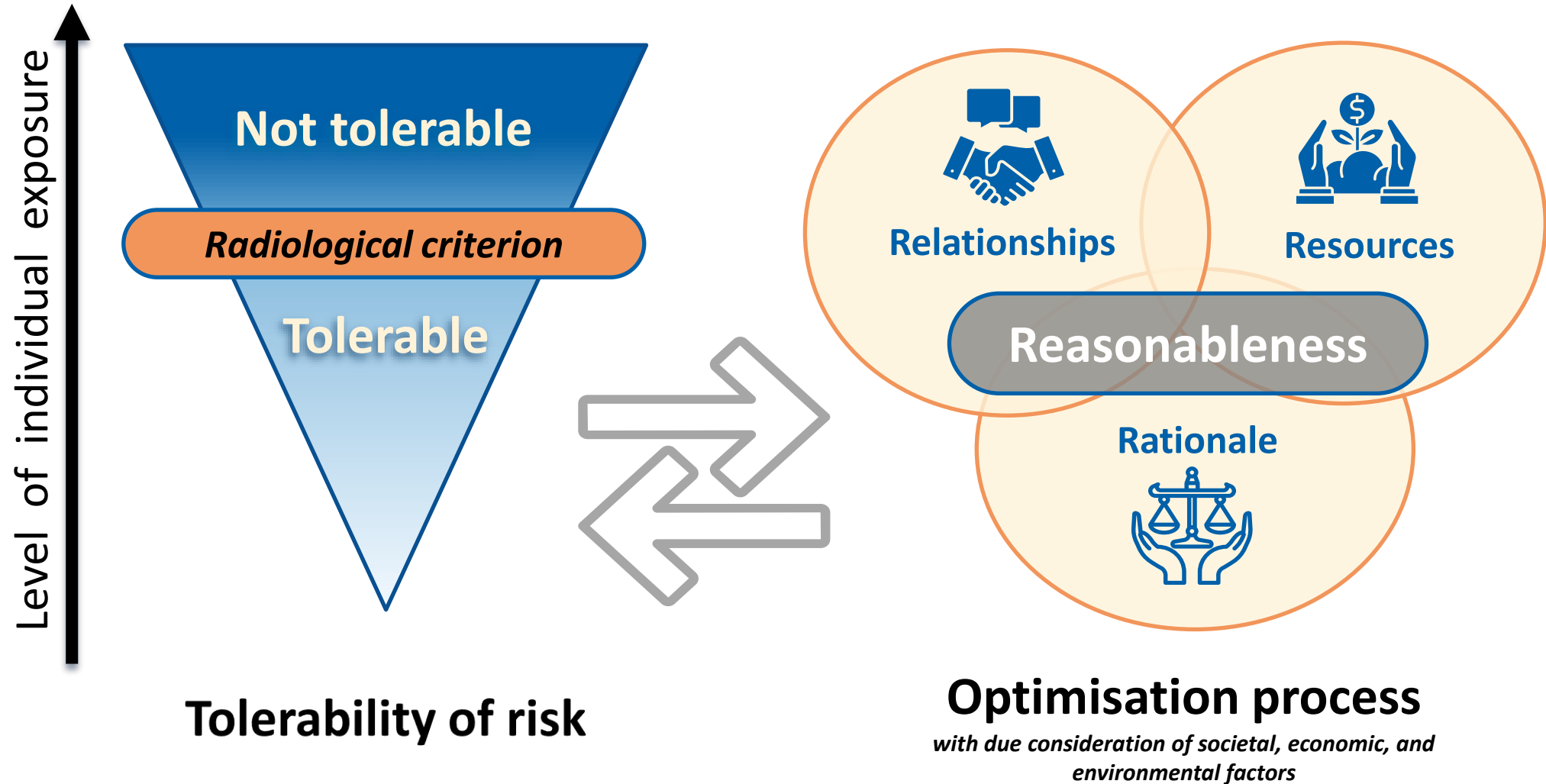
Specific domains of application

- Areas contaminated by **past activities** (in press) **(TG98)**
- Activities involving **mobile high activity sources (TG106)**
- **Emergencies and malicious events (TG120)**
- **Ethics** in practice **(TG129)**
- WP on **Artificial intelligence**

Current Reflections by TG114 on Tolerability and reasonableness

- The aim of the system is « *protecting patients, workers, the public, and the environment against detrimental effects of ionising radiation exposure, without unduly limiting the benefits associated with the uses of ionising radiation.* »
- Applying Tolerability and reasonableness aims to reach a “**good and proportionate level of protection**” with due consideration given to the **individual and societal level of risk** associated with ionising radiation under the specific circumstances, but not only.
- To address the **societal, economic and environmental factors**, considerations should be given to the concepts of **well-being, sustainable development, and an all-hazards approach**.
- To ensure the respect of **ethical values** and to rely on **stakeholder involvement** to achieve a **sustainable protection**.

Application of ALARA for the different types of exposure situation



On-going PoW – Fundamental concepts: TG114 – Tolerability and reasonableness

Paper “Revisiting Tolerability and Reasonableness in the System of Radiological Protection” published in Health Physics Journal in open access (Feb 2026).

Health Physics 130(2):p 166-174, February 2026. | DOI: 10.1097/HP.0000000000002092

- **A series of topics under consideration:**
 - **Very low level of exposure**
 - **Balancing factors** when applying ALARA approach
 - Selection of **radiological criteria** for tolerability
 - Addressing **uncertainties**
 - **Environmental radiological protection**

On-going PoW – Fundamental concepts:

TG124 – Application of the principle of justification

Application of the Principle of Justification

What 'more good than harm' means in society today
On what basis the judgement should be made

Points to be emphasized:

- Justification is ultimately **judged by society**.
- **Ethical considerations** are integral to the justification process.
- **Sustainable development** objectives may help guide justification decisions.
- Doing good and avoiding harm often belong to **different dimensions of evaluation**.
- A **wide range of factors** should be considered, noting that radiation exposure may sometimes be a relatively minor issue.
- **Rigour of the justification process** should be proportionate to the magnitude of radiation risk and complexity of the issue.
- Justification decisions always entail some degree of **uncertainty**.

Discussion on Multi-Level Justification

Level 1: General

Ensure benefit in general

Level 2: Generic

Ensure benefit in a generic application

Level 3: Specific

Ensure benefit in a specific situation

- **Is it applicable to all exposure situations?**
 - The number of levels could vary depending on the situation.
- **What does the decision process look like at each level?**
 - Justifying authority
 - Elements to be considered in the benefit/detriment balance
 - Technologies and applications grouped together
 - Stakeholder involvement
- **How would this affect current national justification practices?**

ICRP TG127 on Exposure situations and categories of exposure

Aim of TG127: To review ICRP Pub 103 and subsequent Publications in terms of exposure situations and categories of exposures

Since 2007 (ICRP glossary - 2019), the ICRP has defined 3 exposure situations:

- **Planned exposure situation:** An exposure situation resulting from the deliberate introduction and operation of radiation sources, used for their radioactive properties. For this type of situation, the use of the source is understood, and as such the exposures can be anticipated and controlled from the beginning.
- **Existing exposure situation:** An exposure situation resulting from a source that already exists, with no intention to use the source for its radioactive properties, before a decision to control the resulting exposure is taken. Decisions on the need to control the exposure may be necessary but not urgent.
- **Emergency exposure situation:** An exposure situation resulting from a loss of control of a source, or from intentional misuse of a source, which requires urgent and timely actions to avoid or mitigate exposure.



ICRP TG127: key points under discussion

- **Maintenance of the 3 exposure situations:**
 - Planned exposure situation: risk management trumps circumstances
 - Existing exposure situation: circumstances should be integrated into risk management
- **Clarification of occupational exposure, alignment with ILO**
 - Existing exposure situation and occupational exposure do not conflict
- **Reaffirm that dose constraints and reference levels are optimization tools**
 - Not stricter application of the principle of limitation
- **Reaffirmation of the principle of environmental protection for its own sake**
 - Waiting for the conclusions of the dedicated WP to decide on a fourth category

Future TG on principle of dose limits: Proposed mandate

- **Historical evolution of the concept of dose limits** (including limits for deterministic effects), **dose and risk constraints and reference levels** in ICRP recommendations and publications;
- **Review of the rationale for the selection of values** relating to dose limits, dose and risk constraints and reference levels in ICRP recommendations and publications;
- Consideration of **on-going ICRP reflections** on the application of the system and on the radiation detriment, and coordination with the Task Groups in charge of these reflections;
- Reconsideration of the **comparative analysis** with approaches adopted for the protection of workers and the public in fields other than radiation protection;
- Provision of **advice on the application of the principle and the rationale of the values** for the **protection of individual and people in all types of exposure situations including consideration for pregnant women** in the perspective of the new General Recommendations.

Recent papers from ICRP Main Commission

Memorandum

Essentials of the System of Radiological Protection

Werner Rühm, Kimberly Applegate, Nobuhiko Ban, Francois Bochud, Simon Bouffler, Kun-Woo Cho, Chris Clement, Eduardo Gallego, Olga German, Gillian Hirth, Makoto Hosono, Michiaki Kai, Dominique Laurier, Senlin Liu, Nicole E. Martinez, Sergey Romanov, Thierry Schneider, David G. Sutton, Andrzej Wojcik

<https://iopscience.iop.org/article/10.1088/1361-6498/ae02a2>

Radiation and Environmental Biophysics
<https://doi.org/10.1007/s00411-024-01089-w>

REVIEW



The system of radiological protection and the UN sustainable development goals

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<https://link.springer.com/article/10.1007/s00411-024-01089-w>

**VANCOUVER
CALL FOR ACTION**
To Strengthen Expertise
in RP Worldwide



Strategic Planning Group for drafting the new General Recommendations Publication

- Set up in **2026** with the objective of Publication in **2032**
- **Defining the structure** of the new General Recommendations publication
- Consider **potentially substantial changes** to the proposed new general recommendations
- **Discuss proposals** for adjustments with relevant **Task Groups and Working Parties**
- Take into account and discuss **feedback from stakeholders** and the **assessment of the likely impact** of a new General Recommendations publication on practical aspects of delivering effective radiological protection

ICRP Symposium



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