



Ethics of clearance

**To understand where we come from,
To discuss where we might get ...**

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Introductory lecture

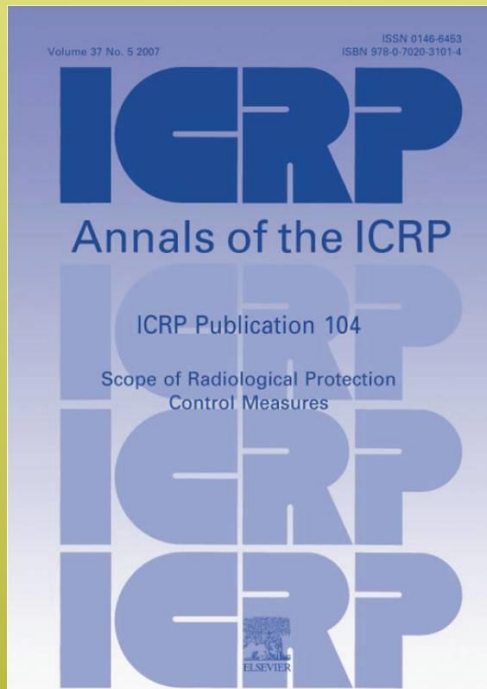
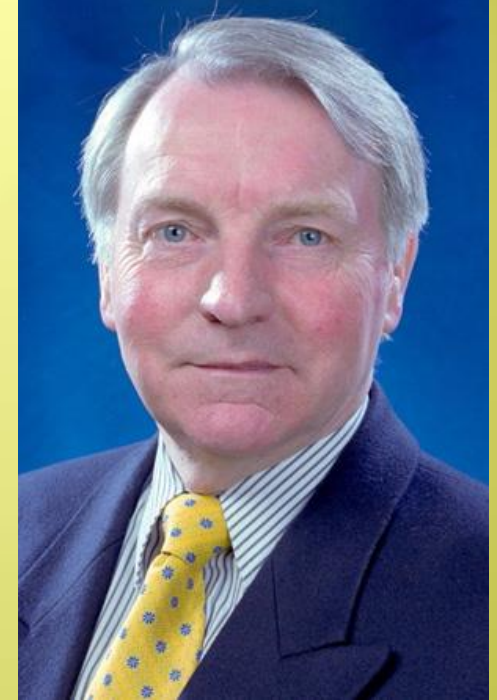
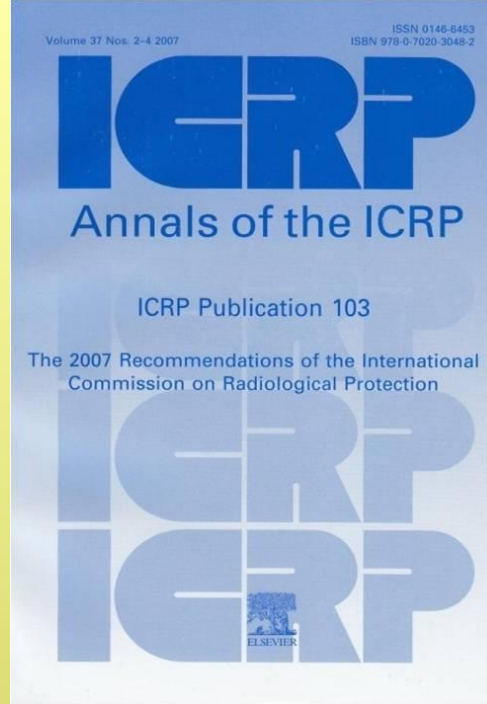
Ethical basis of the concept of clearance within the overall philosophy and system of radiation protection

This presentation is without prejudice to the interpretation given to the Directive by the services of the European Commission and to the legal obligation of Member States to transpose the exact requirements of the Directive; in this presentation quotes are not always exact for reasons of simplicity and visibility,

Building blocks for the construction of the ethical basis of clearance

- *Historical development of exemption concepts and criteria:*
 - **SS 89,**
 - **R-SG-1.7,**
 - **International and Euratom BSS**
- *ICRP guidance*
 - **Publications 103 and 104**
 - **Ethical foundations of the system of radiological protection. Publication 138 (2018).**

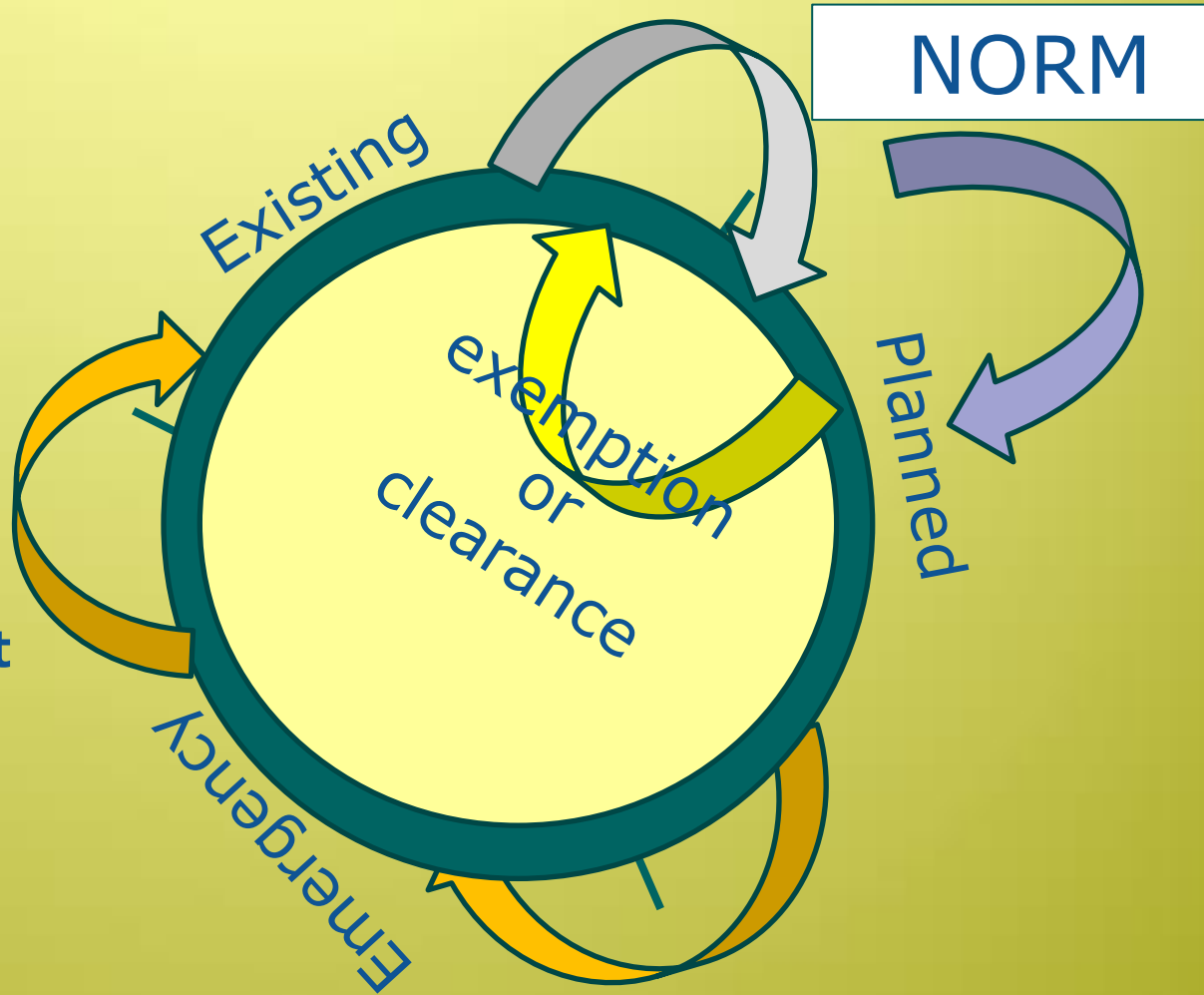
Publication 60 referred to the international guidance on this matter but neither referred explicitly to the 10 $\mu\text{Sv}/\text{y}$ value nor discussed a possible radiological basis for it. In earlier versions of **Publication 103** addressed neither exemption nor clearance in the final draft.



Publication 104 provided a thorough overview of related developments, but failed to offer guidance on how trivial individual doses fit in the overall radiation protection system.

Exposure situations (Euratom BSS)

- Existing
- Planned
- **An activity introducing a source or modifying an exposure pathway that needs to be kept under a regime of regulatory control and enforcement**
- Emergency



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Ethical Foundations of the System of Radiological Protection

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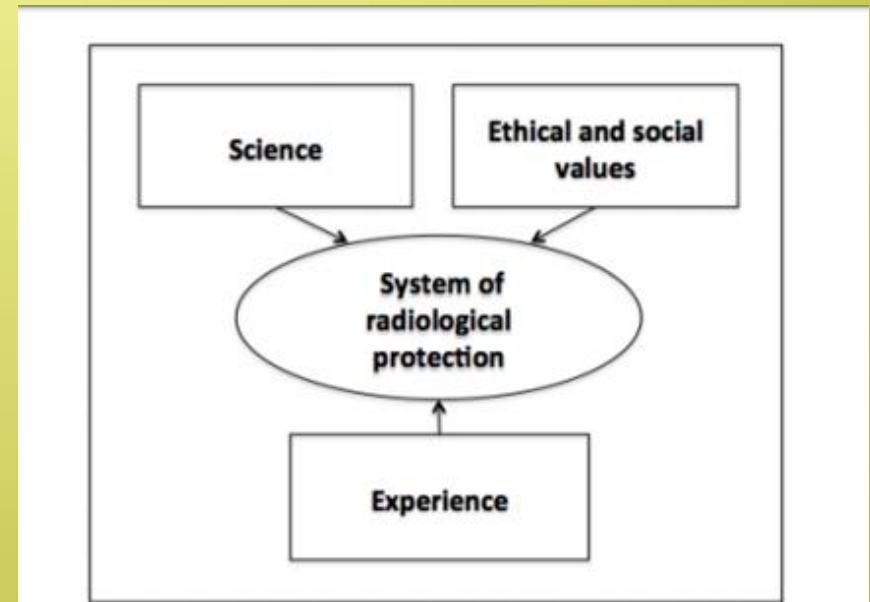


Fig. 2. The three pillars of the system of radiological protection.

The ethical values underpinning the system

- *The system of radiation protection relies on the **principles** of Justification, Optimisation and Limitation*
- *The system relies on four **core ethical values**:*
 - **Beneficence and non-maleficence**
 - **Prudence**
 - **Justice**
 - **Dignity**
- ***Procedural values** allocating responsibilities to those involved in the radiological protection process such as:*
 - **accountability**
 - **transparency**
 - **inclusiveness (stakeholder participation)**

Beneficence and non-maleficence

Beneficence means promoting or doing good, and non-maleficence means avoiding causation of harm.

Non-maleficence is closely related to prevention, which aims to limit risk by eliminating or reducing the likelihood of hazards

Beneficence includes consideration of direct **benefits**, for individuals, communities, and the environment.

- Closely linked to the principle of **Justification**
- Application to waste management?
 - **justification of the fuel cycle as a whole or separately for waste management?**
 - **concentration (disposal) or dispersion?**
 - **clearance?**

Justice

Justice is defined as fairness (degree of equity) in the distribution of advantages and disadvantages among groups of people (distributive justice)

- The principle of equity reflects the personal circumstances in which individuals are involved.
 - It is the role of **dose constraints and reference levels** to reduce the range of exposure to individuals subject to the same exposure situation.
- The principle of equal rights guarantees equal treatment for all with regard to higher levels of exposure.
 - It is the role of **dose limits** to ensure that all members of the public, and all occupationally exposed workers, do not exceed the level of risk deemed tolerable by society and recognised in law.

Justice

- *Distributive justice: fairness in the distribution of advantages and disadvantages among groups of people*
- *Restorative justice: fairness in compensation for losses*
- *Procedural justice: fairness in the rules and procedures in the processes of decision-making.*

Justice

- *Distributive justice: fairness in the distribution of advantages and disadvantages among groups of people*
 - Relevant at very low doses?
 - Distribution of exposures among hypothetical individuals?
 - Combine probabilities of exposure and of health risk?

 Related to the ethical value of Prudence

Ethical foundation of clearance

- **Prudence** in exposure scenarios (especially for artificial radionuclides) yields conservative activity concentration values, and can be given a cautious probabilistic interpretation.
 - Also prudence with sorting, mixing, and monitoring
- **Procedural values:**
 - Accountability in dismantling nuclear installations both for industry and regulator
 - Documentation and transparency
 - Inclusiveness: industries processing cleared materials
 - Need for dialogue
 - Involve industries and workers in these industries as stakeholders

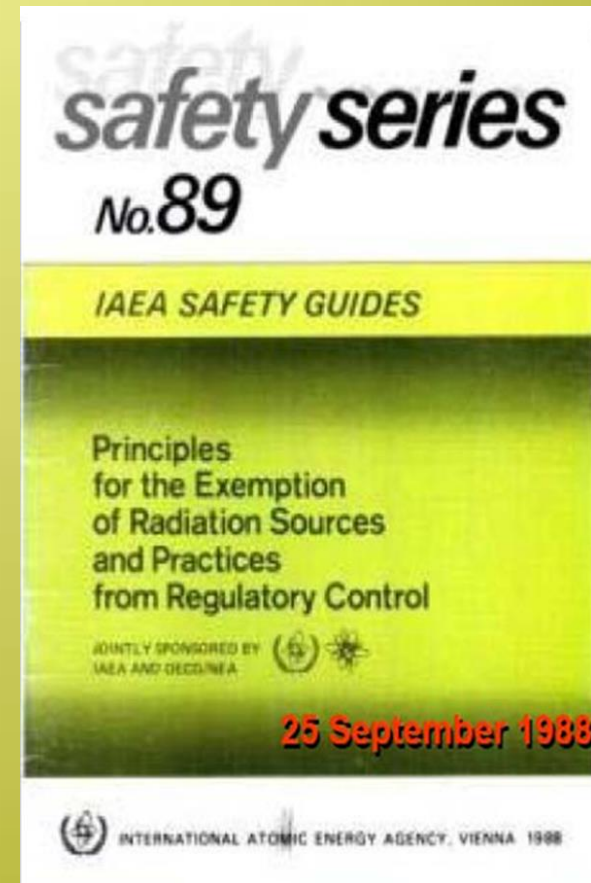
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Safety Series 89

Published in 1988, now listed as obsolete in the IAEA Safety Standards series, but still important for understanding the development of the concept.

- *Two basic criteria were identified for determining whether or not a practice could be a candidate for an exemption from the Basic Safety Standards:*
 - **individual risks must be sufficiently low as not to warrant regulatory concern;** and
 - radiation protection, including the cost of regulatory control, must be optimized.



Safety Series 89

defined a level of individual dose that could be defined as 'trivial'.

- “it is widely recognized that values of individual risk which can be treated as insignificant by the decision maker correspond to **a level at which individuals who are aware of the risks they run would not commit significant resources of their own to reduce these risks.**“
- “Most authors proposing values of trivial individual dose have set the level of annual risk of death which is held to be of no concern to the individual at **10^{-6} to 10^{-7}** .
- Taking a rounded **risk factor of 10^{-2} Sv^{-1}** for whole body exposure as a broad average over age and sex, the level of trivial individual effective dose equivalent would be in the **range of 10-100 μSv per year.**”
- “Because an individual may be exposed to radiation doses from **several practices** that may have been judged exempt, ... it may be reasonable for national authorities to apportion a fraction ... to each practice. Such fractionation could lead to individual doses to the critical group **of the order of 10 μSv in a year from each exempt practice.**”

Dosimetric criteria in EBSS

The general criteria for the exemption of practices from notification or authorisation or for the clearance of materials from authorised practices are as follows:

(a) the radiological risks to individuals caused by the practice are sufficiently low, as to be of no regulatory concern; (b) ...

For compliance with (a), it shall be demonstrated that

- workers should not be classified as exposed workers, and*
- the following criteria for the exposure of members of the public are met in all feasible circumstances:*

For artificial radionuclides:

The effective dose expected to be incurred by a member of the public due to the exempted practice is of the order of 10 µSv or less in a year.

For naturally-occurring radionuclides:

The dose increment, allowing for the prevailing background radiation from natural radiation sources, liable to be incurred by an individual due to the exempted practice is of the order of 1 mSv or less in a year.

RS-G-1.7

- *Application of the Concepts of Exclusion, Exemption and Clearance (2004)*
- *Scope defining levels (SDL's) for artificial radionuclides fit in the conceptual framework of exemption, rather than exclusion, and should be regarded as the lower boundary to a **graded approach of regulatory control**.*
- *The values in RS-G-1.7 were incorporated for exemption of large quantities and for general clearance both in the IBSS and the EU Directive*
 - **Council Directive 2013/59/Euratom**

Ethical foundation of clearance

- ***Criteria for clearance relate to the concept of justification***
- *they are not related to the principle of Justice*
 - **No dose limit:** the tolerability of risk is not applicable;
 - **No constraint:** dosimetric criteria can range from 10 μSv to 1 mSv per year, for public exposure, depending on the exposure situation.

Criteria other than dosimetric?

- *Radionuclide-specific considerations*
 - **Cost of processing and measurement**
- *Pragmatic approaches, also in view of simplification*
 - **Food and drinking water**
 - **Food and non-edible agricultural produce**
- *Clearance and post-accidental contamination*
 - **Avoid spread of radioactive contamination**
 - **Enhancement of background (e.g. in containers controlled for orphan sources)**

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Authorised release or clearance?

- *Is there still room for « conditional clearance » ?*
 - **Clearance for landfill disposal?**
disposal with industrial waste or specific recycling routes
 - **Rather: specific exemption levels for the recipient:**
Criterion 1 mSv/y for landfill workers?
 - **Stakeholder involvement also for « unconditional » clearance**
- *Release of sites*
 - **Sites remain under regulatory supervision**
 - **Re-occupancy preferably without restrictions**
But should doses be trivial?

A few points for discussion

- ➔ *Should we apply clearance criteria to the release of former nuclear sites?*
- ➔ *Do we need new levels for disposal in landfill?*
- ➔ *How should we manage compliance with clearance levels, strictly or pragmatically?*
 - *What is the role of the supervising authority? Verify compliance or approve overall approach?*
 - *Are we ready to involve stakeholders?*
 - *Are we ready to communicate on the clearance policy? In response to media or proactively?*

A few points for discussion

- *Should we apply clearance criteria to the release of former nuclear sites?*
 - **UK: criterion $10^{-6}/\text{y}$; how is this assessed?**
 - **DE: very low activity concentrations for “soil areas”**
- *Do we need new levels for disposal in landfill?*
 - **Should landfill operators be permitted to refuse cleared materials?**
- *How should we manage compliance with clearance levels, strictly or pragmatically?*
 - **« of the order of $10 \mu\text{Sv}/\text{y}$ » or default levels?**
 - **Take the general clearance levels without further consideration?**
 - **UK: old values for C-14, Cs-137**