



Review of the ICRP system

The approach to existing exposure situations

2nd International Symposium on the System of Radiological Protection

Abu Dhabi, UAE

October 23, 2013

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The Aims of the Recommendations

(§ 26) To contribute to an appropriate level of protection for people and the environment against the detrimental effects of radiation exposure **without unduly limiting the desirable human actions** that may be associated with radiation exposure

(§ 29) The Commission's system of radiological protection aims... to manage and control exposures to ionizing radiation so that deterministic effects are **prevented**, and the risks of stochastic effects are **reduced to the extent reasonably achievable**

The Principles

- **The principle of justification:** Any decision that alters the radiation exposure situation should do more good than harm
- **The principle of optimisation of protection:** All exposure should be kept as low as reasonably achievable, taking into account economic and societal factors with restrictions on individual exposure to limit inequities in the dose distribution
- **The principle of application of dose limits:** The total dose to any individual from regulated sources in planned exposure situations other than medical exposure of patients should not exceed the appropriate limits recommended by the Commission.

Exposure Situations

- “The process causing human exposures from natural and man-made sources.”



- “Protection can be achieved by taking action at the source, or at points in the exposure pathways, and occasionally by modifying the location or characteristics of the exposed individuals.”
ICRP103, § 169

The Source Factor

	Source
Existing	Already there when decision on control need to be made
Planned	Deliberately introduced and fully under control
Emergency	Loss of control or unexpectedly introduced

Existing Exposure Situation : The Time Factor

- Planning **protection actions** can be done on the basis of actual conditions to influence pathways
- The reactions should not need to be urgent and can be implemented at any time
- Protection actions are effective immediately when implemented
- **Progress may take time** for reaching a full control of the situation i.e. bringing all individuals below the relevant reference levels (e.g. radon and contaminated areas after a nuclear accident)

Types of Existing Exposure Situations

- Exposure of aircraft crew to cosmic rays
- Exposure to radon in dwellings and workplaces
- Exposure to naturally occurring radioactive material
- Exposure in contaminated territories after a nuclear accident or a radiation emergency
- Exposure on contaminated sites from past activities

Unique Features of Existing Exposure

- **Ubiquity, variability**
- Situation should be **characterised** before to be controlled
- Controls mainly through the **pathways** (source not always easy to control directly)
- **Large distribution** of individual exposures
- Exposure of workers may be **adventitious** (not part of the job)
- Lack of awareness, **lack of RP culture**
- Risk reduction depending on personal behaviour (**self-help** protective actions)
- **Long-term** perspective

A Similar Approach

Planned exposure situations

Dose limit

Dose constraint

Optimisation

Existing and Emergency exposure situations

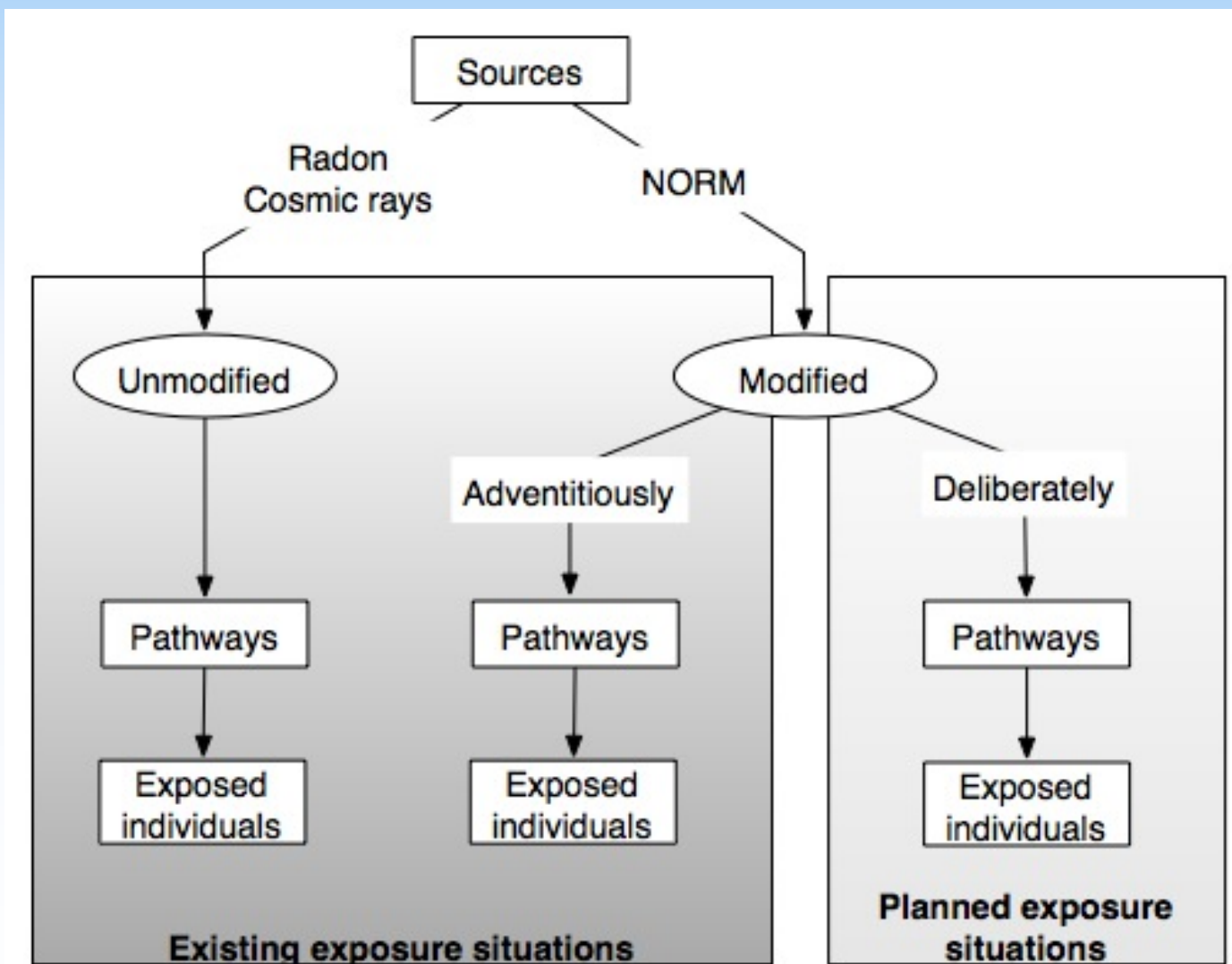
Reference level

Optimisation

How Does NORM Fit?

- NORM = **existing exposure situation**
 - Primary source = concentration of ubiquitous natural activity in material from the earth's crust
 - Human activities may create or alter pathways modifying concentrations
 - Pathways can be controlled by preventive or corrective actions
- **Same approach** (optimisation below a dose restriction)
- NORM **can be managed as planned exposure situation**
 - When the existing source is removed and noticeably modified to be used as a radiation source

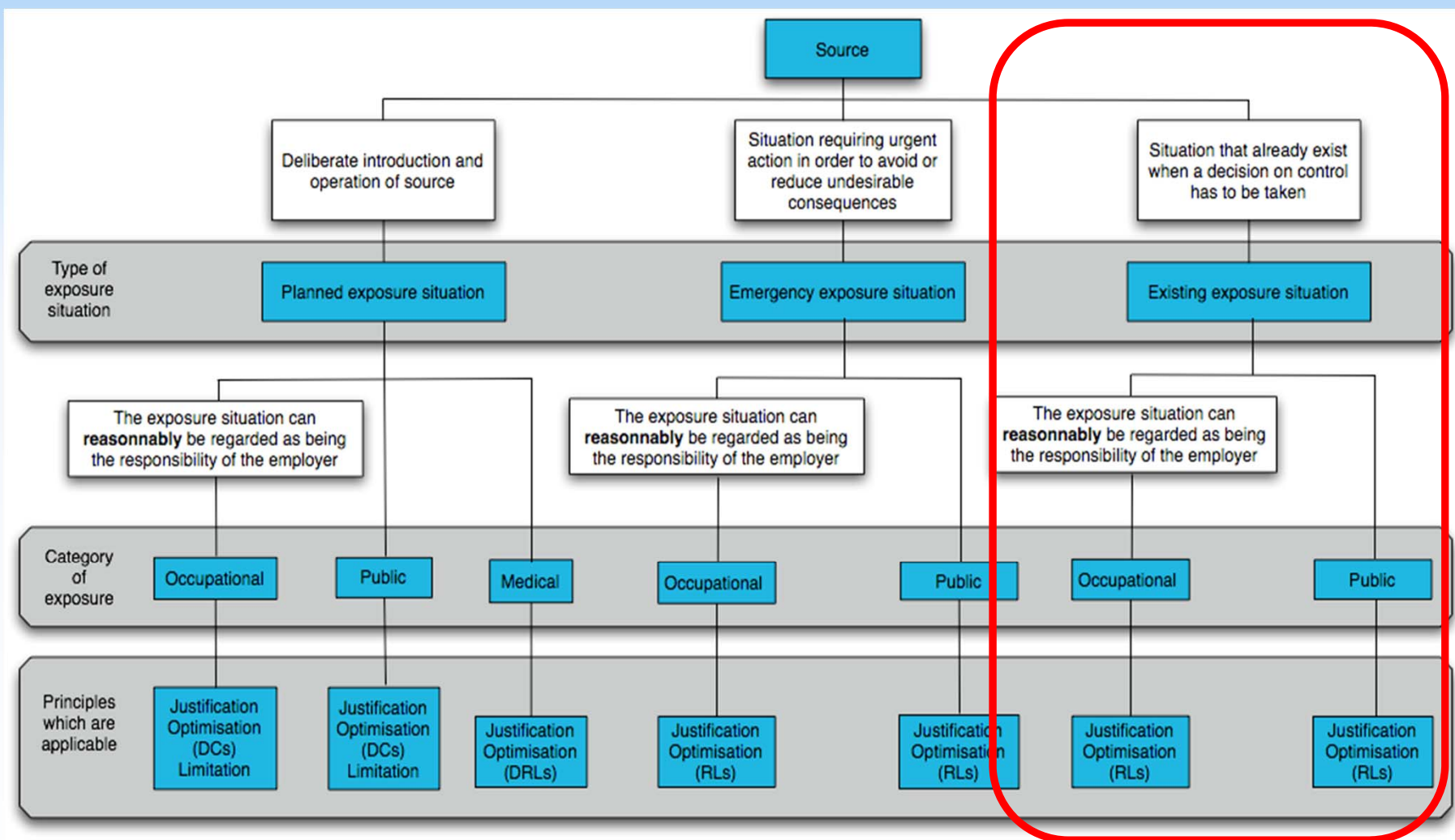
Exposure from Natural Sources



The Categories of Exposure

- **Occupational exposure:** “... radiation exposures incurred at work as a result of (*exposure*) situations that can reasonably be regarded as being the responsibility of the operating management.” ICRP 103, § 178
- **Medical exposure:** “Radiation exposures of patients occur in diagnostic, interventional, and therapeutic procedures.” ICRP 103, § 181
- **Public exposure:** “Public exposures encompasses all exposures of the public other than occupational exposure and medical exposures of patients.” ICRP 103, § 180

Application to Exposure Categories



Graded Approach

- What are the **risks**? What are the **opportunities**?
- Appropriate and **adapted** strategies
- **Ambition, realism, effectiveness**
- Degree of enforcement related to the ambition
- Legal responsibilities = mandatory provisions, commensurate with the degree and the type of the responsibilities
- Consequence of exceeding the RL also depending on the situation
- **Action may not be warranted**
 - Exclusion: not amenable to control
 - Exemption: control unwarranted (disproportionate)

Complications

- The concept of restricting individual doses is **not just equivalent** to “dose limits”. It involves establishing the adequate protection expectations for the particular circumstance
- The use of a reference level vs. dose limit is a function of the regulatory construct chosen to be most appropriate
- Applying some or all of the requirements for planned exposure situations is not automatic, but may be appropriate if the exposures are significant, or the ongoing actions can be well controlled
- Backfitting can be tough and expensive, and must reflect a justified balance of costs and benefits

Thoughts

- The overall objective of RP is protection of people and the environment and is valid for all exposure situations.
- You have to know what you are dealing with before you can make decisions about what to do
- The approach selected must match the circumstances of the situation and the exposure
- Responsibilities must be clear
- Stakeholders must be involved

Thoughts

- Exposures are always to be optimized
- Protection expectations and regulatory tools are independent of exposure situations
- Constraint or Reference Level provide boundary in optimization process
- Numeric value of limit can serve as protection expectation for occupational exposure in existing exposure situations based on ethics and safety
- Decision and control tools can be applied in graded approach in existing exposure situations just as in planned exposure situation

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