The philosophy of the ICRP system applied to radon and NORM

Challenges in applying the RP system in management of NORM and radon

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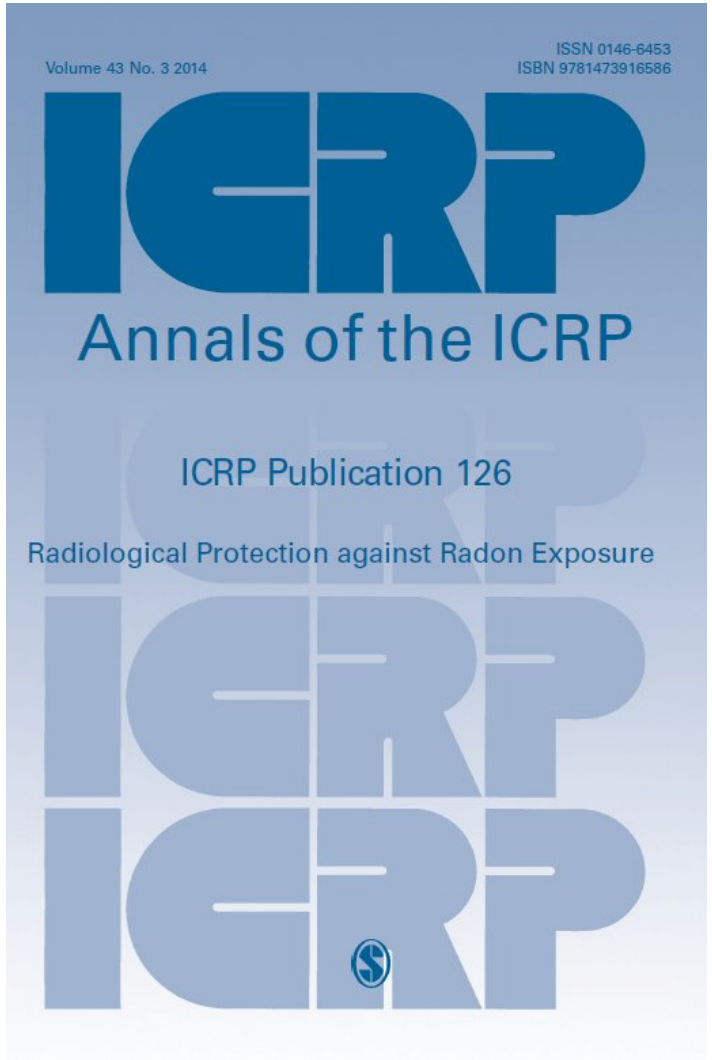
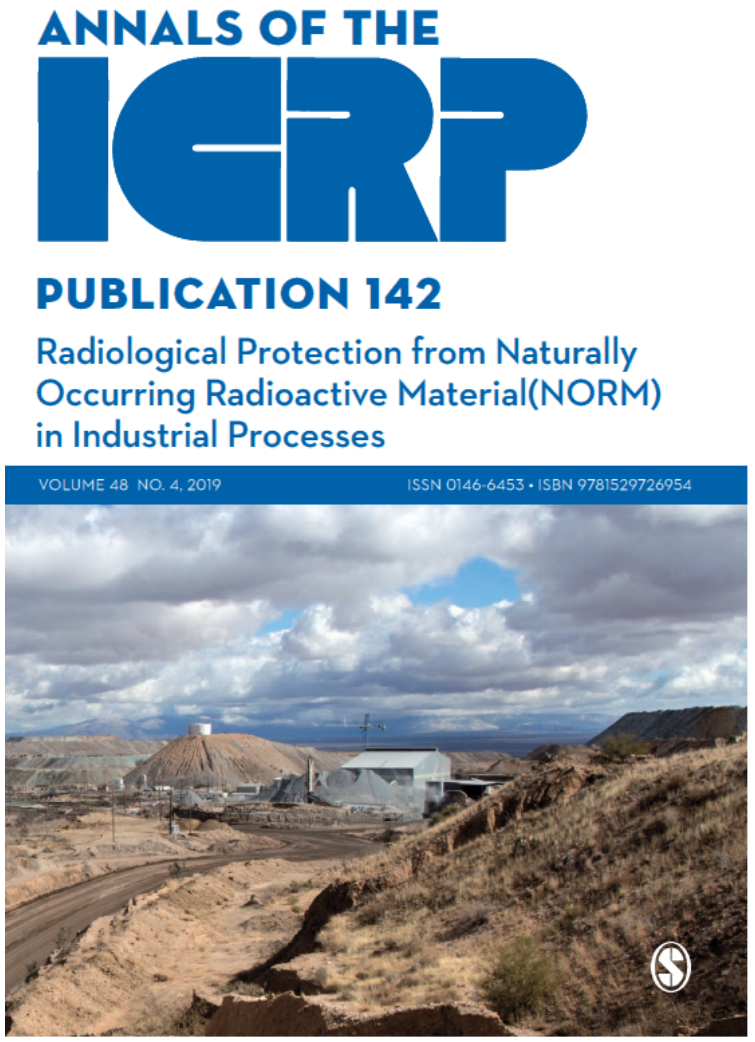
Jean-Francois Lecomte
C4 Emeritus Member

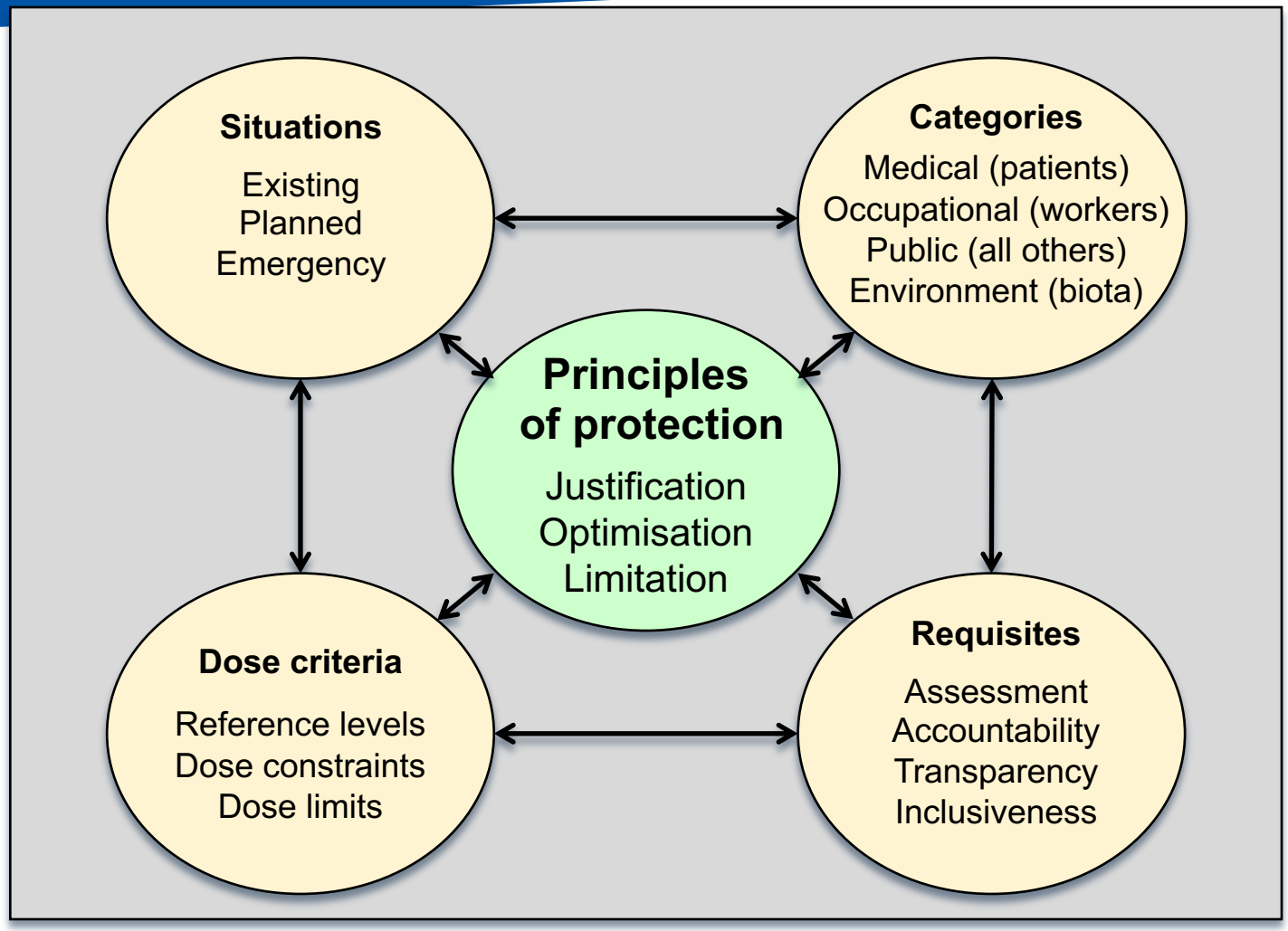
ICRP INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

ICRP Publications 126 (Radon, 2014) and 142 (NORM, 2019)





The ICRP System of Protection



Characteristics of the Rn & NORM exposures

- Natural radionuclides **already existing** and not used for their radioactive properties (Rn + NORM)
- **No real prospect of emergency** leading to tissue reaction or immediate danger of life (Rn + NORM)
- **Ubiquity** and **variability** of the exposures (Rn + NORM)
- Exposure can be anticipated but its level cannot without a **characterisation** (Rn + NORM)
- **Internal exposure** difficult to prevent (Rn + NORM)
- **Lack of RP culture** (Rn + NORM)
- Often **multi-hazards** and radiological risk rarely dominant (NORM)
- There are **limited options** for management of residues and waste (NORM)

Exposure Situations & Categories of exposures

- ICRP considers **Radon** and **NORM** exposures **as existing Exposure Situations**

- They can lead to:
  - **Occupational** exposure, but not for all workers
  - **Public** exposure
  - **Environmental** exposure (NORM only)

- An approach both **integrated** and **graded** is recommended

RP Principles

- **Justification**
  - Of the protection strategy
  - After characterisation
  - Priorities: Radon prone areas/buildings & National list (NORM)
- **Optimisation of the protection**
  - Driving principle (prevention & mitigation ALARA)
  - Prevailing circumstances (options may be more limited)
  - Use of reference levels (in concentration for Radon)
- **Application of the dose limits**
  - A priori not relevant
  - May be applied for regulatory purpose

Integrated approach – Radon

- Management of radon exposure as far as possible **at the level of the building** whatever its occupants
  - Dwellings, workplaces, mixed-use buildings
  - In a public health perspective (WHO)
  - Unique reference level
- **Straightforward** and **realistic** approach
  - No distinction smokers / non-smokers
  - No specific requirement for children
- Combination with **Indoor Air Quality** and **Energy saving** policies
- Address health, economic, architectural and educational issues
- General ambition: address both the **highest exposures** and the **global risk**

Graded approach – Radon

- Selection of the **reference level**: between 100-300 Bq/m3
- National action plan: set **priorities**: radon prone areas/buildings
- **Prevention** and **mitigation** (existing and new buildings)
- **Incentive** or **mandatory** requisites, **long-term** strategy
- **Graded** approach for workers
  - At the level of the building with RL in concentration (Bq/m3)
  - At the level of workers with a RL of the order of 10 mSv/y
  - Occupational exposure:
    - In some activities and facilities (national list)
    - When the dose remain > RL
  - Other workers treated in the same way as mb of the public, with arrangements
- Recommendation to manage radon and other radiation **separately** (pragmatism)

Integrated approach – NORM

- **Workers**:
  - Starting with the **protection strategy already in place** or planned to manage other workplace hazards (hygiene & safety at work) and **integrating, as necessary**, specific radiological protective actions to complement

- **Environment:**
  - **All hazards**: radiological and non-radiological stressors
  - **All impacts**: human and ecological (non-human species)

Graded approach – NORM – Workers

- Select a relevant **Reference Level** reflecting the distribution of exposures
  - Less than a few mSv/y in most cases; above a few mSv/y in some cases but very rarely exceeding 10 mSv/y
- Start with appropriate **collective protective actions** and continue with **individual** ones (2 series)
  - **Collective**: related to workplaces and working conditions
  - **Individual**: related to each worker individually
- More or less thorough **implementation** of protective actions

Graded approach – NORM – Public

- **Characterisation** (who is exposed, when, where, how)
- **Optimisation** within a **graded approach** through the control of discharges, waste, recycled residues (including building materials)
- Selection of a relevant **Reference Level**
  - Generally less than a few mSv/y
- **Stakeholder involvement** (including multidisciplinary approach)

Graded approach – NORM – Environment

- **Step by step** approach
  - Generic assessment
  - Specific assessment
  - Detailed Environmental Impact Assessment (EIA) as necessary

- Use of tools (RAP…) and criteria (DCRL…) established by ICRP (Pub 124) **as appropriate**

- **Stakeholder involvement**

Ethical considerations

- **See Pub 138**

- **Tolerability is challenging** (what means unacceptable?)

Conclusions

- Many **similarities** between Radon and NORM (Rn is the main exposure in several processes involving NORM)

- The key recommendations are:
  - **Characterisation** of the situation
  - **Justification** of the protection strategy
  - **Optimisation** of the protection through an approach both **integrated** and **graded**

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