

The ICRP Approach for Radiological Protection from NORM in Industrial Processes – ICRP future Publication 142

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TG 76 on Protection against NORM Exposure

- Launched in 2007, re-launched in 2013
- Report included in the **Series of C4 reports on Existing ES**: ICRP 111 (Post-accident), 126 (Radon), 132 (Cosmic), 142 (NORM), TG98 (Contaminated sites)
- Public consultation from Nov 2018 to Feb 2019
- 25 comments received and addressed
- Approved in July 2019 for publication as **Pub 142** (expected late 2019)

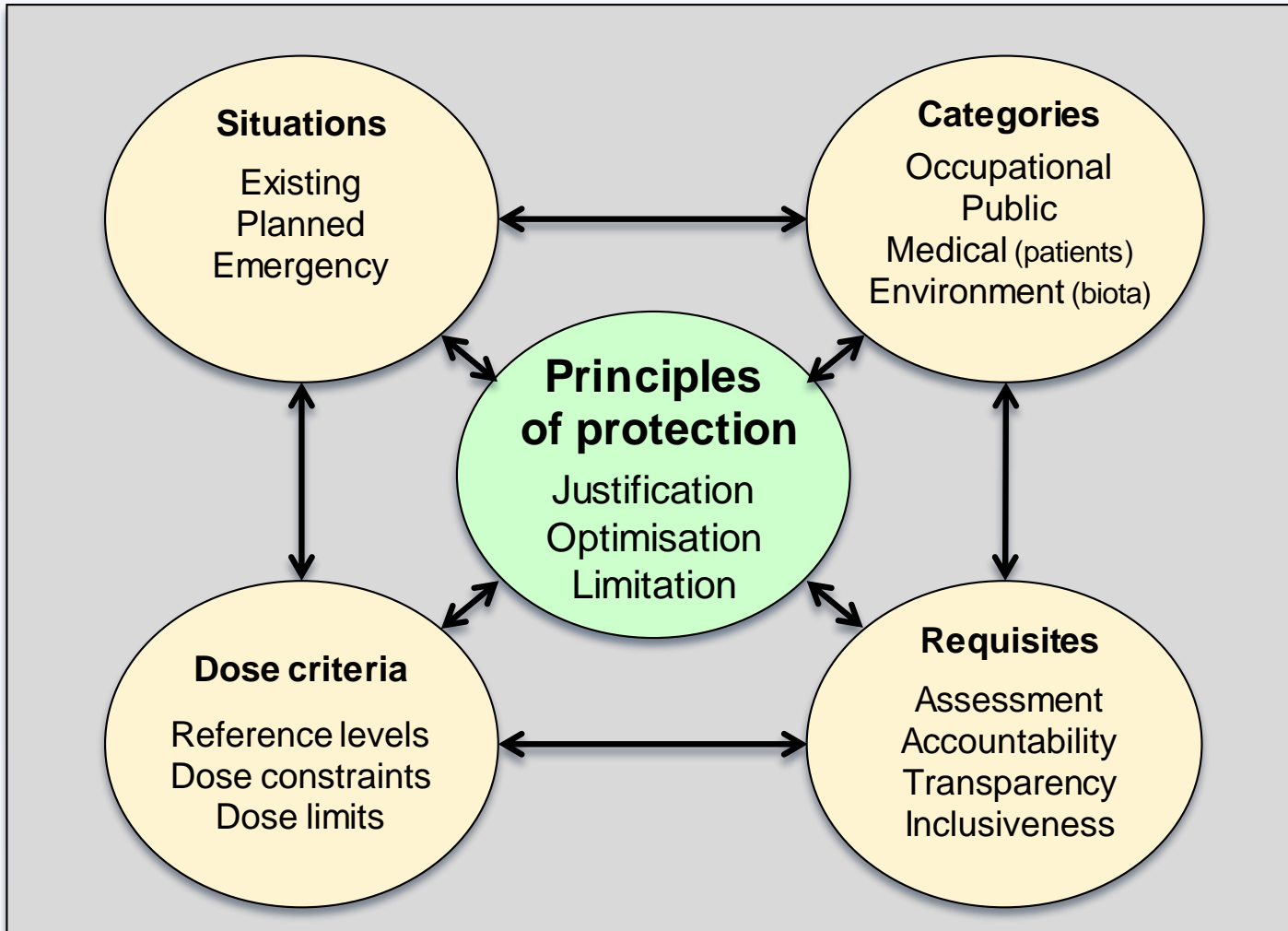
A wide range of practices

- Mining and extractive industries (other than U mines)
- Production of coal, oil, gas
- Production and use of metals (thorium, niobium, zirconium, titanium...)
- Phosphate industry
- Water treatment
- Cement production
- Building materials
- Etc.

Characteristics of NORM industries

- **Identified**, very diverse, already on-going, generally big size but **not one sector** in itself
- Often **multi-hazards**, radiological risk rarely dominant
- Subject to **authorisation**, not for RP
- Experience in risk management but **poor RP culture**
- NORM cycle: Extraction, transformation, use, reuse/recycling, waste
- **Ubiquity, variability** of exposures
- **No real prospect of emergency** leading to tissue reaction or immediate danger to life
- May pose an issue of **environmental contamination**

The ICRP System of Protection



Exposure Situations / Categories of Exposure

- **Existing/planned ES is a controversial issue for NORM**
 - IAEA/BSS & EU/BSS (NORM managed as planned ES)
 - NORM may be deliberately introduced in the industrial process but not for its radioactive properties
 - The process involving NORM is mainly incidental
 - ICRP considers **NORM as existing ES** (Pub 103, § 284, 288), except if NORM is used for its radioactive properties
 - The situation-based system is proportionate to the level of the risk
 - Flexibility in the use of regulatory tools to achieve protection
- Processes involving NORM may lead to **occupational** exposure (not for all workers), **public** exposure and **environmental** exposure

RP Principles

- **Justification**
 - Of a protection strategy (idem for a new process unless exception)
 - After characterisation
 - National list (on a case by case basis for processes out of the list)
- **Optimisation**
 - Driving principle
 - Implemented in the same way as for other industries
 - Prevailing circumstances (options may be more limited)
- **Dose limitation**
 - A priori not relevant
 - May be applied for regulatory purpose

Protection of workers

- An approach both **integrated** and **graded** is recommended
- By starting with the **characterisation** of the exposure situation, and integrating, as necessary, specific radiological protective actions to **complement the protection strategy already in place** or planned to manage other workplace hazards
- The approach is then graded
- By selecting a relevant **Reference Level** reflecting the distribution of exposures
 - Less than a few mSv/y (most cases)
 - Above a few mSv/y but very rarely exceeding 10 mSv/y
- By selecting appropriate **protective actions**: 2 series
 - **Collective**: related to workplaces and working conditions
 - **Individual**: related to each worker
- More or less thorough implementation of protective actions

Protection of the public

- **Characterisation** (who is exposed, when, where, how)
 - Exposure pathways analysis
 - Dose assessment
 - Justification of action
 - Optimisation of protection
 - Involvement of stakeholders
 - Long-term monitoring
- **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 of mSv/y
- **Stakeholder involvement**

Protection of the environment

- Source = discharges and residues
- **Integrated** approach
 - All hazards: radiological and non-radiological stressors
 - All impacts: human and ecological (non-human species)
- **Graded** 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**
- **Involvement of stakeholders**

Radon exposure

- Reference to **Pub 126**
- Management of radon exposure as far as possible **at the level of the building** whatever its occupants
 - National action plan
 - Reference level: 100-300 Bq/m³
 - List of materials at stake + information
- **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
- Recommendation to manage radon and other radiation **separately** (pragmatism)

Conclusion

- To address **natural radiation** remain a **challenge**
- ICRP recommendations are:
 - **Characterisation** of the situation and justification of a protection strategy covering radiological risk
 - **Integrated approach**: starting with the strategy already in place or planned to manage other workplace hazards
 - **Graded approach**: within the optimisation process (e.g. collective protection and, as necessary, individual protection for workers)
 - Involvement of **stakeholders**

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