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

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Report included in the Series of C4 reports on Existing ES: ICRP 111 (Post-accident), 126 (Radon), 132 (Cosmic), 142 (NORM), TG98 (Contaminated sites)

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25 comments received and addressed

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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

**Principles of protection**
- Justification
- Optimisation
- Limitation

**Situations**
- Existing
- Planned
- Emergency

**Categories**
- Occupational
- Public
- Medical (patients)
- Environment (biota)

**Dose criteria**
- Reference levels
- Dose constraints
- Dose limits

**Requisites**
- Assessment
- Accountability
- Transparency
- Inclusiveness
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
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)
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**