Introduction to TG 98 Report

How the System of Radiological Protection Relates to the Management of Contaminated Sites

Task Group 98 Workshop

Radiological Protection in Areas Contaminated by Past Activities

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Terms of Reference

- **Describe and clarify the application of the Commission's Recommendations on RP of workers, the public, and environment**
- **Scope: Sites contaminated from past industrial, military and nuclear activities**
  - Residual activity never subject to radiological control, or
  - Not controlled according to ICRP current Recommendations
- **Report will consider characterisation of sources, exposure pathways, dose distribution, categories of exposure, protection of the environment, and the setting of reference levels for sustainable protection strategies**
- **Consider stakeholder involvement in all steps**

More on Scope of Report

- TG 98 does not address the planned remediation of areas as part of the operation or decommissioning of facilities that were continuously maintained under adequate regulatory control, or cases of contamination of localised areas within the site boundary of an authorised facility, which are treated in the framework of planned exposure situations.
- Emergency exposure situations in case of a severe nuclear power plant accident and subsequent post-accidental phase, which are addressed in Publication 146 (ICRP, 2020), are not considered in the scope of this publication.

Main Points

1. The Commission recommends managing exposures in areas contaminated by past activities as existing exposure situations. A graded and integrated all-hazards approach should be taken for the protection of the workers, public and the environment, addressing actual exposures and exposures not certain to occur, both now and in the future.

- Existing exposure situations are defined in ICRP Pub. 103.
- A graded approach means "…implementing the system of protection in a way that is proportionate to the magnitude and likelihood of the risk, the complexity of the exposure situation and the prevailing circumstances." (ICRPaedia glossary)

TG 98 Definitions

- Integrated approach means "…remedial actions should be taken to ensure both the protection of people and the environment."
- All-hazards approach means "…radiological and non-radiological hazards should be considered together while defining the best protection strategy."
- Exposures not certain to occur means "…exposures arising from contaminated areas over the medium and long term that are not expected to be delivered with certainty." This term was selected to avoid confusion with potential exposures, which are defined in Pub. 103 in the context of planned exposure situations.

Main Points

2. The remediation process underpins the management of contaminated areas. It encompasses 5 phases: recognition, site characterisation, planning of remediation, implementation of the remedial action plan, and post-remediation management. Waste management is included as an important aspect to consider during the remediation process.

- This process will be discussed in the following presentation by Analia Canoba on implementation.

Main Points

3. **Early, broad and ongoing stakeholder involvement in the remediation process, including the selection of relevant radiological criteria, is central to a sustainable strategy.**

- **Stakeholder involvement is a key aspect of most successful contaminated site remediation projects. An example will be featured in the case study presentation today by Stephen Long for the Maralinga site in Australia.**
- **The ethical foundation for stakeholder involvement is featured in TG 98's section on justification and the role of stakeholders is highlighted in the description of the optimisation process.**

Main Points

4. **The reference level for public protection should be selected in the lower range of the 1 to 20 mSv per year dose band, with the objective to progressively reduce exposure close to 1 mSv per year as the site situation improves.**

- **TG 98's approach for managing public protection in existing exposure situations is consistent with recent ICRP Publications.**
  - Pub. 146 for managing public exposures in the long-term phase following a large nuclear accident
  - Pub. 142 for managing NORM exposure arising from industrial processes (with radon and thoron being treated separately according to Pub. 126)
- **This advice is supported by practical experience, as described in the case studies.**

Main Points

5. **Remediation workers are, in most circumstances, managed as occupationally exposed workers. Nevertheless, the Commission recognises that flexibility in the use of regulatory tools to achieve protection may be required to implement an adequate protection strategy.**

- **This subject will be discussed in the next presentation on implementation.**

Structure of the Publication

- Section 2 presents the characteristics of exposures associated with areas contaminated by past activities, based on case studies described in Annex A.
- Section 3 describes the Commission's system of radiological protection applied to exposures resulting from areas contaminated from past human activities, including the type of exposure situation, the category of exposure concerned and the basic principles to be applied.
- Section 4 provides guidance on the implementation of the system of radiological protection of the public, the environment and remediation workers over the lifetime of the remediation process.
- Section 5 summarises the main conclusions.
- The Annex includes 5 case studies each of which provides details of a particular existing exposure situation, and how the situation was managed.

Contemporary Issues Discussed in TG 98

- Management of occupational exposures in existing exposure situations (EES)
- Sustainability and stakeholder involvement
- Ethical foundation of RP
- Protection of the environment
- Exposures not certain to occur

Occupational Exposures

- Radiation doses to remediation workers should be managed as planned exposures when the EES is well characterised and exposure pathways can be controlled.
- A graded approach should be applied to the management of workers who are exposed exceptionally or episodically.
- More details on the treatment of occupational exposures will be provided in the next presentation.

Sustainability and Stakeholder Involvement

- Early, broad, and ongoing stakeholders' involvement is central to designing and implementing a sustainable remediation strategy.
- The protection strategy to control exposures from contaminated areas should take into account health, economic, environmental, societal, cultural, and ethical considerations, as well as other specific local considerations.
- A co-expertise process of cooperation between experts, professionals and local stakeholders allows for sharing local knowledge and scientific expertise to evaluate and better understand the radiological situation, develop protective actions to protect people and the environment, and improve living and working conditions.

Ethical Foundation of RP

- TG 98 report incorporates the ethical values outlined in ICRP Publication 138.
- The four core ethical values – beneficence/non-maleficence, prudence, justice, and dignity – are considered an integral part of the recommended protection strategies for managing exposures associated with contaminated areas.
- Ethical values of beneficence/non-maleficence, prudence, and dignity support a broad view of justification that considers the well-being of individuals and the environment now and across future generations.
- In the optimisation process, the use of reference levels as individual dose criteria prevents serious inequity in the distribution of individual doses to humans, in line with the ethical value of justice.

Protection of the Environment

- Although not listed in the 3 categories of exposure identified in Pub. 103 (occupational, public and medical), ICRP also extended the system of protection to address the protection of the environment, including flora and fauna, more explicitly.
- Remediation of contaminated areas should consider the protection of human and non-human biota in an integrated manner.
- Environmental radiological protection includes more than protecting flora and fauna. It includes the conservation of other ecosystem components such as air, water, soils, sediments, and habitats.
- Efforts devoted to the assessment of impacts on flora and fauna should be commensurate with the level of risk.

Exposures Not Certain to Occur

- Potential exposures are defined in Pub. 103 as those arising in planned exposure situations as a result of “deviations from normal operating procedures including accidents and malicious events.”
- Management of contaminated sites may also require consideration of exposures that are possible but not certain to occur for the different protection strategies. To avoid confusion, TG 98 uses the phrase “exposures not certain to occur” for EES.
- Assessments of exposures not certain to occur should be reasonably realistic instead of focusing on highly unlikely scenarios. (The probability of an event and its consequences can be evaluated to assess the risk.)
- The Dalgety Bay case study provides a useful example.

Overview of Case Studies

- Five case studies are presented in the TG 98 report. Many remediation decisions in these examples predate the latest general recommendations of the ICRP (Pub. 103). Nevertheless, most of the implementation strategies adopted at these sites are compatible with the current recommendations.
- The first case study is the Rocky Flats Plant near Denver, Colorado, USA. It illustrates the stakeholder involvement process and prospective dose assessment (the land was and is unoccupied). The radionuclide of concern is Pu-239 with a reference level of 0.15 mSv per year.
- The second case study is the former above ground nuclear test site at Maralinga that covers about 3300 km2 in southern Australia. This example will be presented later in this workshop.

Overview of Case Studies

- The third case study is the remediation of radium contamination in the Swiss watch industry. It illustrates the setting of reference levels in a contaminated area that was not primarily land. The radionuclide of concern is Ra-226 from radium dials with a reference level of 1 mSv per year.
- The fourth case study is the Techa River area in the Chelyabinsk Region of the Ural Mountains in the former Soviet Union, which is now in the Russian Federation. It illustrates a complex site where past, present, and future exposures need to be considered, along with evaluation of radionuclide transport and land use restrictions. Radionuclides of concern are mixed fission products including Sr-90 and Cs-137. A reference level has not been established.

Overview of Case Studies

- The fifth case study involves Ra-226 contamination from a former airfield and aircraft servicing base that operated from 1917 to 1959 in Dalgety Bay, Scotland, UK. The radionuclide of concern is Ra-226 in the form of discrete particles. The remediation goal for the exposures not certain to occur is that the current or future probability of an individual receiving 1 mSv committed effective dose is less than 10^{-6} per year.

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