

ICRP

Report of the ICRP TG 80 “Radiological Protection in Geological Disposal of Long-lived Solid Radioactive Waste”

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ICRP

INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

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Terms of Reference

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Scope

Different phases of a geological disposal facility

The application of the ICRP system of protection (justification, optimisation, dose concepts)

Basic ICRP principles dealing with future generations

Terms of reference (1)

- I. Develop a report which covers both the protection of humans (**workers and the public**) and the environment and discusses key issues like the transition from a planned to an existing exposure situation in case of a loss of control of the waste system as well as the applicability of dose calculated for the far future for decision aiding.

The report should update ICRP Publication 46, 77, and 81.

Terms of reference (2)

II. Provide guidance in **plain language** on:

1. the **basic concepts and terms**, eg. the radiation protection principles, the different types of situations (**planned, emergency, and existing**), dose and risk constraints;
2. the nature and role of **optimization** ;
3. the use and application of **dosimetric units and concepts** at different time frames;
4. the role of **stakeholder** involvement in different stages of planning and development.

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1. Scope of this report
2. Basic values and goals underlying protection for a geological disposal of radioactive waste
3. Application of the ICRP system of protection during different timeframes in the life of a geological disposal facility
4. „Endpoint considerations“ (The Representative Person and Protection of the environment)

Annex 1: The ICRP system of protection, focusing on aspects relevant to the geological disposal of long-lived solid radioactive waste

Annex 2 ICRP use of „potential exposure“

Annex 3 Technical and management principles and requirements

Annex 4 Glossary

Scope

The report deals with the **radiological protection of workers, members of the public and the environment**, following the disposal of long-lived solid radioactive waste in geological disposal facilities.

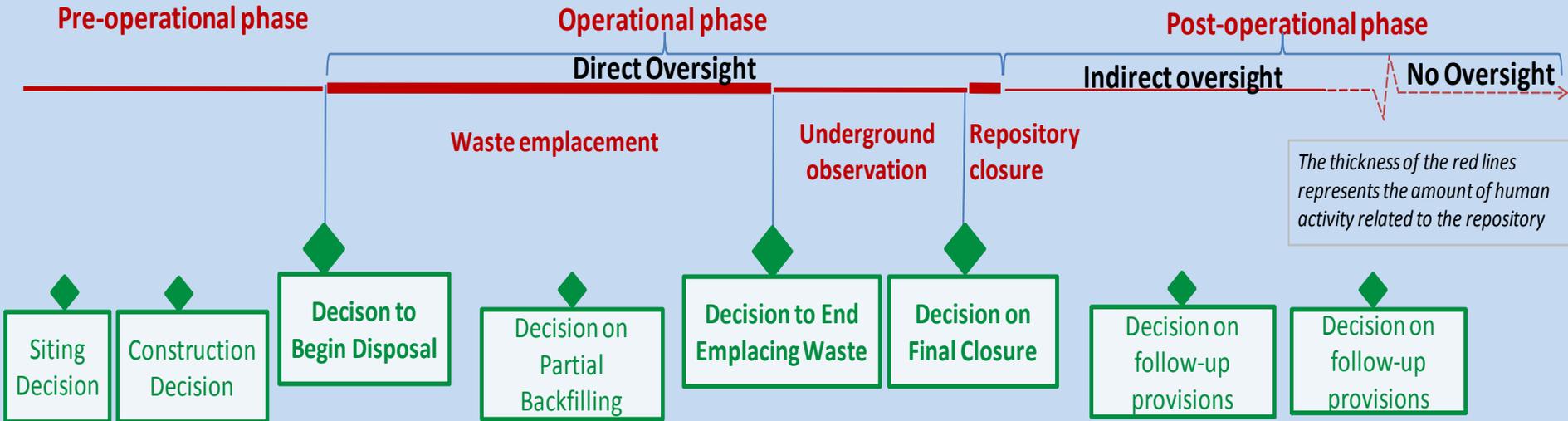
The recommendations given apply to **disposal facilities where there is still an opportunity for their implementation** during the site selection, design, construction, and operational phases.

The report does not address near surface facilities.

The main protection issue dealt with are exposures in the **far future**. Any estimates of doses to individuals and populations will have growing associated **uncertainties** as a function of time.

Due to the long timescales, **verification** that protection is being achieved cannot be expected in the same manner as for current discharges.

The Commission recommendations rely on the basic principle that individuals and populations in the future should be afforded at least the same level of protection as the current generation.



Different phases of a geological disposal facility

The application of the radiation protection system of ICRP on long timeframe concerns **oversight**

For the application of the ICRP system of protection three main timeframes have to be considered

Direct oversight: when the repository is being implemented (pre-operational and operational phases of the repository);

Indirect oversight: when the repository is sealed or at least drifts are sealed and indirect oversight is being exercised to provide additional assurance on behalf of the society (post-closure period of institutional oversight);

Time where oversight cannot be assumed because memory of the repository may be lost. It is not an objective to lose the memory of the site, but there is no guarantee that it is possible to keep the oversight in the long-term.

The level of oversight affects the capability to reduce or avoid exposures.

The application of the ICRP system of protection

1. Justification (para 40)

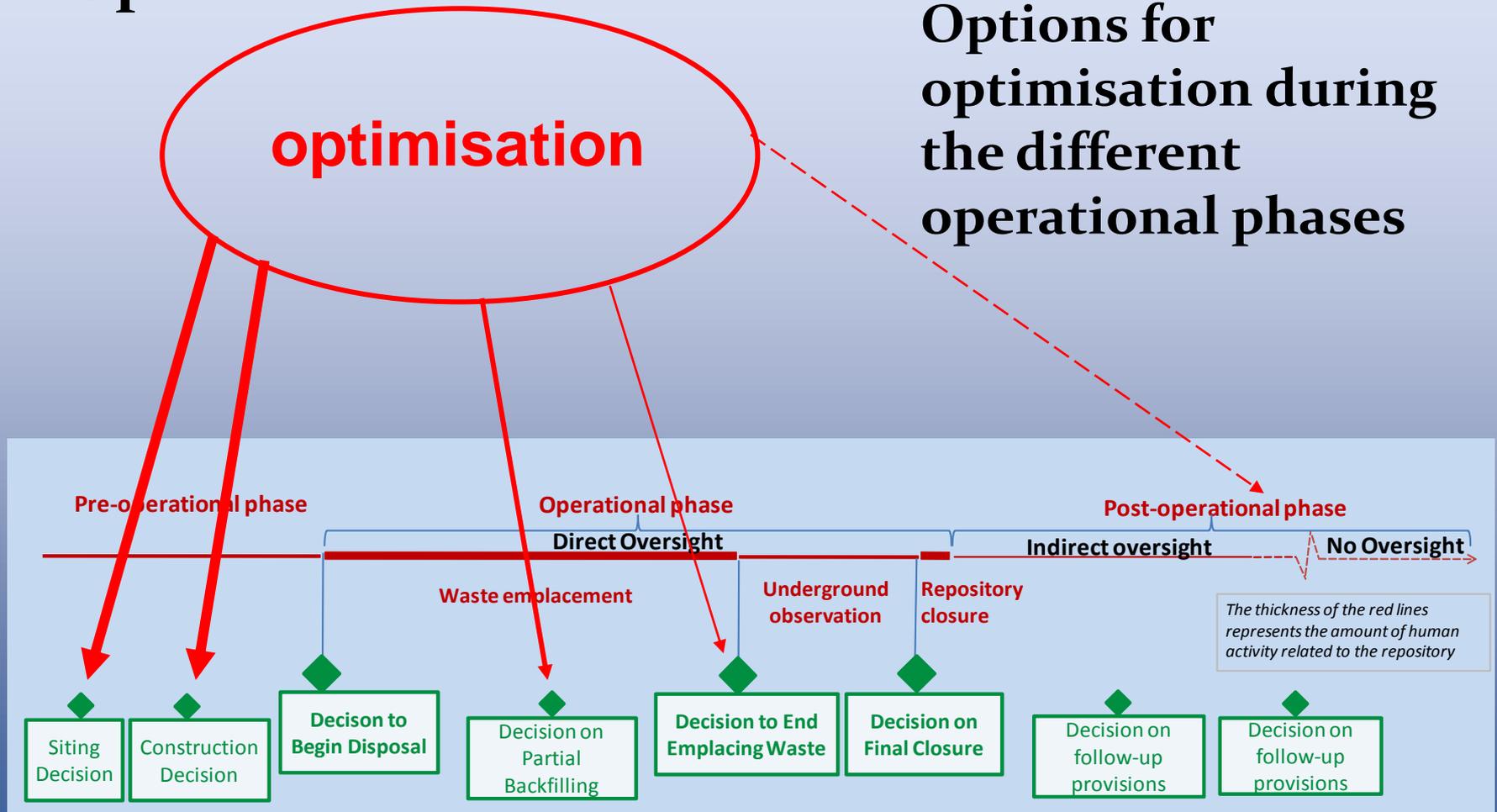
“Waste management and disposal operations are an integral part of the practice generating the waste. It is wrong to regard them as a free standing practice that needs its own justification. The waste management and disposal operations should therefore be included in the assessment of the justification of the practice generating the waste (ICRP 77 §34). This assessment should include considerations of different options for waste management and disposal including the justification of these options.

If the national waste disposal policy has changed and the practice is continuing, it may be necessary to reassess the justification of the practice. If the practice has ceased, the protection strategy, rather than the practice, has to be considered for justification.”

The application of the ICRP system of protection

2. Optimisation

Options for optimisation during the different operational phases



Optimisation of protection

Protection can be considered optimized from an ICRP viewpoint provided that:

1. due attention has been paid to the **long-term safety implications of various design options** at each step in the development and operation of the disposal facility;
2. there is a reasonable assurance that the assessed **doses and/or risks** resulting from the generally expected range of the natural evolution of the disposal system **satisfy the appropriate constraint**, over timeframes for which the uncertainties are not so large as to prevent meaningful interpretation of the results;
3. the **likelihood of events that might disturb the performance of the disposal facility**, so as to give rise to higher doses or risks, **has been reduced** as far as reasonably possible by the siting or design.

The application of the ICRP system of protection

3. Dose and risk

The **effective dose**:

1. The prospective application for planning and optimisation of protection.
2. The retrospective application for demonstrating compliance with dose limits, or for comparing with dose constraints or reference levels.

The **potential exposure** is an exposure that is not expected to be delivered with certainty but that may result from an accident at a source or an event or a **sequence of events of a probabilistic nature**, including equipment failures and operating errors.

Basic ICRP principles dealing with future generations

The assessment of the **robustness** of the protection system provided by solid waste disposal facility in the long-term does not need a precise knowledge of the evolution of the general health of the population in the far future.

At the design stage, what is at stake is not to evaluate what would be the level of **health effects** in a group of population in the far future. The challenge is rather to estimate, in an **optimisation process** through a comparison (using dose and risk indicators) of options, the levels of protection achieved by a given disposal facility system and to judge if the estimated protection level of the chosen strategy is acceptable in the light of the level of protection accepted today.

RADIOLOGICAL EXPOSURE SITUATIONS AS FUNCTION OF DISPOSAL FACILITY EVOLUTION AND PRESENCE AND TYPE OF OVERSIGHT

Disposal facility Status	Type of Oversight		
	Direct Oversight	Indirect Oversight	No oversight
Design-basis ¹ evolution	Planned Exposure Situation ²	Planned (Potential) Exposure Situation ³	Planned (Potential) Exposure Situation ³
Non-design basis evolution (footnote 4)	Emergency Exposure Situation at the time of exposure, followed by an Existing Exposure Situation	Emergency Exposure Situation at the time of exposure, followed by an Existing Exposure Situation	Emergency and/or Existing Exposure Situation
Inadvertent Human Intrusion	not relevant	not relevant	Emergency and/or Existing Exposure Situation (footnote 5)

- 4 **Non-design basis analyses include very unlikely or extreme events that could be postulated to lead to significant exposure to people and the environment. If comparisons to numerical criteria are considered appropriate, the reference levels defined for emergency and/or existing exposure situations are recommended. For an emergency exposure situation a reference level between 20 and 100 mSv per year is recommended; for an existing exposure situation a reference level should be selected in the lower part of the band between 1 and 20 mSv per year, e.g., in the range of a few mSv per year.**
- 5 **If comparisons to numerical criteria are considered appropriate, the reference levels defined for emergency and/or existing exposure situations are recommended.**

Web consultation

Comments due 4 November 2011

7 comments (15 pages; as of 26. October 2011) with specific questions for clarification and/or recommendations for improvement.

Consultation with IAEA-WASSC.

Consultation with OECD/NEA/EGIR-RWMC .

Specific issues require further clarification.

Terminology is an issue >> request for a glossary.

Thank you for your attention

For further questions please ask me
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Comments can be submitted to the ICRP
website (<http://www.icrp.org>) until 4
November 2011

