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Supplement of

Exploring the bearing of subjective preferences on site selection processes

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Federal Office
for the Safety of
Nuclear Waste Management

Exploring the Bearing of Subjective Preferences on Site Selection Processes

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Justification | Objectivity of Decisions

In site selection decisions, we aim at **objectivity**. To ensure that:

- Decisions depend on the object only, and **cannot be influenced** by anybody's will.
 - Have a **fair game**. – (The rules of the game are set. The outcome depends only on the characteristics of the objects/sites.)
 - **All can agree** to the findings, because everybody would have decided the same way.
- Everybody can comprehend, understand – and accept

Unavoidable Subjectivity

In decision theory, subjectivity is, in particular, involved in:

- Goal setting
- Balancing conflicting goals
- Finding evaluation criteria (indicators) for measuring goal achievement
- Weighing and aggregation of criteria
- Evaluating uncertainties (risk seeking or risk avoiding attitude?)

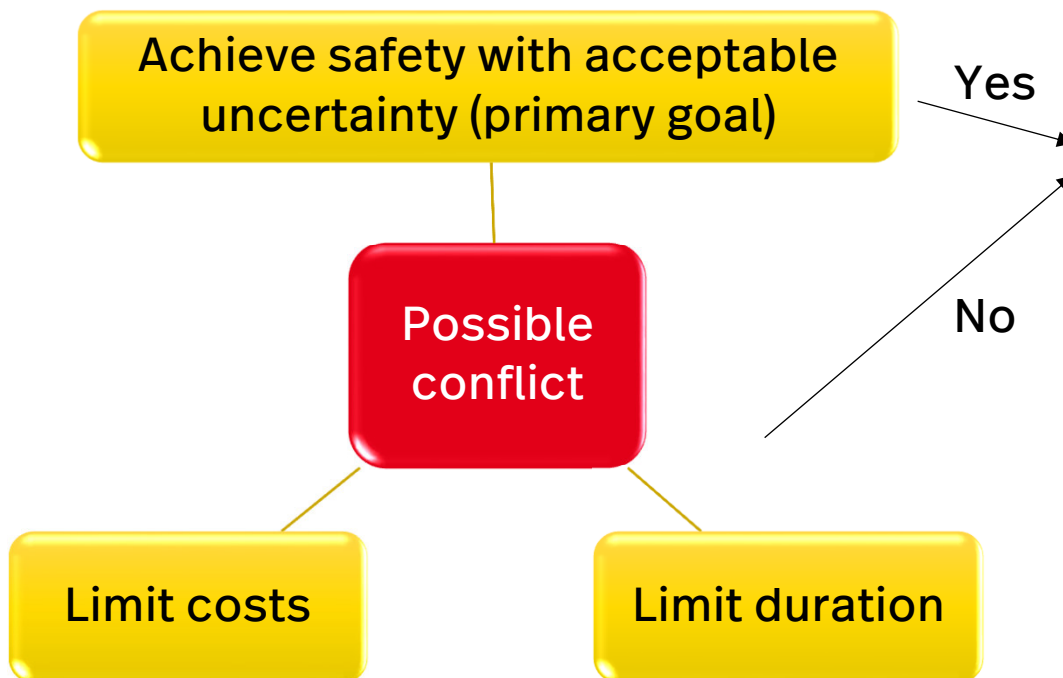
→ Subjective preferences influence site selection

Example 1: Conflicting Goals



Balancing the conflicting goals is guided by **subjective** preferences.

Example 1: Conflicting Goals



Should we carry out in-depth site exploration in many candidate sites ?

Balancing the conflicting goals is guided by **subjective** preferences.

Example 2: Deciding on Criteria / Weighing of Criteria

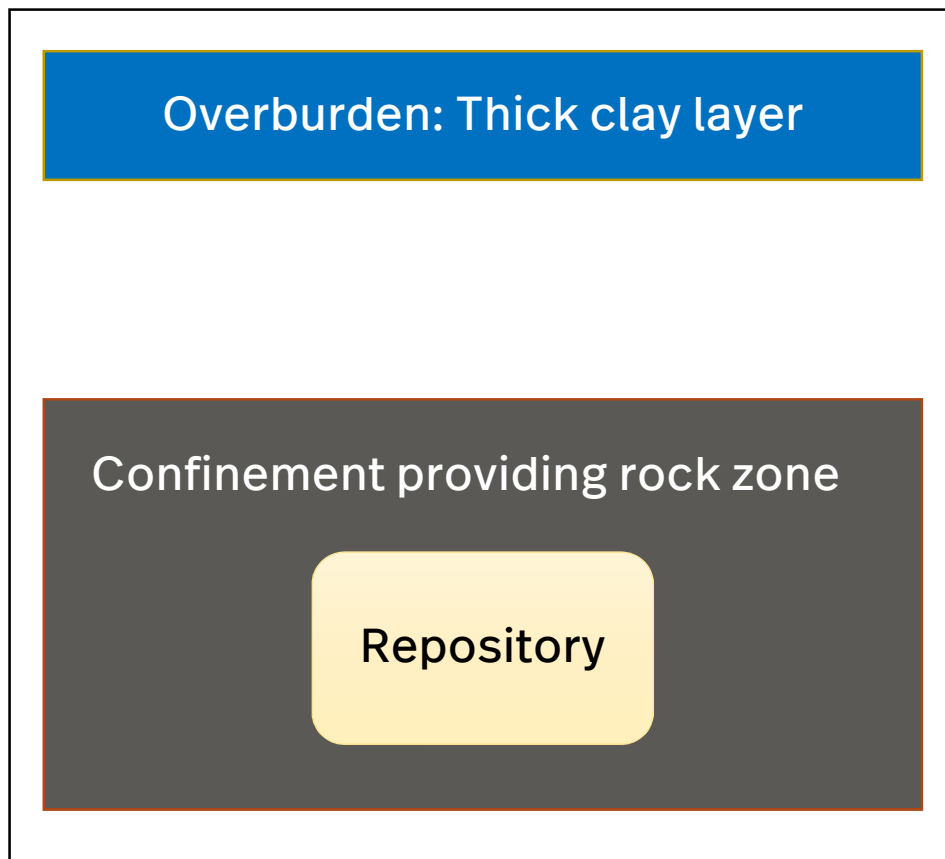
Overburden: Thick clay layer

Confinement providing rock zone

Repository

Is a thick clay layer in the overburden relevant to safety?

Example 2: Deciding on Criteria / Weighing of Criteria



Is a thick clay layer in the overburden relevant to safety?

No, should not be accounted for:

- Integrity of the overburden not guaranteed
- No „official“ component, no safety function
- Most radionuclides will not travel that far in any scenario

Yes, should be accounted for:

- Will retard radionuclides in cases that have been overlooked (unknown unknowns)

If yes:

How relevant? Weighing? → **subjective**

Example 3: Can we say, (two sites are) “equally safe” ?

Safety requirements = required level of safety (StandAG)

Are all sites that satisfy the safety requirements equally safe?

Example 3: Can we say, (two sites are) “equally safe” ?

Safety requirements = required level of safety (StandAG)

Are all sites that satisfy the safety requirements equally safe? Two opinions:

Yes: We can define it that way:
safe:= safe enough := fulfilling the required level of safety
(Safety is defined by the safety requirements)

No: Repositories can have different safety levels,
which cannot be measured directly through indicators.
(Safety cannot be measured directly. Indicators are always coarse measures.)

→ **Subjective preferences differ**

Conclusion:

Safety evaluations and site selection decisions are partly subjective.

Regulations

- limit the permissible range of subjective beliefs
- but still give leeway to subjective evaluations

➔ Subjectivity expresses residual ambiguity about how to reach the goals within the regulatory framework.

A Problem for Justification

- Subjective decisions can cause (non-desirable) ambiguity in site selection procedure
- How can we justify subjective claims?

As a discussion starter:

It is sufficient if we agree (on the tolerated subjective beliefs).

- Decisions could be based on subjective beliefs that are tolerated by most/all („Compatible belief“)
 - Not necessary to share the same beliefs
- Agreement could act as justification for subjective beliefs in decision making

Steps involved to find out agreement

1. Identifying where subjective beliefs play a role
2. Deciding who should agree
3. Finding agreement
 - Identify latitude in beliefs and common beliefs
 - Discuss and check for misapprehensions
 - Discuss and negotiate what might be acceptable subjective beliefs

Supporting measures

1: Remove stigma from term “subjective”

Subjective beliefs (judgements) are not necessarily

- unsound
- arbitrary

→ Subjective decisions, per se, do not make a selection process arbitrary.

2: Embrace subjectivity

→ No need to attempt purely fact-based reasoning where subjectivity dominates.

Project METIENS

METIENS identifies where subjective beliefs play a role in safety assessment and site selection

It does so after:

- Identifying, in principle, ways of eliminating sites
- Identifying, in principle, ways of assessing and comparing safety

Thank you
for your attention !