

**WP1:**  
**Definition of assessment case/  
Application to the assessment cases**

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# WP1 - Preamble

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- The safety relevant performance of the bentonite is mainly defined by its chemical, mineralogical, and physical properties.
- This is why comprehensive sets of requirements regarding the chemical, mineralogical and physical, characteristics of bentonite have been developed.
- In most cases these requirements assume a bentonite density as boundary conditions for the requirement to be fulfilled.



# Conceptual understanding of processes and phenomena related to homogenization

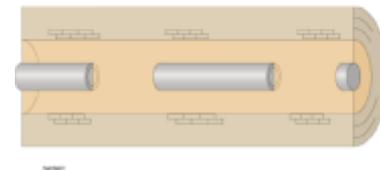
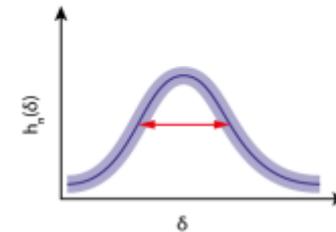
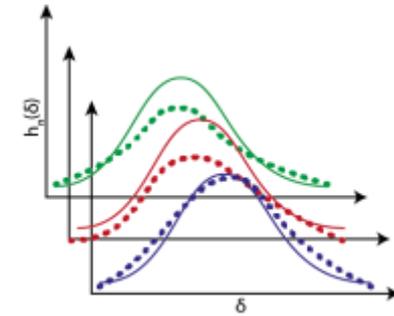
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- Independently of the application the **buffer and backfill**, which are inhomogeneous at installation, **will take up water after deposition**, leading to swelling. **This will cause the voids in the buffer**, between rock and buffer and between canister and buffer **to disappear** and the buffer will be homogenized.
- However, a **certain inhomogeneity will persist** possibly **due to** processes such as **friction in the bentonite**.
- This **residual inhomogeneity is important for the design basis and the configuration** (pellets and blocks) at which the buffer is deposited. Swelling and homogenisation is also important in the case of mass loss by erosion or failed installation.



# Objectives of WP1

1. Derive the degree of disorder (homogeneity or heterogeneity) that results from specific bentonite applications such as the ANDRA tunnel plug, the Nagra disposal cell and the KBS-3 deposition tunnel backfill based on experimental evidence and numerical simulations
2. Integrate a term of property variability in the safety assessment of the nearfield and
3. Formulate requirements in respect to the emplacement density of bentonite that includes property variability and that allows to fulfil specific safety functions.



# Description of work

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- In the frame of WP1 the **needs of safety assessment regarding the evaluation of non-homogeneous backfill properties** are addressed. In particular:
  - in how far non-homogeneous material property distributions comply with safety requirements.
- The **outcome** of the this work package is planned to be a:
  - **(hydro)-mechanical assessment of the case studies**, given a range of uncertainties in the boundary conditions based on empirical and numerical evidence that, based on a probabilistic approach, would ultimately result in a set of requirements under consideration of the host rock and the repository design.
- For this work package **three case studies were defined**:
  - **the ANDRA tunnel plug, the Nagra disposal cell and the KBS-3 deposition tunnel backfill.**

# Description of work

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- Based on the outcome of the assessment cases and the evaluation method and uncertainties, the end user will formulate design specific requirements that can be used for the safety case in a final workshop.



# Partner of Workpackage 1

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- **ANDRA & Nagra:** will contribute to state of the art document identifying the best approach considered to minimize heterogeneities in bentonite based components in order to fulfil the safety requirements
- **ENRESA:** will contribute to the definition of the assessment case.
- **GRS:** will assess the requirements on the buffer homogeneity regarding the German disposal concept in clay rock
- **POSIVA** and its partner **VTT:** will describe a method to assess homogenisation of material differences (density, swelling pressure, saturation degree, etc), relevant for Posiva's purposes.

# Partner of Workpackage 1

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- **RWM** will participate in the preparation of documentation regarding the state of art about the safety case consideration of bentonite buffer / seals components of a GDF
- **SKB's** objective is to define cases for the design basis as well as for the long term performance that can be assessed within the framework of the project
- **SURAO** will contribute to a state of the art report on mechanical and hydraulic homogeneity of buffer/backfill from Czech bentonites incl. results of WP3 and WP5 and develop sets of requirements for long term safety.
- **MKG** will follow the work in the work package and coordinate interaction with WP6



**thank you  
for your attention**

**nagra** ●