



BUNDESGESELLSCHAFT
FÜR ENDLAGERUNG

THE GERMAN SITE SELECTION PROCEDURE AND ASSESSMENT OF UNCERTAINTIES

2nd URS PhD Workshop

MERLE BJORGE

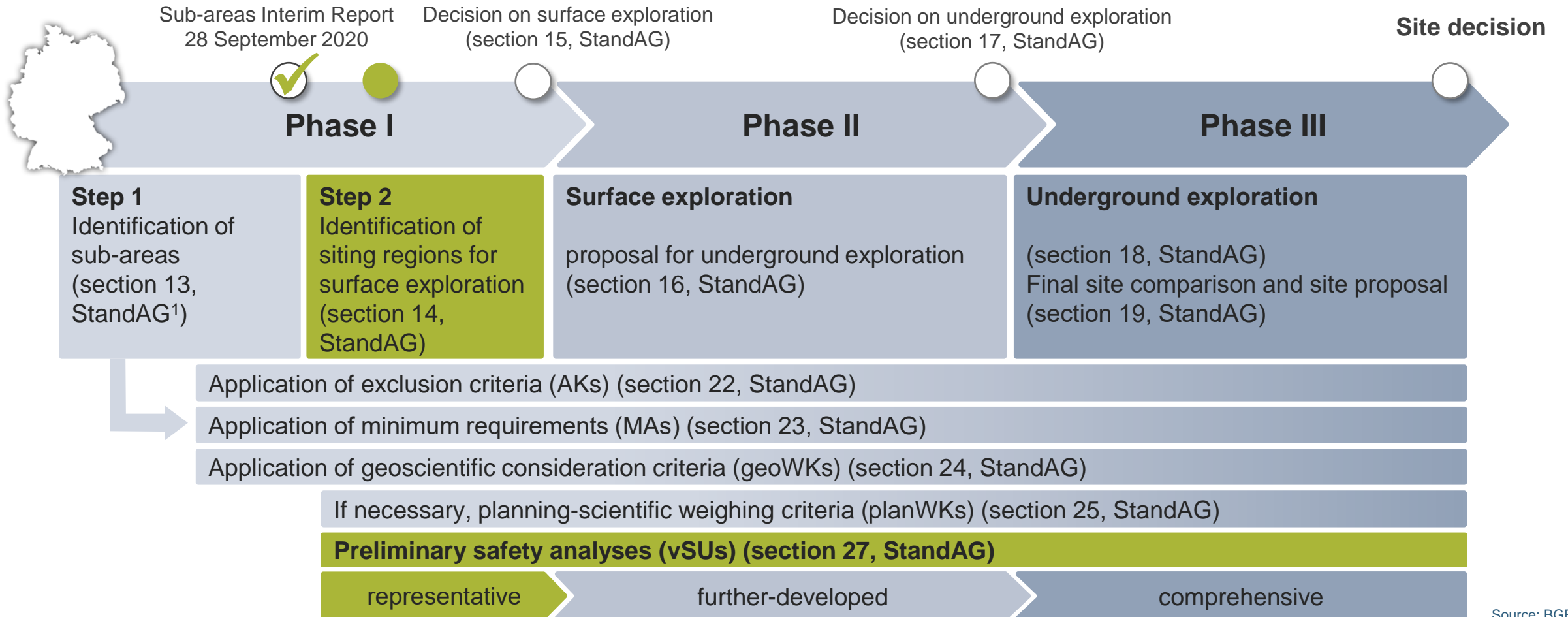
Kassel, 16.-17.03.2023

SITE SELECTION PROCEDURE

Sequence of procedure steps



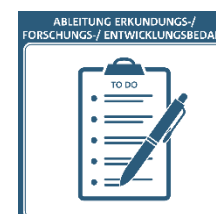
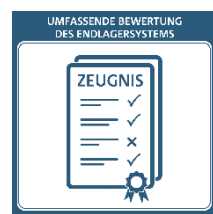
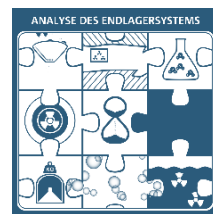
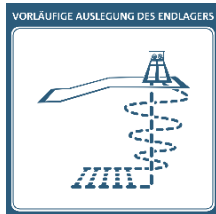
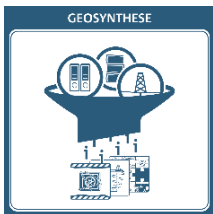
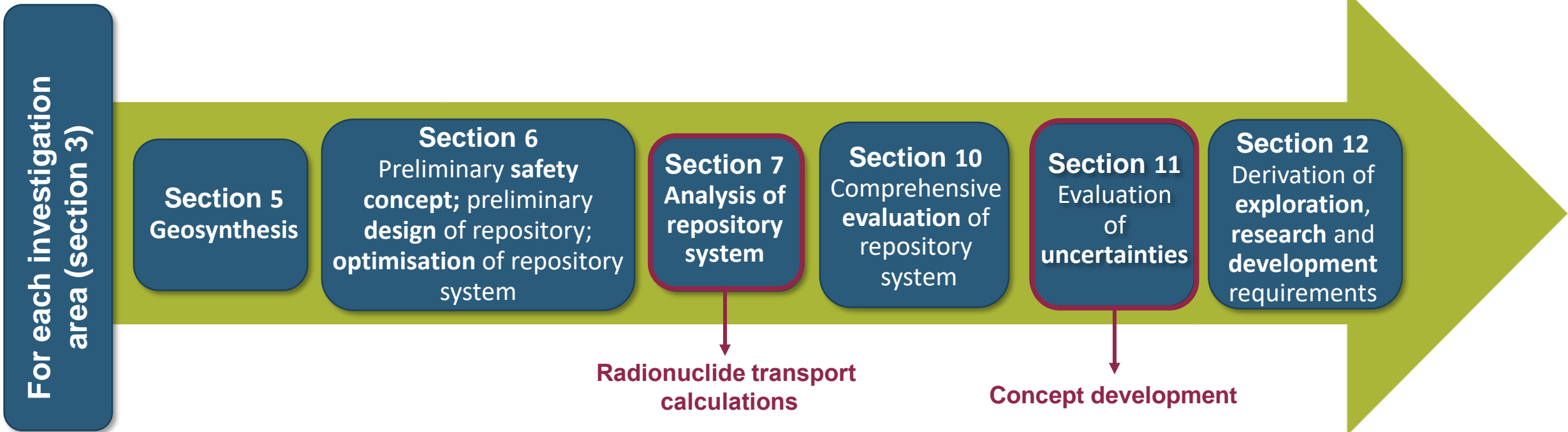
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Source: BGE

¹Repository Site Selection Act of 5 May 2017 (Federal Law Gazette Part I, p. 1074), last amended by Article 1 of the Act of 7 December 2020 (Federal Law Gazette Part I, p. 2760)

REPRESENTATIVE PRELIMINARY SAFETY ASSESSMENTS (RVSU)



UNCERTAINTY ASSESSMENT

Section 11 EndlSiUntV



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§ 11 Abs. 1 EndlSiUntV

Systematic
identification of
uncertainties

Uncertainty
characterization

§ 11 Abs. 2 EndlSiUntV

Uncertainty
treatment and
their effects on
results

§ 11 Abs. 3
EndlSiUntV

Estimation of
potential for
uncertainty
reduction (by R&D
measures)

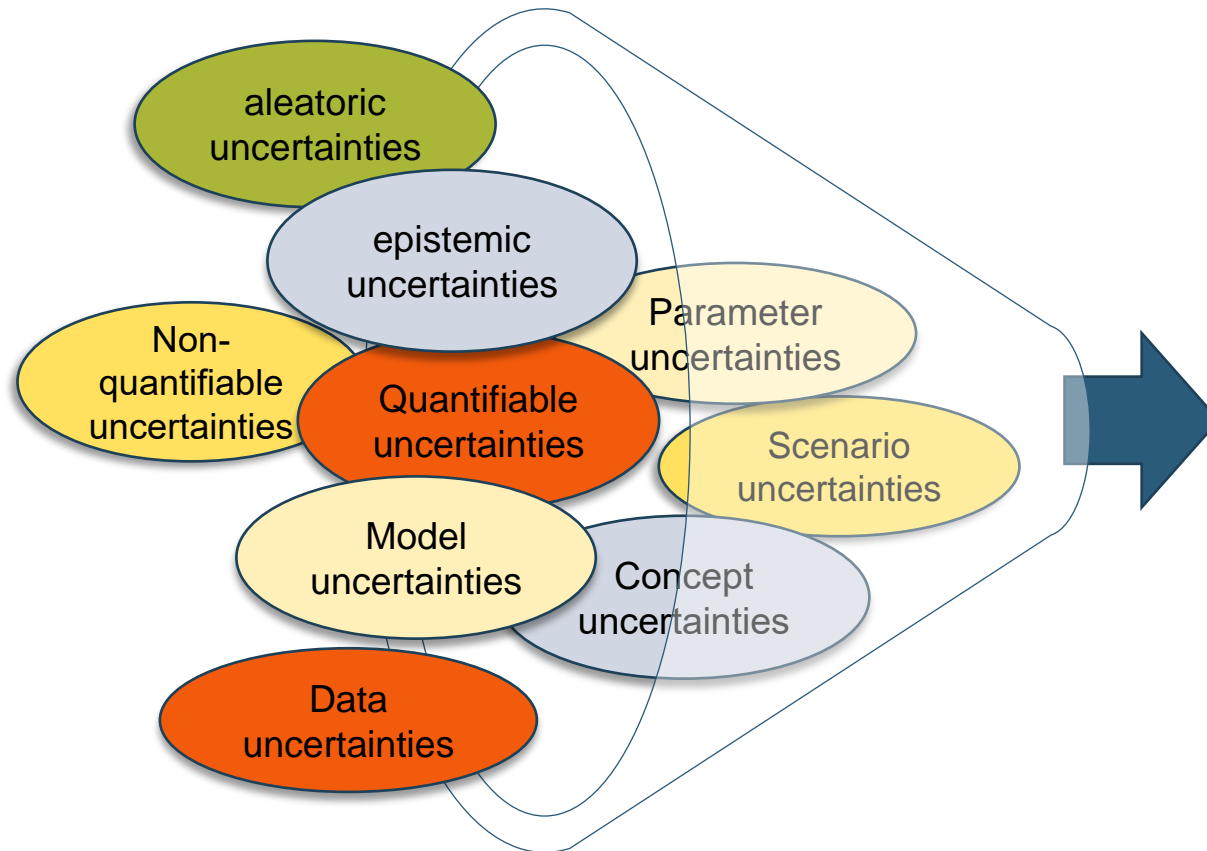
Documentation

UNCERTAINTY ASSESSMENT

Concept development



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Systematic approaches

- Uncertainty classification

Uncertainty class

Data and parameter uncertainty

Scenario uncertainty

Model uncertainty

Method uncertainty

- Uncertainty documentation
 - Entry table for uncertainties
 - Discussion of uncertainties in reports

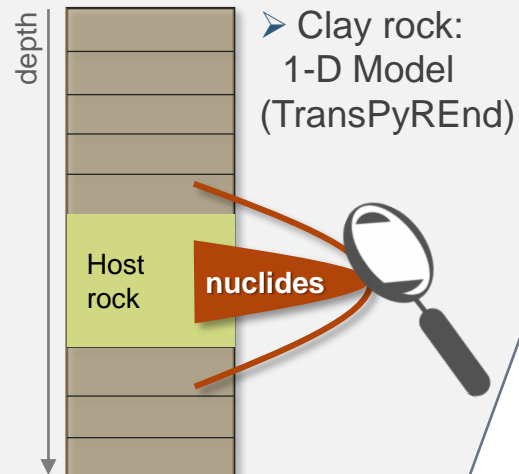
QUANTITATIVE ASSESSMENT OF THE RADIONUCLIDE TRANSPORT



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Expected evolution of the disposal system

Calculation of radionuclide transport



Regulatory requirements

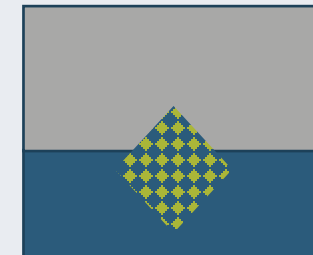
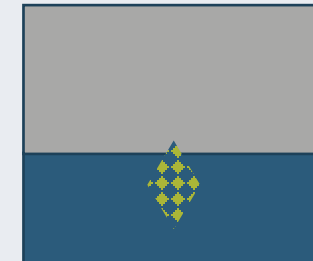


- **In total**, no more than a fraction of 10^{-4} and
- **Annually**, no more than a fraction of 10^{-9}

Both of the mass and the number of atoms of all originally emplaced radionuclides

From the area of the essential barriers

Assessment

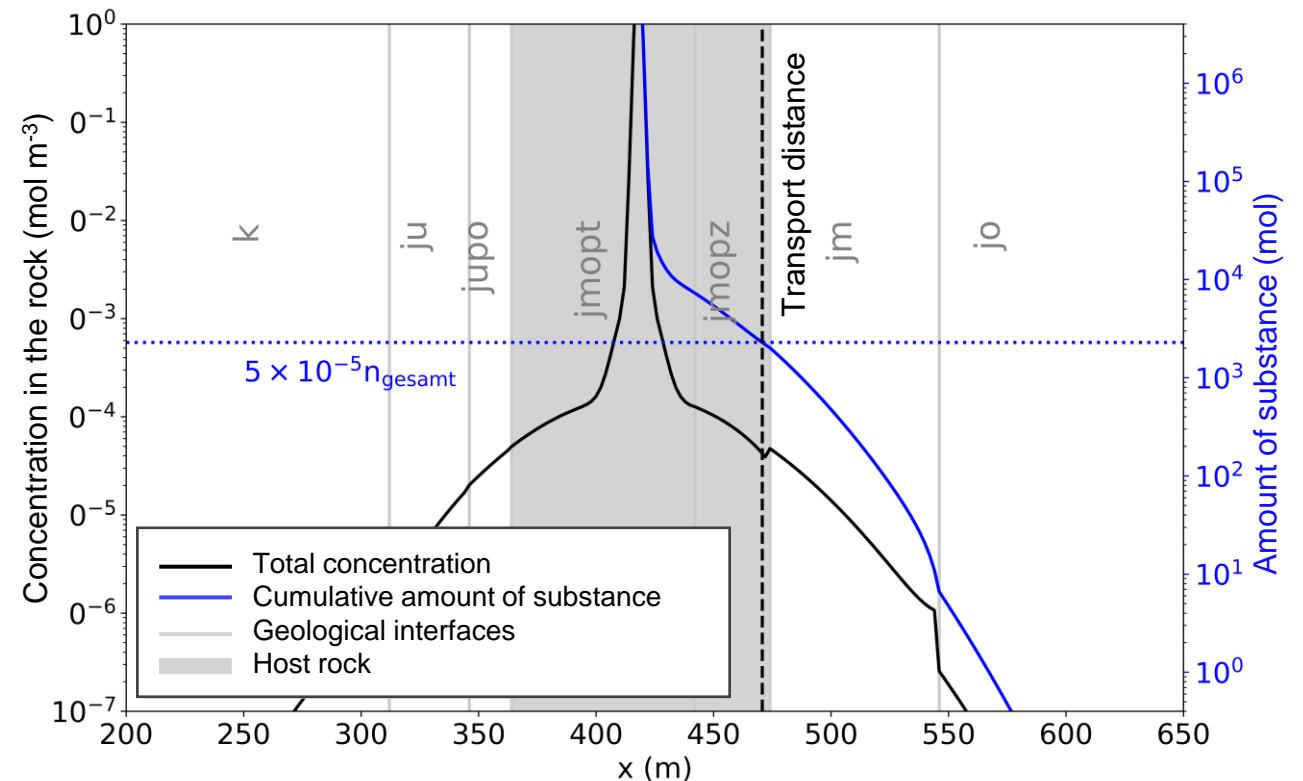


RADIONUCLIDE TRANSPORT CALCULATIONS (EXAMPLE)

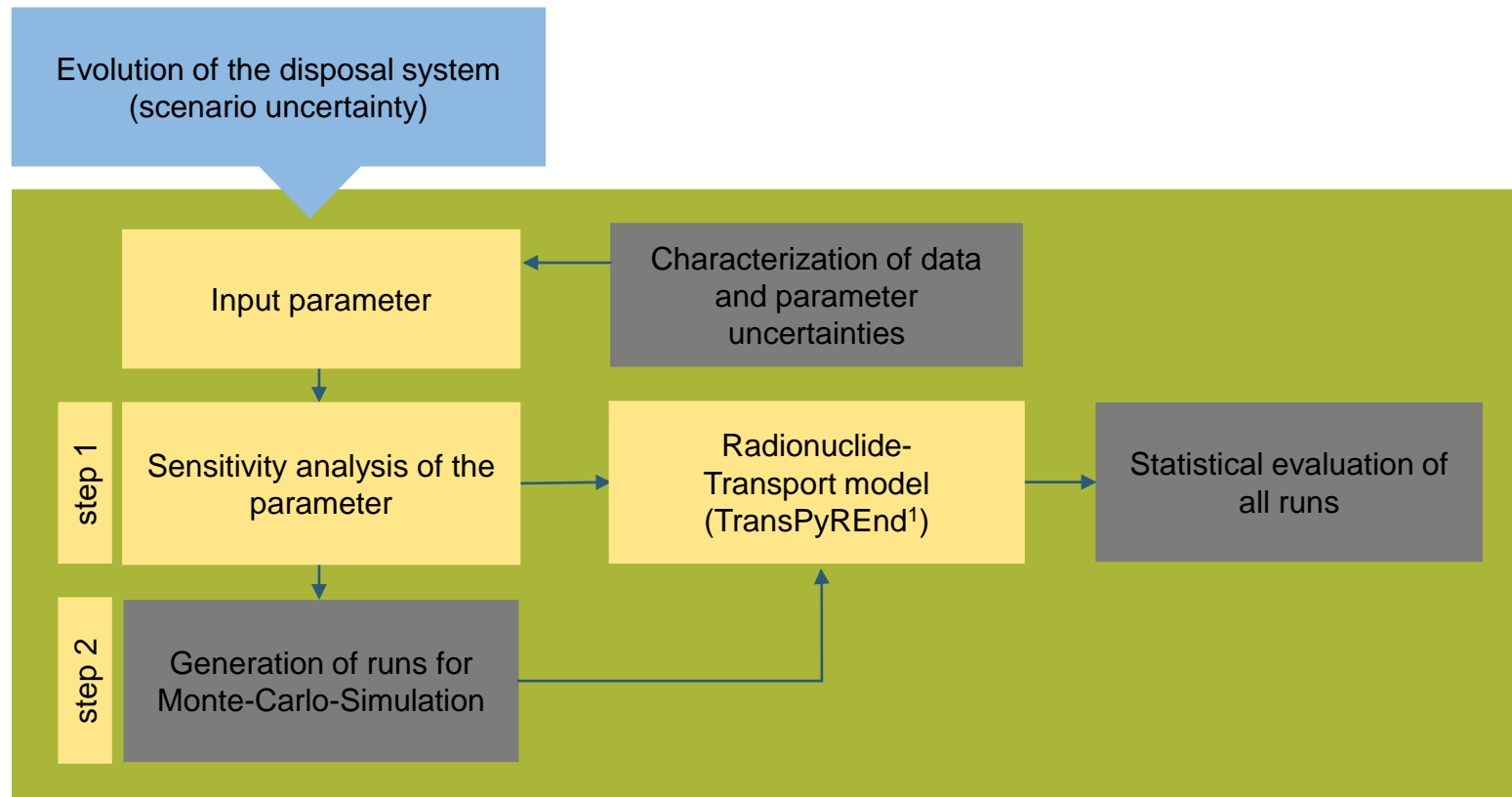


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- Result based on best estimates for all parameter
- Over an assessment period of 1 Ma
- Transport distance for this example = 54 m
- Transport distance is within the host rock
 - Indication that legal requirements are met



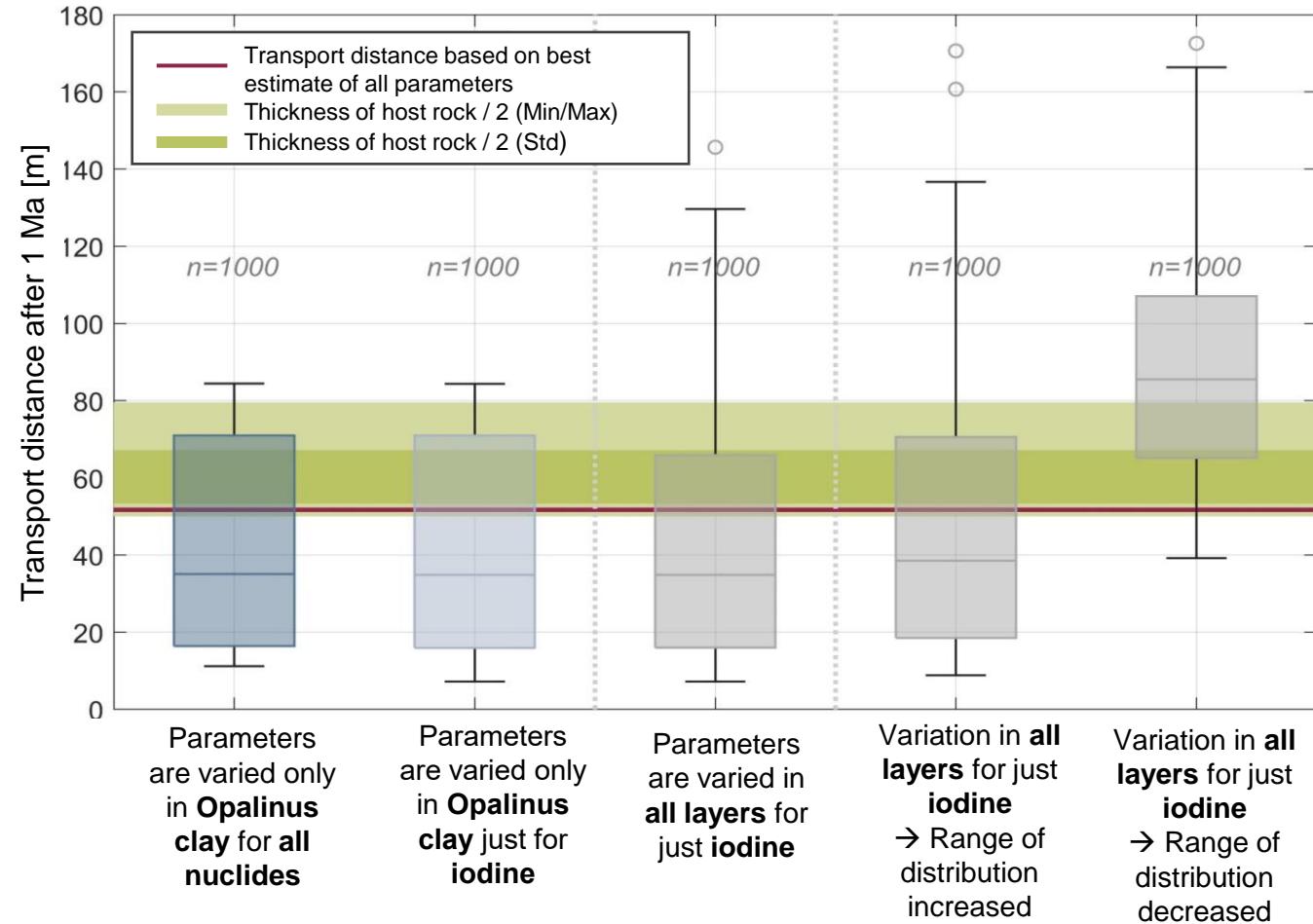
UNCERTAINTIES IN CALCULATING RADIONUCLIDE TRANSPORT



¹Behrens et al., 2023. TransPyREnd: a code for modelling the transport of radionuclides on geological timescales

UNCERTAINTIES IN CALCULATING RADIONUCLIDE TRANSPORT (WORKING STATUS)

- Variation of diffusion and sorption coefficient
- Log-uniform distribution
- Calculation for a number of nuclides
 - Transport is dominated by iodine



SUMMARY

- Site selection procedure for high-level radioactive waste is regulated by the **site selection act (StandAG)** and the **Disposal Safety Requirements and Analysis Ordinance (EndlSiAnfV & EndlSiUntV)**
- Current Step includes the first-time application of **preliminary safety assessments (rvSU)**
 - to which extent can a **safe containment of radioactive waste** be expected if best possible use of geological conditions is made?
- Important aspects:
 - Quantitative Assessment of the **radionuclide transport**
 - Development of a **1-D model (TransPyREnd)** for the assessment in clay rock
 - Identification and assessment of **uncertainties**
- **Concept** for the application of rvSU is in development, first status was published in March 2022

THANK YOU FOR YOUR ATTENTION!

References

- Behrens et al., 2023. TransPyREnd: a code for modelling the transport of radionuclides on geological timescales (<https://adgeo.copernicus.org/articles/58/109/2023/>)
- EndlSiAnfV: <http://www.gesetze-im-internet.de/endlsianfv/>
- EndlSiUntV: <https://www.gesetze-im-internet.de/endlsiuntv/>
- Methods for Phase I Step 2: <https://www.bge.de/de/endlagersuche/wesentliche-unterlagen/methodik/>
- StandAG: https://www.gesetze-im-internet.de/standag_2017/



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www.einblicke.de



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THANK YOU FOR YOUR ATTENTION! WOULD YOU LIKE TO READ AGAIN ?



Information on Sub-areas Interim Report

[Interactive introduction to compilation of Interim Report and to all criteria and requirements](#)

[Sub-areas Interim Report with all documents and annexes](#)

[Dedicated page for each sub-area](#)

[Interactive map with all sub-areas and excluded areas](#)

Information on status of rvSU methodological development

[Descriptions of areas for methodological development](#)

[Event series on YouTube](#)

[Overview of representative preliminary safety analyses](#)

[Concept for carrying out representative preliminary safety analyses](#)

[Description of method for carrying out representative preliminary safety analyses](#)