



Supplement of

A systematic approach for surface exploration of sites – a database to research and evaluate suitable methods

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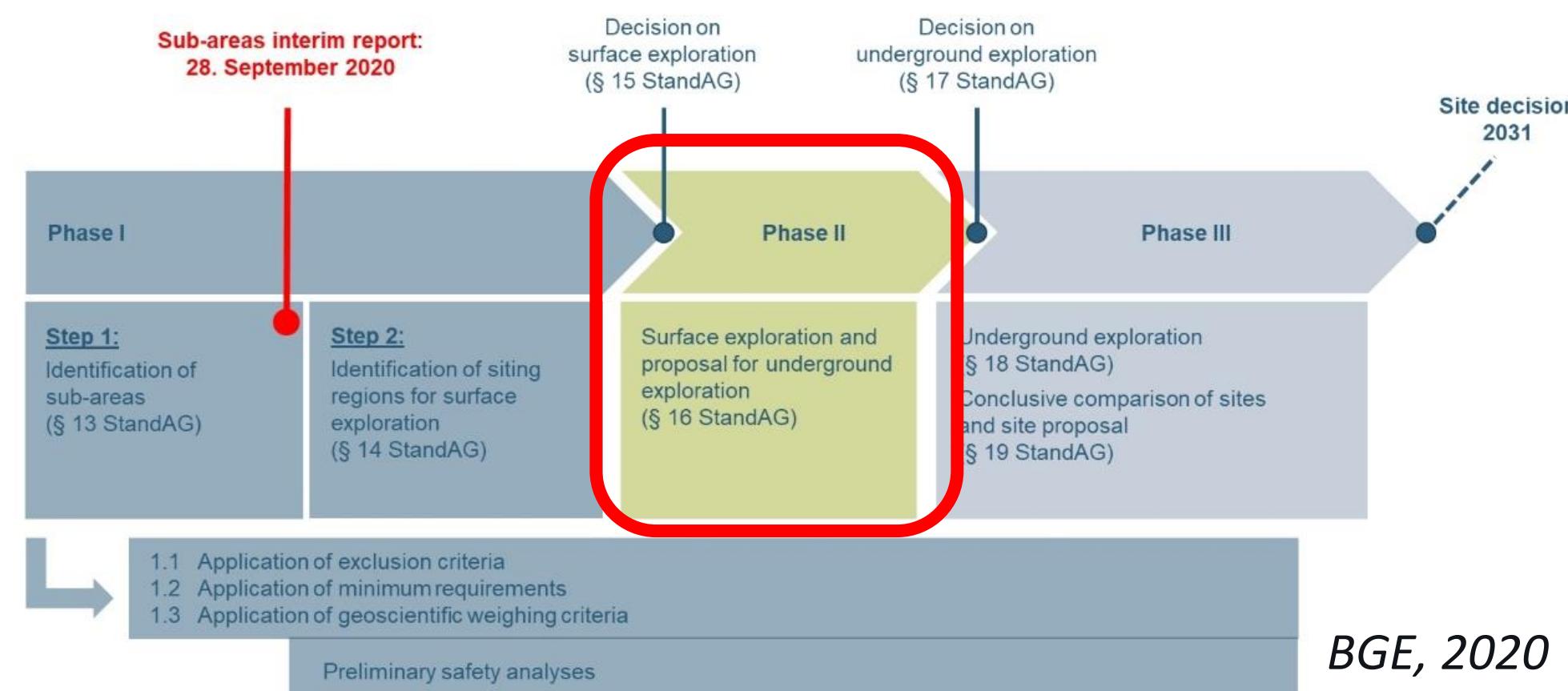
A systematic approach for surface exploration of sites – a database to research and evaluate suitable methods

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Motivation

The site selection procedure for a high-level radioactive waste repository in Germany is based on the Repository Site Selection Act (StandAG, 2017), which comprises three phases. In phase 2, the Federal Company for Radioactive Waste Disposal (BGE) will conduct surface exploration. Commissioned by BGE, the BGR compiles and assesses geoscientific methods and programmes for surface exploration. Our goal is to develop recommendations for the surface exploration of sites and siting regions. For this purpose, we have developed a systematic 3-step approach.



1) Derivation of exploration objectives

Based on siting criteria defined by StandAG

- 6x Exclusion criteria (AK)
5x Minimum requirements (MA)
11x Geoscientific weighing criteria (AwK)

e.g.

Exclusion criterion 2:

Active fault zones

Exploration objective:

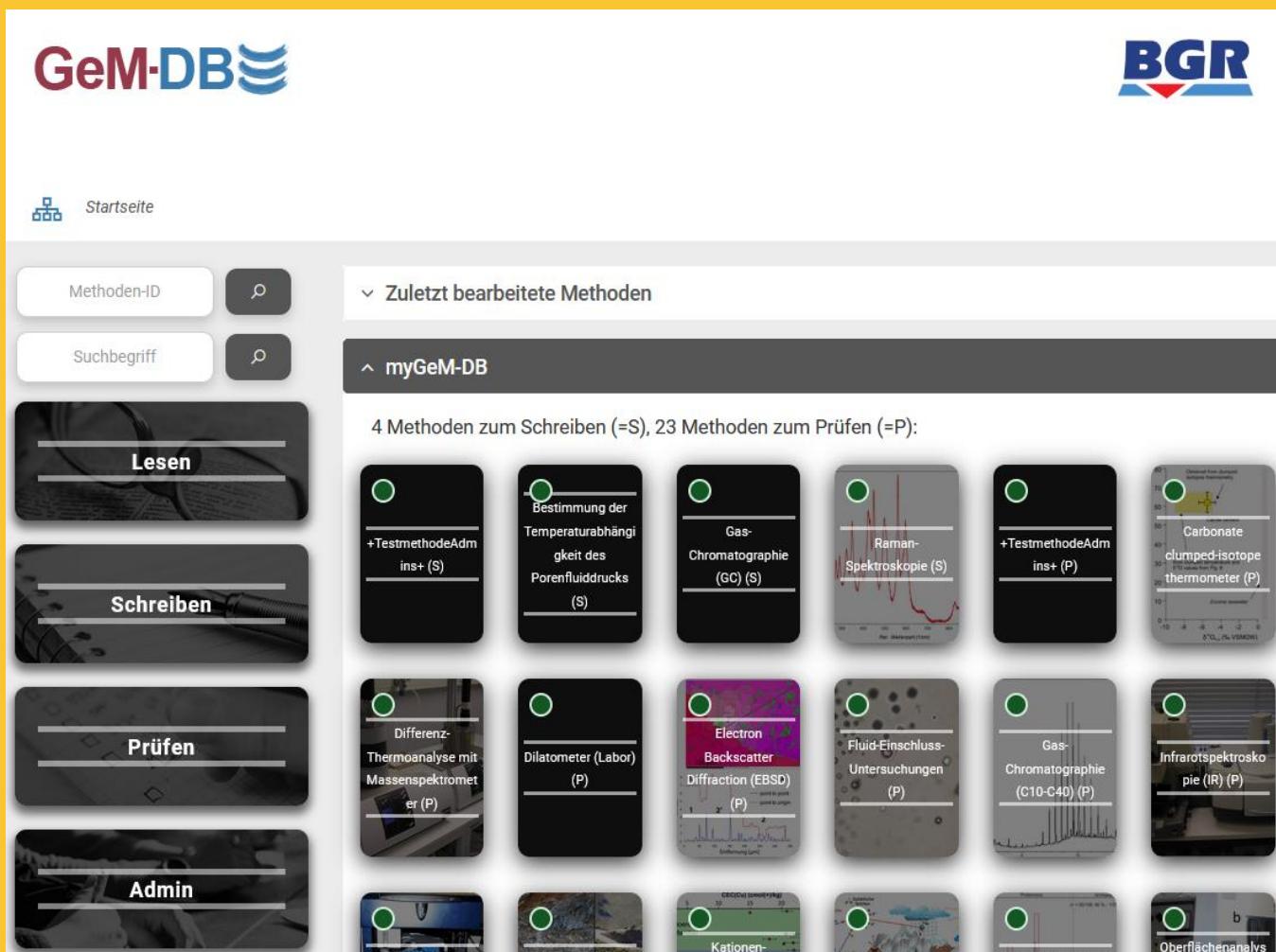
Example:

Location, geometry and spatial extension of a fault/fault zone

We published or findings in Kneuker et al. (2020)

Database development

- Based on MS SQL Server 2017
- Interactive, user-friendly web interface (PHP)
- Extendable
- Searchable for:
 - Methods
 - Exploration objectives



We published a description of the database in Beilecke et al. (2021)

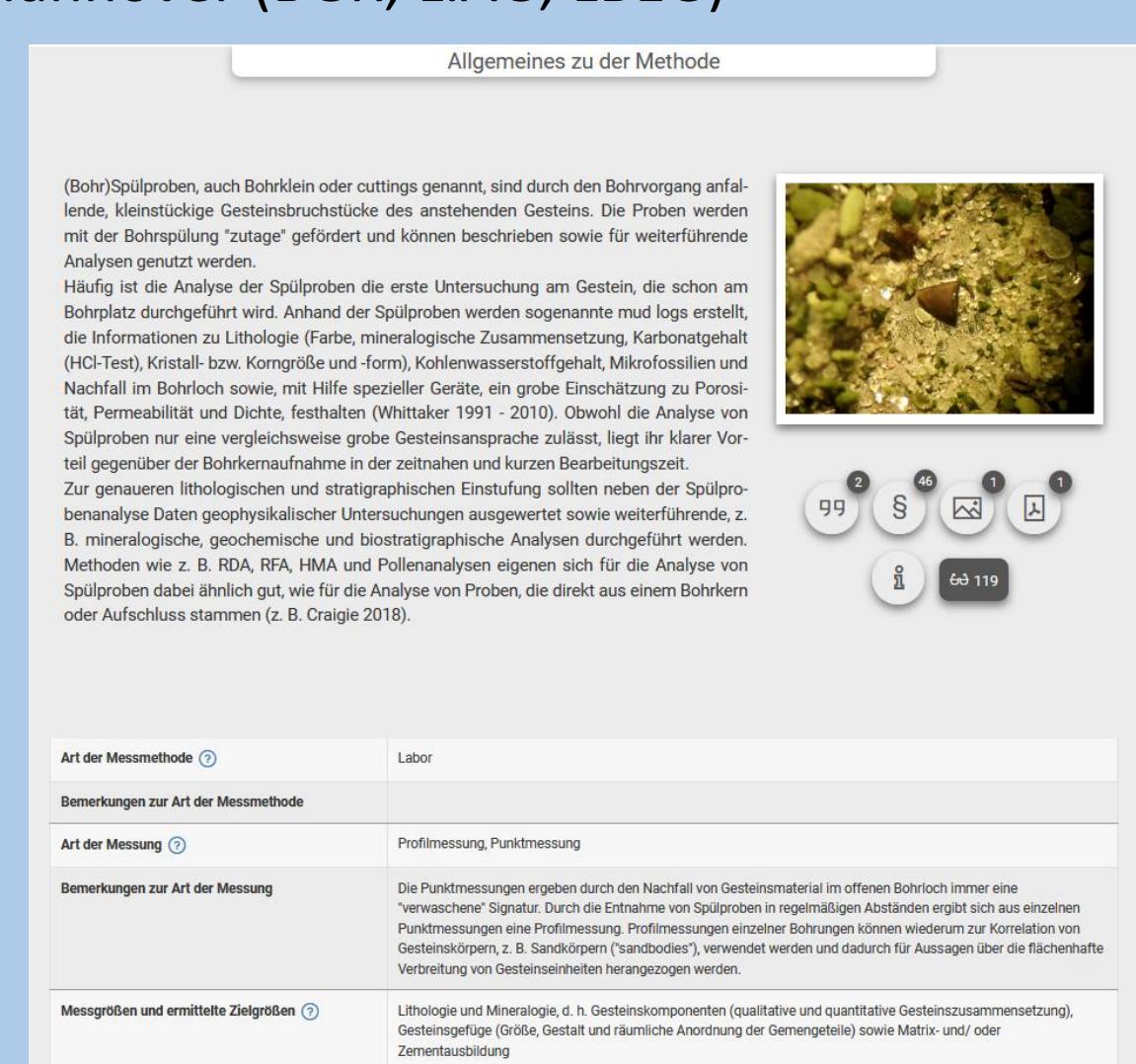
GeM-DB



2) Compilation of (measuring) methods

Input of > 100 experts of the Geozentrum Hannover (BGR, LIAG, LBEG)

- Input (> 140 methods):
- General description of the method
 - Attributes / metadata:
 - Measurement location (air, surface, drill hole, laboratory)
 - Measured parameter
 - Lateral/vertical resolution
 - ...
 - Useful combination of methods
 - Suitability assessment for:
 - > 175 exploration objectives
 - 3 host rocks

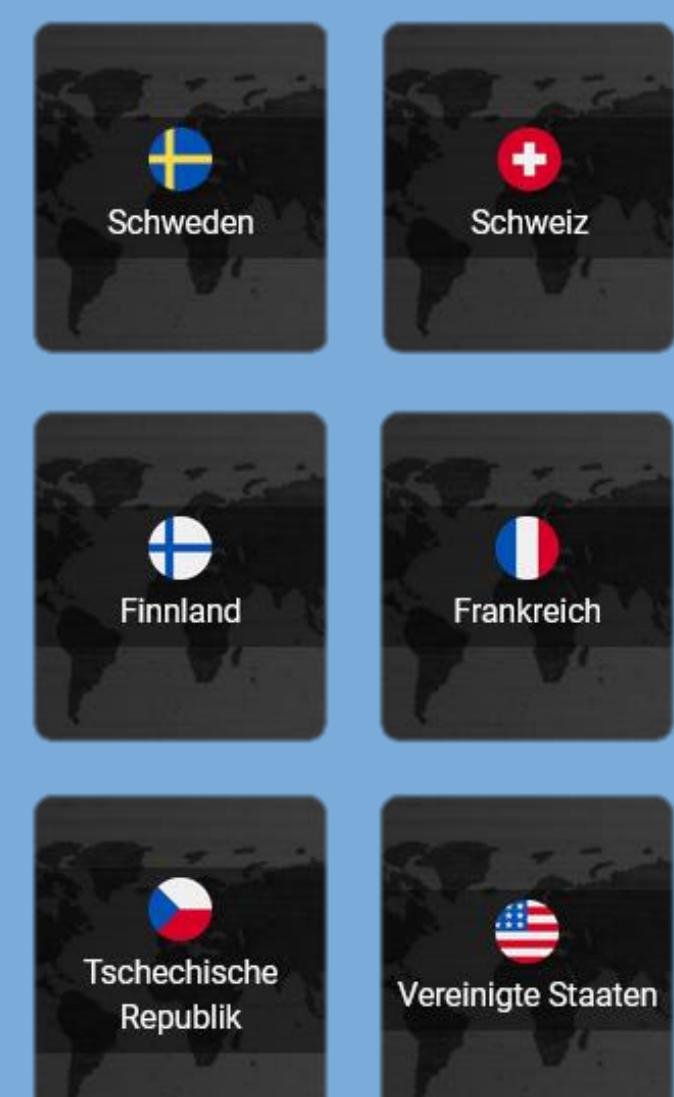


Feedback:
missing methods

3) Analysis of (inter-)national exploration programmes

Analysis of comparable exploration programmes:

- Systematic approach based on (geo-)scientific criteria
- Same host rocks (claystone, rock salt or crystalline rock)



Output:

- Identification of „crucial“ exploration objectives (e.g. structures, pathways for fluids, lithology)
- Applied methods and aims and their "translation" into the German siting criteria and requirements (StandAG)
- Temporal sequence of applied methods

→ Feedback: missing methods and links

Feedback:
missing links

Surface exploration programme



Our goal is to develop recommendations for the surface exploration of siting regions based on the combined input from GeM-DB and (inter-)national case studies. The final report will be published at the end of 2022.

Conclusions

- We defined > 175 exploration objectives from StandAG
- We developed the database GeM-DB to link, archive, and research methods and exploration objectives
- (Inter-)national exploration programmes help us to:
 - Identify missing methods
 - Identify missing links to exploration objectives
 - Assess temporal sequence of methods
- We use GeM-DB as a „tool“ to ...
 - Analyse (inter-)national case studies
 - Identify suitable methods for exploration objectives

See also our talk Richter et al., Fri. 10:40-11:00, Session 2B

References

Beilecke, T. et al. 2021: Nutzung der geowissenschaftlichen Methodendatenbank GeM-DB. Zwischenbericht, 31 p., BGR, Hannover.

Kneuker, T. et al. 2020: Zusammenstellung von Erkundungszielen für die übergäige Erkundung gemäß §16 StandAG. Zwischenbericht, 78 p., BGR, Hannover.

StandAG: Gesetz zur Aufsuchung und Auswahl eines Standortes für ein Endlager für hochradioaktive Abfälle. Standortauswahlgesetz vom 5. Mai 2017 (BGBl. S. 1074) das zuletzt durch Artikel 12 Absatz 16 des Gesetzes vom 20. Juli 2017 (BGBl. S. 2808) geändert worden ist (Standortauswahlgesetz – StandAG), 2017.

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