Applicability of Multi-Criteria Decision Analysis in the Site Selection Procedure for HLW Final Disposal

Robustness-Oriented Comparison of Emplacement Concepts

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BACKGROUND

- **Decision Problem:** determining emplacement concept for HLW packages
- Involves geological, engineering, operational safety and human factors
- In Germany:
  - verbal-argumentative decision-making approach is practiced
  - preference currently tends towards drift emplacement concept (BGE, 2022)

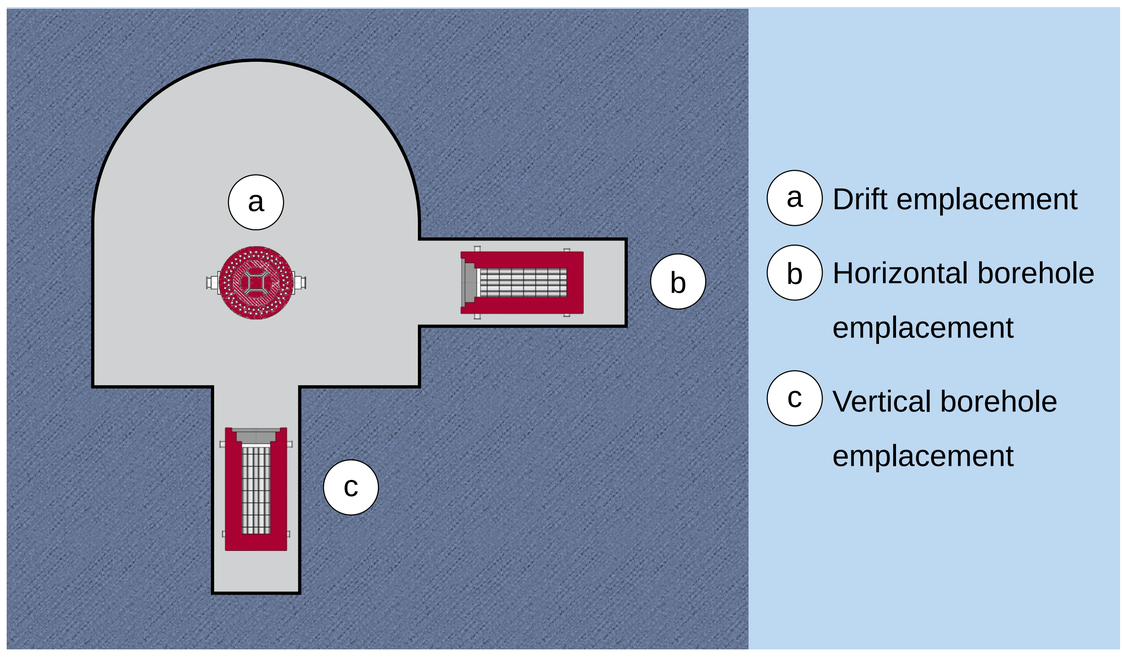

Fig. 1: Sketch of the three general emplacement concepts for final disposal of HLW packages.

OBJECTIVE

Goal

- Development of a decision model for comparison of robust emplacement concepts for HLW final disposal
- Integration of MCDA method
- Appropriateness test within the context of the emplacement concept

Research Question

- What methodological steps are necessary to successfully conduct a comparison using MCDA methods?
- Which criteria are relevant for a robustness-directed comparison?
- How should these criteria be weighted for a cross-host rock comparison?
- To what extent is the development of the decision model feasible and practical with integrating MCDA methods?

Benefit

- Supporting decision-makers (Frieling et al., 2020)
- Achieving and enhancing temporal and financial efficiency during site selection
- Increasing of transparency, understanding and acceptance

METHOD

MCDA – Multi-Criteria Decision Analysis

Methods which can support complex decision problems assessing multiple criteria to evaluate the best available alternative or to define the optimal alternative.

Tab. 1: Generalized and simplified application of MCDA for the case of apple decision-making.

Criteria		Weight	Alternative		
4		100 %	A 	B 	C 
C 1	Cost	15 %	1 (medium)	1 (medium)	2 (low)
C 2	Origin	15 %	1 (?)	0 (far)	2 (local)
C 3	Quality	25 %	1 (good)	2 (high)	0 (low)
C 4	Taste	45 %	2 (good)	2 (good)	1 (medium)
C 1		0,15	0,15	0,30	0,30
C 2		0,15	0,15	0,00	0,30
C 3		0,25	0,25	0,50	0,00
C 4		0,45	0,90	0,90	0,45
Result		1	1,45	**1,70**	1,05

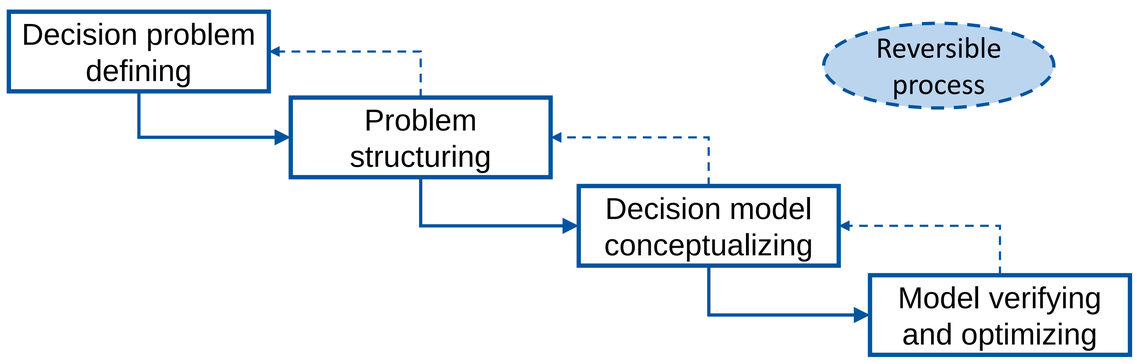

Fig. 2: General methodology for decision model development (adapted from Belton and Stewart, 2003).

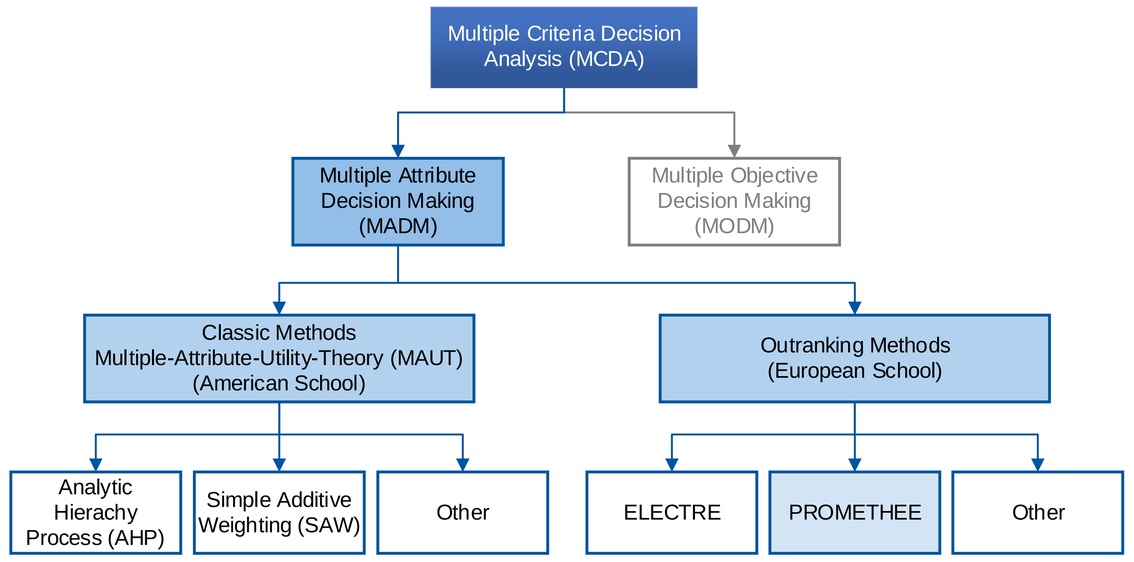

Fig. 3: Classification of MCDA methods (adapted from Frieling et al., 2020).

OUTLOOK

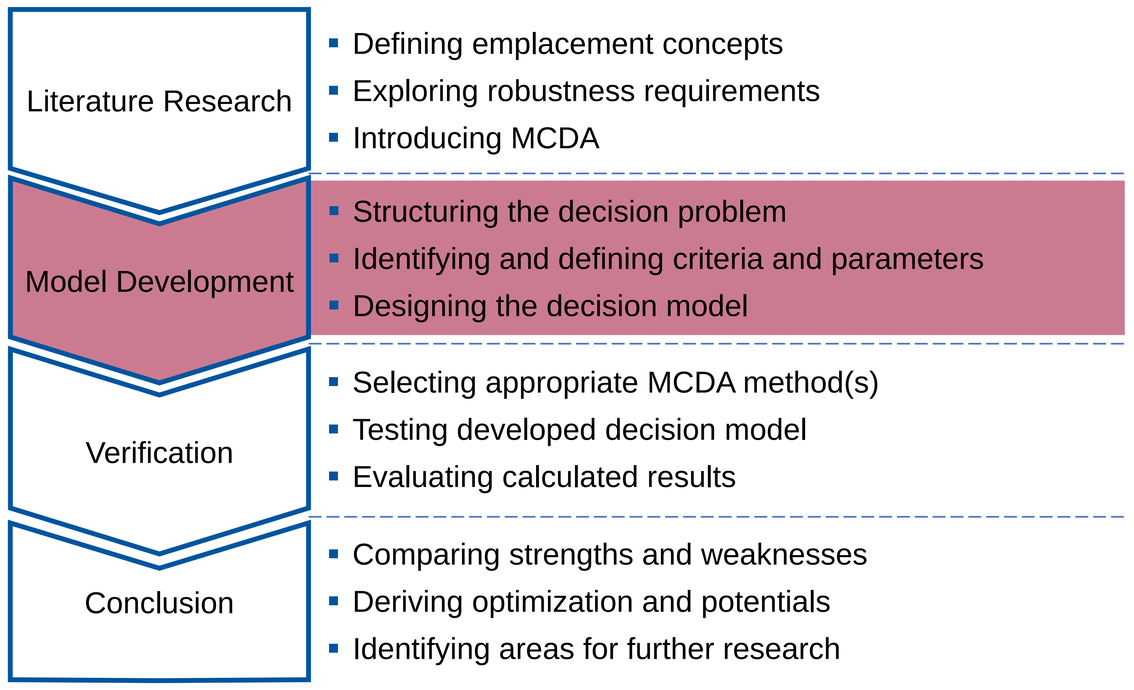

Fig. 4: The four defined methodological work packages including key steps of the doctoral thesis.

REFERENCES

Belton, V. and Stewart, T. J.: Multiple criteria decision analysis: An integrated approach, 2. print, Kluwer Acad. Publ, Boston, Mass., 1-12, ISBN: 9780792375050, 2003.

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