

Governing Radioactive Waste Disposal: Processes for Resolving a Wicked Problem



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Part 1

*What is special
about nuclear waste risks?*



Nuclear Waste Repository



■ Complexity

- Multitude of causal and intervening factors
- Interdisciplinary approach necessary
- However – not more complex than other technologies

■ Uncertainty

- Modeling over very large time intervals
- No historic precedent for such long time management
- High relevance for system boundaries and non-knowledge

■ Ambiguity

- Extremely high mobilization potential
- Direct link with debate about future of nuclear power

Nuclear waste

Three major challenges

- *Perceived dissent among experts on most appropriate disposal method: confusion in the public debate*
- *High potential for social amplification*
 - Long term threat
 - Stigma effect of "nuclear"
 - Typical "creeping danger" risk perception
 - High potential for social mobilization
- *Symbolic connotation for large centralized technologies (Human Hybris)*

Part II

Risk Perception (Nuclear Waste Repository)



Empirical evidence

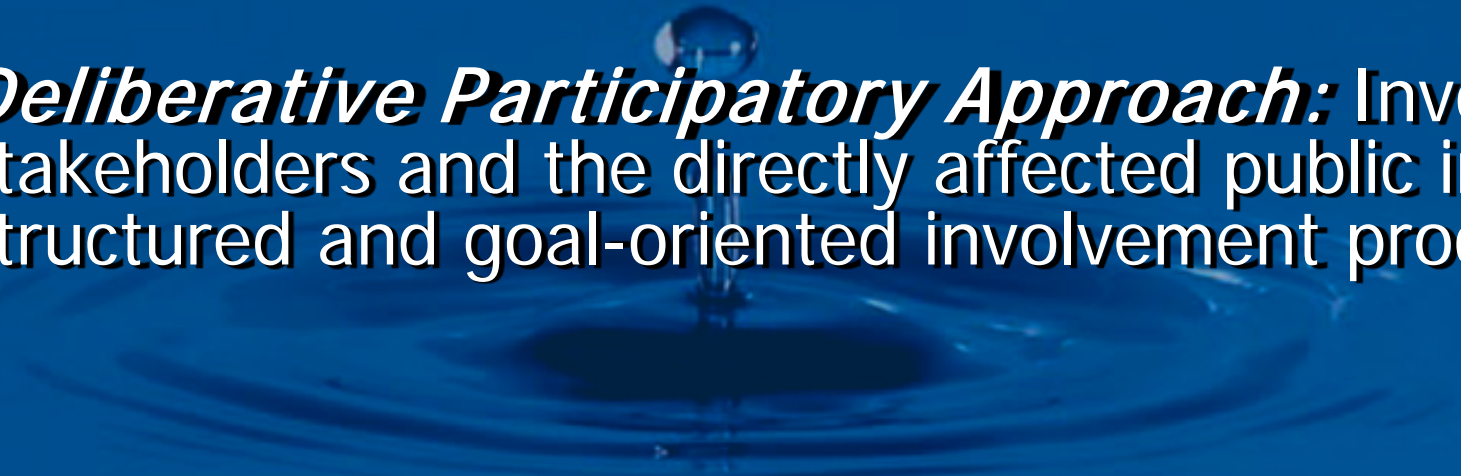
- Almost all surveys worldwide demonstrate that a large majority of the population judges risk of nuclear waste repositories as highly serious and threatening while the majority of experts estimates the risks of being fairly low compared to other risks of daily life.
- Surveys also reveal that opposition and mobilization potentials reach magnitudes of above 80% when people are asked whether they would accept a nuclear waste repository in their back yard. Yet they agree that a waste repository is necessary.
- With respect to risk management, communication and siting procedures there are major differences between countries (Finland, Japan, USA, GB, Switzerland), which are good sources for institutional learning

Part III

Institutional Arrangements for Risk Governance

A water droplet is captured in mid-fall, just above the surface of a pool of water. The droplet is clear and spherical, with a small highlight on its upper left side. Below it, the water surface is disturbed, creating a series of concentric ripples that spread outwards. The background is a solid, deep blue color, which makes the white text and the clear water droplet stand out prominently.

Three Major Options

- ***Top-Down Decision Making*** (expert driven selection, legitimization by parliament, implementation if necessary by force)
 - ***Muddling Through***: stakeholder driven process by navigating along public support and opposition and hope for a window of opportunity
 - ***Deliberative Participatory Approach***: Involving stakeholders and the directly affected public in a structured and goal-oriented involvement process
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Why is participation necessary?

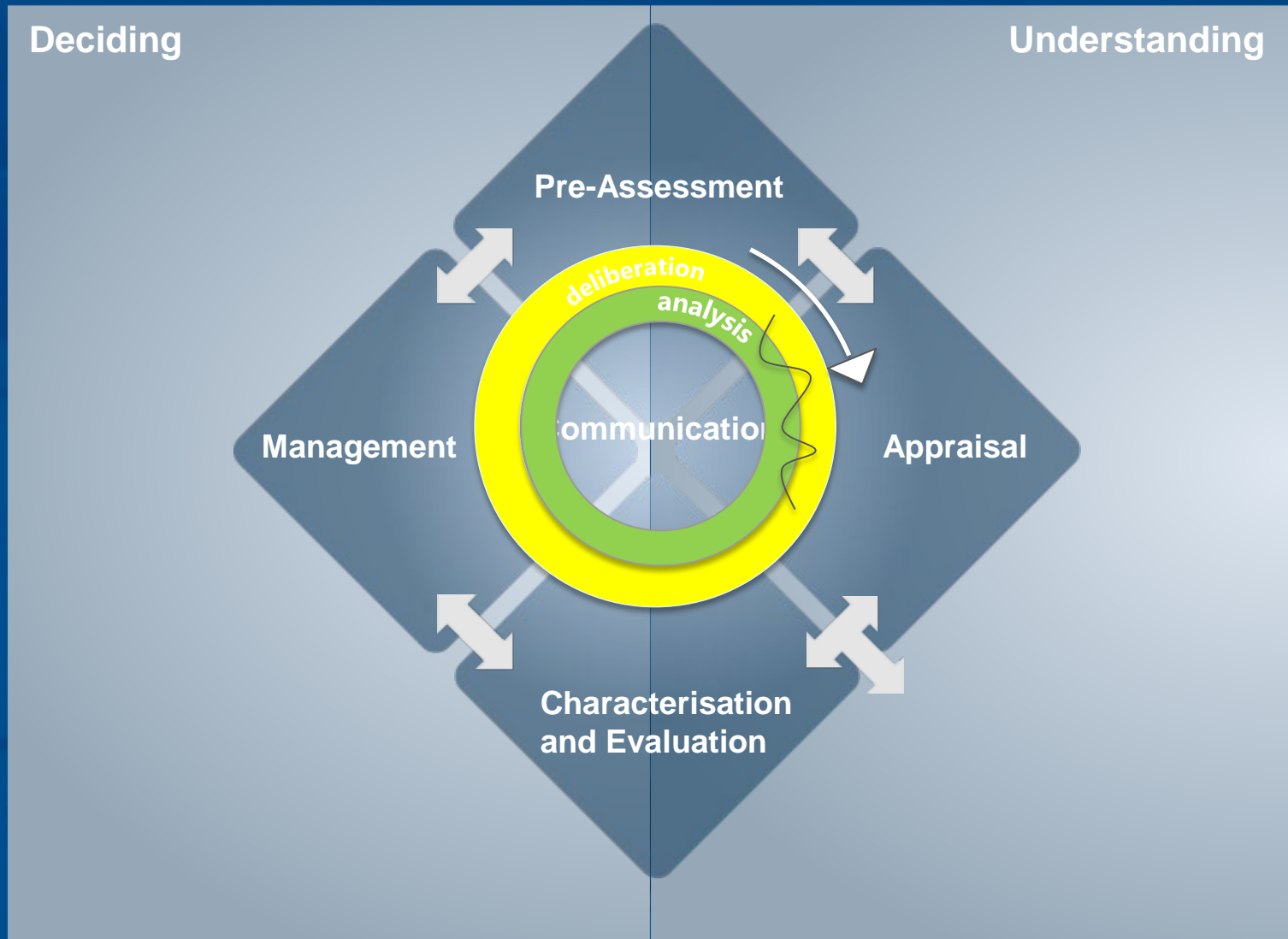
- Increase of uncertainty and ambiguity with the widening of time horizons
- Integration of systematic, analytic, interdisciplinary and experiential knowledge essential
- Loss of trust and confidence in the problem solving capacity of the political sector, in the fairness and „common good“ orientation of the economic sector and in the impartiality of the scientific sector
- Prevalence of new governance structures (including governments, industry, science, civil society)
- Procedural legitimization might overcome impasse
- Acceptance surplus with participation

STAKEHOLDER INVOLVEMENT

Actors			Scientists/ Researchers	Affected stakeholders	« Civil society »
			Scientists/ Researchers	Scientists/ Researchers	Affected stakeholders
	Agency Staff	Agency Staff	Agency Staff	Agency Staff	Agency Staff
	Instrumental	Epistemic	Reflective	Participative	
Type of participation	Find the most cost-effective way to make the risk acceptable or tolerable	Use experts to find valid, reliable and relevant knowledge about the risk	Involve all affected stakeholders to collectively decide best way forward	Include all actors so as to expose, accept, discuss and resolve differences	
Dominant risk characteristic	Simple	Complexity	Uncertainty	Ambiguity	

As the level of knowledge changes, so also will the type of participation need to change

Risk Governance Process



Participatory requirements


■ Complexity

- Knowledge-oriented strategy (epistemic discourse)
- State-of-the art characterization of risks (scenarios)

■ Uncertainty

- Reflective discourse (weighing pros and cons)
- Balancing too much precaution against too little precaution
- Investment in resilience

■ Ambiguity

- Participatory discourse
 - Evaluation of different options and locations
 - Risk-benefit packages (compensation)
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German Policies

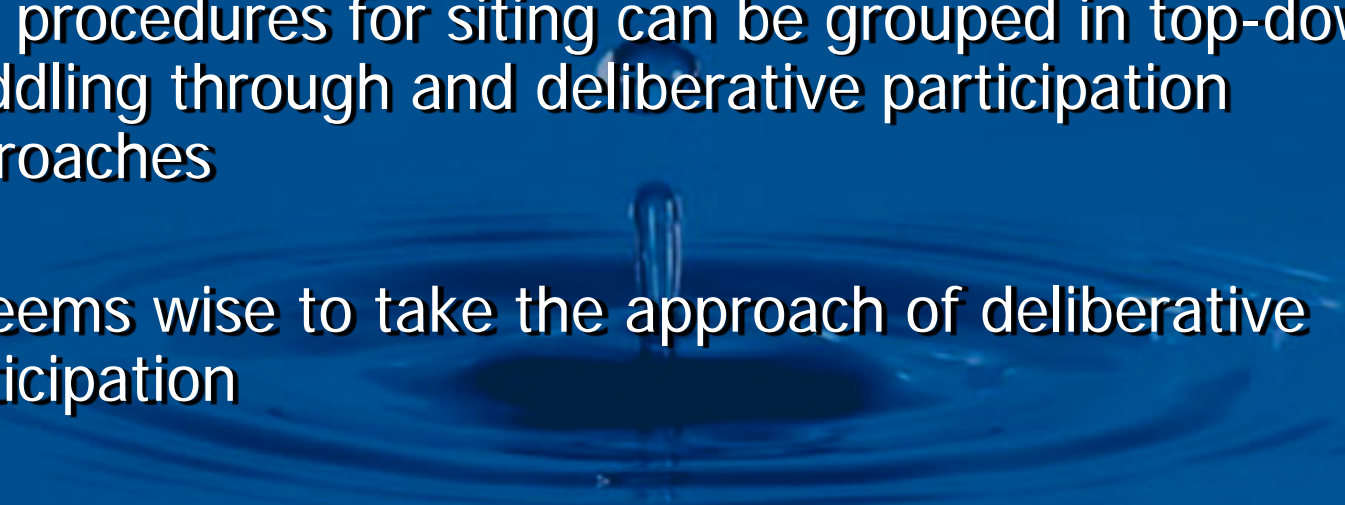
- Political paralysis until 2011
 - Gorleben selected for further characterization as national high-level site
 - Ongoing protest and public outrage at the location
 - Initiative AK-End did not resolve conflicts
- Nuclear Phase out after 2011
 - Agreement on phase out until 2021
 - National consensus on new approach for site selection
 - Parliament establishes nuclear waste committee (2014-2016)
 - Committee issues final report in July 2016
 - Report emphasizes participatory approaches

Part IV

Conclusions



Conclusions I

- Nuclear waste repositories are risk sources characterized by medium complexity, high uncertainty and extreme ambiguity
 - Worldwide high potential for negative risk perceptions and social mobilization
 - The procedures for siting can be grouped in top-down, muddling through and deliberative participation approaches
 - It seems wise to take the approach of deliberative participation
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Conclusions II

- New institutional and participatory forms of decision making are needed
- Inclusion of a broad governance representation: Political economic, scientific and civil society actors
- Three types of discourse procedures:
 - *Complexity*: Scientific modeling (epistemic discourse)
 - *Uncertainty*: Balance between precaution and innovativeness (reflective discourse)
 - *Ambiguity*: Building trust and consensus (participatory discourse)
- Necessity of a neutral platform for designing, organizing and moderating these discourses under the umbrella of a impartial and highly esteemed supervisory board.