Evolution and Major Turning Points of HLW Disposal Policy in Several Countries

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Introduction and Purpose

- We began our study by surveying the background situation and discussion of the evolution and major turning points of High-level Waste disposal policy in several countries in order to extract key issues and lessons learned.
- We also evaluated the conditions which preceded and followed the major events, by tracing and analyzing the evolution and key issues of HLW disposal policy in each country. Furthermore, we identified the major turning points in each country, such as the new approach mentioned in the RD&D Programme 92 in Sweden and the Law on Radioactive Waste Management Research of 1991 in France.
- Moreover, we examined the background of evolution and turning point in each country, and identified the key issues for HLW disposal policy.
- Finally, based on this survey, we tried to extract important common factors to promote HLW disposal policy. These factors include the stepwise approach, reversibility/retrievability, fairness of the process, dialogue, etc.

Method

- Historical Overview of Geological Disposal in the World ⇨ History
- Historical Overview of Siting Process in 6 countries ⇨ Siting
- Identification of Major Changes in the Policy/Strategy in each country ⇨ Turning Point
- Information gathering before, during and after policy/strategy change ⇨ Turning Point
- Analysis and review of experience ⇨ Lessons learned

Historical Overview

1950s	Proposal of Geological Disposal
1960s	Start of R&D
1970s	Start of International Joint Study
1980s	Feasibility Study, Start of Siting activities in several countries
1990s	Discussions on Ethical and Environmental Aspects
2000+	Implementation of Disposal Operations

Framework of Analysis on Siting Process

- 1st step : Identification of the problems preceding the turning point and the cause of the turning point
- 2nd step : A review of the turning point experience and discussion for the future
- 3rd step : Survey on the developments after the Turning Point

Evolution and Major Turning Points

	Turning point	Characteristics of policy changeover
United States	1982-1987	The method to select one site from multiple sites was changed, and a specific candidate site was singled out partly for political reasons.
Sweden	1987-1992	Change-over by (calm) discussions based on experience. Subsequent development looks almost smoothly progressed.
France	1989-1991	Large-scale changeover after facing significant opposition. Turning back to the concept study phase.
Canada	1989-1998	Sociological studies were made; however, the government concluded they were insufficient. Moderate changeover
Switzerland	1998-2000	Changeover within the framework of nuclear policy discussions.
Germany	1998-2002	Indication of changeover in conjunction with government and policy changes.

Evolution and Major Turning Points
Case 1 : Sweden (Turning point 87-92)

Background leading to turning point. Main factors	➢ Science and technology-led site selection process. ➢ Established the concept（KBS-3） at an early stage. ➢ Protests against site survey and drilling activities. ➢ Suspension of field survey.
Characteristics of situations at turning point	➢ Review of the comprehensive approach led by the government including broad sectors in society. ➢ Formulation of RD&D Program by SKB, an implementer. ➢ The process advances with no major regression.
Topics of development after turning point	➢ Objections expressed in two northern municipalities on detailed research. ➢ Six municipalities including Oskarshamn and Osthammar agreed on feasibility study. ➢ Oskarshamn and Östhammar decided to accept site characterization.

Evolution and Major Turning Points
Case 2 : France (Turning point 89-91)

Background leading to turning point. Main factors	➢Science and technology-led site selection process. ➢Typical "Decide-Announce-Defend" (DAD) approach. ➢Approach led to vigorous opposition.
Characteristics of situations at turning point	➢Search for solutions led by Parliament and its members. ➢New legislation, which considered public opinion. ➢Regression from selecting the research site phase to the concept study phase.
Topics of development after turning point	➢Starting construction of Bure underground laboratory ➢Siting of underground laboratory in granite region was deadlocked by local resident opposition. ➢Full-fledged review of retrievability by the National Assessment Committee.

Before Turning Point : Typical situation

	Specialists on disposal-related sciences and technologies	Society in general	Stakeholders/ Residents
Phase R&D	Our responsibility	Not concerned or their work	Not concerned or their work
	←	No conflict	→
Phase Siting; Selection of research/ candidate site	Our responsibility	Anxious about	Our problem We decide
	DAD →		
	←	Confrontation/ Conflict	→

Lessons Learned from Turning Points
Items Identified

① Concerns over fairness of the process (Are we the least lucky of all because of the imposition of a repository?)
② Validity of selection process (whether a broad technological study was made)
③ Candidate site selection led by science and technology groups, followed by announcement of decision ("Decide-Announce-Defend" approach)
④ Selection only from scientific and technological viewpoint
⑤ Concerns over the disposal concept (anxiety about a repository left uncontrolled early)
⑥ Concerns over safety of a repository
⑦ Concerns over influences of a repository on a local community
⑧ Identification of important people and communication
⑨ Concerns over the rigid disposal concept
⑩ Concerns over disregarding other promising technological developments

Lesson Learned 1

Decision - Making under uncertainty :

- Two types of uncertainty
  - Uncertainty about the development of society
  - Uncertainty about the development of science
    - Natural events
    - Technology
- The level of uncertainty depends on the types of uncertainty and time
- We should consider those characteristics of uncertainty to establish a reasonable D-M system

Lesson Learned 1 : Decision-making under uncertainty
Reasonable D-M system coexists with uncertainty

- Inter-generational stepwise D-M system which lasts over several decades, corresponding to the disposal project
- Present generation's responsibility in view of " present as time continuum"
- Initial generation prepares several options and hands them over to continues future generations in reasonable society's time frame to maintain the future generation's right of choice
- Central option is geological disposal based on the knowledge of nature and feasible technology without any undue burden on future generations

Lesson Learned 2 : Ethical Consideration
Three types of ethics

- Intergenerational ethics

  (between generations)*

- Intragenerational ethics

  (within contemporary generations) *

- Environmental ethics

*:OECD/NEA, 1995

Lesson Learned 2 : Ethical Consideration
Inter/Intra-generational ethics

- Intergenerational ethics
  - Responsibilities vs right of choice
  - Burden on future generations
- Intragenerational ethics
  - fairness of the process
  - Validity of selection process
  - Open and fair decision-making system
  - Participation of every stakeholder and the public

Lesson Learned 2 : Ethical Consideration
Environmental ethics

- Identification of sociological and natural influences of a repository on a local community
- EIA as a dialogue tool : Possible?

Lesson Learned 3 : Dialogue and Communication
Major Issues learned from experience in several countries

① Environmental impact on local communities
② Sociological impact on local communities
③ Validity of site selection process and fairness
④ Reversibility of disposal project
⑤ Institutional control of repository
⑥ Long-term safety of geological disposal
⑦ Alternative technologies

Lesson Learned 3 : Dialogue and Communication Share Issues in Stepwise manner

- Issues identified to be addressed
- Participation of stakeholders and the public
  - Including the local and central/federal government, residents, implementer, and regulator
- Adaptive table to talk about issues
- Dialogue tools
  - Such as the Environmental Impact Assessment and Safety Case
- Dialogue and iterative review are central to the stepwise approach

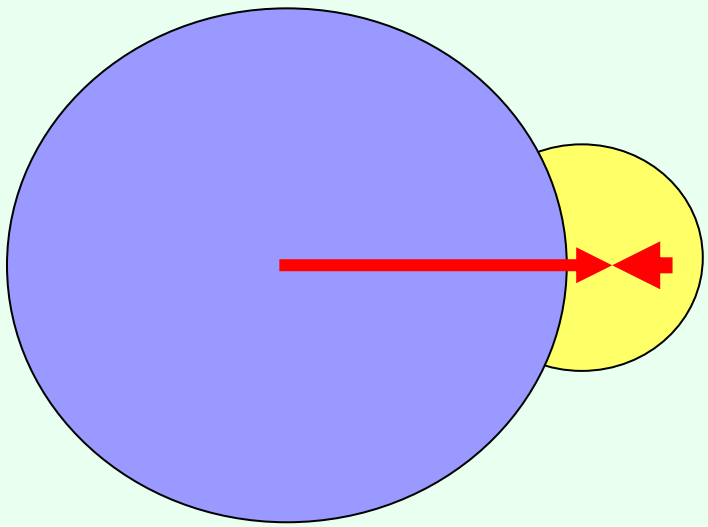
Lesson Learned 4 : Flexibility and alternatives

- Flexibility is inevitable for intergenerational decision-making under uncertain conditions.
  - Uncertainty will gradually decrease in a stepwise and iterative manner
  - On the other hand, it's reasonable to think that unforeseen phenomena will always exist and appear. Flexibility is also required to respond to those surprises.
- Alternatives
  - In order to respond to surprises, alternatives are effective for smooth evolution after turning point.
  - "A decision is by definition a choice between at least two alternatives. (NAS/NRC, 2001)."
  - Alternatives depend on the extent of the flexibility of a policy.

Lesson Learned 5

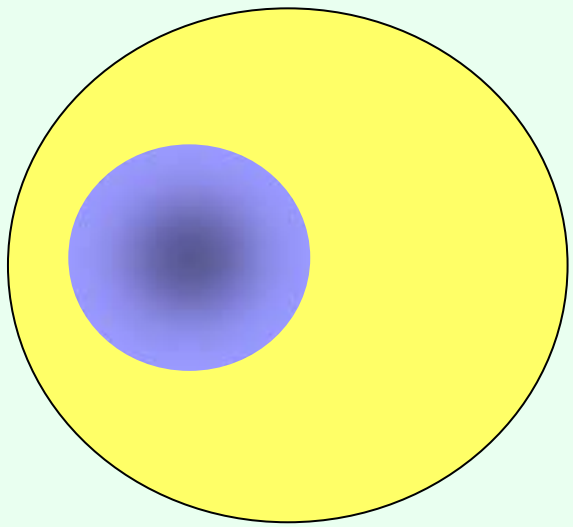
Clarification of roles of Specialists

Decide, Announce, Defend and Defeated



This situation often resulted in a confrontation structure

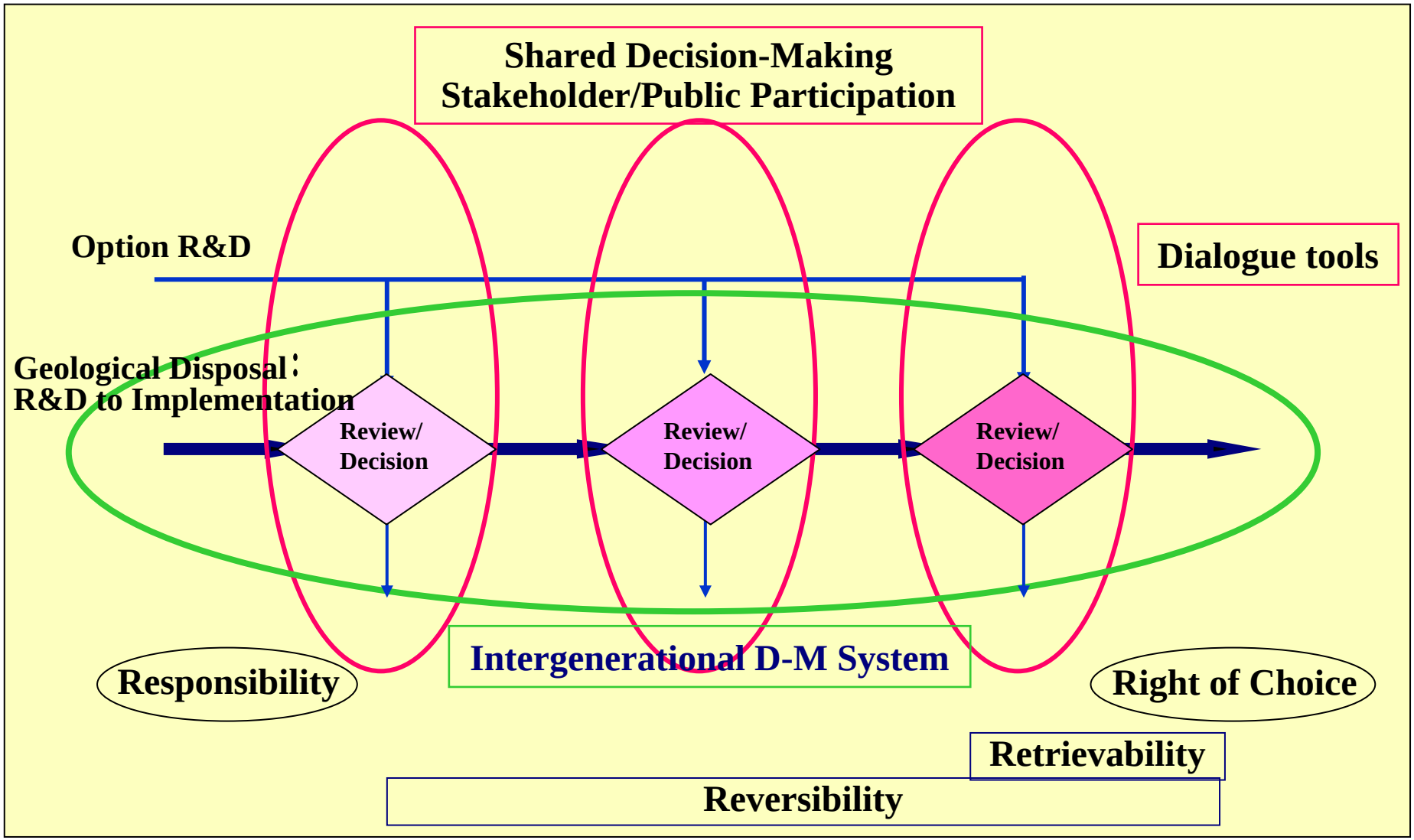
Communication, Dialogue, and Shared Decision-making



:Science & Technology

:Society

Sketch of Shared/Stepwise Decision-Making



For a New Era

- Stepwise Approach, and
- Dialogue/Communication (Shared decision making)
  - Based on the discussion of the uncertainties/ethics

⇨ established as common understanding

- What should we do for the future?
  - We should develop a stepwise dialogue procedure
  - Central dialogue tool: EIA?, Safety Case? Further discussion
    - A central dialogue tool is necessary to share the issues/a discussion of the issues and to deepen the stakeholders' understandings

Stepwise dialogue

	Implementer, Specialists on disposal-related sciences and technologies	Society in general	Stakeholders/ Residents
Environmental issues (ex. EIA)	Our responsibility	(Basically their work)	Our problem. We can discuss
	←	Building trust	→

During early dialogue process, mutual understanding and trust are expected to build

Long-term safety issues (ex. Safety case)	Our responsibility	(Anxious about. We look at the discussion)	We can understand what they do and say. (or We can discuss)
	←	Fulfill their responsibilities respectively	→