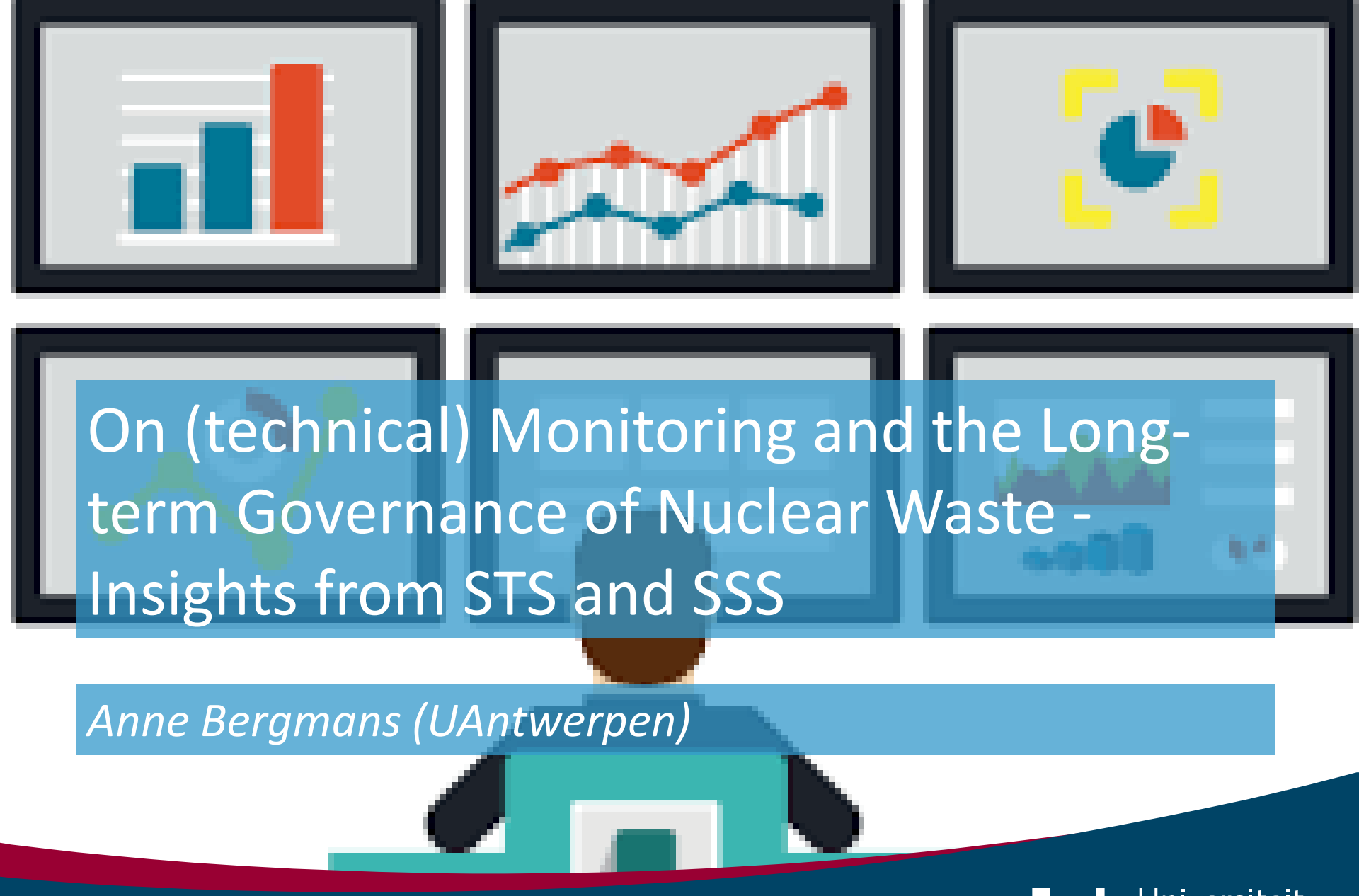


On (technical) Monitoring and the Long-term Governance of Nuclear Waste - Insights from STS and SSS

Anne Bergmans (UAntwerpen)

Technical Monitoring and the Long-term Governance
ENTRIA Workshop – ITAS am KIT- October 18-19, 2016

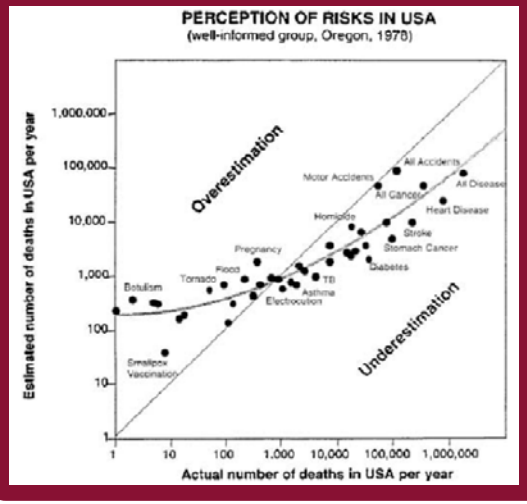
Universiteit Antwerpen

Social Studies of Science and Technology

STS: Science and Technology Studies

SSS: Social Studies of Science

RISK Perception



RISK Communication

RISK Dialogue

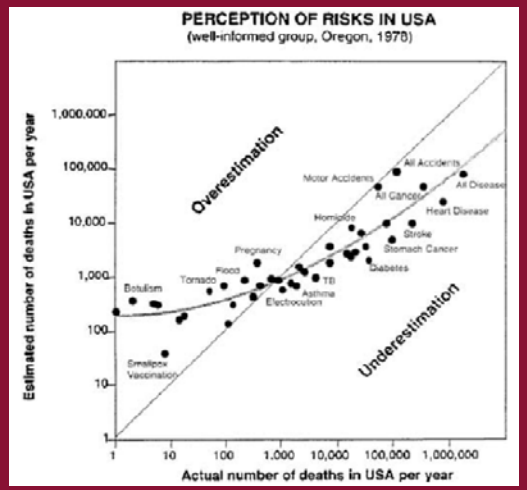
Flood Risk Communications
Public Dialogue Project

Social Studies of Science and Technology

STS: Science and Technology Studies

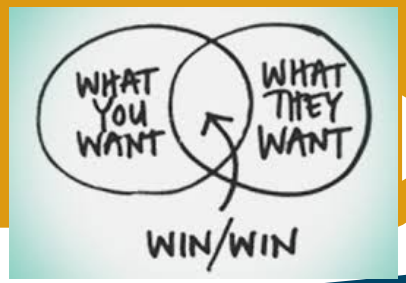
SSS: Social Studies of Science

RISK Perception



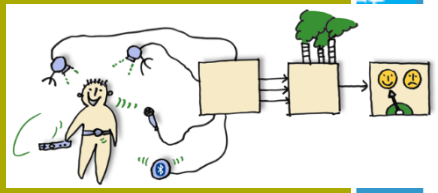
RISK Communication

PARTICIPATORY Methods



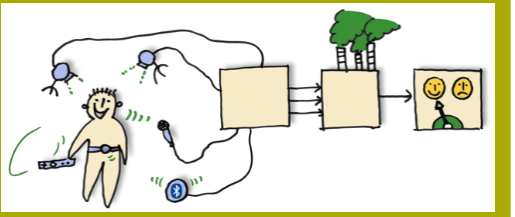
RISK Dialogue

SOCIOTECHNICAL Interactions



Focus on

SOCIOTECHNICAL Interactions



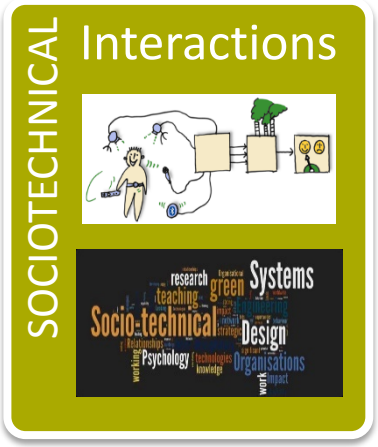
NWM as a 'Wicked Problem'

- Complex and 'messy'
- Uncertainty and contingency

"Dealing with radioactive waste is a **wicked problem**, for it is **complex** and technology-driven, facing both socio-political (strategic and institutional), as well as scientific or factual (cognitive) **uncertainties**."

Final Report CARL project - http://webhost.ua.ac.be/carlresearch/

Socio-Technical Interactions



Social aspects of science and technology

- Social acceptability of technology
- Social shaping of technology

Technical translation of socio-political requirements

- Technical feasibility of socio-political expectations and demands
- How technology shapes its (social) environment

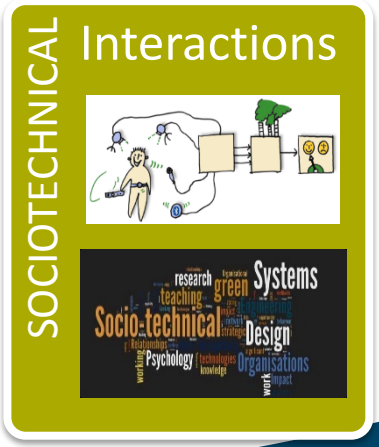
Socio-technical divide largely artificial

Context matters

Limitations of positivistic attitude towards science and expertise

Examples in NWM

- Waste streams and disposal technology similar across the globe, yet not exactly the same
- Ambiguity about what classifies as waste
- “Safety first” … but
  - Different interpretations and perceptions of safety
  - Varying ‘solutions’ considered (even if basis is GD)
- Introducing reversibility in the concept of GD
- Monitoring for confidence building
- Siting: principles, criteria, procedures



What is so special about nuclear waste?

"… radioactive waste is not a problem that stands on its own. It is the unwanted by-product of a socially contested activity, namely the production of electricity through the generation of nuclear power."

Final Report CARL project - http://webhost.ua.ac.be/carlresearch/

A double stigma

Waste

- A ‘cultural misfit’ (Sundqvist, 2002)

Nuclear waste

- Link to energy production
- Link to nuclear weapons production

Consequences of the ‘nuclear renaissance’ (cf. UK)

- Repository ≠ landmark of the end of the nuclear era
- Repository = symbol of the solvability of the waste problem

Waste is a dynamic category

Social construct

- Does not exist in itself
- Defined in relation to its context

Matter out of place (Douglas 1966)

- No longer wanted/needed
- Loss of function or discarded

NORM

Legacy waste

Future waste

Waste from reprocessing

Military waste

Spent fuel

…

Spent MOX fuel

Waste from research reactors

What is so special about nuclear waste?

Extremely long time frames …

for implementing ‘solutions’

⇨ Complexity & Uncertainty

⇨ Inevitable burden on future generations

Hence importance of …

Long-term Governance

www.gov.uk

(Technical) Monitoring

www.navantis.com

Some observations regarding

(long-term) GOVERNANCE

Observation n°1

Prevailing discourse: participation of all stakeholders as the standard

BUT

I. Remaining ambiguity / lack of shared norms about
   - Who to participate?
   - When to participate?
   - What to participate about?
   - How to organise participation?

II. Tendency to focus on siting

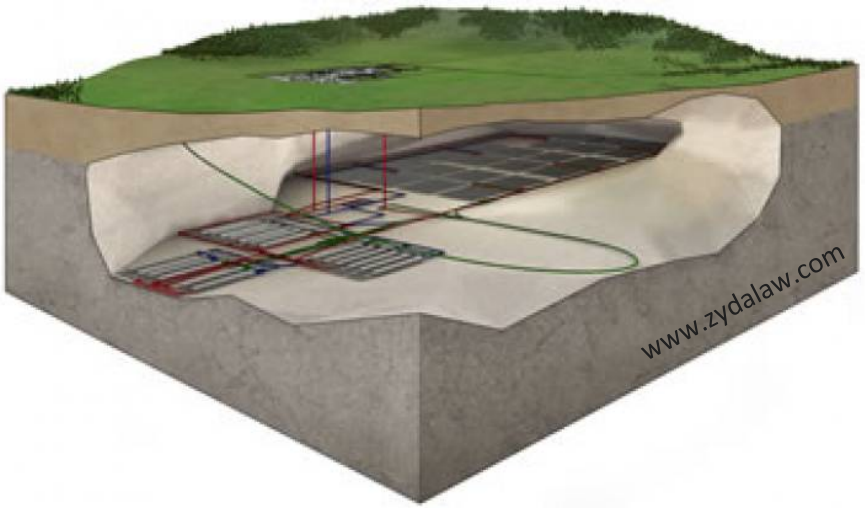
www.emaze.com

Voluntary siting
Consent-based siting
…
➡ Who wants the stuff ?

When nimby conspirators start questioning theoretically ideal locations and long since studied solutions

Observation n°2

Siting means … finding a place for final disposal or central interim storage (CIS)



Observation n°3

(part of) The waste is already out there


Dounreay
SCOTLAND
North Sea
Hunterston A
Chapelcross
Sellafield
Calder Hall
Windscale
Drigg LLW Repository
Springfields
Atlantic Ocean
Wylfa
Capenhurst
Trawsfynydd
ENGLAND
Sizewell A
WALES
Culham JET
Berkeley
Oldbury
Bradwell
Hinkley Point A
Harwell
Dungeness A
Winfrith

Source: NDA


www.can-ouest.org
Flamenvillle
Penly
Bessines
Pierrelatte
Cadarache
Centrales nucléaires
Usines de fabrication de combustibles, usines de retraitement
Sites de stockage, centrales de démantèlement,
sites industriels ou militaires, anciennes mines

Ownership of the problem

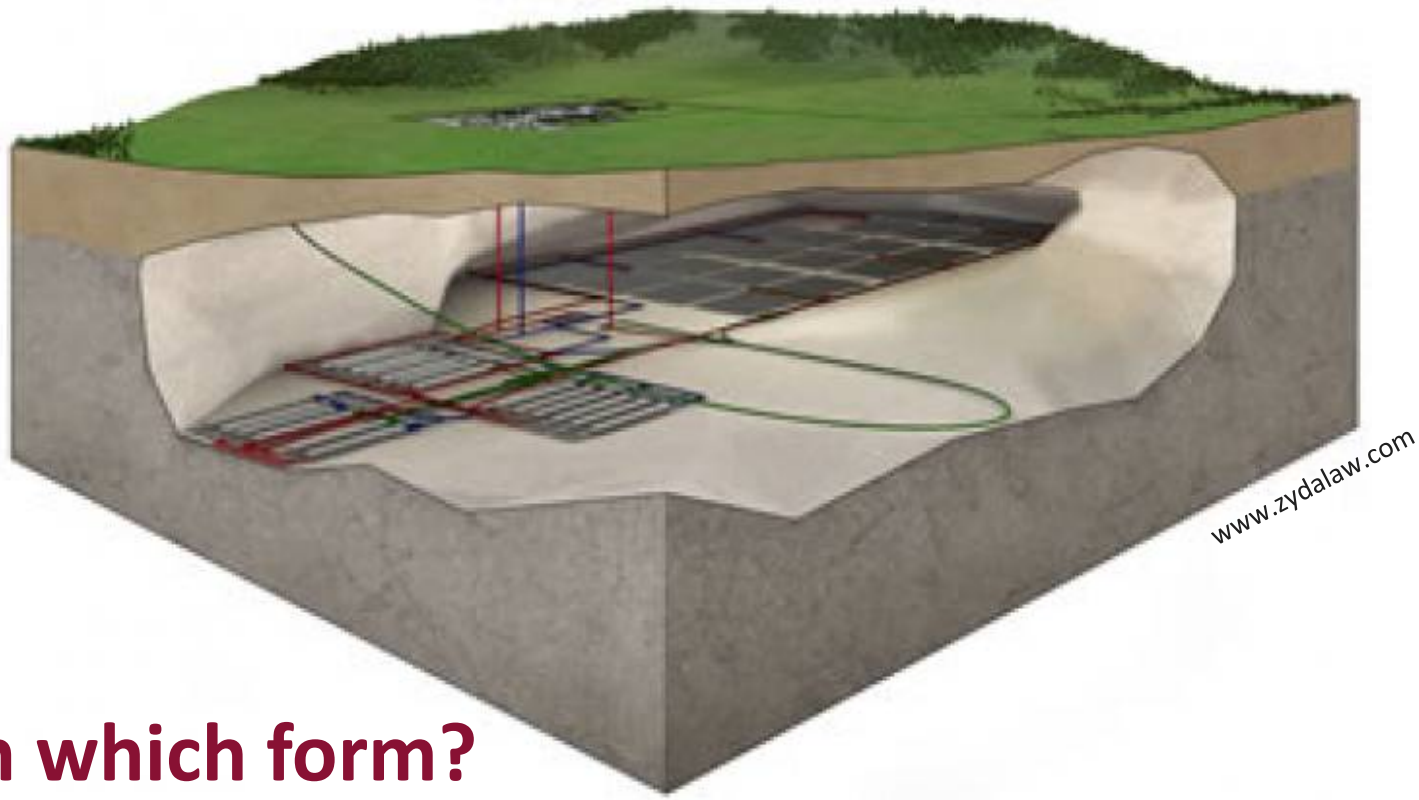
Problem = nuclear material 'out there' in need of safe long-term management

➡ **First and foremost problem of nuclear communities**

- ➡ Who has the stuff ?
- ➡ What are the options ?

Observation n°4

Geological disposal: the ineluctable fate ?!



But in which form?

Under which circumstances?

A sociotechnical imaginary ?

cf. Jasanoff & Kim (2009)

GD: an imagined (distant) future

- Vision of a good and desirable future
- Portrayed as feasible
- Portrayed as the only possible future

A global sociotechnical imaginary with national variations

E.g. France : REVERSIBLE GD

Reversibility according to the NEA

(OECD- NEA 2012)

Reversibility

- the **ability in principle to reverse decisions** taken during the progressive implementation of a disposal system
- reversal is the actual action of going back on (changing) a previous decision
- by changing direction and by restoring the situation that existed prior to that decision

Retrievability

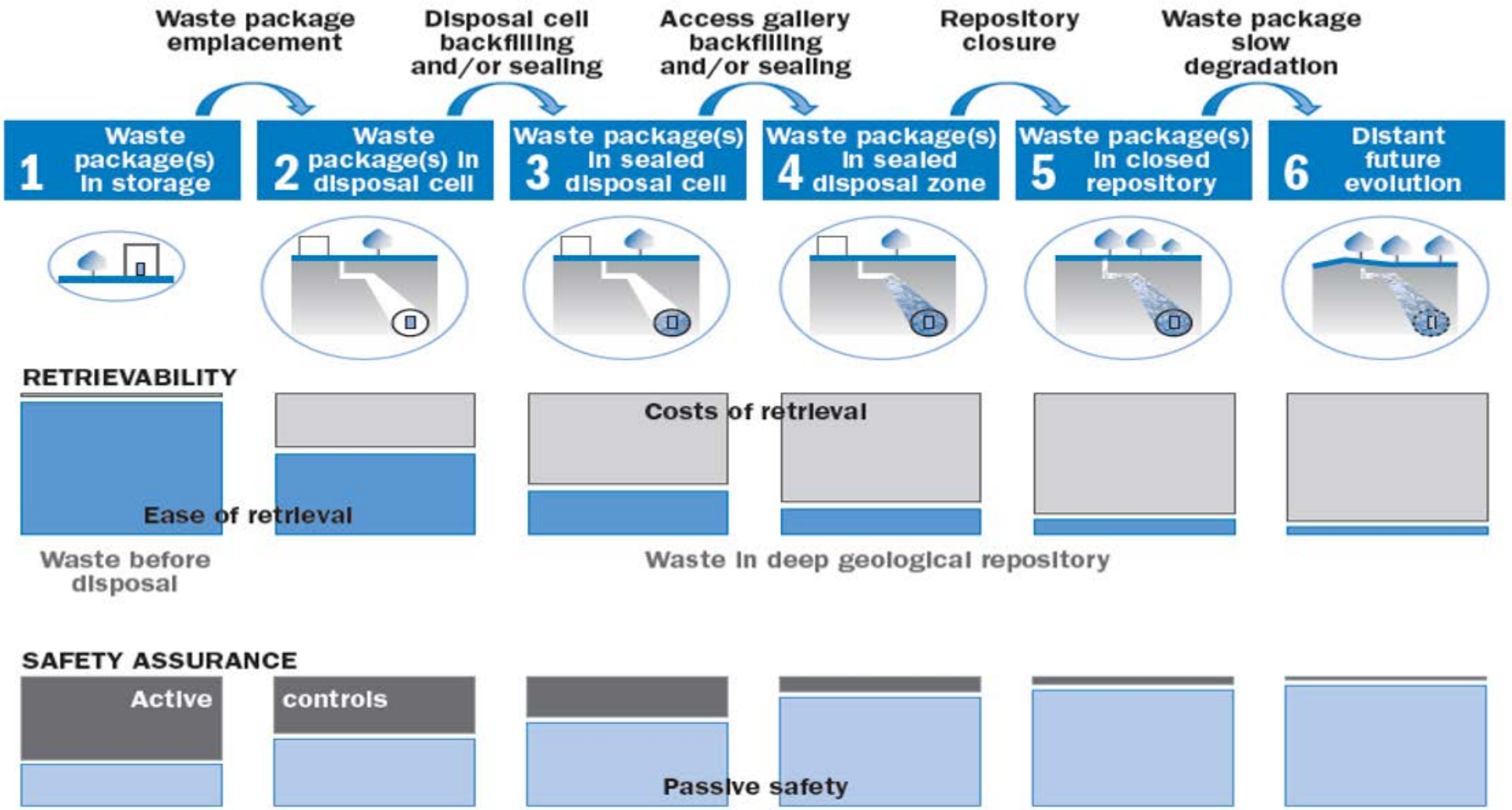
- the **ability in principle to recover** waste or entire waste packages once they have been emplaced
- retrieval is the concrete action of removing the waste

⇨ expert driven definitions to fit ruling sociotechnical imaginary

Reversibility the French way

Reversibility as a **political tool to deal with uncertainty**

- Focus on processes and ‘governance’, on precaution and keeping options open
- Flexibility of waste inventory as the main (official) argument for R(&R)
- Modular conception of the facility
- Final closure as a political decision



Source: OECD-NEA

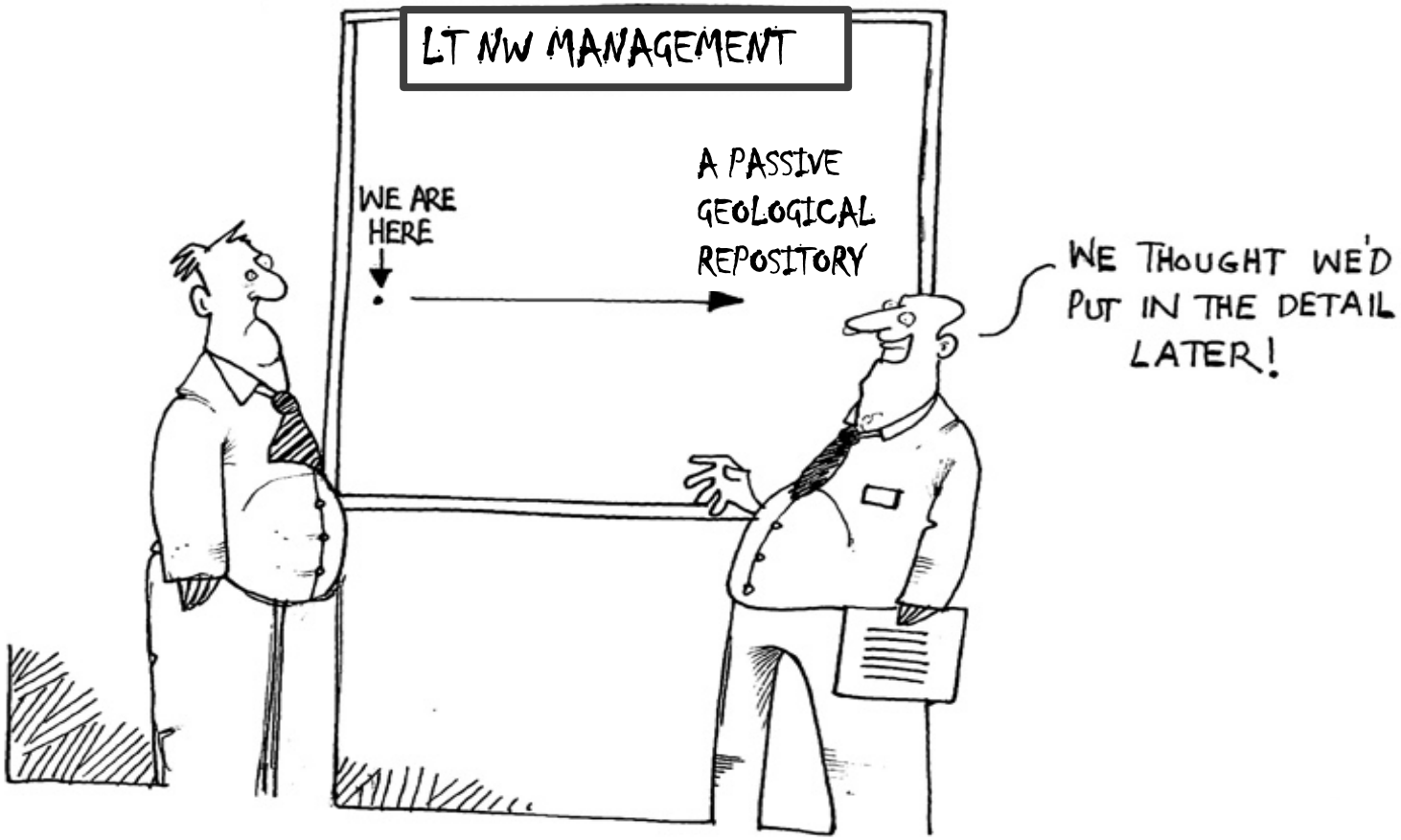
Reversible GD: Emergence of a new ST imaginary?

challenging the concept from within

imagining an **open ended** instead of a closed **future**

Observation n°5

Geological disposal is not a solution, it is a technology in the making



Adapted from: hksocialinvestor.blogspot.com

GD as an ongoing sociotechnical experiment

[cf. e.g. Taebi en Van de Poel]

A (scientifically) controlled, open-ended exploration towards a possible solution

- Final goal of passive safety cannot be guaranteed

⇨ Implies a long-term relationship between the surface and the underground, between the facility and its host community (near long-term governance)

⇨ Existing nuclear sites inevitably affected

‘Near long-term’ governance

Landström & Bergmans (2014)

Siting now

- Concerns
  - Repository design
  - Barriers
  - Environmental processes
  - Local participation

Easily 150 years of active hosting, construction, operations and monitoring

Post-closure safety

- Concerns
  - Loss of containment
  - Preserving memory
  - Preserving knowledge

Observation n°6

(technical) MONITORING as an integral part of LT-GOVERNANCE

Monitoring

"any kind of follow up on the behaviour of a repository and its natural and social environment" (Hocke, Kuppler & Bergmans 2012)

Cf. position local community participants in MoDeRn project

- Broad definition of monitoring
  - environmental monitoring, repository monitoring, pilot facilities, evolutions in technology (continuation of research in URL's),
  - status reports on wastes not yet disposed of, stocktaking of nuclear materials not (yet) considered as waste,
  - socio-economic impact monitoring, health statistics, …
- Situated over a period from site investigation to post-closure

Monitoring as a tool for

Dealing with uncertainty (checking vs confirming)

Informing milestone decisions before, during and after operations

- e.g. restrict operational licence in time

Stimulating continuous search for improvements: supporting flexibility/reversibility

Ensuring sustained implementer performance (vigilance)

⇨ Monitoring as part of wider process of consultation and participation dedicated to the question of geological disposal

(Source: local community participants in MoDeRn)

To conclude

From

Ownership of the problem

to

Ownership of the ‘solution’

Ownership of the 'solution'

Creating room for technical democracy

LT NW governance as a continuous process of (**P**)TA

Existing nuclear communities as key actors

- Site stakeholder groups (cf. UK)
- Potential for tangible engagement in R&D

Some crucial issues

GD as part of a process, not a product

Maximum possible 'promise' = unfinished GD facility

Acknowledge and foster complexity

Key role for monitoring

www.insotec.eu
2011-2014

www.modern-fp7.eu
2009-2013

http://uahost.uantwerpen.be/carlresearch/
2005-2008

THANK YOU !

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