Strategic Monitoring – a proposal for the institutional surveillance of complex and long-term disposal programmes


I wear two hats: academic (ETH) and public administrator (Canton of Zurich), plus (i. a.):
• 1992-2004 Member of the Swiss Federal Nuclear Safety Commission,
• 2012+ Member of the oversight committee of the URL Mont-Terri (Commission de suivi)

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Strategic Monitoring – a proposal for the institutional surveillance of complex and long-term disposal programmes


Thomas Flüeler, Nuclear Technology Unit Head

I do not participate in MODERN2020 but I am part of the ongoing Swiss site-selection process (and have monitored it for 10 years)

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Radioactive waste management, RWM: monitoring!

Up to now we have been dealing with repository monitoring during the Conference on Radioactive Waste Management (RWM) focusing on confirmatory (near-field) and operational monitoring, as well as environmental (far-field) measurements.

nagra.ch, eawag.ch, idahoeser.com ↓2019-4-1
Deep geological repositories …

… are a long-term issue (regarding long-term safety) …

NEA (1999). The role of the analyses of the biosphere (…)
... require long-term involvement

- **Generation 0**
  - Licence for preparatory work
  - Criteria: inventory design, procedure

- **Generation 1**
  - Siting

- **Generation 2**
  - Construction licence

- **Generation 3**
  - Operating licence

- **Generation 40**
  - Decommissioning licence

- **Generation 400**
  - State ownership

**Time**

- NPPs funding
- Waste discussion
- Implementation
- Legacy?

- Benefit from nuclear electricity
- Cost from nuclear waste

Risk-benefit asymmetry

Flüeler 2005/6
... require long-term involvement

So they are a long-term institutional issue

= objective
and institutional long-term issue
Today

Wehntal
(potential siting region N Zurich)

With disposal we start out "today" (not with the use of nuclear energy of course)
«Tomorrow»: long-term disposal of waste

Wehntal
140,000 y ago
... require long-term societal involvement (1)

e. g., Swiss case

Planning, building, closing repositories requires long-term societal involvement
... require long-term societal involvement (2)

e. g., Swiss case

<table>
<thead>
<tr>
<th>HLW repository</th>
<th>2010</th>
<th>2030</th>
<th>2050</th>
<th>2070</th>
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<td>Site selection/general licence</td>
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<td>Nuclear construction licence</td>
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<td>Repository construction</td>
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<td>Nuclear operating licence</td>
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<td>Emplacement operations</td>
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<td>Monitoring phase</td>
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<td>Closure of main facility</td>
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<td>Closure of whole repository</td>
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<td>Long-term monitoring</td>
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</table>

In around **70 years (or later)**: technical, regulatory, political, and societal decision(s) due to close high-level (HLW) waste facility

Nagra, NTB 16-02, p. 12
Today (Swiss site selection, phase 3 started)

But think …

Dome of Cologne
Tomorrow (70 y from now: waste facility closed)

... what can happen in that period of time ...

70 y back: Dome of Cologne, April 1945
Nuclear waste as a “wicked problem”

(High-level) “nuclear waste management has the deserved reputation as one of the most intractable policy issues facing the United States and other nations using nuclear reactors for electric power generation”

– Complex, ill-defined, ill-structured
– Problem framing difficult
– Lack of stopping rules (no “closure” – no “solution”?)

“Ill-defined” in the sense that there is not one solution but there are, e.g., many (national) solutions

Rittel & Webber 1973
D. W. North, Risk Analysis 1999
Rather: nuclear waste as a “messy problem”

(High-level) “nuclear waste management has the deserved reputation as one of the most intractable policy issues facing the United States and other nations using nuclear reactors for electric power generation”

– Complex, ill-defined, ill-structured
– Problem framing difficult
– Lack of stopping rules (no “closure” – no “solution”?)
In need: **strategic monitoring**!

My assumption is that we also need strategic monitoring (Frédéric Plas said that “monitoring is a tool for governance”)

... to get from **A** to **B**
Long time schedules: up to site restoration

e. g., Swedish case (in ca. 60 y)

SFR
SFL
SF repository

SFR low-level waste
SFL long-lived waste
SF spent fuel

SSM (2017) ↓2019-3-20
Long time schedules: interruptions?!

Maybe there will be disruptions (not necessarily wars)

http://sitn.hms.harvard.edu (R. Senft) ↓2019-3-20
Main issue of RWM and Records, Knowledge & Memory: Handing over the torch
Main issue of RWM and Records, Knowledge & Memory: Handing over the torch

Asse (Germany) (to be recovered) Hopefully in good condition(s)
The system is highly complex: contents ...

Long-term safety of repositories

“is not … a rigorous proof of safety ... but rather a convincing set of arguments”*

Diversified lines of arguments must lead to the same result(s)

*NEA (1999): Confidence in the long-term safety ...
The system is highly complex: process ...

Long-term safety of repositories

“is not … a rigorous proof of safety ... but rather a convincing set of arguments”

The **proof over time** is decisive (site selection to closure of facility)

... in a lengthy process

As we all have learned the hard way – painful and arduous:

NEA (1999): Confidence in the long-term safety ...
Where people trust the institutions (Johan Bertrand said that monitoring shall “raise confidence and understanding” and “facilitate steps towards decision making”)

The system is highly complex: actors ...

The reasoning is difficult (few experts have full insight)
– 99 per cent of all are lay persons (also experts)
– conclusion: the process, not just the product, is in focus

Confidence in the process, trust in the actors

Trust in the system

– Needs resources: structures, competent institutions, staff (persons), discourse, time, money …
The system is highly complex: persons ...

Staff needs …
– an adequately developed culture
– respect for others
– admitting failures
– stamina and flexibility
– change of perspective
– empathy

But it isn’t just the system – it’s you personally that are decisive (don’t hide behind statements like “it’s up to politics to decide”)
Respect

Lay people concentrate on the process and on actors whom they are very well able to judge:
– Were the rules complied with?
– Are the experts credible, even authentic?
– Are they arrogant?
– Do they admit mistakes?
– Do they really address (my) questions/remarks?

Indicator:

Trust of the public in process and personnel

Laypersons concentrate on the process and on the actors – they simply have to! (this is in line with what Axelle Meyermans said about the French stakeholders not interested in R&D but in the process)
Approach towards “closure” (of issue)

– Comprehensive, transparent and participatory manner
– Some fundamental rules proposed
– Juxtaposed with “reality”

"Closing" issues is not just the experts’ decision - "technical consensus" on monitoring is not enough

Stepwise procedure

1. Discuss: comprehensive societal discourse
2. Decide: “common ground” in goals and stepwise strategy
3. Implement: execute programme and prepare long-term knowledge basis
4. Evaluate: assess programme (policy, process) regularly
**1. Discuss: comprehensive societal discourse**

- “Involvement of stakeholders”: as many relevant perspectives (not as many individuals as possible)
- “Social robust”: most arguments, evidence, social alignments, interests and cultural values lead to a consistent option (Rip 1987)
- Have pros and cons thoroughly scrutinised, to successfully “close” certain issues, and proceed to the following step, stage or phase

Dörte Themann is right in claiming that it needs a societal dialogue, and Mansueto Morosini recognised that monitoring involves "value judgements” – the whole undertaking does! And start early (cf. Canada’s "Choosing a way forward")
2. Decide: “common ground” in goals and stepwise strategy

No consensus will be reached “at heart”, in the stakeholders’ core beliefs.

Society must agree, though, on three levels:

– **Problem recognition** (waste exists, problem to be tackled, eventually “solved”, at least set on track to be solved)

– **Main goal consensus** (degree of protection and intervention)

– **Procedural strategy** (“rules of the game”)

Over thirty years ago Luther Carter* called in to find "a common ground" yet without specifying – Let me make it crystal clear: Passive safety must prevail!

3. Implement: execute programme and prepare long-term knowledge basis

- Necessity to integrate different requirements
- Step-by-step approach
- Chance of “institutional constancy”
- Special “national” task of the issue

→ calls special attention to the role of the regulatory authorities

This is out of the scope of this talk
## Proposal for policy evaluation (ongoing: 1.-4.) (1a)

<table>
<thead>
<tr>
<th>Area</th>
<th>Approach/ concept</th>
<th>“Good” governance</th>
<th>(Regulatory and other) capture</th>
<th>Safety culture</th>
<th>Path dependence, lock-ins</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Formal (system) structure</td>
<td>Legitimation</td>
<td>(A-)Symmetry</td>
<td>Continuous learning</td>
<td>Persistence</td>
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<td></td>
<td>Legislation: goal, time frame, players, boundary conditions, etc.</td>
<td>Research &amp; development plan</td>
<td>Code of conduct, guidelines</td>
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<tr>
<td></td>
<td>Participation: degree, who/what for</td>
<td>Resources: staff, money</td>
<td>Feedback of staff &amp; stakeholders</td>
<td>Research financing</td>
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<tr>
<td></td>
<td>Goal orientation, effectiveness/ efficiency</td>
<td>Competence(s) and experience</td>
<td>Education, permanent training</td>
<td>Review organisation</td>
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## Proposal for policy evaluation (ongoing) (1b)

<table>
<thead>
<tr>
<th>Area</th>
<th>Approach/concept</th>
<th>Criteria (Italicics)</th>
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<tbody>
<tr>
<td>“Good” governance</td>
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<td>Safety culture</td>
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<tr>
<td>A. Formal (system) structure</td>
<td>Legitimation</td>
<td>(A-)Symmetry</td>
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<tr>
<td>... (cont’d)</td>
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<tr>
<td>Degree of consensus, inclusiveness, capacity building</td>
<td>Expert blocking</td>
<td>Organisational learning</td>
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<td>Rule of law</td>
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## Proposal for policy evaluation (ongoing) (2)

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<th>Area</th>
<th>Approach/concept</th>
<th>(Regulatory and other) capture</th>
<th>Safety culture</th>
<th>Path dependence, lock-ins</th>
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<tbody>
<tr>
<td>“Good” governance</td>
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<tr>
<td>B. Understanding of roles</td>
<td>Division of roles</td>
<td>Institutional analysis</td>
<td>(Senior management) commitment</td>
<td>Openness of decision making</td>
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<td>Programme tasks</td>
<td>Interrelations with other players</td>
<td>Leadership</td>
<td>Comparison of options</td>
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<td>Strategic planning</td>
<td>Structure analysis</td>
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<td>Responsibilities</td>
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### Proposal for policy evaluation (ongoing) (3a)

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<tbody>
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<td>“Good” governance</td>
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<tr>
<td>C. Internal structures</td>
<td>Transparency/accountability</td>
<td>Mental models</td>
<td>Failure culture</td>
<td>Resistance vs. innovation</td>
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<tr>
<td>(organisational, personnel)</td>
<td>Justification of decisions</td>
<td>Recurrent key statements</td>
<td>Openness of communication</td>
<td>Mechanism of selection</td>
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<td>Framework and respective guidelines</td>
<td>Terms of reference, code of conduct</td>
<td>Trust</td>
<td>Components of self-reinforcement</td>
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<td>Controlling:</td>
<td>Performance analysis</td>
<td>Compliance analysis</td>
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<td>target analysis</td>
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# Proposal for policy evaluation (ongoing) (3b)

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<tr>
<td>… (cont’d)</td>
<td>Responsive-ness</td>
<td>Agenda analysis</td>
<td>Resistance vs. innovation</td>
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<td>Quality management</td>
<td>Incident reporting</td>
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<td>Reviewing</td>
<td>Complacency</td>
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<td>Norms, values, and basic assumptions</td>
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For illustration purposes and in today’s setting I just pick out one example (Peter Hocke asked what failure culture means)
A guardian should not be the National Monitoring Body as installed in Germany but one of the type National Council for the safe governance of radioactive waste: pluralistically composed, independent of the industry yet knowledgeable and not driven by daily politics.

How to treat mistakes, failures

– Conceptually: robust site selection, regress
– Regulatory: safety assessments according to phase
– Design-wise: e. g., integration of control mechanisms (pilot facility for surveillance and control), (limited) retrievability
– Organisationally, culturally: Way to treat minority views, enlarged assessment, National Body (guardian)

– The value of a dialogue, above all, depends on the diversity of controversial opinions
– No rational argument has a rational effect on somebody who does not want to assume a rational attitude

Popper (1982): The open universe. An argument for indeterminism
Conclusions

– Inclusive, systematic and participatory approach needed to consider both technical and social issues and to single out goal priorities (presumably with safety first)
– Setting up a respective process is a prerequisite to proceed in site selection (and subsequent steps)
– (National) lead agency in conjunction with
  - a clear division of roles among the players,
  - rules of the “game” and
  - criteria to judge
And:
– Regular programme and policy evaluation (strategic monitoring) mandatory to control if procedure on track

Long term is not all negative: We have "decades to learn" as Matt White rightly coined it – but we also HAVE TO!

It is planned to apply the concept to other long-term sociotechnical policy fields such as CCS or (conventional) special toxic waste