



Supplement of

Transdisciplinary research with respect to trust/confidence building by longer-term, near-field monitoring of a geological repository – part II

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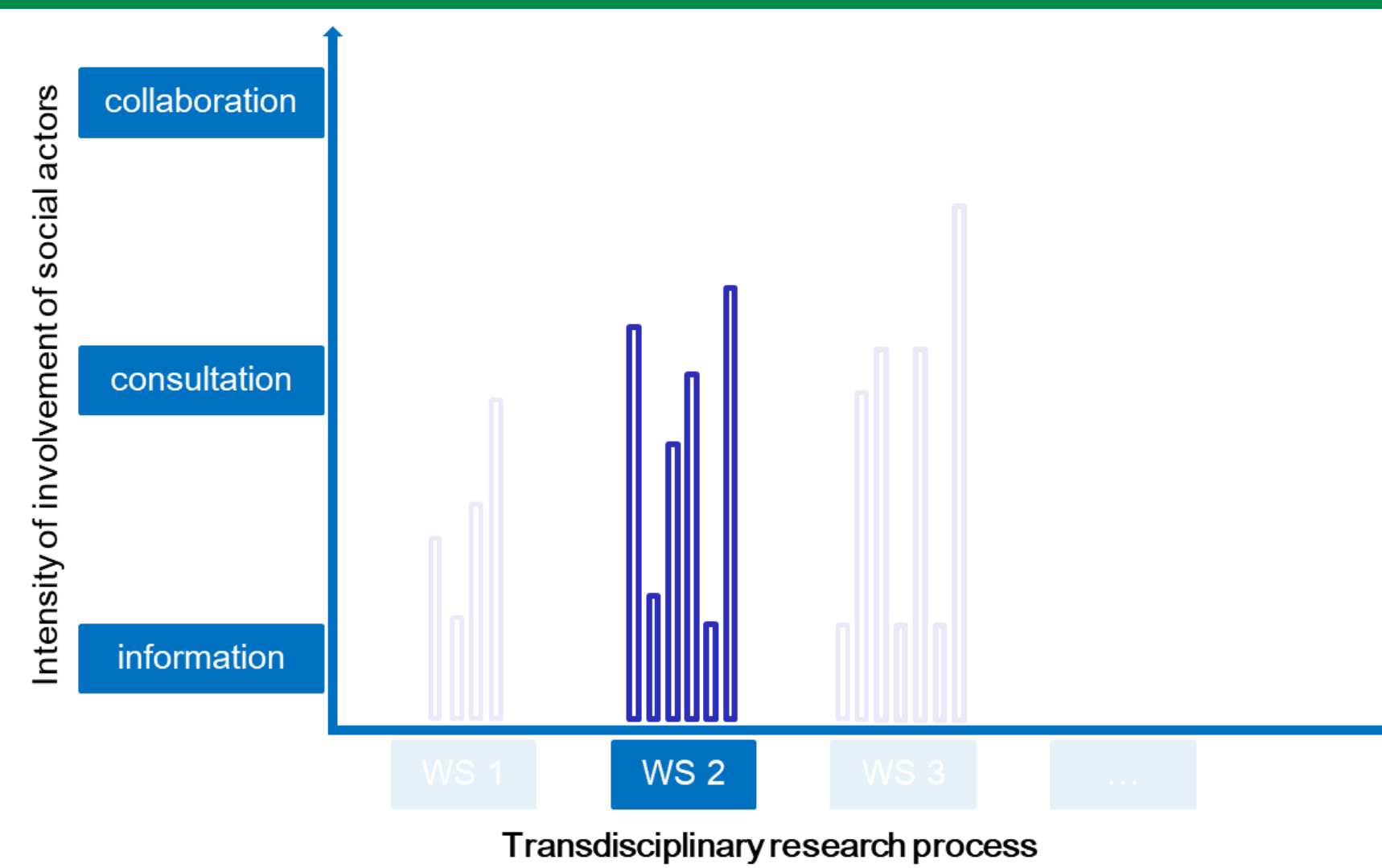
Transdisciplinary research with respect to trust/confidence building by longer-term near-field monitoring of a geological repository – part II

Johann Arne Othmer, Karl-Heinz Lux, Ralf Wolters, and Jörg Feierabend

Introduction



In the disposal of radioactive waste in Germany, a question arises with regards to how confidence in the safety and thus also in the acceptability of a deep geological repository can be increased. One way to achieve this is to involve the interested public in the monitoring process of the repository. The transdisciplinary research (tdR) project TRANSENS, specifically its work package TRUST, is investigating how the longer-term monitoring of a deep geological repository can lead to greater trust and confidence among the public. This scientific research is done in cooperation with a group of non-scientific actors chosen from the interested public, the so-called ArbeitsGruppe Bevölkerung (AGBe). The results of the second workshop with the AGBe are presented in this poster, focusing on the workshop process, the used methodology, and the insights gained.



Concept of the workshop

The second workshop with AGBe took place on 6th May 2022 in Hannover. 7 members of the AGBe and 6 scientists were participating. The workshop was thematically based on open questions from the first workshop, which were supplemented by additional content and topics. Overall, the workshop consisted of the following three thematic blocks:

- **Block 1:** Common tdR on socio-technical monitoring
- **Block 2:** Concerns, reservations and worst-case scenarios
- **Block 3:** Conflicting goals in monitoring

At the beginning of each of these thematic blocks, a short impulse was given in the form of a presentation in order to create a basis for the following discourse. The goal of these discourses was an open-ended exchange of system knowledge and target knowledge around the respective research question.



The following methods/formats were used to support these open-ended discourses:

- Silent discussions
- Small group discussions
- Plenary discussions

For the documentation of the discourses following methods were used:

- Whiteboards
- Evaluation matrix
- Observation

Since often only a part of the AGBe-members shared their perspective in discussions and the discussion therefore does not reflect the entire mood, an online questionnaire was sent to the AGBe-members after the workshop.

Results

Block 1:

The discussion on social and technical aspects was very extensive and sometimes digressing. The aspect of information and communication from the first workshop was taken up again, so communication on monitoring options, but also on the advantages and disadvantages of monitoring, was considered relevant and confidence-inspiring. Contradictory opinions on repository monitoring and regressions in the process were seen as potentially less confidence-inspiring. Monitoring was understood as a "pilot's parachute", which acts as an "aid for trust (note: in a safe flight)" and could thus reduce possible fears and reservations. Monitoring is a way to verify assumptions or decide to retrieve. However, it was also noted that monitoring is not a "cure-all" for trust and that trust is shaped more by people than by trust/confidence in concepts.

Block 2:

In the second block, doubts were raised about the function of the geological barrier, the "correct waste inventory" (note: what is meant here is the limitation of the actual disposal to the waste inventory approved for the repository) and the "theoretical knowledge". Assumptions for the safety of the repository are based on these "theoretical knowledge", but are only theory and, as it is known, theories can also be changed. Concerns about possible human factors such as carelessness, negligence and the neglect of safety-related aspects were also mentioned. Furthermore, reservations were expressed about the possibility of identifying and reacting to undesirable developments in the repository, which related to the sensitivity of monitoring data and the timely and flexible reaction. The health hazard from the escape of radioactivity and "arbitrary" political decisions were named as the worst-case scenarios.

Block 3:

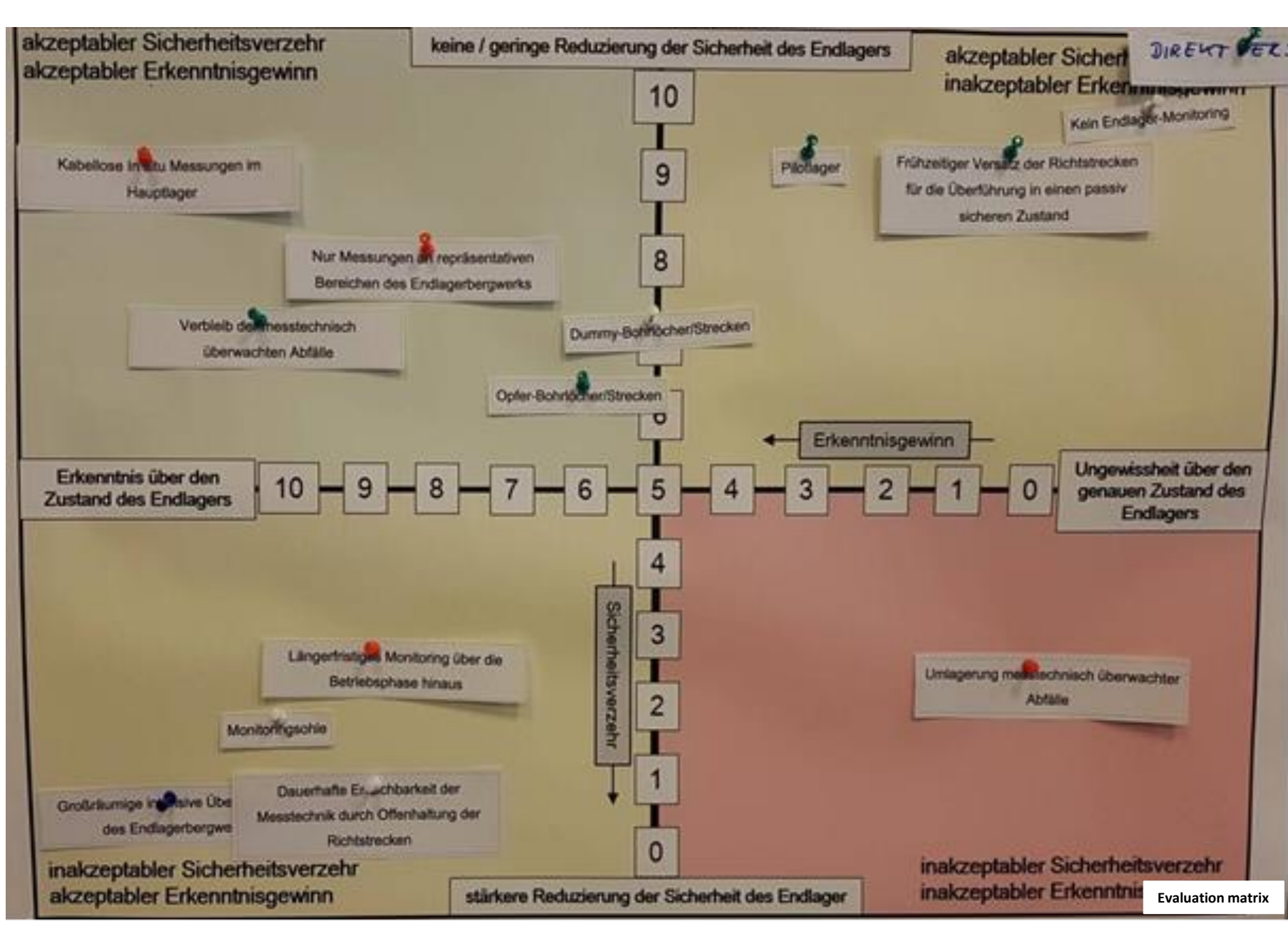
In the discussion on intergenerational equity of monitoring, the importance but also the consequences of monitoring for future generations were intensively reflected. A central aspect of the discussion was the transmission and preservation of knowledge over longer periods of time. In general, monitoring was also seen as an opportunity for future generations, although the resulting risk also had to be taken into account. Those affected by the final disposal, including future generations, should have the opportunity to have a say in the final disposal monitoring. On the other hand, the transfer of the repository to passively safe state was also considered to be appropriate for the generations.

The discussion on uncertainty in connection with repository monitoring, was a particular topic. With regard to the consideration of monitoring to gain knowledge and the resulting new uncertainties from this, a change in the attitude of individual

AGBe-members became apparent, who stated that their previous attitude "to measure everything that is possible" had changed and that there could no "100 percent security" even with monitoring. With regard to uncertainties, it has been shown that it is important to educate those who are affected.

This discussion was followed by the evaluation of the conflicting goals of knowledge gain vs. loss of security with the evaluation matrix. Accordingly, the following decisions in connection with the technical design of a monitoring system have been rated as acceptable by the AGBe with regard to the gain in knowledge and the loss of security:

- Wireless in situ measurements in the main repository
- Longer-term monitoring after the operational phase
- Only measurements in representative areas of the repository mine



Online questionnaire:

Which aspect of socio-technical monitoring is the most important for your confidence in the safe disposal of radioactive waste?	
Aspect	Total
Technical design and implementation	0
Communication and information	5
Participation	0
Ethical aspects	0
Financial aspects	0
other: the communication of the technical design and implementation - both not detached from each other	1
Which aspect of the technical monitoring is the most important for your confidence in the safe disposal of the radioactive waste?	
Aspect	Total
Barrier integrity	2
Information gain	3
Exchange option	1
Other:	0

Discussion and outlook

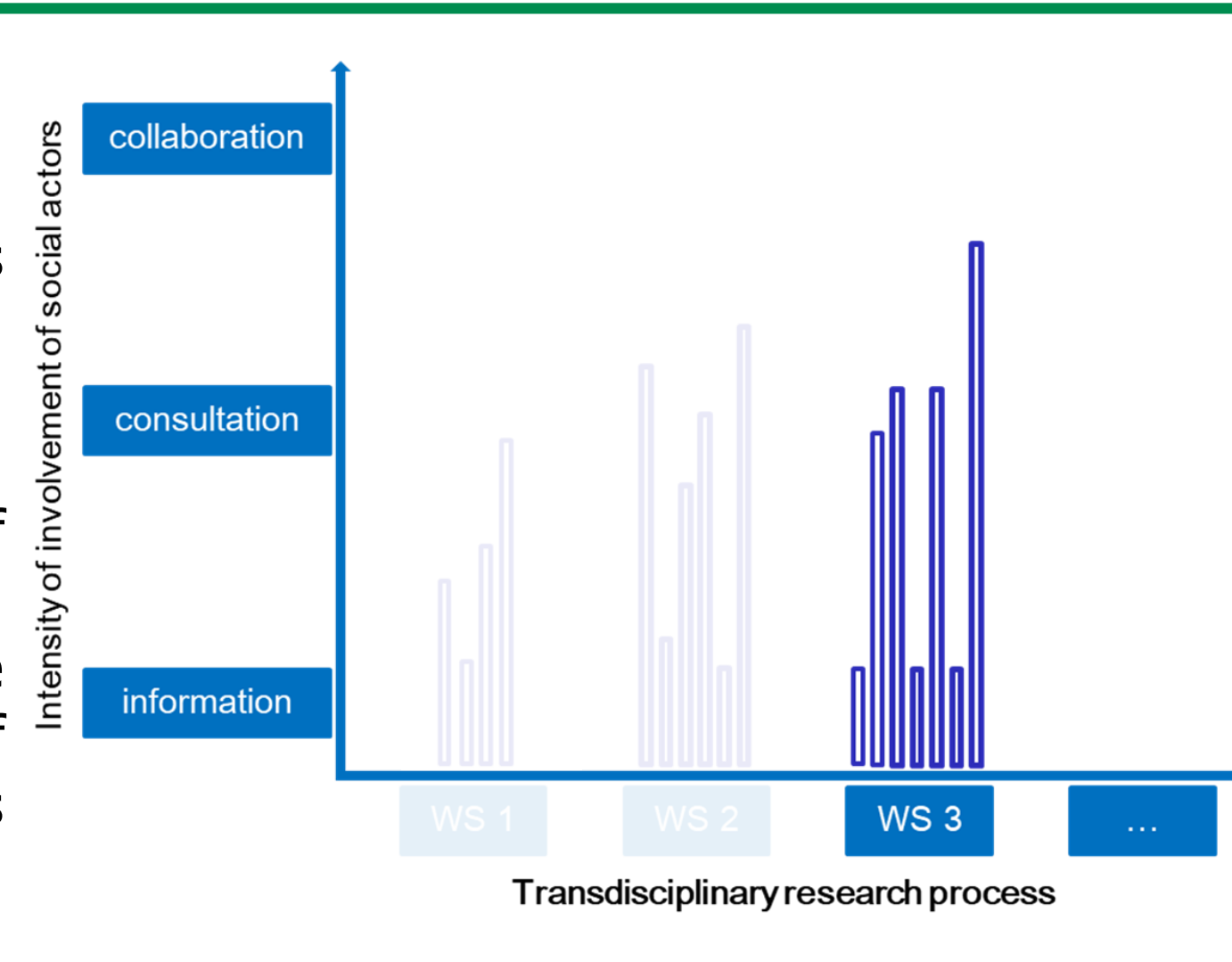
Discussion:

A change in attitude with regard to repository monitoring could be determined in this second workshop: The initial requirement "to operate monitoring in part beyond what is required by science" has changed significantly. Monitoring of the repository is still preferred, but with a different intensity than before. This change in the attitude of the AGBe could result from the changed attitude to dealing with uncertainties. With the questionnaire it could be shown that for the AGBe the aspect of communication and information on repository monitoring has the highest relevance for confidence in the safe disposal of radioactive waste, which was surprising.

Further findings on the design of a workshop were gained. It should be noted here that the beginning of the workshop with an open discussion on pre-defined questions in the plenum yielded less specific insights. Discussions in the plenum, which were carried out after an exercise and were connected to the exercise, were much more successful. Formats within the workshop that combine questions with a specific task for processing worked better than questions in the plenum. The use of the evaluation matrix can be considered as practicable.

Outlook:

In May 2023, a third workshop was held with AGBe, in which aspects such as participation, decision-making and data transparency in the context of repository monitoring were discussed in more detail. A publication of the obtained results is currently being worked on.



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