

## **Boundaries of nature in negotiating Czech geological disposal for spent nuclear fuel**

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### Introduction

Negotiating geological disposal is a complex sociotechnical process.<sup>1</sup> Underground, there are geological formations that need to be explored, drilled into, and into one of which the long-lived and highly radioactive waste will once be placed. Above the surface, there are villages, recreational areas, people who pick mushrooms in the forests, but also laboratories where materials are tested, international relations, and so on. It may seem that the geological formations do not change – in terms of our civilization, they have been here for ever, and will stay here for ever. As a matter of fact, that is one of the main arguments when proving the long-term safety of the future repository. However, when we look closer, we will see that the world underground interacts with the world on the ground. Once the geological repository is negotiated between state organisations and municipalities, once it is talked about in public discussions, the rock-solid geological formations sometimes start to change. This paper will explore these changes – it will look into how nature is dealt with in the negotiation process of geological disposal, how it is used as a resource for arguments, and how its boundaries are maintained or changed when taken from the underground into the world of politics.

### Nuclear power and spent nuclear fuel in the Czech Republic

The Czech Republic operates two nuclear power plants (NPP): NPP Dukovany, which started operation in 1987, and NPP Temelín, which started operation in 2002. The projected operating lifetime of both of the NPPs was originally 30 years, and in Dukovany it will likely be extended to 50-60 years. These two NPPs make up for about 30% of electricity production in the Czech Republic. They are owned and operated by ČEZ, the largest and dominant Czech energy producer and distributor, which is 70% owned by the Czech state. Nuclear power seems to be quite popular in the Czech Republic: all major political parties support it, and according to surveys, the Czech public is one of the most supportive within the European Union (see e.g. Eurobarometer 2008, p. 8). Recently, the Czech government together with ČEZ have put forward a proposal to build two new reactors at the Temelín power plant. In 2011, three companies who are bidding for the construction received documentation for the bid. In addition, there is a long-term plan to construct an additional nuclear block at Dukovany. After Fukushima, Prime Minister Petr Nečas has repeatedly said that the disaster will not influence the plans for nuclear new build in the Czech Republic (see Svačina and Konopásek 2012, p. 2).

As a country with nuclear power, the Czech Republic produces spent nuclear fuel and highly radioactive waste. The two NPPs are expected to produce about four thousand tonnes of spent nuclear fuel and three thousand cubic metres of highly radioactive waste during their 40 years lifetime. Should the currently proposed nuclear new build be completed, the amount would rise to nine thousand tonnes of spent nuclear fuel and five thousand cubic metres of highly radioactive waste.

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1 Much of the empirical research that this paper draws on was carried out during our work on the InSOTEC project funded within the EC-FP7 ([www.insotec.eu](http://www.insotec.eu)).

After the fuel is taken out from the reactors and cooled in water pools for several years, it is put into “dry” storage containers and placed in storage facilities adjacent to the nuclear power plants. These storage facilities are large enough to contain the four thousand tonnes of spent nuclear fuel. The fuel is expected to stay there for several decades, during which its heat output as well as radioactivity should decrease significantly. Nevertheless, its radioactivity will remain dangerous for living organisms for more than a hundred thousand years. Therefore, the radioactive waste needs to be dealt with in the long term.

By the Czech law, the state is responsible for the management of all kinds of radioactive waste. To this end, a state organisation called Radioactive Waste Repository Authority (RAWRA), which is subordinate to the Ministry of Industry and Trade, was established in 1997. Similarly to many other countries, the preferred way of dealing with highly radioactive waste and spent nuclear fuel in the Czech Republic in the long term is the construction of deep geological disposal. This strategy is put down in a governmental document called “Strategy for dealing with radioactive waste” (MPO ČR 2001). In addition, this document contains a schedule for implementing geological disposal. According to this schedule, a “primary” and a “backup” site with “the best geological conditions” are to be identified by 2015. By 2025, this selection is to be confirmed by detailed geological research. The construction of the repository is planned to start in 2050 and be finished in 2065 (MPO ČR 2001, p. 22; cf. also Svačina and Konopásek 2012, p. 8). This schedule is followed by RAWRA, although the 2015 deadline is deemed unrealistic, and has been moved to 2018.

#### A short history of the preparation of Czech deep geological disposal for radioactive waste

Deep geological repository is essentially a mine excavated in a stable geological environment (these can be for instance salt formations, clay, tuff, or granite). The general concept is that radioactive waste is placed in a system of “engineered barriers”, often comprising of a metal container and bentonite seals, and put into holes drilled deep (usually between 300 and 1000 metres) in the stable geological formation. It is expected that this combination of engineered and natural barriers will keep the waste isolated from biosphere until it ceases to be dangerous for living organisms (i.e. until its radioactivity decreases to a level of naturally found uranium).

The preparation of a Czech deep geological disposal started in the early 1990s when it became clear that Czechoslovakia and later the Czech Republic would not be able to export its spent nuclear fuel to the Soviet Union and later Russia, as had been previously planned. There was no specific organization dedicated to radioactive waste management at that time. Radioactive waste management was overseen by several ministries, mainly the Ministry of the Environment and the Ministry of Economy. In the early 1990s the Czech Geological Survey under the Ministry of the Environment carried out research which identified 27 areas potentially suitable for constructing deep geological repository. This number was later narrowed down by the Nuclear Research Institute to eight smaller areas. The criteria in this process were first and foremost geological – the goal was to identify the most suitable places in terms of geological conditions.

When RAWRA was created in 1997, it took over the geological disposal development programme. It revised the work done by the Czech Geological Survey and the Nuclear Research Institute and started a new process of “regional mapping”, which considered primarily geological criteria, but included also other criteria for finding the most suitable places for geological disposal, such as proximity of the identified sites to valuable natural resources, industrial objects, or natural reserves (Svačina and Konopásek 2012, p. 5). This endeavour resulted into a list of eleven locations in various geological environments. Seven of these locations were in granite rock, and RAWRA decided to focus on six of them.

When the six preselected sites were announced in the early 2000s, strong local public

opposition followed. People organized local protests, and most of the municipalities organized local referenda in which sweeping majorities voted against the repository. Partly as a result of this opposition, in 2004 the Minister of Industry and Trade announced a five-year moratorium on the site selection process. After the moratorium ended in 2009, RAWRA resumed negotiations with the municipalities in the six preselected areas. Most recently, a new candidate site was added to the list. It is situated very close to two uranium mines, one of which is still in operation. At present, RAWRA emphasizes the need to carry out geological research at the preselected sites in order to be able to see whether they are really suitable or not. It tries to negotiate with the municipalities to obtain their consent with the research. However, none of the municipalities has agreed so far.

At the national level, a “Working group for dialogue about geological disposal” was established. It is a formalized group whose creation was initiated by RAWRA. It brings together representatives from the parliament, several ministries, RAWRA, national and local NGOs and the affected municipalities. The group has a formal statute and is to a large extent inspired by the “Riscom” model for public participation.<sup>2</sup> It has formulated its goal to be to “strengthen the transparent process of site selection for geological disposal..., respecting the interests of the public.” (Pracovní skupina pro dialog o hlubinném úložišti 2010, p. 1). In practice, since its inception the group has focused on legislative matters and is trying to find a way of implementing a “veto” right for the municipalities in the site selection process.

#### The emphasis on site selection in the process of negotiating geological disposal

It can be observed that the Czech effort to construct geological disposal is characteristic by looking for a *site* for the repository. This is apparent for example in the schedule that RAWRA endorses: according to the schedule, it is necessary to find the primary and a backup site first (and rather soon). Then there will be quite a lot of time to work on the site, confirm its suitability, and construct the repository there. Representatives of RAWRA confirm this vision: for instance, at a public discussion at one of the preselected sites, the director of RAWRA said that although it is not clear whether in the end the Czech Republic will need its geological repository, the task of RAWRA now is to identify sites that are suitable for the construction of geological repository. In other words, site selection – the *where* question – is the main and often the only visible part of the Czech geological disposal development programme. This fact has wider implications for the way the future repository is negotiated. Perhaps most notably, when the prevailing question is *where* to build the repository, nature comes into play.

#### Natural conditions in site selection, and how to make a geological repository mobile

In the general deep geological disposal concept, the long-term safety is provided by the natural environment that the containers with the waste will be placed into. Although the steel or copper containers may last for thousands of years, their long-term durability cannot be guaranteed. The really long-term safety lies in the scientific proof that the geological environment will remain stable and will keep the dangerous waste away from living organisms even when the containers corrode or break. Geology is supposed to provide the long-term safety of the repository, and natural science is supposed to provide the certainty of this safety.

Thus, quite obviously, geological conditions play a prime role when one talks about the safety of the future repository. For instance, at a conference held in 2009 in Prague, François-Michel Gonnot, the president of the French radioactive waste management agency ANDRA, said: “It is better to rely on geology than on society. Which is a point difficult to accept but which is ...

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2 For more information on the Riscom model, see for instance [http://www.karita.se/our\\_approach/riscom\\_model.php](http://www.karita.se/our_approach/riscom_model.php) >. Vojtěchová (2009) reports on the initial application of the model in the Czech Republic within the „Argona“ project.

unfortunately the truth. We have to trust geology more than the people.“ (RAWRA 2009) Mr. Gonnot continues to say that the concept of geological repository is technically feasible and that its safety can be scientifically demonstrated. He also adds that “a geological repository project is not only a scientific and technical project, it's a challenge for the society“ (*Ibid.*). Nevertheless, he makes a clear distinction between geology and society, and when talking about the long-term safety of geological disposal, he emphasizes that it is the geology that people need to rely on. In this perspective, it is reasonable to look for a place with the best possible geological conditions when searching for a site for the future repository.

Such was the Czech strategy in the early 1990s, when the Czech Geological Survey was looking for the most suitable sites based on geological criteria. However, this site selection strategy gradually started to change. Soon after RAWRA was created, it started the process of “regional mapping”, where geological conditions still played primary role, but other criteria were considered as well. Reducing the number of the 27 areas meant many choices made, for instance related to transport infrastructure, proximity to cities, or the distance from neighbouring countries. Also, some rather practical choices related to the geology were made – RAWRA chose to focus on areas in granite, perhaps because of their availability, but perhaps also because much of the related international research is carried out in granite environments (such as at the Grimsel test site in Switzerland, or at Äspö Hard Rock Laboratory in Sweden), and some of the most advanced geological disposal programmes are situated in granite environment as well.

Thus, the quest for the site for geological repository has moved from looking for a place with the best geology to looking for “the most suitable site”. This is not to say that geological criteria necessarily had to become compromised. The geologists involved in the site selection process would say that all of the preselected sites possibly provide excellent geological conditions for the repository (interview with a member of staff at RAWRA). Nevertheless, in the beginning, the siting of the repository was a geological problem, a problem of the best natural conditions. Gradually, it became a problem of a combination of “good enough” geological conditions and other circumstances. What has changed is the boundary between what in the planning and negotiation process belongs to nature, and what does not. While in the beginning it seemed that the location of the repository will be fully determined by natural conditions and their scientific investigation, now it seems that natural conditions are not so deterministic. As far as natural conditions are concerned, all of the preselected sites are “good enough”. As a matter of fact, the director of RAWRA said at a public meeting that should negotiations on all of the preselected sites fail, RAWRA could “go back” and consider other sites than those that are currently in the selection (public meeting in Věžná, 16th April 2012). Thus, it can be inferred that the redrawing of boundaries of natural conditions in the site selection process has contributed to making the project of geological repository more mobile than it seemed at its inception.

Elam and Sundqvist (2011) have made a similar observation in the Swedish context. They show how the Swedish KBS programme for radioactive waste management was made a “mutable mobile” (Latour 1987, De Laet and Mol 2000 ) by separating the “how” question from the “where” question. According to them, this separation was achieved partly by freeing nuclear waste management technology from geology (Elam and Sundqvist 2011, p. 257-258): in the subsequent developments of the KBS concept, more focus was put on the engineered barriers, which resulted into less strict criteria for siting, to the extent that instead of looking for a site with the best possible geology as they had done before, the Swedish implementer SKB invited every municipality in Sweden to participate in a local “feasibility study” (Elam and Sundqvist 2011, p. 258).

It is interesting to compare the Swedish case described by Elam and Sundqvist with the Czech case. The Czech history of radioactive waste management is shorter than the Swedish one, and the prevailing Czech focus on site selection could be compared to the Swedish situation in the middle of 1980s, when SKB insisted on carrying out geological research at various sites across the

country in the quest for the best possible site (Elam and Sundqvist 2011, p. 257-258). Still, the situation is not exactly the same. The Czech programme does not emphasize technology that would demonstrate the feasibility of the repository and provide for the mobility of the concept. At the same time, we have seen that since the 1990s, the project of the Czech repository, although still concerned mainly with looking for a suitable site, has become somewhat more flexible and mobile. There seems to be a paradox: while the Swedish programme was successful at separating the “where” question from the “how” question and focus on the latter in order to become more mobile, the Czech programme is still predominantly concerned with the “where” question. Nevertheless, by changing boundaries of the role of natural conditions, it has recently made more room for negotiations and finding its place. One reason why this is possible in the Czech case so far may be that so far, the Czech geological repository development programme has never really had to prove anything. While the Swedish programme had to prove its feasibility to the government back in the middle of 1980s when it was concerned mainly with looking for the best site, yet unable to find one, the Czech programme will need to prove the safety of the repository only when the site is identified, chosen, and research at the site is carried out. Therefore, so far the Czech programme is currently flexible in that in a sense it has little immediate obligations, and it has limited the deterministic character of natural conditions – that is, at least at the rhetorical level in public debates and seminars, to which we shall now turn.

### Mobilizing nature during public discussions

Since the moratorium ended in 2009, the Czech geological disposal development programme has been manifesting itself mostly by “public” work that representatives of RAWRA carry out. RAWRA has asked all the municipalities from the preselected sites to organize public debates; they have organized an international conference as well as several larger public meetings, most recently in the parliament. At a first glance, nature does not seem to play an important role during these discussions. Similarly to the perspective of Mr. Gonnot, RAWRA representatives do acknowledge that radioactive waste management is also a social problem, but they also draw and maintain the dividing line between the “social” part of the problem and the “technical” part of the problem. When they come to a debate in a certain municipality, it is assumed to be clear that they came there because the area is expected to have good geological conditions for the repository. The nature is expected to be favourable there, which already makes the interest of RAWRA in the area legitimate. At the same time, this nature is not a subject of the discussion. The progress of a typical debate is that RAWRA representatives give a presentation on the general technical concept of deep geological disposal, and then address questions related to the technical implementation (again, at a very general level) and “social” aspects of the project, such as the demands on transportation, or the financial compensations that the municipality could receive (such was the case for instance in Věžná on 16th April 2012, in the Senate on 24th April 2012, or in Jihlava on 14th February 2012).

Despite the apparent absence of nature (in terms of natural conditions) during the debates, it is an important resource: it legitimises the very presence of RAWRA in the municipality. Geology is immobile and hidden under the surface, and therefore, it allows people from RAWRA to say: “based on geological data, we think that your site may be good. But we need to do research, that is why we need access to your land.” In this way, by being there but being unknown, it legitimises technical intervention – geological research – in the area.<sup>3</sup> However, carrying out geological research is not “innocent” – it is often seen by the local people not as mere research, but as the first step in the implementation of the geological repository itself, and it can also be something of a “test” of the *acceptability* of the repository (Konopásek and Svačina, forthcoming). The fact that the implementers consider the geological conditions at *all* of the preselected sites as “excellent” (interview with a member of staff of RAWRA) only supports this reasoning. Thus, to sum up this

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3 And allow the researchers “to maintain a degree of control” (Soneryd 2007, p. 308-309).

part, in public discussions, nature often plays a quiet role of an entity that is immobile and hidden, and needs to be accessed to and scrutinized. At the same time, it is not disputed during the debates, and is rarely brought up as a topic for discussion, as if it were the domain of expert geologists. In this sense, it seems to be quite an important *political* resource, one that legitimises the access to the preselected site.

### Nature against nature

So far, this paper has been concerned with only one conception of nature – that which relates to the geological conditions for constructing deep geological repository. However, there is a different conception of nature that also comes up during the negotiation process, and especially during public debates in the affected municipalities: it is perhaps a coincidence that most of the areas that were preselected for geological disposal in the Czech Republic could be described as “beautiful”. They are usually rolling landscapes with forests and meadows, parts of which are often listed as nature protected areas. The local people often express their fondness for this nature. This conception of nature is brought up quite often during the public debates: people argue that this nature is important to them. Nevertheless, this conception of nature does not seem to be strong enough. It is perhaps the particular framing of the public debates or the scientific and research interests that support framing nature in terms of geological conditions rather than a beautiful and valuable landscape.

It may be interesting to relate this observation to Asdal's account of public hearing institutions (Asdal 2008). Asdal argues that “material arrangements are crucial in enabling agency” (Asdal 2008, p. 21), and goes on to show that a public hearing institution enacts difference and multiplicity, and may take part in enacting uncertainty (*Ibid.*). Contrary to Asdal's account of public hearing institutions, the public debates organised by RAWRA seem to inhibit rather than enact difference and multiplicity – for instance, they enact a specific notion of nature, that of “geological conditions”. In this sense, they could also be seen as means to avoid uncertainty by inhibiting difference and multiplicity.

### Cutting nature from the public debate by means of socio-technologies

Public debates that have been discussed so far are not the only means of public discussion on the project of geological disposal in the Czech Republic. Since its creation in 2010, an important element is also the “Working group for dialogue on geological disposal”. It is the only body that is devoted to the geological disposal, operates at the national level, and includes representatives of the NGOs as well as the civil society. It has been noted that the Working group has been focusing on how to implement the right of veto for the municipalities. The group does not discuss matters such as natural conditions or engineered barriers. Therefore, it can be seen as cutting questions of nature from the public debate.

More generally, social scientists have long been called to take part in the process of negotiating geological disposal. However, in the Czech Republic, their role is limited to carrying out public opinion surveys and to help make the planning process more “transparent”, which is done mostly by means of implementing “political technologies” of deliberation. Thus, rather than pointing out the problematic nature of the divide between “nature” and “society”, social scientists help to maintain this divide. Perhaps even more surprisingly, environmental organisations seem to be no less vigorous in this endeavour: they seem to voluntarily take up a limited role of either public protest at a local level, or involvement in formalized participatory mechanisms, but they do not seem to raise issues of nature in order to bring it “back to collective, political life” (Asdal 2003, p. 71; cf. also Latour 2004).

## Conclusion

This paper tried to explore some ways in which nature is dealt with in the process of planning and negotiating geological disposal for highly radioactive waste in the Czech Republic. The Czech disposal development process is characteristic by its focus on site selection. In site selection, natural conditions – that of geology – play a prime role. However, the paper showed that the role of geological conditions in the planning process has gradually changed, which made the whole project somewhat more flexible and mobile. Further, it was shown that although not an issue as such, nature is an important resource when arguing for technical intervention at a specific site, which may conversely be seen by some as the first step in the implementation of the repository itself. Third, it was suggested that the public debates organized in the process of negotiating the Czech geological disposal often enact only one vision of nature, that of “geological conditions”, while other possible visions are deemed irrelevant. Finally, it was suggested that a national “Working group for dialogue on geological disposal” participates on the separation of nature from politics by means of implementing certain technologies of deliberation and public participation, which NGOs participating in the group do not seem to contest. As a result, it can be concluded that in spite of the fact that the boundary between nature and engineering is being changed and moved, the divide between nature and politics seems to be well maintained and kept in the same place – for instance, the forms of public participation seem to be thus “frozen into” the well orchestrated public debates and meetings of the formalized Working group. Last but not least, in many situations, nature is not raised as an issue for public discussion; rather, dealing with nature is often delegated to natural scientists and certain conceptions of nature do not seem to be contested when negotiating geological disposal in the Czech Republic.

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