Disposal choices: the construction of safety in the management of nuclear wastes

The fuel cycle partitions ‘nuclear energy production’ into phases, with mining, fuel production, power generation, decommissioning etc constructed as distinct activities. This work - in progress- builds on existing research into nuclear waste disposal to develop a wider sociological critique of the management of radioactive wastes across the fuel cycle.

Using research centred on the proposed development of new mines (Abraham) and on geological disposal of spent fuel (Molyneux-Hodgson) – colloquially known as the front end and back end of the fuel cycle, respectively – the literatures on the management of mine waste and of spent fuel waste are brought into dialogue, through a focus on understanding how the safety case for each are formulated.

**How to sociologically explain this drastic difference?**

### Lower radiation dangers?
- The IAEA (2007:5)\(^1\) states that 'the longevity of the associated radiological hazard from radioactive waste produced at the stage of uranium processing and milling would indicate the necessity to use deep geological repositories.

**Allowed movement vs permanent ensacemement**
- In UMWD, safety is ensured through *allowed movement*. Because thorium and radium have long half-lives, and also because of the presence in the tailings of residual uranium which also has a very long half-life (hundreds of millions of years), the tailings will remain radioactive for practically an indefinite period. [...] However, the continued presence of these parent nuclides over such long periods seems unlikely and a mean residence time of 1000 years for radium and thorium has been assumed in some assessments. [...] all Ra-226 moves from the tailings to fresh waters after 1000 years (Thomas/IAEA, 1981: 34)\(^2\).
- For the IAEA, what makes the waste repository safe in the case of uranium mining is not the permanent retention of radionuclides, but their controlled release over time.
- In a GDF, safety is ensured through sought permanent ensacemement, and any anticipated release is rendered unacceptable.

### A different nuclearity?
- Hecht (2012)\(^3\) introduced the concept of nuclearity to analyse diverging attitudes toward radiation risk in uranium mining projects.
- The initial exclusion of uranium mining from the 1968 Non Proliferation Treaty led to heterogenous mining practices and increased health and environmental repercussions (Hecht, 2012).
- Uranium mining not being labelled a ‘nuclear activity’, she argues, led nuclear nations to exploit uranium reserves in non-nuclear nations under poor regulation standards.
- But cases of environmental degradation are also reported in nuclear nations like France where strong public concerns have emerged (e.g. Mine at Bois Noir Limouzat or uranium ore processing plant in Gueugnon).

**Absence, presence, accountability**
- For Hetherington (2004)\(^4\), disposal is an act of *placing* waste so that its *absence* can be managed in space and time.
- In UMWD, managing absence is about managing temporary presence so that it can eventually be forgotten.
- In a GDF, it is no longer about managing absence, rather it is about managing sustained presence.
- Placing is not solely material, it also considers the placement of accountability: ‘it is a question of how we account for or are held accountable by that which we have tried to dispose of but have left unfinished’ (Hetherington, 2004: 163).
- ‘To appreciate fully the agency of absence we see most clearly the importance […] of disposal when the management of absence does not work effectively, when it unexpectedly returns or attains a presence and shocks us into the recognition of its significance’ (Hetherington, 2004: 170).

### Discussion
- For Douglas (1984)\(^5\), waste is *matter out of place*, matter that was spatially moved where it does not belong. Before a waste package arrives at a GDF, it will have gone through many human-enacted transformations. From enrichment to fuel processing and discard, it will have been on board of multiple trucks, stored in several containers, all conducted under complex safety protocols at different nuclear workplaces. Through this movement, the nuclearity of the ‘stuff’ increases, and by the time it reaches the GDF, it becomes *matter way out of place*.
- When disposal is thought as placing of both materials and accountability, the safety cases of both UMWD and GDF can be better understood. Where UMWD seeks the temporary encasement of what has been left unfinished, a GDF aims for the containment of the consequences of a socially contested human activity.
- The low volume of spent fuel seen problematic allows high technological complexity observed in GDF designs, whereas the enormous volumes of radioactive waste from uranium extraction do not make such treatment possible, however advocated by the IAEA.

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