VISUAL ESSAY 4

TAKING CARE OF NUCLEAR WASTE

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Introduction

FIGURE 1 After passing the gates to the nuclear facilities at Olkiluoto, Finland, photographs are permitted only in designated places but mental images can be taken anywhere you go. Photograph: Cornelius Holtorf.

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This visual essay is based on a trip to Helsinki and Olkiluoto in Finland in April 2022. The occasion was the Sixth International Conference on Geological Repositories (ICGR), organised by the Nuclear Energy Agency (NEA) at the OECD and this time hosted by the Ministry of Economic Affairs and Employment of Finland in Helsinki. After the conference, my colleague Leila Papoli-Yazdi and I took part in a site visit to Olkiluoto on the west coast of Finland. This is the site of three nuclear power stations, an operational underground repository for low and intermediate-level radioactive waste and the building site of ONKALO, the Finnish geological repository for spent nuclear fuel. Onkalo is widely known as the first repository of its kind being built in the world, and as the subject of Michael Madsen's powerful documentary *Into Eternity* (2010). The site is operated by the company Posiva.

From existential risk to global climate action

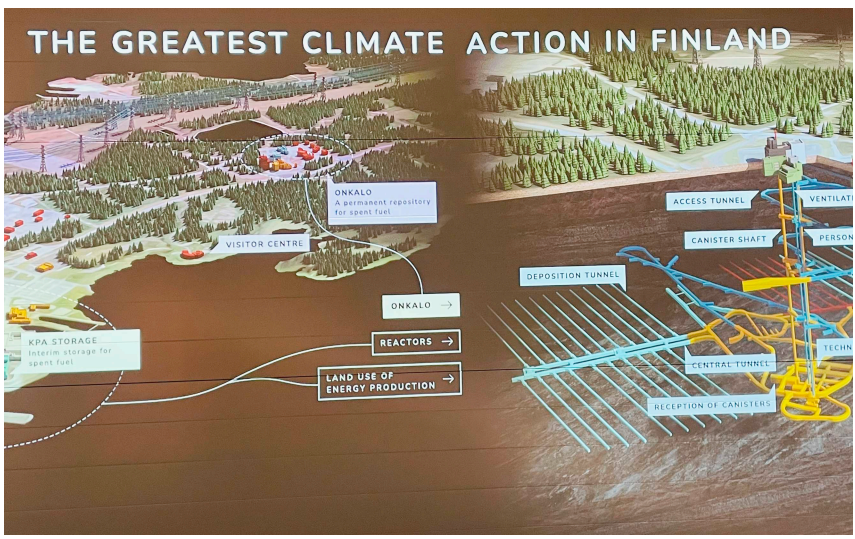

FIGURE 2 "The Greatest Climate Action in Finland" – display in the Visitor Centre at Olkiluoto. Photograph: Pasi Tuohimaa.

100,000 years is a very long time and some spent nuclear fuel and other radioactive waste decay very slowly. But understandings in society of the significance of nuclear energy, the roles and responsibilities of the nuclear energy sector, and thus the appreciation of its legacy change fast. Radioactive waste had not been given much attention when nuclear energy was first introduced, but in the 1970s the anti-nuclear movement came to see the long-lived legacy of burnt nuclear fuel to be the Achilles heel of nuclear energy, sensitising citizens and politicians for environmental concerns. Today, some people in the environmental movement have started to reconsider this

position, as nuclear energy (unlike coal, oil, and gas) does not emit carbon into the atmosphere and can thus contribute to minimising climate change threatening human futures. Radioactive waste increasingly appears as a smaller problem than climate change. Unsurprisingly, the nuclear energy sector and Posiva now pride themselves in being able to contribute to sustainable energy production, protecting the biosphere.

The art of forgetting

FIGURE 3 ONKALO Timeline. Graphic provided by Pasi Tuohimaa.

On the long coach journey to Olkiluoto, I am reading Ian Hodder's book *Entanglement* (2012). Things are usually taken for granted by people, their own lives and histories being forgotten. "But suddenly the things return or transform and have to be dealt with", argues Hodder (2012, 103), reminding us that people and things tend to get entangled with each other, sometimes unwittingly and unexpectedly. According to the ONKALO timeline, the geological repository at Olkiluoto is expected to be closed approximately 100 years from now. From then onwards, the design of the repository is intended to ensure passively the safety of people and other living beings. During the site visit, we listened to a presentation by Mika Pohjonen, Managing Director of Posiva Solutions, Posiva's offshoot company selling know-how in nuclear waste management and final disposal. When I asked him publicly when the site will be completely forgotten, he first apologised about his poor memory but then responded that it will definitely be forgotten at the start of the next Ice Age, in about 10,000 years. According to Posiva, no active oversight or other actions will be required in the long term. But what does it mean that in the ONKALO Research Gallery exhibition, the visualisations of the site 4,000 and 100,000 years ahead were entirely devoid of any trace of living beings other than

trees? Does this vision represent a worrying post-human dystopia or a welcome Earth-centric utopia?

Taking a people-centred approach

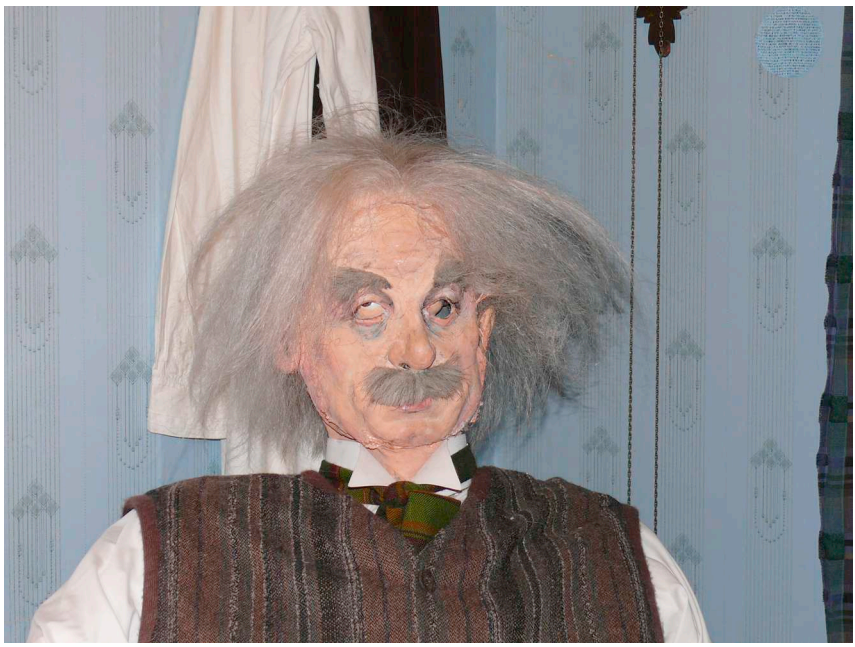

FIGURE 4 Would you buy a used car from him? Scientific genius Albert Einstein in a didactic display in the Olkiluoto Visitor Centre, presumably intended to reinforce the credibility of science. Photograph: Cornelius Holtorf.

During the ICGR conference in Helsinki, there was a session on building and maintaining trust in society, run by the NEA Forum on Stakeholder Confidence. Speakers reflected on the importance of communication and dialogue, especially with local communities near (possible) sites of geological repositories. There is something of a consensus in the global radioactive waste sector that the biggest challenges to be solved are not technical and scientific but about public acceptance, i.e. social and cultural. Accordingly, one slide of Mika Pohjonen's presentation emphasised the importance of trust and transparency for public acceptance: "it takes years to earn the trust, and only minutes to lose it – we do not risk this under any circumstances." Yet at Olkiluoto, such people-centred views were surprisingly absent. Although Posiva catered well for the visitors' needs, the displays and messages were thoroughly object- and techno-centred, largely devoid of prominent consideration for people. The Visitor Centre features a

much-neglected puppet of Albert Einstein, apparently embodying the science people were asked to trust. Elsewhere, the silhouette of a mother with a daughter was drawn to indicate the scale of nuclear fuel rods inside the nuclear reactor, as if it was perfectly logical and safe for them to be there. In the ONKALO Research Gallery exhibition, we met a dummy of a dehumanised worker, reduced to his high-viz clothes and safety accessories, placed next to a metal fence with a red "keep out" sign.

Uncertainty as an opportunity for care

FIGURE 5 In the Visitor Centre at Olkiluoto, Posiva Solutions is taking good care of its visitors. Instead of flowers, the buffet table is embellished with a reference to technical beauty. Photograph: Cornelius Holtorf.

Another session at the ICGR conference focused on communicating scientific uncertainty from the scientists to the community. One senior scientist representing the European Joint Programme on Radioactive Waste Management (EURAD) asked with consternation what had gone wrong that people were so fearful of geological repositories when in fact there are far greater uncertainties (and risks) in daily life that do not cause corresponding reactions. Several speakers argued that better ways of communicating scientific reasoning and an improved understanding of science will lead to wider acceptance by the public. But ironically, trust and

acceptance may also result from naivety and ignorance, whereas comprehensive knowledge of science may foster scepticism and opposition to nuclear engineering. The so-called deficit model of the public understanding of science dismisses people's genuine concerns. In some languages, including German and Swedish, certainty and safety are the same word, but perceived uncertainty can advance the safety of geological repositories too. Uncertainty is an invitation to let your action be informed by sympathy and care for local communities and other people who are deeply worried. It provides an opportunity to take responsibility for the future, prepare for change ahead, and design creative responses (see also Holtorf and May 2020).

Toxicity of cultural heritage

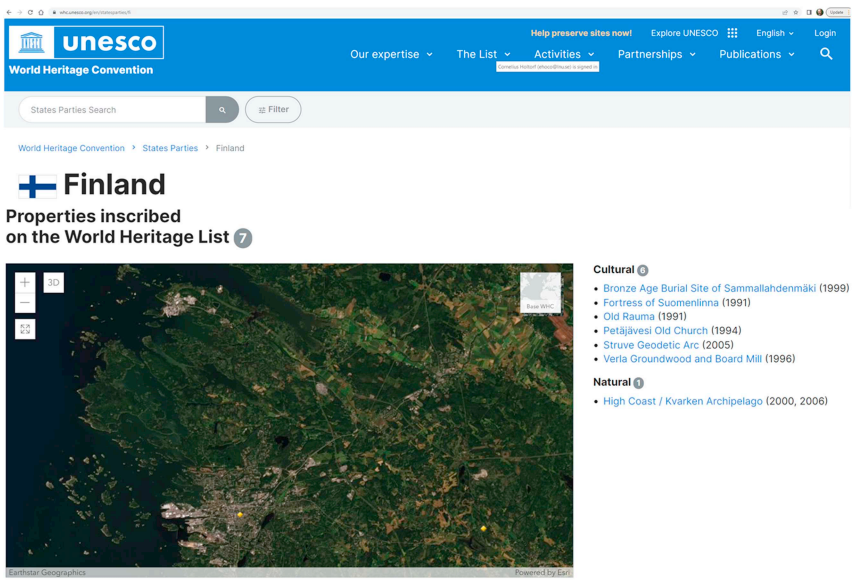

FIGURE 6 Seven. Natural and cultural legacies in Finland, inscribed in UNESCO's World Heritage List. Light points at the bottom of the picture: World Heritage sites Old Rauma and Sammallahdenmäki. Buildings at the top: Olkiluoto. Source: UNESCO, https://whc.unesco.org/en/statesparties/fi.

Like radioactive waste, UNESCO World Heritage is of global significance but managed nationally. Not far from Olkiluoto, the city of Rauma has two World Heritage properties: the historic city of Old Rauma and the Bronze Age Burial Site of Sammallahdenmäki. Cultural heritage like these sites is being conserved for the benefit of future generations, just like radioactive waste is being safely locked away for the benefit of future generations. Arguably, radioactive waste may be seen as a

form of cultural heritage (Holtorf and Högberg 2021), and cultural heritage, in a way, can be considered toxic, too (Wollentz et al. 2020). There are currently 1154 inscribed World Heritage sites deemed to be of "outstanding universal value". But too many of the States Parties to the World Heritage Convention have turned the act of inscription into a matter of competition and prestige. UNESCO World Heritage has become a tool for nation-building and is frequently misappropriated as "World-level National Heritage" (Yan 2016, 239). In many contexts, counting World Heritage sites (Finland has seven) is most important, contaminating the Convention's original ambition to increase and diffuse knowledge about the peoples of the world and to advance global peace and collaboration. Fortunately, the global participants at the ICGR and passing Rauma and Sammallahdenmäki on the trip to Olkiluoto exchanged knowledge, met friends, and instigated collaborations, benefitting everybody.

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