

////////// NUCLEAR
////////// SPACES:
// COMMUNITIES,
// MATERIALITIES
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////////// LOCATIONS
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////////// CULTURAL
////////// HERITAGE

Nuclear Spaces: Communities, Materialities and Locations of Nuclear Cultural Heritage

Concluding report

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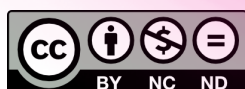
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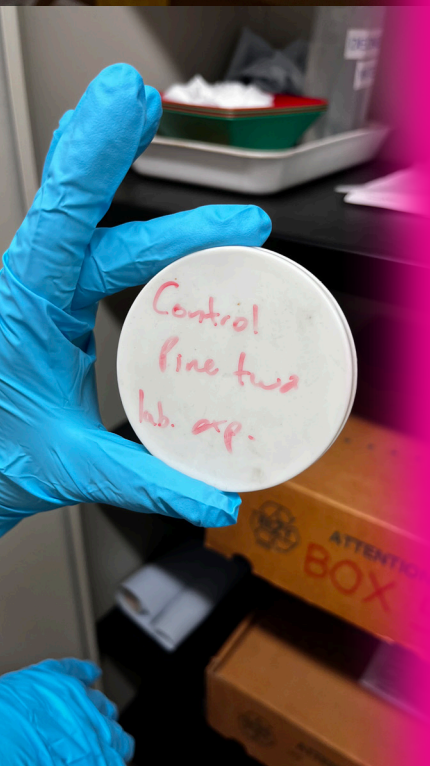


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Executive policy summary

NuSPACES was a multi-site study of nuclear cultural heritage as an emerging field of practice, scholarship and policy-making, created in response to the funding call Cultural Heritage, Identities & Perspectives: Responding to Changing Societies (CHIP) by the Joint Programming Initiative on Cultural Heritage and Global Change (JPICH), and drawing on the definition of nuclear cultural heritage formulated by a preceding pilot research project *Nuclear Cultural Heritage: From Knowledge to Practice* conducted in 2018-2022 and funded by the AHRC grant AH/S001301/1 (see also Rindzevičiūtė et al 2019). The analysis of British, Swedish and Lithuanian cases has helped to identify key challenges in this field.

- The first challenge is **political polarisation** where different actors' views on the ambivalent role of nuclear technology in society clash and achieving consensus is difficult.
- The second challenge is the risk of perpetuating **societal inequalities** through heritage processes, where entire social groups are at risk of exclusion from being represented in nuclear cultural heritage on the basis of social class, gender, ethnicity and race.
- The third challenge is closely linked to the relative **novelty** of nuclear technology: significant forms of industrial architecture and the material culture of nuclear technology could be lost because of low awareness of their cultural heritage potential.
- Finally, the fourth challenge is **power imbalances** of cultural sense-making, where the rich diversity of local and transnational narratives can be lost in favour of national master narratives, because historically nuclear power has been associated with centralised nation-state institutions and great powers, where colonial relations can be obscured.

Recognising these challenges, NuSPACES wants to draw attention to **nuclear cultural heritage-making as a productive social process**, an interface which enables societies to cope with difficult and complex problems. New forms of community are produced through the practices of collecting, interpreting and governing nuclear cultural heritage. Nuclear cultural heritage-making has significant implications for **democracy** and **civil society** by opening up pathways for integrating different policy

sectors, bringing different stakeholders together and actively shaping more viable, living milieus in the (post-)nuclear age.

Taking into account this processual and productive notion of heritage and reflecting on the collaborative knowledge production with practitioners in the nuclear and heritage sectors, NuSPACES calls for:

- ✓ New **international partnerships** leading to novel cultural heritage initiatives in relation to nuclear decommissioning and regional development;
- ✓ New **understandings of the societal role of cultural heritage** as a driver of prosperity;
- ✓ New **approaches to governing** deindustrialisation and decommissioning through heritage processes rather than treating heritage as remains, legacy and relics of the past.

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To inform these partnerships, understandings and approaches, NuSPACES proposes the following policy recommendations:

1. Nuclear communities are not fixed. Ideas about the future influence notions of the past and have the power to redefine existing communities and to define new ones, which means that stakeholder engagement processes have to be wide-reaching and inclusive. The task for the policy-maker is to enable community members to articulate and voice their take on futurity by developing an inclusive stakeholder engagement framework. This form of engagement is constitutive to identification of the public and cultural value of heritagisation, because the strategic context will influence significantly the selection process around nuclear cultural heritage. For instance, commitment to the hosting of nuclear objects can influence the narration and reinterpretation of nuclear roots or origins: these can, for example, be framed in terms of the heroic management of past errors, when the early stages of nuclearization resulted in environmental contamination and messy legacy of radioactive materials.

2. To make full use of the heterogeneous and polylogue materialities of nuclear sites, nuclear cultural heritage-making requires interdisciplinary collaboration recognising diverse professional expert knowledge. Nuclear decommissioning and associated memory work are of existential significance for

scientist and engineer communities as well as for hosting and resident communities. However, nuclear decommissioning also presents a unique opportunity for other professional and social groups to uncover new aesthetical, social and political values in nuclear infrastructures and objects as they are material witnesses of the nuclear age. It is important, therefore, that representatives of these groups are engaged at all stages of the identification of the public and cultural values of materials, because these values will be articulated differently in different disciplinary contexts. What may appear as mundane, insignificant, or deemed technologically challenging for one group, can be of key importance for another group. Documentation and digitalisation are central, but they should not replace conservation and preservation.

3. Nuclear cultural heritage-making requires policy innovation by joining up different policy sectors to create an interface for genuinely democratic governance of nuclear locations. This is necessary to secure spatial and environmental justice, to minimise and prevent the risk of residual governance, as well as to mitigate the possible negative effects of long-termism. Failing to take into consideration the cultural value of nuclear establishments, as well as their cultural impacts, can be regarded as a form of residual governance. The heritage approach, in turn, can contribute to balancing short-term and local approaches in response to the unique challenge of governing the extreme long-term task of securing high-level radioactive waste.

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Images on the next page: Ignalina NPP, photo: Milda Kiškytė, debate in Malmö, photo: Andreas Nilsson, Malmö Museum; second row: Barsebäck, photo: Milda Kiškytė, Ignalina NPP, photo: Oksana Denisenko; third row: Ignalina NPP, photo: Milda Kiškytė, Sellafield, photo: Anna Storm; fourth row: Barsebäck, photo: Anna Storm, Chernobyl monument in Visaginas, photo: Andrei Stsiapanau



Introduction: Nuclear Spaces

Nuclear cultural heritage-making is an emergent and fast-growing area of knowledge and practice worldwide. The legacy of building, operating and closing down nuclear power plants, research reactors, testing and deploying nuclear weapons and running nuclear research facilities is intertwined with the making of modern energy systems and global structures of national security. Whereas the end of the Cold War in 1991 coincided with the end of the boom of building nuclear power plants, the 2020s are marked with renewed promises to invest in nuclear power. However, the 1950s-60s anticipation of a radiant nuclear future has been replaced with complex environmental, economic and social concerns around nuclear decommissioning, particularly its impact on local communities, and the challenge of safeguarding nuclear waste and protecting future generations.

In this context, the cultural forms through which we make sense of inherited nuclear infrastructures, as well as the intergenerational transmission of material culture and knowledge, come to the fore. Local resident communities, nuclear industry veterans, anti-nuclear movements and amateur and professional historians of nuclear power have strong interest in documenting the nuclear past and preserving elements of its material culture. Communities exposed to radioactive contamination and land extraction seek restorative justice through cultural heritage action (Jurkonyte 2023; Jacobs 2022; Christopher Hill and Jonathan Hogg, ongoing; Rindzevičiūtė, Dovydaitytė, Kasperski, forthcoming). Additionally, national and international policy and industry bodies have begun to recognise the value of the cultural heritage approach for public engagement and safe decommissioning (for instance, German Federal Office for the Safety of Nuclear Waste Management (BASE), the *Radiant Monuments* conference organised by ICOMOS (2024); see also Brandt & Dame 2019; SKB 2019; Kärnavfallsrådet et al. 2019; NEA-OECD 2015; Gunn & Croft 2010; Cocroft 2006).

However, what constitutes nuclear cultural heritage and how it can benefit different social groups is unclear and contested. Nuclear decommissioning entails large and costly projects where the imperative is to deliver “value for money” by removing the radioactive and material structures in a speedy and efficient manner. There is a risk, therefore, that valuable tangible and intangible forms of nuclear cultural heritage will be lost and that social inequalities might be perpetuated in the process. In turn, the shrinking material basis of nuclear culture could have

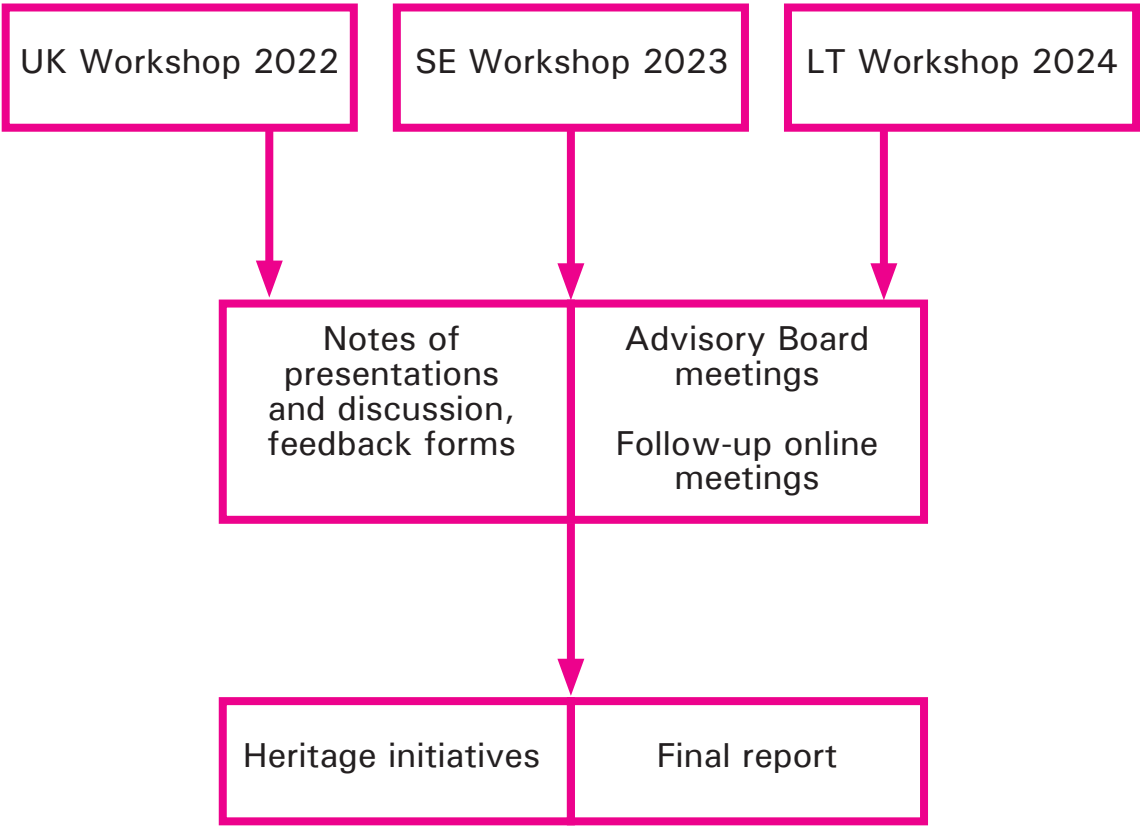
detrimental impact on reflexive democracy: as noted by the UK Department for Digital, Media, Culture and Sport (DCMS), “the additional value of culture lies in it being a site of contestation, reflecting the importance of disagreement and negotiation in diverse societies” (DCMS 2022).

To address these issues, the international research project Nuclear Spaces: Communities, Materialities and Locations of Nuclear Cultural Heritage (NuSPACES, 2021-2024) was set up to study the cultural heritage process in key national nuclear sites in the UK, Sweden and Lithuania. Although these sites have served different purposes and are located in different contexts, their nuclear reactors were shut down within about a decade: Dounreay in 1994, Barsebäck in 1999 and 2005, Sellafield in 2003, and Ignalina in 2004 and 2009. These developments significantly influenced local economies and communities.

To gather different voices and create new partnerships between different stakeholders, NuSPACES organised workshops and field trips that engaged over 40 leading scholars, creative practitioners, curators, archivists, museum, heritage and information managers, including nuclear sector and atomic settlement representatives.

The NuSPACES research team would like to thank all the participants and the Associate Partner organisations, for their input in the discussions and facilitation of access to the research sites. This final report presents key findings and insights derived from the study of archival sources, public policy documents, media debates, and qualitative semi-structured interviews. The report also draws on participatory evidence-gathering workshops in Sellafield and Whitehaven in West Cumbria, UK (2022), Barsebäck and Malmö in Skåne, Sweden (2023) and Visaginas and Vilnius in Lithuania (2024).

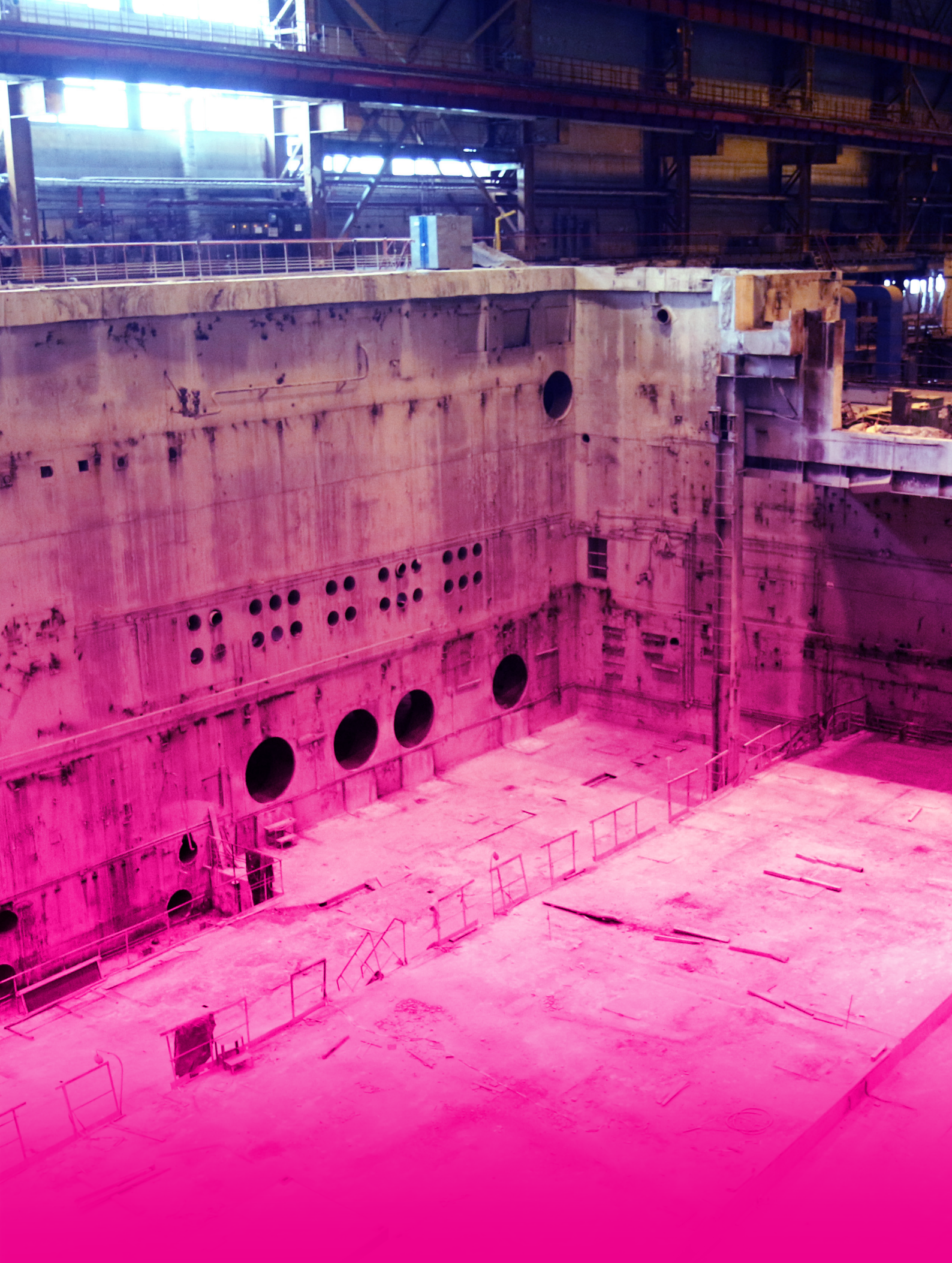
Figure 1. Engagement process



In addition to the final report, stakeholder engagement resulted in a wide range of new initiatives. For instance, to mention just a few examples, in 2023, the Energy and Technology Museum in Vilnius won funding from the Lithuanian Council of Culture to restore the model of the Ignalina Nuclear Power Plant, originally produced in 1980. In August 2024, the municipality of Visaginas inaugurated a new Visaginas City Museum, which both collects and displays objects pertaining to everyday life in an atomic city, the history of the building and decommissioning of the nuclear power plant, as well as the history of Visaginas residents who participated in the clean-up of Chernobyl (Visaginas 2024). The NuSPACES P.I. Eglė Rindzevičiūtė served on the advisory board of the *Materialising the Cold War* project, led by Sam Alberti and Holger Nehring, which culminated in the exhibition “Cold War Scotland,” opened at the National Museum of Scotland in July 2024. Anna Storm contributed to the exposition on Ågesta nuclear power plant, opened at the National Museum of Science and Technology in Stockholm in 2023 (Tekniska 2024; Högselius 2023). In collaboration with Malmö Museum, Karin Edberg engaged children to produce drawings on Barsebäck nuclear power plant, which were accessioned in the Museum’s permanent collection.

The report is structured as follows: it is organised around the three key categories that guided our research: Communities, Materialities and Locations. Each theme is critically examined by drawing on the national site studies and participatory engagement workshops. The discussion refers to country- and site-specific examples, but if you are interested in detailed empirical research findings, please get in touch with the authors who will be happy to share their academic publications with you.

The report design was created by Jonas Žukauskas and Jurga Daubaraitė, who used magenta to refer to the original radiation symbol drawn at the University of California Radiation Laboratory in Berkeley in 1946. The symbol originally had magenta on a blue background, however, because blue tends to fade quickly, it was replaced with yellow. Magenta also echoes Žukauskas’ and Daubaraitė’s art installation “Nuclear Assembly,” which was presented at the exhibition *Splitting the Atom*, curated by Ele Carpenter and Virginija Januškevičiūtė at the Vilnius Contemporary Art Centre in 2020.



Ignalina NPP, photo: Milda Kiškytė



WAGR reactor in Sellafield, photo: Sellafield Ltd

Part 1. Communities: Nuclear Roots

Many pioneering nuclear cultural heritage initiatives attributed central value to the “greats” and “firsts”: prominent individual nuclear physicists and engineers and their inventions, such as bombs and reactors (Alberti 2022; Storm, Krohn Andersson, Rindzevičiūtė 2019). The emphasis on the community, “the typical” rather than “the unique” and the everyday rather than breakthroughs appeared later. As the nuclear industry developed, acquired its history and new generations of employees started replacing the earlier ones, the idea of nuclear community heritage emerged to celebrate *veteran scientist and engineer communities*.

However, as the siting of nuclear establishments and nuclear testing caused tensions and protest, nuclear cultural heritage-making also began to recognise the complicated dynamics between the newcomers in nuclear locations (resident communities) and existing settlers who preceded the industry (host communities), as well as a large community of temporary workers, carrying out maintenance work at the yearly revisions of nuclear power plants. The most critically-oriented forms of difficult nuclear heritage-making (Macdonald 2009) appeared in the wake of the bombing of Hiroshima and Nagasaki and the Chernobyl disaster, where museums and memory sites recognised the suffering caused by the destruction and radioactive contamination (*hibakusha communities*) (Jacobs 2022; Christopher Hill and Jonathan Hogg, ongoing; Barad 2019).

The community landscape of nuclear cultural heritage also features policy communities that emerge in response to economic, political and environmental events (Hajer 1993), such as, for instance, anti-nuclear environmental movements, nuclear disarmament movements and protest movements against hosting nuclear waste (Ross and Gibbs 2024; Kirchhoff and Meyer 2014), as well as regulatory communities, both nationally and internationally (Evens 2024).

The key insight is that *what constitutes a community in a nuclear context* is not given. Each community will have their own “origin story”, values and truths. These differences can become incompatible and subject to political contestation. Nuclear cultural heritage-making is best approached as a community-building process that draws on diverse historical strands and has potential to branch out in the future. Accordingly, a fluid, constructionist and performative, rather than a rigidly representational approach to nuclear cultural heritage is required to capture and navigate this rich diversity of communities.

1.1. The power of the context

Drawing on the study of selected nuclear sites in the UK, Sweden and Lithuania, NuSPACES suggests that the meaning and significance of nuclear cultural heritage takes shape differently in relation to different social and professional groups. It is key to recognise the role of diverse social landscapes, their complex historical trajectories, their visions of the future and the ways in which the social groups are embedded in structures of political economy. Note that these structures can extend geographically and institutionally far beyond the physical boundaries of the nuclear sites in question.

1.2.1 Case: Dounreay and Sellafield

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In the UK, Dounreay and Sellafield constitute the key Cold War legacies, materialising the British entrance into the nuclear age and aspiration to uphold their international status as a nuclear power. Heritage-making in these sites is multi-layered and multi-directional where different professional and social communities intersect as they deploy at times clashing and contradictory rationales and strategies. All of them feature a high degree of politicisation. Furthermore, nuclear industry employees are constrained by the Official Secrets Act, as the UK has one of the oldest and most restrictive secrecy regimes (Moran 2013). In this context, heritage and museums constitute an important channel for public reflection and debate on the nuclear past. Thus local museums such as the North Coast Visitor Centre in Thurso, Caithness, and the Beacon Museum in Whitehaven, Cumbria, present the origins and development of the local nuclear establishments in their elaborate displays. These displays are produced by the agency that is managing the nuclear sites, the UK Nuclear Decommissioning Authority (NDA, est. 2005). Through these exhibitions the NDA seeks to engage with both host and resident communities, particularly the communities of nuclear veterans who engage in amateur collection and memory practices to record and share their experience. Forming part of the communication strategy of the NDA, the exhibits celebrate the “firsts” and mark key events, both positive and negative ones, including controversies such as the Windscale disaster (1957) and, since the 1950s, radioactive contamination of the Irish sea and the Atlantic coast. The industry has made a few attempts to capture intangible heritage through oral history interview projects, such as Sellafield Stories, collected in 2010-

2011 and the ongoing interview collection in Dounreay (Davies 2012; NRS 2023). Furthermore, the NDA is developing a corporate heritage strategy, which includes documentation and collection of cultural heritage values and is embedded in the structures of information management, required to secure safe governance of nuclear waste. Part of these efforts is the Nucleus archive, opened in Wick, Caithness, in 2017, which has a hybrid role as a corporate institution performing some local public services.

The resident communities in Caithness and West Cumbria have experienced deep transformations in the past, hosting waves of labour migrants alternating with waves of depopulation and deindustrialisation (W1 2022; Haraldsen 2018). Nuclear cultural heritage making, for them, is a way of coping with future uncertainty as much as reflecting upon the past (Kalshoven 2022). In both Dounreay and Sellafield the heritage of nuclear infrastructures is anchored in the local history and search of regional self-knowledge, situating nuclear modernity in wider cultural contexts, such as pre-modern Caithness and the local mining, sheep farming and romantic touring landscapes in the Lake District (Ross 2023).

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1.2.2 Case: Barsebäck

The Barsebäck nuclear power plant became a landmark early on, visible from afar in both Sweden and neighbouring Denmark and especially Copenhagen, located just across the Sound (Edberg and Storm, forthcoming). Barsebäck was initially an expression of regional, national and transnational collaborations in the energy sector, which was later turned into a point of conflict as Denmark opted out of the nuclear route and anti-nuclear sentiments grew. From a national perspective, Barsebäck became one of the four main Swedish reactor sites, it was the smallest but critical, serving as an input to the southern part of the energy grid, balancing the bigger input from hydropower in the northern part of the country with the densely populated areas in the south. As its immediate surroundings feature high industrial diversification and easy access to the major metropolitan areas of Copenhagen and Malmö, the nuclear communities are dispersed. There are no specially-built nuclear residential quarters, apart from a

barrack establishment for temporary workers, and substantial infrastructural investment in the hosting municipality, initially Löddeköpinge and later, with municipalities merging, Kävlinge. The Barsebäck plant however had numerous long-standing employees and working at the plant is depicted as belonging to a family. In addition, the nearby residents, while not necessarily forming an “atomic town,” all shared the experiences of the specificities of living close to a nuclear facility, with distribution of iodine pills, emergency alarm radio systems in their kitchens and a clear presence of the nuclear company in local activities and concerns.

Heritage values connected to Barsebäck have been articulated by different heritage professionals since the late 1980s, that is, just a decade after it went into operation. However, in the early years efforts to identify heritage values were mainly regarded as a joke by the communities of employees and nearby residents. In connection to what was described as a politically motivated, technically “premature” and locally traumatic shutdown of the two Barsebäck reactors, the relevance of thinking in terms of heritage values gained more traction, among other things featuring a conference with representatives from a wide range of stakeholders locally, regionally and nationally (Storm 2014). The overall engagement from the nuclear company however remained reserved and dependent on a few dedicated enthusiasts alongside a group of veterans. In the 2000s and 2010s, a couple of inventories and documentations were carried out by different regional museums, collecting oral history testimonies from employees, completing building conservation footage and description as well as landscape documentation. Special focus is put on the so-called Expo, a visitor centre designed by Per Friberg, which operated up until the shutdown of the plant. In the 2020s, connected to the approaching dismantling of the plant, a network of regional museums began to work with more focus on collecting stories, objects and interpretations of the landscape, the technology and the people, including protest activities and transnational fears (W2 2023).

1.2.3. Case: Ignalina and Visaginas

In contrast to Barsebäck, Ignalina nuclear power plant in Lithuania is associated with a community that has rather clear geographical and ethnic boundaries. The history of

the construction (1970s-80s), operation (1980s-2009) and decommissioning (2009-present) of Ignalina nuclear power plant is entangled with the development of the monoindustrial atomic town of Visaginas, the former Soviet city of Sniečkus. This is the history of a heterogeneous, but tightly knit community of Russian speaking scientists, engineers and service workers, who settled in a densely forested region of north-eastern Lithuania. Heritage-making for them is an attempt to anchor their complex personal biographies in the material environment, to stabilise and cope with the fundamental geopolitical shift, which, following the collapse of the Soviet Union, had led to the restructuring of the nuclear sector in Lithuania and transforming their status from the principal nationality to ethnic minority (Rindzevičiūtė, Dovydaitytė, Kasperski forthcoming). The post-communist community narratives are framed by a code of professional responsibility and political loyalty to the Lithuanian state (compare with Schmid 2008).

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Attitudes towards nuclear heritage are changing over time, with the new generation of residents creatively engaging with nuclear urbanity and being more eager to instrumentalise the past for economic development (Dovydaitytė and Denisenko, forthcoming). Documentation of local nuclear stories is taking place both by independent creative entrepreneurs, who assemble informal archives, build memorial signs, design cultural tourism routes, as well as the Visaginas city museum, inaugurated in August 2024.

In addition to the Russian-speaking community, there is an entire host of other overlapping communities, which range from the 1980s' anti-nuclear environmental movement activists to the 1990s' energy planners who, having received Ignalina nuclear power plant from the Soviet Russian government, are managing the decommissioning of the plant with the support of the European Union and international organisations. These nuclear communities are dispersed across the country and strongly represented in the major cities. Vilnius and Kaunas, for instance, host groups of artists, architectural and urban historians as well as social scientists who have begun to engage with the Soviet nuclear legacy. They seek to reconsider the established master narratives of Lithuanian national cultural heritage that put premium on traditional, rural identities and engage with the new form of collective building through high technology and technological risk (Dovydaitytė 2022).

1.3. Policy recommendations

The community effect of nuclear cultural heritage-making is fluid and highly heterogeneous. The rationales and interests of nuclear heritage communities are pragmatic and revolve around future concerns (Kalshoven 2022; Holtorf and Högberg 2022; Harrison 2020). Community identities evolve in response to the chronology of decommissioning and deindustrialisation (Barsebäck and Visaginas), the possibility of hosting radioactive waste for the extreme long term (West Cumbria) and preserving information for future generations (Caithness).

Nuclear cultural heritage-making, in this way, is used by both “communities of origin” and “communities of purpose” (Djelic & Quack 2010). The meanings of “origin” and “purpose” can shift depending on the stage of the nuclear location. For instance, during the initial period, nuclear builders and first employees would define themselves as communities of purpose, but at the later stage of decommissioning, being transformed into veterans, they can redefine themselves as communities of origin. A similar dynamic can be traced among anti-nuclear activist communities, who are mobilised around the purpose and assemble their material culture to mark the historical forms of campaigning and strategic mobilisation.

Taking stock of these diverse experiences, we propose that policy-making should consider the following:

- **Nuclear communities are not fixed. Ideas about the future influence notions of the past and have the power to redefine existing communities and to define new ones, which means that stakeholder engagement processes have to be wide-reaching and inclusive.** The task for the policy-maker is to enable community members to articulate and voice their take on futurity by developing an inclusive stakeholder engagement framework. This form of engagement is key to identification of the public and cultural value of heritagisation, because the strategic context will influence significantly the selection process around nuclear cultural heritage. For instance, commitment to the hosting of nuclear objects can influence the narration and reinterpretation of nuclear roots or origins: these can, for example, be framed as the heroic management of the past errors, when the early stages of nuclearization resulted in environmental contamination and messy legacy of radioactive materials.



Sellafield

Sellafield, photo: Anna Storm



Part 2. Materialities: Nuclear Routes

Nuclear cultural heritage-making engages with multiple materialities, the most distinctive ones being ionising radioactive materials, which can be regarded as part of the “natural archive” of late modernity (Keating and Storm 2023; Jurkonytė 2022; Schuppli 2020; Carpenter 2020). However, the distinctiveness of radioactivity does not directly translate into the cultural value hierarchy, established in the European version of heritage conservation, where authenticity and distinction are deemed most worthy of preservation (Bourdieu 1996). The hazard of radioactivity is a death sentence for radioactive materials: they are to be contained rather than preserved, hidden, rather than revealed, and, where possible, extinguished, rather than conserved. At the same time, nuclear material culture includes an entire host of associated non-radioactive materialities, which embody the environmental, technical, social and political architectures and human-made and natural infrastructures of nuclear power. The association with radioactivity, however, makes these materialities special, raising their potential cultural value and affecting their status, comparable with a halo of radioactive mystique, for instance, in the context of the Cold War arms race (Boyle 2020; Schmid 2006), or stigma, associated with accidents and contamination (Pitkanen 2017; Leiss 2013).

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It is useful to think about this complexity as a *nuclearscape*, a term proposed by Harper (2024), who extended Arjun Appadurai’s influential concept of the “technoscape” to the nuclear military-industrial complex. Technoscapes, according to Appadurai, are created through the intersecting flows of people, technology and digitally mediated imaginaries, where the -scape refers to “the fluid, irregular shapes” (Appadurai 1996, 33). Similarly, nuclearscapes emerge through imaginaries, which, although diffuse, coalesce into symbolic power hierarchies and span networks of imitation. Like communities, these nuclear-related materialities, we argue, are not stationary and they hardly ever have a fixed form. They take shape through diverse forms of mobilities, circulation and are channelled through often complex pathways, where it is not always easy to disentangle the local, national, international and global circuits.

Indeed, the very idea of mobility has a political effect in the nuclear locations. Note that nuclear security mechanisms do not seek to stop movement of people, materials, ideas, but rather shape and channel movement by setting limits to the circulation of knowledge both inside and outside nuclear establishments

(Wellerstein 2021, Alexis-Martin et al 2020). Therefore, nuclear spaces are structured through both the explicit, visible, and hidden, obscured movement of people and materials, and constant re-assembling of sociotechnical communities. Nuclear materialities do not speak directly. They are translated through difference-making engines of classification, which sort them according to the materials' scientific, economic, security, artistic and social value and mobilise them in pursuit of group goals. A reactor, plutonium sample, cooling tower or ventilation stack can function as a boundary object, accommodating layers of contradictory meanings and uses (Bowker and Star 1999). Following Irina Sandomirskaja's argument about heritage restoration as the simultaneous creation, management, and destruction of material layers of the past (Sandomirskaja 2023), we propose that nuclear cultural heritage-making, in this context, is a process of constant articulation and assembly of material layers, connecting and disconnecting, revealing and concealing, in response to the changing physical affordances which are entangled with security, political and technical rationales.

2.1 Uncertain materialities and mobilities

While studying heritage-making in the selected nuclearscapes, NuSPACES observed that circulation, stabilisation and disruption are fundamental features that affect the politics of materialities. Flows of labour, construction and engineering materials, including uranium fuels and electric energy, as well as flows of forms of nuclear culture, such as discourses and display strategies, are transboundary: they cross national borders and institutional boundaries.

Nuclear material culture, in this way, witnesses both the development of globalisation and its discontents and is influenced by ongoing global mobilities. For instance, since the 1990s, increasing globalisation of labour markets and subcontracting introduced a more fluid flow of employees, who tend to commute to nuclear locations. This dislocates and, in Appadurai's (1996) words, sometimes deterritorialises the flows of memory, identity-making and consumption (see also Harrison and Sterling 2020). In the context of such fluidity, the narratives of stable, industrial identities may not speak to the new generations of nuclear communities and new narratives of nuclear mobilities, as well as

forms of presentation, are required. The “nuclear exhibitionary complex,” that has taken shape since the 1940s (Rindzevičiūtė 2021) requires updating and innovation.

2.1.1. Case: Sellafield and Dounreay

The nuclearscapes of Dounreay and Sellafield track Britain’s role in political and industrial globalisation and are entangled with the history of colonialism (Hogg 2016). Sellafield stores the vast accumulation of radioactive waste, some of it possibly stemming from the uranium sourced from Congo, which was then a Belgian colony, or from Canada and Australia, mined in the lands of indigenous peoples. Plutonium, some of which was produced in Windscale and Calder Hall, is being prepared for storage. The iconic architecture of the Windscale ventilation stacks and Calder Hall reactors, as well as the Dounreay sphere, constitute a particularly visible material legacy (Kalshoven 2024). Indeed, the very first heritage value assessment of a nuclear reactor in the UK was done in response to the proposal to preserve the Dounreay sphere as it had become a nationally significant and locally cherished landmark (Gunn & Croft 2010; Ross 2021). The concrete and metals, however, are significantly irradiated and cleaning up these material structures is deemed unfeasible. These structures are slowly disappearing from the landscape, as they are being dismantled. The urban infrastructures built to house nuclear workers, however, have a more secure future; Thurso being a particularly instructive case with several neighbourhoods of “atomics” (Ross 2021).

Nuclear decommissioning of Sellafield and Dounreay will last many years; possibly a century in the case of Sellafield. In this way, decommissioning is becoming an integral part of the nuclearscape. Decommissioning actively transforms the range and meaning of nuclear materialities by recategorizing and physically changing them. For instance, the Science Museum collected several objects linked to the process of decommissioning, such as pieces of workers’ uniforms. Similar to Barsebäck in Sweden, the white overalls, worn by the employees during the operation of the plant and its early decommissioning stages, have been replaced by blue overalls, associated with construction workers, when the high-level radioactive parts had been removed (W1 2022; W2 2023).

Materials that find their way into museum collections tend to be on a smaller scale, transportable: the NDA sponsored exhibitions, as well as local heritage enthusiasts, and accession easily collectable objects which speak of the popular culture and corporate communication, such as promotional badges and souvenirs produced by the NDA's predecessor, British Nuclear Fuels Ltd (NRS 2023). Occasionally, larger objects are included in museum collections: parts of Dounreay control panel are displayed in North Coast Visitor Centre and are also included in the National Museums Scotland collection.

However, heritage collections tend to bypass radioactive objects. Storing even small samples of radioactive materials requires a license. For instance, in 2024, Kingston University faced the difficult decision to legally dispose of its rich collection of beach sand from Seascale, which contains radioactive particles released by Sellafield. While the sample was used to train students to work with radioactive materials, the very history of the collection of the sample and the sample's subsequent transformation as radioactive isotopes which were decaying is of value. Should some radioactive materials be managed as cultural heritage rather than waste is a difficult question. Certainly something that is central to twentieth century modernity and the Cold War would be lost if none is preserved (W3 2024; Beaufils 2023).

2.1.2 Case: Barsebäck

A "material flows" perspective helps understand the ways in which the significance of Barsebäck extends beyond regional industrial development and connects with the political economy and ecology in the region, nation and globally. One perhaps slightly ironic circumstance was that Barsebäck continued to deliver electricity to Denmark through an underwater cable during the years of heated anti-nuclear protest activities and huge demonstration marches, in which the Danes actively participated. Another critical flow of materialities was the specially designed ship M/S Sigyn that continuously transported radioactive waste from Sweden's coastally-located reactor sites, to intermediate storage of spent nuclear fuel or final storage of low- and medium level wastes. The ship drew quite a bit of attention, both from protesting environmental groups like Greenpeace, but also as a tourist attraction open to the public during the summer months.

However, with the ongoing dismantling of Barsebäck, the place-

boundedness of radioactive materials has come to the fore. The host municipality of Kävlinge envisages a completed dismantling process followed by a free release of the attractive coastal location for the establishment of new residential areas, tentatively named Barsebäck Seaside. These plans had to be put on pause when it became clear that the national underground storages for different types of radioactive waste are close to reaching the limit of their capacity, while expansion plans and new construction are severely delayed. In this situation, temporary storage facilities were built at the Barsebäck site, decisively prolonging its existence as a nuclear regulated and closed site (W2 2023).

With the nuclear company moving into a concrete dismantling phase, all public facing activities were cancelled. A new and smaller visitor centre, which opened after the shutdown of the reactor, was finally closed down and the space turned into a regular entrance space for employees. Guided tours of the plant ended in the early 2020s as well as the funding for a so-called Local Safety commission, which was a governmentally funded construction to provide a form of information space between the local community and the nuclear company (Storm and Edberg, forthcoming). In the ongoing heritage efforts, one particularly strong focus is on the plant as a workplace and everyday activities in the landscape, alongside the architectural interest for the Expo building (Storm 2014; Storm 2018). A transnational aspect is captured through interviews with Danish anti-nuclear movements, but the local scale is definitely the dominating perspective and main interpretative lens.

The natural environment converges into a nuclearscape through the generous windows of Barsebäck's control rooms – it is uncommon for a control room to have a window on the outside, which means that everyday reactor operators not only closely monitored the control panels, but could also contemplate the changing seasons in the skies and fields. Indeed, this particular architecture and experience questions the established lens on control rooms as metaphors of Cold War militarism, as they were claustrophobic spaces, physically isolated from the environment and where the perfect rationality of decision-making was little more than an illusion (Edwards 1997). There is a small radio in the control room which operators used to catch the music illegally streamed by Danish pirate radio, anchored in the sea (W2 2023). These multiple materialities, mobilities and experiences materialise at Barsebäck to tell specific stories, where a nuclearscape

appears to be tamed and lived in, and yet posing questions about the sources of uranium, struggle for local democracy and labour conditions, and terraforming in the form of ponds to store low level radioactive discharges. These material witnesses (Schuppli 2020) might lack the global drama, associated, for instance, with Britain's role during the Cold War, or the Windscale and Chernobyl disasters, but they have the potential to speak in many voices about nuclear legacies.

2.1.3. Case: Ignalina and Visaginas

In comparison, in Ignalina and Visaginas the materiality flows unlock the dramatic intertwining of nuclearcapex with ethnoscapex and one of the most significant political events of the last century, the collapse of the nuclear-powered Soviet empire. Moreover, the Russian occupation of parts of Ukraine (2014-2024) including Zaporizhzhia (2022-2024) and Chornobyl (2022) nuclear power plants illustrated the exploitative and colonial character of the Soviet nuclear power industry, which became weaponised in violation of international law (Matviyenko 2022).

In this politically charged context, the flows and their sedimentation, redirection and recirculation, resulting from the building, operation and decommissioning of the nuclear power plant, constitute a particular ecology. The concrete, ubiquitous in the industrial buildings, materially witnesses state socialist construction and its fall. For instance, informal inscriptions on the pavements left by the builders of the atomic town are being considered for preservation by local heritage enthusiasts (Dovydaitytė & Denisenko, forthcoming). The housing blocks evolve as palimpsests, transformed by their residents who engage in creative DIY to repair their parts of the buildings (W3 2024). The radioactive cores of two RBMK type reactors, stopped and defueled, remain intact, the extremely radioactive graphite being preserved until the decision is made as to further decommissioning. The fuel rods are removed and packaged for storage. The decommissioning generates a lot of material that is being processed and sold through auctions – in terms of materiality, decommissioning emerges as coastal erosion, where what appear as firm structures are washed away, are dispersed and merge with the environment.

Heritage-making takes places at the margins of these large-

scale, high-stakes material flows, where smaller, often everyday objects are preserved by former employees as mementos. Some of them, such as an atomic run certificate, a festive badge, or work instruction, are donated to the city museum, which opened on 2 August 2024. Employees' donations are also stored in the informal collection of the Visitor Centre at the nuclear power plant (W3 2024). The cultural recategorisation and stabilisation of nuclear materialities also takes place through artist projects, such as Augustas Serapinas repurposing concrete blocks from the nuclear power plant (2018), Jonas Zukauskas and Jurga Daubaraitė transporting the model of Ignalina nuclear power plant to the Baltic pavilion at Venice biennial of architecture (2016) and Emilija Škarnulytė meticulously documenting the plant's industrial surfaces and environment in her experimental films *Energy Island* (2016) and *Burial* (2022) (Dovydaitytė 2022; Rindzevičiūtė 2022).

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Nuclear materialities might include "secondary" artefacts and structures created outside the nuclear site but no less "real" than real nuclear things. The full-scale simulator of Ignalina's second unit control room launched in 1998 to train nuclear operators is being considered for inclusion in the future energy museum by Visaginas municipality, thus preserving it as a symbol of nuclear transition and an authentic sociotechnical environment of nuclear specialists' training (W3 2024; Rindzevičiūtė 2021). The scale model of the plant produced in 1980 for the Soviet industry achievement exhibition, now preserved at the national Energy and Technology Museum, through its various uses across different institutional and disciplinary settings, proves to be not a mere display device but a material agent able to shed a light on the complex transnational history of nuclear energy (Dovydaitytė, forthcoming).

2.2 Policy recommendations

Reflecting on the case examples, NuSPACES suggest that a viable nuclear cultural heritage policy would take materiality seriously, through preservation, conservation, and critical exploration, deploying object-based and object biographical research techniques. The materialities of nuclearscapes and their cultural heritage significance are so heterogenous in terms of their physical composition and scale, the trajectories of object and infrastructure biographies so complex and evolving, that it is impossible to account for them in a single report or to capture in a single museum collection. Engaged, collaborative, interdisciplinary and long-term research and collecting practices are needed.

Materialities are not just bearers of information, they can be considered actors in their own right, witnesses to the complex nuclear era, the development of which is inscribed in their physical structure. Although documentation is of key importance, the value of materiality cannot be fully replaced through recording and digitalisation. Future generations may need to ask questions that are different from ours. It is therefore centrally important that the rich diversity of nuclearscapes' material culture is secured. NuSPACES suggest that:

- **To make full use of the heterogeneous and polylogue materialities of nuclear sites, nuclear cultural heritage-making requires interdisciplinary collaboration recognising diverse professional expert knowledge.** Nuclear decommissioning and memory work are of existential significance for scientist and engineer communities as well as for hosting and resident communities. However, nuclear decommissioning also presents a unique opportunity for other professional and social groups to uncover new aesthetical, social and political values in nuclear infrastructures and objects as they are material witnesses of the nuclear age. It is important, therefore, that representatives of these groups are engaged at all stages of the identification of the public and cultural values of materials, because these values will be articulated differently in different disciplinary contexts. What may appear as mundane, insignificant, or deemed technologically challenging for one group, can be of key importance for another group. Documentation and digitalisation are vitally important, but they should not replace conservation and preservation of nuclear material cultures and their ecosystems.



Windscale ventilation stack, photo: Sellafield Ltd



Part 3. Locations: beyond residual governance

The spatial dimension is key for nuclear cultural heritage-making: although nucleascapes are shaped by flows, they are always situated in particular places, even in their intangible or digital forms. In everyday heritage practice, spatiality is articulated through practical questions: where potential heritage is located, what can be preserved in situ, and what should travel elsewhere, to other locations such as museums and archives. This conceptual and pragmatic configuration of locations is shaped by cultural policy and other governmental instruments.

There is a strong connection between the spatial and governmental dimension: while, as famously noted by Michel Foucault (2007), modern governments continuously develop new forms of controlling territories and populations, governance itself forms a key resource that transforms spaces into places (Ettlinger 2011) through institutions and networks, both formal and informal (Rhodes 1999). This is particularly true in the context of post-industrial and urban planning where many different layers, such as environmental, technological, social and cultural, require complex orchestration of governmental approaches (Batty 2024). Orchestrating scientific expertise into the government of these layers is a continuous challenge faced by policy practitioners (Rindzevičiūtė 2023) and this has significant implications for nuclear cultural heritage-making where access to knowledge, materials and locations can be highly restricted. Locating and governing nuclear cultural heritage, in this way, demands a specially designed participatory approach, able to deal with the “wicked problems” that characterise this intersectorial field (Collier and Gruendel 2022; Rittel and Weber 1973).

Addressing nuclear cultural heritage-making as a spatial practice of place-making and the process of place-attachment is central for understanding its social and political potential (Mbah and Kuppler 2024). It is key for tackling the spatiality of exclusion, securitisation and geographies of suffering (Pitkanen and Farish 2018). The focus on locality and the local is also about decentering the social science studies of the nuclear technology, which inform governmental imaginaries. For instance, a recent study by Meyer and Sérandour (2024) demonstrated that anglophone social and historical research on nuclear technology is spatially unbalanced: nuclear power plants and US cases are significantly over-represented, whereas, for instance, uranium processing and waste disposal are least researched. Charting the locations of nuclear cultural heritage, therefore, is both an epistemological and political project.

3.1. From “cleaning up” to good governance through heritage

NuSPACES suggest that nuclear cultural heritage has a significant role to play in the context of nuclear decommissioning that goes beyond “cleaning up” the contaminated infrastructures and landscapes and considers preservation, reuse and creation of new value (Äikäs and Matila 2024; Banaszkiewicz 2023; Rindzevičiūtė 2022; IAEA 2011). A focus on nuclear cultural heritage-making facilitates a site-specific approach to the multi-layered governmental landscape, which is particularly suitable for addressing the challenge of governing complexity in the Anthropocene (Blake & Gilman 2024; Rindzevičiūtė 2023; Korosteleva and Petrova 2022).

In this context, NuSPACES argue that nuclear cultural heritage-making should not be considered as a policy attachment to, for instance, social policy fighting deprivation or regional economic development policy. In contrast, nuclear cultural heritage-making is as a central interface for genuinely democratic governance of nuclear locations that works to minimise and prevent the risk of *residual governance* as well as to mitigate the possible negative effects of *long-termism*.

The risk of residual governance

The historian Gabrielle Hecht (2023, 28-31) has proposed three dimensions of residual governance: (1) management of discarded materials, the residues of industrial activity; (2) governance that becomes a residual activity when it dismisses negative social and environmental impacts and uses “simplification, ignorance and delay” tactics; (3) regards people and places as waste and externalities. Although Hecht builds her critique of residual governance by drawing on colonial exploitation in South Africa, she forewarns that elements of residual governance are manifest in liberal democracies. Residual governance happens where the entanglements of nuclear power and radioactive materials with the particular locality are abstracted and regarded as externalities of the national and international benefits. NuSPACES suggest that failing to take into consideration the cultural value of the nuclear establishments as well as their cultural impacts can be regarded as a form of residual governance.

The fallacy of long-termism

Nuclear cultural heritage making presents a unique interface of the past and future and could serve as an experimental model

of the effective orchestration of short- and long-term futures socially and materially (see Rindzeviciute 2023; Andersson and Rindzeviciute 2015). However, long-termist orientation entails risks. According to Michelle Bastian (2024, 405), long-term thinking must be anchored in the local problematique, so that it does not become a form of “chronowashing,” where a concern with the long-term future is communicated while conducting business as usual. While Bastian tracks forms of chronowashing visible in the wasteful logic of mass retail and compartmentalised spaces of future concerns, nuclear localities are quite distinctive because the long-term concern with high level radioactive waste presents a very concrete, immediate hazard that needs to be continually cared in very particular localities. The unique challenge of governing the extreme long-term to secure high-level radioactive waste is striking the right balance of short-term and local approaches in line with spatial and environmental justice.

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3.1.1. Dounreay and Sellafield

The most visible and most widely communicated markers of nuclear localities are buildings: spheres, cubes and chimneys that shape the skyline of the nuclear coasts in West Cumbria and Caithness (Kalshoven 2023). These large scale shapes looming in vast landscapes suggest a particular vantage point which is concealing as much as revealing the actual heterogeneity of nuclear locations. As Kalshoven (2023) details, the progress of nuclear decommissioning is presented to the public as an impactful change in the skyline, where the structures are being carefully dismantled. However, it would be a mistake to identify nuclear cultural heritage locations exclusively with visible structures and the sites that they occupy. It can be argued that there is a complex sociotechnical environmental ecology where nuclear cultural heritage is created, presented and disseminated.

The emphasis of multi-site heritagisation is particularly strong in Dounreay, which is situated at the northernmost coast of mainland Britain. The material culture legacy of Dounreay is being documented, collected, archived and displayed in the local museum in Thurso and the nearby Nucleus archives in Wick, while the entire residential quarters of Thurso are material witness of the nuclear way of life (Ross 2021). The local residents seek to accumulate and store the cultural capital of nuclear

cultural heritage so that it underpins local politics that seeks to attract industrial investment in the region. Similarly, the West Cumbrian community seeks to capitalise on Sellafield nuclear cultural heritage to argue their case for investment and economic development by layering high-tech industries in what has been an agricultural and industrial mining region (W1 2022).

Deciding where material culture is collected, stored and displayed is perceived as a question of local autonomy in both Dounreay and Sellafield: for instance, the local community protested against sending a segment of the Dounreay control panel to the Science Museum in London insisting, successfully, that it stay in Scotland. While Dounreay's legacy is also represented in the collections and displays of National Museum Scotland in Edinburgh, less is known about the locations of memory and material culture that are confined within the British nuclear industry and military defence. The search for the deep geological repository, in which West Cumbria have expressed interest, adds another spatial layer to the notion of nuclear cultural heritage where radioactive waste can be considered a cultural object.

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However, the strong emphasis on local decision making is not matched by cultural policy funding: British local governments do not have tax-raising powers and spending on culture and the arts is legally discretionary. Archives, museums and culture venues are the first to see budget cuts; for instance, the Whitehaven Archive and Local Study Centre reduced their opening hours because of a shortage of funding. A robust model of governing locations of nuclear cultural heritage requires coordination of established arm's length heritage regulators, Historic Environment Scotland and Historic England, the NDA, local and national cultural policy bodies and research universities. New types of interdisciplinary mediators to resource policy-making are required in the regions: to support vibrant local amateur communities, more art and heritage professionals are needed to develop transnationally-oriented projects and attract funding.

3.1.2. Barsebäck

The governance of the decommissioning process at Barsebäck comes across as highly uncertain and marked by tensions between decommissioning tasks and waste storage tasks, and their different geographies and temporalities. The current dismantling work at Barsebäck is partly a local business, carried with pride by the long-term workforce, partly a company business, where Barsebäck kraft AB forms part of the larger Uniper sphere, and finally, it is partly a Swedish national business with conflicting time schedules for expanding and constructing radioactive waste storages and transport routes.

The spatial governance of the nuclear cultural heritage of Barsebäck is fragmented across different institutions and lacks both dedicated funding and to some extent clear directions. At the national level there is not much interest and engagement in the heritagisation of Barsebäck, whereas the regional and local level is heavily dependent on individual engagement and networking both within the museum structure and within the nuclear company. The local municipality is not directly taking part in any activities. The ongoing museum network project collectively documenting Barsebäck during its decommissioning and dismantling suffers from internal reorganisations and competing tasks. A new exhibition in the making at Malmö Museums may incorporate a section on Barsebäck, but it is not yet decided. A recently re-discovered archive in Alnarp of landscape drawings from the well-known architect Per Friberg, who led the design process of both the Expo building and the landscape surrounding Barsebäck, is currently being sorted and prepared for better preservation. A pending request to make the Expo a listed and protected building is currently being handled at the County Administrative Board, partly through a new building conservation inventory carried out by a consultant company. While the focus on the local can be considered as positive, there is a need to for link the localist approaches into a bigger whole. For instance, a new exhibition at the National Museum of Science and Technology in Stockholm on the small plant of Ägesta, opened in 2023, does not take the larger national or transnational picture into account. While Sweden is developing a robust framework of long-term orientation by engaging local administration to meet the needs of the deep geological repository, the cultural heritage agenda appears to be left out from this policy innovation at the moment.

This fragmented governance landscape can appear as conducive to democratic and heterogenous engagement, because it certainly allows room for multiple voices. However, the question is if these multiple voices are heard and where, when the overview, coordination and – importantly – dedicated funding, is not entirely in place. What brings hope is that there is an increasing level of trust and collaboration between different actors and stakeholders, and there are furthermore indications of an increasing interest among those actors in engagement in nuclear cultural heritage.

3.1.3. Ignalina and Visaginas

Similarly, in Lithuania the heritage dimension is not yet included in the decommissioning plan of the Ignalina nuclear power plant, which is dictated by technological competences and funding is streamlined to the target of reinstating a version of a brownfield site (W3 2024; VATESI 2023). However, recently new relationships between the industry, local municipality and cultural organisations, such as the national Energy and Technology Museum, were established (W3 2024). Cultural mediators are seeking to salvage certain material elements from the process of dismantling. Emerging contacts between industry, town and culture sector are partly a result of mostly internationally funded flows of artists, cultural practitioners and researchers who, since the shutdown of the plant in 2009, have been promoting public awareness of the cultural and social dimensions of the nuclear industry (Dovydaitytė 2022). The national cultural policy lacks recognition of modern industrial heritage because of its age (“too young”) and its connection to Soviet occupation (W3 2024).

Much policy innovation is emerging at the local level. Nuclear cultural heritage has been one of the priorities of Visaginas Municipality since 2020. Although the silhouette of Ignalina NPP is considered a significant local marker and a symbol of nuclear heritage, the town plans to engage with the nuclear past independently of this nuclear object doomed for demolition: the Visaginas City Museum opened in 2024, the concept of reviving the simulator of the control panel of the second unit of the nuclear power plant is being developed, and the integration of nuclear-themed objects in public spaces is being considered (W3 2024). The challenges include attracting funding, lack of cultural professionals with know-how to manage and mediate

difficult heritage, and answering the different needs of various stakeholders, including first builders, Chernobyl liquidators, multi-ethnic groups, a new generation of creative entrepreneurs, and tourists. Instrumental use of nuclear heritage for economic regeneration may clash with local needs for commemoration and preservation. Emerging NGOs engaged in preservation of local history are dependent on project-based funding through public competition by the national funder for culture. Unstable financing contributes to an uncertain future and lack of guarantees for continuity.

Local, national and international collaborations are crucial for nuclear cultural heritage making, especially in a country with weak recognition of industrial heritage in general (Drémaité 2012) and because the nuclear legacy transgresses national geographies and histories. In Visaginas, local industrial heritage activists sought to include the first kindergarten built in 1978 on the national heritage list. Although this initiative was supported by Docomomo International (International Committee for Documentation and Conservation of Buildings, Sites and Neighborhoods of the Modern Movement), the application was rejected by the national heritage department.

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However, the awareness of the local and national significance of nuclear cultural heritage is growing. In 2023, after several initial failures, the restoration of the scale model of the Ignalina nuclear power plant has received funding from the Lithuanian Council for Culture. Letters of support from the NuSPACES team and The International Committee for the Conservation of Industrial Heritage (TICCIH) have contributed to the nuclear object's recognition as a cultural heritage object.

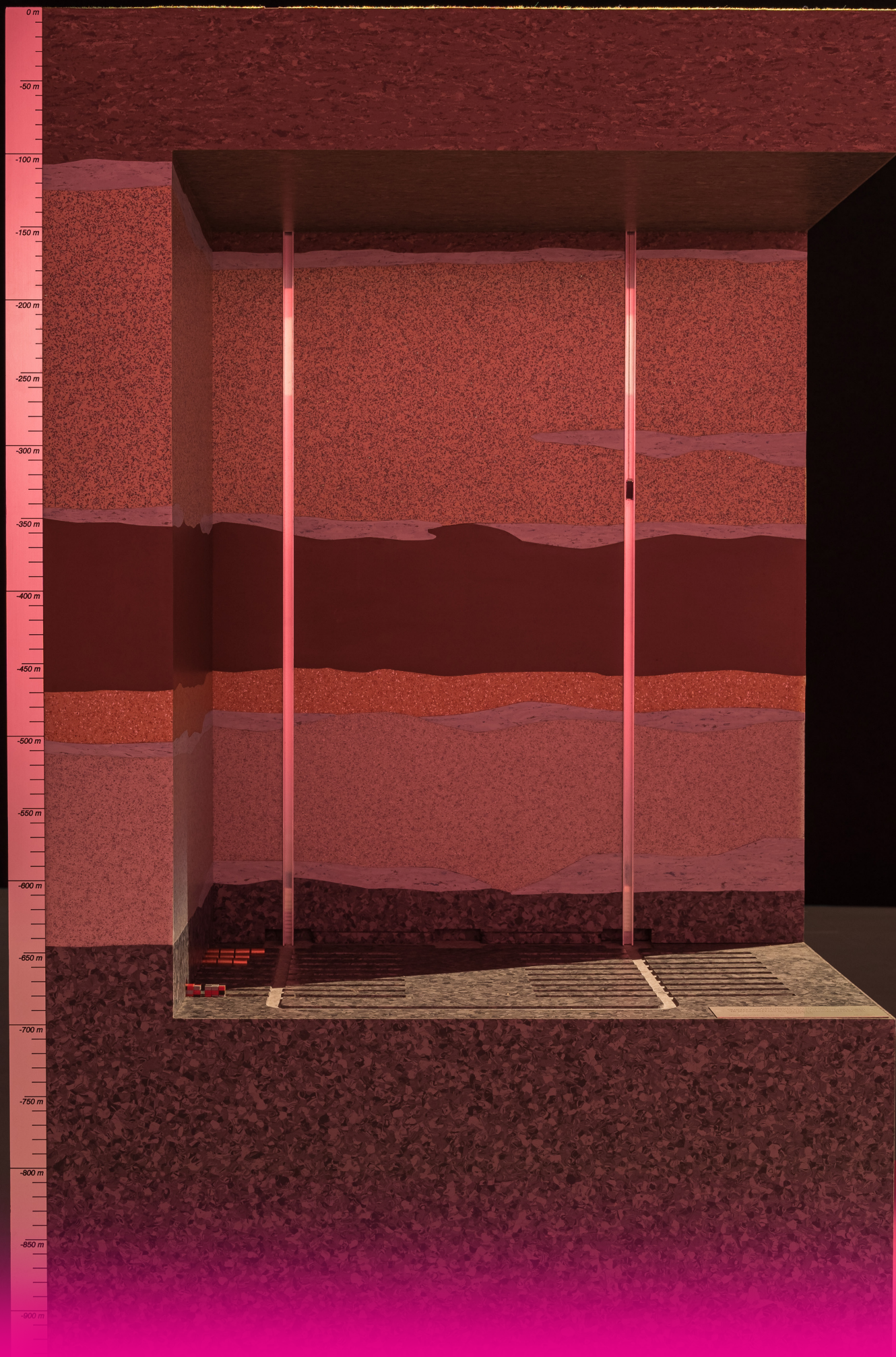
These and other developments in the Visaginas municipality reveal the power of local governance. However, there is a wealth of documentation, objects and materials that circulate within the highly restricted channels of nuclear decommissioning. Given that decommissioning is progressing, there is a pressing need to integrate those flows of knowledge and matter through strategic policy innovation, public debate and multi-site governmental agency collaboration (W3 2024).

3.2 Policy recommendations

Nuclear locations, in this way, have their own temporalities and governmental needs, the specificities of which can be articulated and acted upon through cultural heritage making. Nuclear spaces are localised, turned into places as they are embedded in manifold governmental frameworks, cutting across energy and industrial planning, national security, science, research and development, environmental policy, heritage and cultural policy, local and regional governance. Furthermore, nuclear localities are subject to international regulation and hence nuclear establishments are embedded in international networks of trade, monitoring, and knowledge exchange at, for instance, the OECD and IAEA. The same applies to cultural heritage, which draws on Unesco international conventions, collaborations and the international funding networks. All these different policy frameworks develop around diverse rationales and are characterised by specific historical path-dependencies. NuSPACES calls for the assessment of the heterogeneous localities where nuclear cultural heritage is created, made public and disseminated, suggesting that:

- **Nuclear cultural heritage-making requires policy innovation by joining up different policy sectors to create an interface for genuinely democratic governance of nuclear locations.** This is necessary to secure spatial and environmental justice, to minimise and prevent the risk of residual governance, as well as to mitigate the possible negative effects of long-termism. Failing to take into consideration the cultural value of nuclear establishments, as well as their cultural impacts, can be regarded as a form of residual governance. The heritage approach, in turn, can contribute to balancing short-term and local approaches in response to the unique challenge of governing the extreme long-term task of securing high-level radioactive waste.





Conclusion

Organised along the key categories of Communities, Materialities and Locations of nuclear cultural heritage, the report outlines the ways in which nuclear cultural heritage-making could be mobilised as a resource to build cohesion, bridge cultural, social and economic divides and strengthen local, regional and national resilience and democracy. Taking stock of the research and engagement experiences, NuSPACES proposes an approach to nuclear cultural heritage as a wide range of practices, such as the selective valuation, preservation and staging of objects and infrastructures related to nuclear technology, as well as intangibles, such as organisational practices, rituals and the everyday cultures of nuclear communities. In all, engaging with the past and the future through nuclear cultural heritage can open up new and unexpected avenues to tackle some of the most complex environmental, sociotechnical and cultural challenges of the twenty first century.

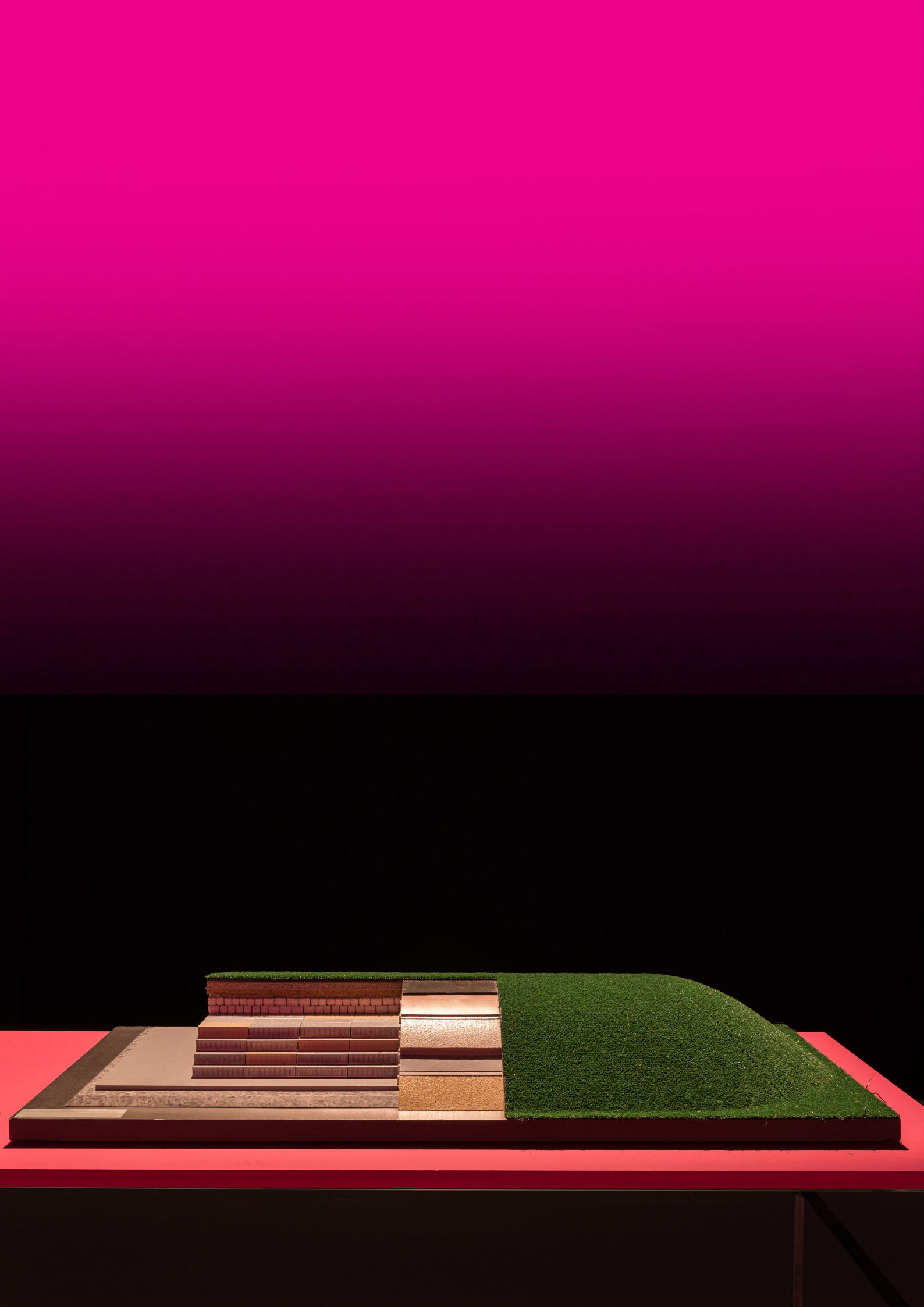
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W1 Workshop 1: UK, 2022.

W2 Workshop 2: Sweden, 2023.

W3 Workshop 3: Lithuania, 2024.



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Image on the left: Long-term waste depository model from Ignalina NPP information centre, "Nuclear Assembly" art installation by Jurga Daubaraitė and Jonas Žukauskas, at exhibition Splitting the Atom, Vilnius Contemporary Art Centre, 2020 , photo: Andrej Vasilenko

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