



Supplement of

The role of nuclear cultural heritage in long-term nuclear waste governance

Viktorija Noka and Melanie Mbah

Correspondence to: Viktorija Noka (v.noka@oeko.de)

The copyright of individual parts of the supplement might differ from the article licence.



The role of Nuclear Cultural Heritage in long-term nuclear waste governance

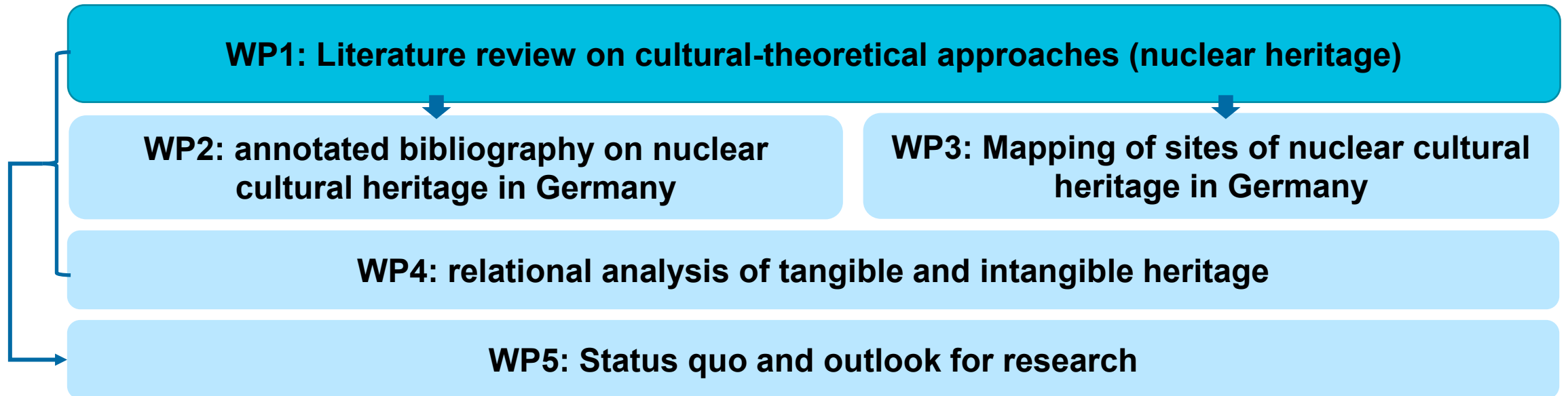
Viktorija Noka, Dr. Melanie Mbah, Ryan Kelly, Alexandra Lampke, Dr. Sophie Kuppler | Berlin, 15.09.2023

Context: nuclear waste management (in Germany)

- Highly radioactive waste as an eternal burden (Brunnengräber 2015)
- The site selection procedure (StandAG) should be transparent, participatory, learning, self-questioning and science-based to promote the acceptability and ensure ‘added value’ of the site beyond its core function (NEA, 2022)
- During and after the site selection process, the construction and operating phase, and after closure, the memory of these processes must be preserved, to guarantee safety in dynamically changing contexts, and honor the region that takes on the burden (cf. Kuppler/Hocke 2019; Mbah/Kuppler 2021; Mbah/Kuppler i.a.)
- An active nuclear cultural heritage can serve the prevention of loss of knowledge and support decision-making processes with regard to nuclear sites (Rindzevičiūtė, 2019)
 - ➔ all technical and social knowledges, artefacts and practices related to nuclear technologies can become part of a nuclear cultural heritage (practice)

Context: the NuCultAge project

Aims: identify and synthesize theoretical concepts and approaches; identify sites of nuclear heritage in Germany and analyze examples; describe characteristics and prerequisites for the institutionalization of a nuclear heritage; identify research needs



Methodological approach: literature review

Identification of research clusters and associated keywords

Systematic search for relevant literature with search strings, i.e. “nuclear” & “heritage” combined with snowball search

Identification of ca. 350 publications of which about 200 were significant & scanned

Around 50 publications used for the literature review

Cluster	Keywords
cultural heritage	cultural heritage, cultural memories, heritage futures, (German) nuclear legacies
energy	(German) energy cultures
imaginaries	sociotechnical imaginaries (STI), spatial imaginaries
place	place attachment, place identity, identity politics, homeland/home
historical	places of remembrance, culture of remembrance, agency of objects
nuclearity	nuclearity, nuclear landscapes /spaces, nuclear identity
governance	long-term governance, reversibility

Literature review: Cultural Heritage

- Cultural heritages are a heterogenous **assemblage** of “objects, people, places, practices, pronouncements, bureaucratic apparatuses” that includes “various people, institutions, apparatuses (dispositifs) and the relations between them” (Harrison 2020, 37)
- Cultural heritage is not an ‘end-product’, but an on-going **practice**
 - Not just a technical and managerial practice, but also a cultural and political one
- Although heritage practices are concerned with the past, heritage work is just as much about conserving the past as it is about **making futures** (Penrose/Harrison 2020)
 - Preserving memory and information on “unwanted legacies” such as nuclear waste is crucial for preparing and supporting the decision making of future generations (Penrose/Harrison 2020; Pescatore/Palm 2020)
 - Waste has a certain “material and discursive legacy, the management of which is, like heritage, oriented towards the construction of particular kinds of actual and imagined futures” (Harrison 2020, 49; cf. Harrison 2016; May/Holtorf 2020)

Literature review: defining Nuclear Cultural Heritage

“anything that has come into contact with nuclear science and technology”

and includes the **“collecting, storing, archiving, preserving and caring for** representative artefacts of nuclear material culture, mapping and safeguarding sites, preparing and selecting documentation, recording intangible practices, and **establishing and keeping new archives”** (Rindzevičiūtė 2019, 4)

Nuclear Cultural Heritage as...

- ... a practice
- ... meaning-making
- ... future-orientated
- ... spatialized and place-based



What does this mean
for long-term nuclear
waste governance?

Literature review: energy cultures and imaginaries

- Energy cultures as “the social and physical interactions forming relations in the energy system” (LaBelle 2020, 3) that are shaped and re-produced by dominant socio-technical and spatial imaginaries (Walker et al. 2010; Sadowski/Bendor 2019; Suhari 2022)
- Sociotechnical imaginaries are visions of desirable futures (Jasanoff/Kim 2009)
- spatial imaginaries are “deeply held collective understandings of socio-spatial relations that are performed by, give sense to, make possible and change collective socio-spatial practices” (Davoudi et al. 2018, 101; cf. Chateau et al. 2021)
- Spatiality as a manifestation of social and technological transformation is both, constitutive and constituting for possible energy futures (Chateau et al. 2021, 7; Levenda et al. 2019)

Nuclear imaginaries are both part of the heritage assemblage and influence the practices of identifying, valuing, curating, and communicating past and future visions of (nuclear) energy systems

Literature review: the role of place and remembrance

- “Places are continuously made through ‘social, political, and material processes by which people iteratively create and recreate the experienced geographies in which they live’” (Landström/Kemp 2020, 38 based on Pierce et al. 2011, 54)
- Place attachments activate networks and foster social cohesion within institutionalization processes (cf. Otto/Leibenath 2014; Knaps et al. 2022; Osborne et al 2021; Landström/Kemp 2020)
- Places of remembrance are “crystallization points of collective memory and identity” (François/Schulze 2001, 9)
 - Product of both, material and immaterial elements - i.e. geographical places, but also social constructs, like events or rituals (Kroh/Lang 2010)

Integrating place-based experiences of the past acknowledges that there are significant bottom-up processes at work that reflect how the past is curated for the future

Literature review: Long-term governance and institutionalisation

- “Institutionalization - the activities and mechanisms by which structures, models, rules, and problem-solving routines become established as a taken-for-granted part of everyday social reality” (Schneiberg/Soule 2005, 122)
- Institutions are enablers for processes of cooperation and coordination among actors in that they offer rules for engagement and thus also offer a frame for the production of new institutions (Hasse/Krücken 2008, Beunen et al. 2022)
- (Long-term) governance process – a system of interactions through which specific societal tasks are accomplished
 - Specific challenge of long-term governance: creating opportunities, preparing future decisions, passing on knowledge (cf. Kuppler/Hocke 2019)

Discussion: understanding Nuclear Cultural Heritage



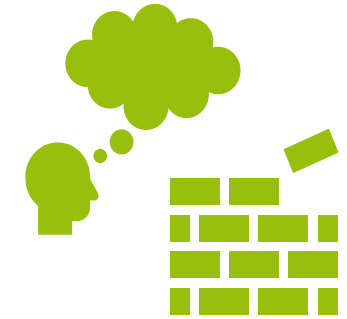
Temporality

making decisions about what pasts are important for the future as a projection of a future imaginary



Spatiality

significant role in reference to nuclearity as well as for the development of heritage practices, and as part of a long-term waste governance



(Im)materiality

influences how we do long-term waste governance (what we consider as important to pass-on in this context)

Discussion: putting nuclear cultural heritage into practice

Nuclear Cultural Heritage as part of long-term governance (Rindzevičiūtė, 2022)

- Nuclear cultural heritage should be embedded within strategic development of decommissioning
- Nuclear cultural heritage is not made “about the community” but “with and by the community” (Rindzevičiūtė, 2022, 28)
- Should include methods of participatory governance
 - Participation does not always equal democratisation (cf. Mbah 2022)
 - Inclusivity in development of material and immaterial nuclear cultural heritage (social justice and ethical approaches)

Examples: putting nuclear cultural heritage into practice – a framework

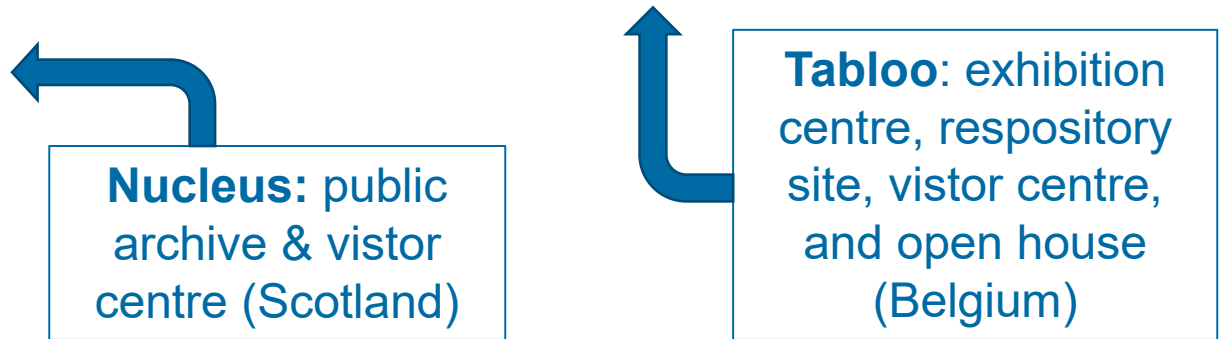
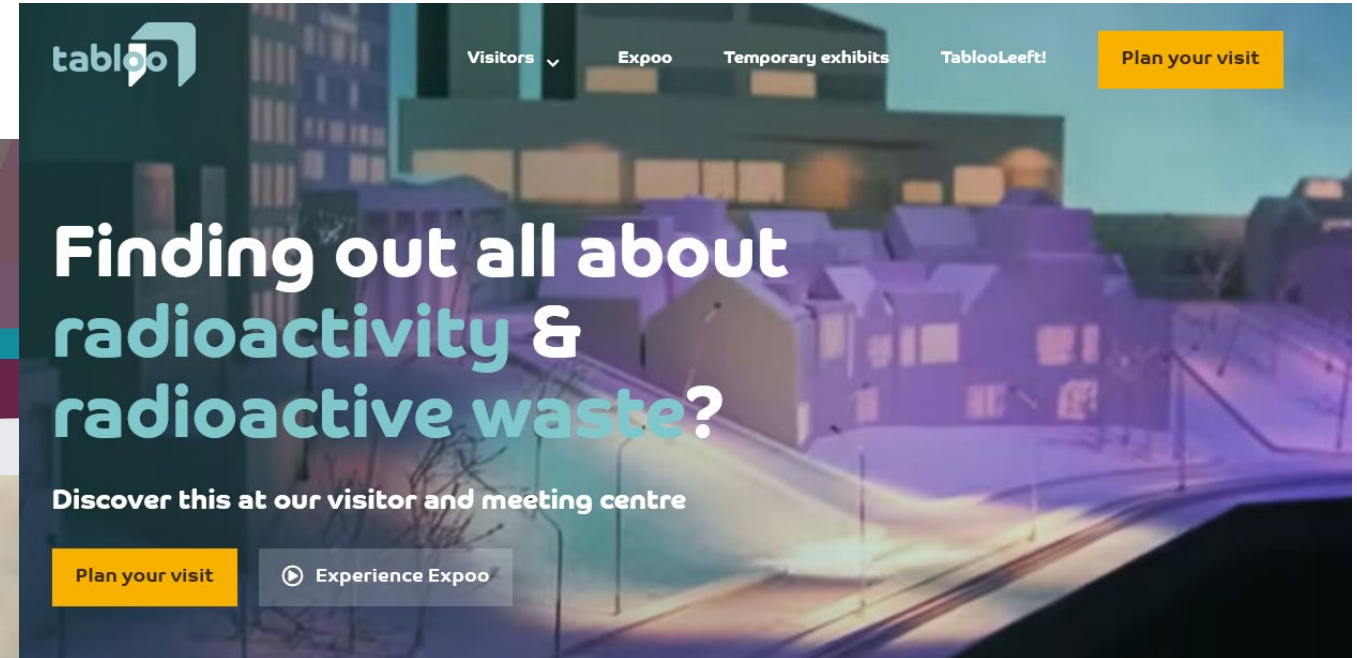
“Preserving **R**ecords, **K**nowledge, and **M**emory” framework (RK&M) (Pescatore/Palm, 2020)

- Transfer of knowledge and meaning through multiple forms, formats, and mechanism to ensure durability
- Meaning- & value-producing mechanism
- Includes archives, libraries, time capsules, markers, active heritage, international mechanisms, oversight provisions

The Preservation of Records, Knowledge and Memory (RK&M) Across Generations: Scoping the Issue

Active heritage as a “heritage that is likely to evolve over time, such as traditions, local lore, enactment societies of past historical events or past practices, local lore, enactment societies of past historical events” → link to intangible cultural heritages

Examples: putting nuclear cultural heritage into practice – international



Examples: putting nuclear cultural heritage into practice – bottom-up

stiftung .atomerbe

ÜBER UNS STIFTEN & SPENDEN FÖRDERUNG KONTAKT NEWSLETTER



Das Vermächtnis der Anti-Atom-Bewegung



Gorleben as a place of nuclear cultural heritage: culture, places, and practices of remembrance incl. archives, direct-action interventions

Thank you for your attention!

Research presented as part of the NuCultAge project
Funded by BASE – grant no. 4723F90101

Project contacts:

Viktoria Noka
v.noka@oeko.de
Oeko-Institut
Energy and Climate Division
Berlin, Germany

Dr. Melanie Mbah
m.mbah@oeko.de
Oeko-Institut
Nuclear Engineering & Facility Safety Division
Freiburg, Germany

References

- Beunen, R.; van Assche, K.; Gruezmacher, M. (2022): Evolutionary perspectives on environmental governance: Strategy and the co-construction of governance, community, and environment. In: *Sustainability* 14 (16), p. 9912. DOI: 10.3390/su14169912.
- Brunnengräber, A. (2015): *Ewigkeitslasten, Die "Endlagerung" radioaktiver Abfälle als soziales, politisches und wissenschaftliches Projekt - eine Einführung* 1. Auflage. Baden-Baden: Nomos, Edition Sigma. Online available at <https://ebookcentral.proquest.com/lib/kxp/detail.action?docID=4350203>.
- Chateau, Z.; Devine-Wright, P.; Wills, J. (2021): Integrating sociotechnical and spatial imaginaries in researching energy futures. In: *Energy Research & Social Science* 80, pp. 1–8. DOI: 10.1016/j.erss.2021.102207.
- Davoudi, S.; Crawford, J.; Raynor, R.; Reid, B.; Sykes, O.; Shaw, D. (2018): Policy and Practice Spatial imaginaries: tyrannies or transformations? In: *Town Planning Review* 89 (2), pp. 97–124. DOI: 10.3828/tpr.2018.7.
- François, E.; Schulze, H. (ed.) (2001): *Deutsche Erinnerungsorte*. 3 volumes (2). München: Beck.
- Harrison, R. (2016): Archaeologies of emergent presents and futures. In: *Historical Archaeology* 50 (3), pp. 165–180. DOI: 10.1007/BF03377340.
- Harrison, R. (2020): Heritage as future-making practices. In: Harrison, R.; DeSilvey, C.; Holtorf, C.; Macdonald, S.; Bartolini, N.; Breithoff, E. et al. (ed.): *Heritage Futures. Comparative approaches to natural and cultural heritage practice*. Unter Mitarbeit von Anders Högberg und Gustav Wollentz. London: UCL Press (Comparative Approaches to Natural and Cultural Heritage Practices), pp. 20–50.
- Harrison, R.; DeSilvey, C.; Holtorf, C.; Macdonald, S.; Bartolini, N.; Breithoff, E. et al. (ed.) (2020): *Heritage Futures, Comparative approaches to natural and cultural heritage practice*. In collaboration with Högberg, A. and Wollentz, G. (Comparative Approaches to Natural and Cultural Heritage Practices). London: UCL Press. Online available at <https://directory.doabooks.org/handle/20.500.12854/74734>.
- Hasse, R. and Krücken, G. (2009): Neo-institutionalistische Theorie. In: Kneer, G. and Schroer, M. (ed.): *Handbuch soziologische Theorien*. Wiesbaden: Springer VS (Handbuch), pp. 237–251.
- Jasanoff, S. and Kim, S.-H. (2009): Containing the atom: Sociotechnical imaginaries and nuclear power in the United States and South Korea. In: *Minerva* 47 (2), pp. 119–146. DOI: 10.1007/s11024-009-9124-4.
- Knaps, F.; Herrmann, S.; Mölders, T. (2022): Landscape identity: Approaches to its conceptualisation, capture and integration into place branding processes. In: Abassiharofteh, M.; Baier, J.; Göb, A.; Thimm, I.; Eberth, A.; Knaps, F. et al. (ed.): *Spatial transformation. Processes, strategies, research design*. Hanover: ARL - Academy for Territorial Development in the Leibniz Association (Forschungsberichte der ARL, 19), pp. 164–178.

References

- Kroh, J. and Lang, A.-K. (2010): Erinnerungsorte. In: Gudehus, C.; Eichenberg, A. and Welzer, H. (ed.): Gedächtnis und Erinnerung. Ein interdisziplinäres Handbuch. Stuttgart, Weimar: Verlag J.B. Metzler (Springer eBook Collection), pp. 184–188.
- Kuppler, S. and Hocke, P. (2019): The role of long-term planning in nuclear waste governance. In: *Journal of Risk Research* 22 (11), pp. 1343–1356. DOI: 10.1080/13669877.2018.1459791.
- LaBelle, M. (2020): Energy cultures, Technology, justice, and geopolitics in Eastern Europe. Cheltenham, UK, Northampton, MA, USA: Edward Elgar Publishing.
- Landström, C. and Kemp, S. (2020): The Power of Place, How Local Engagement with Geological Disposal of Radioactive Waste Re-situated Technoscience and Re-assembled the Public. In: *Science & Technology Studies* 33 (1), pp. 36–53, last accessed on 28 Mar 2023.
- Levenda, A. M.; Richter, J.; Miller, T.; Fisher, E. (2019): Regional sociotechnical imaginaries and the governance of energy innovations. In: *Futures* 109, pp. 181–191. DOI: 10.1016/j.futures.2018.03.001.
- May, S. and Holtorf, C. (2020): Uncertain futures. In: Harrison, R.; DeSilvey, C.; Holtorf, C.; Macdonald, S.; Bartolini, N.; Breithoff, E. et al. (ed.): Heritage Futures. Comparative approaches to natural and cultural heritage practice. Unter Mitarbeit von Anders Högberg und Gustav Wollentz. London: UCL Press (Comparative Approaches to Natural and Cultural Heritage Practices), pp. 263–275.
- Mbah, Melanie. 2022. Participation in decision-making processes as a key to a successful long-term governance. In Technical Monitoring and Long-Term Governance of Nuclear Waste, ed. Peter Hocke, Sophie Kuppler, Ulrich Smeddinck and Thomas Hassel, 95-110. Baden-Baden: Nomos.
- Mbah, M. and Kuppler, S. (2021): Raumsensible Long-term Governance zur Bewältigung komplexer Langzeitaufgaben. In: Brohmann, B.; Brunnengräber, A.; Hocke, P. and Isidoro Losada, A. M. (ed.): Robuste Langzeit-Governance bei der Endlagersuche. Soziotechnische Herausforderungen im Umgang mit hochradioaktiven Abfällen. Unter Mitarbeit von Bettina Brohmann, Achim Brunnengräber, Saleem Chaudry, Maria Rosaria Di Nucci, Rosaria Di Nucci, Stefanie Enderle et al. Bielefeld (Edition Politik), pp. 413–446.
- NEA (2022): Stakeholder Confidence in Radioactive Waste Management: An Annotated Glossary of Key Terms – 2022 Update (Radioactive Waste Management, 2022). Online available at https://www.oecd-nea.org/upload/docs/application/pdf/2022-01/7606_fsc_annotated_glossary_2022_2022-01-20_08-49-30_223.pdf, last accessed on 31 May 2023.
- Osborne, C.; Mayo, L.; Bussey, M. (2021): New frontiers in local government community engagement: Towards transformative place-based futures. In: *Futures* 131, p. 102768. DOI: 10.1016/j.futures.2021.102768.

References

- Otto, A. and Leibenath, M. (2014): The interrelation between collective identities and place concepts in local wind energy conflicts. In: *The International Journal of Justice and Sustainability* 19 (6), pp. 660–676. DOI: 10.1080/13549839.2013.868871.
- Penrose, S.; Harrison, R.; Holtorf, C.; May, S. (2020): The hundred-thousand-year question. In: Harrison, R.; DeSilvey, C.; Holtorf, C.; Macdonald, S.; Bartolini, N.; Breithoff, E. et al. (ed.): *Heritage Futures. Comparative approaches to natural and cultural heritage practice*. Unter Mitarbeit von Anders Högberg und Gustav Wollentz. London: UCL Press (*Comparative Approaches to Natural and Cultural Heritage Practices*), pp. 143–152.
- Pescatore, C. and Palm, J. (2020): Preserving Memory and Information on Heritage and on reserving Memory and Information on Heritage and on Unwanted Legacies - New Tools for Identifying Sustainable Strategies to Prepare and Support Decision Making by Future Generations. In: *SCEaR Newsletter 2020/1 (June) (UNESCO Memory of the World Programme)*, pp. 4–15. Online available at <https://literaryarchives.files.wordpress.com/2020/07/scearnewsletter2020-1june30.pdf>, last accessed on 31 May 2023.
- Rindzevičiūtė, E. (2019): Nuclear cultural heritage: Position statement (AH/S001301/1). AHRC Research Networking Project. Kingston upon Thames. Online available at <https://nuclearculturalheritage.files.wordpress.com/2019/11/2019-nuclear-cultural-heritage-position-statement.pdf>, last accessed on 23 Nov 2022.
- Rindzevičiūtė, E. (2022): Nuclear cultural heritage, From knowledge to practice. Kingston University London, UK. Kingston upon Thames. Online available at https://nuclearculturalheritage.files.wordpress.com/2022/10/2022-october-12-nuclear-heritage-final-report.pdf?force_download=true, last accessed on 20 Oct 2022.
- Sadowski, J. and Bendor, R. (2019): Selling Smartness: Corporate Narratives and the Smart City as a Sociotechnical Imaginary. In: *Science, Technology, & Human Values* 44 (3), pp. 540–563. DOI: 10.1177/0162243918806061.
- Schneiberg, M. and Soule, S. A. (2005): Institutionalization as a contested, multilevel process: The case of rate regulation in American fire insurance. In: McAdam, D.; Davis, G. F.; Zald, M. N. and Scott, W. R. (ed.): *Social Movements and Organization Theory*. Cambridge: Cambridge University Press (*Cambridge Studies in Contentious Politics*), pp. 122–160. Online available at <https://www.cambridge.org/core/books/social-movements-and-organization-theory/institutionalization-as-a-contested-multilevel-process-the-case-of-rate-regulation-in-american-fire-insurance/1FB1041B7D0EE5DAAE179F4A0C26D540>.
- Suhari, M. (2022): *Transdisziplinäre Zusammenarbeit. Kreatives Handeln und die Transformation von Energiekulturen, 2022*. Online available at <https://nbn-resolving.org/urn:nbn:de:bsz:1141-opus4-595>.
- Walker, G.; Cass, N.; Burningham, K.; Barnett, J. (2010): Renewable Energy and Sociotechnical Change: Imagined Subjectivities of ‘the Public’ and Their Implications. In: *Environ Plan A* 42 (4), pp. 931–947. DOI: 10.1068/a41400.