Heritage Science and Societal Challenges: a blueprint for action

Introduction

In 2019, the National Heritage Science Forum (NHSF) held a meeting on 'Supporting excellent interdisciplinary research'. The meeting sought to address a key outcome of the Strategic Framework for Heritage Science in the UK[1]; that is the need for an environment that supports interdisciplinary research and maximises the opportunities for a discipline such as heritage science that straddles the sciences and humanities.

At the meeting, four think pieces were presented to catalyse discussion around what is needed to create an environment that enhances interdisciplinary research. The discussions concluded that the heritage science community – both those doing the research and those using the research – should focus on identifying 'Grand Challenges' for heritage science that connect research to the issues which matter to society. 'Grand challenges' are big issues, often global in scale, that require cross-disciplinary approaches. They are bigger than research questions and the heritage science community will need to look strategically to other partners and sectors to address them. It is proposed that viewing heritage science research through the lens of societal relevance will enable the articulation of both the direct impact of heritage science and how it can contribute to solving important issues facing society.

This blueprint identifies five 'societal grand challenges' for heritage science research. Our intention is that the societal grand challenges for heritage science research will encourage the community to re-examine the research questions it asks, collaborate to define research priorities, re-think the way that research is practised, and open up opportunities for the sector to work with others and contribute to solutions beyond the reach of a single discipline. Use of the blueprint will show how heritage science can unlock the intellectual capital associated with heritage and demonstrate that heritage is as relevant to the major issues that concern people today and tomorrow, as it is to understanding the past. This will stimulate new research and innovation within the heritage science sector and amongst others working on heritage assets. It will in turn inform infrastructure requirements and skills development needs and will lead to new strategic partnerships; all necessary components of an environment that supports excellent interdisciplinary research and delivers public benefit.

The societal challenges

The NHSF Research Working Group has identified five challenges facing society and for each it has suggested how heritage science research could have a transformational impact on these challenges. This paper is a starting point for wider thinking that will elicit, for each societal challenge, the questions to which heritage organisations and society think heritage science can contribute.

The identification of these challenges is timely. The new strategic research and innovation agenda[2] of the Joint Programming Initiative on Cultural Heritage and Global Change identifies four priority themes which

[1] Strategic Framework for Heritage Science in the UK: http://www.heritagescienceforum.org.uk/what-we-do/strategic-framework

[2] Strategic Research and Innovation Agenda, 2030 (JPI-CH): https://www.heritageresearch-hub.eu/strategic-research-and-innovation-agenda-2020-sria/

are closely aligned to the challenges set out in this paper. This presents an opportunity for building the collaborations that are undoubtedly necessary.

Societal Challenge 1: Sustainable development

The concept of sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs"[3] has influenced thinking for over 30 years. Specifically, sustainable development is a way of organising society that balances environmental, social and economic needs so that society can exist in the long term. It remains a huge challenge for society and *Transforming Our World: the 2030 Agenda for Sustainable Development*[4] identifies 17 Sustainable Development Goals (SDGs) and 169 related targets that provide a framework for action through global partnership.

Heritage science supports the aim of sustainable development through its focus on enhancing the understanding, care and sustainable use of heritage so it can enrich people's lives, both today and in the future[5]. Heritage science employs research methods from the physical and social sciences; quantitative and qualitative methods of data collection and analysis; and theoretical and experimental approaches to address the challenges faced by cultural and natural heritage globally. It is underpinned by the values which people (individuals and communities) attach to heritage thus distinguishing it from other sciences by giving it a unique human-centred purpose.

Can we combine heritage science and social science methods to map heritage as a global resource? Can we adopt a sustainable development approach to the long-term management of heritage as a global resource and scale-up from individual site-based management to global cooperation and partnership approaches? Can we be clearer about how heritage science research and practice contribute to the implementation of the SDGs and where there are opportunities for greater impact?

> ***Use heritage science as an enabler of sustainable development, assessing its contribution to the UN Sustainable Development Goals and to the long-term management of heritage as a global resource for the benefit of societies around the world.***

Societal Challenge 2: Climate emergency

Climate change will alter sea levels, marine and terrestrial temperatures, rates of coastal erosion and patterns of extreme weather[6]. These threats will induce physical changes on heritage, well studied by heritage science, which in turn will have economic and societal impacts. Responses to these challenges will need to involve the affected communities in tasks such as risk evaluation, site recording and management of loss[7].

Tackling the climate emergency and progress towards net zero demands an interdisciplinary approach. Predictive modelling, forecasts and big data analysis need to be combined with social science and community engagement to generate holistic solutions. Materials science and climate research can explain the impact climate change is already having on cultural and natural heritage, what the likely future impacts are, and how these might be addressed. Heritage science research can explore how traditional, sustainable

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[3] Bruntland Commission Report, 1987: UNESCO https://en.unesco.org/themes/education-sustainable-development/what-is-esd/sd

[4] The 2030 Agenda for Sustainable Development, United Nations, https://sustainabledevelopment.un.org/post2015/transformingourworld

[5] Wikipedia entry accessed November 2020:https://en.wikipedia.org/wiki/Heritage_science

[6] Harkin, D., Davies, D., Hyslop, E., Fluck, E., Wiggins, H., Merritt, M., ... & Westley, K. (2020). Impacts of climate change on cultural heritage. *MCCIP Sci. Rev*, *16*, 24-39.

[7] The Climate Heritage Network brings together organisations from across the world. It is a voluntary, mutual support network of arts, culture and heritage organisations committed to aiding their communities in tackling climate change and achieving the ambitions of the Paris Agreement.

heritage techniques can be applied to improve the sustainability of the built environment and reduce its carbon footprint. The adaptation of historic buildings to reduce their carbon footprint will require collaboration between researchers, communities and government[8].

Can we integrate complex modelling that includes behavioural studies and probabilistic modelling into heritage science research to generate new approaches and a better understanding of the data to assess long-term impacts of climate change and extreme weather events on cultural heritage and communities? Can heritage scientists, architects and the construction industry work together to develop methods for, and produce evidence of, the benefits of the reuse of buildings to inform climate policy decision-making?

> ***Collaborate with environmental sciences and social sciences to both extend our understanding of the impact of a changing climate on heritage whilst also using knowledge derived from the study of heritage assets to address the climate emergency and deliver progress against the UK's net zero targets.***

Societal Challenge 3: Improved wellbeing

An increasing body of research points to the benefits that cultural heritage brings to people's mental and physical wellbeing[9]. What is less well understood is what it is about cultural heritage that leads to improvements in wellbeing and consequently, how to maximise those benefits and make them available to all parts of society. If robust metrics and a high-quality system for quantifying the contribution of heritage to identity, self and sense of place can be developed it would enable comparative studies, the mapping of wellbeing, or correlation with other indices. These comparisons are necessary to understand inequalities in outcomes and enable interventions to be designed that will address the needs of different parts of society.

Can methods used to analyse the connections between place and wellbeing be transferred to cultural heritage and wellbeing? Can augmented reality and virtual reality extend our understanding of the relationships? Can lessons be learned from the way that people have responded to denial and access to heritage during Covid-19 isolation that can improve how access to cultural heritage is provided in the future in a way that maximises wellbeing benefits?

> ***Bring together heritage science, social science and health science methods to better understand the role of cultural heritage in notions of identity, self and sense of place and how this contributes to wellbeing.***

Societal Challenge 4: Equality and inclusivity

Long-standing issues that divide society have been brought into focus by recent events[10] that have resulted in large sections of society coming together to address systemic inequalities. While heritage has a vital role to play in responding to this increasing public polarisation, historic monuments have also become a focus for BLM protests creating, "an unprecedented and widespread level of engagement with issues around

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[8] Sesana, E., Bertolin, C., Gagnon, A. S., & Hughes, J. J. (2019). Mitigating Climate Change in the Cultural Built Heritage Sector. *Climate*, *7*(7), 90.

[9] Recent examples of research into the relationship between cultural heritage and wellbeing
- National Trust research into the connections between place and wellbeing: Places that make us (2017) research into neurophysical and emotional responses (facilitated by Functional Magnetic Resonance Imaging) and behavioural responses to place. Why places matter to people (2019) research into how people's connections with place affect their wellbeing.
- What Works Wellbeing Heritage and Wellbeing (2019) scoping review of the impact of historic places and assets on community wellbeing finds beneficial impacts but limitations and gaps in current evidence which could be addressed by new research.
- Heritage Alliance Heritage, Health and Wellbeing (2020) case studies demonstrating the breadth of contributions of heritage to wellbeing with recommendations to enhance the role that heritage plays in boosting wellbeing.

[10] For example: the Covid-19 pandemic; Black Lives Matter, Me Too, Equal Pay and LGBTQ rights movements.

heritage, identity, place and belonging in our public conversation"[11]. Equality and inclusivity challenges require solutions that can only come from the plurality of voices, ideas, and perspectives found in a diverse, equitable, inclusive and culturally vibrant workforce. A core principle of the investment that will be made under "*Let's Create*", the 2020-30 Arts Council strategy[12] is "the need to diversify the cultural sector - the leadership, workforce and governance of organisations; the audiences and visitors influencing and experiencing the creative and cultural offer; and the artist, creatives and producers"[13]. Poor diversity is a persistent issue in the heritage sector including heritage science and targeted actions are required to improve activities that involve communities and young people with diverse backgrounds[14].

Heritage science research can support the understanding of different heritage values and provide evidence towards improved understanding of different histories and cultures. However, the way in which research is undertaken can itself be a barrier to social inclusion. Can heritage scientists embrace research council initiatives[15] that "challenge researchers to rethink their methodologies, their language and their assumptions in the co-creation and co-production of research with communities[16]? How can heritage science contribute to the decolonisation of collections and research practices? Can the sector work together, with other sectors and with funders to achieve an inclusive research environment and system of funding allocation? UK Research and Innovation (UKRI) has recognised that equality, diversity and inclusion (EDI) is crucial for delivering excellence in research and innovation by establishing an EDI External Advisory Group, developing the UKRI-wide EDI Strategic Framework and publishing harmonised diversity data on four protected characteristics (sex, age, ethnicity, and disability)[17].

> ***Address the collective responsibility for equal opportunities for people from all backgrounds to participate in heritage science and define the questions that are asked about heritage and the methods used to understand the past, inform current actions and shape future opportunities.***

Societal Challenge 5: Digital society

At the beginning of 2020 96% of households in Great Britain had internet access[18]. Digital innovation and society's relationship with technology is reshaping how people live their lives be that the way they bank or shop, the way they communicate with each other, learn or engage with cultural heritage. Already moving at pace, the way that society in the UK uses and benefits from technology has been accelerated by the coronavirus pandemic. The volume of digital-born content is increasing exponentially, and many current events will be remembered through the digital traces they have left online. What impact will these powerful changes and the rate of change have on society's relationship with cultural heritage? How can the shift to a digital society be managed sustainably, in an equitable way that benefits all parts of society and with minimal adverse impact on the environment?

There is a potential for technological innovation to transform heritage science research and generate new ways of understanding, managing and accessing heritage. For example, we can learn from the systems and techniques used to digitally unite and explore dispersed natural sciences collections to mobilise heritage

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[11] Antink B, et al, Heritage for Inclusive Growth, RSA in partnership with British Council, https://www.thersa.org/reports/heritage-inclusive-growth

[12] Let's Create: Arts Council England strategy 2020-2030, https://www.artscouncil.org.uk/letscreate

[13] Arts Council Equality, Diversity and the Creative Case Data Report 2018-19 https://www.artscouncil.org.uk/sites/default/files/download-file/ACE_DiversityReport_Final_03032020_0.pdf

[14] Careers in Heritage Science: opportunities and constraints NHSF Report, http://www.heritagescienceforum.org.uk/news/item/new-nhsf-report-careers-in-heritage-science-opportunities-and-constraints

[15] For example, the UKRI Connected Communities cross-Council programme https://ahrc.ukri.org/research/fundedthemesandprogrammes/crosscouncilprogrammes/connectedcommunities/

[16] Arts and Humanities Research Council Delivery plan 2019, https://www.ukri.org/wp-content/uploads/2020/09/AHRC-250920-DeliveryPlan2019.pdf

[17] https://www.ukri.org/our-work/supporting-healthy-research-and-innovation-culture/equality-diversity-and-inclusion/

[18] Digital Society, ONS – Internet access, households and individuals, Great Britain: 2020

data[19], make it widely accessible and effect a step-change in its research potential. But inequality of access to the technology and methods that enable this is a major issue for the cultural heritage sector. Innovation is needed to develop technology and methods that are accessible to organisations regardless of their size, digital know-how and funds, and FAIR principles must be embedded into the generation and curation of heritage science data so that it can be accessed and reused for wider research, commercial and public value.

Can the links between heritage science, computer science, digitised collections, data science and digital humanities be strengthened to open up new understanding of heritage? Can novel techniques be developed that will expand the application of heritage science to low-tech environments? What impact will algorithms have on people's access to heritage? Can technical infrastructure be established to support the mobilisation and integration of heritage science data? Can the role of heritage science innovation in value creation and relevance to other sectors be increased? Can a digital society's enthusiasm for heritage provide the opportunity to engage with people as citizen heritage scientists through technology, and recalibrate the relationship between the producers and users of heritage science data to generate new and unexpected discoveries?

> ***Integrate technological innovation and data science into heritage science research and practise to transform the way that collections, buildings and archaeology are managed, accessed and understood.***

A call to action

For heritage science to be relevant to society it must address the questions that are important to society. This paper has identified five challenge areas and raises many questions; but it is not suggested that these are the only questions that need to be asked nor the only areas in which heritage science can make a contribution.

The next steps are to explore how heritage science research is already addressing the societal challenges, where there are opportunities for heritage science to address the challenges (not in isolation but by working with others), what this means in terms of the research priorities of the future, what barriers to addressing the challenges exist, and how we can work together as a community and in partnership with others to overcome them.

Between now and the end of June 2021 we would like your help with this, focusing on two initial areas:

- **Case studies of how heritage science addresses the challenges**

We are looking for case studies of how heritage science research and practice is addressing the five societal challenges in this paper. A template has been prepared to help with this, which can be downloaded from the National Heritage Science Forum website. The template includes an example case study that focuses on climate change and the historic environment (see website for link).

- **Mapping institutional research strategies to the challenges**

How does your organisation's research strategy, corporate strategy or teaching programme align to the societal challenges?

We would welcome examples of how individual organisations are already taking action to address the five challenges as well as statements from organisations who recognise a gap in their existing research strategy with respect to the societal challenges, and how they plan to use the challenges to incorporate a focus on wider societal issues.

[19] For example, DiSSCo: Distributed System of Scientific Systems https://www.dissco.eu/

The case study template can also be used to provide this information.

We are collecting the case studies between now and June 2021. We will feature some of the case studies as part of a blog series in June and others on our website. All case studies will feed into our understanding of the connections between heritage science and its contribution to solving the current and future issues of value to society[20].

Please send completed case studies to Caroline Peach administrator@heritagescienceforum.org.uk

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[20] See also the work of the NHSF Impact Group