Strategic Framework for Heritage Science in the UK 2018-2023

Developed on behalf of the heritage science sector by the National Heritage Science Forum

Introduction

In 2010 a National Heritage Science Strategy (NHSS) was produced to address the findings of the 2006 House of Lords Science and Technology inquiry into Science and Heritage[1]. The Inquiry found that the sector was fragmented and under-valued and recommended that the "heritage sector should come together in developing a broad-based national strategy for heritage science".

Alongside the publication of the National Heritage Science Strategy two other initiatives have had a transformative effect on heritage science in the UK and have delivered against many of the objectives of the 2010 strategy.

The Science and Heritage Programme was an £8 million programme of investment from AHRC and EPSRC that ran from 2007-2014[2]. It strengthened interdisciplinary research, increased capacity for heritage science, and addressed many of the specific research challenges identified during the gathering of evidence for the National Heritage Science Strategy[3].

Secondly, the sector created the National Heritage Science Forum (NHSF) in 2013[4] to overcome fragmentation. The Forum brings together leading organisations that generate and use heritage science research and provides both the impetus and mechanism for collaboration. The Forum responds to policy issues, facilitates the sharing of equipment and resources, improves access to heritage science research, collates data on funding and research activity, and shares information on heritage science amongst public and professionals through a range of communication channels including social media.

In the eight years since the original strategy was published there have been significant changes in the environment in which heritage science operates; not least, political and funding structures. This new strategic framework takes into account progress by the sector and the changes in the operating environment which include:

- **The establishment of UK Research and Innovation, and associated changes within the Research Councils**
- **The Government's Industrial Strategy and the need to be explicit about the role of heritage science in economic growth, research and innovation, skills development, and the country's productivity**
- **Brexit and how to maintain the UK's standing in the world by creating, retaining and spreading heritage science value through leadership in skills and expertise, collaborative research, funding, infrastructure and goods and services**
- **The publication by the UK Government of the Culture White Paper and the Digital Strategy**
- **The creation of Historic England and Historic Environment Scotland**
- **The publication of the Arts & Humanities Research Council (AHRC) heritage strategy**
- **The launch of the European Research Infrastructure for Heritage Science, and its UK hub**
- **The Mendoza review and the review of DCMS-sponsored museums**
- **The forthcoming Culture Strategy for Scotland**
- **Increased importance of 'place' and 'wellbeing' in cross-government policies.**

[1]House of Lords Science and Technology inquiry into Science and Heritage http://www.heritagescienceforum.org.uk/documents/HoL_inquiry_2005-6.pdf

[2]Science and Heritage Programme http://www.heritagescience.ac.uk/

[3]Evidence for the 2010 National Heritage Science Strategy, see three evidence reports at http://www.heritagescienceforum.org.uk/what-we-do/national-heritage-science-strategy

[4]National Heritage Science Forum http://www.heritagescienceforum.org.uk/

This new strategic framework builds on the achievements of the 2010 strategy. It incorporates new areas that are important to society, aligns to national initiatives (such as the Government's Industrial Strategy), and provides fresh impetus to communicate the goals of the heritage science community more widely.

The framework has been developed by the National Heritage Science Forum in consultation with the heritage science community and with input from participants at events focused on collaboration with industry, and health and wellbeing. It provides a tool for the heritage science community and partners to engage with and it is intended to facilitate organisations and individuals working together to develop associated delivery plans.

Vision

Heritage science is the application of science and technology to heritage to improve understanding, engagement, and its long-term management.

The vision of this strategic framework is that:

The UK's extraordinarily rich and varied tangible and intangible heritage will be enhanced by better use of science and technology for the benefit of society.

The framework provides a structure through which the heritage science community can work together to:

- **define outstanding research priorities**
- **secure investment**
- **strengthen links across the heritage sector and with other partners**
- **create a supportive policy environment**
- **build the capacity of the sector**
- **articulate the value of heritage science to society and the economy**

So that by 2023 heritage science in the UK is better resourced and coordinated, addressing the present and future needs of heritage, and demonstrating value to society.

The main audiences for the strategic framework are the heritage sector[5] as users of the strategy and, opinion-formers, policy-makers, aligned sectors[6] and partners as groups that the heritage sector will work with on delivery.

Three strategic themes for 2018–2023

The framework has three themes that contribute towards its vision. Each theme has a goal and a number of associated strategic outcomes that describe where change is needed to deliver the goal.

Theme 1 ***Excellent research that addresses the present needs and future requirements of heritage***

Theme 2 ***A skilled and diverse heritage science community (workforce and volunteers) that is well placed to respond creatively to future change***

Theme 3 ***Demonstrable social and economic impact***

[5]'Heritage sector' is used broadly to encompass the many different types of organisation that make up the sector, including: heritage organisations, owners of heritage, academia, commercial organisations and third sector organisations. In the context of this strategic framework it also encompasses the historic environment.

[6]'Aligned sectors' is used to describe those sectors to which heritage makes an important contribution including tourism, creative industries and construction.

Using an outcomes framework

Heritage science delivers benefits (or positive outcomes) for heritage and society. This strategic framework is presented as an outcomes framework. The outcomes are the changes that are needed to achieve the overall goals and the framework provides a tool for the sector to assess how its activities contribute towards those goals.

The three themes and associated outcomes were the subject of a consultation that ran in April 2018. The feedback received through that consultation, and aligned events and presentations, have shaped the framework. The framework provides a structure around which the sector can come together to show how its work maps against the goals, where there are gaps, and which parts of the sector are best placed to take forward the different elements.

The UK's extraordinarily rich and varied tangible and intangible heritage will be enhanced by the better use of science and technology for the benefit of society

GOAL **Excellent Research**	GOAL **A Skilled Heritage Science Community**	GOAL **Demonstrable Social and Economic Impact**
OUTCOME Accessible funding streams	OUTCOME Increased engagement with heritage science at school age	OUTCOME Improved innovation and commercial application of research
OUTCOME Defined research priorities for the sector	OUTCOME Technical skills and knowledge	OUTCOME Strategic relationships between businesses and research organisations
OUTCOME An environment that supports interdisciplinary research	OUTCOME Accessible training and postgraduate opportunities	OUTCOME Discoverability of research and data
OUTCOME Physical and digital infrastructure	OUTCOME Recognition of heritage science as an attractive career	OUTCOME Evidence of economic impact
	OUTCOME Citizen heritage scientists	OUTCOME Increased effectiveness of wellbeing interventions

Achieving change: the themes in more detail

For each of the three themes in this framework, the NHSF has defined a key challenge, looked at what the sector has achieved that can be built on, and has identified current opportunities to address the challenges.

Excellent research that addresses the present needs and future requirements of heritage

The challenge

The UK has an impressive record of organisations collaborating on research that uses science and technology to enhance the understanding of cultural heritage, engagement with it, and its long-term management.

The challenge is to ensure that, amidst political and policy changes such as the publication of the Industrial Strategy and the restructuring of the Research Councils, funding is secured that enables this field of research to continue to deliver excellence that is relevant to the heritage sector's needs.

What can we build on?

The Science and Heritage Programme[7] was an £8.1 million programme of investment from AHRC and EPSRC that ran between 2007 and 2014. It funded 48 projects, involving more than 300 researchers, 234 institutions and 50 industry partners both in the UK and overseas. The programme is one example of how academia, industry and heritage organisations are able to work together in innovative ways to combine knowledge and skills from many different disciplines to improve the understanding, preservation and enjoyment of heritage.

The UK's success at interdisciplinary and collaborative working is not limited to its borders. UK organisations have been key partners in European research projects. Between 2008–2013 UK institutions led or contributed significantly to EU-funded projects which resulted in a UK return on investment of €4.88 million. From 2014 to April 2017, the EU Horizon 2020 programme had awarded €14.81 million of grant funding to UK heritage science research[8].

Where are the opportunities?

UK Research and Innovation was launched in April 2018, with "a focus on cross-cutting issues that are outside the core remits of current funding bodies, such as multi-and inter-disciplinary research"[9]. The heritage sector will develop strong and high-level relationships with UKRI and its Research Councils making a robust case for the value of heritage science research. New mechanisms to support interdisciplinary research must work well for heritage science, alongside larger sectors such as space, life sciences and transport. A cross-sectoral approach should also be adopted by Government so that Departments, particularly the Departments for Digital, Culture, Media and Sport (DCMS), Business, Energy and Industrial Strategy (BEIS), Housing, Communities and Local Government (MHCLG), Education and Environment, Food and Rural Affairs all recognise, through policy and where appropriate regulation, the positive contribution of heritage to UK society and economy[10].

A research infrastructure for heritage science is needed as a long-term resource. Access to a balanced geographical distribution of physical and digital research infrastructures will help all parts of the heritage sector in the UK to address current and future challenges including the

[7] Science and Heritage Programme http://www.heritagescience.ac.uk/

[8] Why heritage science is important (NHSF) http://www.heritagescienceforum.org.uk/documents/Why_heritage_science_is_important_FINAL.pdf

[9] Government Office for Science, 2 February 2017, https://www.gov.uk/government/news/sir-mark-walport-will-lead-uk-research-and-innovation

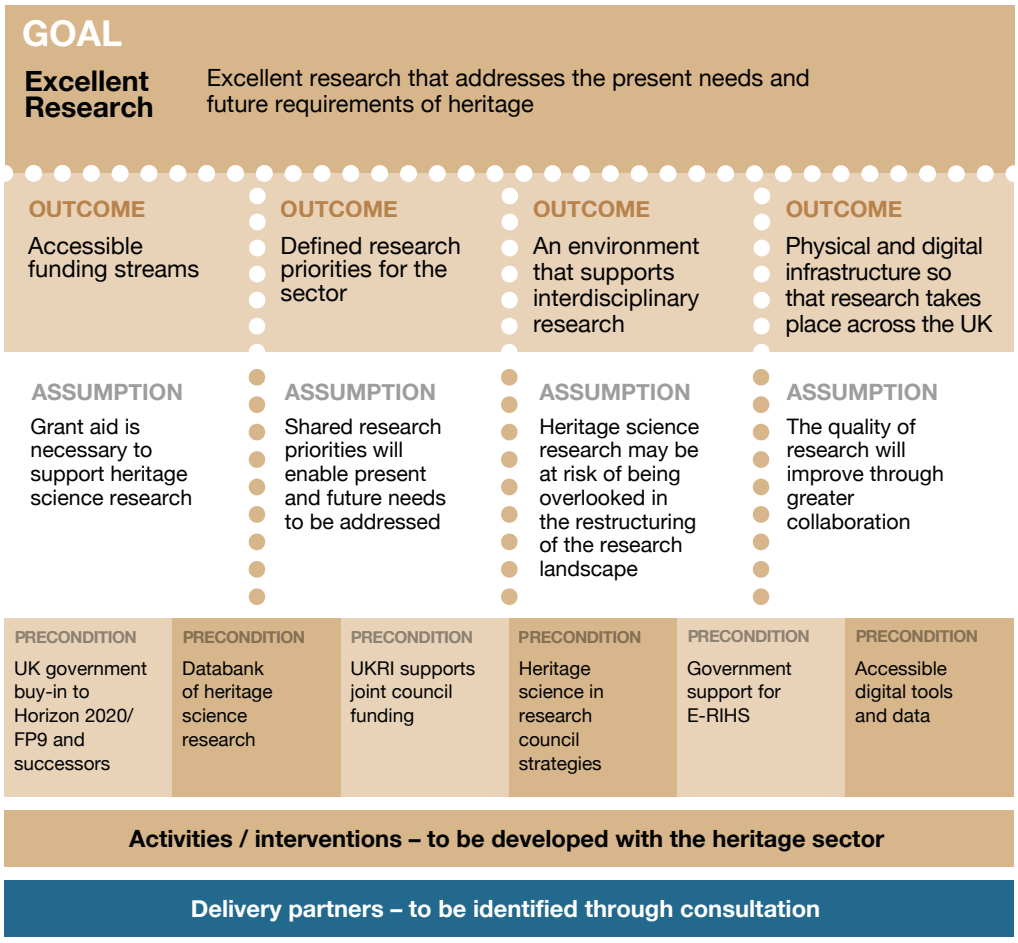
[10] The creation of the Heritage Council in Spring 2018 presents a way of engaging across government https://www.gov.uk/government/news/newly-formed-heritage-council-will-help-ensure-sector-thrives

impact of mass tourism, the protection of cultural assets, and climate change to mention but three. There are existing clusters of institutions active in the field of heritage science research many of whom are already members of the National Heritage Science Forum. The recently launched European Research Infrastructure for Heritage Science (E-RIHS)[11] and its UK hub will recognise and strengthen distributed facilities in Higher Education, Independent Research Organisations and Public Sector Research Establishments. Developments in advanced miniaturised instrumentation mean that physical infrastructure is increasingly mobile (for example the SEAHA mobile heritage lab and the ISAAC (Imaging & Sensing for Archaeology, Art History & Conservation) mobile laboratory of Nottingham Trent University).

An effective digital infrastructure is necessary to support training and knowledge exchange and to enable the discovery, sharing and re-purposing of research so that it has maximum impact and benefit to practitioners, society and industry.

Strategic outcomes for excellent research

- **accessible funding streams**
- **defined research priorities**
- **an environment that supports interdisciplinary research**
- **a physical and digital infrastructure that ensures world-leading heritage science research can take place across the UK.**



[11] European Research Infrastructure for Heritage Science http://www.e-rihs.eu/

A skilled and diverse heritage science community (workforce and volunteers) that is well placed to respond creatively to future change

The challenge

The interdisciplinary nature of heritage science is both an opportunity and challenge for building a community that can apply science and technology to improve the understanding and engagement with heritage and its long-term management. The sector includes individuals from arts, humanities and science disciplines and requires a combination of technical scientific knowledge and practical problem-solving skills. Employers report that it can be challenging to recruit people with this combination of skills and knowledge as the pool, though growing, is still small. Students and recent alumni often do not confidently identify with the term 'heritage scientist' and cite a lack of clear career paths as an obstacle to progression within the sector[12].

The challenge therefore is to provide a broad range of opportunities to develop the heritage science skills needed for the future; skills which are accessible and attractive to a diverse population, and which will benefit the sector.

What can we build on?

Research into capacity in the heritage science domain carried out in 2009 suggested an ageing workforce[13]. The funding by the Research Councils of Collaborative Doctoral Training programmes and Collaborative Doctoral Partnerships has helped to increase sectoral capacity and open up new approaches to learning and research by bringing together academia, heritage institutions and companies. The sector needs to welcome these developments by creating job opportunities that are accessible and attractive to a diverse population as well as a pipeline of other skills development routes such as apprenticeships.

In 2017 the NHSF commissioned research into the opportunities and barriers encountered by those embarking on postgraduate study and a career in heritage science. Findings from this study point to a need to build a heritage science identity both as an area of study and as a career. The very strength of being able to apply skills from other disciplines to heritage science also means that the sector is vulnerable to trained heritage scientists leaving to apply their skills elsewhere.

A heritage science identity could be fostered earlier in life through engagement with heritage science through the curriculum. Research commissioned by Historic England '*Heritage Science Resources for the National Curriculum in England*'[14] reviewed science programmes (physics, chemistry, biology) at key stages 3, 4 and 5 and identified topics and areas where Heritage Science could be used to deepen understanding, enhance knowledge, and form connections between the subjects being studied.

[12] Research into heritage science careers commissioned by NHSF, 2018. Due to be published December 2018.

[13] Understanding capacity in the heritage science sector http://www.heritagescienceforum.org.uk/documents/nhss_report_3_web.pdf

[14] Heritage Science Resources in the National Curriculum in England, Historic England, 2016. The research concluded *"work undertaken through this project to map heritage science concepts to curriculum topics reveals there are opportunities at all key stages (3 to 5) and across biology, chemistry and physics"*.
https://www.historicengland.org.uk/research/current/heritage-science/heritage-science-resources-for-the-national-curriculum/

Where are the opportunities?

Government has identified a need to address the UK's shortage of STEM skills[15]. Here is a unique opportunity to show how the development of heritage science skills not only underpins the management and interpretation of heritage assets, (enhancing the value of these assets to society), but also has specific advantages:

- **Heritage science, (through the application of science to the non-science domain of heritage), presents a means to engage with science and develop scientific skills amongst people who might initially not be interested in science.**
- **Heritage science is successful at engaging women in STEM subjects; a high proportion of the people working and volunteering in the heritage industry are female[16].**
- **Heritage science sits at the intersection of the sciences, humanities and arts; it is interdisciplinary and multi-disciplinary creating highly employable individuals with transferable knowledge and skills.**

To take advantage of this opportunity, the sector needs to develop better labour market intelligence (evidence of current and future skills needs, and the demographics of the workforce) and a communications campaign.

Skills and training are devolved policy areas but across England[17], Scotland[18], Wales[19] and Northern Ireland[20] there have been significant changes in the approach towards apprenticeships. For example, in England, apprenticeship frameworks are being phased out and replaced by Apprenticeship Standards. Apprenticeships can be studied at levels equivalent to GCSE (level 2) to Bachelor's or Master's degree (levels 6 and 7). These changes present an opportunity to diversify entry routes, for exploration alongside existing programmes such as the Icon Internship Programme[21].

Opportunities to develop heritage science skills and knowledge could also be more made widely available to volunteers[22]. Heritage Counts (2016) reports that the Taking Part Survey found that there were over 615,500 historic environment volunteers in England in 2015/16[23]. The sector could explore how to use heritage science to create opportunities for more people to be involved in a diverse range of science and technology-based interactions with heritage, for example, in ways that improve physical and mental wellbeing. Is there potential for 'citizen heritage scientists' so that more people can benefit from enhanced quality of life through their engagement with heritage?

Strategic outcomes for a skilled and diverse heritage science community

- **Increased engagement with heritage science at school age**
- **Technical skills and knowledge to address present needs and future requirements of heritage**
- **A range of accessible apprenticeships and postgraduate opportunities**
- **Recognition of heritage science as an attractive career**
- **Citizen heritage scientists**

[15] House of Commons Science & Technology Committee report on the inquiry 'Industrial Strategy: science and STEM skills' https://publications.parliament.uk/pa/cm201617/cmselect/cmsctech/991/991.pdf

[16] How heritage science is addressing the gender balance (blog post), UCL, 2016 https://www.ucl.ac.uk/bartlett/heritage/news/mar/2016/how-heritage-science-addressing-gender-balance

[17] Apprenticeships in England https://www.instituteforapprenticeships.org/

[18] Apprenticeships in Scotland https://www.skillsdevelopmentscotland.co.uk/what-we-do/apprenticeships/

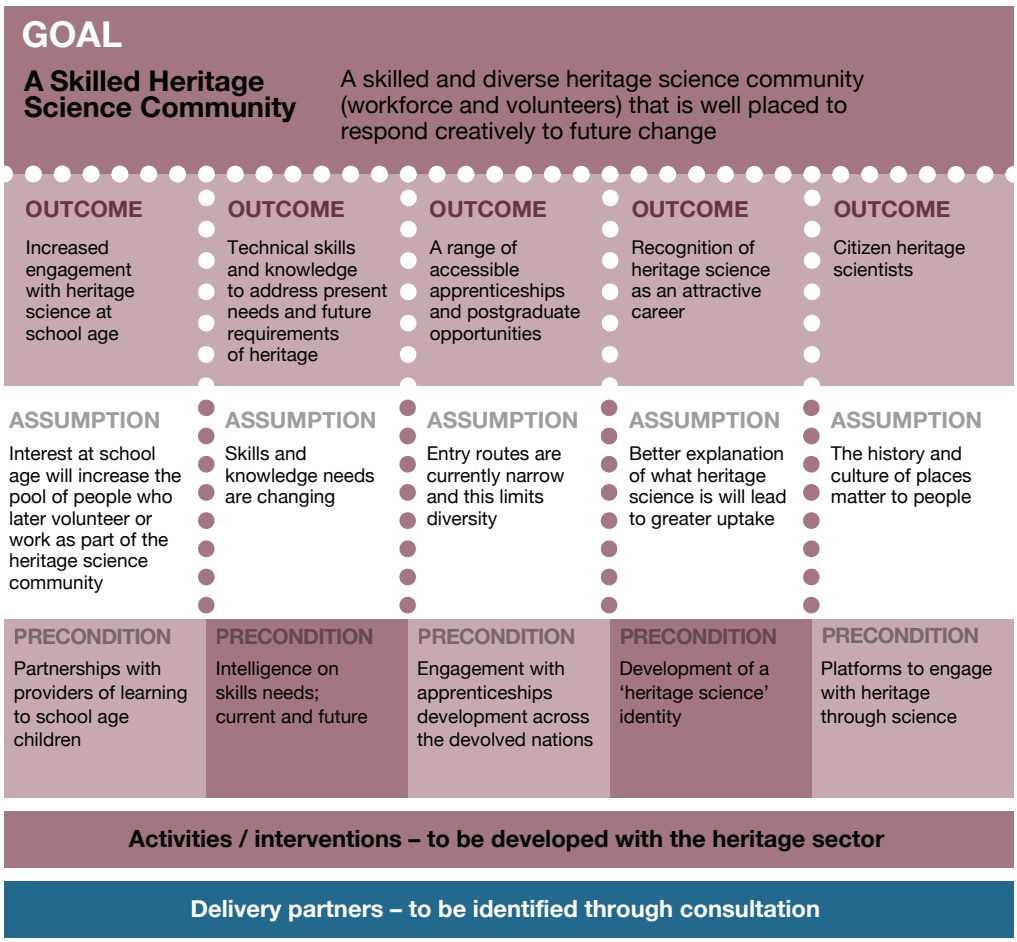
[19] Apprenticeships in Wales https://beta.gov.wales/apprenticeships-skills-policy-plan

[20] Apprenticeships in Northern Ireland https://www.nidirect.gov.uk/campaigns/apprenticeships

[21] Icon Internship Programme https://icon.org.uk/what-is-conservation/internships

[22] It is not suggested that volunteers be used to replace the skilled paid workforce, but that there is an opportunity to engage volunteers with heritage in new ways through heritage science.

[23] See the wellbeing theme for benefits of engaging volunteers with heritage science.



Demonstrating the social and economic impact of heritage science

The challenge

Heritage science generates social[24] and economic[25] value. This is evidenced through research that helps us to understand our place in the world, through techniques that preserve heritage assets, through direct employment or as a result of the strategies that protect heritage as a resource in an age of mass tourism. Being able to provide evidence of this value, and communicate it, is important to demonstrate return on investment of public funds that go into research, infrastructure and the institutions safeguarding heritage. Understanding the economic contribution of heritage science is of particular relevance when seeking to align to major government policies such as the Industrial Strategy.

The challenge focused on in this strategic framework is to understand and evidence the contribution that heritage science makes to society and the economy, and demonstrate the opportunities for increasing social and economic impact.

[24] Heritage and Society, 2018 (Heritage Counts, Historic Environment Forum)
https://historicengland.org.uk/content/heritage-counts/pub/2018/heritage-and-society-2018-pdf/

[25] Heritage and the Economy, 2018 (Heritage Counts, Historic Environment Forum)
https://historicengland.org.uk/content/heritage-counts/pub/2018/heritage-and-the-economy-2018/

What can we build on?

The heritage sector is sizeable and includes heritage institutions, service organisations (such as suppliers of goods and materials, insurance, conservation) and academia. Research carried out by Professor May Cassar as part of an Impact Fellowship funded by the Arts and Humanities Research Council and supported by the (then) Department of Business, Innovation and Skills[26], identified a heritage science ecosystem that helps to define the market for heritage science research. The same research project included industry challenge workshops that brought together industry, academia and heritage organisations (2015). A similar event was coordinated by the National Heritage Science Forum as part of its work to refresh the National Heritage Science Strategy in 2017[27]. Both initiatives demonstrated no shortage in the willingness of industry, academia and heritage organisations to engage with each other to explore the commercial application of heritage science research; and both events were consistent about what needs to be done to increase economic impact.

There is a need for better discovery of research and access to data to enable its re-purposing, uptake by business, and contribution to society and the economy. Improved understanding of the benefits of Open Access research and data are part of the solution, as is an effective digital infrastructure. But there is also demand for better mechanisms for translating research into practice. Traditional publishing and conference models for sharing heritage science research are defining access. A translational research hub as exists in other areas of research, such as medicine[28], would help industry to access research more readily so that it can be made use of commercially to improve policy and practice. The heritage industry includes a large number of SMEs and micro-enterprises for which access to research and developments to support innovation and increase productivity are particularly challenging. Existing networks rely on individual relationships; again, the UK hub of E-RIHS has the potential to grow research-business partnerships across the UK, to understand the research needs of business and to contribute to economic development across the UK.

Where are the opportunities?

The principal opportunity is in advocacy for the economic impact of heritage science aligned to the UK Industrial Strategy. This involves demonstrating the potential to increase the commercialisation of research, increase productivity and contribute to a more equitable distribution of economic benefits in the UK. The Industrial Strategy identifies a role for government in place-making and regeneration, in which heritage (and heritage science research) also have a role. The recent publication by Cadw (Welsh Government) of Priorities for the Historic Environment of Wales (2018) emphasises the sector's contribution to the economy and underscores the role of the historic environment in contributing to all four themes of the National Strategy 'Prosperity for All'[29].

The sector would benefit from making clear its own contribution to the UK's Industrial Strategy themes[30], but also by identifying its support for the strategies of the devolved administrations and the 'sector deals' of industries aligned to heritage such as tourism, construction and the creative industries. Work related to the Industrial Strategy is industry-led and stronger relationships with other parts of the heritage industry (and aligned sectors) would help the heritage science community to advocate for its contribution to the economy, and consequently wider benefits to society. A current weakness is the heritage science sector's inability to provide longitudinal and broad evidence of economic impact. Methods of measuring economic impact and a willingness by the sector to engage with them to build up the body of evidence need to be developed.

There is also a specific opportunity to deliver benefit to society by contributing to the health and wellbeing agenda. To date, heritage science research has tended to focus on the

[26] Impact Fellowship funded by the Arts and Humanities Research Council and supported by the (then) Department of Business, Innovation and Skills http://www.heritagescience.ac.uk/Impact_Fellowship

[27] Link to NHSF workshop report when published

[28] For example, University of Cambridge Office for Translational Research, School of Clinical Medicine http://otr.medschl.cam.ac.uk/

[29] Priorities for the Historic Environment of Wales (2018) Cadw https://gov.wales/docs/drah/publications/priorities-for-the-historic-environment-of-wales.pdf

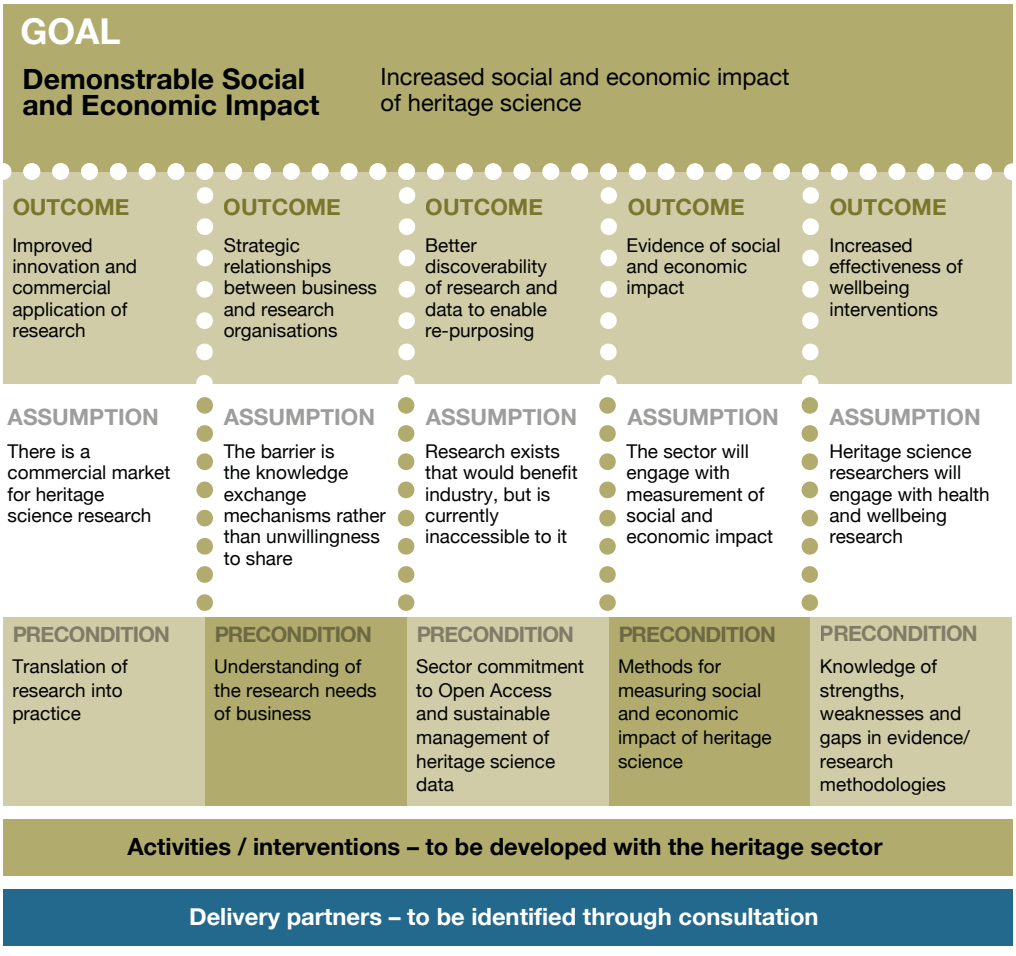
[30] UK Industrial Strategy https://www.gov.uk/government/topical-events/the-uks-industrial-strategy

understanding of material aspects of heritage. Health and wellbeing are high profile issues for UK government and devolved administrations and they matter to people. The All-Party Parliamentary Group on Arts, Health and Wellbeing published the 'Creative Health' report in 2017[31]. The report includes a chapter on evidence and notes that, "The evidence base spans a wide range of methodologies and practices. It is unevenly distributed across the field, concentrated in such areas of scholarly interest as arts and dementia and patchier in relation to, say, prevention and the management of long-term conditions."

There is an opportunity for the heritage science community, with its position at the intersection of sciences, arts and humanities to contribute to an understanding of the evidence base; its strengths, weaknesses and gaps. This includes methodologies and areas of application (for instance is there much more evidence around arts than heritage?) as well as the process of contributing to the wider research agenda (e.g. NICE stakeholders[32]), using evidence to effect policy change, and improving the effectiveness of on the ground wellbeing interventions.

Strategic outcomes for increasing the social and economic impact of heritage science

- **Improved innovation and commercial application of research**
- **Strategic relationships between business and research organisations**
- **Better discoverability of research and data to enable re-purposing**
- **Evidence of social and economic impact**
- **Increased effectiveness of health and wellbeing interventions**



[31] Creative Health (2017), p.35 https://www.artshealthandwellbeing.org.uk/appg-inquiry/

[32] See https://www.nice.org.uk/get-involved

Delivering the strategic framework

This is your strategic framework. This document has identified areas of focus for each theme of the framework. It has shown what the sector can build on to deliver against the goals and where there are specific opportunities for action. Throughout this document you will have seen that the activities and interventions that support each theme are to be developed as a result of the heritage sector working together, and that specific delivery partners are to be identified through consultation.

To build up the delivery plan that supports the delivery of the framework you will need to tell the National Heritage Science Forum about the activities you are involved in that map to the goals of each theme. The Forum will coordinate this information to show how institutions from across the sector are contributing to the different strands. It will highlight where there are gaps that require new initiatives and broker conversations about who in the sector is best placed to lead those initiatives.

In this way the sector will be able to use the framework to demonstrate what is already happening and advocate for what is needed to deliver: excellent research, a skilled heritage science community and demonstrable benefits from heritage science to society and the economy.

Further information

Caroline Peach – administrator@heritagescienceforum.org.uk

National Heritage Science Forum, 2018

Acknowledgements

Trustees of the National Heritage Science Forum:

Dr Lora Angelova, The National Archives

Daniel Bone, Ashmolean Museum University of Oxford

Gill Campbell, Historic England

Professor May Cassar, Institute of Sustainable Heritage, UCL

Dr Christina Duffy, British Library

Professor Carl Heron, The British Museum

John Jackson, Natural History Museum

Professor Pip Laurenson, Tate

Katy Lithgow, National Trust

Alastair McCapra (Chairman of Board of Trustees)

Dr Paola Ricciardi, University of Cambridge Museums

Alison Richmond, Icon

Jacqueline Ridge, National Galleries Scotland

Professor Mary Ryan, Imperial College London

David Thickett, English Heritage Trust

Dr Aurelie Turmel, Historic Environment Scotland

Dr Constantina Vlachou, Historic Royal Palaces

Professor David Watkinson, Cardiff University

The Forum also gratefully acknowledges input from:

Respondents to the 2018 consultation

Heads of Conservation and Scientific Research group

Participants at the Health & Wellbeing and Industry & Innovation events of 2017

Nancy Bell

Emma Duggan, Wellcome Collection

Diane Gwilt, Amgueddfa Cymru-National Museum Wales

Robin Higgons, Qi3 Limited

Dr Ewan Hyslop, Historic Environment Scotland

Kostas Ntanos

www.heritagescienceforum.org.uk

Rear cover image:
© Fitzwilliam Museum, Cambridge.
Using CT scanning at Addenbrooke's Hospital, Cambridge to examine the construction of an Egyptian coffin (Fitzwilliam Museum E.1.1822)

Front cover image: © Historic Environment Scotland – Trial of Ground Penetrating Radar at Portcullis Gate, Edinburgh Castle