



## Climate Emergency ‘Deep Dive’

Wednesday 24 January 2024, 10:00-16:00 (hybrid meeting)

Event Chair: Dr Constantina Vlachou

This ‘deep dive’ event addressed the [climate emergency societal challenge](#) by bringing people together from different communities of interest to discuss the work that the heritage science sector is already doing to address the climate emergency and gaps to be addressed by future research.

The day began with a welcome by Dr Constantina Vlachou and a keynote address from Emeritus Professor Peter Brimblecombe. After this, the event programme was divided into three sections: risk, mitigation and adaptation. Each section featured an introductory talk, followed by several ‘flash presentations’. The event ended with a roundtable discussion facilitated by Dr Josep Grau-Bové.

## Keynote Address: Climate Change and Heritage

**Speaker: Emeritus Professor Peter Brimblecombe (National Sun Yat-sen University, Taiwan)**

How do we distinguish between the effects of *climate* on heritage and the effects of *climate change* on heritage? That is, when examining the effects of climate change on heritage, are researchers facing entirely new processes, distinct from ordinary weathering, or are they seeing an acceleration of existing processes?

To unpack this, Prof Brimblecombe introduced a theoretical model for how climate imposes pressure or stress on heritage. The model distinguishes between impulses (single destructive events), cycles (recurring climate events), and accumulations (a gradual build-up of damage).

Prof Brimblecombe also encouraged heritage scientists to tune their climate parameters more carefully, and to consider the significance of spatial and temporal scales. He then provided examples of where climate change research could be relevant to sustainably managing intangible heritage.

The talk finished with an overview of the challenges in converting climate change research to practice in the heritage sector:

1. Focusing on modelling climate pressures rather than outcomes (and relying too heavily on damage functions).
2. Lack of qualitative methodologies.
3. Interfacing with management who need to translate the research into practice.

4. Both assessing error in climate models and assessing the chance of causing bad management decisions. Perhaps the direction of change is a more reliable measure than the size of the change in climate pressure.
5. Interdisciplinarity and internationalisation – projects often need interdisciplinary skills, but this may not be achieved, and there is a lack of studies happening in Asia, Central and South America, and Africa.
6. Teams and training – working internationally means navigating cross-cultural relationships and technological issues.
7. There are few major journals in the field, and these can be difficult to access.

## **Risk**

### **Introduction: Current perspectives on risks of climate change for cultural heritage**

#### **Speaker: Dr Scott Allan Orr (UCL Institute for Sustainable Heritage)**

This overview of climate change risk and cultural heritage began with the limitations of recent approaches:

1. A lack of evidence for the risks of climate change (specifically where changes will occur, to what extent, and which heritage will be impacted).
2. Disproportionate focus on environmental risks and the impacts of weather, as opposed to the specific risks of *climate change*.
3. Inconsistent terminology and limited conceptualisation of risk, making sharing information more difficult.
4. Lack of emphasis on intangible heritage.

Dr Orr shared his work on creating a structured approach to risk in cultural heritage, aligning it with the framework produced by the UN Intergovernmental Panel on Climate Change. He encouraged researchers to consider interactions within risks, and to think carefully about what level of uncertainty will be feasible to establish in their models.

Some upcoming developments in climate change risk assessment include:

1. Improved quality of climate projections and related datasets (and how to ‘future-proof’ data).
2. Attribution science – understanding what would have been if industrialisation and anthropogenic climate change had not happened.
3. Integration of machine learning and AI to help identify patterns in complex data.
4. Community engagement and citizen science.

### **Flash Presentation: Understanding the impact of climate change to English Heritage**

**Speaker: Dr Paul Lankester (English Heritage Trust)**

English Heritage has recently undertaken a 1-year pilot project to map Climactic Impact Drivers across all their sites to better understand the impact that climate change will have. The next phase of the pilot will have two parts – a national risk assessment, and site-specific climate change risk assessments at 5 sites. The assessments will consider buildings/assets, collections, gardens and landscapes, people, and operations.

For a national-scale risk assessment, English Heritage will need to move beyond understanding hazards, and will also need to consider exposure (what is valued and likely to be affected at a particular site) and vulnerability (what is a site's predisposition to being adversely affected and its capacity to cope).

The site-based risk assessments will take a workshop-based approach with site stakeholders. Based on this and other data, English Heritage will identify and prioritise the most significant impacts of climate change and develop adaptation pathways.

### **Flash Presentation: Rising Sea Levels – The Cultural Heritage of Southern Iraq**

**Speaker: Dr William Deadman (Durham University)**

This talk covered the potential impact of rising sea levels on the cultural heritage of southern Iraq, based on work carried out as part of the Endangered Archaeology in the Middle East and North Africa (EAMENA) project.

To assess this risk, the project used Climate Central's online tool for mapping sea level rise. However, accurately modelling sea level changes is highly complex, with many variables and parameters involved. Collating results and untangling the disparity between different model projections is an ongoing challenge in the project.

### **Flash Presentation: Resilience of Soft Capping Under Future Climates**

**Speaker: Dr Jenny Richards (University of Oxford)**

Soft capping is the highly effective conservation strategy of laying soil and vegetation onto ruined walls. It impedes weathering processes by minimising thermal fluctuations, moisture ingress and surface runoff. However, there is a question regarding whether the species that form the soft caps will be able to survive in the face of climate change. To investigate, Dr Richards has used species distribution modelling to predict the future distribution of species based on current environmental factors. The results suggest that only the east coast of Scotland will remain suitable for certain sedum species by the end of the century, but that grasses will be more resilient.

## **Flash Presentation: Towards multi-determinant risk assessment approaches for climate change and cultural heritage**

**Speaker: Helen Thomas (UCL)**

Helen Thomas is working with Historic England to develop a multi-determinant risk assessment approach for climate change and cultural heritage, which moves beyond merely looking at the interactions between climate hazards and material degradation. She has proposed that understanding the current condition of the site and its local heritage value, as well as drawing on the work of citizen scientists, can be useful for creating a more comprehensive risk framework. Further areas for research are creating accurate damage functions, and better understanding the compounding nature of risks.

## **Mitigation**

**Introduction: Climate Change, Heritage & Mitigation**

**Speaker: Dr Hana Morel (UCL, MOLA, ICSM CHC)**

This talk set out the international dimension of understanding climate change through the roles of the Intergovernmental Panel on Climate Change reporting, the UNFCCC and subsequent international agreements, and various intergovernmental bodies that support heritage in thinking about climate change. Hana framed climate mitigation (all efforts to reduce or prevent emissions and enhance carbon sinks) through its accepted definition, what it means for heritage, and the need to limit human-induced factors, as well as our legally binding commitments, targets and reporting through an overview of the UK's agenda for tackling climate mitigation. Dr Morel highlighted the work of the International Co-Sponsored Meeting on Culture, Heritage and Climate Change (ICSM CHC) in demonstrating that culture and heritage play significant roles in understanding knowledge systems, impacts and alternative sustainable futures. She also highlighted the emerging role of culture and heritage across the international climate change landscape, including at recent COPs and within the IPCC.

Her three takeaways were:

- The realisation that culture & heritage are central to climate change understandings, responses & action
- The need to use diverse forms of evidence for understanding climate change & decision- & policy-making
- The importance of institutions to facilitate equitable inclusion of diverse knowledge systems in decision- & policy-making.

**Flash Presentation: How English Heritage reduced its carbon footprint for preventive conservation by 40%**

**Speaker: Dr David Thickett (English Heritage)**

English Heritage has employed risk calculators and dehumidifiers, changed fuel types, reduced the amount of air conditioning used across various sites, improved the energy efficiency of their showcases, and implemented better object vulnerability tests to reduce their carbon footprint for preventive conservation by at least 40%. By addressing ways to reduce their carbon footprint across assets through focusing on Scope 1 and Scope 2 in the first instance, English Heritage is providing novel approaches for the heritage sector, and better understanding and cost-effectiveness in doing so.

**Flash Presentation: How do you decarbonise a palace?**

**Speaker: Jen Stone (Historic Royal Palaces)**

The first step that Historic Royal Palaces (HRP) have taken towards decarbonisation is trying to remove fossil fuels from their heating systems. This has involved measuring electricity usage, identifying the most energy-intensive sites, partnering with expert consultants, and prioritising changes based on feasibility and funding. To implement these changes, they are first improving basic maintenance and heating set-ups and introducing energy efficiency measures like draft-proofing and double glazing. These new technologies are being tested in less sensitive areas, and HRP are also drawing on existing knowledge from experts and other heritage organisations. A key role in the process has been understanding buildings and their complexity of how they function. Jen echoed David's point on affordability.

**Flash Presentation: Sustainability in Archives – Technological Revolution**

**Speaker: Dr Pedro Máximo Rocha (The National Archives)**

Since 2010, The National Archives (TNA) has been managing its indoor environment using a seasonal drift programme, and by switching off air conditioners over weekends. However, new challenges have begun to appear. Sensors and the environmental monitoring system need to be modernised, and it is difficult to process the quantity of data being collected. TNA also needs to lower energy costs, which they are seeking to address by replacing windows and further reducing air conditioning usage. New sensors will provide better monitoring information, and AI coding tools will assist with the processing of this data, as well as with managing the indoor environment during the window replacement programme. The long-term plan is to use 3D digital modelling to map sensors and simulate environmental changes.

## **Flash Presentation: Let's fill those gaps – what conservators need to address the climate emergency**

**Speaker: Lorraine Finch (Icon Sustainability Network)**

In 2022, Lorraine Finch addressed the importance of standardised methods for decision making. She undertook research on behalf of the Roots and Branches project to identify gaps in the provision of training, learning and resources for cultural heritage and climate mitigation. She found four main gaps: 'how to' guidance, suggestions and examples, networking and support, and case studies. However, she ultimately concluded that narrowing down these broad gaps would be beneficial for the sector, and that conservators need assistance with accessing information. She therefore proposed that the sector improve in collaboration and information sharing.

## **Flash Presentation: Environmental parameters for collections – A brave new world**

**Speaker: Isobel Griffin (National Galleries Scotland)**

This talk began with a summary of recent developments in sector guidance on reducing carbon footprints through internal environmental parameters. This was followed by an explanation of some of the challenges heritage organisations face when seeking to change their environmental control systems: outdated technology, concerns about damaging collections, negotiations with vendors of loaned objects, and communicating with stakeholders. National Galleries Scotland has been employing low-energy and fabric-first solutions. They have plans to report on energy consumption and environmental conditions at the same time to emphasise their connection.

## **Adaptation**

### **Introduction**

**Speaker: Kate Guest (Historic England)**

This talk started with a definition of climate change adaptation and an overview of recent UK policy activity, including the National Adaptation Programme, which is now in its fourth round of reporting. Kate Guest highlighted that intangible heritage is still a significant gap in discussions around adaptation in the heritage sector.

Three areas of focus for adaptation and heritage were identified: developing and adopting good practice; gathering and presenting evidence to demonstrate the contribution of the historic environment to the resilience of places and communities; and managing loss. In this discussion, Kate encouraged the heritage sector to better publicise existing adaptation work, and noted projects including sensitivity mapping and the development of nature-based solutions. She also suggested that the sector may need to adjust its approaches to loss, for example, by considering a

value based-approach rather than a significance-based approach, by building confidence in making difficult decisions, and through collaborative discussion.

### **Flash Presentation: The National Trust's approach to climate adaptation**

#### **Speaker: Dr Katherine Shingler (National Trust)**

The National Trust is carefully considering how climate change will affect all aspects of its operations. The National Trust [Climate Change Hazard Maps](#) have been a key tool, but it has also been important to complement this data with lived experience. Accordingly, the National Trust has developed a property observation tool that allows sites to log the impacts of weather and track changes over time. To support teams in carrying out adaptation work, the National Trust has been piloting an 'adaptation handrail', which is a process that guides site teams through creating and implementing an adaptation response plan.

Dr Shingler shared three of the National Trust's current research priorities and collaborations: identifying and prioritising vulnerable coastal sites; developing a climate matching tool that will allow international heritage sites with shared climate challenges to dialogue with each other; and improving analysis and visualisation of data to support evidence-based decision making. Dr Shingler also made an open call for research partners to investigate the impact of lightning and the resilience of building fabric.

### **Flash Presentation: Cultural Heritage and Adaptation to Climate Change in the Peruvian Andes**

#### **Speaker: Prof Nick Branch (University of Reading)**

This is a research project that combines cultural heritage with environmental science and indigenous knowledge to develop adaptation policies and practices, and consequently initiate socio-economic development and benefits, for rural farming communities in the Peruvian Andes. Prof Branch provided two case study examples. The first was adaptation measures introduced for managing wetlands based on pre-Hispanic cultural history and indigenous knowledge. The second was rehabilitating agricultural terrace systems in the face of unpredictable precipitation patterns, and by capitalising on some of the opportunities afforded by increased water availability. Adaptation measures require long-term local community and NGO collaboration, as well as ongoing monitoring.

### **Flash Presentation: GoGreen Project**

#### **Speaker: Dr David Thickett (English Heritage)**

GoGreen is a 4-year Horizon Europe project involving 13 partners and covering a range of initiatives related to green conservation practices. Ongoing research into green stabilisation technologies for iron, copper and glass is an example of an adaptation component of the project. GoGreen is also hoping to develop a web application, and a series of teaching modules that will allow universities to easily include sustainability in their heritage conservation programmes.

### **Flash Presentation: Adapting to a changing land- and seascape at Ra's al-Hadd, Oman: An archaeological perspective**

#### **Speaker: Dr Caroline Cartwright (The British Museum)**

Dr Cartwright began with an archaeological overview of the prehistory of Ra's al-Hadd, Oman. There is evidence that, during the Bronze Age, Ra's al-Hadd had a predominance of healthy mangrove vegetation and that this facilitated a healthy economic and cultural life. However, during the Iron Age, people began to over-exploit the area's natural resources, prompting a need to adapt to changing conditions. Understanding this past could suggest ways forward for Ra's el-Haddad today amidst the climate crisis.

### **Flash Presentation: Historic England and JBA Consulting – review of climate change and heritage research**

#### **Speaker: Emily Prtak (JBA Consulting)**

- Historic England has commissioned JBA consulting to review climate change and heritage research by public bodies, research institutions, and charitable organisations in the UK. The aim is to identify strengths and gaps in this research landscape so that Historic England can prioritise its research focus over the next two years. Initial findings show that most research has focused on developing models and assessing the long-term impacts of climate change on heritage. Research on flooding and coastal erosion; embodied carbon; and the role of historic land- and seascapes in carbon sequestration and offsetting have been underrepresented. However, some aspects of the review's methodology could have contributed to these trends. There is much relevant but ad-hoc ongoing research that has been difficult to identify and include in the analysis.



## Roundtable

**Speakers: Dr Scott Allan Orr, Dr Hana Morel, and Kate Guest**

**Facilitator: Dr Josep Grau-Bové (UCL Institute for Sustainable Heritage)**

This roundtable discussion focused on four questions:

1. Where can heritage be part of the solution for climate change?

The development of climate change is part of a human story, whether with focus on how settlements and communities have responded to significant shifts in the environment, to whether the long-term continuation of practices has led to various forms of environmental degradation. Understanding heritage, both natural and cultural, is intertwined in this story, thus a critical contributor to re-visiting alternative futures. Suggestions included: heritage skills contributing to nature-based or culture-based solutions (e.g., land or water management; maintenance, repair and retrofitting the built environment), using past knowledge to inform current adaptation responses (e.g., ways in which communities have built capacity and thus resilience), and leveraging heritage to tell compelling stories about the risks of climate change to reach broader audiences.

2. It is important to listen to a diverse range of voices in this climate change and heritage discussion. Are there any voices missing?

Yes, embedding diversity into research and discussions helps reduce knowledge and research gaps, including known or unknown biases. Heritage professionals and climate scientists must be more inclusive across communities, sectors and disciplines to be better informed.

Heritage professionals and climate scientists could communicate better so that they are more aware of each other's work and needs. It is also important to consider how to build trust and meaningful partnerships to facilitate real, lasting collaboration across knowledge systems.

3. How should we think about the fact that much climate change and heritage research is occurring at different scales? Should we integrate findings at different scales? Is this a research gap, or is it just a given aspect of the research landscape?

Researchers will need to identify and understand how their own expertise can contribute to climate change and heritage research on different scales, be in, site-based, local, regional, or potentially international. They may always need to consider how they balance resolution and scale, and reach levels of higher confidence, so this is an area of re-negotiating contribution potential of research rather than a research gap per se. It is true that local research can have higher levels of impact within its own community, but sometimes findings - or even processes, approaches and methods - can be applicable to other communities or help inform higher-level organisations or government bodies.

4. Are there certain kinds of evidence that heritage scientists are neglecting?

Qualitative evidence; discussing negative results; and measuring the public's perceptions, values and observations of both tangible and intangible heritage and wider understandings of climate change impacts, action, and resilience on a local level. Clearly in terms of climate change responses, the need to understand cost-effectiveness will also be a growing concern.

This discussion was followed by several questions from the audience that focused on the United Nations' Sustainable Development Goals; building longevity into heritage climate research; and the need for consistency in terminology.

## Wrap Up Session

### Speaker: Dr Josep Grau-Bové (UCL Institute for Sustainable Heritage)

Dr Grau-Bové shared four research successes and corresponding questions for heritage science and climate change.

1. We are reworking data to make it meaningful to heritage ... but what data typologies and connections are we missing?
2. Our interpretation is truly interdisciplinary, bringing together practice and theory ... but is there expertise we are missing?
3. Research is happening at many scales and with many climate types ... but which climates are we overlooking?
4. Research and practice are managing to prevent damage while cutting emissions ... but do we know enough about damage and lifetimes?

He then suggested some connections between climate change and [the other NHSF societal challenges](#).

1. Digital society
  - AI & the coding revolution are lowering the cost of data analysis.
  - Institutions adapt by promoting training in computer skills.
  - Results from models are widely available, enabling better assessments.
2. Sustainable development
  - Practical, real-world implementations of sustainable solutions e.g. reducing carbon footprints, dehumidifying display cases rather than whole spaces, comparing the climate impact of different assets.
  - What quality of data do we need to make good decisions? What is good enough? ('Perfect' data is expensive so what is actually practical?).
  - Learning from our past is proving fruitful.

### 3. Wellbeing

- There are substantial gaps in the collection of qualitative data on the impacts of climate change and how it impacts communities.
- Need to know more about value and perception from communities.
- Managing loss.

### 4. Equality and inclusivity

- Data from citizens is highly valuable.
- Indigenous narratives can contribute to our understanding of adaptation.
- Decisions need to be informed by local knowledge and experience.
- There are still barriers to the dissemination of information, although there are some great ongoing initiatives e.g. course development, web apps.

This initial discussion of potential research gaps and questions was interrogated further in a series of online follow-up discussion groups that took place in the 6 weeks following this event.

**[A recording of the keynote presentation, and PowerPoint slides for all other presentations, are available online here.](#)**