Report on the review of the Government Indemnity Scheme environmental guidelines.

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LFCP

Large Print version

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Executive Summary

The scope of this review is to assess the environmental conditions which apply under the Government Indemnity Scheme (GIS) and test whether they remain fit for purpose, and explore future expectations and recommend any changes to the requirements of the environmental conditions for loans in relation to the current operating context of the cultural heritage sector.

The current operating context means that the GIS environmental guidelines are no longer fit for purpose, especially in light of rising energy costs and the climate crisis. The GIS environmental guidelines can be difficult to implement in practice, do not recognise the lower risk posed to the majority of objects from the environmental factors of Relative Humidity, temperature and light in relation to other risk factors, and were written before the current imperative to address the climate crisis.

Mechanical control of temperature and humidity is responsible for high energy use and climate impact in cultural heritage institutions. Current international practice to improve collections care whilst reducing energy use and the climate impact of the sector is a risk management approach based on context. For the GIS this means removing the environmental guidelines which state bands for Relative Humidity and temperature. Borrowers, using the GIS, should provide conditions that mimic the lender for short term loans and reflect historic conditions for long term loans providing microenvironments for those items with specific requirements, and allowing more use of daylighting, as appropriate.

Expert advice and guidance in collections care could be provided by Arts Council England (ACE) alongside sharing data and information, and collaborating with others, nationally and internationally, to provide a consistent voice and a single message on environmental guidance. ACE could fund the adaptation and retrofitting of cultural heritage buildings.

The recommendations are based on the most up-to-date research and scientific consensus on materials deterioration and are responsive to the need to reduce the climate impact of care of collections and of the sector in general.

Contents

1. Methodology

The review of the environmental standards of the Government Indemnity Scheme (GIS) was carried out by LFCP. LFCP, founded in 2003 by accredited conservator Lorraine Finch, is a conservation and preservation agency accelerating the cultural heritage sector's climate and environmental actions through research, knowledge sharing and resource creation.

The review was a desk-based research exercise. It was overseen by sector representatives, invited by Arts Council England (ACE), with input from the National Museum Directors Conference, and established as a Reference Group. The members of the Reference Group were:

- Amber Xavier-Rowe. Head of Collections Conservation, English Heritage.
- Dr Christian Baars. Co-Chair International Council of Museums UK / Head of Collections Care, National Museums Liverpool.
- Wilma Bouwmeester. Environmental Adviser to GIS.
- Sara Crofts. Chief Executive, Institute of Conservation.
- Kirstie Hamilton. Director of Programmes, Sheffield Museums Trust. (National Museums Directors Conference nominee)
- Eloise Stewart. Chair, UK Registrars Group. (National Museums Directors Conference nominee)

Consultation with the Reference Group occurred via 1:1 online meetings, two Reference Group meetings and email. Consultation with members of the ACE GIS Task and Finish Group occurred via online meetings and email.

The purpose of the Reference Group was to provide expert advice and guidance in all aspects of this desk-based review of the GIS environmental guidelines. They provided additional knowledge and information, provided operational context and feedback on drafts of the report.

2. Background

2.1 The UK Government Indemnity Scheme

The United Kingdom's Government Indemnity Scheme provides a form of insurance, guaranteed by the UK Government. It allows museums, galleries, libraries, the National Trust and other similar institutions and bodies in the UK to borrow items for public benefit; for long term loan or borrowed for the duration of a specific exhibition. Indemnity will insure the lender against any loss or damage and free the borrowing museum from having to pay commercial insurance premiums. The scheme was introduced in 1980, by an Act of Parliament known as the National Heritage Act 1980.

ACE manages the GIS on behalf of DCMS. It issues more than 1,000 indemnity contracts each year, underwriting between £12 and £19bn international, national and regional loans.

2.2 Reason for the review of the GIS environmental guidelines

The Guidelines were last reviewed in 2012 with an update of references in 2016. Since then a number of external changes are impacting on the operation of the scheme and the capacity of museums to work within its requirements.

ACE states that particular considerations at this time include:

- The need to reduce greenhouse gas emissions to minimise climate change impacts, as required by international government strategy and policy.

- Lets Create, the Arts Council strategy for 2020-30 which introduced the Environmental Responsibility Investment Principle.
- Continuing increases in operational costs for museums, particularly rising energy costs.
- The changes to our climate that are already happening, and those we know will happen due to the increases in greenhouse gas emissions to date and the need to adapt (note 1).

Note

1: ACE Invitation to Quote. Review of environmental standards for the Government Indemnity Scheme. October 2022, p2

2.3 Aims and outputs of review

Review the environmental conditions which apply under GIS and test whether they remain fit for purpose, and explore future expectations and recommend any changes to the requirements of environmental conditions for loans.

- Establish how GIS environmental guidance and conditions currently works as written and in practice.
- Quantify the climate impact of current practice.
- Evidence risk of damage as a result of environmental factors.
- Analyse policy and operating context.
- Identify how challenges of the current operating context impact on museums' ability to meet GIS environmental guidelines for their collections.
- Explore current and emerging international practice in collections preservation.
- Make recommendations for Arts Council, DCMS and the sector on what the guidelines should be identifying areas for future focus or research.

3. Analysis

3.1 How GIS environmental guidance currently works.

3.1.1 As written

The GIS covers short-term loans borrowed for the duration of an exhibition and long-term loans, nationally and internationally.

The guidelines and application forms for GIS are provided on the ACE website (note 2). They are separated into national institutions, non-national institutions and those with Designated collections. These forms are:

a. GIS: guidelines for national institutionsb
b. GIS: guidelines for non-national institutions
c. GIS application form, national institutions
d. GIS non-national application form - designated
e. GIS non-national application form
f. Images template - GIS scheme

The GIS guidelines for national institutions do not state environmental guidelines for temperature, Relative Humidity (note 3) and light. National institutions sign the irrevocable undertaking to the Secretary of State, contained in Annex B of the GIS Guidelines. This commits them to, “provide a level of environment monitoring and control equivalent to that applied to objects or items in our own collection which are similar to the object(s) loaned and which are necessary for the appropriate and effective care of the object(s) loaned”. The indemnities for individual instances (an example is contained in Appendix G) states that they must also, “comply with any further conditions which the Environmental Adviser of the Arts Council may recommend to the borrower” (note 4).

The undertaking for non-national institutions similarly requires the borrower to, “provide a level of environment monitoring and control equivalent to that applied to objects or items in our own collection which are similar to the object(s) loaned and which are necessary for the appropriate and effective care of the object(s) loaned”. The appended model application form indicates environmental guidelines for temperature, Relative Humidity and light. They state:

- The minimum and maximum conditions for Relative Humidity per week will be within the band 40-65% with a maximum cycle of 10% within 24 hours.
- Temperature within the band 16°-24°C with a maximum cycle of 4°C within 24 hours (note 5).
- Light levels of 200 lux or below, and 50 lux and below (note 6).

Environmental conditions are required to be maintained 24 hours a day, 7 days a week throughout the loan period from the time the indemnified object arrives until it departs from the loan venue, in accordance with Annex D of the GIS Guidelines for national and non-national institutions. Relative Humidity, temperature, light levels must be monitored through the loan period in the space within which the indemnified object is contained.

There is flexibility built into the application form for non-nationals, for temperature, Relative Humidity and light. The GIS guidelines states ‘There may be good reason for not maintaining these conditions, if so please provide an explanation’ and in several places it states that a level of environmental monitoring and control necessary for the appropriate and effective care of the object loaned should be provided without referring to actual numbers (note 7).

Borrowers with short term loans are required to provide environmental readings for the same period one year prior to the display period. Copies of the charts from the first week of the display period are required to be submitted to ACE without delay at the end of the first week of the display period (note 8).

Borrowers with long term loans are required to provide an annual ‘State of the Environment’ (SOTE).

The GIS guidelines for both nationals and non-nationals do not acknowledge the risk of climate change to heritage because they were written before the current imperative to address climate change.

3.1.2 In Practice

- There is a great deal of misunderstanding around the GIS guidelines in the cultural heritage sector. GIS environmental guidelines are perceived as a statement on collections care providing guidance on the long-term preservation of items rather than an indemnity scheme. The guidelines are referred to as standards in the sector from which it can be understood how the GIS environmental guidance is perceived. There is little knowledge of the guidelines as a whole, the environmental guidelines and the process. The GIS process and guidelines are thought to be rigid and inflexible.

- There is a lack of comprehension by borrowers and potential users of the scheme of the flexibility that exists within the GIS guidelines as written and as it applied in practice with regards to the application of the environmental guidelines. In line with the guidelines, the ACE GIS environmental advisers have the discretion to waive some of the requirements for Relative Humidity and temperature if they are not relevant to the nature of the material. In terms of the maximum cycles of

temperature and Relative Humidity in 24hrs, the requirement for no more than 4ºC in 24 hrs may also be waived at the discretion of the Adviser. The requirement for no more than 10% Relative Humidity in 24hrs may be relaxed depending on context and on how often these fluctuations occur.' (note 9)

- Borrowers report that they struggle to maintain the environmental conditions for temperature, relative humidity and light as stated in Annex C, Guidelines for non-nationals.

  It's a constant struggle to keep the parameters in range. Everyone's trying and struggling to keep them in band, just so that they are fulfilling the criteria. (note 10)

- Collections owned by the borrowing institution are stored and displayed in conditions that don't meet GIS environmental guidelines yet they have to apply GIS environmental guidelines for loans. "In order to meet GIS we have to meet higher standards than we have in the last 125 years […] GIS parameters are too rigid and don't take into account historic circumstances in which collections have survived very well." (note 11)

- Lenders' collections are not stored or displayed in environmental conditions which meet the GIS environmental guidelines; yet when loaned they are displayed and/or stored within the GIS environmental guidelines.

- The GIS environmental guidelines do not take into account the context of the loan nor the risk associated with the context. The same environmental guidelines are applied to all items but some are more stable than others.

  'Each object should be reviewed on its own merit. You know that flexibility is important because a panel painting versus a meteor have different requirements.'

‘I think GIS were written at a time when the type material was much less diverse than it is now. The fact that it's called nail to nail makes it very clear that it was paintings. Originally it was paintings, works of art, and some sculpture, and of course it's been broadened out enormously since, and it's no longer one painting that goes somewhere for 3 months and then comes back. It can be groups of items and whole collections. It's wide but the guidance hasn't grown in the role.’

‘The focus is always on paintings and arguably the 40 to 60 range is good for paintings, works on paper and some furniture collections as well. But there's a vast array of collections that this doesn't apply to at all.’ (note 12)

- There is variance in how borrowers understand and interpret the environmental guidelines for Relative Humidity and temperature especially around the bands. Interpretation of the bands vary. There was no consensus amongst the Reference Group regarding how the environmental guidelines bands should be interpreted. Therefore, it can be concluded that the difference in interpretation means that the environmental guidelines bands are applied differently within the sector.

  ‘The text uses the word cycle, and I have no idea what they mean with that.’

  ‘The wording is open to interpretation, because it is worded in different ways in different sections.’ (note 13)

- The GIS environmental guidelines are interpreted rigidly by borrowers due to fear, concern, lack of knowledge, a lack of access to advice and a lack of confidence with the result that the environmental conditions applied to during the loan are tight.

‘If you're at Tate, you could probably have really dynamic conversations with your conservation team. If you're a smaller place, you probably would stick to what you know rigidly, because you don't have any advice to tell you otherwise.’

‘There's a risk aversion. Everyone wants to get it right. That ability to look into the flexibility offered is… you're too nervous to do it. Your perception is that if I do go into that grey area of flexibility, in the event of a claim would there be no payout?’ (note 14)

- The rigid interpretation of the environmental guidelines by potential borrowers acts as a barrier, with the result that they do not apply to the scheme (note 15).

- The GIS environmental guidelines are not suitable for international loans (note 16). They are based on environmental conditions that are suitable in London, not in Canada or the Philippines.

- The GIS is described by borrowers as not intuitive and not an easy process. The GIS is described this way because borrowers have difficulty understanding the process.

  ‘Documentation is dense. It is not easy to read or obvious what you should do.’

  ‘It feels really opaque’ (note 17)

  Borrowers struggle to provide the environmental data required and with the demands that applying places on staff time, especially given a lack of staff capacity. Borrowers have used commercial insurers because of the resource demands of GIS. GIS makes assumptions about what is in place for borrowers in terms of staff resources and staff knowledge.

‘The amount of time spent on applying and also on reporting for GIS is excessive and unsustainable for a stretched team.’

‘GIS penalises the little guys. If you’re a national, you’ve got plenty of people to administer GIS, but if you're small you don’t.’ (note 18)

- There is a desire for ACE to provide more advice and guidance on conservation and preservation, good collections care, environmental control, emerging practice in collections care and accessing information and resources.

- The GIS exacerbates the disparity of access to cultural heritage regionally and between small institutions and the nationals.

Notes

2: https://www.artscouncil.org.uk/supporting-arts-museums-and-libraries/supporting-collections-and-cultural-property/government

3: Relative Humidity is the moisture content of the air divided by the maximum amount of moisture the air can hold at that temperature. It is expressed as a percentage with 0% being very dry and 100% being very damp.

4: Government Indemnity Scheme. Guidelines for nationals. Arts Council England. Annex G. January 2016. p.86

5: From December 2022 until Summer 2023 the minimum temperature requirement of 16ºC was suspended. https://www.artscouncil.org.uk/supporting-arts-museums-and-libraries/supporting-collections-and-cultural-property/government#t-in-page-nav-5

6: Government Indemnity Scheme. Guidelines for non-nationals. Arts Council England. Annex C. January 2016. p69

7: Government Indemnity Scheme. Guidelines for non-nationals, loc.cit., p.69
8: Government Indemnity Scheme. Guidelines for non-nationals. Arts Council England. Annex G, January 2016. p.85
9: Reference Group. Received 8th June 2023.
10: Reference Group 1:1
11: International Climate Control Conference. Panel Discussion. Nick Merriman. 1st December 2022
12: Reference Group 1:1's
13: Reference Group 1:1's
14: Reference Group 1:1's
15: Reference Group 1:1
16: As stated in the Government Indemnity Scheme. Guidelines for non-nationals, loc.cit., p69
17: Reference Group 1:1
18: Reference Group 1:1

3.2 Risk of damage from environmental conditions.

The GIS provides environmental guidelines in order to reduce the risk of claims due to environmental factors of Relative Humidity, temperature and light. No claims have been made under GIS for damage caused by these environmental factors. One of two interpretations can be applied, either that the environmental conditions, as related to the environmental guidelines, are preventing damage or that environmental conditions pose a low risk to cultural heritage items (note 19).

Research in the sector by heritage scientists, nationally and internationally indicate that environmental conditions outside of the GIS environmental guidelines pose a low risk to items. Research undertaken by Dr David Thickett, Senior

Conservation Scientist, English Heritage states “In historic buildings many collections have been outside of the ‘accepted’ museum limits for Relative Humidity and temperature for many decades, frequently their whole lifetime. [...] Despite this, many collections seem to survive well.’’ (note 2) He concludes that “There is [...] increasing evidence, from scientific analyses of actual object responses in their environments, that many objects can safely tolerate very wide temperature and quite wide Relative Humidity bands.” (note 21)

Analysis of the environmental conditions at the Peabody Museum of Natural History of Yale University, which has a long tradition of promoting and maintaining high standards of collection care, demonstrated that “Objects have survived remarkably well for decades or centuries in conditions which were far from ideal.” (note 22) Bart Ankersmit, Senior Researcher at the Netherlands Cultural Agency, states “environmental control has assumed an importance that it does not deserve. Environmental control is one piece of the puzzle of preventive conservation.” (note 23)

Studies into the risk factors relating to cultural heritage items reveals that the most important risk to objects in daily practice is physical force, followed by fire, water, and pests (note 24). Physical force refers to handling and the damage caused by poor handling. Research by Professor Łukasz Brataz, Polish Academy of Sciences into the risks posed to items by environmental factors support these findings. This research shows that cracks in a wooden C18th object grew 0.6mm in a year in an uncontrolled environment. 92% of the crack length was caused in a few catastrophic events such as damage caused when moved (note 25).

‘If you look at data of what causes damage to collections, the majority of it is physical damage [...] people dropping things walking into stuff, and getting damaged in transport.’ (note 26)

Professor Bratasz states that “Controlling or keeping a stable climate to mitigate a small risk is very cost ineffective”. (note 27)

Figures for claims made to the GIS between 2010 and 2022 reinforce the research. Claims made for this period were for handling damage, loss, theft, vandalism and fire.

[Page 11 of the standard print version shows a bar chart wit the following approximate information:

Claims made to GIS 2010 to 2022

- Handling: 70%
- Loss: 15%
- Theft: 5%
- Vandalism: 5%
- Fire: 5%]

Risk is dependent on context and the object type. For example, ceramic is at risk from handling and when being moved, a rhino taxidermy is at risk of theft whilst a painting in a museum sponsored by a fossil fuel company could be at risk vandalism as a result of climate protest. Risk needs to be assessed based on context.

Case Study - The National Gallery of Victoria

The National Gallery of Victoria have partnered with the Getty Conservation Institute to assess whether widening the environmental range causes damage to wooden objects by acoustic emission (AE) monitoring of a sixteenth-century Flemish retable. AE monitoring can detect environmentally induced micro-damage before it is visible. No damage has been detected (note 28).

Notes

19: The risks from the environmental factors of Relative Humidity, temperature and light are:
Relative Humidity: mould, mechanical damage and chemical degradation.
Temperature: mould, mechanical damage and chemical degradation.
Light: mechanical damage and chemical degradation.

20: Sustainable Collections Environments. Studies in Conservation and Restoration. David Thickett. 2019. Issue 10.

21: ibid.

22: Toward Sustainable Collections Management in the Yale Peabody Museum: Risk Assessment, Climate Management, and Energy Efficiency. Ł. Bratasz, T. White, S. Butts, C. Sease, N. Utrup, R. Boardman, S. Simon. 'Bulletin of the Peabody Museum of Natural History'. 59. 2018. p254

23: Preventive conservation and risk. 'International Climate Control Conference'. Bart Ankersmit. 2nd December 2022

24: ibid.

25: What do we know about the climate vulnerabilities of cultural heritage objects? 'International Climate Control Conference'. Lukasz Bratasz. 2nd December 2022

26: Reference Group 1:1

27: Bratasz, What do we know about the climate vulnerabilities of cultural heritage objects? loc.cit.
28: Collaboration with National Gallery of Victoria. Project Updates. 'GCI News'. Spring 2022. p26

3.3 Climate impact of GIS environmental guidelines.

The museum sector accounts for 24% of the CO_2e emissions of the 698 Arts Council England National Portfolio Organisations (ACE NPOs) (note 29). The 'Climate, Culture and Environmental Responsibility: Annual Report 2021-2022' states that of the 698 ACE NPOs, 92% of CO_2e was produced by energy usage: 48%CO_2e electricity and 44% CO_2e gas respectively (note 30).

A breakdown of CO_2e data for the ACE NPO museums is not available. No data is available showing the greenhouse gas emissions associated with the use of mechanical environmental control to maintain the GIS environmental guidelines. The absence of data makes it difficult to state with confidence what the climate impact of the GIS environmental guidelines are.

It is possible to state that the GIS environmental guidelines will become obsolete in relation to the current climate impacts and predicted climate impacts on buildings and collections. As the climate changes, will cultural heritage organisations be able to maintain the environmental guidelines in the GIS for Relative Humidity and temperature in 2030, 2040, 2050 and into the future?

As evidenced above, fluctuations in Relative Humidity, temperature and light pose a low risk to most items, yet borrowers maintain environmental conditions within the GIS

environmental guidelines which the borrower may not provide for their own collections, which the lender may not use and which may not be necessary for the object type resulting in unnecessary energy use and the associated greenhouse gas emissions.

- The GIS environmental guidelines require the same environmental conditions to be provided for all objects regardless of the risk, context and material type which results in objects having environmental conditions provided by mechanical control even when they don't need it.
- The GIS environmental guidelines require the same environmental conditions to be provided for all objects regardless of the geographic location of the borrowing institution.
- The GIS environmental guidelines require environmental conditions to be provided even if the lender has not requested them.
- Loans are stored and displayed in environmental conditions which meet the GIS environmental guidelines but which the objects have not previously been stored or displayed in.
- Borrowers struggle to maintain the environmental conditions set in the GIS environmental guidelines especially during periods of extreme weather.
- For short term loans environmental data for the same period one year prior to the display period is required.
  '... an end to us having to provide readings from the previous 12 months to the proposed display period. This would allow us to shut down plant (or run according to wider parameters) whenever non-critical items are on display.' (note 31)
- The GIS does not take into account current and emerging practice around energy efficient use of mechanical control in the provision of environmental conditions such as partial shutdowns, system setbacks and seasonal setpoints.

- Borrowers maintain environmental conditions within the GIS environmental guidelines as stated in Guidelines for non-nationals, Annex C because of misunderstanding and perceptions of the GIS.

Put simply, borrowing institutions are consuming more energy than necessary leading to an excess production of greenhouse gas emissions because they are **'doing more than they need to because they are trying to meet GIS targets rather than doing what is best for the collections or more broadly the climate. GIS is influencing decision-making in a negative way and is a barrier to lower energy /carbon use'.** (note 32)

Notes

29: Culture, Climate and Environmental Responsibility: Annual Report 2021-2022. 'Julie's Bicycle and Arts Council England'. 2023, p.10
30: Ibid., p.10.
31: Reference Group 1:1
32: Reference Group 1:1

3.3.1 Climate impact of mechanical control

"There are several different measures now used for sustainability. Energy cost is the oldest." (note 33)

Mechanical control of Relative Humidity and temperature for the display and storage of collections in the normal operations within the sector and for the GIS is responsible for the greatest energy use. For example, at the National Gallery of Victoria, Australia running the HVAC accounts for over 60% of their electricity consumption. Research for 'Eleven to Zero' reveals that 90.04% of greenhouse gas emissions comes from power consumption in a museum with no public (note 34).

greenhouse gas emissions for air conditioning in comparison to other environmental control strategies (note 35)

[Page 15 of the standard print version shows a bar chart with the following approximate information:

Comparison of environmental control strategies

CO2ekg/m2/per year

Air conditioning
- Minimum: 1.9
- Maximum: 2.9

Background hearing
- Minimum: 0.5
- Maximum: 1.5

Dehumidifier
- Minimum: 0.1
- Maximum: 0.8]

Research in the cultural heritage sector on sustainable environmental management for collections provides evidence of reduced energy use:

- Data provided by the Reference Group regarding the implementation of new technology for environmental control shows a carbon saving of 313tCO_2e per year. (Electricity saving = ca. 100,000kWh per year.)

Case Study - The Museum of Fine Arts

The Museum of Fine Arts (MFA) tested an overnight shut down (coasting) of the air handler for the heating, ventilation and air conditioning (HVAC) system serving a group of galleries in a new wing of the museum. Data was collected from March 6 to April 4 2014 when 50% of the HVAC and return fans were shut off each night for 12 hours. Overnight shutdown of the air handlers resulted in 42% nightly reduction in consumption and cost. The energy use during periods of system shutdown resulted in 40% savings of kWh/month. Related electricity usage was reduced by more than 40%.[...] The coasting conditions examined at the MFA greatly decreased their carbon emissions, water intake, and other environmental consequences as compared to their non-coasting conditions (note 36).

Case Study - The Smithsonian

“The Smithsonian Institution reduced energy costs by 17% by widening the range of Relative Humidity control from 5 to 8 %. The potential for energy reduction is also illustrated in recently built museum storerooms and archives where the use of passive climate control has allowed for almost zero energy consumption while at the same time conditions for the preservation of stored collections were improved.” (note 37)

Case Study - Hermitage Amsterdam

Relaxing the museum’s indoor climate specifications for temperature and Relative Humidity resulted in significant energy savings. Class AA saved 49% and Class A saved 63% compared to the current strict indoor climate in this case study (note 38).

Case Study - Bristol Archives

After a year of regular monitoring, staff found that air conditioning had never been needed, temperatures had stayed stable, and £6000 energy had been saved (note 39).

The example and case studies show that sustainable environmental management reduces energy use and, as a result, climate impact.

Notes

33: Thickett, Sustainable Collections Environments. loc.cit.
34: Eleven to Zero - Hamburg Museums Action. 2nd February 2023
35: Comparison of Environmental Control Strategies in Historic Buildings. David Thickett. 'Studies in Conservation'. IIC. 2020
36: Life Cycle Assessments of Loans and Exhibitions: Three Case Studies at the Museum Fine Arts, Boston, 'Journal of the American Institute for Conservation'. 55:1. Sarah Nunberg, Matthew J. Eckelman & Pamela Hatchfield. 2016
37: Bratasz et al, Toward Sustainable Collections Management in the Yale Peabody Museum: Risk Assessment, Climate Management, and Energy Efficiency. loc.cit., p.255
38: Impact of ASHRAE's museum climate classes on energy consumption and indoor climate fluctuations: Full-scale measurements in museum Hermitage Amsterdam. R.P. Kramer ∗, H.L. Schellen, A.W.M. van Schijndel. 'Energy and Buildings' (130). 2016. p294
39: Carbon Literacy for Museums Toolkit Trainer Manual. 'Carbon Literacy Project'. 2022. p74

3.3.2 Light

‘From a sustainability point of view changing the GIS environmental guidelines regarding lux and ultraviolet levels will make negligible difference to energy use and climate impact.’ (note 40**)** However a small amount of gain in reduction of emissions and energy use could be made if the GIS environmental guidelines allowed for more illuminance by natural light, as appropriate.

‘With regards to light, the environmental guidelines for lux drives GIS users away from using natural light for illumination. The reliance on artificial illumination has an obvious environmental impact in terms of energy use.’ (note 41)

Notes

40: Reference Group 1:1.
41: Reference Group 1:1

3.4 Current and emerging international practice in collections preservation.

The unsustainable costs of providing environmental conditions using mechanical control have been known since the 1990’s. Heritage scientists recommend a risk management approach based on context rather than prescribing a set of numbers for temperature and Relative Humidity.

Research undertaken for sustainable collections management concluded “The body of scientific evidence indicates that wider variations are safer for most collections than previously assumed and that typifying materials on a collection-by-collection basis is beneficial.” (note 42) Additionally “Over the

last 20 years, continued scientific research has shown that it is completely possible for museums to continue to preserve and protect their collections without rigid climate control. New guidelines have been developed [...] encouraging museums to adapt more bespoke settings based on their collections, historical conditions, and geographic location, amongst other criteria. Adoption of these new practices could save millions - in money and in carbon." (note 43)

Context based means environmental conditions based on the historic conditions objects were stored in, the historic annual Relative Humidity and temperature averages, local climate and seasonal changes and geographical location which take into account risk. Micro-environments are recommended for objects which require specific environmental conditions.

"Items that are sensitive can be protected better by microenvironments than by elaborate building systems. Microenvironments, when you do a full risk analysis over 100 years, are the only thing that will give you total reliability." (note 44)

"It is significantly more effective and efficient to condition the small volume of showcases than condition an entire room. [Conditioning a room] massively increases the capacity and energy needed [...], compared to a showcase of similar volume." (note 45)

"There is simply no one-size-fits-all pattern for good environmental control strategies, nor is there likely to be, no matter how good HVAC engineering becomes." (note 46)

The Heads of Conservation in the UK "have taken a positive and progressive step by committing to a risk management approach to environmental requirements for collection materials, balancing the care of and access to collections with

the demands of sustainability [... to] drive significant reductions in energy consumption and emissions, effectively mitigating the effects of climate change [... and] work towards a Net Zero future in support of the Paris Agreement and the UK Net Zero Strategy". (note 47)

For those institutions maintaining environmental conditions with mechanical control the current and emerging practice also includes:

- Widening parameters. (note 48) "Recent environmental guidance in the heritage field has also signalled a shift away from prescriptive narrow ranges of temperature and relative humidity towards the adoption of broader environmental parameters suitable for many classes of objects." (note 49)
- Removal of temperature requirement stating guidelines for Relative Humidity only.
- Removal of the lower temperature requirement.
- Full shutdowns of HVAC. The National Museum of Wales "in many places has turned off climate control measures completely where systems were running 24/7 after monitoring found that "the environment naturally stays within the parameters we're looking for"". (note 50)
- Partial shutdowns of HVAC, i.e. overnight, at weekends etc. At the Rijksmuseum 49% of system is shutdown nightly reducing energy consumption by 30%. (note 51)
- Use of microclimates, e.g. folders, boxes, framing and wrapping.
- System setbacks. The methodical nightly, weekend or seasonal adjustment to HVAC settings.
- Seasonal setpoints.
- Adjusting fan speeds.
- Outside air reduction.
- Maintenance and improvements to building management systems (BMS) to reduce energy consumption.

Current and emerging international practice regarding environmental conditions also includes:

- Passive measures using building materials and the way the building works to maintain the environment.
- Use of microclimates, e.g. folders, boxes, framing and wrapping.
- Moving items. At the Victoria and Albert museum, a Michelangelo wax sculpture is removed from display from April to September. During this time the sculpture is at risk because the gallery is too warm (note 52).
- Improvements in collections care such as replacing tungsten and halogen lamps for LEDs and removing or replacing humidifiers to reduce heat input into the building and to reduce energy consumption.

For exhibitions and loans, the climate impact is also being reduced by:

- Hosting fewer temporary exhibitions.
- Increasing the length of exhibitions.
- Reducing the number of items borrowed.
- Increasing the use of items from the institution's own collections.
- Using locally-sourced loans.
- Limiting the number of loans.
- Reuse and recycling of display materials.
- An institutional sustainability statement for exhibitions and loans.
- Pre-planning to ensure sustainability is embedded into the process.

For transport for exhibitions and loans, the climate impact is being reduced by:

- Use of packing materials that are deemed sustainable.
- Reuse of packing materials.
- Transport of loans using electric vehicles.

- Consolidation of loans, i.e. grouping collections and deliveries to ensure only a single trip is necessary.
- Reduced use of in-person couriers/ use of virtual couriering.

Notes

42: Bratasz et al, Toward Sustainable Collections Management in the Yale Peabody Museum: Risk Assessment, Climate Management, and Energy Efficiency. loc.cit., p254
43: Getting Climate Control Under Control Declaration, Tino Sehgal, ART2030 and Ki Culture, 2022.
44: Zoom in with ASHRAE. 'International Climate Control Conference'. Stefan Michalski. 1st December 2022
45: Thickett, Sustainable Collections Environments. loc.cit.
46: Environmental guidelines for museums. David Grattan and Stefan Michalski. 'Canadian Conservation Institute'. 21.09.2017
47: Environmental Statement of Heads of Conservation in the UK. 25th April 2023
48: The Bizot Green Protocol and the National Museum Directors' Council statement on environmental conditions are currently being updated to reflect this.
49: Conservation Online. Anna Duer. 20th Dec 2022
50: The Heat is On. Jonathan Knott. 'Museums Journal'. May/June 2022. p57
51: International Climate Control Conference. Panel Discussion. Karen Keeman, 1st December 2022
52: Climate Resilience for Museum Collections. Bhavesh Shah, Sarah VanSnick and Emily Long. 'V&A blog'. March 18, 2022.

3.5 Policy and operating context.

The uncertain global financial outlook and the need to reduce greenhouse gas emissions are two aspects of the complex operating context in the cultural heritage sector. The sector is composed of small organisations with a single person responsible for all functions to nationals with many staff; volunteer run museums to those with paid and trained specialist staff; institutions with no funding to those which are well funded and purpose built museums and archives to those which are based in buildings that were never intended for this function. Added to this are a loss of skills and knowledge, rising costs and lack of access to expertise, amongst many other challenges.

Let's Create provides other examples of the operating context. These are:

- Demands on public funding, leading to reducing funding for cultural heritage.
- Business models of publicly funded cultural organisations are often fragile, and generally lack the flexibility to address emerging challenges.
- A retreat from innovation and risk taking.
- Global financial outlook uncertain.
- Historic cultural, social and economic divisions.
- Persistent and widespread lack of diversity (note 53).

3.5.1 Current context

Covid-19 reduced the number of visitors to museums. Visitor patterns are not back to pre-Covid patterns. This makes planning difficult. It also indicates that the sector may need to do new and/or different steps to attract visitors as well as keep costs under control. The reduction in visitor numbers has led to a reduction in income causing museums and archives to reduce

their staff. This has led to a loss of knowledge and skills in the sector. The reduction in income due to low visitor numbers has also led to closure of museums and restricted opening hours.

The dire financial situation in the cultural heritage sector caused by Covid-19 has been worsened by the rising cost of energy. Heritage Alliance members stated that they “face increases of anywhere from 200% to 900% [...] the current situation poses a greater risk to heritage than Covid did.” (note 54) A survey carried out by OnePoll for Ecclesiastical Insurance revealed that:

- 84% of cultural heritage organisations are reducing costs to survive
- 44% are making staff redundant
- 42% were limiting rooms that were open and heated
- 39% reducing their opening hours, opening on fewer days and reducing staff hours
- 72% of those surveyed believe that many heritage organisations will be at risk of closure due to the energy crisis. In fact, closures have already occurred, including Eastleigh Museum and Strutt’s North Mill Museum causing “huge concern due to the ‘loss of cultural value to the country”. (note 55)
- An unforeseen consequence of rising energy costs is that “heritage sites are taking extra risks in using cheaper modes of running such as candles, open fires and portable heaters”. (note 56)

The effects of Covid-19 and rising energy costs are increasing the competition for funding.

Rising energy costs not only impact the institutions but also their visitors and staff. Museums are reporting reduced visitor numbers with the consequent loss of income. To retain necessary visitor numbers museums and heritage sites are

reducing their prices, reducing their income further. “Hot on the heels of Covid, the cost of living crisis presents yet another challenge to keeping heritage assets in use and accessible.” (note 57)

Staff are experiencing a real terms reduction in salary, alongside rising costs of living. It is noticeable that professionals are leaving for better paid jobs. Added to this there is “difficulty recruiting and retaining staff in a historically low-paid sector” (note 58) at a time of rising costs. The UK’s departure from the EU has added to the difficulty of recruiting staff at all levels.

A further point to consider with regards to the operating context is climate change in relation to cultural heritage sites and institutions becoming a focus for protests. And with regards to a potential reduction in funding in the sector as organisations move away from funders linked to fossil fuels. Additionally funding and sponsorship from fossil fuel companies can lead to reputational damage.

Notes

53: Let’s Create Strategy. 2020-2030. ACE. 2020
54: Alberge, It’s very tough’: UK Castles, museums, theatres to close as energy prices hit. loc.cit.
55: Nine in ten heritage sites are concerned about their future due to the cost of living crisis. ‘Museums Association’. Katie Ross. 13th January 2023
56: Ross, Nine in ten heritage sites are concerned about their future due to the cost of living crisis. loc.cit.
57: Ross, Nine in ten heritage sites are concerned about their future due to the cost of living crisis. loc.cit.
58: Alberge, It’s very tough’: UK Castles, museums, theatres to close as energy prices hit. loc.cit.

3.5.2 Projected climate impact on buildings and collections care

It is the case that the cultural heritage sector has little to no idea of the projected impact of climate change on buildings and collections care, in most instances. ‘Only 3 in 10 museums have analysed the climate impacts they are likely to be challenged by.’ (note 59) Yet climate change is already impacting the sector, the buildings and the collections.

Current and projected impacts of climate change include:

- Cultural heritage institutions will be less able to maintain temperature and Relative Humidity levels within the GIS environmental guidelines.

- Increased greenhouse gas emissions.
  Running mechanical environmental control to maintain environmental conditions within the GIS guidelines in a changing climate will cause more greenhouse gas emissions.

- Flood and water damage due to extreme weather events.
  ‘The discharge systems, as in the downpipes and the water catchment systems on the buildings were built 100 years ago, they are just not designed for the amount of rainfall we're now receiving so as a result we've got water coming into the buildings.’ (note 60)

- Flood and water damage due to rising sea levels and storm surges.

- Damage to buildings.
  Damage to buildings is occurring due to extreme weather. The hotter, drier summers cause drying out of buildings and cracking of the structure which allows water ingress. The lack of rainfall in the summer of 2022 led to the drying of the moat at Oxburgh Hall, a National Trust property, which put the building at risk from subsidence. Heavy rainfall is leading to water ingress; often in parts of the building where this has never occurred before. In February 2022, The Royal Navy Submarine Museum, The PWRR and Queen's Regiment Museum and The Museum of East Anglian Life all closed due to storm damage.

- Increasing number of pest infestations and mould outbreaks.
  Increasing numbers of mould outbreaks are already being experienced. Pest and mould remediation cause more greenhouse gas emissions. A three day treatment of a mould outbreak in a museum store had a carbon footprint of $1tCO_2e$. (note 61)

- New pests such as termites and Grey silverfish (Ctenolepisma longicaudata). There will be an increase in invasive pest species into the UK which are able to survive due warmer temperatures.

- Loss of revenue.
  Due to the closure of sites because they are too cold or too warm for both staff and visitors.
  'Last year we were thinking about closing because it was too hot for staff.' (note 62)

  Revenue will also be lost due to closure of sites for repair after damage caused by extreme weather.

- Reduced number of visitors in extreme weather events.

- Increased running costs.
  Cultural heritage organisations will face increased costs due to maintenance and repair costs as a result of damage caused by extreme weather, the additional energy used to run mechanical environmental control during periods of extreme weather, for pest and mould remediation and for the conservation of damaged items.

Notes

59: NEMO, Museums in the Climate Crisis. Findings and Recommendations at a Glance. loc.cit.
60: Reference Group 1:1
61: Carbon footprint calculation from LFCP
62: Reference Group 1:1

3.5.3 Other points regarding operating and policy context

- Many museums don’t have, and never have had, environmental control. A “Tiny percentage of the world's collections are in climate control.” (note 63) “Many museums still don’t have any climate control.” (note 64)

- The location of museums and archives in historic buildings or buildings not built for this purpose means that they were not designed to maintain the current environmental conditions required. They are inefficient to heat, difficult to maintain and there are issues around retrofitting.

- Museums and archives report having ‘old’ and ‘out-of-date’ HVAC systems. These are costly to maintain and upgrade.

- Limited access to expertise. The Reference Group expressed concern regarding the fact that there is no central place/body to go to for advice and guidance on good practice/current practice in museums including on collections care and environmental needs of differing materials.

  ‘Who is the body [...] to learn about what to apply for your collection? What is good care for your collection? [...] ‘Who is the authority in the UK? Where do you go? And it seems to be that by default these requirements (GIS) have become that place. And I'm not convinced that GIS is the right place.’

  A lot of people are quite nervous. I've been quite nervous about trying something completely different. What if it damages the object in the long term? What research is out there? Who's researching this? Who can tell you? (note 66)

- Lack of sharing of data. Data and information relating to current good practice for environmental conditions; detailing who is doing what in terms of research on sustainable climate control; energy saving; showing the impact of climate change on heritage and the impact of the sector on climate change exists but is difficult to find and often impossible to access.

  ‘There is a lack of visibility/access to current research and data.’

Notes

63: Zoom in with IIC. ‘International Climate Control Conference’. Julian Bickesteth. 2nd December 2022

64: What do we know about the environmental vulnerabilities of cultural heritage objects? Lukasz Bratasz. ‘International Climate Control Conference’. 2nd December 2022

65: Reference Group 1:1’s

66: Reference Group 1:1

3.6 Challenges of the current operating context.

The challenges of the current operating context makes it increasingly difficult for museums to meet environmental guidelines for their collections.

‘Maintaining environmental conditions is only going to get more and more complex and cost more in terms of the planet.’

You have to keep everything switched on and and and going even if you don't have visitors or your income is lower. [...] A priority is to keep the environmental conditions going. But it could become unsustainable for some institutions.’

‘Big brain drain with redundancies, loss of expertise and people. They go, and it can have an impact on being able to maintain care and environmental guidelines.’ (note 67)

Note
67: Reference Group 1:1’s

3.6.1 Climate change

“The climate crisis and environmental degradation will be the most significant challenges facing all of us over the next decade and beyond.” (note 68)

“Less than 1 in 10 museums have completed an analysis about challenges associated with climate change in their region.” (note 69)

Climate change impacts on museums' ability to maintain environmental guidelines because the hotter summers will mean that it becomes increasingly difficult to maintain temperature control. This has already occurred. In the summer of 2022 temperatures of 27°C in exhibition spaces and above and over 30°C in staff areas were recorded. For those spaces where the climate was mechanically controlled the systems struggled to cope with the extreme temperatures.

'HVAC equipment doesn't know what to do. It wasn't designed to work at those extremes of temperature. HVAC is insufficient for those days.'

'Last summer during the heatwave we found it really difficult, because of chiller capacity. It is undoubtedly more challenging to operate mechanical equipment effectively when you're working in a heatwave.'

'There are complex and compound risks. For example, France this summer had prolonged droughts, which meant that the water levels and rivers were very low. Because they've got a lot of their energy coming from nuclear power stations sitting on rivers they didn't have the cooling capacity which meant that they had to run back their electricity production. And so the combined effects of very hard weather, droughts, and unstable electricity production causes problems. In terms of what we're looking at as temperatures rise, if we're relying on mechanical ventilation systems to keep the temperatures down and to keep the humidity at a reasonable level with power cuts at the same time then we really have a problem.' (note 70)

The effects of climate change are already being seen on the environmental data submitted to ACE for GIS. 'I do occasionally see annotations on graphs. I have started to see comments, saying, **"Well, this peak here, it was extremely**

extreme weather", and extreme weather is starting to feature more. I have seen some museums comment on the fact that broadly their conditions were within the bands, but there were occasions when they ventured outside it, and they would annotate that as the result of the weather.' (note 71)

It is not only the hotter summers which are of concern, rapid changes in weather conditions are also placing items at risk especially with relation to high Relative Humidity. For example, the cold snap in December 2022 led to condensation that ran down the walls in an historic house. The rapidity of the change means that it is unlikely that HVAC systems will be able to respond quickly enough.

Notes

68: Let's Create Strategy. 2020 - 2030. ACE. 2020
69: Museums in the Climate Crisis. Findings and Recommendations at a Glance. 'NEMO'. 2022.
70: Reference Group 1:1's
71: Reference Group 1:1's

3.6.2 Rising energy costs

The rising costs of energy impacts on museums' ability to meet environmental guidelines because of the costs associated with running their mechanical environmental control. "70% of our energy bill is spent on climate control. Energy costs have increased from 9p to 90p per unit." (note 72)

'Switching off one air handling unit for one year has saved £15,000 for one gallery.'

Rising costs of energy [...] may force museums to turn off climate control' (note 73)

Notes

72: Climate Control for Museums and Archives Managers. 19th January 2023.

73: Point of View: Facility Managers/Engineers. ‘International Climate Control Conference’. Karen Keeman. 1st December 2022

3.6.3 Lack of knowledge

The sector lacks knowledge of risk management for collections, preventive conservation and collections care. This has led to an adherence to unsuitable or unnecessary environmental guidelines, and a blind acceptance of guidance on environmental conditions.

The sector also lack knowledge of:

- Building Management Systems for collections care. This also applies to the engineers contracted to provide them.

  ‘Few conservators know how air conditioning systems work, what they do, and how they operate. Conversely, most engineers have a poor understanding of the specialist control requirements in museums [...] engineers attend museum sites with the same approach as they would an office building. A prerequisite for a paradigm shift would be to give conservators the tools for enabling meaningful conversations with engineers [...] which would give them the confidence to engage in effective meetings with engineers and jointly explore creative solutions to environmental control problems.’ (note 74)

- The impacts of climate change on collections and the sector, mitigations, adaptation and the need for immediate action.

Note

74: Reference Group 1:1

3.6.4 Loss of skills and knowledge from the sector

Skilled and knowledgeable staff are being lost from the sector compounding the lack of knowledge.

3.6.5 Reduced funding/ reduced income

Reduced funding/ reduced income means that cultural heritage institutions cannot undertake mitigation action or adaptation such installing LEDs, retrofitting, installing renewable energy, improving rainwater goods and drainage, rehousing projects, upgrading shelving and moving collections. The Network of European Organisations, European Museum Survey found that “The main cause reported as impeding museums’ sustainable transition is a lack of funds”. (note 75)

Note

75: For more information see Museums in the Climate Crisis. Recommendations for the sustainable transition of Europe. NEMO. 2022, p.4

4. Recommendations and areas for future focus or research.

4.1 Recommendations

1. Remove the environmental guidelines stating specific numbers and bands for Relative Humidity and temperature. Replace these with the requirement that environmental conditions are provided which mirror those of the lender for short term loans and the historic conditions for long term loans. Microenvironments should be provided for those items with specific requirements. The environmental conditions are agreed in the loan agreement.

a. The Arts Council Environmental Adviser provides advice and guidance to lenders and borrowers on environmental conditions appropriate to object materials, context and risk management.
b. Include environmental data from the lender about the conditions the item(s) loaned are currently kept in, in all relevant documents including the loan agreement.
c. Ensure that the requirement for Relative Humidity and temperature which mirror the lenders are prominent and plain to see in the Guidelines.

2. Change light limits to doses to allow daylighting more easily.

To follow the recommendation of environmental conditions which mirror those of the lender it is suggested that the lender determines a target light budget (in lux hours) for the period of the proposed loan of light-sensitive objects.

3. ACE becomes the source for advice and guidance on collections care in the UK.

This will address the lack of expertise regarding the care of collections and the loss of skills and knowledge in the sector.

Key areas identified for advice and guidance, maintained up-to-date with the latest preventive conservation science:

- Environmental conditions.
    - Risk factors posed to collections by environmental conditions
    - What environmental control is
    - Why flexibility of application of environmental conditions is desirable
- Risk management for collections care.
- Emerging practice in collections care.
    - Context based rather than a prescribed set of numbers
        - Why the sector is recommending this approach rather than setpoints
    - Balancing the needs of their collections with the demands of sustainability
- Sustainable collections care.
    - Achieving storage and display conditions sustainably
    - Microenvironments: what they are, what they do and how to create them
    - Passive environmental control and how to achieve it
- Mechanical Ventilation Systems.
- Mitigation.
- Adaptation.
- Retrofitting.

An education and awareness campaign on collections care especially around environmental conditions and emerging practice is recommended.

4.2 Areas for future focus and research

Share

ACE should become the hub from which information, data, knowledge and skills created within the cultural heritage sector is shared.

Funding

Provide or, at the very least, signpost cultural heritage institutions to funding for adaptations, retrofitting and maintenance of buildings. A well maintained and well insulated building has more impact on the care of collections than environmental control. A well maintained and well insulated building also reduces energy use and its climate impact.

Research on greenhouse gas emissions related to the provision of environmental control

There is a dearth of data available to quantify the impact of collections care in terms of energy used and greenhouse gas emissions. The lack of data makes decision making on adaptation and mitigation difficult. Quantitative data is needed giving a clear breakdown of museum activities and their associated greenhouse gas emissions, which is comparable across institutions and the sector.

Make the GIS guidelines clear.

- The statements made in the GIS guidelines need to be clear and easy to understand.

- Check the GIS Guidelines for consistency of wording and revise as required. For example, the word standard is used in Part 6 of the Guidelines. It is the only instance where it is used (note 76).

Note

76: Government Indemnity Scheme. Guidelines for non-national Institutions. Part 6. Compensation arrangements in respect of objects loaned by national institutions. January 2016. p57

Make the process easier.

Many comments were made regarding the difficulties associated with using the GIS (see In Practice section). A particular area of difficulty was provision of environmental data.

To improve communication, help with clarity and to make the process easier Case Studies could be made available to show how the GIS works in practice.

Appendices

Appendix 1. Material reviewed

Webinars reviewed

Conversations with ChangeMakers: Strategies for Reducing the Energy Consumption of Buildings. **AIC Sustainability Committee/Icon Sustainability Network.** 22nd February 2023

International Climate Control Conference. **Ki Culture.**1st to 2nd December 2022

Sustainability on Display: Preservation-Friendly Ways of Reducing the Carbon Footprint of Museum Exhibits. Conference. **Image Permanence Institute.** 3rd February 2022

Understanding the Environmental Needs of Museums, Libraries and Cultural Institutions, Angela Moore. Sustainable Preservation: Quick Tips and Approaches for Museums, Libraries and Archives Conference. **Image Permanence Institution.** 6th May 2021

Environmental Guidelines reviewed

American Institute for Conservation (AIC) Museum Environmental Guidelines.

Australian Institute for the Conservation of Cultural Material (AICCM) Environmental Guidelines 2022.

American Society of Heating and Refrigeration Engineers (ASHRAE) 2019.

Bizot Protocol 2015.

BS EN 16893. 2018: Conservation of Cultural Heritage. Specifications for location, construction and modification of buildings or rooms intended for the storage or use of heritage collections.

Canadian Conservation Institute (CCI) Environmental Guidelines 1999

CCI Environmental Guidelines for Museums. David Grattan and Stefan Michalski. 21.09.2017

IIC and ICOM-CC Declaration Environmental Guidelines. (note 77) 2014

Note

77: ICOM-CC: International Council of Museums - Committee for Conservation. IIC: International Institute for Conservation of Historic and Artistic Works

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Bhavesh Shah, Sarah VanSnick and Emily Long. Climate Resilience for Museums. 18th March 2022 https://www.vam.ac.uk/blog/caring-for-our-collections/climate-resilience-for-museum-collections

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Sustainable Collections Management in the Yale Peabody Museum: Risk Assessment, Climate Management, and Energy Efficiency. ‘Bulletin of the Peabody Museum of Natural History. 2018’. 59, p249-268

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Culture: The Missing Link to Climate Action. ‘British Council and Julie’s Bicycle’. October 2021.
https://juliesbicycle.com/news-opinion/the-british-council-executive-report/

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Recommendations for the sustainable transition of Europe. 2022
https://www.ne-mo.org/fileadmin/Dateien/public/Publications/NEMO_Report_Museums_in_the_climate_crisis_11.2022.pdf

Nunberg, Sarah, Eckelman, Matthew J. and Hatchfield, Pamela. Life Cycle Assessments of Loans and Exhibitions: Three Case Studies at the Museum Fine Arts, Boston. ‘Journal of the American Institute for Conservation’. 2016. 55:1, p2-11

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Environmental Statement of Heads of Conservation in the UK. 25th April 2023. https://www.icon.org.uk/resource/environmental-statement-from-heads-of-conservation-in-the-uk.html

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GIS: guidelines for national institutions. V4. January 2016

GIS: guidelines for non-national institutions. V3. January 2016

GIS application form, national institutions. June 2021

GIS non-national application form - designated. June 2021 (4)

GIS non-national application form. June 2021 (4)

Guidance (Version 2). GIS Condition precedent and loan agreements. 7th October 2016

Images template - GIS scheme

State of the Environment Form

GIS temporary suspension of minimum temperature. 16th Dec 2022 https://www.artscouncil.org.uk/search?query=government+indemnity+scheme

Appendix 2. GIS guidelines

GIS 2016
GIS: Guidelines for national institutions and non-national institutions
Part 2
Environmental monitoring and control
2.13 The Secretary of State will need to be satisfied that arrangements have been made for providing a level of environmental monitoring and control necessary for the appropriate and effective care of the object loaned. Some general conditions are contained in Annex D. The Environmental Adviser to the Arts Council can provide additional advice to nationals.

Annex B. National and non-national (Annex B2 non-national institutions with designated collections)
(ii) to manage, safeguard and care for the object(s) in the same manner that this institution would manage, safeguard and care for objects or items in its own collection(s) which are similar to the object(s) loaned as necessary for the appropriate and effective care of the object(s);
(iii) to provide a level of environmental monitoring and control equivalent to that applied to objects or items in our own collection which are similar to the object(s) loaned and which are necessary for the appropriate and effective care of the object(s) loaned; (p.71)

Annex G. Sample Section 16 Indemnity for national and non-national institutions
Environment
9. The borrower agrees to provide a level of environmental control appropriate to the care of the indemnified object, and to comply with any further conditions which the Environmental Adviser of the Arts Council may recommend to the borrower.

But states (both national and non-national):
Part 6. Compensation arrangements in respect of objects loaned by national institutions
Loan from a national to a non-national – standards of security, etc
6.3 In order for non-national borrowers to benefit from taking on objects for which the Exchequer will bear most of the risk, they must at least meet the standards set down by the Arts Council on matters such as security, transport, environmental monitoring and control, and food and drink so that risk to public property is reduced. (p.57)
And
The loan agreement
6.5 When lending objects to non-nationals, the lending national institution should ensure that the following issues are addressed by the terms of the loan agreement with the borrowing non-national institution:

- public benefit
- security and transport (refer to Annexes D to F)
- environmental monitoring and control (refer to Annex D)
- minimum liability
- arrangements for condition reporting

Annex D. General Security conditions and environmental conditions which apply under the GIS (national and non-national)
7. environmental conditions to be maintained 24 hours a day, seven days a week throughout the loan period from the time the indemnified object arrives until it departs from the loan venue.
8. Museums must monitor Relative Humidity, temperature, light and UV levels through the loan period in the space within which the indemnified object is contained.

Annex C. Model application form for non-national institutions (not in application form for nationals - no Temperature/Relative Humidity guidelines given)

Environmental control

9. [...] it is possible that additional environmental conditions may be added to the terms and conditions of the offer of indemnity, particularly where fragile material is involved. (p.65)

From the application form for non-nationals:
“The minimum and maximum conditions for Relative Humidity per week will be within the band 40-65% with a maximum cycle of 10% within 24 hours, and temperature within the band 16°-24°C with a maximum cycle of 4°C within 24 hours.” (4ii., p.69)

There may be good reason for not maintaining these conditions, if so please provide an explanation:

Appendix 3. Other published environmental guidelines and standards

AICCM Environmental Guidelines 2022

- Context based - separates guidance into **temperate** and **humid**

Temperate = 15 to 25°C
40% to 60%RH (50+/- 10%RH)

Humid = 15 to 25°C
45% to 65%RH (55+/-10%RH)

Provisions

- Stable diurnal drift in temperature and relative humidity (RH) within the deadbands is the optimal outcome. (note 78)
- Multiple short-term fluctuations of 5 to 10% RH that are longer in duration than two hours should be investigated and addressed
- Unstable temperatures, such as rapid increases or multiple short-term fluctuations of more than 4°C should be investigated and addressed
- Temperature and relative humidity parameters for the preservation of cultural material will differ according to their materials, construction, and condition. Constant conditions maintained within the parameters described above are generally acceptable for most objects in stable condition. (note 79)

‘AICCM recognises that sustainable and resilient conservation practice comes from an ability to balance advocacy for and practice in collection care in response to other priorities such as an organisation’s mission, function, programming and resources.

AICCM will periodically review the published Environmental Guidelines to ensure that the recommendations remain current and applicable to the national cultural heritage profession, collection care practices, climate change and local climatic conditions.’

Notes

78: Have moved away from 2018 provisions which defined acceptable fluctuations to acceptable diurnal drifts.

79: https://aiccm.org.au/conservation/environmental-guidelines/ Accessed 20th December 2022.

ASHRAE 2019
- Advocates a risk management perspective.
- Consider the role of local climate and seasonal variations.
- Does not set one generalised target instead splits into context based recommendations for ‘Modern Purpose Built Buildings or Rooms’, ‘Historic House Museums’ and ‘Open Structured Buildings and Historic Houses’.

BIZOT 2015 (also referred to as Bizot Green Protocol)
Guiding principles
Museums should review policy and practice particularly regarding loan requirements, storage and display conditions and building design and air conditioning systems with a view to reducing carbon footprints. Museums need to find ways to reconcile the desirability of long term preservation of collections with the need to reduce energy use.

Museums should apply whatever methodology or strategies best suit their collections, building and needs, and innovative approaches should be encouraged. The care of objects is paramount. Subject to this,

- environmental standards should become more intelligent and better tailored to specific needs. Blanket conditions should no longer apply. Instead conditions should be determined by the requirements of individual objects or groups of objects and the climate in the part of the world in which the museum is located;
- where appropriate, care of collections should be achieved in a way that does not assume air conditioning or other high energy cost solutions. Passive methods, simple technology that is easy to maintain, and lower energy solutions should be considered:
- natural and sustainable environmental controls should be explored and exploited fully;
- when designing and constructing new buildings or renovating old ones, architects and engineers should be guided

significantly to reduce the building's carbon footprint as a key objective;
- The design and build of exhibitions should be managed to minimise waste and recycle where possible.

Guidelines
For many classes of object containing hygroscopic material (such as canvas paintings, textiles, ethnographic objects or animal glue) a stable relative humidity is required in the range of 40 to 60% and a stable temperature in the range 16 to 25°C with fluctuations of no more than 10% RH per 24 hours within this range . More sensitive objects will require specific and tighter relative humidity control, depending on the materials, condition, and history of the work of art. A conservator's evaluation is essential in establishing the appropriate environmental conditions for works of art requested for loan.

The Bizot Protocol is being refreshed to reflect the further shifts in knowledge, evidence, technology and appetite for change. The refreshed version is due to be published in June 2023.

BS 5454:2012. Guide for the storage and display of archival materials.
Withdrawn on publication of BS EN 16893:2018

BS EN 16893:2018 Conservation of Cultural Heritage. Specifications for location, construction and modification of buildings or rooms intended for the storage or use of heritage collections.
4.3 Environmental Strategy
4.3.1 General
An environmental management strategy should be developed, based on an assessment of the needs of the collection. The strategy shall include a statement of the expected collection lifetime and the energy demand arising from the environmental

conditions needed to achieve this, taking into account the sensitivity, significance and use of individual collections items.

The strategy shall make clear the balance the organisation intends to aim for between conservation requirements, collection use and energy economy.

4.3.3 Specifications for environmental protection

The environmental specifications for collections shall include:

1) the permissible upper and lower limits for temperature and a desired seasonal drift;
2) the permissible upper and lower limits for relative humidity and a desired seasonal average;

5.3.4.1 General

Most collection types can be stored in an environment (relative humidity and temperature) that changes gradually over an annual cycle, which can be achieved through passive means.

BS EN 17820: 2023 Conservation of Cultural Heritage - Specifications for management of moveable cultural heritage collections.

4. Principles for managing collections, 4.1. Overview and responsibilities, 4.1.d

A collecting organisation shall pursue its operations in an environmentally sustainable manner seeking to minimize its environmental impacts wherever possible, including minimizing its use of energy and its carbon footprint.

Annex D (normative)
Caring for collections

D.3.7 The organization shall commit to establish and carry out the following operations and procedures:

a) regularly inspect buildings housing collections, record the findings, and specify and seek improvements, including reducing energy use and carbon emissions.

(Replaces BS PAS 197: 2009 Collections Management.)

Canadian Conservation Institute (CCI)
Provide a general introduction to the current approach to controlling ambient relative humidity and temperature in museums intended for all museum professionals based on the "Museums, Galleries, Archives and Libraries" chapter in the American Society of Heating, Refrigeration, and Air Conditioning Engineers Inc. (ASHRAE) Handbook.

There are five Classes of Control: AA, A, B, C, and D. Within control levels AA, A, and B, seasonal adjustments are noted separately from permissible short-term fluctuations. For control levels C and D, the wide fluctuations specified could result from either purposeful seasonal adjustments, or from short-term fluctuations, or from both (which is usually the case).

Environmental conditions affect objects in many ways. Some objects are vulnerable in conditions that may not affect other objects at all. Some attempts to improve conditions for an object might actually affect it adversely. For example, moving an object from a poor environment to a theoretically better one might cause severe mechanical damage. There is simply no one-size-fits-all pattern for good environmental control strategies, nor is there likely to be, no matter how good HVAC engineering becomes. Understanding how environmental factors affect collections helps conservators make consistently good choices. (note 80)

In 2023 CCI’s Climate Guidelines (an interactive tool to develop risk based local guidelines) will be launched.

Note

80: https://www.canada.ca/en/conservation-institute/services/preventive-conservation/environmental-guidelines-museums.html

ICOM-CC and IIC 2014 Declaration on Environmental Guidelines

Sustainability and management

- The issue of museum sustainability is much broader than the discussion on environmental standards, and needs to be a key underlying criterion of future principles.
- Museums and collecting institutions should seek to reduce their carbon footprint and environmental impact to mitigate climate change, by reducing their energy use and examining alternative renewable energy sources.
- Care of collections should be achieved in a way that does not assume air conditioning (HVAC). Passive methods, simple technology that is easy to maintain, air circulation and lower energy solutions should be considered.
- Risk management should be embedded in museum management processes.

Museum environment

- It is acknowledged that the issue of collection and material environmental requirements is complex, and conservators/conservation scientists should actively seek to explain and unpack these complexities.
- Guidelines for environmental conditions for permanent display and storage should be achievable for the local climate.

Loans

- There needs to be transparency about actual environmental conditions achieved in museums to ensure that realistic requirements are made for loan conditions.
- Noting that most museums in the world have no climate control systems in their exhibition and storage spaces, we acknowledge the need for a document that will influence decision makers that the environmental conditions for

international loans may not be appropriate for the permanent display and storage of collections in all museums.
- There needs to be flexibility in the provision of environmental conditions for loans from museums which have climatic conditions different from the set points in the guidelines. This may be achieved with alternative strategies such as microclimates.

PAS 198:2012 Specification for managing environmental conditions for cultural collections.
Withdrawn on publication of BS EN 16893:2018