CLIMATE CHANGE CASE STUDY

GREENER ARCHIVES: MAKING CONSERVATION MORE SUSTAINABLE

Circular Economy

HISTORIC ENVIRONMENT SCOTLAND | ÀRAINNEACHD EACHDRAIDHEIL ALBA

INTRODUCTION

Historic Environment Scotland's (HES) Archive Conservation team, based at John Sinclair House in Edinburgh, looks after the archives held by HES. These include over five million historic photographs, drawings, records, books and other materials that offer a rich insight into Scotland's past. The team takes great care to ensure that these precious archives are preserved for future generations.

To do so, they undertake preventative and interventive measures, including remedial treatments, re-boxing, improving shelving, and appropriately adapting the environment in which the collections are stored, moved, displayed and accessed. In the past, some of these measures have been energy or resource intensive: air conditioning that is used for environmental control, plastics for protecting archives during transportation or in situ, and cleaning supplies for everyday maintenance. Yet, over the last couple of decades, the focus of the conservation community has shifted towards making its practices more energy efficient, environmentally responsible and sustainable. Much of this change has focused on infrastructure development to reduce dependency on energy-intensive systems. However, the Archive Conservation team has also found other ways to do its part for the environment.

Reducing the carbon footprint and environmental impact of an archive is a challenging task due to the requirements of conservation. However, as part of the HES network of 'Green Champions', the Archive Conservation team has considered every part of the operations and practice and identified areas for improvement. The team have adapted the Waste Hierarcy from the Waste and Resource Plan, and use the Refuse, Reduce, Reuse, Recycle and Rot (5Rs of Sustainability) approach to assess their practices and take action to minimise their carbon footprint and environmental impact.

This case study explores the Archive Conservation team's implementation of the 5Rs and details the positive outcomes they have achieved. It offers a valuable insight into how the HES archives are being sustainably protected and conserved for future generations.

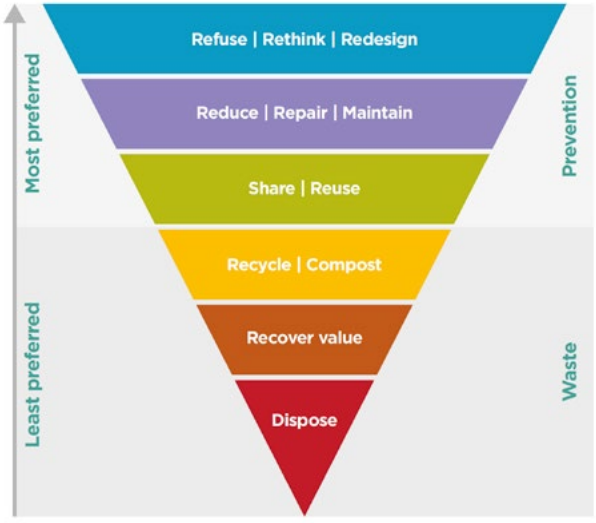

Fig. 1: The Waste Hierarchy from the HES Waste and Resource Plan.

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Key findings

The key findings of this case study show that:

- Following a framework such as the 5Rs of sustainability can have a profoundly positive environmental and social impact, instilling sustainable practices at all stages within work operations.
- A hierarchy of action, with Reuse being a priority and Rot being a last resort, creates a robust method for minimising environmental impact.
- The changes that have been made (and are continuing to be made) by the Archive Conservation team have suceeded in reducing waste, limiting environmental harm and enhancing social benefits.
- Fully integrating environmental considerations into project planning and time management ensures that sustainability is not an afterthought, and instead enhances the outcome of any project.
- Even in sectors with clear challenges, such as archive conservation, there are always opportunities to improve environmental sustainability.

REFUSE

A fundamental aspect of the Archive Conservation team's environmentally responsible strategy is the principle of refusal. This means carefully assessing whether new items are necessary before making a purchase. Rather than always buying in bulk to take advantage of discounts, the team only purchases essential quantities. This approach prevents surplus materials accumulating in storage and potentially being discarded in the future due to loss of information about their intended purpose.

To further minimise environmental impact, the team has transitioned to using plant-based cleaning products in workspaces, and refusing plastic bottles and resultant waste by refilling containers at a local refill shop. Whenever possible, the team prioritise local suppliers for the purchase of essential items such as cotton wool and paintbrushes. This not only supports the local economy but also reduces the carbon footprint associated with delivery and allows for the refusal of plastic packaging.

The commitment to refusing single-use items has been strengthened through the installation of a washing machine in the John Sinclair House building. This enables reusable alternatives such as cloths, hand towels, lab coats and aprons to be cleaned and maintained rather than discarded. When acquiring these reusable items, the team considers sustainability by choosing suppliers with environmentally responsible practices and, where possible, opting for products made with recycled materials.

"Our first question when we consider getting something new is, do we really need it?"
Conservation Manager

REDUCE

In recent years, the wider archives community and other cultural institutions have become more conscious of their environmental impact, particularly in terms of energy usage and dependency on plastic materials. This growing awareness helps to reduce environmental harm while safeguarding valuable collections. The Archive Conservation team is committed to minimising its environmental impact by reducing energy consumption and plastic usage. These efforts align with broader sustainability goals.

Reducing energy consumption

Maintaining optimal environmental conditions is essential for storing archives, traditionally requiring air conditioning systems to regulate temperature and humidity. However, the Archive Conservation team has implemented strategies to reduce energy use while maintaining the specific environmental conditions required to protect collections from damage.

One significant measure involved monitoring and optimising air conditioning use within storage areas. In 2018, it was discovered that two air conditioning units were underperforming, creating potentially harmful conditions for the collections. Through a monitoring programme, it was demonstrated that in some cases, natural conditions provide suitable conservation environments without the reliance on energy-intensive systems. This highlighted the importance of monitoring environmental conditions closely before installing or relying on systems that may not be necessary and are potentially harmful.

For the largest archive Strong Room (a storage room with additional security), maintaining natural conditions is more challenging due to its three external walls. Here, seasonal temperature adjustments were introduced. This strategy aligns the room's conditions more closely with the external environment, stabilising relative humidity (RH) levels, while reducing overuse of heating and cooling systems, thereby saving energy. Additionally, to minimise the use of energy-intensive mechanisms, passive RH control (for example, without mechanical ventilation systems) has been adopted in freezer storage for at-risk collections. This has been particularly effective in reducing energy consumption, as humidity control is generally more energy intensive than temperature control.

Another key improvement involved enhancing insulation in the Cool Climate Store (8–15° C and 30–50% humidity to slow deterioration of the collections), located at the centre of the archive building. Prior to 2018, its lack of insulation resulted in excessive energy consumption and wastage. Following a thermal imaging study by the HES Heritage Science team, areas for improvement were identified, leading to the installation of insulation in wall cavities, ceilings and floors. This upgrade has reduced heat loss and overall energy consumption, extending the lifespan of essential equipment while maintaining optimal storage conditions.

Lighting upgrades have also played a role in managing energy use. The team's ongoing lighting improvement program has been progressively replacing outdated light fixtures from the 1990s with energy-efficient LEDs. Additionally, automatic lighting has been installed in one of the print rooms, lowering energy

consumption and minimising unnecessary light exposure to unboxed collections. This not only conserves energy but also extends the life of the materials stored in those areas.

Reducing plastic usage

Plastic materials have traditionally been used in archival conservation for protection and isolation purposes. However, recognising the environmental challenges associated with plastic waste, the Archive Conservation team has taken steps to reduce reliance on these materials by finding alternatives where possible.

To cut down on plastic use during collection moves, the team chooses plastic-free transportation methods whenever weather conditions and facilities permit. Where plastic is necessary, they reuse plastic sheeting from previous deliveries or moves (Fig. 2). Similar efforts have been made to replace polyester sleeves, which are often used to protect fragile materials, with paper support folders, a more sustainable and eco-friendly alternative. While high-quality plastic remains essential for long-term storage in specific cases, the team's priority is to limit the use of single-use plastics wherever feasible.

Plastic usage has also been reduced in the storage of mould-damaged archives through the implementation of a mould management strategy. This proactive approach focuses on cleaning and preventative measures to control and mitigate mould growth, decreasing the need for plastic isolation materials. Plastic packaging is also routinely saved and reused for future archival purposes (Fig. 3), such as for isolation during quarantine procedures.

Fig. 2: Use of plastic in temporary archive protection.

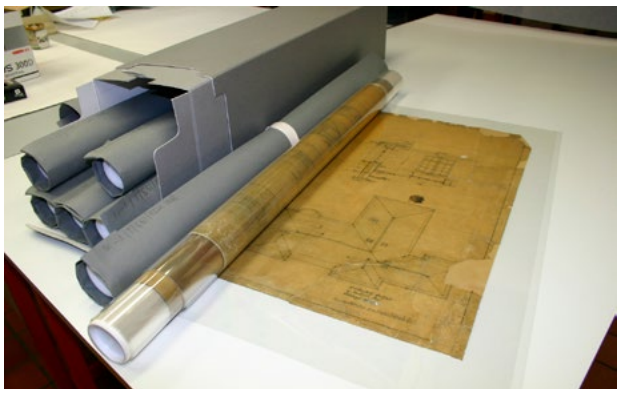

Fig. 3: Use of plastic in permanent archive protection.

"Our priority remains minimising the use of single-use plastics."
Paper Conservator

REUSE

Whenever possible, the Archive Conservation team incorporates reuse into its conservation practices, despite the challenges posed by contamination from chemicals, mould or dirt. By implementing innovative solutions, the team ensures that materials are repurposed without compromising best practices for collection care.

One key initiative is the reuse of old, unwanted books, photographs and files for emergency response training. These reused materials provide practical, hands-on experience in handling wet and damaged collections, equipping team members with essential skills needed to respond effectively in crisis situations (Fig. 4).

The team has also adopted sustainable alternatives for personal protective equipment and work textiles. Single-use lab coats and aprons have been replaced with washable, reusable options. Nitrile gloves, which are essential for some archive conservation tasks, are now washed and reused whenever possible to extend their lifespan. At the end of their life, the gloves are recycled through TerraCycle. Reusable masks have also been introduced for mould remediation and solvent work, reducing waste while maintaining a safe working environment.

In a recent project, hundreds of old boxes that no longer met the team's storage needs were redistributed to other cultural organisations, including DC Thomson

Fig. 4: Emergency Response Training Session using second-hand and deaccessioned materials.

and the National Trust for Scotland. This initiative allowed materials to remain in use rather than being discarded, promoting a circular approach to resource management.

Sustainability has also been a key consideration in shelving solutions. New shelving installations have been selected with future reuse in mind, as they can be dismantled and reassembled without damage, an essential factor in the team's future relocation. Additionally, plan chests (a drawer system for holding large drawings or plans flat) from other parts of the organisation have been repurposed, reducing the need for new storage units and minimising material consumption (Fig. 5). To further support reuse efforts, the team utilises the Warp It platform to rehome unwanted frames and boxes, helping these items to find a new purpose within the wider community.

Even packaging materials from deliveries are being repurposed, often finding new life in at-home art projects. This creative approach diverts materials from landfill by turning discarded items into opportunities for imaginative reuse.

By prioritising reuse in conservation practices, the Archive Conservation team demonstrates that sustainable solutions can have far-reaching benefits for both the environment and conservation practices.

Fig. 5: New shelving with reused plan chests inserted.

RECYCLE

The Archive Conservation team is deeply committed to following HES recycling policies, continually seeking ways to improve waste management and repurpose as many materials as possible. For specialist materials that cannot be recycled due to contamination or composition, the team takes a proactive approach to identifying sustainable disposal methods.

Over the past five years, the team has contributed to 'loose parts play' initiatives (using everyday objects to boost children's creativity in play). They have donated a variety of items to community groups, with a particular focus on supporting and benefiting disabled groups in the local community. Items recycled in this way have included emergency kit helmets, which expire under health and safety regulations after just five years. Heavy-duty gloves, large pieces of cardboard, tubes, old lamps, and nonfunctional equipment have also found new life in creative and educational projects instead of being discarded.

Additionally, TerraCycle boxes have been introduced in the archives offices, allowing for the recycling of items that cannot be processed through standard municipal recycling streams. These include nitrile gloves, shipping materials, shrink wrap, bubble wrap, Plastazote, pens and hard hats. The team continues to explore additional specialist recycling streams to divert more materials from landfill.

To promote a culture of recycling, engaging posters have been placed in prominent locations to encourage best practices among staff. A particularly notable example of the team's commitment to waste reduction and recycling was during a large-scale clear-out. When a skip was initially proposed for disposing of unwanted materials, the Archive Conservation team intervened, ensuring that all items were assessed for reuse, recycling or redistribution via the Warp It platform.

"We have found these initiatives foster a sense of community and creativity."
Conservation Manager

ROT

Where reuse and recycling are not viable, the team explores biodegradable alternatives to prevent unnecessary landfill waste. Some conservation tasks, particularly mould remediation and chemical treatments, render nitrile gloves non-recyclable. To address this, a stock of biodegradable gloves is maintained. When disposal is unavoidable, these gloves can break down more effectively in general waste rather than contributing to long-term plastic pollution.

As the final option in the waste hierarchy, rot or disposal is always considered a last resort. By continually adjusting processes and identifying sustainable alternatives, the team keeps its environmental impact to a minimum across all aspects of archival conservation.

A GREENER FUTURE

Looking ahead, the Archive Conservation team is actively integrating the costs of environmentally friendly practices into its budget planning. For example, sustainability initiatives such as TerraCycle recycling are accounted for in financial projections.

Recognising that balancing time management with sustainability practices can be challenging, the team is embedding environmental considerations into all planning stages. This helps to set realistic expectations for project timelines while ensuring that sustainability remains a core principle.

Sourcing continues to prioritise sustainability, with procurement decisions favouring local suppliers and environmentally responsible production methods. In a recent supplies contract, for example, cost and sustainability were equally weighted, embedding green purchasing into the decision-making process. To maintain momentum, sustainability is a standing agenda item in weekly team meetings, providing a dedicated time to discuss new initiatives and track progress. Green principles are also integrated into major projects, such as archive relocations and the development of a new building repository. The archive management is keen to explore and support options for a repository designed to Passive House standards, a model that offers a stable archive environment while significantly reducing energy demand.

The efforts outlined within this case study mark just the beginning of an ongoing commitment to environmental responsibility, with the team continually seeking new ways to protect both archival collections and the planet.

WANT TO KNOW MORE?

This case study forms part of a series of Climate Change Case Studies. It is part of our work to reduce our environmental impact as set out in our Waste and Resources Plan and Climate Action Plan.

Our Climate Action Plan outlines how we intend to work towards making our organisation more prepared for, and resilient to, changes in our climate, while also playing a leading role in supporting the Scottish Government to meet its ambitious climate change targets.

To find out more about our Climate Change projects, have a look at our published Climate Change Case Studies, or contact our team:

E: climatechange@hes.scot

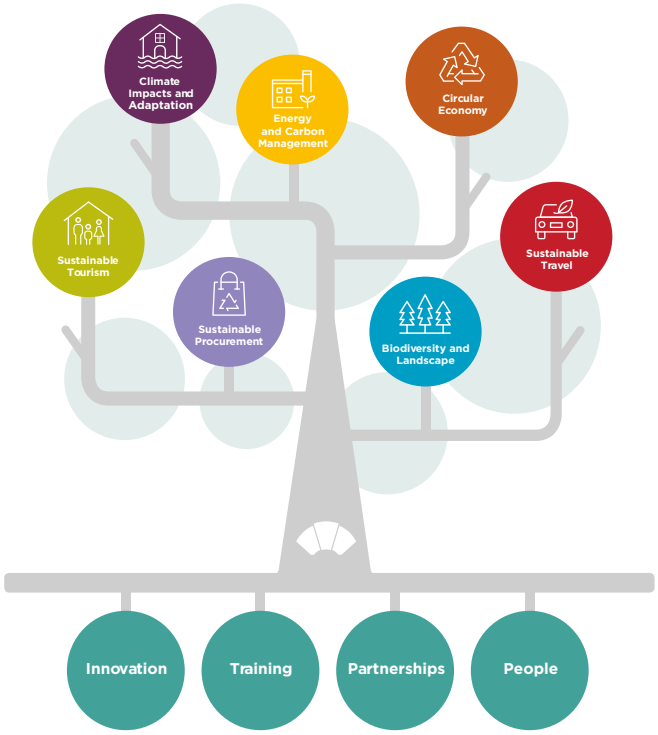

Fig. 6: HES Climate Action Plan themes.

HES RESOURCES

We have a variety of research, guidance, and information covering a range of topics relating to the historic environment. These are all free to download from our website: Historic Environment Scotland publications. They include the following series:

INFORM Guides
These leaflets provide a brief introduction to over 50 subject areas of historic environment conservation, maintenance and repair.

Short Guides
Our Short Guides give a more detailed overview of best practice techniques when working with historic buildings. Topics include energy efficiency, repair and maintenance, climate change adaptation and micro-renewables.

Refurbishment Case Studies
This series details the findings from our on-site work trialling and testing techniques for the repair, maintenance and upgrading of traditionally constructed buildings and components. Topics include energy efficiency works, retrofitting and techniques and materials.

Technical Papers
These papers cover the results of technical research carried out or commissioned by HES. They include topics such as thermal performance of traditional windows, U-values and traditional buildings, keeping warm in a cool house, and slim-profile double glazing.

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