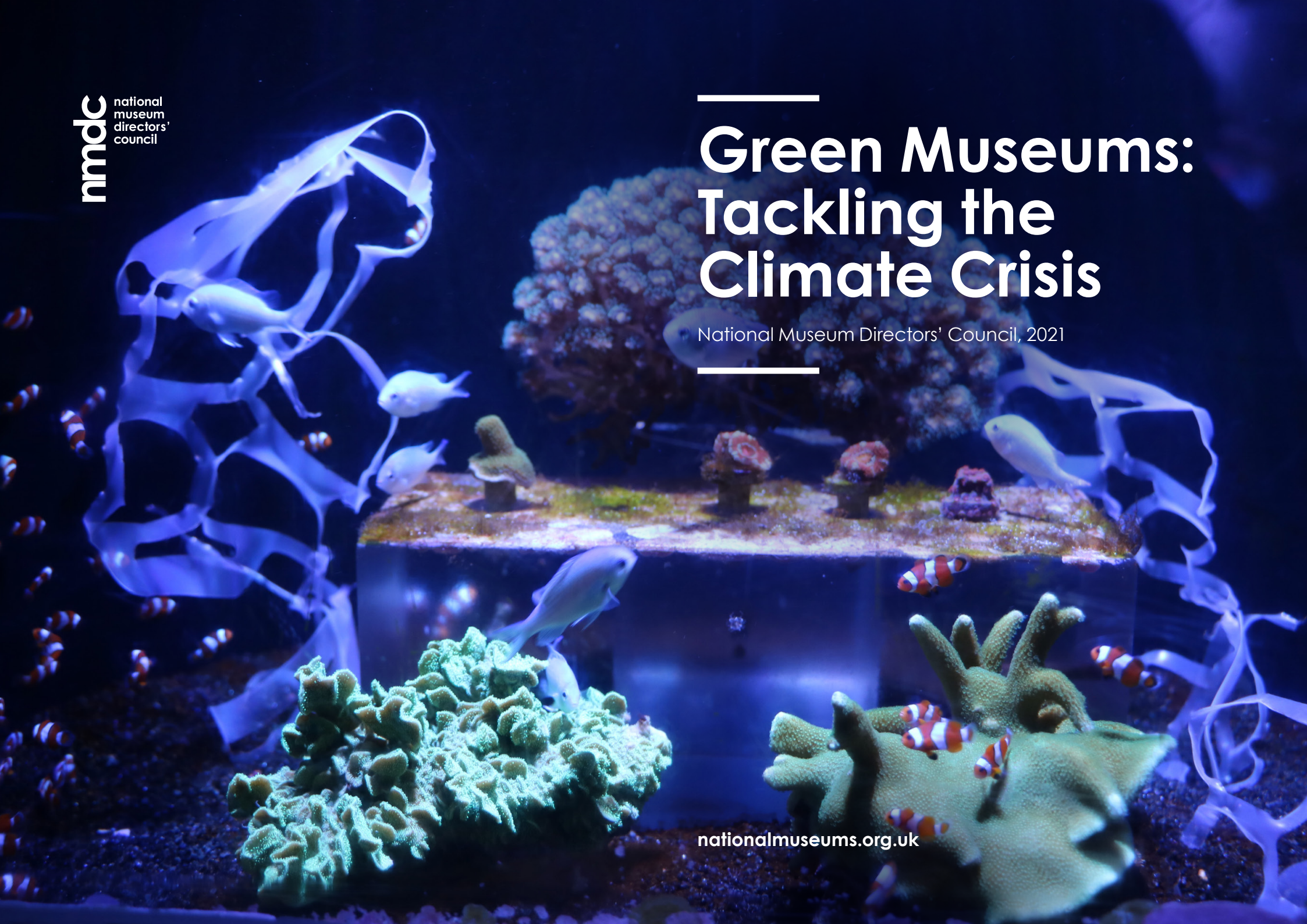


nmdc national museum directors' council

Green Museums: Tackling the Climate Crisis

National Museum Directors' Council, 2021

nationalmuseums.org.uk

Contents

Foreword

This report highlights the many ways in which members of the National Museum Directors' Council are tackling the climate and biodiversity crises. These case studies demonstrate the key contribution which museums and their partners are making to advancing science, changing human behaviour and working alongside governments to help safeguard the future of our planet.

Tackling climate change is a global challenge which requires all countries and communities to get into crisis mode and work together if we are to succeed in combating this existential threat.

As cornerstones of civil society with high levels of public trust, museums are uniquely placed to instil in the public a sense of urgency through action-orientated exhibitions and to portray a more hopeful future. The examples in this report demonstrate the excellent work which is already underway across the UK's museums to encourage audiences to undertake positive change.

Motivating change not only comes from public programming but from museums' own commitments to sustainability. Working towards Net Zero within museum estates lessens their own environmental impact, and openness and transparency about this work inspires visitors and partners to assess the environmental impact of their own lives.

Museums, along with their partners and audiences, have huge opportunities to continue to contribute and grow their impact – helping to turn the tide on the climate crisis by striving for carbon neutral operations, conducting world-leading research and inspiring audiences.

Mary Robinson
Adjunct Professor of Climate Justice, Trinity College Dublin.

Image credit

Cover:
Beat Plastic Pollution photo courtesy of Horniman Museum and Gardens

01

Research

Museums are committed to conservation and research. They use their collections, including extensive natural history and science collections, to conduct research which makes a huge contribution to fighting the climate crisis. Much of this work takes place as part of cross-sector partnerships bringing together curators, scientists and academics from museums, universities and research organisations across the globe. These projects focus on a range of issues facing the planet from protecting ocean ecosystems to understanding biodiversity and preventing further extinctions.

Butterflies Through Time
University Museum of Zoology, Cambridge

The Esmée Fairbairn supported *Butterflies Through Time* project connects historical museum collections with contemporary conservation initiatives. Specimen data are guiding habitat restoration work on nature reserves, in collaboration with local conservation organisations whilst engaging the public with environmental change.

One site targeted by this project is the Great Fen, where work is taking place to re-wet a 3700-hectare area, and link up two remaining fragments of fenland in north Cambridgeshire, after 99% of this biodiverse habitat is believed to have been lost in the UK since the 17th century. Museum specimen data are helping to provide a clearer understanding of past wildlife that lived in the area, giving a historical baseline for biodiversity, against which the success of the restoration can be gauged.

Two species of fenland-specialist butterfly held in the collections at the University Museum of Zoology (UMZC) highlight how these historical specimens can also engage new audiences. The swallowtail and large copper butterflies were once common in Cambridgeshire but went locally and nationally extinct due to fenland drainage. Showing the public extinct species that used to live in the area gives a clear demonstration of how much the environment has changed and what has been lost as a result. This information can engage publics with why conservation efforts are needed and highlight work aimed at halting biodiversity declines.

In another project, the chequered skipper butterfly is undergoing a reintroduction programme in England. As part of this, researchers are gathering data from historical specimens, including at UMZC, to find where and when it used to exist in Britain. This will help address why the species became extinct in certain locations when it did and inform decision-making when selecting reintroduction sites.

Image captions

Previous page:
Large copper butterfly © University of Cambridge.

Right:
Image shows sediment from the extinction layer in North America. © Dr Rhodri Jerrett, Department of Earth and Environmental Sciences, University of Manchester.

Testing Climate Change at the Extinction Event
Manchester Museum

Manchester Museum is the public engagement partner in a three-year £580K Natural Environment Research Council (NERC) funded project to study climate change at the extinction event 66 million years ago.

A mass extinction at the end of the Cretaceous period, 66 million years ago led to the demise of most of the dinosaurs and the majority of species on land and in the sea. A meteor impacted in the Gulf of Mexico at this time, but how exactly did the meteor impact cause mass extinction?

Scientists at the universities of Manchester and Plymouth have been studying the composition of fossil molecules from bacteria which lived in peat which was accumulating at the time of the meteor impact. By studying their composition, it is possible to reconstruct the temperature change that happened because of the meteor impact.

Global warming is forecast to exceed 2°C above preindustrial temperatures by 2100. Current climate models find it difficult to predict how the oceans and atmosphere distribute the warming around the planet. Atmospheric CO_2 levels forecast for 2100, were last experienced between 34-100 million years ago, so this study will provide evidence to better predict the Earth's future.

This research will be a central story in the Museum's new dinosaurs display and learning and public programmes in development, due to open as part of the hello future project in late 2022.

Reef Refugia Project: Adaptation of the Coral Triangle over 30 million Years

Natural History Museum

Coral reefs are the most diverse marine ecosystems on Earth and provide enormous economic value for hundreds of millions of people including through fishing, tourism, and coastal protection. However, reefs are under increasing threat from local and global human impact, from pollution and overfishing to acidity linked to rising carbon dioxide.

Although reef ecosystems in clear and shallow water capture popular imagination and may appear healthier, there is increasing evidence that so-called marginal reefs living in turbid or deeper water can be more resilient to bleaching, changes in water quality and other impacts. Many species thriving in this darker muddier water are also found in more typical reef habitats so these reefs might be critical for maintaining resilient populations of corals; however, they are poorly understood.

A NERC-funded project led by the Natural History Museum is increasing understanding about marginal reefs across geographic regions and through time, to see how reefs have adapted to changing environmental conditions. To work out the reasons behind these corals' success, researchers must search much further back in our planet's history. The Natural History Museum cares for an extensive coral collection, including corals collected by Charles Darwin on the voyage of the Beagle in the 1830s and ancient fossil corals including rugose and tabulate corals from Dudley in the West Midlands dating back 440 million years. The Coral Triangle region of Southeast Asia seems to have been home to the greatest reef biodiversity at least 20 million years with two-thirds of reef-building coral species living in the region today. Analysis of large scale datasets – including recently-discovered fossils from the Coral Triangle, further examples from the fossil record and present-date ecological data – sheds light on how coral has evolved in turbid water reefs. Over 2019-20, the team carried out four fieldwork seasons in collaboration with the University Malaysia Sabah (UMS) taking and analysing reef video surveys and corals, giant clams and sediment and water samples, with further environmental data collection in 2020-21. Understanding how coral has responded to past environmental change helps us predict how it will respond to future challenges including warming ocean temperatures. This aids development of management strategies, including whether coral from marginal reefs could be used to repopulate clear-water reefs that have been bleached. Study sites in Darvel Bay will soon become part of a new marine protected area defined by Sabah Parks in Malaysian Borneo, thanks in part to data collected through the project and presented to policymakers, with further workshops planned in Malaysia with conservation agencies in 2022. The project is continuing after leveraging Horizon 2020 Excellent Science funding worth £3.2m from 2019-2023.

> "Museum climate research and collaboration informs policy development across the globe."

Image caption:
Pavona and Porites coral colonies living in a turbid habitat in Malaysia © The Trustees of the Natural History Museum, London

02

Public Engagement

Due to high levels of public trust in museums, exhibitions and outreach programmes have a role to play in informing audiences about environmental issues and inspiring them to take positive action. Some exhibitions and installations are created specifically to engage the public with the climate crisis whilst others interpret and present collections without an intrinsic link to environmental concerns through a new lens.

Growing Together
Royal Albert Memorial Museum and Art Gallery

The Royal Albert Memorial Museum & Art Gallery's (RAMM's) newest community initiative placed planting and growing at the centre of improving community wellbeing in Exeter.

As spring unfolded after a long winter in lockdown, the team at RAMM produced six 'Growing Together' seed activities to take part in. Inspired by the museum's upcoming seed exhibitions for summer 2021, *Seedscapes: Future-Proofing Nature* and *Léonie Hampton: A Language of Seeds*, the packs encouraged participants to plant one species a week, and learn a few fun facts along the way.

The seeds included aromatic herbs, bright flowers and medicinal blooms, such as calendula, basil and sunflowers. All were bee and nature-friendly and easy to care for in a garden or on a windowsill. The museum sent free seed and info packs out to around 50 different community groups, such as Ladysmith Infant and Nursery School, Refugee Support Devon, and Exmouth's Deaf Academy. Members of the public could also order their Growing Together seed and info packs from RAMM's online shop at a subsidised price. Each new seed planting activity was released on the RAMM social media channels every Monday between early April and mid-May 2021. Participants were encouraged to engage and share their seed planting journeys with RAMM and other members of the growing community online.

The project aimed to inspire local communities across Exeter and the wider Devon community to come together and re-ignite their love of nature. The pandemic situation had a drastic impact on people's mental health. Data reveals that, at its peak, over half (53.1%) of British people reported that it had affected their wellbeing. The project helped to empower people to feel less isolated, bring happiness and relief into their lives and learn a few skills along the way after a difficult period of lockdown.

> "Museums inspire communities and help them to reconnect to nature."

Image captions

Previous page:
Growing Together © Royal Albert Memorial Museum

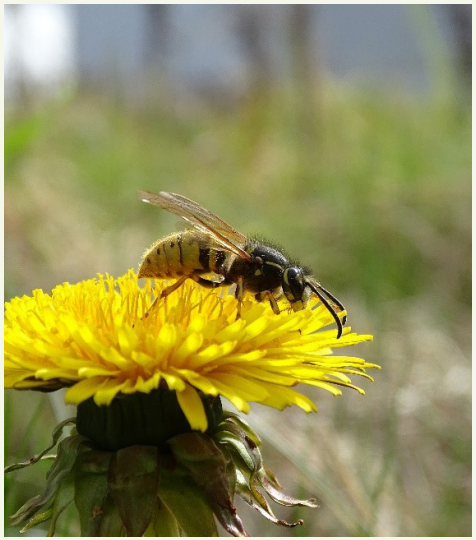
Next page:
Common wasp queen, Vespula vulgaris
© National Museums Scotland

Urban Biodiversity
National Museums Scotland

National Museums Scotland is developing Biodiversity Action plans for all its sites. Each offers very different opportunities ranging from the main site in the centre of Edinburgh and its rooftop terrace to the National Museum of Flight at East Fortune in East Lothian located in an agricultural environment.

The National Museums Collections Centre (NMCC) in Granton, North Edinburgh, houses the majority of NMS' 10 million natural science specimens and visitors are received from around the world who wish to use the natural science collections to better understand all aspects of our changing natural environment. Where better than the grounds of the Collections Centre and the adjacent property owned by National Galleries Scotland to demonstrate to local residents how, even in an urban environment, we can make a positive impact on biodiversity in our own back gardens? The museum's natural scientists, together with the Learning and Engagement and Collections Services teams, are collaborating with local community groups, schools, the Royal Botanic Garden Edinburgh and National Galleries Scotland to bring awareness of urban biodiversity.

The team has begun a base-level survey of the biodiversity of NMCC site and the plan is to continue through the next year to record seasonal variations. Introducing some modest interventions (reduced grass cutting and halting the use of pesticides for example) as part of a community engagement program, they will continue to regularly survey the site to demonstrate the role of modest interventions in enhancing local biodiversity and to celebrate the urban environment. All the biological records and changes recorded will be posted on social media channels and web pages. This is planned as a long-term recording scheme linked to the wider Waterfront development at Granton.



Beat Plastic Pollution
Horniman Museum and Gardens

***Beat Plastic Pollution* was a pop-up display in the Horniman Aquarium which, overnight, inserted more than 150 items of single-use and waste plastic into the Horniman's permanent aquarium exhibits, including replacing one of the best-loved displays – the jellyfish – with around 30 plastic bags.**

Alongside frogs, fish, seahorses and coral reefs, visitors saw flip-flops hanging from mangrove trees, yogurt pots polluting the Amazon, and drinks bottles lining a British pond. Each exhibit was accompanied by information about the impact plastic has on aquatic creatures, and actions visitors could take to reduce this harm.

The display ran from 8 June 2019 – World Ocean's Day, when the entry fee to the Aquarium was waived – to 1 August, a month longer than planned due to the response from visitors. Although seeing plastic waste in the Aquarium was shocking for some visitors, and some were disappointed not to see jellyfish, the overall reaction was overwhelmingly positive, supporting the Horniman's stand against plastic pollution.

What began as a passion project for the Aquarists became an event embraced by the whole Horniman team (waste plastic for the display was crowdsourced from staff), seen by almost 17,500 in-person visitors, and shared on social media channels with a combined reach of over 100,000 followers. *Beat Plastic Pollution* inspired visitors to make environmental pledges, to share and talk about the display, and in the case of one five-year-old, to create a 20-page booklet about plastic pollution which he shared with his school and his MP. In September 2020 the *Beat Plastic Pollution* display won the Museums and Heritage Award for Limited Budget Project of the Year.

Image caption:
Plastic bags take over the jellyfish tank, Beat Plastic Pollution © Horniman Museum and Gardens

Story:web
Tyne & Wear Archives & Museums

Story:web blows the doors off museums, releasing objects and their stories into the world as big data for everyone to own, encouraging the telling of stories together, creating a digital palette to enable new ways of telling complicated interlinked stories.

Story:web is a collaboration between Great North Museum Hancock (GNMH), Open Lab at Newcastle University, Sarah Mander from the Tyndall Centre for Climate Change Research and The Centre for Climate Change and Social Transitions, and sound artist David de la Haye. This partnership highlights the unique position of university museums to access cutting edge research, using the museum's skills to interpret complex information in engaging ways, to deliver real world impact for research and delivering direct and unique benefits for audiences.

This web-based resource will use images and sounds to tell climate stories using more than words, linking them to where (young) people are online to help them share their own stories, connecting their here and now with global changes. Artificial intelligence will discover more objects, images and sounds, and help show how all our stories are interlinked and together tell the story of climate change. Story:web will be a tool that threads together seemingly unconnected snippets into a web of stories that mirrors our global ecosystem.

There is no single climate change story and every story has the power to inspire climate action. The Story:web team was one of eight finalists to be selected to exhibit this idea of a 'museum of the future' at the Glasgow Science Centre ahead of COP26, from a field of over 264 entries from 48 countries. The team was then further successful in its application to the Museum's Association Digital innovation and Engagement fund to realise Story: web, creating an innovative, open source digital resource for the wider sector.

03

Estates and Operations

Museums are constantly reviewing their operations to reduce the environmental impacts of all activities. Due to many museums managing large estates and the pressures of caring for unique and delicate collections, operations typically have high energy intensity. However, museums are addressing this challenge using new technologies and implementing green solutions across their sites. Efforts to reduce environmental impact do not stop at building management, but flow through every aspect of museum operations from banning single use plastic in cafés to promoting sustainable travel.

Sustainable Travel
National Galleries Scotland

National Galleries Scotland (NGS) has been striving to become more sustainable, which includes helping to promote more environmentally friendly practises to staff, visitors and the wider community. Transport has been a key part of their Environmental Policy and Plan 2018-2022. In particular, to address staff travel and making outreach work more visibly sustainable by using low carbon transport methods.

The Learning and Engagement Team created Art in the Open; a mobile art studio developed as part of the *Celebrating Scotland's Art* project. With the support of ongoing funding from the National Lottery Heritage Fund and a partnership with Sustrans, this enabled the use of an electric cargo bike to deliver sessions all over the city – engaging with the community, including people who do not currently visit NGS sites, and making art available to all. Facilitated by the NGS Project Learning Officer, the bike took artist Damian Callan all over the city, holding free drop-in sessions and inviting people to sketch the outdoors – helping visitors and communities access art in the middle of their local park and doing so in an environmentally friendly way.

Since this initial trial NGS have acquired an electric cargo bike of its own, primarily for use for *Art in the Open* but with the view to making it available to all staff for transporting equipment or supplies between sites. A small fleet of push and electric bikes are awaiting funding for staff use between sites, adding to NGS' Cycling Friendly Employer credentials to help reduce carbon emissions and improve health and wellbeing.

Image captions

Previous page:
SMG's National Collection Centre
© Science Museum Group

Right:
© National Galleries Scotland

Greening Estates and Operations
Science Museum Group

In April 2021, the Science Museum Group, a group of five museums across the UK, announced an ambitious commitment to following a Net Zero by 2033 target, following the Science-Based Target initiative (SBTi) and tackling scopes 1 (direct emissions), 2 (indirect emissions) and 3 (indirect emissions including their supply chain) in line with the Paris agreement and keeping global temperature rise to below 1.5 °C above pre-industrial levels.

To tackle scopes 1 and 2, the group is working to a decarbonisation strategy which will look to create sustainable practice across their five museums and Collections Centre and embed this approach within masterplan and exhibitions projects. This includes building on projects which have already replaced ageing heating, cooling and lighting with more efficient appliances, implementing renewable energy sources locally and lowering operational energy consumption.

At the group's Science & Industry Museum in Manchester, a £4.3 million government grant will transform their estate and place zero carbon technology at the heart of the visitor experience. Of this, £2.6 million be used to transform the museum's iconic Power Hall which showcases Europe's largest collection of working steam engines – by installing roof insulation, glazing, a new electric boiler and a ground source heat pump. This will reduce C02 emissions by 60% (515 tonnes) and improve energy efficiency and power the historic engines sustainably – enabling this gallery of historic engineering to become a landmark of future green energy, inspiring future innovators & scientists.

At the National Collection Centre in Wiltshire where much of the iconic collection is held, 44,000 native locally sourced trees have been planted. There are also 88 acres of photovoltaic arrays installed that generate about 50 GWh of energy annually – enough to power over 15,400 homes. A raft of habitats for wild pollinators including a wildflower meadow at Locomotion railway museum in County Durham have been planted and a garden at the Science & Industry Museum in Manchester celebrating 150 years of the Liverpool station.

Virtual First Courier Policy
Tate

Faced with international travel restrictions, stemming from Covid-19, Tate was quick to adopt a virtual-only courier policy. The policy ensured Tate could continue to share its unique collection through both individual loans and international touring exhibitions. The use of virtual couriers enabled Tate to deliver the exhibition programme across the four Tate galleries in London, Liverpool and St. Ives while also reducing carbon emissions.

This policy allowed Tate to gain significant experience of lending and borrowing safely, securely and within the parameters of insurance, without a physical courier. Tate Modern's *Warhol* exhibition was successfully deinstalled and transported to Museum Ludwig, Cologne without the presence of in person couriers. Digital communication and trackers on the vehicles were successfully used to ensure the safe handling and movement of artworks.

Constable: A History of His Affections in England was installed at Mitsubishi Ichigokan Museum, Tokyo with Tate colleagues joining their counterparts digitally to oversee the handling and installation of sixty works from Tate's Collection. Working together through digital communication allowed the exhibition to open smoothly and on schedule. In January 2021, confident that working with virtual couriers was tested and robust, Tate confirmed that it would move to a virtual first courier policy.

Recognising this policy in perpetuity embedded the very significant impact that this way of working would have on

Tate's ability to reduce carbon emissions. To date this policy has already seen a significant reduction in courier travel and the associated carbon emissions. With the close collaboration and agreement of lending institutions, Tate Modern's *Sophie Taeuber-Arp* exhibition was installed in June 2021 without a physical courier travelling to London. In July 2021, Tate successfully used virtual courier processes to remotely oversee the installation of the opening exhibition at the Museum of Art Pudong in Shanghai. *Light*, a major exhibition of more than 100 works from Tate's collection including works by J. M. W. Turner and Bridget Riley, premiered in China.

Image caption:
Sophie Taueber Arp exhibition installation, Tate Modern. Tate team demonstrate working with a virtual courier.

Managing Repository Environments
The National Archives

The National Archives is committed to minimising its environmental impact while delivering value for money to taxpayers. As the UK Government's official archive with 16 on-site repositories storing 168km of physical documents, effectively managing repository environments is the greatest source of carbon emissions and energy consumption.

Over 15 years, the Estates and Collection Care Departments have transformed the efficiency of the environmental management system controlling repository environments, and actively driven the development of new standards for the storage of library and archive collections nationally and internationally (PAS 198, PD 5454, BS 4917 and CEN EN 16893).

Through monitoring the building, undertaking pioneering research, and making strategic equipment upgrades, the National Archives created a demand-led environmental management strategy to replace the 24/7 air conditioning operation.

The new operation involves powering down equipment overnight and on non-working days, and implementation of 'seasonal drift', a strategy that permits the repositories' environmental conditions to drift within seasonally adjusted set points throughout the year. As well as improving the building's Display Energy Certificate (DEC) rating from G to B, and reducing greenhouse gas emissions by over 80% since 2010, this ground-breaking work has been instrumental in developing new standards that have encouraged

energy-saving collections management across the sector and worldwide.

The National Archives continues to set increasingly ambitious targets with sustainability as a key driver in equipment upgrades. For example, it recently replaced large traditional boilers with a Combined Heat and Power Unit (CHP) to further reduce overall carbon emissions. This is due to the increased efficiency of the new boilers and the ability of the CHP to also generate electricity, which can be used to lessen the draw from the national grid.

Image caption:

national museum directors' council

nationalmuseums.org.uk

Image caption:
© The Trustees of the Natural History Museum, London