Practical realities of the transition to a net zero future

Nick Merriman

Some figures

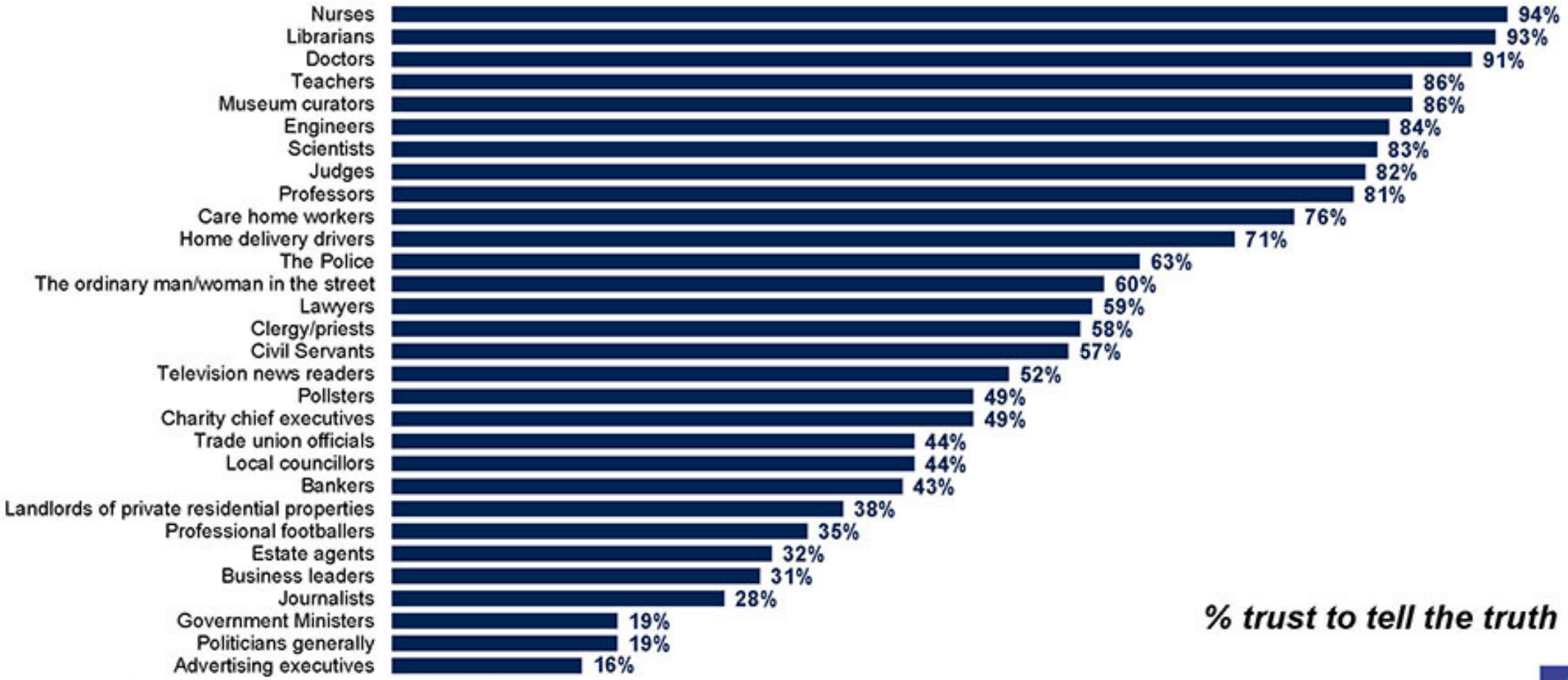
- We are in the middle of the sixth mass extinction phase in the planet's history; the last one was 66 million years ago
- The last 8 years were the eight hottest years on record around the world
- The IPCC says global warming of 2˚C above pre-industrial levels will lead to increased droughts and flooding, sea level rises, ecosystem change, species loss and extinction on land and in the sea, reduced productivity for agriculture and fishing and climate-related poverty and disease
- Climate change is likely to be the greatest cause of species extinctions this century.
- Antarctica is losing ice mass at an average rate of about 150 billion tons per year, and Greenland is losing about 270 billion tons per year, adding to sea-level rise
- We have lost over half of all coral reefs since 1950
- Between 12% and 20% of global greenhouse emissions come from tropical deforestation

Some more

- 500 million people live in areas that experience desertification
- 2.3 billion people already live in countries experiencing high water stress - climate change will make their lives harder
- 99% of the world's population live in places where the WHO air quality guidelines levels are not met. The combined effects of ambient air pollution and household air pollution are associated with 6.7 million premature deaths annually
- 84% cent of young people aged 16–25 years across ten countries are worried by climate change
- We are the first generation to know we are destroying the world, but we could be the last that can do anything about it

Veracity Index 2021 – all professions

"Now I will read you a list of different types of people. For each would you tell me if you generally trust them to tell the truth, or not?"



% trust to tell the truth

Base: 1,007 and 1,009 British adults aged 18+, interviewed by telephone 29 Oct – 4 Nov and 5 – 10 November 2021

Ipsos MORI

Buildings and Site – lots of green space


Anthropology


Natural History


Music

Aquarium

Gardens and Bandstand

Family activities

Project Coral

Main targets by 2040

Action area	Benchmark (2018-19 unless stated)	Target by 2040
Energy	369 tonnes CO2e	As close as possible to absolute GHG neutrality by 2040, through av 5% annual reduction of 2018/19 baseline
Water	7,172 cu m (2017-18) (7,172,000 litres); 200,000 litres recycled	6000 cu m; 500,000 litres recycled
Waste	88.08 tonnes; 27.8 tonnes recycled (31.5 %)	60 tonnes; 30 tonnes recycled (50%)
Staff travel	Reduce no. of staff using their cars by 7% over the next five years	All staff use sustainable transport including electric vehicles
Biodiversity	Plan to develop biodiversity benchmark for whole site in 2022-23	Increased species count across the whole site (to be agreed once benchmarking complete)

Action areas

- Energy
- Capital Programme
- Managing our buildings
- Procurement
- Air Quality
- Water
- Waste
- Adaptation of buildings
- Mitigation of climate impacts
- Transport
- Digital
- Banking
- Staff and volunteer engagement & training
- Communication
- Public engagement
- Investigation of off-setting/carbon positive approaches
- Biodiversity

Key Metrics on emissions, waste and water

	2017-18	2018-19	2019-20 (after BH open)	2020-21 (Covid)	2021-22	2022-23
Gas (KwH)	1,345,171	1,383,588	1,411,692	1,244,663 (-10% re 2018-19)	1,080,059	1,297,378
Gas CO2e (tonnes)		255	260	229	216	238
Electricity (KwH)	1,412,045	1,345,277	1,348,331	1,096,560 (-18% re 2018-19)	1,187,472	1,210,851
Electricity CO2e (tonnes)		114	375	280	230	257
Business travel	NA	NA	NA	NA	NA	To come
Total waste (tonnes and CO2e)	No data	No data	No data	No data	87.96 T (based on Sept 21- Mar 22) [add in CO2e]	87.38 8.284 T of CO2
Recycled (tonnes)	No data	No data	No data	No data	24.46 Tn (27.5%)	23.33
Water (cubic metres)	No data	7,172 (2017-18)	No data due to meter faults	No data due to meter faults	6,373 m3	9,418m3
Food and green waste (tonnes)	No data	No data	No data	No data	12.55	14.90
Total CO2e in tonnes					446 plus waste 517	

Examples of objectives

- **Energy**
- Develop a roadmap to ensure GHG neutrality target met by 2040

- **Capital Programme**
- Ensure all capital investment, large and small, contributes long-term to GHG neutrality targets

- **Managing Our Buildings**
- Ensure our buildings are managed optimally to reduce GHG emissions

- **Procurement**
- Develop and implement a sustainable procurement strategy which emphasises triple-bottom line considerations

- **Air Quality**
- Highlight air quality issues to the public and develop ways of reducing air pollution on our sites

- **Water**
- Develop and implement a plan to reduce water usage and recycle water on our sites

Building Carbon Impact – Baseline Tonnes CO^2

The 'Baseline', emissions for the THM have calculated using the digital twin modelling and the current carbon emissions factors are summarised below;

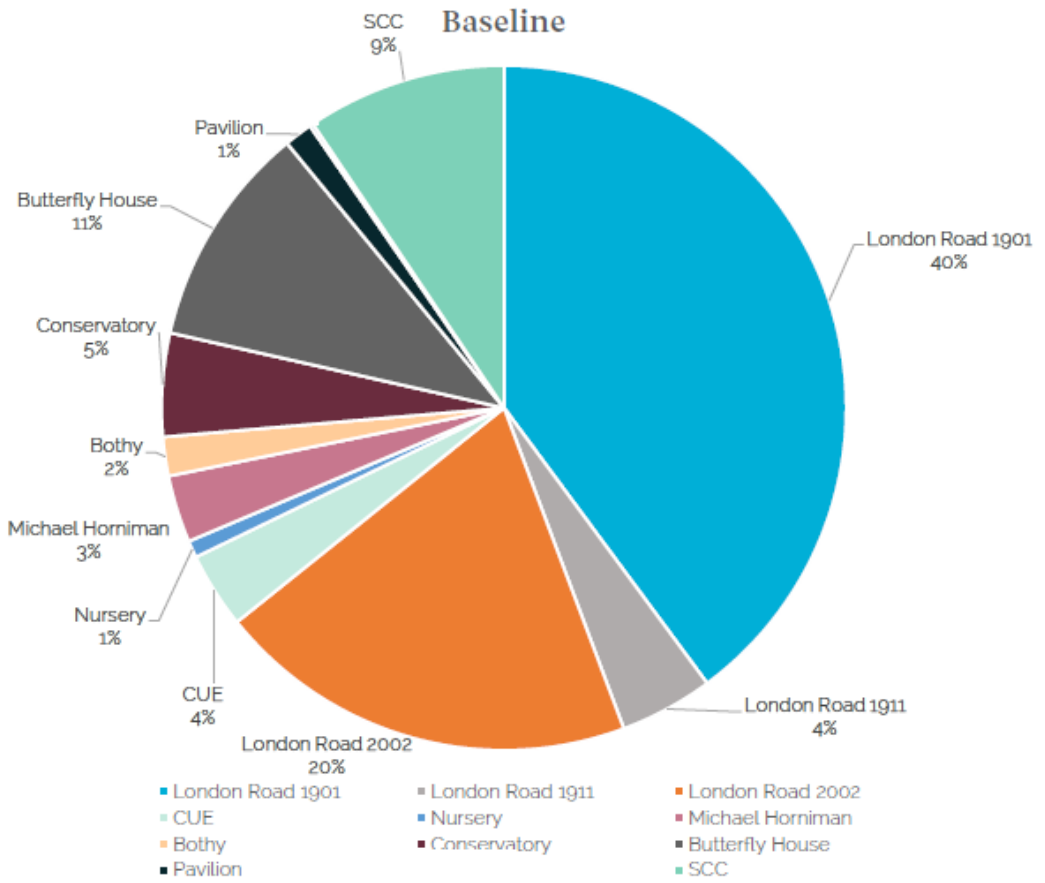
EMISSIONS	$1CO2_e$/YEAR (2022)
Scope 1	337
Scope 2	181
Total	518

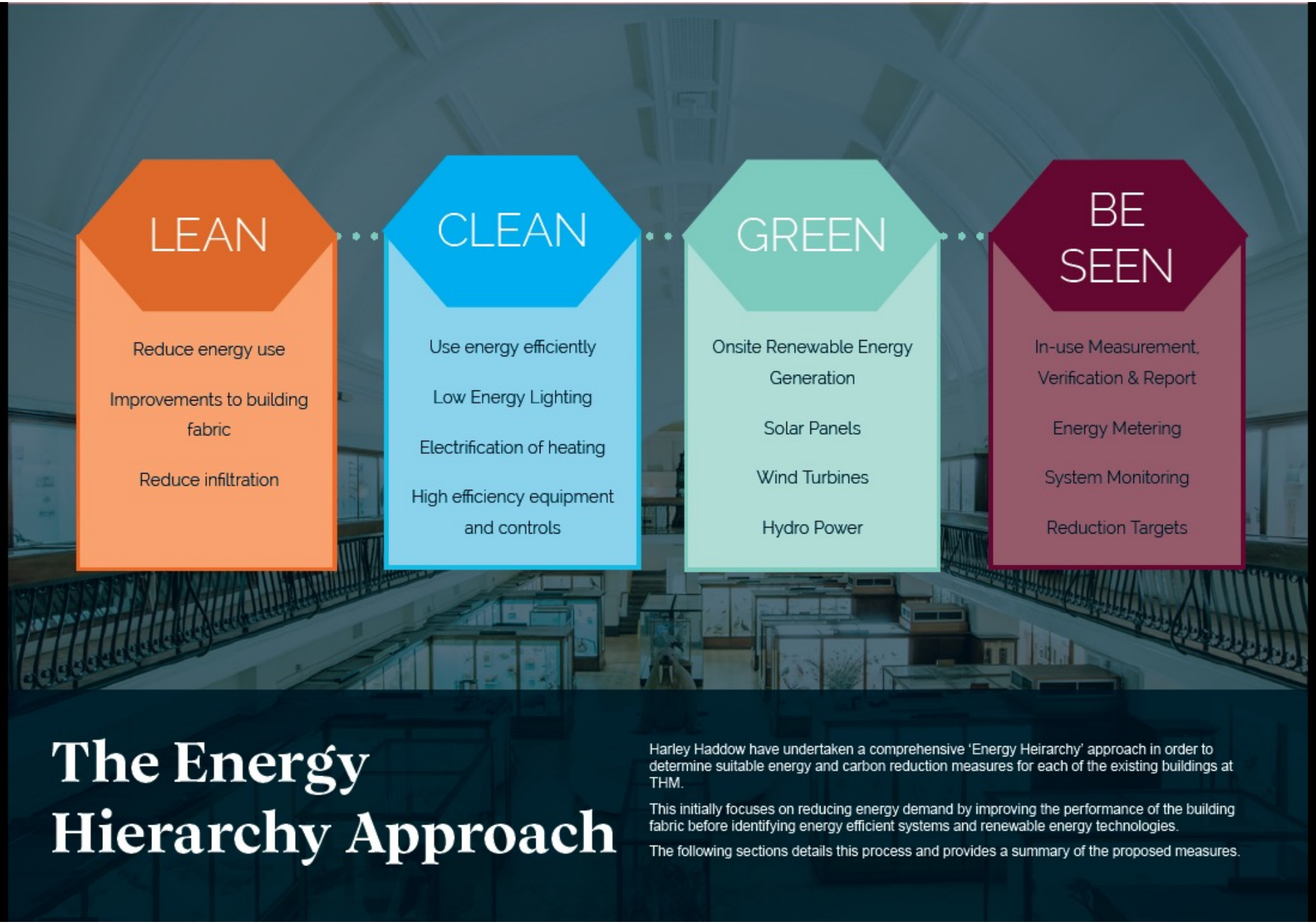
Scope 1 Direct emissions account for ~65% of annual total, these are primarily related to the local combustion of natural gas, highlighting the requirement to decarbonise space heating.

Scope 2 Indirect emissions from grid supplied electricity are currently lower accounting for 181 TCO2e or 35% of total emissions per annum.

The pie chart opposite shows the percentage of total carbon emissions across THM Estate, as expected the main Museum buildings account for the highest proportion as they are the largest in footprint and include the high energy areas such as the environmentally controlled galleries and the Aquarium.

What is highlighted is the high energy use of the Butterfly House and Conservatory which are relatively small but have significant heating loads.





The Energy Hierarchy Approach

Harley Haddow have undertaken a comprehensive 'Energy Heirarchy' approach in order to determine suitable energy and carbon reduction measures for each of the existing buildings at THM.

This initially focuses on reducing energy demand by improving the performance of the building fabric before identifying energy efficient systems and renewable energy technologies.

The following sections details this process and provides a summary of the proposed measures.

Road Map to Net Zero

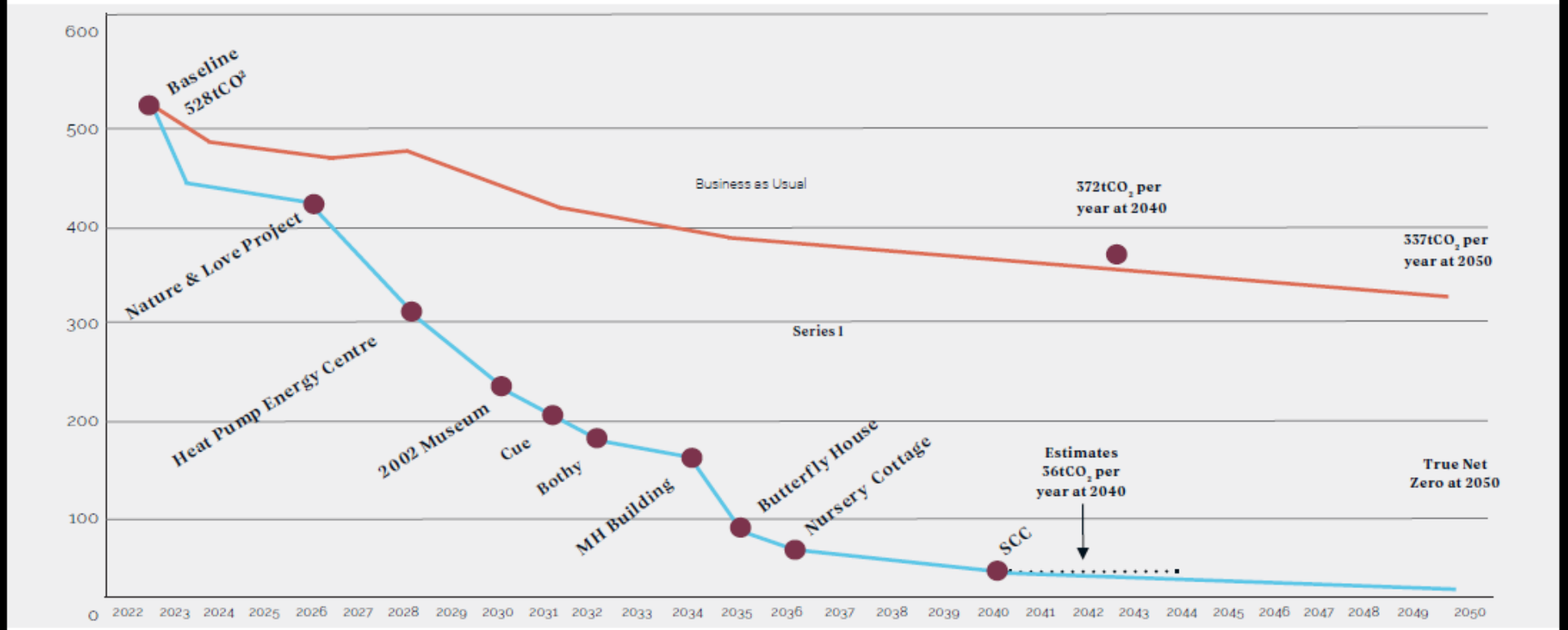
The proposed Road Map to Net Zero identifies the total annual carbon savings when the proposed measures for each building have been applied.

This has been calculated using 'Digital Twin' modelling and the predicted Carbon Emissions Factor (CEF) of the National Grid.

The Roadmap also includes the total emissions of the site if no interventions are provided. The timeline of the building upgrades have been proposed though discussion with THM and follows the programme of the current and proposed schemes.

The results of the assessment indicates that if all the proposed measures are adopted there is the potential that by 2040 there are still related emissions of 36tCO² per annum, although this is a 93% reduction from the current baseline this would miss the net zero target.

Therefore additional measures may be required to offset these remaining ~~emissions, this~~ would be achieved by the Museum's existing green energy supply tariff but true Net Zero would not be fully realised until the National Grid is fully decarbonised, which the UK Government has committed to achieve by 2050.



Reducing waste - removing single use plastics from our Café


Chelsea
Fringe
The alternative garden festival
BBC
RADIO LONDON

Waste and recycling

London Road Tree Planting

Beat Plastic Pollution Intervention


Why not use reusable carry bags, totes or basket instead of the single use plastic bag.
5 trillion single-use plastic bags are used worldwide every year.

Nature + Love

Sector-wide initiatives

- Carbon calculator tools
- Carbon literacy training
- Conferences & online resources
- Gallery Climate Coalition
- Museums Association campaign
- ICON – incl risk based approach
- National Museum Directors Council Environment & Ecology Group
- UK Museum COP

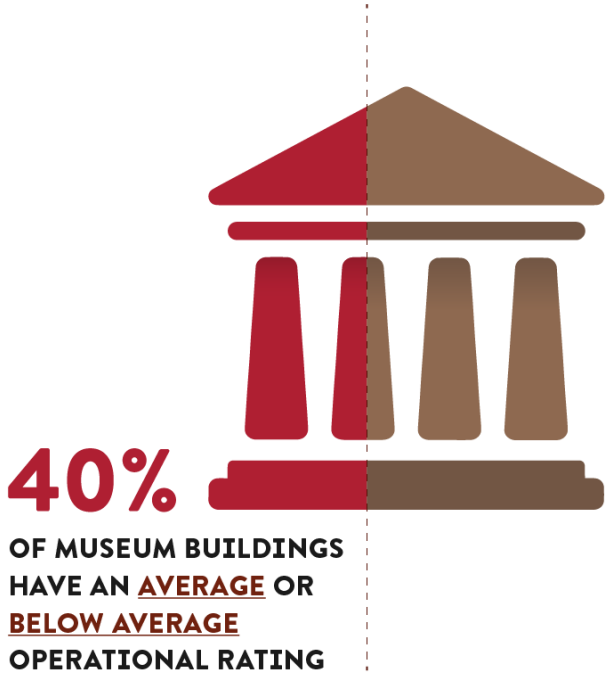
UK Museum COP 31 Oct 2023: Working Groups

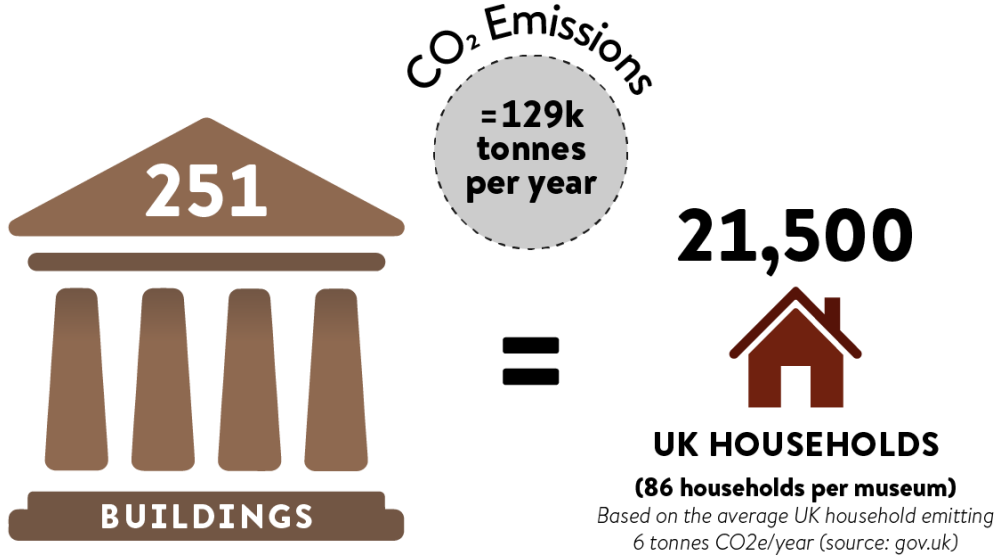
- Ethics
- Heritage Buildings
- Scope 3 emissions esp visitor travel
- Workforce development
- Funding
- Collections care & management

Bizot Green Protocol 2023 – Guiding Principles:

- Environmental standards should become more intelligent and better tailored to specific needs.
- Care of collections should be achieved in a way that does not assume air conditioning or other high energy cost solutions.
- Natural and sustainable environmental controls should be explored and exploited fully.
- Architects and engineers should be guided significantly to reduce a building's carbon footprint as a key objective.
- The design and build of exhibitions should be managed to minimise waste and recycle.
- Shipping by sea, road or train should be the preferred option for long distance object movement.
- Virtual couriering should be the preferred option when moving objects.
- Exhibition duration should be extended to unlock the international pattern of tours and reduce total carbon emissions from transport.

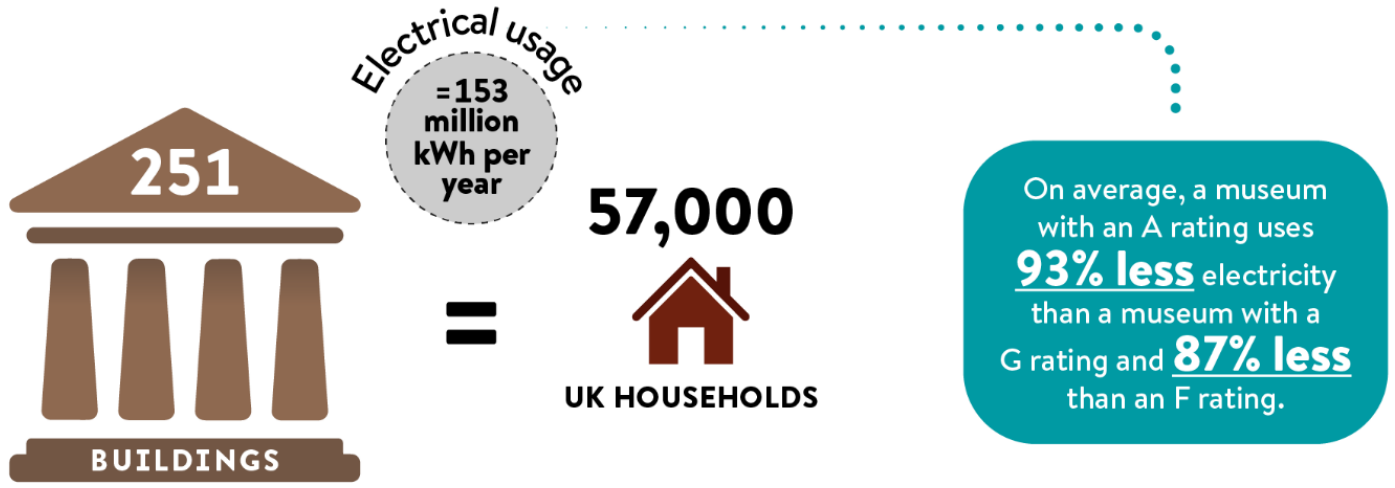
Buro Happold work on museums' Display Energy Certificates

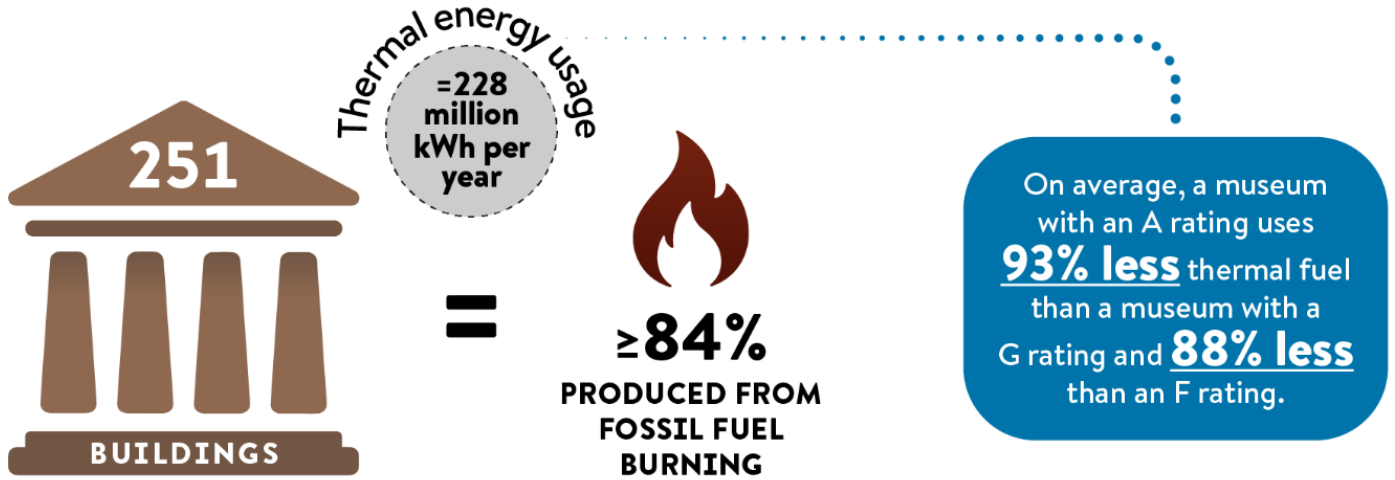




2022 Scenario – Key Facts

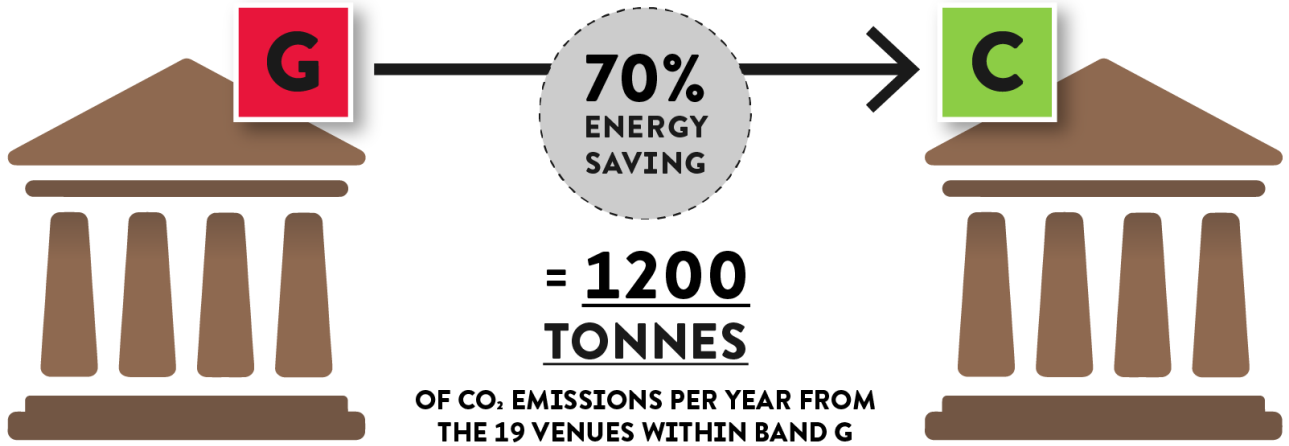
Energy Usage

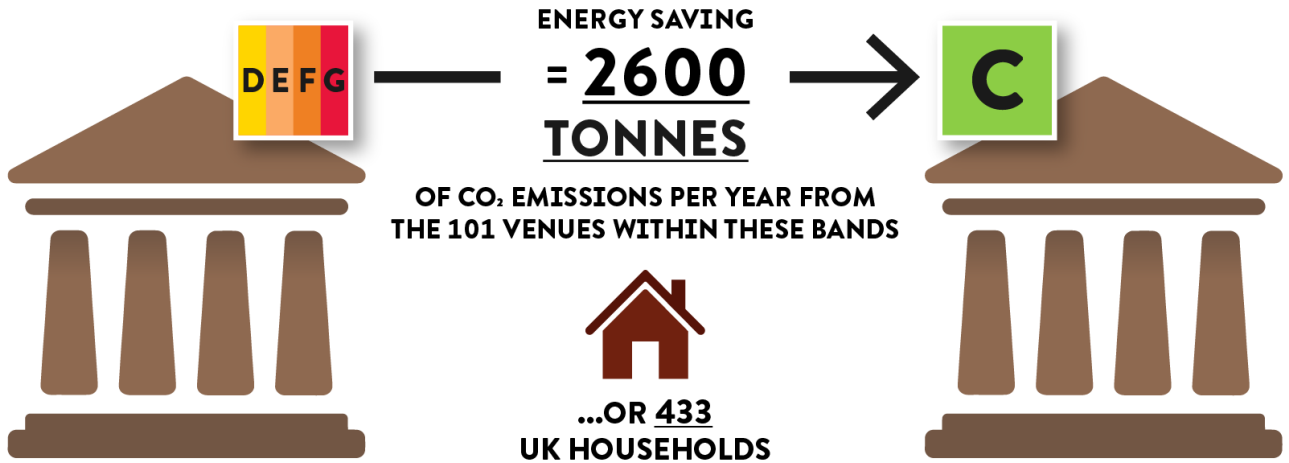




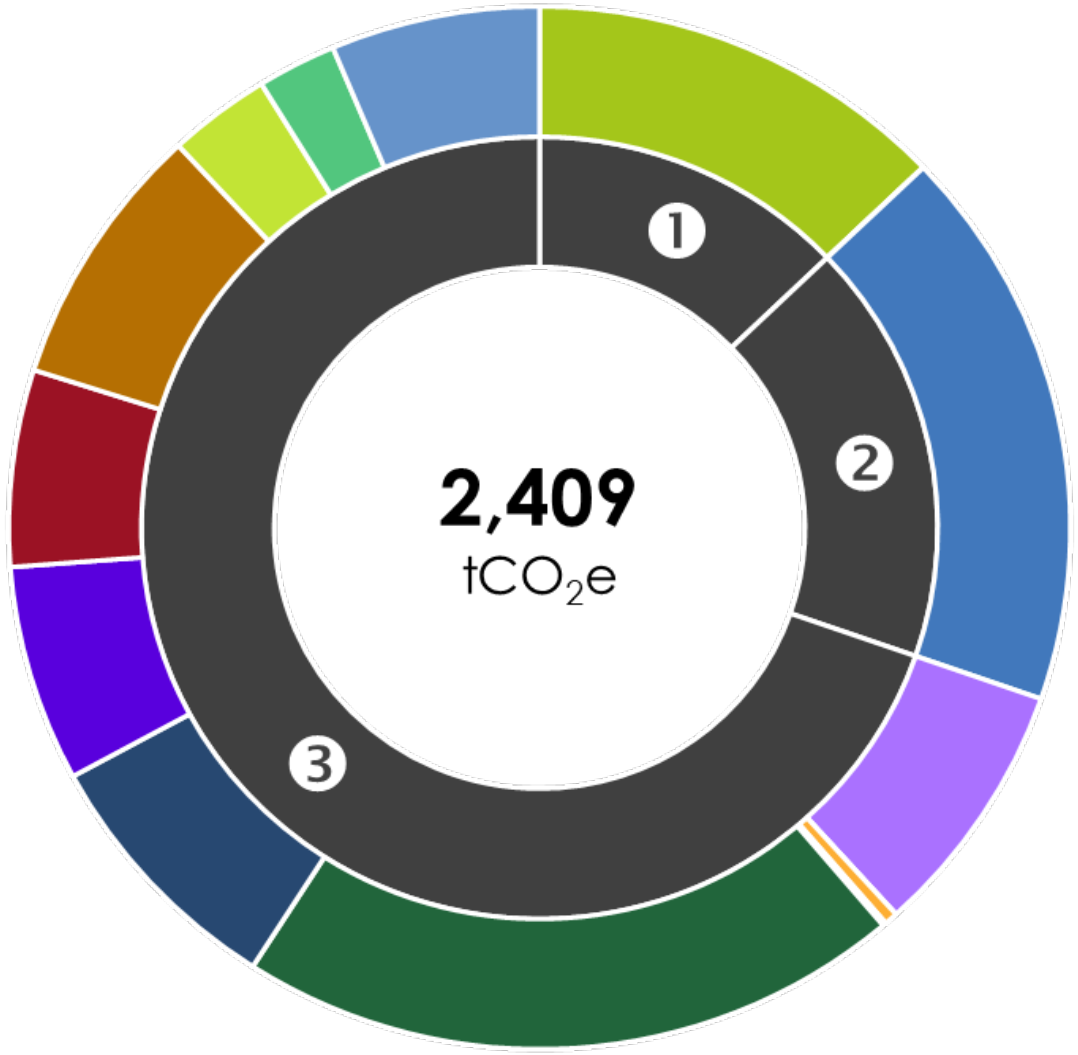
2022 Scenario – Key Facts

Potential Savings





Scope 3 Working Group



SCOPE	CATEGORY	tCO2e	%
1	Fuels	311	13%
	Fleet	<1	<1%
2	Electricity	422	17%
3	T&D and WTT	192	8%
	Upstream Fleet	<1	<1%
	Waste	1	<1%
	Water	3	<1%
	Purchases	490	20%
	Retail	194	8%
	Food & Beverage	162	7%
	Investments	147	6%
	Employee Commuting	198	8%
	Home Working	76	3%
	Business Travel	58	2%
	Object Travel	154	6%
	Total	**2,409**	**100%**

Ashmolean carbon baseline and decarbonisation pathway

Challenges

- It’s difficult, complex and confusing
- Little government support
- Changes are expensive – take opportunities whenever there is capital expenditure
- Time is running out
- No rewards for reducing impact
- Must rethink model of constant growth
- BUT – we must continue to act