29.04.26

Information Pack

Fixing Our Broken Planet

Natural History Museum Design Studio and Hawkins\Brown Environmental Intelligence team

Hawkins\
Brown

Fixing Our Broken Planet
The process

Description

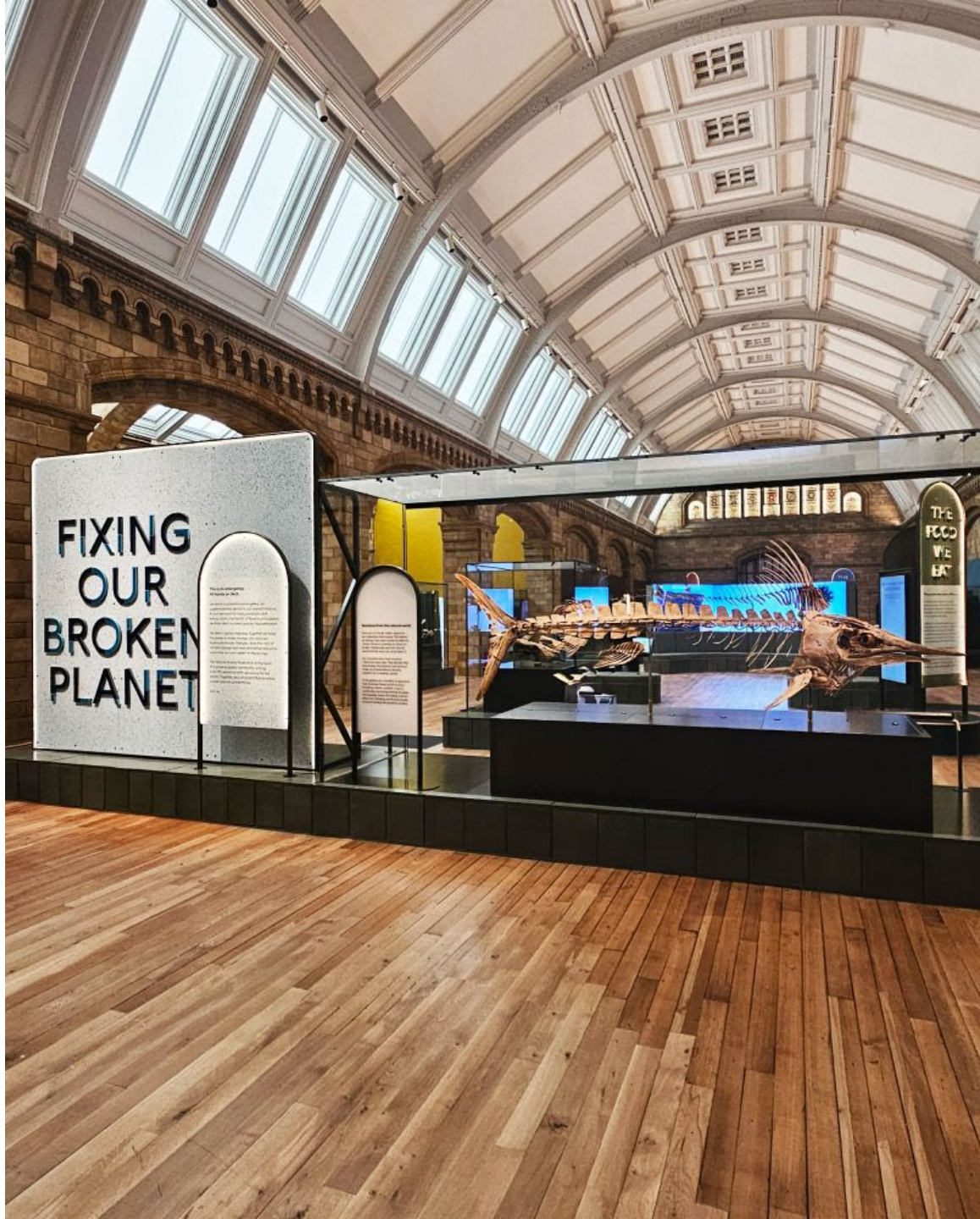
The Natural History Museum's new permanent gallery, "Fixing Our Broken Planet", explores the biggest challenges to planetary and human health, plus the science-backed solutions to address them. Housed in the museum's iconic 1881 Waterhouse Building, the 686 m^2 exhibition, designed by NHM Design Studio, takes a light-touch approach to minimise material use and celebrates the restored Victorian details. The Hawkins\Brown Environmental Intelligence (EI) team were appointed as Sustainability Consultant from RIBA Stages 2-6.

The challenge

It was the first time the Natural History Museum had integrated KPI monitoring and whole life carbon assessment (WLCA) into its processes, but the exhibition content demanded minimisation of the environmental impact. We worked closely with the NHM design and sustainability teams to tailor the process.

Activities included:

- Sustainability KPI setting and monitoring
- Low-carbon material workshops
- Iterative whole life carbon and circular economy calculations related to the whole installation and individual parts
- Integrated decision making
- Employer's Requirements and procurement processes
- Data collection templates
- Upskilling sessions
- Final reporting



Fixing Our Broken Planet
Strategic definition - early design

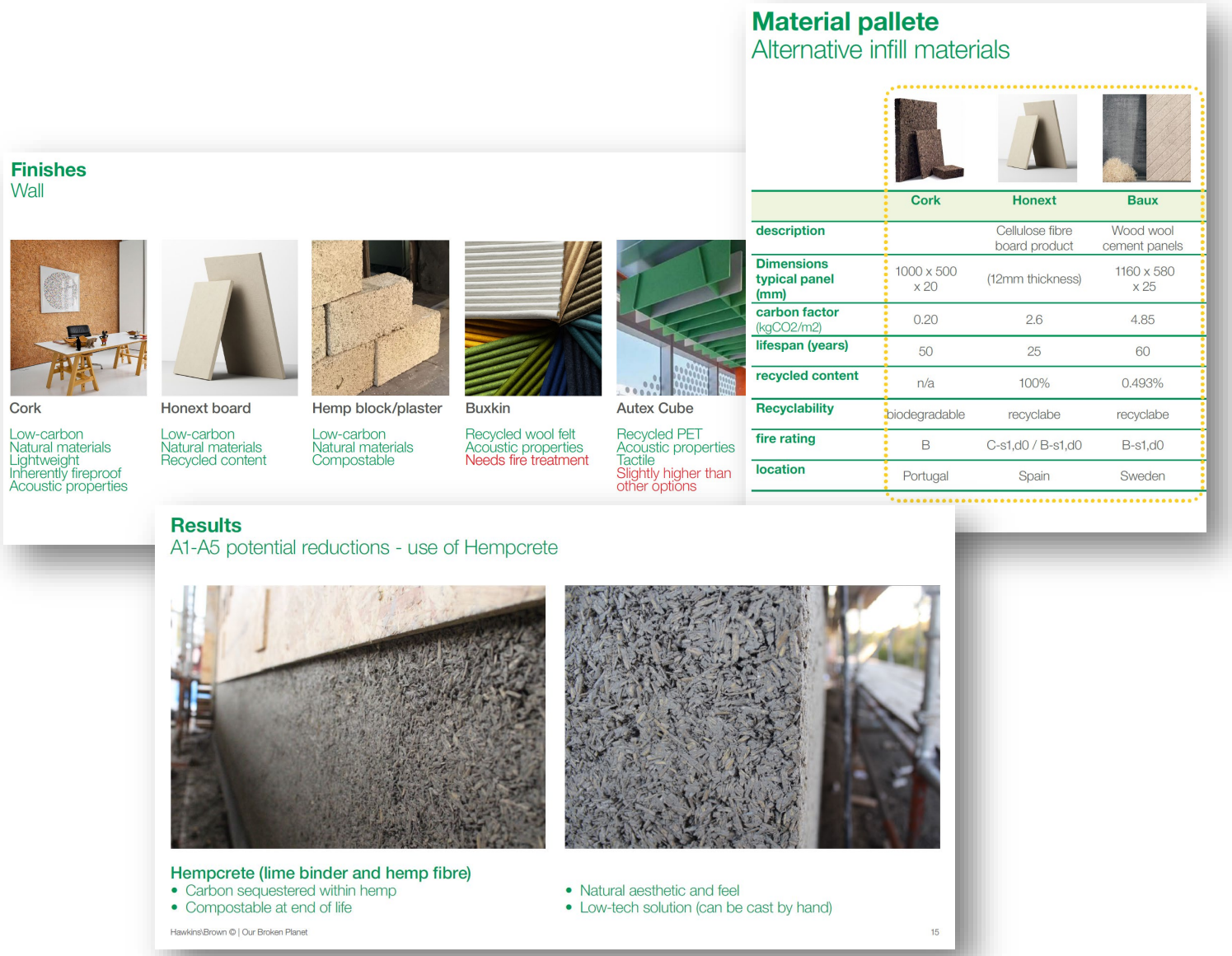
Early material studies & reuse opportunities

The team carried out early material studies to explore the potential to reuse elements from previous exhibitions.

We investigated several innovative materials, including options based on natural sources or incorporating recycled content, such as plastics repurposed from waste.

Some key challenges in balancing low-carbon choices with other sustainability criteria included:

- **Health and indoor air quality:** Some products marketed as ‘low-carbon’, particularly those made with recycled plastics, contain chemical compounds that raise concerns for indoor air quality and human health. This highlights the risk of relying solely on marketing claims or single-issue metrics—lower carbon does not always mean healthier or safer.
- **Aesthetic limitations:** These materials often come with a restricted palette and limited texture options, which did not always align with the exhibition’s aesthetic aspirations.
- **Fire safety and embodied carbon:** Natural materials, while often viewed as healthier and more sustainable, typically require additional fire protection treatments to meet safety regulations. These treatments can increase both embodied carbon and chemical content, potentially offsetting some of the initial environmental benefits.
- **Oddy testing for conservation of protected items:** Within the showcases, natural materials were prohibited as the environments needed to be inert for conservation purposes. Bio-based materials do not pass Oddy testing requirements.



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Identifying carbon hotspots

Identifying Carbon Hotspots

Early carbon assessments helped identify the main hotspots, such as AV equipment, showcases, and steel infill. These findings informed the development of the exhibition experience, which explored a more analogue approach with fewer installed screens. Assessments were aligned with RICS WLCA PS v2, but with a greater level of granularity to pick up hotspots.

Reflections on Early Data & Design Influence

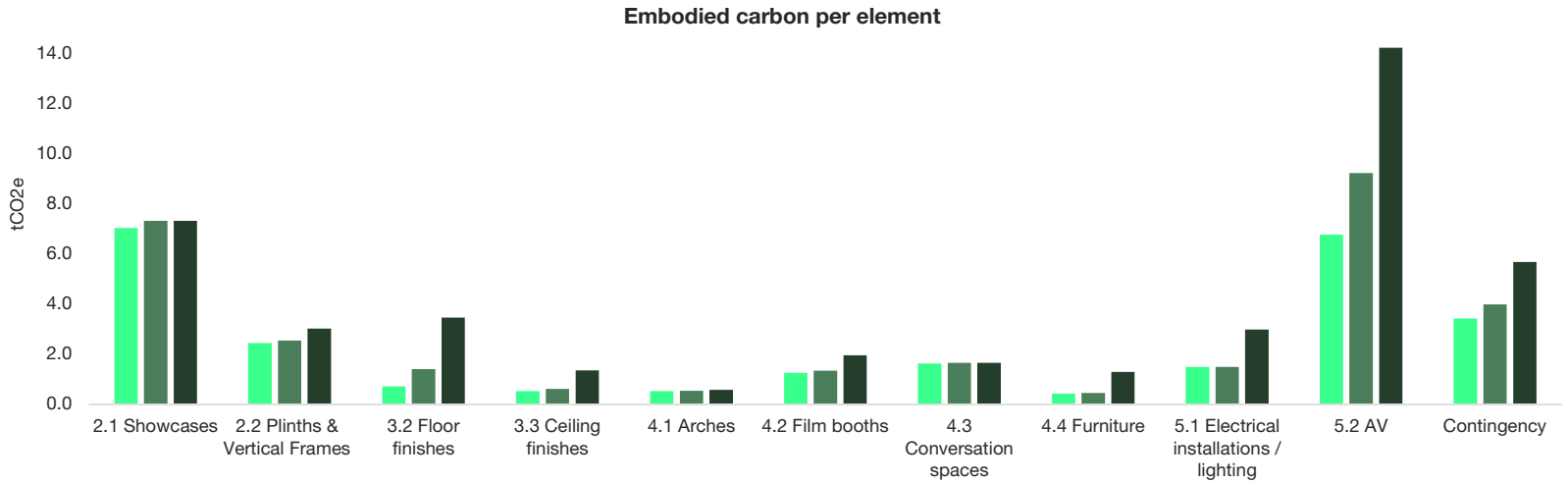
The early WLCA results played a critical role in influencing the design approach. By sharing carbon data at design team meetings, the project was able to shift material decisions early, where changes have the most impact.

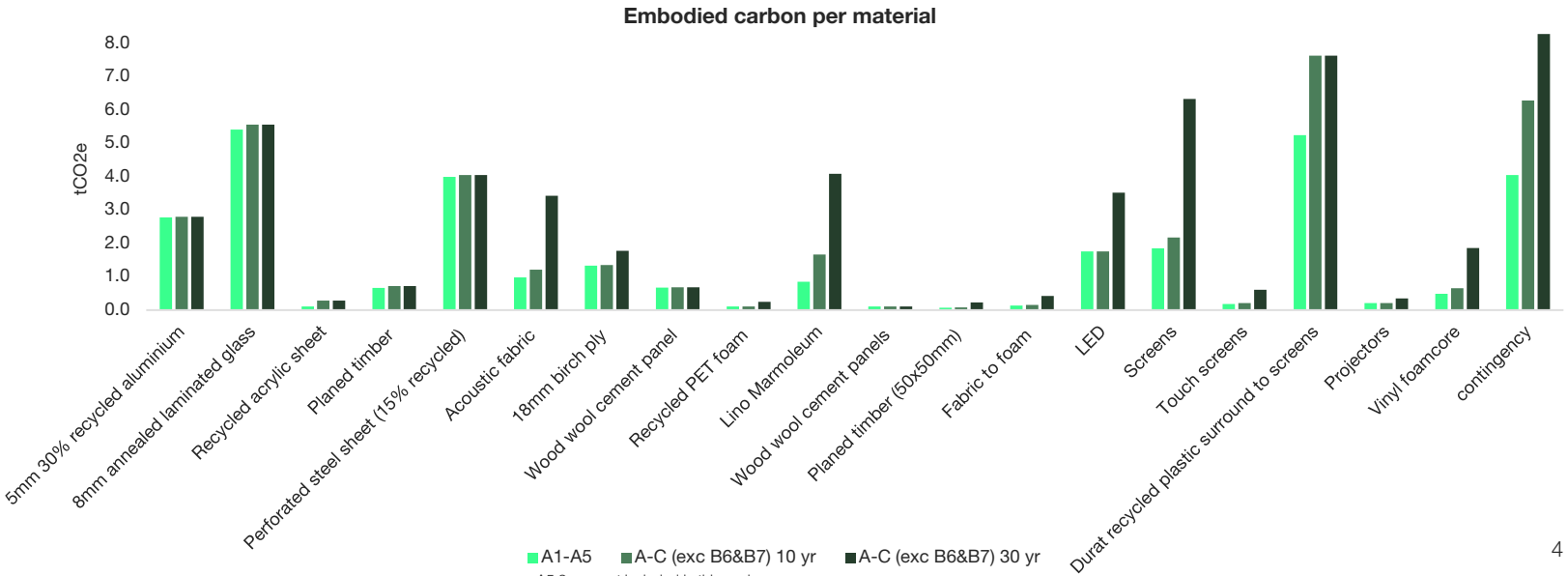
Material efficiency was considered throughout. The exhibition design was gradually simplified; for example, wall linings were removed, which had the added benefit of revealing the materiality of the existing space. AV equipment was omitted in favour of more analogue narrative devices, saving upfront and operational carbon.

This collaborative process also raised awareness of the environmental implications of design choices, helping the team balance carbon reduction with creative and curatorial requirements.

Design development

The carbon hotspot exercise was carried out at each design stage to track decision-making and stay on track.





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Procurement and construction

Employer's requirements and data collection

Following Stage 4A, the carbon and sustainability KPIs were formally included in the Employer's Requirements (ERs). To support this, a data collection template was provided to the contractor. This spreadsheet captured essential information for embodied carbon analysis, including EPDs, transport distances, waste factors, etc. This data was critical for both the final WLCA and for monitoring performance against the project's defined KPIs.

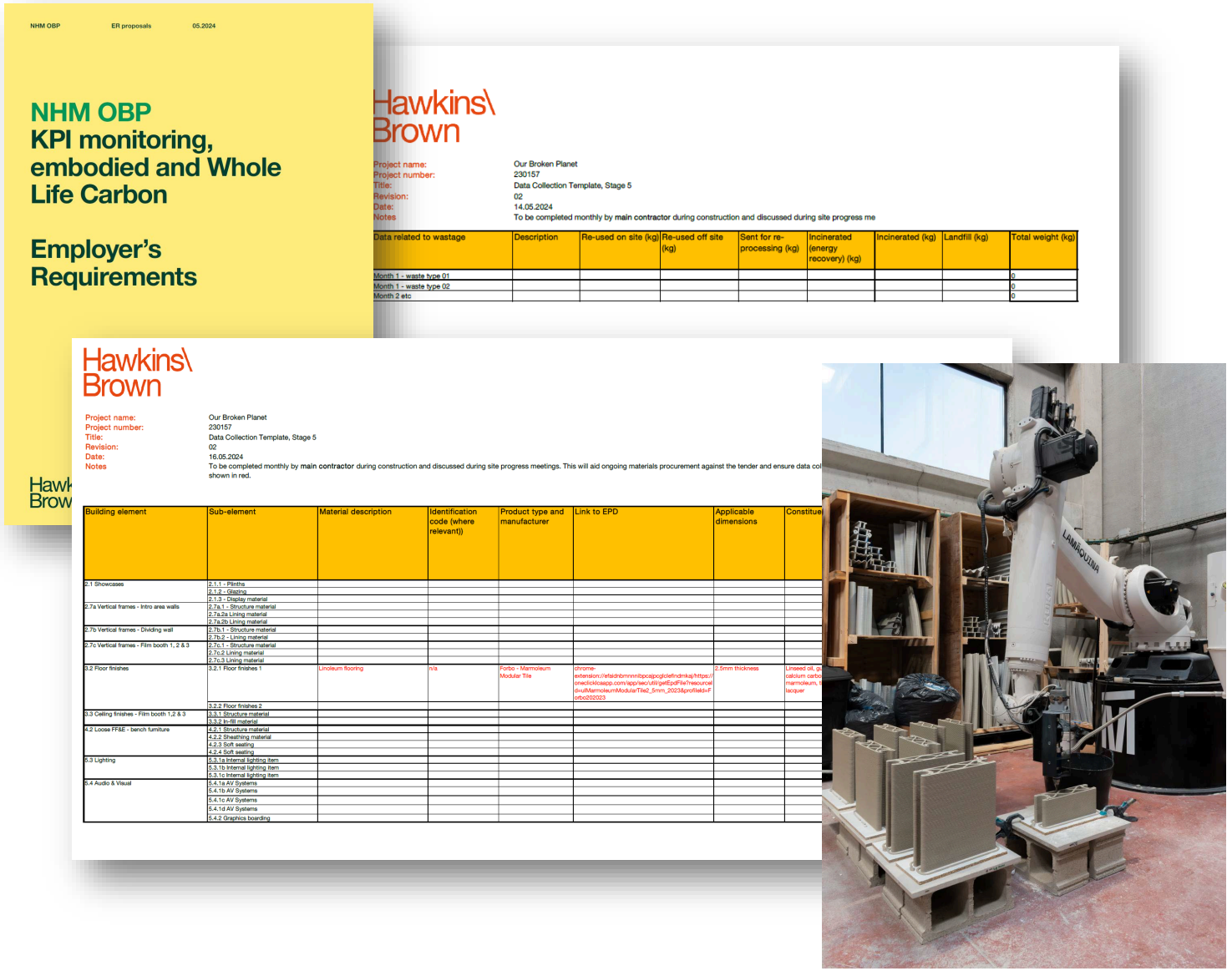
Contractor engagement

Engaging the contractor effectively is essential for robust data collection and successful monitoring against sustainability goals. Meetings and workshops were held with the contractor to explain the intent behind the data collection, how to ask for and find the information and how to fill in the spreadsheet. Even so, some materials were procured from a range of small-scale local providers who are not used to tracking the source of their products, so this is a real opportunity for the future. This process will be improved upon when the NHM procures projects in the future.

Innovative material use

The material chosen for the showcase plinths, after an extensive optioneering process, was a 3D printed recycled ceramic as it:

- is robust and inert
- ethically sourced and manufactured with clean energy
- could be fixed without metal, using a bio-based polymer
- can be de-mounted for re-use or recycling again



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Post completion findings

Data was broken down in several ways to drive key findings. This page shows the embodied carbon by exhibition element and material. We also tested different lifecycles, as the exhibition is planned for 10 years, but may be in place for longer, in which case maintenance is key. The RICS WLCA PS requirements are for a 60-year life cycle, which is not relevant here.

Glass

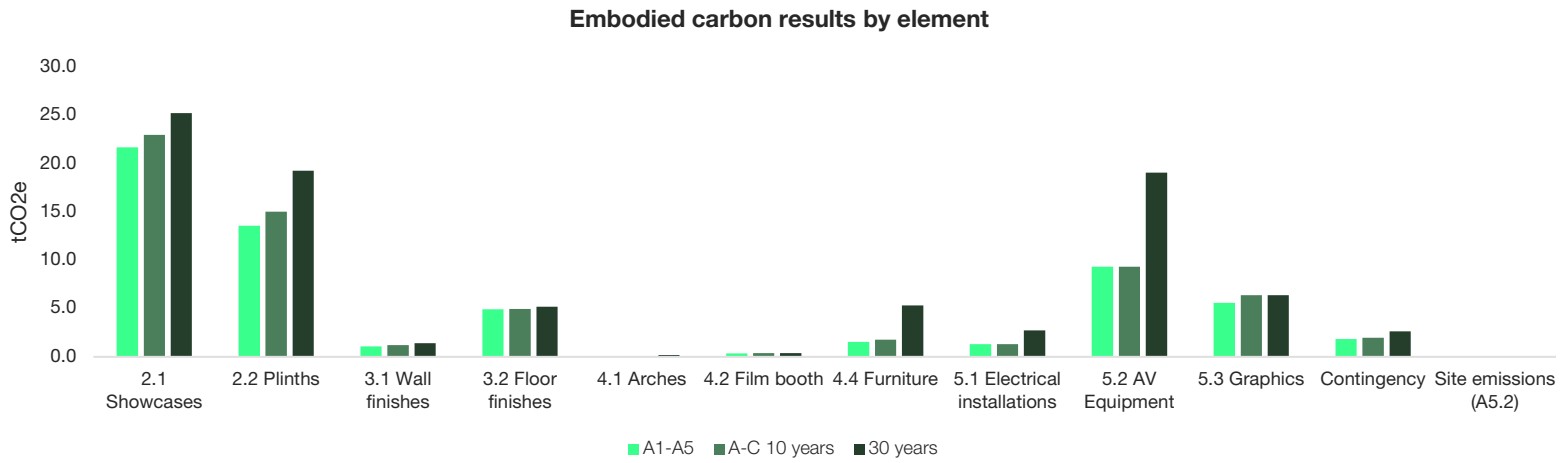
Glass accounts for the largest share of upfront carbon. This is predominantly attributed to the specialist performance laminated glass. Its production is energy-intensive, including the addition of non-reflective finishing. The PVB interlayer also limits recyclability at end-of-life, increasing overall lifecycle emissions.

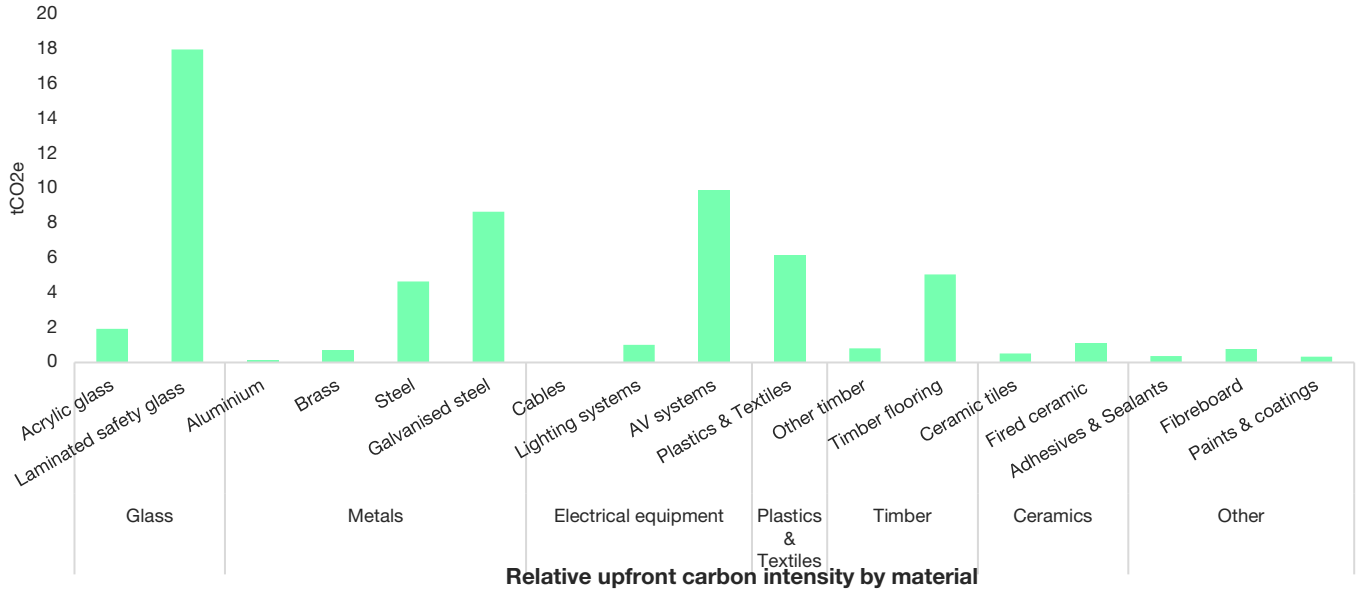
Steel

Galvanised steel elements & mild steel box sections are used for all the displays due to the conservation environment required. The steel was sourced from multiple suppliers with no confirmed origin available, so it was hard to verify recycled content, which might have improved the figures.

Electrical equipment

The project achieved reductions in electric equipment use over the design period. However, the high carbon intensity and limited end-of-life recovery potential of AV mean much of their material value is lost during Waste Processing & Disposal stages (C3-C4).





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End of life scenarios

To facilitate recyclability, the exhibition was designed for easy dismantling and sorting by material type at the end of its life cycle.

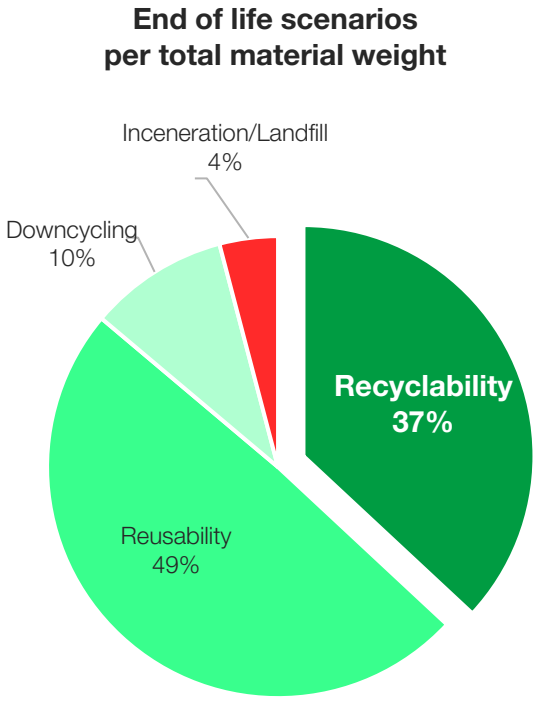
Assumption	Recycle	Reuse	Downcycle	Incineration/ Landfill
Metals	100%	0%	0%	0%
Regular glass	100%	0%	0%	0%
Plastic (best case)	90%	0%	0%	10%
Electrical items	50%	0%	0%	50%
Laminate glass	0%	100%	0%	0%
Engineered wood	0%	100%	0%	0%
Ceramic	0%	0%	100%	0%
Other materials	0%	0%	0%	100%

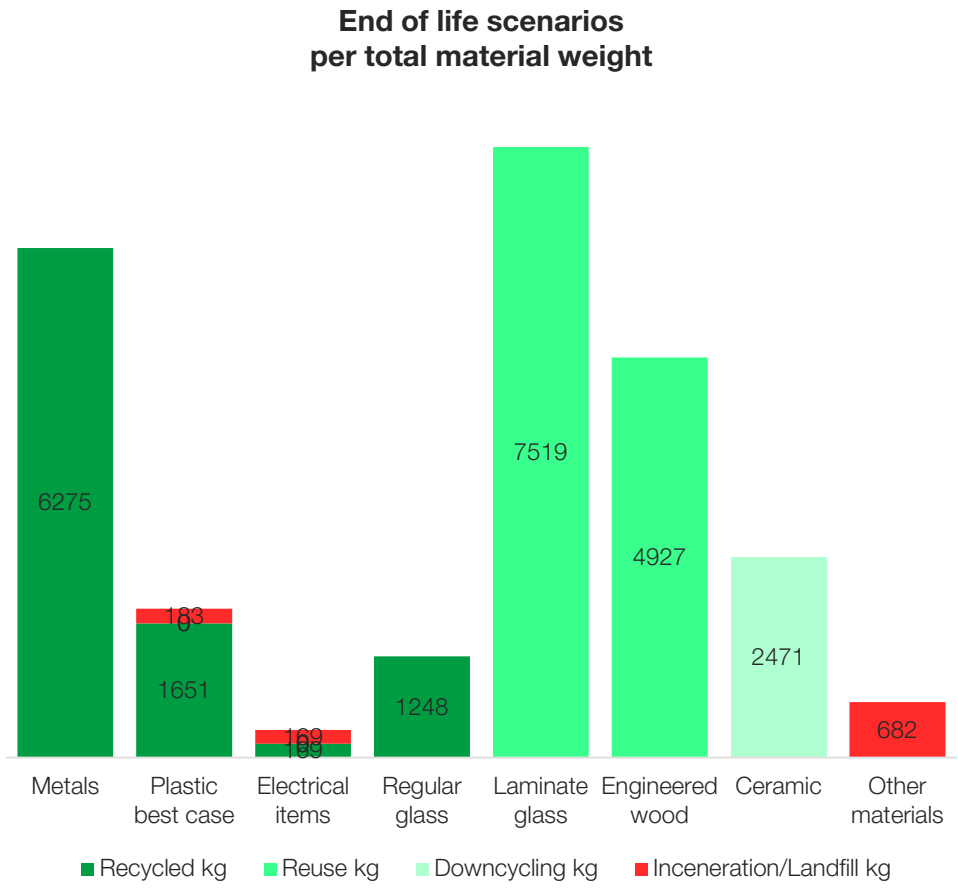
Key Findings

Recyclability potential included:

- 49% of material weight can be reused
- 10% can be downcycled
- Only 4% of material weight is expected to be disposed of via incineration or landfill

Overall, this represents a positive outcome, with most materials diverted from disposal. Laminated glass and engineered wood cannot be recycled but have strong potential for reuse, which significantly reduces their environmental impact.





Fixing Our Broken Planet
Post completion findings

This chart tracks the development of the project and key decisions through an upfront embodied carbon metric.

Benchmarking the final results

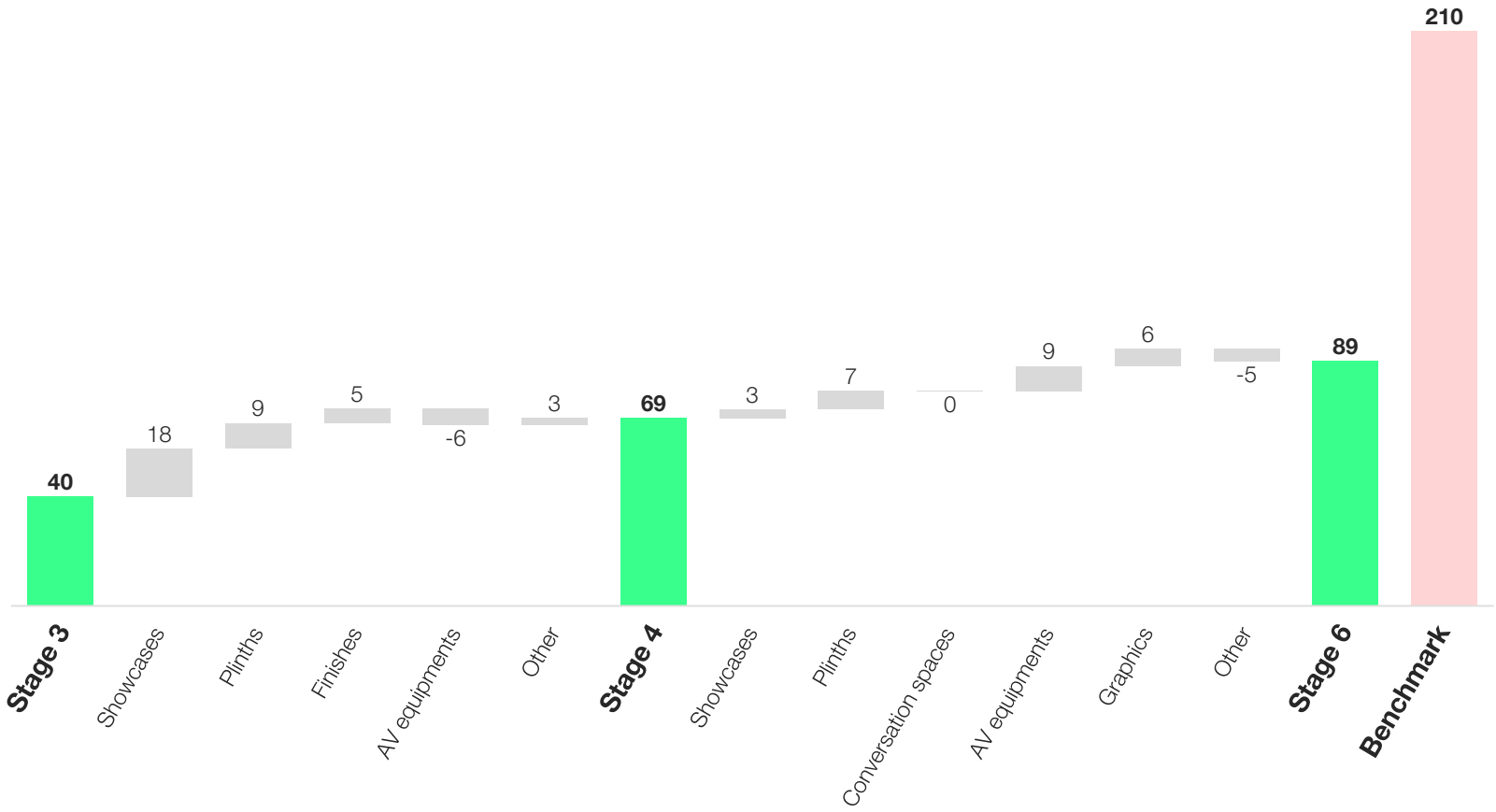
While there is no established industry benchmark for exhibition fit-out, the latest guidance from the built environment sector, the UK Net Zero Carbon Building Standard (UKNZCBS), was used as a reference point. Version 1, released March 2026, has a CAT B figure in it for offices of 210kgCO2e/sqm, which “Fixing Our Broken Planet” is significantly under.

Key points

- Evidence-based design is an essential design tool; integrating WLCA early helped inform material choices and design decisions with real data rather than assumptions.
- WLCA helped to identify key carbon hotspots specific to exhibition fit-outs, such as showcases, plinths, and AV elements, allowing consideration of how these could be mitigated.
- On-going WLCA monitoring during design stages, as well as at each milestone, is important to keep emissions on track.

Upfront Embodied carbon timeline

$kgCO_2e/m^2$



Fixing Our Broken Planet
Impact

This final page documents the key lessons learned and the impact of the embodied and whole life carbon work undertaken. The exhibition itself, its narrative approach, and the focus on actions we can all take to play our part in “Fixing Our Broken Planet” have all been widely celebrated, leading to its shortlisting in several museum awards.

A positive and collaborative process

The engagement of the NHM throughout all phases of the project was a significant strength. Their early commitment to sustainability and interest in understanding and improving performance created a strong foundation for collaboration. This proactive stance enabled a more holistic approach to decision-making and set a positive precedent for future exhibition projects.

Exploring natural and innovative materials

While the team explored innovative and natural materials, it became clear that the market for truly low-carbon and healthy options is still developing. Research into recycled board products revealed that their binders can be as intensive as new materials. Many natural materials require additional fire safety treatments that increase embodied carbon, and availability remains limited in terms of palette, durability, and certification. Further investment and testing are needed in this space to expand viable alternatives. The solution was to use a modular 3D printed ceramic, which turned out to be an effective result in terms of carbon, natural material, and technical requirements.

Procurement and specification as key levers

For small-scale but highly designed projects like exhibitions, procurement and material specification are critical in reducing embodied carbon. Carbon hotspots across the project include glass, steel, and electrical elements, all of which show wide variation in carbon intensity across available products in the UK. Targeted reduction and specification of these offers an effective opportunity to reduce emissions early. Approaches to procurement and product specification should balance contractor supply chains, performance, user wellbeing and planetary health.

Continuous monitoring across all stages

This project highlighted the importance of monitoring carbon and sustainability KPIs at every stage of design and delivery. For instance, changes made during Stage 4B had a measurable impact on carbon outcomes but were not fully tracked. Establishing clear handover protocols and regular updates to the WLCA can help ensure late-stage decisions do not compromise earlier progress.

Long-term impact

The NHM is undertaking embodied and whole life carbon analysis on all their projects. They have started and continue to support the reuse of high-carbon showcases that are designed to standard sizes and used multiple times. They have also engaged with their peer network, and other museums are emulating, leading to Hawkins\Brown’s appointment as Sustainability Advisor for the Science Museum Group. It was a collaborative learning journey for us all.