Department for Transport

ADEPT LIVELABS 2 Decarbonising Local Roads

Centre of Excellence for Decarbonising Roads

Final Report

Centre of Excellence for Decarbonising Roads (North Campus)

North Lanarkshire Council

March 2026

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STATUS/AMENDMENT	PREPARED	REVIEWED	APPROVED
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Executive Summary

The completion of this Live Labs 2 project marks a significant milestone for North Lanarkshire Council (NLC), Scotland and the wider UK local roads sector. Over the course of the project, the Centre of Excellence for Decarbonising Roads has moved from concept to reality, demonstrating how local authorities (LAs) can lead national progress toward lower-carbon and resilient road maintenance and construction.

The construction, renewal, adaptation, and maintenance of the UK's local road assets have long represented a major source of greenhouse gas emissions. With materials alone accounting for around 40% of total embodied carbon in roads, and additional emissions arising from Scope 2 and 3 activities, the sector has historically faced a fragmented landscape of innovation. Individual local authorities have been left to independently trial new technologies, shoulder disproportionate risk, and balance rising costs against uncertain returns in resilience and decarbonisation

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This project fundamentally shifted that dynamic.

Through the establishment of the UK's first Centre of Excellence for Decarbonising Roads, NLC, in partnership with Transport for West Midlands (TfWM), has created a trusted national platform that brings together standards development, knowledge management, a cloud-based evidence repository, and sector-wide measurement and evaluation. What began as a local initiative has now grown into a resource supporting LAs across the UK, reducing duplication, accelerating adoption of proven materials, and improving public value.

Alongside this, the programme's comprehensive materials testing initiative has introduced, assessed, and deployed leading global innovations directly onto UK roads. By demonstrating their performance in real-world conditions, the project has given NLC and other local authorities the confidence and evidence required to move from experimentation to implementation.

Academic and technical partners, including the University of Nottingham, Aston University, Future Highways Research Group, Safetytech Accelerator, Connected Places Catapult, Transparity, Transport Scotland, and Thinks Insight, have played a crucial role in exploring challenges, validating data, and accelerating knowledge transfer. Their involvement has positioned the programme as not only a testing ground for new materials, but a catalyst for long-term change in how the sector evaluates, approves, and scales innovation.

Enabled by Live Labs 2, North Lanarkshire has positioned itself at the forefront of local road innovation in Scotland and beyond, showcasing how local authorities can drive meaningful reductions in embodied and whole-life carbon, enhance resilience to climate change, and embed innovation into everyday operations. The project's legacy is already influencing procurement decisions, material specifications, and strategic planning across the UK local roads sector.

Senior Responsible Officer: Scott Walker | Roads & Lands Maintenance Manager

"Reducing the carbon footprint of our road network activities is central to achieving our vision within The Plan for North Lanarkshire and our Climate Plan, Action on Climate Together 2030. This programme has allowed us to collaborate with partners to advance innovative measures that directly address this critical challenge."

1. Project Overview

1.1 Introduction

ADEPT Live Labs 2: Decarbonising Local Roads is a three-year, UK-wide £30 million programme, funded by the Department for Transport, aimed at decarbonising the local highway network. It includes seven projects, grouped by four interconnected themes, led by local authorities working alongside commercial and academic partners.

A critical cornerstone of the ADEPT Live Labs 2 programme, North Lanarkshire Council (NLC), in partnership with Transport for West Midlands (TfWM), Amey, Colas, and an extensive network of UK and international collaborators, has successfully delivered one of the four themes: **the Centre of Excellence for Decarbonising Roads**. Building upon the original £4,563,550 allocation to NLC and separate funding for the South Campus, the consortium has evolved from a proposal to a nationally recognised engine for innovation, sector alignment, and carbon-focused transformation across the UK local roads network.

From its inception, the Centre set out to address one of the sector's most persistent challenges: a fragmented, inconsistent and siloed approach to materials innovation. Historically, local authorities were left to run isolated trials with limited evidence, variable data quality, and significant cost and risk burdens. Through Live Labs 2, the Centre has fundamentally changed this landscape by creating the UK's first dedicated, trusted, evidence-driven environment for evaluating and scaling low-carbon materials.

1.2 Purpose of the Final Report

The purpose of the Final Report is to critically examine the end-to-end journey of this revolutionary programme was developed and delivered, highlighting key achievements, evidence generated, and its contribution to accelerating decarbonisation across the UK roads sector. Learnings are based on programme documentation, comparative trials, carbon assessments, engagement with partners, and behavioural research, using a consistent and evidence-led evaluation approach.

1.3 Project Drivers and Objectives

The Centre was formulated in response to the macro-, meso- and micro-level challenges facing the industry's ability to meet its net zero targets, now validated by the Centre through extensive behavioural research and cross-sector engagement since 2023. The items that were not present in the Outline Business Case but subsequently surfaced through outreach are highlighted below:

Challenges and Drivers for the Centre	Link to Desired Outcomes
Lack of systems thinking	Establish a Centre of Excellence model led by industry to tackle siloed working and lack of interconnectivity across local authorities.
Carbon measurement and tracking	Establish a consistent approach to carbon evaluation of road materials.
Piecemeal application of new innovation	Enable coordinated materials trials and widespread adoption of emerging technology in decarbonisation.
Scope 3 and fugitive emissions	Transformation of LA approach to whole-life carbon reduction of local roads.
Effective decision-making that balances decarbonisation against other needs	Intelligent commissioning of local road maintenance and construction that balances decarbonisation with operational, financial, technical and wider impacts.
Legislative restrictions	Where relevant, embedding of research outputs into standards and specifications within the UK.
Materials under pressure	Accelerate innovation in highways materials to optimise road infrastructure, thermally and functionally, against climate change.
Behavioural barriers	Address long-standing behavioural barriers preventing adoption of low-carbon materials.

Table 1: Challenges, Drivers and Outcomes

1.4 Workstreams

At its core, the project set out to identify, develop, evaluate, and scale low-carbon material innovations to reduce whole-life carbon emissions across the UK's road networks through two main workstreams: a Knowledge Bank and Smart Materials Testing Programme. The Knowledge Bank workstream involved the creation of a national database to provide LAs with tested, standardised information on innovative materials, associated carbon impacts, and case studies of both successful and unsuccessful trials. This intended to reduce duplication, improve transparency, and support LAs in making informed, cost-effective and carbon-efficient decisions.

The second workstream was a Smart Materials Testing Programme, developing a structured innovation funnel to source, assess, test, and validate cutting-edge materials from the UK and around the world. This includes laboratory testing, live demonstrators in test-bed sites across North Lanarkshire and the West Midlands, and robust carbon measurement using FHRG standards. The aim was to ensure that only credible, evidence-based materials progress toward wider adoption, thereby preventing "greenwash" and increasing sector confidence.

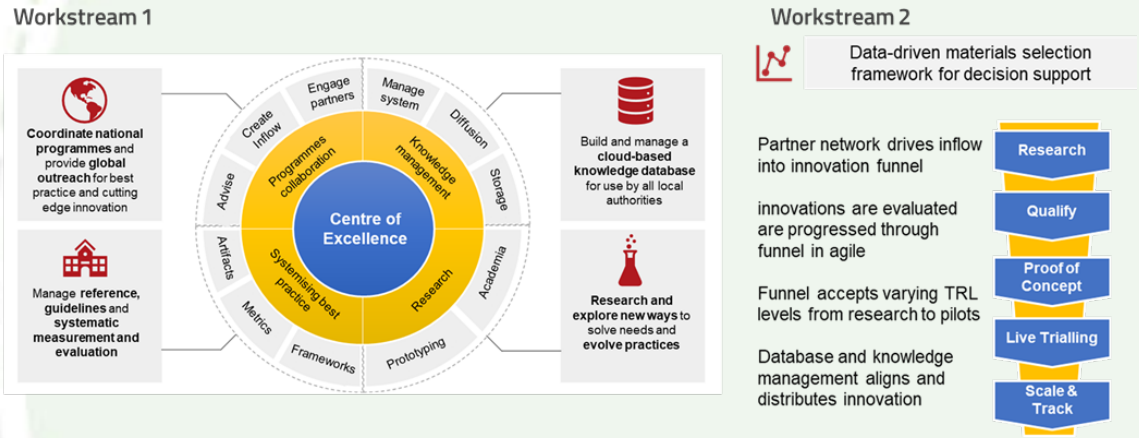


Figure 1: Workstream Overview from Outline Business Case

1.5 Logic Model and Theory of Change

The long-term vision was for the Centre to become a permanent, trusted body that accelerates decarbonisation, reduces costs through standardisation and shared learning, improves material resilience, and strengthens UK leadership in climate-focused road asset management.

Below are the original Theory of Change and Golden Thread for the CEDR North Campus, visualising the relationship between the project background, challenges, inputs, outputs and outcomes.

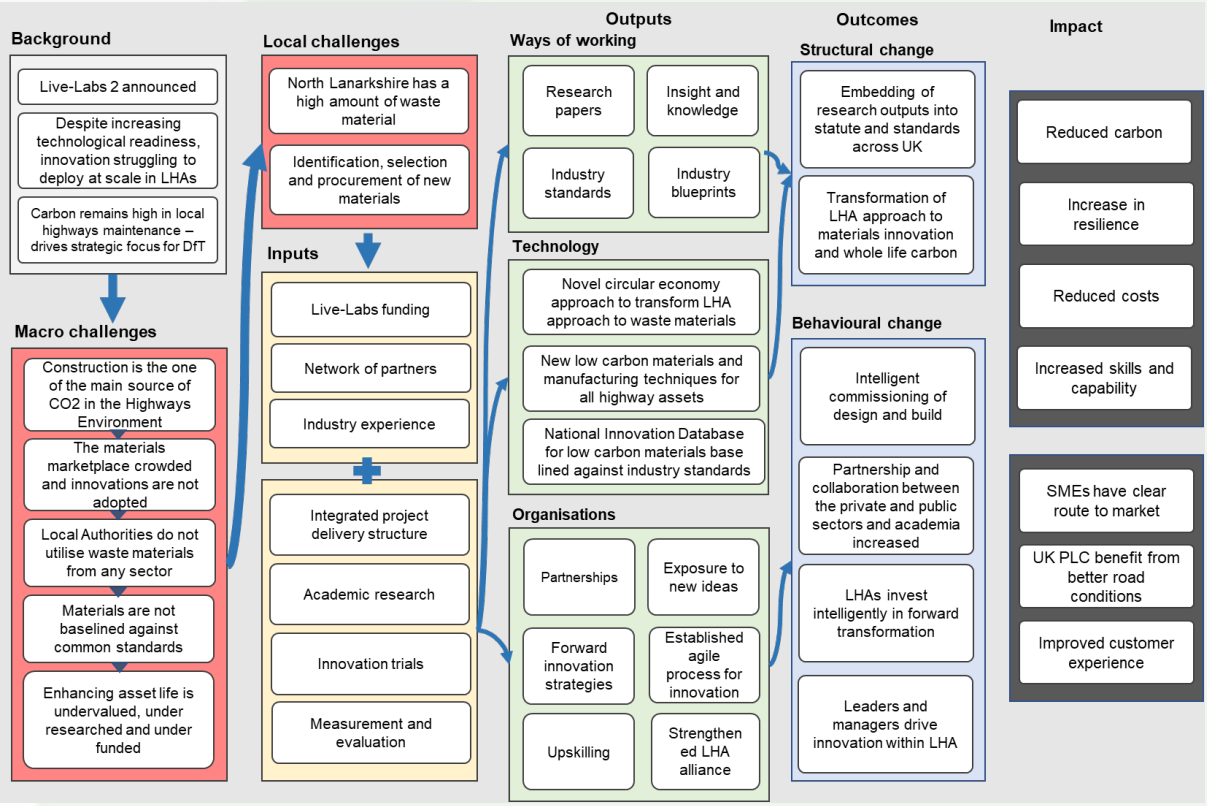


Figure 3: Logic Map

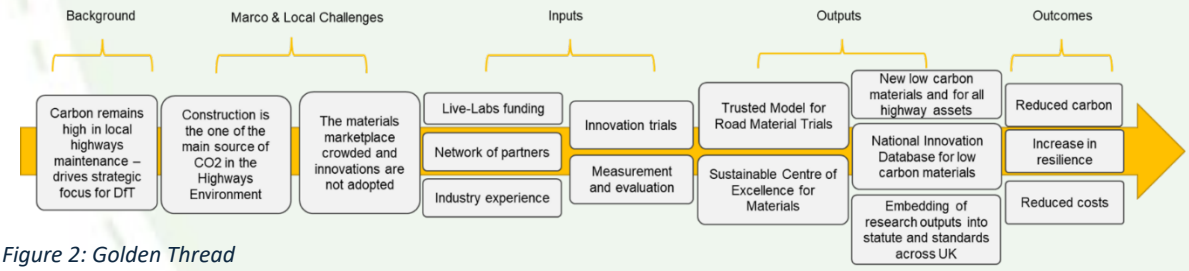


Figure 2: Golden Thread

1.6 Project Structure and Governance

As part of the bidding process, NLC and TfWM were tasked with forming a coherent, collaborative Centre of Excellence across two 'campuses.' Although united as one Centre of Excellence, the North Campus, comprising North Lanarkshire Council and delivery partner Amey, differs from the South Campus in delivery of specific workstreams, as outlined below:

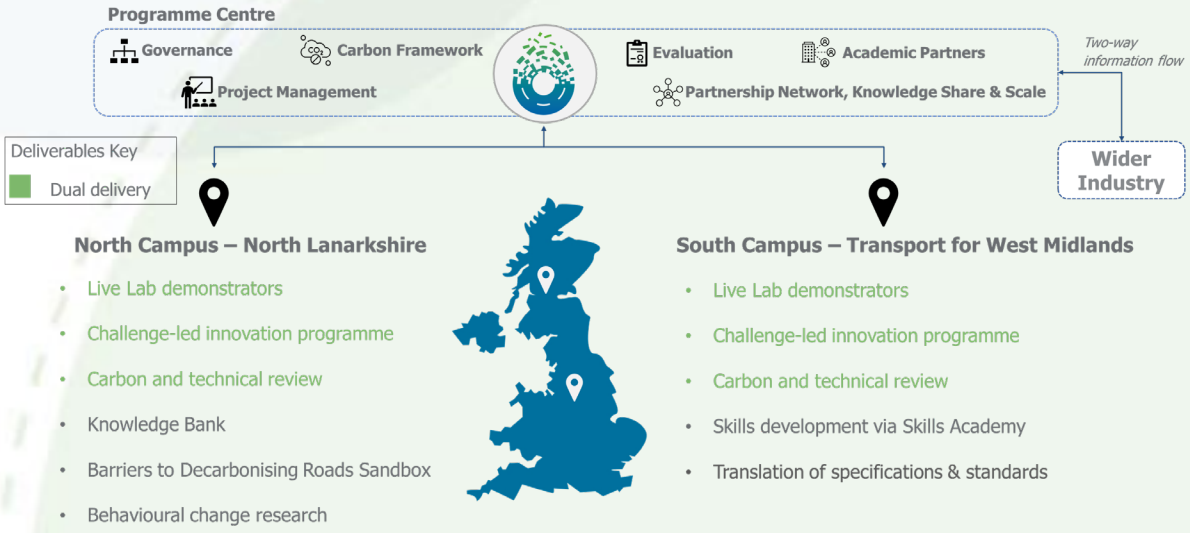


Figure 4: Programme Structure

Further to this, the geographic differences and local priorities between both campuses resulted in key methodological variance for the following reasons:

Difference	Justification
North Campus emphasised 'clean' and comparative trials in initial pothole repair trial to ensure accurate carbon and technical performance data.	South Campus emphasised operational trials to understand the real-world implications for initial pothole trials, following a 'clean' environment for their Pothole Phase 2.
North Campus emphasised 'fence-to-fence' scope for material market scanning and trials, whilst the South Campus focused predominantly on asphaltic materials.	NLC aimed to provide a breadth and depth of insight into all materials relevant to local road maintenance. TfWM focused more on asphalt as it comprises the majority of carbon emissions from materials.
North Campus led the delivery of the Knowledge Bank, Sandbox and behavioural change research.	In line with Outline Business Case commitments from NLC.
Both Campuses differed in project management roles and structures (e.g. North Campus resourced a Technical Lead, Technical Team, Comms Lead and 0.5 FTE Programme Manager).	This is due to differing roles and responsibilities between LA and project delivery partner, as well as budget.
Most, if not all, North Campus trials were conducted on Hot-Rolled Asphalt (HRA).	This is due to the prevalence of HRA in the Scottish local roads sector, thereby requiring any materials to be proven as effective with HRA to enable full adoption into business-as-usual.
North Campus noted slightly less engagement from the same large supply chain organisations than in comparison with the South Campus.	Exact reasons are unknown, however this may have been influenced by the perceived value and size of the Scottish market.
North Campus received more transparency in carbon emissions data from suppliers in comparison to the South Campus.	This may have been influenced by the Carbon Lead from the North Campus working for an organisation with no pre-existing ties to material manufacturing.

Table 2: Differences between North and South Campuses

United as one theme, both campuses maintained strategic and operational alignment through weekly Project Management meetings, regular communications meetings, informal bi-weekly consortium calls, and a Steering Board that convened once per month.

Project Overview

Figure 5: Cross-campus Kick-off Meeting, June 2023

Figure 6: Cross-campus Exhibition at PIARC World Road Congress, October 2023

Figure 7: North Campus Project Pothole, February 2024

Figure 8: LCRIG Innovation Festival, July 2025

Figure 9: Cross-campus Exhibition at PIARC Winter Road Congress, March 2026

Represented by a Senior Responsible Officer from each of the four partner organisations (NLC, TfWM, Amey and Colas), the Steering Board acted as a North Star for the Centre. Underpinned by a joint governance document and protocols agreed from the start, decisions were reached based on a quorum, with public sector SROs having ultimate decision-making capacity. Change requests, joint workstream finance and other areas of overlap were consistently managed through this forum.

Providing further strategic alignment, the Centre created an Expert Advisory Panel within the mobilisation period. The group, consisting of leaders in the local roads industry, met on a monthly basis until the last year of the programme, when frequency reduced to quarterly. Representatives included Transport Scotland, National Highways, FHRG, Midlands Highways Alliance, Mineral Products Association Scotland, University of Nottingham and HAUC UK through the Road to Net Zero project. Their regular insight and amplification of the Centre's initiatives played a vital role to reducing duplication, maintaining technical excellence and stimulating collaboration across local roads, strategic roads and sister sectors like utilities and street works.

1.7 Project Partners and Roles

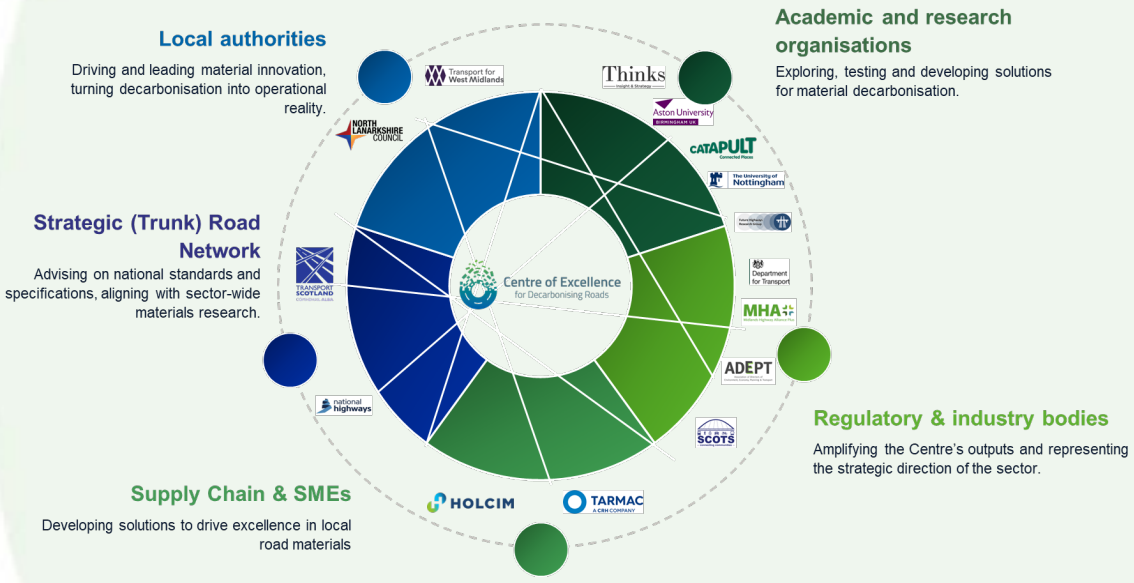


Figure 10: Project Innovation Ecosystem

Project Overview

- **Amey –** Main project delivery partner for the North Campus – provided overall project management, knowledge bank delivery, carbon evaluation, technical evaluation, operational oversight, market scanning, communications and engagement, and subcontract management. NLC's term maintenance contractor for the first 1.5 years of the programme, delivering the initial trials from an operational perspective.
- **South Campus (Transport for West Midlands, with delivery partner Colas) –** Partner project, consulted and provided insight into key workstreams across both campuses.
- **Connected Places Catapult –** Completed a series of three work packages in partnership with the North and South Campuses, including international market scanning, a future foresights report, and an Industry Playbook for LAs to accelerate local road innovation.
- **University of Nottingham and Aston University –** Academic partners, sat on the Expert Advisory Panel and representing the Expert Research Group, provided accelerated life testing for asphaltic materials.
- **Future Highways Research Group** – Advised and supported delivery of the carbon baseline and carbon evaluation of trials. FHRG also sits on the Expert Advisory Panel. Carbon evaluations were completed in line with the FHRG Carbon Calculation and Accounting Standards (CCAS) and with the Carbon Leadership Programme (CLP) toolkit.
- **Safetytech Accelerator –** Delivered the Barriers to Decarbonising Roads Sandbox (BDRS), supporting SMEs to identify and develop solutions for the barriers faced in navigating the UK materials market.
- **Thinks Insight –** Delivered two behavioural change work packages, including initial LA engagement and end-user requirements gathering for the Knowledge Bank, as well as on-the-ground behavioural barrier research.
- **Transparity –** Leveraging Microsoft tools, Transparity developed the Knowledge Bank.
- **Contractors –** Provided both operational support in delivery of trials (Amey and Hochtief), as well as industry insight into key workstreams such as mentorship in the Sandbox.
- **Supply Chain –** Enabled material supply for trials, as well as industry insight into key workstreams such as mentorship in the Sandbox and sense-checking Knowledge Bank content.
- **Small-to-Medium Enterprises (SMEs) –** Participated in trials and in the Sandbox, providing valuable insight into their experiences and cutting-edge innovations.
- **Industry Bodies (National Highways, Transport Scotland, SCOTS, MPA and others) –** Represented on the Expert Advisory Panel and participated in key workstreams such as mentorship in the Sandbox.

1.8 A Retrospective View: Key Achievements

1.8.1 A Nationally Recognised Hub for Decarbonisation

The Centre has successfully coordinated across borders, through the North Campus (North Lanarkshire) and South Campus (West Midlands), enabling consistent learning, testing, and decision-making across regions. Despite the geographic differences and inherent complexity, the collaboration between campuses has strengthened a cross-nations relationship that will endure beyond the end of this programme.

1.8.2 A Structured, Global Approach to Identifying Innovation

In its first year, the team scanned both the UK and global markets to identify leading low-carbon materials and technologies, leveraging relationships across LAs, universities, suppliers, SMEs, and standards bodies. This included collaboration with:

- **Amey**'s Technical and Design team: Conducting comprehensive market-scanning sprints of low-carbon material innovation in the UK, aligned to the DMRB/MCHW series (200+ innovations).
- **Connected Places Catapult**: Leveraging their international academic, research and SME ecosystem, identifying global innovations not originally surfaced by the domestic market scanning (200 innovations).
- **Safetytech Accelerator**: Identifying a further 300 innovations, focused on earlier-stage Technology Readiness Levels to be included within the Barriers to Decarbonising Roads Sandbox (BDRS).
- **The University of Nottingham**, **Aston University** and other university partners: Sense-checking and providing material research themes to further explore.
- **Entries on the website from suppliers:** Through an automated form to the Centre's Innovation Log (65 innovations).

1.8.3 Live Trials Transforming the UK Roads Sector

Multiple trial programmes were delivered across the breadth of local road maintenance and construction activity, such as surface treatments, surfacing, pothole repair, in-situ recycling processes, signage, and line marking. These were underpinned by an award-winning trial methodology developed by the team, where possible comparing multiple materials side-by-side with the business-as-usual material (Highways UK Net Zero Award; Scottish Transport Awards finalist for Excellence in Technology and Innovation). A few notable examples include:

- **SuperSite resurfacing trials**, transforming a two-kilometre B-road into a live testbed for cutting-edge asphalt innovations.
- **Project Pothole**, evaluating six pothole-repair materials side-by-side across six controlled sites.
- **Rejuvenator trials**, comparing performance across SMA and HRA surfaces, produced in collaboration with the University of Nottingham and the M8 DBFO.
- **UK-first trials,** of a waste-plastic polymer-modified bitumen (Ecopals Ecoflakes) and a microcapsule anti-icing asphalt additive (Iterchemica WinterPave).

These trials provided unprecedented like-for-like, real-world data under live traffic conditions, addressing the historical gap in reliable evidence for local authorities.

1.8.4 Creation of the UK's First Knowledge Bank for Low-Carbon Road Materials

One of the most celebrated achievements has been the launch of the Knowledge Bank, an open-access digital platform giving local authorities nationwide the ability to:

- Explore a verified menu of low-carbon materials, sourced from the Centre's market scanning
- Compare lifecycle emissions, centrally storing carbon data such as Environmental Product Declarations (EPDs)
- Access case studies, trial protocols, supplier data and technical insights
- Share operational experiences and peer reviews

The platform rapidly gained adoption, reaching over 2,200 unique users since its launch in October 2025. Its launch webinar and subsequent engagement events have attracted strong sector engagement and positioned NLC as a UK leader in digital transformation for material innovation and decarbonisation.

1.8.5 Sector Leadership, Influence and Recognition

The programme consistently elevated NLC's national profile, earning awards and delivering thought leadership across the UK and internationally. Highlights include:

- Creation of an industry-recognised Centre of Excellence for Decarbonising Roads brand, comprising of a logo, brand guidelines, website, LinkedIn page with over 1,250 followers, YouTube channel, digital resource library, and structured and consistent marketing campaigns.
- Winning the Highways UK Net Zero Award (2024) for comparative trial methodology of pothole repair materials.
- Presenting research at events across the UK, Europe, and the US, including the World Road Congress (2023), NAPA International Summit in Chicago (2025), and the Winter Road Congress (2026).
- Shortlisting for national awards recognising carbon reduction and innovation excellence, including the Scottish Transport Awards.
- Programme manager, Lauren SeBlonka, winning the Highways UK Associate Laureate (Rising Star) Award, recognising her contributions to decarbonisation as enabled through Live Labs 2.

1.8.6 Collaborative Governance and Sector-Wide Partnership

The Centre's strength is drawn from an extensive partnership network involving industry bodies, academics, supply chain experts, and innovators. This ecosystem has enabled:

- A trusted industry review process (carbon, technical and scalability criteria).
- The creation of a unified testing and evaluation methodology, enabling apples-to-apples comparisons across materials.
- Behavioural insights research to address operational, cultural and procurement barriers to innovation adoption (in partnership with Thinks Insight).
- A national advisory ecosystem spanning National Highways, Transport Scotland, Connected Places Catapult, and academic research groups.

1.9 Programme Legacy

Ultimately, the story of the Centre of Excellence is one of transformation; of local authorities gaining the knowledge and tools needed to lead on material decarbonisation, of innovators finding a trusted environment to scale their ideas, and of a sector moving beyond isolated trials toward coordinated, evidence-driven change. What has been built through Live Labs 2 is not only a body of research or a suite of tools, but a lasting foundation for how the UK can continue to reduce the carbon impact of its road networks in the years ahead through better-performing assets.

2. Key Activities

2.1 Project Workstream Overview

The North Campus delivered its mission through two primary workstreams, underpinned by four integrated sub-workstreams. Innovation management through an agile Innovation Funnel provided a structured pipeline for identifying, assessing, and trialling low-carbon materials using consistent technical, operational, and carbon criteria. Communications and engagement built sector awareness through events, digital channels, and partner collaboration, positioning the Centre as a national hub for decarbonisation. Innovation support programmes, including the Sandbox, behavioural research, and foresight studies, helped remove barriers and strengthen the pathway for emerging technologies. Finally, the Knowledge Bank created the UK's first centralised, open-access repository of validated material data, enabling local authorities to make informed, evidence-based decisions and reduce duplication across the sector.

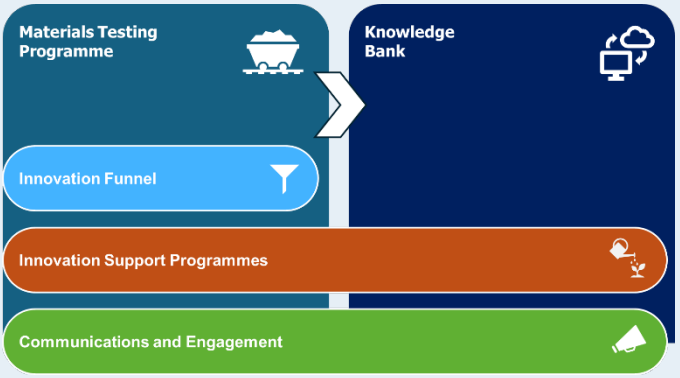


Figure 11: Workstream Overview for the North Campus

Key Activities

2.2 Innovation Funnel

Following a hybrid agile-waterfall approach, the beating heart of this project was the Innovation Funnel. Evolved from previous experience on the Live Labs 1 Staffordshire project, the Funnel comprised five central steps: **discovery, identification, qualification, trial, and scale and share**. This ensured a streamlined methodology for navigating the complex, innovation-rich materials market both in the UK and globally, with multiple 'sift' points to prevent trial expenditure on any unfeasible or nonviable low-carbon materials. Benefitting from digital tools and automation, the Funnel convened operational, technical, carbon and innovation experts at each step for a truly holistic identification, assessment and trial of materials.

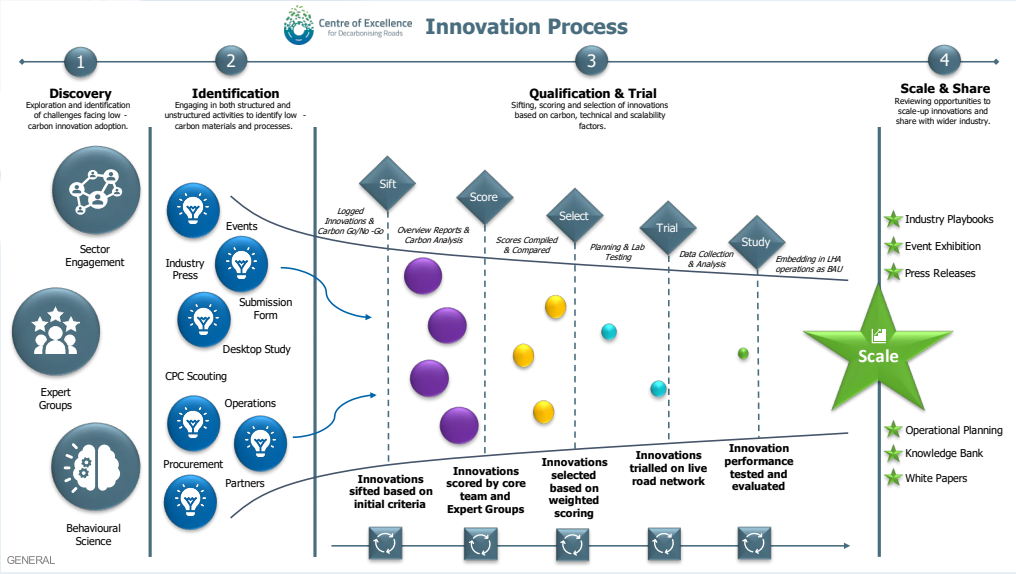


Figure 12: Detailed Innovation Funnel

Key Activities

2.2.1 Challenge Identification

Local Authority Engagement

At the outset, the Centre recognised that innovation in local road materials was often fragmented and siloed, so the team prioritised direct engagement with local authorities across the UK. This outreach included workshops, interviews, and collaborative sessions, all designed to surface practical challenges and barriers that were not fully captured in the original business case.

A comprehensive local authority survey was developed and deployed to map decision-making journeys, identify behavioural, cultural, organisational, and technical barriers to adopting low-carbon materials, and gather data on current practices and pain points. The survey results provided a foundation for the Centre's evidence-led approach, ensuring that subsequent workstreams and interventions were tailored to the actual needs and constraints faced by local authorities.

Throughout the programme, the Centre maintained ongoing dialogue with local authorities, using survey findings to refine the innovation funnel, trial protocols, and knowledge bank features. This iterative process ensured that the Centre's outputs remained relevant and actionable, supporting both strategic and operational change.

Carbon baselining

NLC began the programme by establishing a full carbon baseline of its highways services to address one of the sector's most persistent gaps: the absence of consistent, reliable and comparable carbon data. Early engagement with local authorities and industry partners highlighted that decisions on low-carbon materials were often hampered by fragmented information, inconsistent measurement approaches, and limited visibility of Scope 2 and 3 emissions across road maintenance activities. Establishing a baseline therefore became essential to quantify the current position, identify high-impact carbon sources, and create a robust foundation for evaluating new materials and operational practices. This also aligned with the Centre's broader ambition to enable intelligent commissioning and support whole-life carbon reduction.

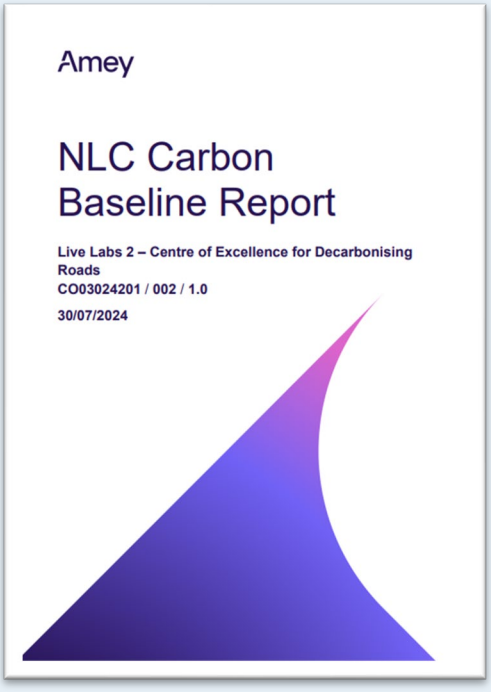


Figure 13: Carbon Baseline Report, available on the ADEPT website

Key Activities

The baseline was developed using the **Future Highways Research Group (FHRG) Carbon Calculation and Accounting Standards (CCAS)** and supported by a structured evidence-gathering process. This included:

- Mapping all major activities within NLC's road maintenance and construction operations.
- Collecting and validating data from suppliers, contractors and internal operations teams.
- Assessing embodied carbon in materials, particularly asphalt, which had been shown to represent around 40% of total embodied emissions.
- Incorporating Scope 2 and 3 emissions and operational impacts to ensure a complete whole-life picture.

This process built on early behavioural research, operational engagement, and supplier transparency, an area where the North Campus benefitted from strong cooperation from material producers.

The result of this work was more than just a quantitative baseline: it became a strategic tool. The baseline enabled NLC and Amey to identify priority decarbonisation opportunities, design comparative trials, and embed consistent carbon evaluation into every stage of the Innovation Funnel, from identification and qualification through to live testing and scaling. It provided the reference point for evaluating new materials (such as biogenic binders, rejuvenators, in-situ recycling, and novel asphalt additives) and ensured that subsequent carbon assessments for each trial were credible, apples-to-apples and transferable across the sector.

What NLC took forward from this work included:

- A consistent and repeatable carbon evaluation methodology adopted across all trials.
- A deeper understanding of the carbon profile of local highways operations and where innovation could deliver the greatest impact. This included a large proportion of emissions in energy consumption, highlighting the need for complementary live labs such as the future street lighting innovation in East Riding.
- Evidence and insights that fed directly into the Knowledge Bank, enabling other LAs to access carbon data, Environmental Product Declarations, and evaluated case studies.
- A foundation for long-term whole-life carbon reduction, procurement reform, and future strategic planning.

In short, the carbon baseline became the first step of the Centre's evidence-led approach to evaluating material innovation.

Key Activities

2.2.2 Inspiration

Building on these foundations, the North Campus team adopted a fence-to-fence approach, recognising the widespread decarbonisation issues across all material categories and service activities within local roads. To tackle this, the team developed a market scanning sprint process aligned to the Design Manual for Roads and Bridges (DMRB) series. From signage to lining to surfacing, the technical team at Amey worked through a structured approach of desktop research, supply chain outreach and operational engagement, collecting over 150 material innovations across ten material series.

All material innovations were stored in a digital Innovation Log, with an automated form for suppliers to add their own innovation on the website (www.decarbonisingroads.co.uk), gathering a further 50 ideas over the duration of the programme. This tool remained instrumental to both the Centre's innovation selection and other Live Labs, as a repository shared early in the programme.

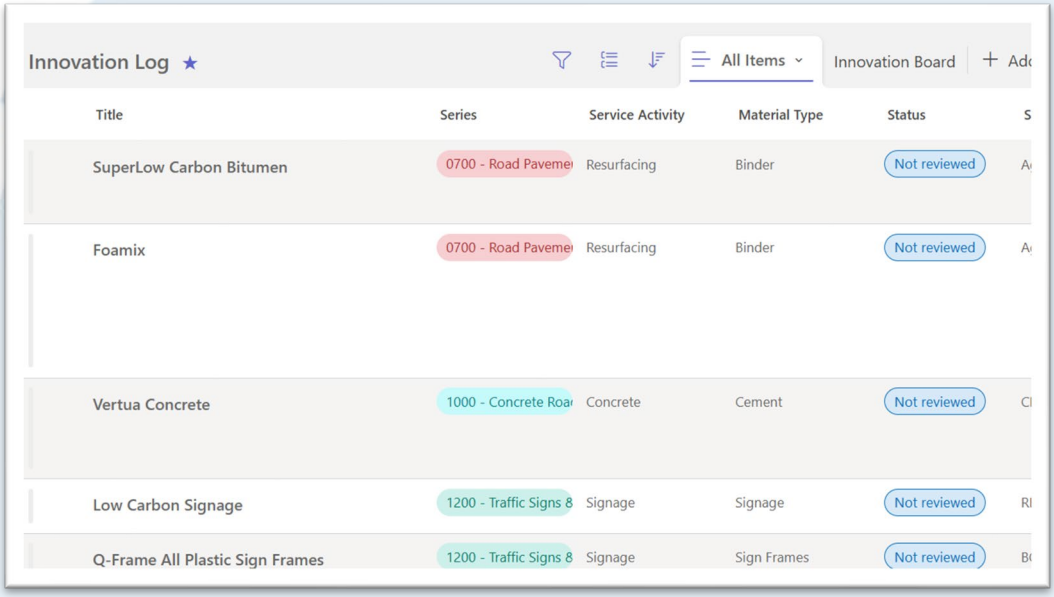


Figure 14: Innovation Log Snapshot

Complementing this initial research, both campuses also commissioned international market scanning from Connected Places Catapult. This aimed for parity, identifying a further 200 innovations from every corner of the global road industry. Compiled in an international market scanning report, CPC summarised the key themes in material innovation, as well as systemic constraints (see Appendix B).

Figure 15: Example State-of-Play Report

Key Activities

2.2.3 Prioritisation

Once initial market scanning was completed for a material category, an initial sift session was hosted. Convening operational, technical and carbon experts, the team would narrow down up to fifteen options based on an initial state-of-play document and innovation snapshots, as seen here.

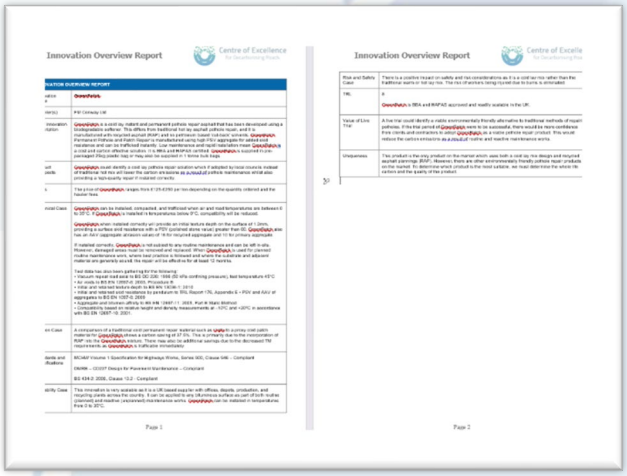
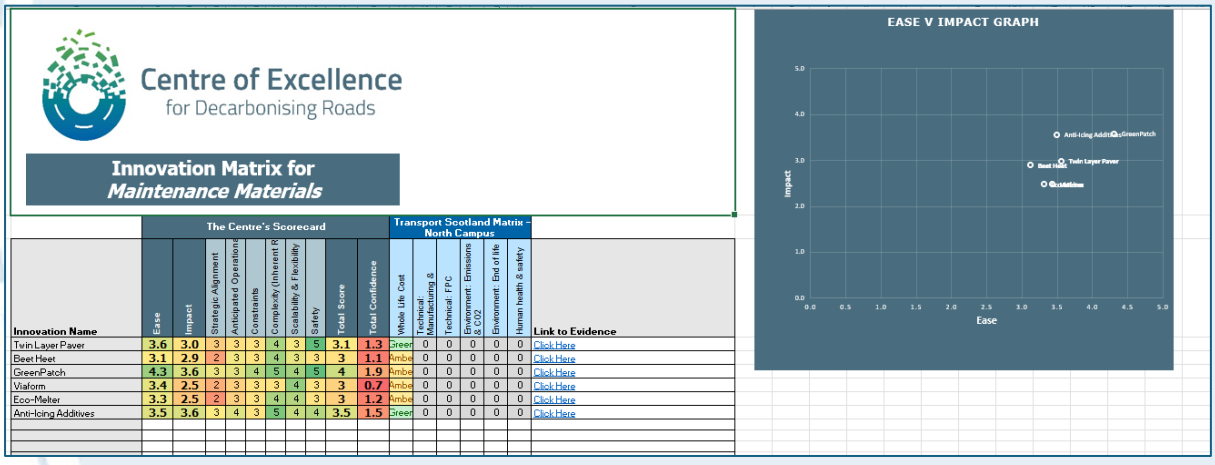


Figure 16: Example Innovation Overview Report

After the sift session, the technical team completed Innovation Overview Reports, or brief business case overviews refined through supplier verification.

With limited available time, both campuses collaborated on an Innovation Scorecard – a digital tool that weighted carbon savings against other factors such as operational effectiveness, efficiency, wider environmental impacts, cost and health and safety – to ensure materials that progressed to trial offered the greatest opportunity to be a viable alternative to the business-as-usual.



	The Centre's Scorecard									Transport Scotland Matrix - North Campus						
Innovation Name	Ease	Impact	Strategic Alignment	Anticipated Operations	Constraints	Complexity (Inherent R	Scalability & Flexibility	Safety	Total Score	Total Confidence	Whole Life Cost	Technical: Manufacturing &	Technical: FPC	Environment: Emissions & CO2	Environment: End of life	Human health & safety	Link to Evidence
Twin Layer Paver	3.6	3.0	3	3	3	4	3	5	3.1	1.3	Green	0	0	0	0	0	Click Here
Beet Heet	3.1	2.9	2	3	3	4	3	3	3	1.1	Amber	0	0	0	0	0	Click Here
GreenPatch	4.3	3.6	3	3	4	5	4	5	4	1.9	Amber	0	0	0	0	0	Click Here
Viaform	3.4	2.5	2	3	3	3	4	3	3	0.7	Amber	0	0	0	0	0	Click Here
Eco-Melter	3.3	2.5	2	3	3	4	4	3	3	1.2	Amber	0	0	0	0	0	Click Here
Anti-Icing Additives	3.5	3.6	3	4	3	5	4	4	3.5	1.5	Green	0	0	0	0	0	Click Here

Figure 17: Example Innovation Scorecard

Each area of scoring had an assigned subject matter expert to complete scoring, with added robustness through detailed explanations of each Likert scale (1-5) in an Innovation Scoring Guidance document. This minimised any inconsistency in understanding the tool, with scorers using the aforementioned Innovation Overview Reports to inform their decisions.

Key Activities

Automatically graphed by ease and impact, materials scoring high in both areas of a certain threshold (typically 3.0 out of 5.0) were progressed to live trial planning. Over the first twelve months, this translated to:

- 200 materials identified
- 7 state-of-play reports created
- 7 sift sessions hosted
- 7 scorecards completed for material categories
- 58 overview reports for material innovations

2.2.4 Trial design and planning

This project was not another case of ad hoc trials. The Centre established a comparative, considered and lab-like environment to elevate local authority decision-making to the highest level of live trial evidence.

Developed into a set of published trial protocols, both campuses set out to approach trials in as clean of an environment as possible, minimising variables that impact technical performance differentiation whilst bolstering comparability in operational carbon data collection.

Each trial had an associated Trial Design document, outlining key research questions, objectives, baseline information and a data collection plan. Not only did this support planning but it provided a vital reference point for post-trial evaluation.

Key Activities

2.2.5 Trials

One of the pinnacles of the programme, the North Campus commenced its first trials in early February 2024, with its trial methodology receiving the Highways UK Net Zero Award in 2024.

From pothole repair to preventative maintenance to in-situ recycling, NLC has completed over 12 trial programmes on numerous sites:

1 Project Pothole
February – March 2024
Side-by-side comparison of low-carbon pothole repair materials and methods with business-as-usual (HRA and standard cold-mix).

2 Reclamite
May 2024
Trials of rejuvenator on HRA and SMA sites, with comparative technical evaluation completed by the University of Nottingham

3 Line-Marking
June – September 2024
Side-by-side comparison of five low-carbon line-marking materials with business-as-usual thermoplastic. Completed on transverse, refreshed and new lining.

4 Fliegl Trailer
January 2025
Trial of a German push-off trailer technology designed to reduce formation of cold spots when laying and consequent defect formation.

5 Jerol
May 2025
Trial of passively safe signpost that can be designed to replace unrequired vehicle restraint systems, made of recycled composite materials.

6 Pentack
August – September 2025
Trial of Danish preservative-rejuvenator material to assess suitability for HRA in comparison to traditional rejuvenators.

Department for Transport

ADEPT LIVELABS2 Decarbonising Local Roads

Key Activities

7 Surfacing SuperSite
July 2025
2km SuperSite, testing low-carbon surface course materials, emulsion-based in-situ recycling, and calcined clay in-situ recycling side-by-side.

8 WinterPave
August – September 2025
Trial of a microcapsule anti-icing asphalt additive, designed to inhibit the formation of ice on the surface of pavement. Trialled on a footway typically gritted in winter.

9 EcoPals EcoFlakes
October 2025
First trial for EcoFlakes in the UK, demonstrating a waste polymer modified bitumen.

10 ACLA
October 2025
Carpark trial of Low Carbon Materials' ACLA, a carbon sequestering aggregate.

11 Biochar
October 2025
Trial of biochar from the Greenprint Live Lab, demonstrating the practical application of biochar generated from grass cuttings pyrolysis.

12 EcoPals & Sima
March 2026
Side-by-side comparison of two waste polymer modified bitumen solutions at Strathclyde Country Park carpark.

Figure 18: Summary of Key Trials

Key Activities

2.2.6 Location Map of Trials

#		Trial Name	Site Location(s)
1		Project Pothole	A723, Carfin
			A73, Cumbernauld
			B7066, Shotts
			B8054, Cumbernauld
			C36, Cumbernauld
			Robberhall Road, Wishaw
2		Reclamite	Mitchell Street, Coatbridge
			Chapelhall Roundabout, A8, Motherwell

Department for Transport

ADEPT LIVELABS2 Decarbonising Local Roads

Key Activities

3	Line-marking	Glasgow Road, A8011, Cumbernauld
		Holytown Link Road, A73, Carfin
		A723, Carfin
		A8011, Cumbernauld, Old Inns Roundabout
		Robberhall Road, Wishaw
		B816, Old Inns to Ward Park Roundabout
4	Fliegl	A806, Chyrston
5	Jerol	A73, Stirling Road
6	Pentack	Caldercruix Road, North Lanarkshire, Scotland
7	Surfacing SuperSite	B7066 by House O'Muir road
8	WinterPave	Abbotsford Road
		Marmion Road
9	EcoFlakes	Chapelknowe Road, B7029, Carfin
10	ACLA	King Street Carpark, Kilsyth
		St John St Carpark, Coatbridge
11	Biochar	Crofthead Crescent, Bellshill
12	EcoPals & Sima	Strathclyde Country Park

3. Evaluation

Following the completion of each live trial, the Centre undertook a structured, multi-layered post-trial evaluation to ensure that every material was assessed consistently, transparently, and in direct comparison with the business-as-usual equivalent. This process covered three core dimensions: **carbon**, **technical performance**, and **operational feasibility**, each aligned with the standardised trial protocols developed earlier in the programme. Carbon performance was evaluated using the FHRG Carbon Calculation and Accounting Standards (CCAS), ISO 14001 and PAS2080 standards, ensuring that embodied, operational, and whole-life impacts are captured using a consistent methodology. In practical terms, the dedicated Carbon Lead leveraged a combination of OneClick LCA, Aspect, FHRG and emissions databases. This also involved the publication of a categorisation guideline for carbon emissions factors, to both support suppliers in understanding industry expectations for carbon reporting and for local authorities to quickly identify the robustness of suppliers' carbon emissions claims (see Appendix B). In total, 25 material carbon evaluations have been published by the North Campus.

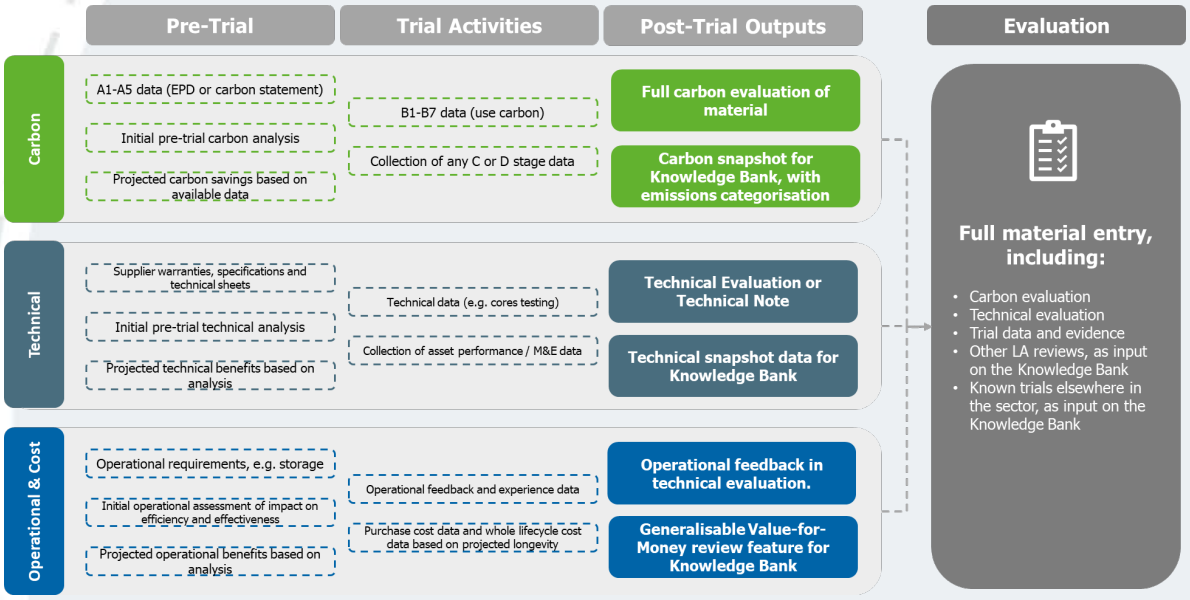


Figure 19: Evaluation Process

Evaluation

Technical evaluations examined the material's durability, performance under live traffic, resilience, and behaviour in local climatic conditions, often supported by input from academic partners such as the University of Nottingham and Aston University through accelerated life testing. In total, 7 technical notes and evaluations have been completed.

Operational evaluation captured how the material performed during installation, including ease of use, curing times, safety considerations, supply chain readiness, and compatibility with current equipment and practices. This was gathered through a combination of operative feedback and site diaries.

Together, these assessments allowed the Centre to determine whether a material was viable for scaling locally within NLC and more broadly across UK local roads. Insights, data, and case studies from each post-trial evaluation have then been standardised and uploaded into the Knowledge Bank, enabling other local authorities to access high-quality evidence and reducing duplication of trials across the country.

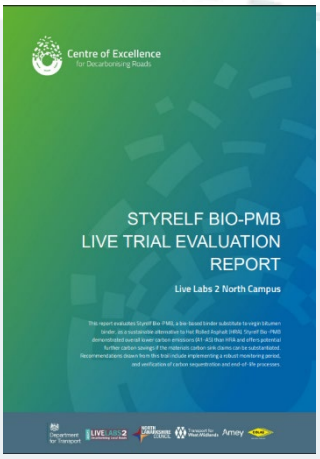


Figure 20: Example Carbon Evaluation Report, available on the Knowledge Bank and ADEPT website

4. Scaling

Significant effort across North Lanarkshire and its partners has been taken to ensure that successful material trials translate into business-as-usual change, as evidenced by the strategic and tactical decisions taken since project mobilisation.

4.2 Scaling Locally

Locally, the ability to scale was bolstered in September 2025 by the NLC Environment and Climate Change Committee, which ratified the Council's commitment to promote the use of appropriate low-carbon materials trialled through the Live Labs 2 programme into business-as-usual activities for road maintenance, in line with The Plan for North Lanarkshire's Ambition Statement 17 (Ensure we keep our environment clean, safe, and attractive).

Since initial trial evaluations and outcomes, North Lanarkshire has transitioned the following materials to business-as-usual:

- **Biogenic thermoplastic** for all line-marking, with increased usage of MMA line-marking where appropriate.
- **Biogenic binders** for resurfacing, with Team Leaders and Engineers expected to specify low-carbon materials in a minimum percentage of schemes, set to increase year-on-year.
- **End-of-life waste tyre mastic asphalt,** for use for screed and crack repair. This has been embedded into the works management system alongside other outcomes of Project Pothole through a carbon and performance-based defect treatment matrix.
- **Preventative maintenance**, Prior to Live Labs 2, preventative maintenance primarily focused on established treatments such as surface dressing, with limited adoption of other preventative maintenance interventions.
- **Passively-safe signposts** as an alternative to Vehicle Restraint Systems, where design and specifications allow.
- Incremental scaling of **microcapsule anti-icing additives** to other footways, with a view to carriageway trials depending on performance monitoring.

Scaling

4.3 Scaling with Partners

As primary delivery partner, Amey has also taken significant steps to embed the findings of Live Labs 2 into everyday operations. From a strategic standpoint, Amey have signed the ADEPT Decarbonisation Pledge, demonstrating ongoing commitment to realising the benefits of Live Labs 2 beyond programme closure.

On a tactical level, the Live Labs 2 delivery team at Amey have undertaken numerous initiatives to accelerate material decarbonisation, such as:

- Presentations to key partners and stakeholders at Transport Scotland, National Highways, supply chain partners and local authorities.
- Supported additional trial delivery to provide technical comparison of rejuvenators on HRA versus TS-2010 via the M8 DBFO with Scottish Roads Partnership.
- Dedicated material decarbonisation working groups for each of its Highways portfolios, sharing Live Labs 2 insights and process mapping service delivery to weave decarbonisation into every stage of highways maintenance and construction.
- Share and elevate key resources published through Live Labs 2, such as the Innovation Log, Trial Protocols and Innovation Scorecard.
- Progressed certain materials to trial and/or business-as-usual based on Live Labs 2 results in North Lanarkshire, including biogenic thermoplastic, binder alternatives, preventative maintenance and sustainable cold-mix repair materials.
- Leveraged Live Labs 2 findings to inform procurement decarbonisation roadmaps.
- Hosted Lunch&Learns across Transport Infrastructure and Consulting on Live Labs 2, including whole-life carbon evaluation and material innovation.
- Funnelled other Live Labs innovation into initiatives across Amey Highways, including a feasibility assessment of the Greenprint methodology for the M8 DBFO in partnership with Scottish Roads Partnership.

Scaling

4.4 Innovation Support Programmes

Recognising that material decarbonisation is not achieved solely through material trials, the North Campus also mapped a cohesive series of innovation support programmes, designed to tangibly and holistically address barriers to business-as-usual. As experienced from the perspective of LAs, SMEs and wider industry, the support programmes pulled on cross-disciplinary expertise from partnerships such as:

- **Connected Places Catapult** (in partnership with the South Campus) – for market scanning and playbook expertise.
- **Thinks Insight** – for behavioural science.
- **Safetytech Accelerator** – for SME and sandbox experience.

The interrelation between these programmes can be viewed below:

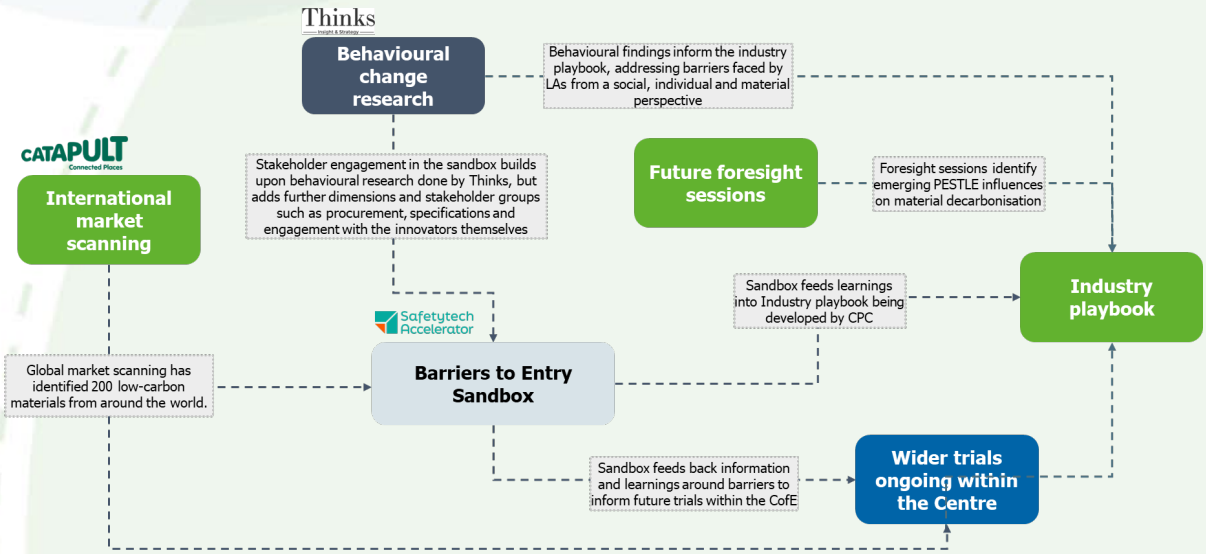


Figure 21: Innovation Support Programme Map

4.4.1 Behavioural Change – 1 & 2

This workstream was established to understand why low-carbon materials are not being adopted at scale by LAs, and to identify behavioural, cultural, organisational, and decision-making barriers preventing change. Initial phases focused on behavioural research, mapping decision-making journeys, and identifying opportunities for intervention. To ensure behavioural science was the cornerstone of this workstream, NLC partnered with Thinks Insight, a behavioural science consultancy previously commissioned to deliver similar research for various central government departments.

Scaling

Behaviour Change 1 – A behavioural approach to defining End User Requirements for the Live Labs Knowledge Bank

In early 2024, NLC and Amey approached Thinks to support with initial challenge identification, aiming to understand how local authority practitioners make decisions about materials and innovation, and to identify the conditions required for a digital platform to support the adoption of low-carbon solutions in practice.

The objectives of the first part of the behaviour change report were:

1. To understand End User needs for a Knowledge Bank through qualitative research;
2. To specify Knowledge Bank End User Requirements (EURs), based on research insights and behavioural science best practice; and,
3. To collaborate with platform suppliers to determine the format of EURs.

The report identified a long list of End User Requirements, grouped into four categories:

- **Informational requirements** – including clear, specific evidence on performance, cost, carbon savings, suitability and longevity, supported by both quantitative data and qualitative context.
- **Feature requirements** – such as decision-support tools, filtering and comparison functionality, mapping, carbon and cost calculators, and mechanisms for peer learning and validation.
- **Operational requirements** – including standardised submission processes, quality assurance, consistency of content, and simple, intuitive user journeys.
- **Organisational requirements** – recognising that successful adoption requires cultural change, leadership buy-in, collaboration between authorities, and a platform that does not add additional burden to already constrained teams.

Outputs and Impact

Overall, the research concluded that for the Knowledge Bank to be effective, it must help shift users from a *"playing not to lose"* mindset towards a more confident, opportunity-driven approach to innovation. By establishing a clear understanding of why innovation stalls in practice, Behaviour Change 1 provided a critical behavioural evidence base that directly informed the Knowledge Bank's design principles, functionality and minimum viable product (MVP), while also shaping wider development, testing and engagement activities. Collectively, this work underpinned the programme's broader strategy for embedding low-carbon materials into BAU decision-making across local authorities.

Scaling

Behaviour Change 2 – On the ground behaviour change

Behaviour Change 2 built directly on the insights from Behaviour Change 1, shifting focus from understanding barriers to developing and testing practical interventions that support the adoption of low-carbon materials in day-to-day local authority operations.

The team examined how low-carbon material innovation is adopted in practice across local authorities, with a focus on both strategic decision-makers and teams delivering works on the ground. Drawing on ethnographic fieldwork, interviews and site observations across North Lanarkshire, Coventry and Lincolnshire, the research showed that while enthusiasm for low-carbon trials is high, long-term adoption remains constrained by concerns around risk, accountability, cost and durability, particularly once external trial funding ends.

The findings highlighted that innovation is enabled by three key drivers:

1. Motivation to innovate
2. Collaboration with contractors and suppliers
3. Availability of appropriate infrastructure, tools and skills

However, these drivers are counterbalanced by the following challenges:

1. Risk aversion
2. Status-quo bias
3. A lack of clear ownership and responsibility for innovation

Ultimately, the research showed that while operatives play an important role in delivery, decisions made earlier in the process, around specification, budgeting and approvals, are more influential in determining whether low-carbon materials are ultimately adopted.

Using behavioural science frameworks in a co-creation workshop, Thinks Insight identified a suite of behaviour change interventions designed to overcome these barriers and embed innovation into business-as-usual. These include one system-level intervention focused on shared risk and liability, alongside prioritised, practical interventions such as Joint Innovation Hubs, Innovation Champions, Decision Prompts and Shared Success Stories.

Figure 22: Behaviour Change 2 research report

Overall, the research provides an evidence-based roadmap for translating successful low-carbon trials into sustained adoption. It strengthens the programme's legacy by identifying practical mechanisms to reduce risk, build confidence, and support consistent decision-making, ensuring that innovation moves beyond isolated trials and becomes embedded across local authorities.

4.4.2 Barriers to Decarbonising Roads Sandbox

The Barriers to Decarbonising Roads Sandbox (BDRS) was created to accelerate the adoption of innovative, low-carbon materials for UK roads by identifying blockers, testing mitigation approaches, and generating clear guidance for suppliers, local authorities and industry stakeholders. The North Campus partnered with SafetyTech Accelerator, as an experienced consultancy in sandboxes for organisations such as the Health & Safety Executive, with the aim of delivering a toolkit to provide startups and innovators in the roads industry with a practical guide for successful market entry.

The team began mobilising the sandbox in March 2024, setting out objectives with all industry partners and stakeholders. With a lens to tackling barriers from a supply chain and SME perspective, the BDRS objectives were to:

1. Understand what the key blockers are to new materials being adopted in local roads
2. Explore why barriers exist and what the key components of them are
3. Understand why certain innovations that 'seem' like they should be an improvement on existing methods do not make it through to full commercial uptake
4. Produce recommendations for how these blockers can be mitigated

Initial market scanning conducted by Safetytech identified over 300 SMEs, providing a strong foundation for innovation sourcing. From this pool, a structured SME selection process prioritised candidates based on strategic alignment, readiness, innovativeness, and the breadth of barriers their solutions could address. The following 6 SMEs were selected;

- **PRG Scotland** - focuses on transforming waste tyres into valuable low carbon materials for road construction
- **Sima** - developed PolyPave, a bitumen extender produced from recycled ultra-low-density polyethylene (ULDPE)
- **Ecopals** - developed EcoFlakes®, an innovative polymer modifier designed for use in asphalt
- **Uberbinder** – A bio-polymerised sulphur binder, eco-friendly road binder that reduces emissions
- **Biozeroc** - offering a low-carbon cement alternative product BioCemTM
- **DMAT** - a technology company pioneering next-generation concrete and mortars

Scaling

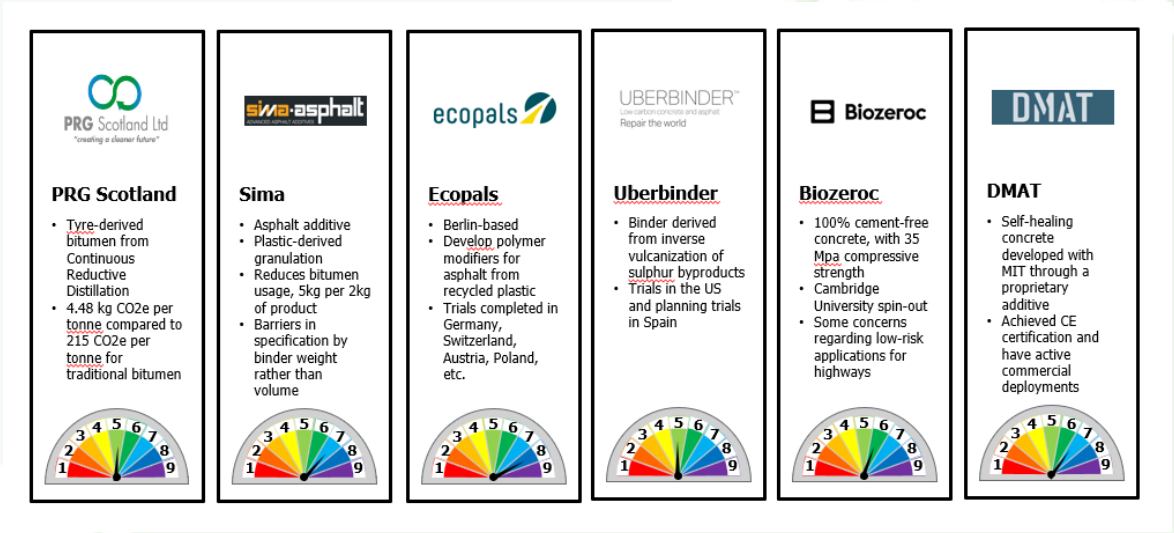


Figure 23: Highlighting all the SME's and their technology readiness levels

We then completed a mentor matchmaking activity, connecting the 6 SMEs with experienced sector mentors, including LAs and National Highways, enabling knowledge transfer and early-stage challenge identification. The programme then advanced into barrier exploration, where SMEs engaged in detailed discussions to identify technical, regulatory, commercial, and operational barriers impacting adoption of their materials and technologies.

Finally, the mitigation exploration phase enabled SMEs and mentors to work together to develop feasible pathways forward, including trial planning, regulatory navigation, feasibility assessments, and early mitigation strategies. This structured approach ensures that each innovator is supported not only in understanding barriers, but in building clear and real-life routes to overcoming them.

In November 2025, all 6 SMEs presented their barriers through an industry-wide webinar, and a final report was produced. The key barrier themes identified were;

- **Regulatory & Specification Constraints:** Strict standards, limited flexibility, fragmented specifications and long approval pathways make introducing new materials slow and risk-laden for councils and SMEs.
- **Procurement Challenges:** Local authority frameworks often prevent small suppliers from bidding directly, create uncertainty on volume commitments, and favour established suppliers.
- **Economic & Market Barriers:** High upfront costs, low demand for innovation, uneven willingness to pay, and scaling challenges limit market traction.
- **Cultural & Behavioural Barriers:** Risk-aversion, low awareness of new materials, and differing levels of technical literacy hinder adoption.
- **Supply Chain & Infrastructure:** Variability in asphalt plants, binder availability, logistics, and lack of infrastructure to test new materials slow progress.

Scaling

Leveraging the SMEs' lived experiences and mentoring relationships, the team produced the following mitigation strategies to accelerate low-carbon innovation in local roads:

1. Evidence-Building via Trials: Developing clear trial protocols to generate robust, comparable evidence.
2. Improved Technical Documentation: Strengthening datasheets, performance claims and validation aligned to UK highway standards.
3. Procurement pathway guidance: Supporting SMEs to understand council processes, frameworks and entry points.
4. Behaviour-Change Integration: Providing training and guidance to shift perceptions within councils and contractors.
5. Cross-Sector Collaboration: Using mentors, advisory panels, and events to widen support networks and reduce adoption risk.

In January 2026, Safetytech coalesced all outputs and insights generated through the BDRS to develop a Toolkit for Innovators entering the roads industry. The toolkit distils this learning into a practical blueprint for accelerating innovation adoption across the UK roads sector, highlighting the importance of understanding a complex, regionally varied decision-making landscape, engaging the right stakeholders within local authorities, generating robust and trusted evidence, and co-designing pilots that align with real operational needs and constraints.

By setting out clear guidance on standards, validation routes, pilot design and common barriers, the toolkit reduces risk for both innovators and local authorities, supports more effective trials, and helps bridge the gap between innovation and business-as-usual adoption, reinforcing CEDR's role in enabling the uptake of low-carbon materials and practices across the UK roads network.

Building on the outcomes of the BDRS, NLC has progressed several innovations into live network testing. To date, NLC has completed two trials of Ecopals' EcoFlakes product and one trial of Sima's PolyPave, demonstrating the transition from early engagement to on-network evaluation. Further trials are planned with PRG and DMAT, supporting a continued pipeline of low-carbon material innovation. Lastly, NLC is funding Uberbinder's slab testing to assess the feasibility of scaling its low-carbon asphalt, including increased levels of RAP, ahead of progressing to load-bearing trials on the North Lanarkshire network.

Scaling

4.4.3 Connected Places Catapult

The Connected Places Catapult (CPC) was commissioned to support the identification, adoption and scaling of low-carbon materials across the local roads sector. CPC's role focused on strengthening the evidence base, understanding systemic barriers to adoption, and translating learning into practical, transferable guidance for local authorities through three main work packages.

Domestic and International Scan

CPC undertook a domestic and international market scan to identify emerging low-carbon materials, technologies and practices relevant to local road infrastructure. This activity broadened the programme's visibility of innovation beyond the UK, highlighting transferable solutions and common barriers faced across different markets. The outputs informed prioritisation of materials for further evaluation, sandbox support and live trials, ensuring the programme focused on innovations with the greatest potential for impact and scalability.

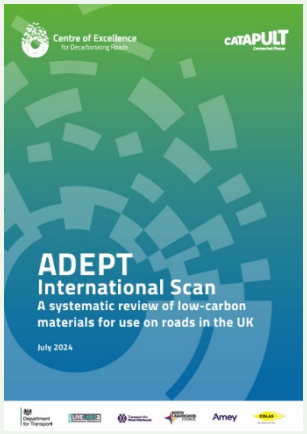


Figure 24: CPC International Scan Report

Strategy and Foresight Sessions

CPC delivered a series of strategy and future foresight sessions to explore the long-term factors influencing decarbonisation of local roads. These sessions examined emerging PESTLE drivers, future regulatory and specification changes, and shifts in market readiness. The foresight work supported local authorities in thinking beyond individual trials, helping to position low-carbon material adoption within a wider systems and long-term planning.

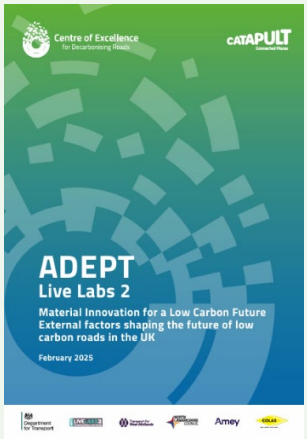


Figure 25: CPC Future Foresights Report

Playbook

A key output of the CPC workstream was the development of the Local Authority Playbook for Low-Carbon Materials. The Playbook provides a practical, end-to-end framework to support local authorities in identifying, assessing, trialling, evaluating and adopting low-carbon materials. It consolidates learning from Live Labs trials, behavioural research, sandbox activity and market engagement into clear stages, checklists and decision-support tools, designed to help embed innovation into business-as-usual processes beyond the life of the programme.

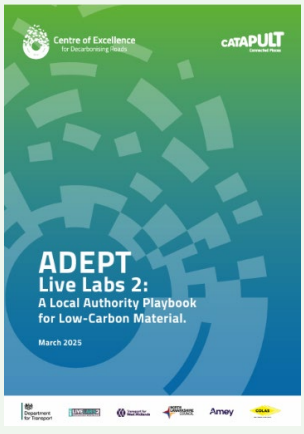


Figure 26: CPC Playbook for Low-Carbon Materials

Scaling

4.5 Knowledge Bank

4.5.1 Process of Development

The Knowledge Bank began as a response to a core challenge identified during early engagement with LAs during 2023. LAs highlighted fragmentation in information, inconsistent carbon evaluations, and limited mechanisms for sharing lessons from trials.

To address this, the Centre created a national evidence base that brings together technical, carbon, cost and performance data to support local authorities in making informed, lower-carbon material choices.

Key Features

- **Homepage and Navigation**: An interface designed for quick access to materials, trials, and case studies.
- **Case Study Library**: LA-submitted examples showcasing trials and operational learnings.
- **Showcase of Materials**: Standardised profiles covering carbon performance, technical evaluation, whole-life considerations, and supplier details.
- **Material Reviews**: LA-written reviews of their experience with materials.

Upcoming Features

- **User Dashboard**: Allows users to track saved materials, compare innovations, and access personalised recommendations.
- **AI Chatbot**: Supports more intuitive search and discovery based on user questions or themes.
- **Specification Tool**: An intuitive tool aligned with the latest version of the Manual of Contract Documents for Highway Works (MCHW), designed to help engineers update project specifications and providing clear guidance on specifying low-carbon materials.

Purpose and Value

The Knowledge Bank addresses long-standing barriers to innovation adoption, including siloed working, inconsistent data, and limited access to trusted evidence. It was designed to:

- Act as a single source of truth for low-carbon materials and trials
- Enable peer-to-peer learning and collaboration between local authorities
- Support the transition from innovation and trials into BAU decision-making
- Embed carbon, cost and performance considerations consistently into material selection.

Scaling

4.5.2 The Journey

Discovery and Design

The journey began with behavioural research carried out with local authorities to understand the practical, cultural and organisational challenges to adopting low-carbon materials. This research directly informed the early design of the Knowledge Bank, ensuring it responded to real user. Early-stage wireframes and end-user requirements were tested with both local authorities and suppliers to shape functionality and content structure.

Development and Testing

Following on from the design stage, the platform was developed through a user-centred approach, including:

- Focus groups with local authorities and suppliers
- User Acceptance Testing (UAT)
- Continuous feedback loops to refine navigation, data presentation and user experience

Content Gathering

As the platform has been built, the team undertook market scanning, identification of low-carbon materials, and delivery of live trials on operational road networks (refer to Section 2, 3 and 4). Outputs from these activities, including carbon profiles, technical assessments and trial evaluations, make up the core content of the Knowledge Bank. This evidence base underpins confidence in the data and supports adoption and scaling by other local authorities.

Launch

After a soft launch and testing period in August 2025, the Knowledge Bank was formally launched in October 2025 through a programme of engagement activity, including a launch event, demonstrations, webinars and presentations to industry bodies and LAs. It was positioned as a live, evolving platform, not a static product, with a clear call for ongoing user input and data contribution from across the sector.

Ongoing Development and Legacy

Following the end of Year 3, the Knowledge Bank continues to evolve through regular updates and incorporation of user feedback. Future priorities identified through engagement include enhanced functionality, deeper interaction between local authorities and suppliers, and long-term monitoring to assess impact beyond programme closure.

The Knowledge Bank is a critical legacy of the Centre, supporting sustained decarbonisation and long-term behaviour change across the local roads sector.

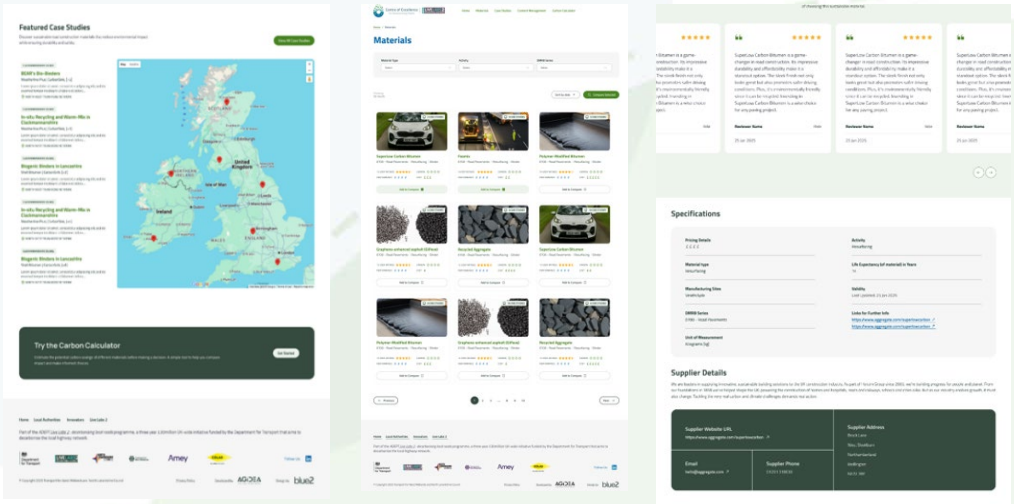


Figure 27: Images of the Knowledge Bank

4.5.3 Metrics of Engagement for the Knowledge Bank

The response from the sector has been clear: a clear, collaborative platform is a valuable asset to decision-making. Since launch, the Knowledge Bank

- Total unique users: 2,200
- Total registered users: 41
- Materials uploaded: 62
- Case studies submitted: 19
- Most-viewed feature: Materials listing with 1,112 views since go live in October. In the last 30 days the Materials listing, Case Study listing and Community Homepage are the 3 top visited pages.
- Repeat monthly visits: 57% of sessions are returning users across all time (repeat visits). This appears consistent month on month, sitting between 55-60%.

4.6 Communications and Engagement

Communications and engagement have been fundamental to the success of the Centre, as decarbonising local roads requires confidence, trust and alignment across the sector. Through consistent, targeted engagement with local authorities, industry, suppliers and national bodies, the Centre has moved innovation beyond isolated trials by sharing evidence, surfacing learning and normalising the adoption of low-carbon materials. Proactive communications have supported peer-to-peer learning, reduced perceived risk, and created a shared understanding of what works, where and why. This sustained engagement has been essential in building credibility, encouraging collaboration, and ensuring that technical evidence translates into behaviour change and business-as-usual adoption across the sector.

Key activities include:

- **LinkedIn** - A professional social network that gives organisations the ability to connect with their audience, share real-time updates, thought-leadership and industry insights. Since August 2023, the Centre has maintained a LinkedIn page, building credibility and targeting audiences through posts and articles.
- **Newsletter** – The Centre's newsletter has been circulated among subscribers on a quarterly basis, providing key updates and industry insights. The newsletter has allowed NLC to effectively communicate its story in a way that builds trust and maintain consistent visibility with stakeholders and partners.
- **YouTube** - YouTube is the second largest search engine and has given the Centre the opportunity to share in-depth content such as trials and insights.
- **Website** – The Centre's website has been a central hub of information for stakeholders and partners to access all the information relevant to the project. Launched in November 2023, with development led by the North Campus, the website has effectively communicated the tone of the brand and driven conversions.
- **Events** - Attendance at events enabled the Centre to build trust through demonstrating our expertise whilst networking with stakeholders and increase awareness. This consequently opened new opportunities for the project, such as LA partnerships, innovation identification and market awareness.
- **Social Value** - Social value creates a positive impact on communities and strengthens the reputation of the project. It fundamentally connects the ethos and objectives of the Live Labs 2 programme with younger generations, demonstrating the breadth of sustainable careers in local roads, whilst building the critical creative skills required to tackle the challenges of decarbonisation. Led by delivery partner, Amey, the North Campus have undertaken multiple social value initiatives across North Lanarkshire, including:
    - Two workshops at primary schools
    - Three workshops at secondary schools and/or youth groups
    - Procurement of numerous local SMEs for the provision of services and materials

Scaling

Figure 28: Social Value at St John's Primary

The cumulative impact of the concerted, strategic communications strategy has been felt sector-wide, with the Centre undoubtedly demonstrating a marketing presence of its own, as evidenced by the metrics:

Channel	Followers	Engagement
LinkedIn	1,247	2162 Reactions 70 Comments 43 Reposts (Over the past year)
Newsletter	472 via LinkedIn 134 via website	
YouTube	8 followers	583 views over 6 videos
Website	8,100 Users	89,000 events (e.g. clicks)
Events	NA	27 events

*Figures as of 23rd March 2026

Scaling

Attending and exhibiting at industry events has been a critical part of how the Centre has delivered impact, providing a platform to actively engage with LAs, industry partners and academics. Through attendance and presentations at national and international events, NLC have been able to spread the message of low-carbon materials and practices, build trust with local authorities, and create opportunities for open dialogue around the practical challenges of decarbonisation. These events have also played a vital learning role, enabling the team to identify emerging low-carbon materials, techniques and best practice from across the sector, understand how others are addressing similar barriers, and feed this intelligence back into the trial programme and Knowledge Bank.

Some of the events and presentations include:

- LCRIG Learning and Innovation Festival (2023, 2024, 2025, 2026)
- LCRIG Strictly Highways (2025, 2026)
- Highways UK (2025)
- Road Expo Scotland (2023, 2024, 2025, 2026)
- ADEPT Autumn Conference (2023)
- ADEPT Spring Conference (2026)
- NAPA Road Forward Summit (2025)
- APSE Conferences (2024, 2026)
- SCOTS AGM (2023, 2025, 2026)
- Live Labs Expo (2024, 2025)
- CPC Summit (2025)
- Traffex (2023, 2025)
- Interchange (2026)
- PIARC Winter Road Congress (2026)
- PIARC World Road Congress (2023)
- MPA Scotland (continuous)
- IAT Training days (2025)
- Transport Scotland Pavement Forum (continuous)
- Dedicated AIA Event (2025)
- Transport Scotland Trunk Roads Environmental Forum (2025)

5. Opportunities for Future Change

Within the realm of material decarbonisation, the local roads sector faces a litany of opportunities, obstacles and data. What remains evident throughout this Live Lab is the systems-based change and levers which must be pulled in order to drive any true reduction in the emissions associated with road materials.

Firstly, the North Campus has trialled, evaluated and proven a number of solutions that offer carbon savings alongside commensurate performance and cost, depending on the circumstances associated with other local authorities and within schemes. This includes:

Service Category	Strategies for Decarbonisation	Innovation Examples	Level of Complexity to Decarbonise	Level of Impact on Service-Level Carbon Emissions
Surfacing	Avoid over-design Temperature reduction in manufacturing Transport and logistics optimisation Increase % recycled content Select longer-lasting materials	Biogenic binders Biogenic PMBs High % of RAP Lignin Graphene In-situ recycling	Medium-High	High
Preventative Maintenance	Integrate into asset management strategy, exploring preventative maintenance with the lowest embodied carbon and greatest durability impact	Rejuvenators Preservatives Micro-asphalts Retexturing	Low	Medium-High
Pothole Repair	Optimise treatment for condition of road and defect cause Increase % recycled content Select longer-lasting materials (depending on asset condition) Reduce waste Transport and logistics optimisation	Recycled materials Cold-mix with RAP MMA cold-mix	Low	Low

Opportunities for Future Change

Line-marking	Transport and logistics optimisation Switch to biogenic materials Switch to cold-applied materials Select longer-lasting materials	Biogenic thermoplastic MMA Abrasion-resistant thermoplastic Water-based paint	Low-Medium	Medium
Signage	Durability Recycled aluminum and steel Composite materials	Composite materials Natural materials (e.g.reed-based signface)	Low	Low-Medium
Winter Maintenance	Transport and logistics optimisation Grit and brine reduction Non-corrosive materials	Alternatives to traditional grit Intelligent winter maintenance systems	Medium	Medium
Footways	Increase % recycled content Avoid over-design Select longer-lasting materials Reduction in waste	Single-layer footway Increased RAP Biogenic binders	Low	Medium

Opportunities for Future Change

Despite the plethora of methods for achieving material decarbonisation, this Live Labs' research has revealed the requirements that must be met for local authorities to reach their net zero targets. These conditions to enable decarbonisation range from commercial-readiness, LA-readiness and technology readiness.

- **Commercial readiness**: incentivisation mechanisms in contracts, reporting requirements and whole-life cost-based decision-making can help bridge the gap between individual trials and business-as-usual.
- **LA readiness**: dedicated carbon and material innovation training, access to resources like the Knowledge Bank, consistent carbon measurement, and clear strategies and policies must underpin any material decarbonisation action. Tools such as carbon management hierarchies, carbon software (e.g. FHRG toolkit), and access to robust materials testing are critical to a LA's ability to select materials that offer whole-life benefit.
- **Technology readiness**: focused, joined-up materials research, innovation funding mechanisms to support the gap between proof of concept and business as usual, and shared risk agreements between LA and supply chain will help advance material innovation in the local roads sector.

By creating the right conditions for material decarbonisation to flourish, the sector inherently addresses wider operational and technical objectives. Lower-carbon materials mean longer-lasting assets; longer-lasting assets mean less repairs and more resilient networks; less repairs and greater resiliency mean less frequent disruption to the public and ultimately better outcomes for the communities that local authorities serve. The logic behind this Live Lab is remarkably close to common sense, but the building blocks needed to implement this common sense are more complex when weighed up against operational constraints.

Therein lies the challenge. And although the North Campus was not able to single-handedly solve the issues preventing material decarbonisation from wider adoption, it has endeavoured to provide data, knowledge, guidance and toolkits to ensure that no other local authority has to go through intensive research to be able to tackle this multifaceted and significant element of emissions.

6. What Didn't Stick

Not all innovation is a success, and in fact failure often yields the most valuable lessons. Indeed, this Live Lab set out to have the freedom to fail to reduce wasted energy or effort across other LAs, and in adopting this mindset, the team became more comfortable with the ambiguity and uncertainty of innovation in local roads.

Those lessons learnt come in two forms – the material and the process. From a materials perspective, NLC gained insight from the trials that did not yield results as anticipated.

- Rejuvenation was not as effective on Hot-Rolled Asphalt as anticipated. Although NLC are transitioning to a greater proportion of preventative maintenance as a result of these trials, they will not include as much rejuvenation as originally envisaged.
- Some materials struggle with securing UK-based scalability. For example, reed-based signage may reduce the embodied carbon of signage in continental Europe, but current EU trade restrictions provide undesirable supply delays for a material that often needs to be ordered in relatively small quantities and as bespoke orders.
- Certain asphalt trailer technologies produced minimal impact on the quality of laying, when compared to the new thermally insulated asphalt trailers already commercially available through the larger asphalt manufacturers.
- Although NLC has an ambition to increase and consistently adopt MMA line-marking, cold-applied lining materials still face challenges in the transition to business-as-usual. Typically requiring dry weather, these conditions are rarely experienced in Scotland.

Equally, some lessons from trials were gained from the trial process itself rather than material performance. From effective communication to joined-up planning, NLC improved its own experience of innovation management. Over the course of more than 25 trial sites, the following became evident:

- **Effective communication** is vital – from LA to contractor to carbon and technical teams.
- **Early contractor involvement** in innovation scanning and prioritisation is essential to smoother procurement and sufficient time for operational planning and skills development.
- **On-site supervision** prevents data collection gaps or deviation from the trial design.
- **Unbiased material testing** is not as readily available as envisaged, and trials should be planned in line with testing availability.
- **Manual carbon data capture can be onerous**, and automation should be sought where possible. This reduces the risk of inaccuracy and data manipulation.
- There is untapped potential for the **Trunk Road/Strategic Road Network and the Local Road Network to collaborate** more closely on materials research and trials.
- **Innovative materials introduce additional complexity**; treatments such as in-situ recycling require increased preparation, programme flexibility, and a balanced approach to managing risk versus reward compared to BAU delivery.

Although the lessons learned extend far beyond what is captured in this list, the moments that did not go to plan reinforced the importance of robust quality management, working with competent contractors, and getting it right first time, regardless of material type. These experiences strengthened team knowledge, collaboration, and confidence in delivering future innovation in North Lanarkshire.

7. Spreading a Tailored Message

To ultimately achieve the impact originally outlined in NLC's Theory of Change, the team must now focus efforts singularly on encouraging other local authorities to adopt low-carbon materials. Early signs indicate a wind of change in the sector, with authorities such as East Renfrewshire Council, the West of England Combined Authority and Transport for Wales already proactively requesting collaboration with the Centre. Building off this momentum, both campuses will strive to develop a consistent cross-sector evidence base. This will be achieved through:

Audience	Communications Objective	Activity in Year 4
NLC Internal Team	Embed Live Labs 2 findings until business-as-usual	• Knowledge transfer workshops • Leadership briefings
Policymakers	Shape policies to address material decarbonisation challenges	• Thought leadership • Participation in policy forums
Emerging Professionals	Upskill workforce of the future through collection of generational knowledge and effective knowledge transfer	• Engineers' toolbox on Knowledge Bank • CPD-style sessions • Exhibition at events aimed at this audience, e.g. LCRIG Innovation & Learning Festival
Engineers and Asset Managers	Drive adoption and specification of low-carbon materials	• 1:1 Collab&Connect sessions • Event exhibition • Industry workshops • Alignment to other industry forums (e.g. UK Labs Network)
Heads of Highways	Encourage commitment to material decarbonisation at a service-level	• 1:1 Collab&Connect sessions • Event exhibition • Industry workshops • Alignment to other industry forums (e.g. UK Labs Network)
Supply Chain	Continuously update materials into the Knowledge Bank and signpost LA clients to share case studies	• Supply chain outreach programme • Event exhibition

Although the content may vary depending on the audience, the central messages will be clear: the drive to decarbonisation must continue, and the sector must recognise the co-benefits of reducing material emissions. Professional development and workshops will upend the assumption that decarbonisation has to cost more or will come with trade-offs in performance.

8. Conclusions

This final report concludes the ADEPT Live Labs 2 programme delivery for the Centre of Excellence for Decarbonising Roads (CEDR) North Campus. Over three years, North Lanarkshire Council, delivery partner Amey and other partners have demonstrated that local authorities can lead a step change in how low-carbon road materials are identified, tested, evaluated and critically adopted at scale.

The programme's most significant legacy is the creation of an evidence-led national capability: a functioning Centre of Excellence model spanning North and South campuses, a robust innovation funnel and comparative trial methodology, and the UK's first open-access Knowledge Bank for low-carbon road materials. Together, these assets reduce duplication across the sector, improve decision-making through consistent carbon and performance evaluation, and provide a trusted pathway for suppliers and SMEs to progress from innovation to implementation.

Just as important, the project has reinforced that successful decarbonisation depends on more than technology. The work has surfaced the behavioural, procurement and specification constraints that can prevent good innovations from "sticking", and it has generated practical guidance to help local authorities run cleaner trials, collect higher-quality data, and balance carbon reduction with cost, safety and technical performance. Where innovations did not perform as expected, those outcomes have been captured as transferable learning, strengthening future commissioning and avoiding repeated investment in approaches that are unlikely to scale.

Looking ahead, the opportunity is to convert this programme foundation into sustained, business-as-usual change. Priorities include continuing to expand and curate the Knowledge Bank content (materials, Environmental Product Declarations, evaluations and case studies), supporting local authorities with targeted collaboration and training, and maintaining an active pipeline of local authority trial and evaluation data focused on the highest-impact activities (particularly surfacing and preventative maintenance). In parallel, there is a clear role for policymakers and industry bodies to accelerate progress through more flexible standards departure processes, proportionate assurance routes, and procurement mechanisms that reward whole-life carbon reduction and performance.

In summary, Live Labs 2 has proven that an evidence-driven, collaborative approach can de-risk innovation and accelerate decarbonisation across the local roads sector. The Centre of Excellence is now positioned as a practical, scalable resource for the UK, supporting local authorities to adopt lower-carbon materials with confidence, strengthening resilience and asset outcomes, and enabling the pace of change required to meet net zero commitments. At the same time, NLC, delivery partner Amey, and all other members of the North Campus will retain the skills, tools, know-how, confidence and passion for decarbonisation that is required to enact sustained change in the local roads sector.

9. Appendices

A. Relevant Links

- **Website**: www.decarbonisingroads.co.uk
- **Knowledge Bank**: https://kb.decarbonisingroads.co.uk
- **LinkedIn**: https://www.linkedin.com/company/centre-of-excellence-for-decarbonising-roads-cedr
- **Resource Library**: https://decarbonisingroads.co.uk/news/
- **YouTube**: https://www.youtube.com/@decarbonisingroads

B. Publications

Publication type	Title	Purpose	Link
Guidance	Trial Protocols	Establish standardised guidance for local authorities to conduct an innovation trial on the live road network.	
Guidance	Innovation Log	Disseminate all innovations identified through market-scanning, including those not progressed to trial.	
Guidance	Local Authority Industry Playbook	Create a simplified innovation management process and repository of guidance for local authorities.	
Guidance	BDRS - SME Final Reports	Share results and mitigation recommendations for barriers to decarbonising roads from the perspective of material SMEs.	
Guidance	BDRS - SME Blueprint	Provide useful guidance, lessons and process flows for SMEs navigating the UK road materials market.	
Guidance	Categorisation of Carbon Emissions Factors	To provide a clear, consistent framework for assessing the robustness and reliability of carbon data sources	
Guidance	Behavioural Trial Protocols	Outline methods for local authorities to embed behavioural change	
Research	Behavioural Research 1	A behavioural approach to defining EURs for the Knowledge Bank	
Research	Behavioural Research 2	An approach to a three-step process to Identify, Explain and Influence roads maintenance behaviours	
Research	Connected Places Catapult International Market Scanning	Identify and assess emerging low-carbon materials and practices from the UK and international markets	
Research	Connected Places Catapult Future Foresights	Explore emerging trends, risks and opportunities affecting the decarbonisation of local roads	
Carbon Evaluation	NLC Carbon Baseline Report	Consistent baseline of carbon emissions across North Lanarkshire Council's roads activities	

Appendices

Carbon Evaluation	Shell SuperLow CarbonInk Carbon Evaluation	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	ACLA	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	Degafill (pothole phase 1)	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	GreenPatch (pothole phase 1)	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	Permafyx (pothole phase 1)	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	Roadmender (pothole phase 1)	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	Viafix (pothole phase 1)	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	Reclamite Rejuvenator (phase 1 & 2 combined)	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	EcoFlakes Pro	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	Superlow Carbon	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	Swarco Eco Hibrite AR (line marking)	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	SPL Regen Insitu-recycling (calcined clay & CEM II combined)	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	Colas Regen Insitu-recycling	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	Swarco Pumabrite (line marking)	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	Styrelf Bio- PMB	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	Tarmac Bio HRA	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	Warm mix HRA	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	GiPave	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	WJ Weatherline (line marking)	Quantify and compare the carbon impacts of materials/ approaches against BAU.

Appendices

Carbon Evaluation	MilePave	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	HardiPave	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	Jerol Signposts	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Carbon Evaluation	Pentack Preservative	Quantify and compare the carbon impacts of materials/ approaches against BAU.
Technical Evaluation	UoN reports and Technical evaluations	

C. Context Documents

- Outline Business Case: https://www.adeptnet.org.uk/documents/north-lanarkshire-council-live-labs-2-strategic-outline-business-case

D. Awards

- Highways UK Net Zero Award (2024)
- Finalist Scottish Transport Award Excellence in Technology and Innovation (2025)
- Highways UK Associate Laureate Award for Programme Manager (2025)
- CIHT Collaboration Award (finalist, winner to be announced June 2026)