Centre of Excellence
for Decarbonising Roads

Regional Workshops
Sept 2026

Department for Transport
ADEPT LIVELABS2 Decarbonising Local Roads
North Lanarkshire Council
Transport for West Midlands
Amey
COLAS

GENERAL


Climate Change
Net Zero Targets
CO_2
NET ZERO
Aging Assets
& Legacy Materials
Old Infrastructure
Road Maintenance
ROAD WORK AHEAD
Data & Evidence Needs
?
Budgets &
No Central Data Source
?
Budget Cuts
Funding Shortfall
Workforce Challenges
WORKER SHORTAGE

Recap of the Centre of Excellence for Decarbonising Roads

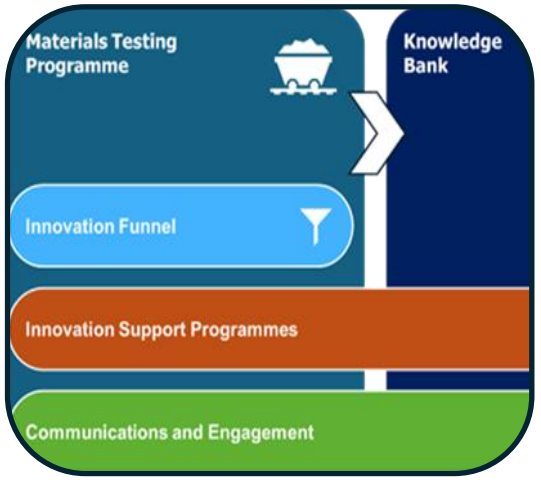


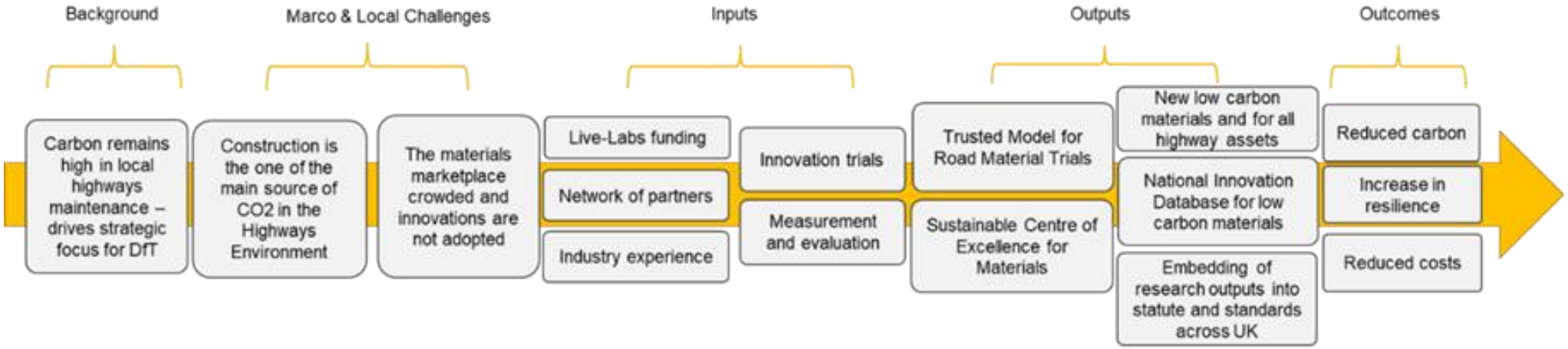
- LL2 theme focused on developing a Centre of Excellence for material decarbonisation of UK local roads
- Delivered by North Lanarkshire Council and Transport for West Midlands, in partnership with Amey and Colas
- Aims to reduce siloed working and encourage low-carbon material adoption
- Supported by live testbeds and knowledge bank for LAs






Glasgow
Stirling
(M80)
Kirkintilloch
(B8048)
Cumbernauld
(B8039)


Materials Testing Programme
Knowledge Bank
Innovation Funnel
Innovation Support Programmes
Communications and Engagement


Background
Marco & Local Challenges
Inputs
Outputs
Outcomes
Carbon remains high in local highways maintenance – drives strategic focus for DfT
Construction is the one of the main source of CO2 in the Highways Environment
The materials marketplace crowded and innovations are not adopted
Live-Labs funding
Network of partners
Industry experience
Innovation trials
Measurement and evaluation
Trusted Model for Road Material Trials
Sustainable Centre of Excellence for Materials
New low carbon materials and for all highway assets
National Innovation Database for low carbon materials
Embedding of research outputs into statute and standards across UK
Reduced carbon
Increase in resilience
Reduced costs


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LIVELABS2
Home
Materials
Case Studies
Empowering Local Authorities to Adopt Low-Carbon Innovations
Part of the ADEPT Live
digital platform desig
tools for adopting su
and construction.
Browse Materials


ve Labs 2
the ground behaviour chang
aviour Opportunities Report


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Toolkit for innovators entering the roads industr
2026

Local authorities

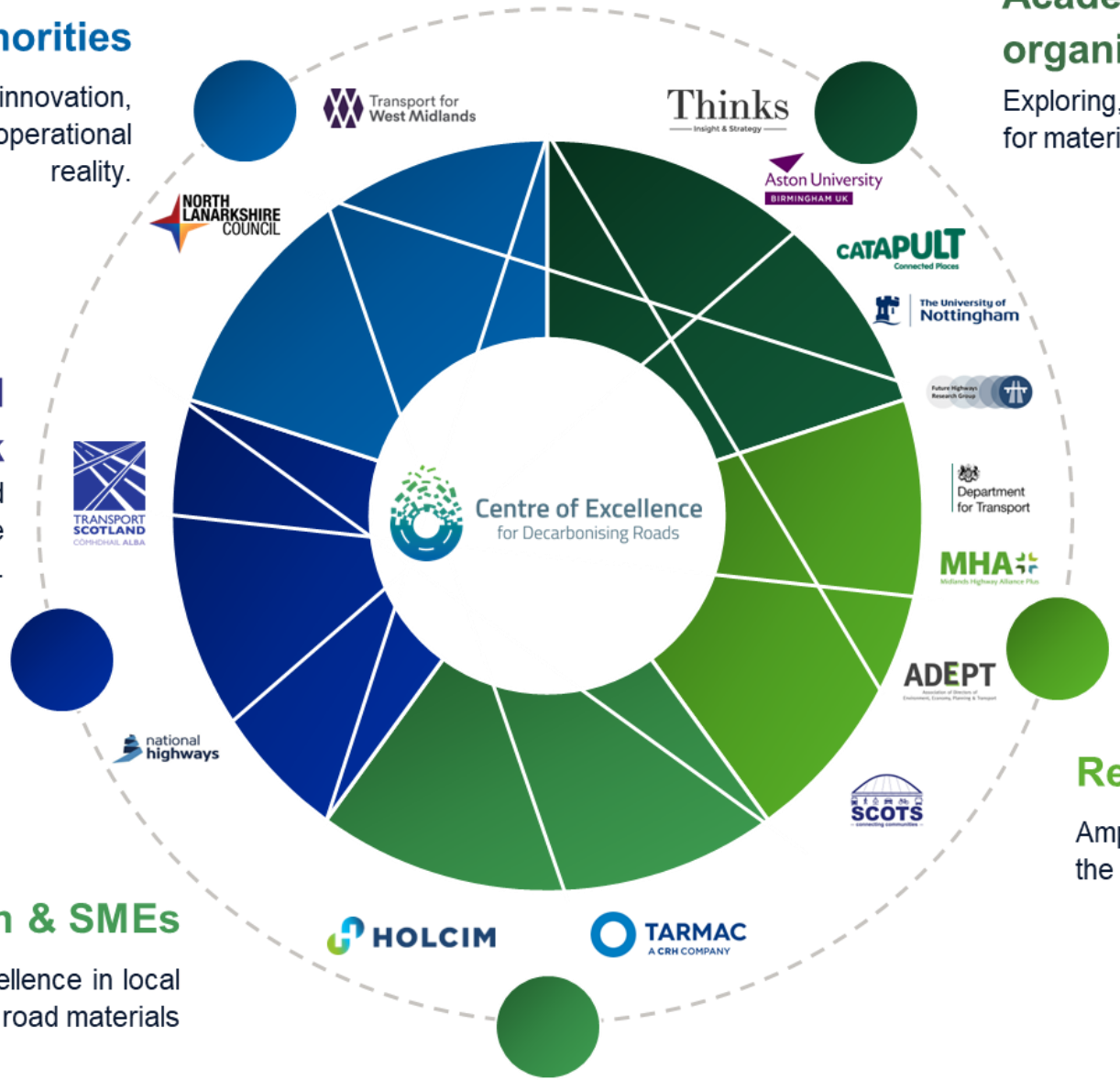
Driving and leading material innovation, turning decarbonisation into operational reality.

Academic and research organisations

Exploring, testing and developing solutions for material decarbonisation.

Strategic (Trunk) Road Network

Advising on national standards and specifications, aligning with sector-wide materials research.



Regulatory & industry bodies

Amplifying the Centre's outputs and representing the strategic direction of the sector.

Supply Chain & SMEs

Developing solutions to drive excellence in local road materials

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Key Updates



Live Trials

Potholes , Rejuvenaors, Road Markings, Supersite, ALCA, Biochar and Winterpave



Sandbox

Challenges facing innovators getting to market



Knowledge Bank

Shared platform for local authorities to share knowledge

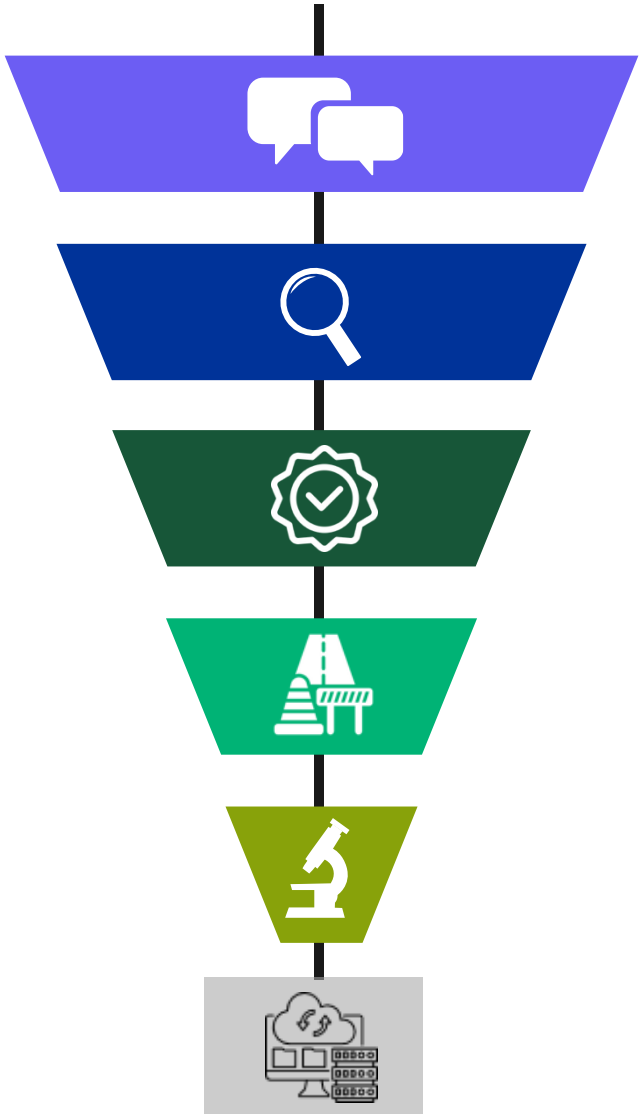


Behaviour Change

Barriers to adoption of low carbon materials from RA side

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The Innovation Funnel



	Objective	Progress
Discover	Discover challenges to decarbonisation	*Behavioural research* *Consultation with LAs*
Identify	Identify leading low-carbon materials	*Innovation Log with 350+ materials* *Global market scanning completed with Connected Places Catapult*
Qualify	Pre-qualify materials	*7 innovation series scorecards completed*
Trial	Trial on NLC and TfWM road network	*30 material trials*
Evaluate	Technical, carbon and scalability evaluation	*Carbon profiles created for first trials in FHRG Carbon Analyser*
Scale & Share	Embedding as BAU and knowledge bank	*Monitoring & evaluation of first trials underway*

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Trials and Tribulations

Trial Deep Dive with Elaine Nicol

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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

July 2024

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.



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.



Supersite: Proposal

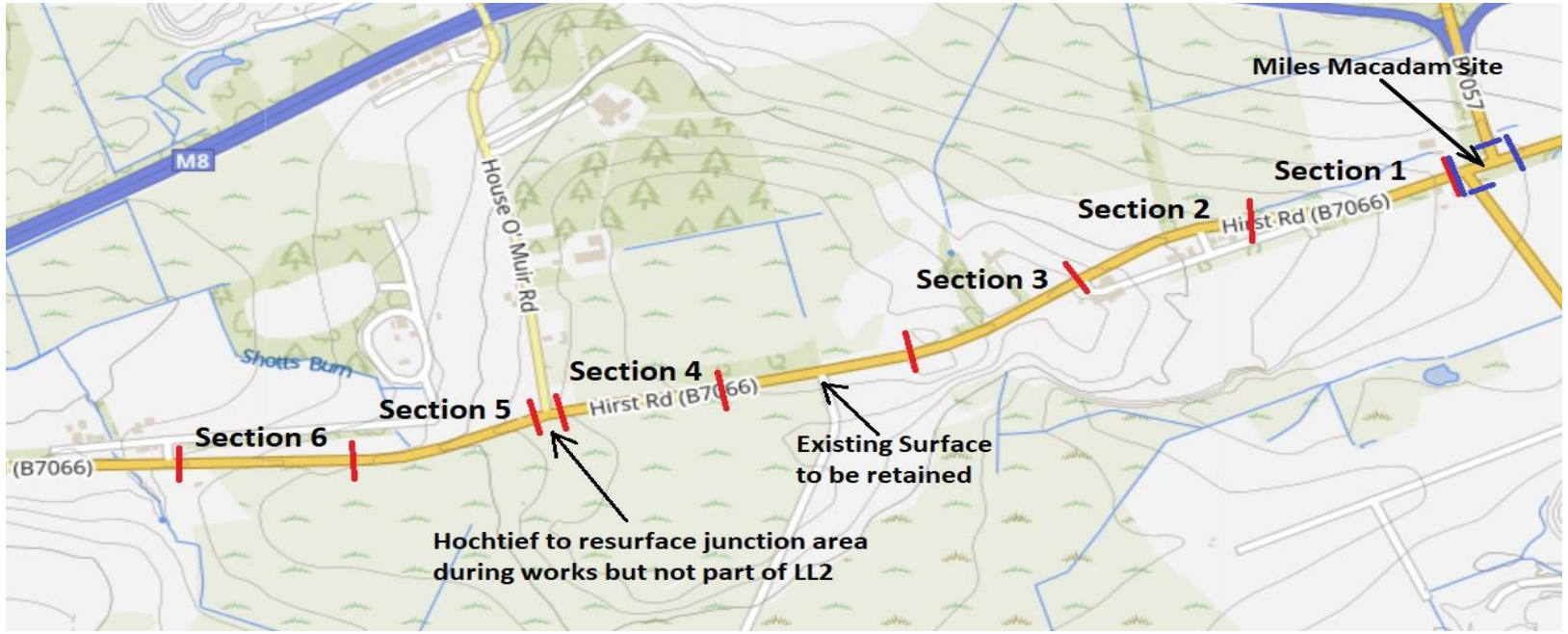
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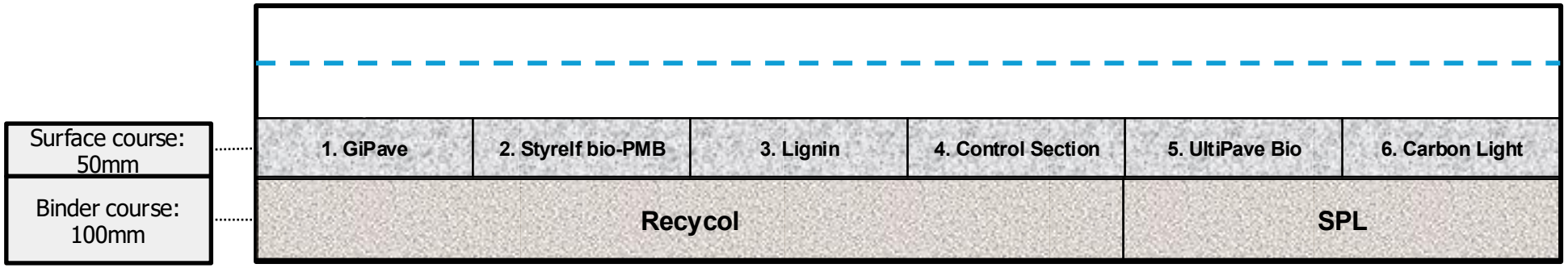
5 comparative low-carbon binders and 1 benchmark

Two varying In-situ recycling binder courses

Miles MacAdam products

Timeline: July 2025





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In-Situ Recycling (Binder)

= Ready for adoption = Some barriers to adoption

	Type	Brief Overview	Benefits	Barriers
Binder Course	Colas Regen	In-situ recycling with asphalt emulsion	• Reduces virgin aggregates • No transport associated with materials and manufacturing • Quick to re-open to traffic • Lower carbon than hydraulically bound alternative	• Improving awareness • Challenging status quo • Supply v demand
	SPL in-situ recycling	In-situ recycling (calcinate clay)	• Reduces virgin aggregates • Reduces transport carbon of materials • Quick to re-open to traffic • Higher levels of stiffness achievable with hydraulically bound alternative	• Improving awareness and education on suitability of sites

Surface Course Materials

= Ready for adoption = Some barriers to adoption

	Type	Brief Overview	Benefits	Barriers
Surface Course	Styrelf TotalEnergies Biogenic PMB	Polymer-modified binder with biogenic components	• Lowers embodied carbon • Whole-life carbon benefits	• Upfront investment in longer-lasting materials
	Iterchemica Gipave	Polymeric supermodifier composed of graphene	• Whole-life carbon benefits • Improved longevity of pavement by approx. 165%	• Upfront investment in longer-lasting materials
	Kraft Lignin	Binder extender pellets derived from byproducts of the paper pulping process	• Lowers embodied carbon • Potential performance benefits, e.g. resistance to rutting	• Only compatible with lower-mix temperatures • Building awareness in the sector
	Tarmac UltiPave Bio	Biogenic binder	• Reduces embodied carbon	• Upfront investment in lower-carbon materials
	Eiffage Carbon Light	Plant-based binder	• Reduces embodied carbon	• Only compatible with lower-mix temperatures

HardiPave

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MilePave

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Supersite: AS-BUILT

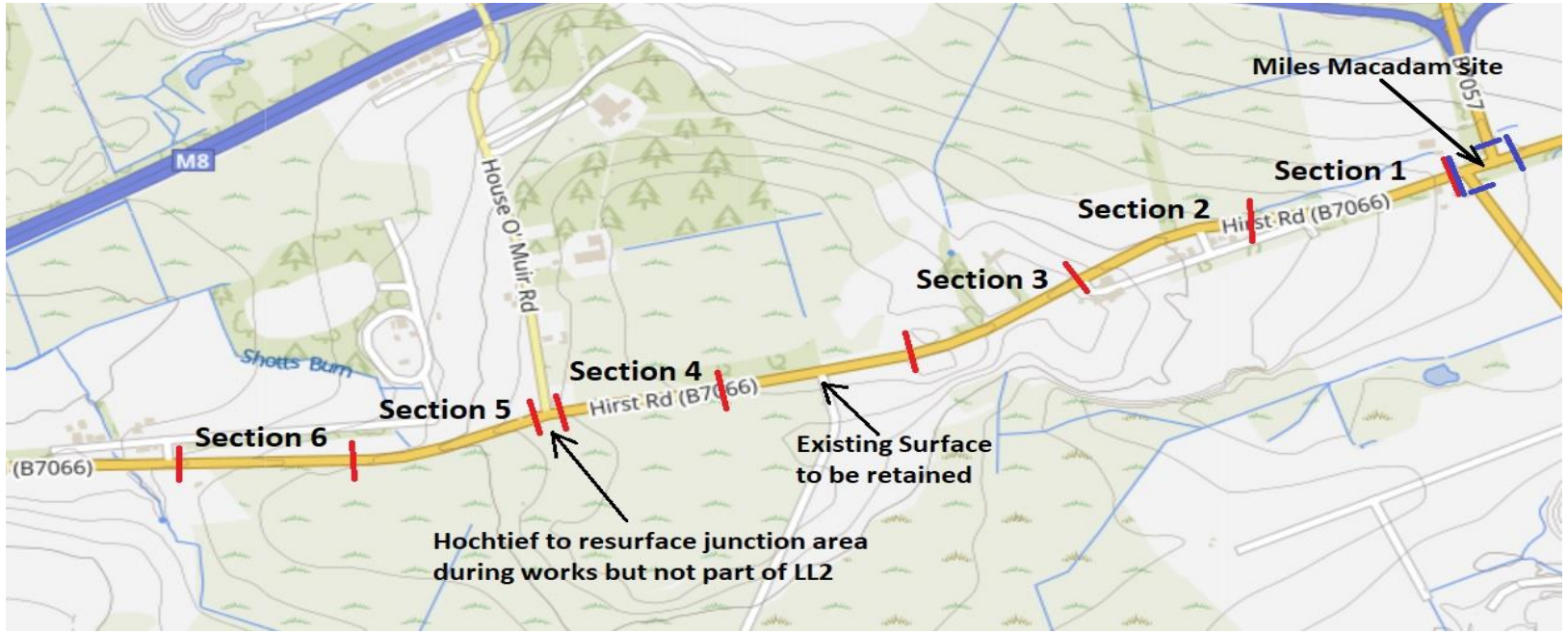
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5 comparative low-carbon binders and 1 benchmark

In-situ recycling in binder course

Miles MacAdam junctions

Timeline: July 2025



	1. GiPave	2. Styrelf bio-PMB	3. Control Section	4. HRA Warm Mix	5. UltiPave Bio	6. HRA Warm Mix
Surface course: 50mm						
Binder course: 110mm to 140mm	Regen (110mm)				SPL (140mm)	

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Lignin Kraft Pellets

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Hevasol vs CEMII







Department for Transport

ADEPT LIVELABS2 Decarbonising Local Roads

NORTH LANARKSHIRE COUNCIL

Transport for West Midlands

Amey

COLAS WE OPEN THE WAY

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SuperSite Recap

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Junctions

Miles Macadam



In-situ 1

Colas Regen



In-situ 2

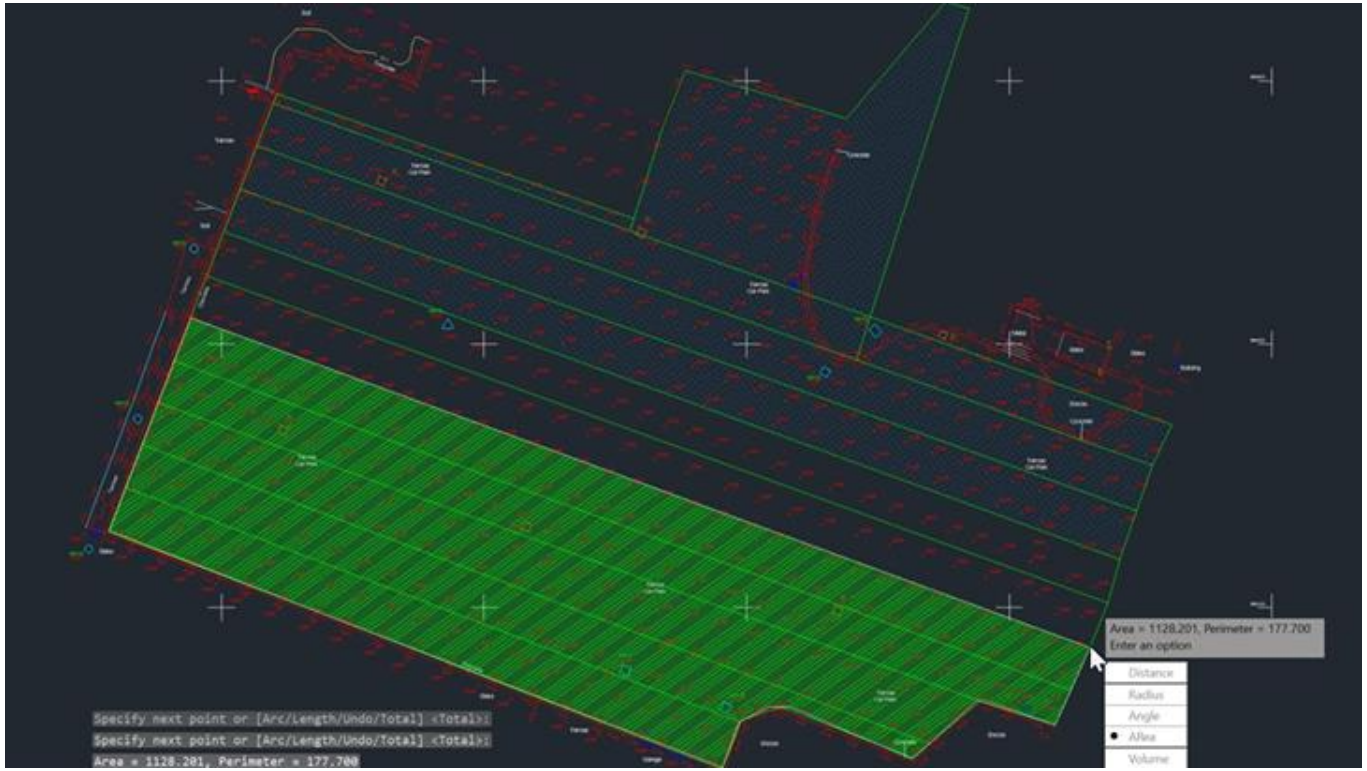
SPL calcinate clay



Surface course

Innovative materials

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Date
March 2026

Road
Strathclyde Park

Source
EcoPals, a German SME who participated in our Sandbox

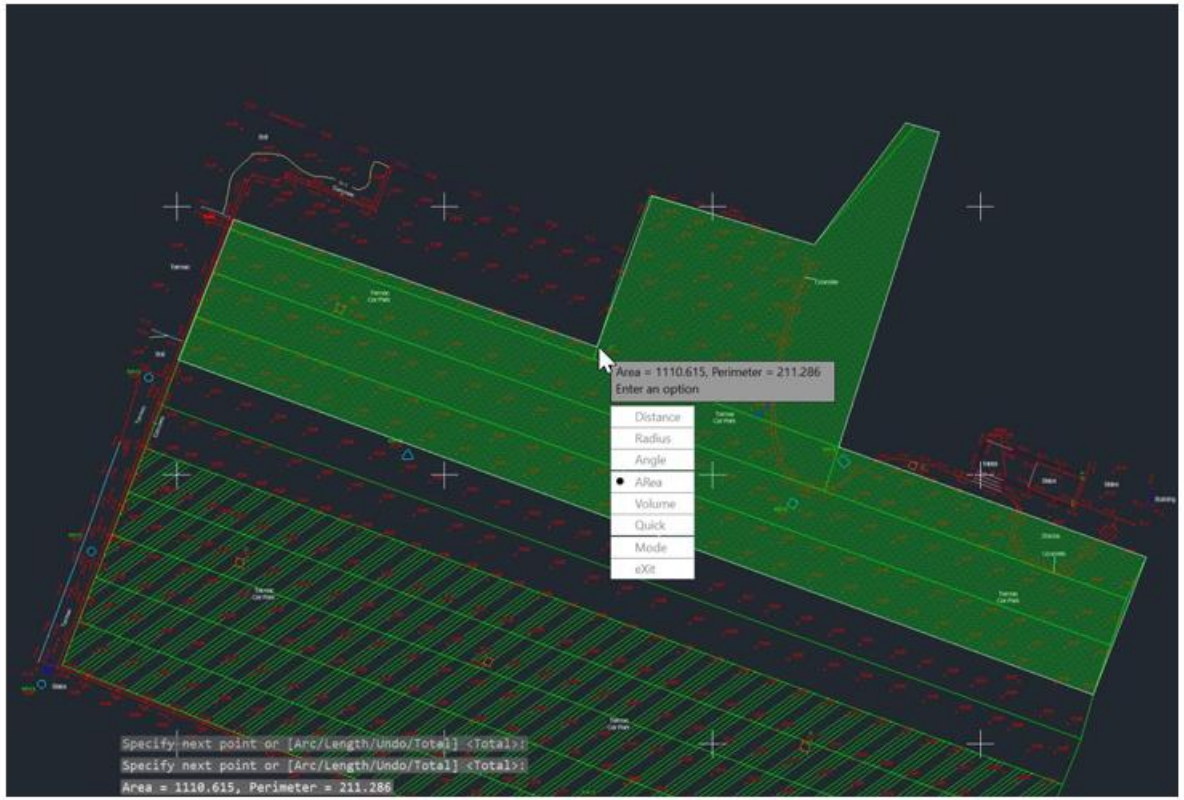
Key Lessons
No issues with procurement / installation

EcoFlakes

Ecoflakes are a plastomer modification for asphalt made from specific recycled plastics for the modification of asphalt and bitumen, increasing stiffness and reducing bitumen by about 4% on average.

Trialled extensively in Germany.

Proposed Area of Sema Polypave



Date
March 2026

Road
Strathclyde Park

Source
Sima, a SME who participated in our Sandbox

Key Lessons
No issues with procurement / installation



Polypave

PolyPave, a bitumen extender produced from recycled ultra-low-density polyethylene (ULDPE). Supplied as granules and transported in bulk bags for ease of handling, PolyPave is added directly into the mixer of an asphalt plant during production, where it melts and homogenises with the bitumen.

Successes and Challenges

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Supersite ✕	**Supersite** ☑
Lack of standardised data collection and government standards ✕	Testing, EPD and Carbon data collection ☑
Lack of benchmarking ✕	Cross boarder use of different materials e.g.Chipper HRA vs SMA ☑

Collaboration is key to decarbonisation

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Failure Files

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What didn't work? Thoughts from the trial delivery team.

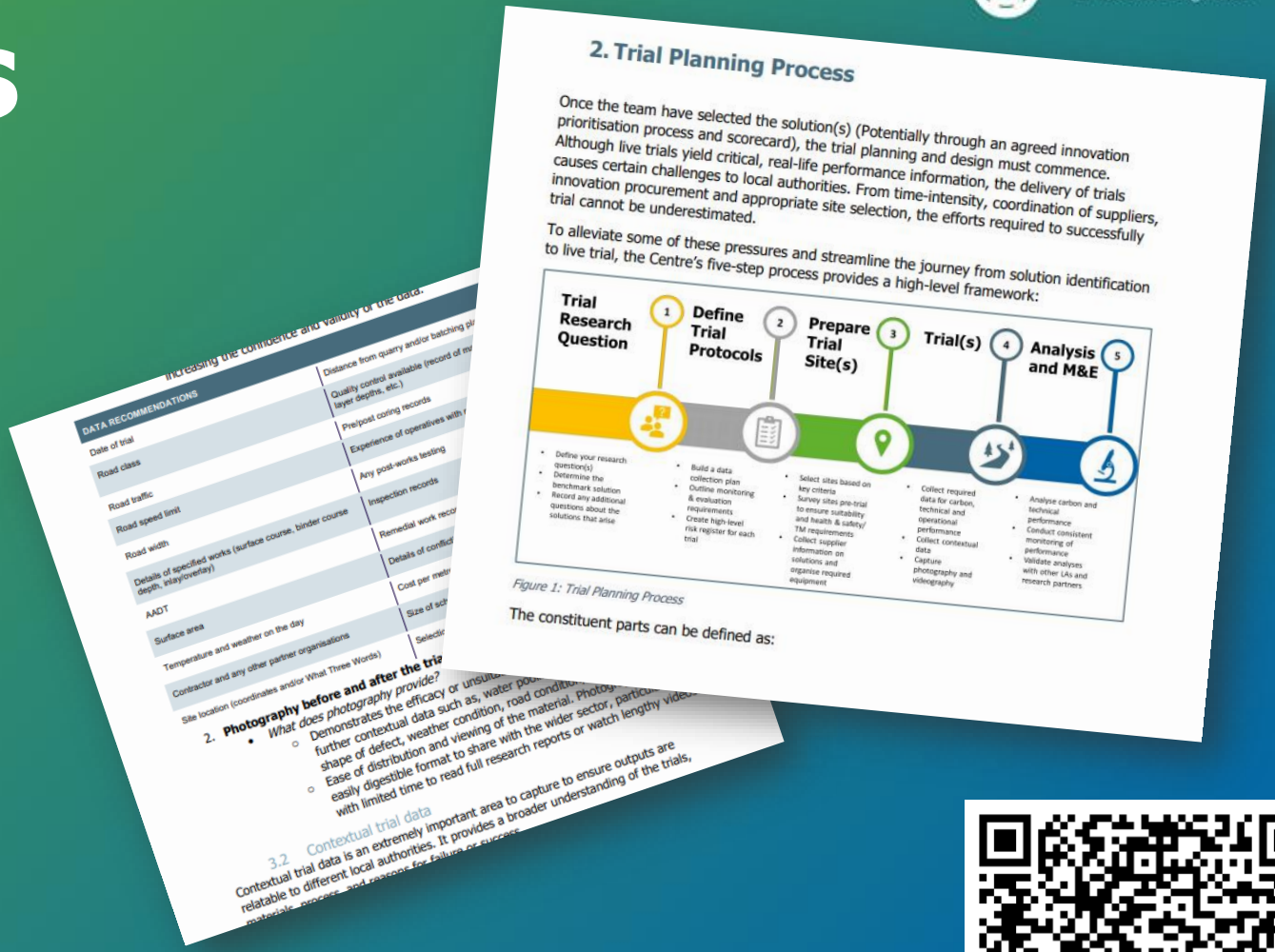
- Data gathering and carbon transparency
- Operational planning complexity
- Supply chain and procurement differences to BAU
- Compatibility with HRA
- Early contractor involvement

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Trial Protocols

- Step-by-step guidance for trial planning
- Recommendations for data collection and design
- Simplified trial checklist
- Once the trial finishes, add as a case study or review on the Knowledge Bank



2. Trial Planning Process

Once the team have selected the solution(s) (Potentially through an agreed innovation prioritisation process and scorecard), the trial planning and design must commence. Although live trials yield critical, real-life performance information, the delivery of trials causes certain challenges to local authorities. From time-intensity, coordination of suppliers, innovation procurement and appropriate site selection, the efforts required to successfully trial cannot be underestimated.

To alleviate some of these pressures and streamline the journey from solution identification to live trial, the Centre's five-step process provides a high-level framework:

Figure 1: Trial Planning Process

The constituent parts can be defined as:

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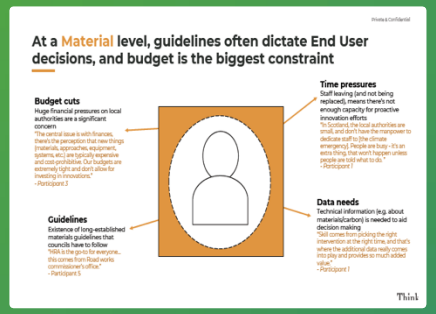
Barriers & Strategy

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The Knowledge Bank

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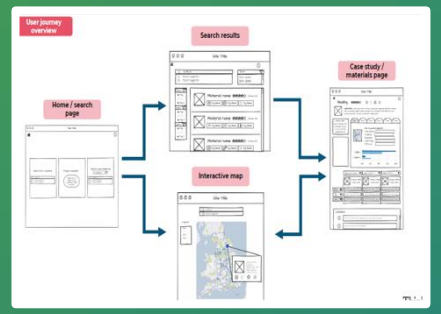
1



End-User Requirements

Working with Thinks Insight, we conducted behavioural research with 10 LAs across the country to assess challenges and initial design prototypes

2



High-level wireframes

Early-stage wireframes and End-User Requirements presented to suppliers and validated by LAs

3



IT options appraisal and onboarding

Three top suppliers rated against key criteria, and top supplier (Microsoft with Transparity) were onboarded

4



Design and development

In-depth designs, development and UAT testing over the last 5 months.
Focus Groups with LAs and Suppliers

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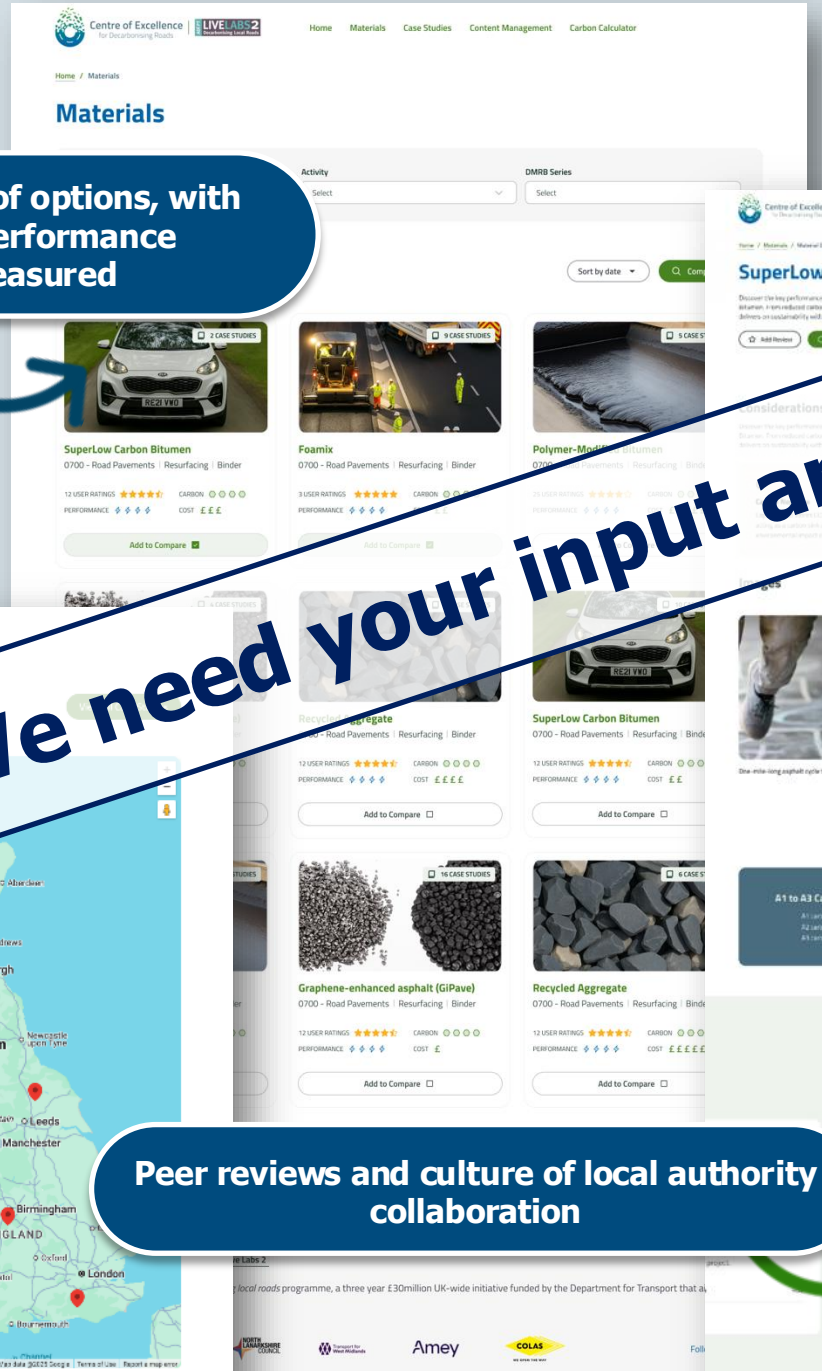
Key Features

Comprehensive menu of options, with carbon, cost and performance consistently measured

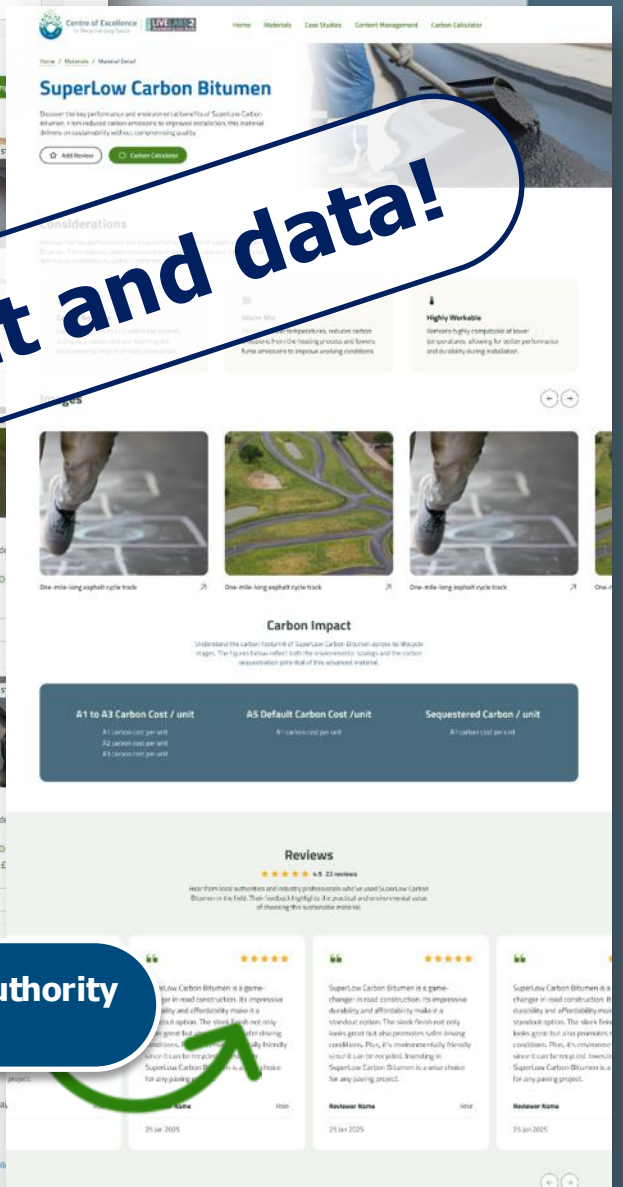
Evidence base for local authority innovation and excellence across the UK

Not the finished item – We need your input and data!

Peer reviews and culture of local authority collaboration







The Knowledge Bank

Centre of Excellence for Decarbonising Roads

https://kb.decarbonisingroads.co.uk/

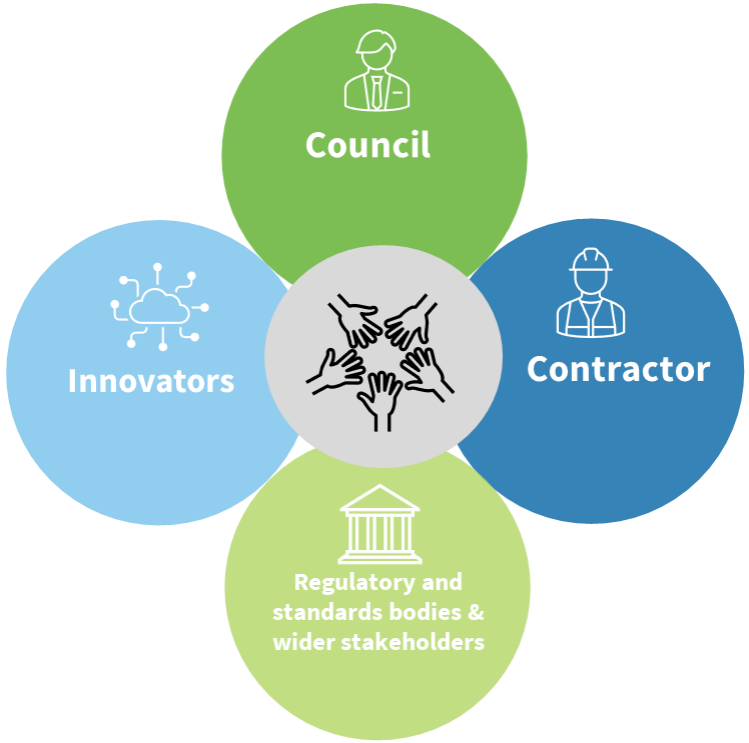


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Safetytech Accelerator

Purpose

The sandbox will build collaborative project teams made up of stakeholders from the Council, Contractor, Innovator and wider Regulatory and Standards Bodies.



Key players

Industry mentors:

- NH, TS, LAs, MPA, Amey, etc.

SMEs:

- Uberbinder
- Sima
- PRG Scotland
- EcoPals
- Biozeroc
- DMAT

Barriers to Decarbonising Roads Sandbox

Creating maximum benefits for local roads through Option 5

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SME Sandbox

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PRG Scotland

- Tyre-derived bitumen from Continuous Reductive Distillation
- 4.48 kg CO2e per tonne compared to 215 CO2e per tonne for traditional bitumen



Sima

- Asphalt additive
- Plastic-derived granulation
- Reduces bitumen usage, 5kg per 2kg of product
- Barriers in specification by binder weight rather than volume



Ecopals

- Berlin-based
- Develop polymer modifiers for asphalt from recycled plastic
- Trials completed in Germany, Switzerland, Austria, Poland, etc.



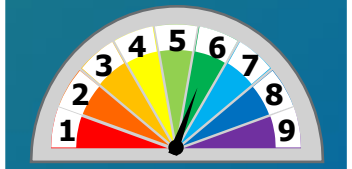
Uberbinder

- Binder derived from inverse vulcanization of sulphur byproducts
- Trials in the US and planning trials in Spain



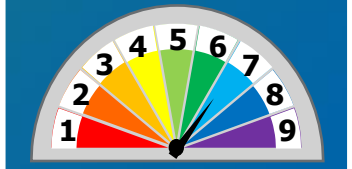
Biozeroc

- 100% cement-free concrete, with 35 Mpa compressive strength
- Cambridge University spin-out
- Some concerns regarding low-risk applications for highways



DMAT

- Self-healing concrete developed with MIT through a proprietary additive
- Achieved CE certification and have active commercial deployments



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Final Reports from SMEs

- **Culture vs. Evidence**: Is innovation resistance cultural or about insufficient benefit evidence?
- How to navigate multiple clients (authorities, contractors, material producers)?
- How can local councils efficiently engage multiple innovators?
- Need for progressive development funding with clear milestones



Common Challenges:

- Industry Risk Aversion: Reluctance to be first adopters
- Startup data vs. established manufacturer validation
- Understanding UK-specific requirements
- Limited capital for decarbonisation initiatives
- Difficulty proving durability claims

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Behaviour Change research

‘On the ground’ ethnographic

- Interviews and Site visits completed with 3 LA’s
  - Coventry
  - North Lanarkshire
  - Lincolnshire

Digital ethnography

- Observational research conducted through a closed WhatsApp chat

Co-creation workshops

- Workshops combining all the findings so far
- Final outputs to be published into a report (QR code below)
- Top ideas following workshops were:
  - Decision prompts
  - Innovation Hub
  - Joint innovation
  - Shared success stories

Workshop

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In your table groups, discuss and agree one key action you will take back to your teams to drive decarbonisation through each of the following areas (15 mins):

Policy & Strategy



People & Skills



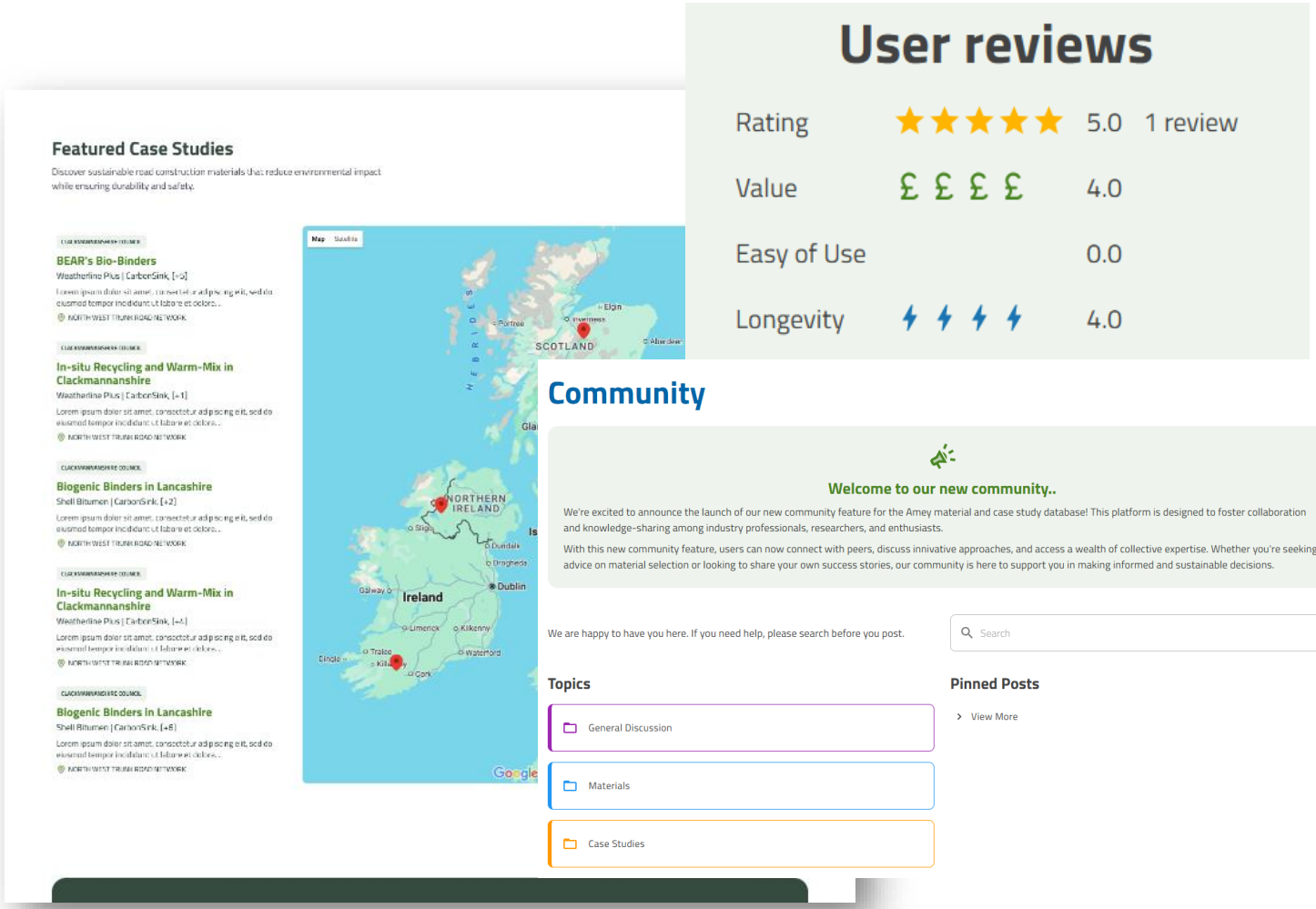
Materials & Methods



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What can you take away?

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Carbon CHAMPIONS

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Q&A

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Carbon Crash Course

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How do we work out carbon emissions?

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Emission factor: representative values that quantify how much CO_2e is released per unit of activity.

An emission factor is required to calculate GHG emissions.

An emission factor quantify emissions per given unit. Covering energy used ($kgCO_2e$ per kWh), Fuel consumed ($kgCO_2e$ per litre of diesel) and raw materials ($kgCO_2e$ per tonne of aggregate).

Sources of emission factors include - UK Government (DEFRA/BEIS), IPCC emission factor database, ICE emission factor database, Environmental Product Declarations, FHRG CLP Toolkit and they can also be supplier provided.

An **emission factor** covers lifecycle stages **A1, A2 and A3** per declared unit.

Carbon emissions = emission factor x activity data
e.g. 65.95 $kgCO_2e/t$ x 235.32t = 15,519.35 $kgCO_2e$

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How do we measure carbon emissions?

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Carbon emissions are not always the easiest to track and often we don't realise we've emitted carbon.

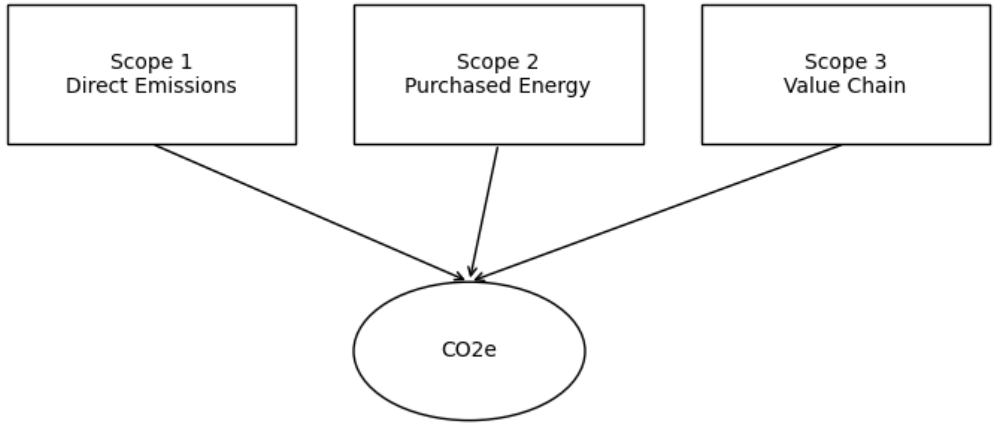
There's a variety of greenhouse gas emissions (GHG) to account.

Emissions are accounted for as CO_2e (carbon dioxide equivalent) – this accounts for carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and your fluorinated gases (HFCs, PFCs, SF_6, NF_3).

CO_2e provides a **single comparable metric** for total climate impact by converting every gas into its carbon dioxide equivalent.

Making it easier to:

- Report emissions consistently
- Track progress towards carbon reduction targets
- Meet GHG protocol and regulatory reporting requirements – Scope 1 (direct), Scope 2 (indirect purchased), Scope 3 (indirect upstream and downstream)

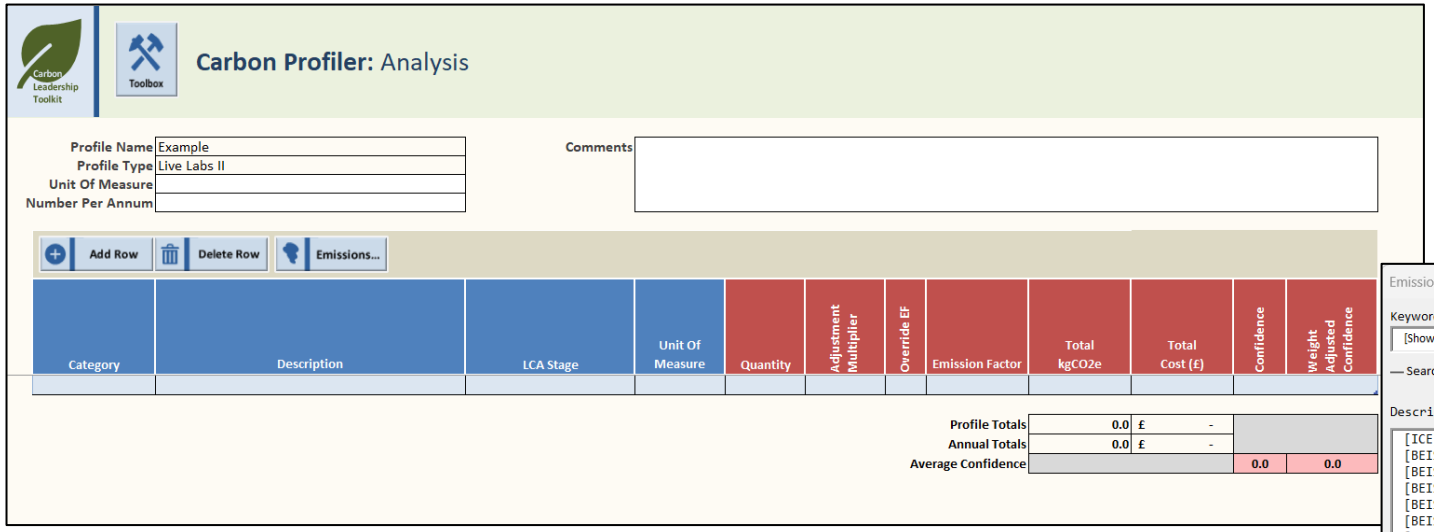


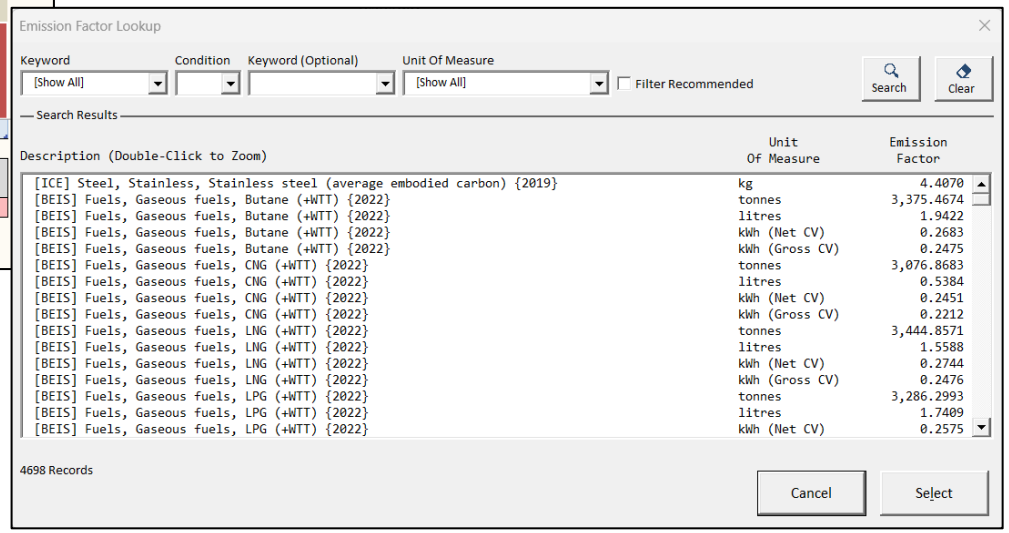
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FHRG CLP Toolkit

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- A Life Cycle Assessment and emission factor database platform used to quantify embodied and whole-life carbon across the life of a project, process or service.
- Bank of emission factors from a variety of sources – NH, FHRG, ICE, BEIS, Live Labs 2. Continuously updated.





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Whole Life Carbon (WLC)

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A WLCA measures the environmental impacts associated with the lifecycles of products, processes or services.

PAS 2080 represents the whole life cycle emissions of infrastructure as a series of numbered modules :

A = before use stage, B= use stage, C= end of life stage

Life cycle stages		
A. Before use	**B**. Use	**C**. End of life
• Planning, design and construction, or retrofit/ refurbishment	• Materials / product • Transport	• Reuse, repurposing or removal of infrastructure • Waste processing

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HRA Surfacing Emission Sources

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A1-A3 Materials: HRA mix, bond coat, precoated chippings

Example –

Materials	HRA 35/14F 40/60 (Control)	A3 (Manufacturing)	tonnes	234.7	1.0	Yes	68.0500
Materials	Bond Coat	A3 (Manufacturing)	kg	2,310.0	1.0	Yes	0.4190
Materials	60 PSV 14/20mm PCC	A3 (Manufacturing)	tonnes	18.6	1.0	Yes	46.2800

A4 Transport: individual transport e.g. fuel usage/mileage from home to depot, plant transport i.e. from depot to site.

Example –

Transportation	HGV > 17 tonnes rigid 100% laden	A4 (Transport to Site)	miles	24.0	1.0	No	1.7848
Transportation	HGV > 17 tonnes rigid 0% laden	A4 (Transport to Site)	miles	24.0	1.0	No	1.2456
Transportation	DG17 KHR Bondcoat Sprayer (Joint2Joint) (Travel)	A4 (Transport to Site)	miles	25.4	1.0	Yes	1.7848
Transportation	DG17 KHR Bondcoat Sprayer (Joint2Joint) (Travel) (Return)	A4 (Transport to Site)	miles	25.4	1.0	Yes	1.2456
Transportation	HGV Transportation of Plant	A4 (Transport to Site)	miles	2.0	4.0	Yes	1.7848

A5 Construction: fuel usage of plant, machine hours, operative hours

Example -

Plant	Paver	A5 (Construction & Installation)	m2	2,100.0	1.0	Yes	0.0595
Plant	Airmaster Tractor	A5 (Construction & Installation)	hours	9.0	1.0	Yes	14.6200
Plant	Streetmaster Tractor	A5 (Construction & Installation)	hours	9.0	1.0	Yes	14.6200
Plant	HD90 Roller	A5 (Construction & Installation)	m2	2,100.0	1.0	Yes	0.0734
Plant	HW90 Roller	A5 (Construction & Installation)	m2	2,100.0	1.0	Yes	0.0565
Plant	Chipper	A5 (Construction & Installation)	hours	15.3	1.0	Yes	10.8100
Plant	Bomag Roller HD13	A5 (Construction & Installation)	m2	2,100.0	1.0	Yes	0.0470
Services	Operatives	A5 (Construction & Installation)	perative.da	9.0	1.0	No	2.3360
Plant	DG17 KHR Bondcoat Sprayer (Joint2Joint)	A5 (Construction & Installation)	hours	9.0	1.0	Yes	27.2000
Plant	Delivery Wagons	A5 (Construction & Installation)	hours	5.0	1.0	Yes	27.2000

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Available Support

Chartered Institution of Highways & Transportation (CIHT)

- https://www.ciht.org.uk/route-2-net-zero/
- https://www.ciht.org.uk/ciht-learn-1/an-introduction-to-fhrg-carbon-calculation-and-accounting-standard-ccas/
- https://www.ciht.org.uk/knowledge-resource-centre/resources/building-carbon-reduction-into-procurement-processes/
- https://www.ciht.org.uk/knowledge-resource-centre/resources/how-can-we-reduce-emissions-by-63-in-a-decade-lessons-from-the-highways-sector/

Institution of Civil Engineers (ICE)

- https://www.ice.org.uk/areas-of-interest/decarbonisation

Institute of Sustainability & Environmental Professionals (ISEP)

- https://www.isepglobal.org/learn/transition-to-net-zero/

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