Future Highways Research Group

FHRG Waypoint Meeting: Q4, 2024

Online Meeting (MS Teams)

ADEPT / Proving Research Partnership

Agenda

- **Welcome & Introduction** **(Hannah Bartram, CEO, ADEPT)**
- **Highways Magazine** **(Dominic Browne, Editor, Highways Magazine)**
- **FHRG Activities Update** **(Andy Perrin, Simon Wilson, Proving)**
  - New members.
  - News from members?
- **VfM Benchmarking Club**
  - Significant review of process, factors, and alignment with challenges.
    - Reflecting asset condition and resilience.
- **FHRG Labs Network**
  - Proposal Review

Agenda
Research Programmes

- **Best Practice Carbon Programme**
  - **Best Practice Carbon Assessments**
  - **Quick Carbon Footprint Assessment**
  - **Carbon Reduction Options: Evaluation Toolkit**
- **Future Procurement Research Programme**
- **Artificial Intelligence (AI) In Highways Services Research Programme**
  - Overarching Programme
  - **AI Enquiries Handling Project**
- **FHRG Membership Renewal**
- **Comfort Break**

Agenda
Continued…

- **Climate Change Resilience**
  - Scaling the problem (Simon Wilson, FHRG)
  - ADEPT Board Update (ADEPT Climate Adaptation Guide, Andrew Warrington, Arcadis)
  - Open Discussion (All FHRG Members)
    - What are the key challenges we are experiencing and anticipate?
    - How are we responding – any best practice emerging?
    - What role should the FHRG play going forward?

      (Including engagement with the ADEPT Climate Resilience Working Group)
- **Live Labs II: Updates**
  - Wessex
  - Liverpool
  - CEDR
- **Date of Next Meeting & AOB**
- **Close**

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Welcome

Hannah Bartram, CEO, ADEPT

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Sector News: Highways Magazine

Dominic Browne, Editor

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VfM Benchmarking Club

Andy Perrin

Value for Money Benchmarking Club

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- **Assessments are demonstrating an ever-improving performance in terms of value for money across the membership.**
  - And better collaboration with partners.
- **Most authorities are, however, managing a deteriorating asset.**
  - Investment and capacity are critical barriers to sustainability.
  - Public satisfaction continues to reflect this.
- **Annual review of VfM factor set and scoring guidance now underway.**
  - To include feedback from peer reviewers and assessment recipients.
  - Issues to consider:
    - Ensuring our assessments reflect both value for money and the direction of travel in terms of asset condition
      - Important messages for DfT, elected members and other funding bodies.
    - Redefine ‘Excellent’
    - Alignment with Carbon Best Practice Assessment
- **All views and observations welcome.**

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FHRG Labs Network: Proposed Syndicate Group

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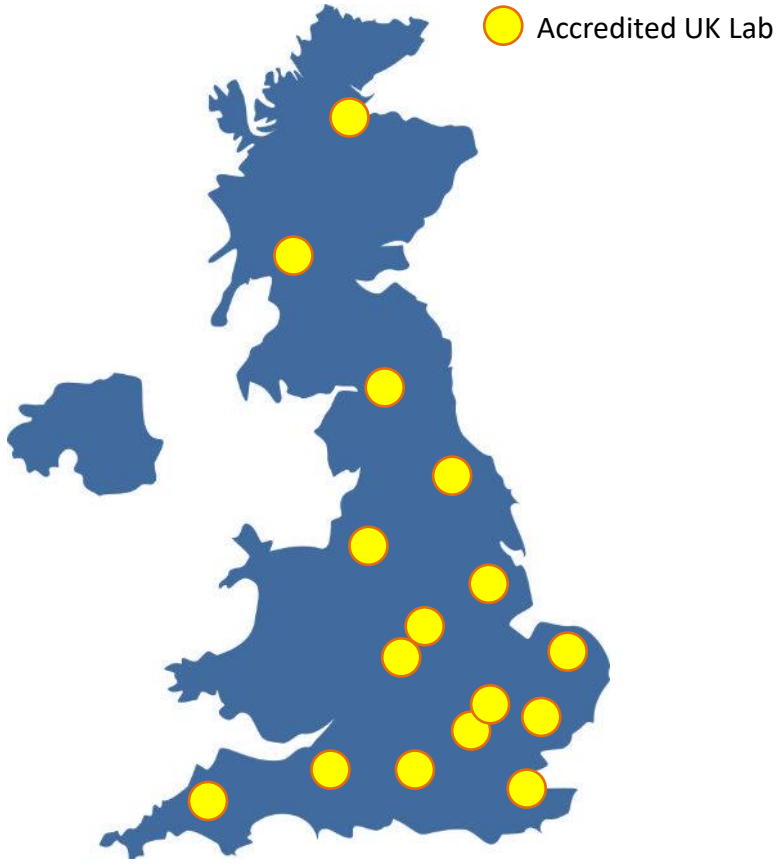
FHRG Labs Network (Update)

Client-Side Methods & Materials Experimentation & Testing



- **A small number of client-side labs remain.**
  - Many have suffered from underinvestment.
- **A huge number of new materials and processes to test.**
  - Driven by new technologies and political priorities.
- **Push methods and materials testing to members' labs.**
  - Investing in client labs and capabilities.
  - Private sector collaborations fund activities.
- **Labs share trials data and best practice.**
  - At FHRG meetings.
  - Through a "labs" portal?
- **FHRG members given access.**
  - Utilising the UK labs knowledge, capacity and capabilities.
- **Proposed as an FHRG syndicate group.**
  - With its own / current structures.
- **Jon Evans and Tom Gifford (Lincolnshire) are exploring this…**

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Best Practice Carbon Programme

ADEPT / FHRG Programme

Programme Overview

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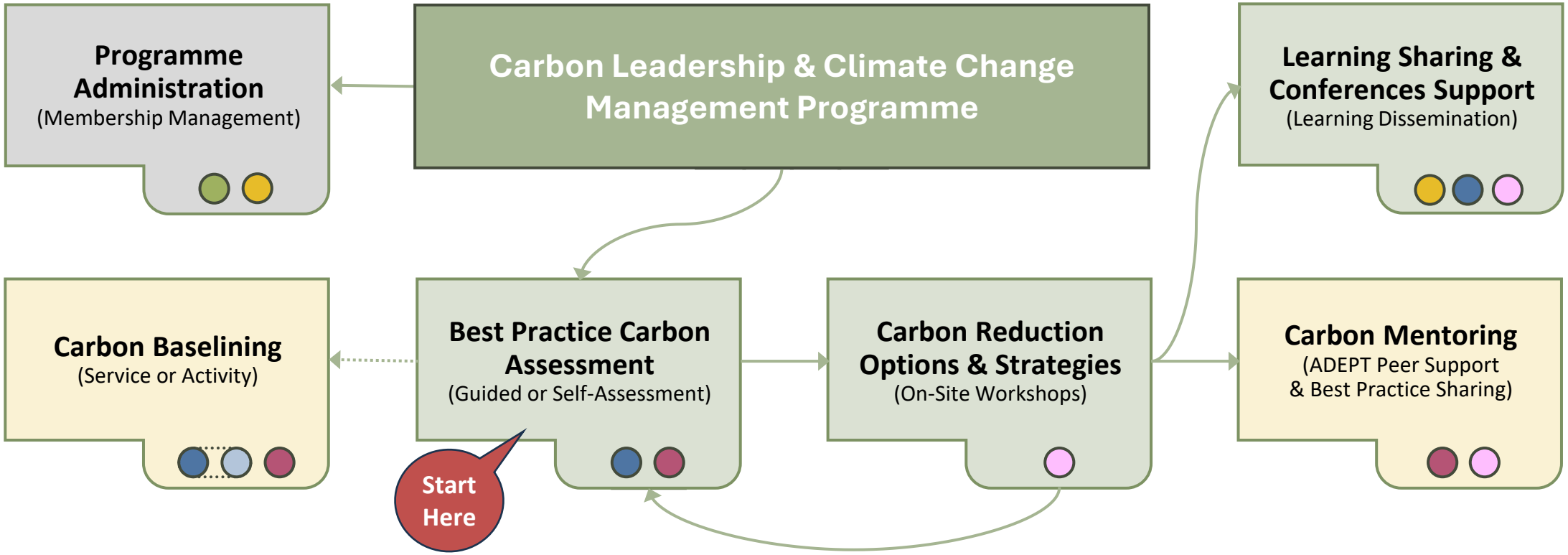

- ADEPT Membership Management
- ADEPT Promotion (Coast Communications)
- Proving (Carbon Analysis & Benchmarking)
- Carbon Analysis Support Partners (Colas)
- ADEPT Peer Reviewers
- Thought Leaders & Training Partners

Preliminary & Tentative
For Discussion Purposes Only

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Best Practice Carbon Assessment

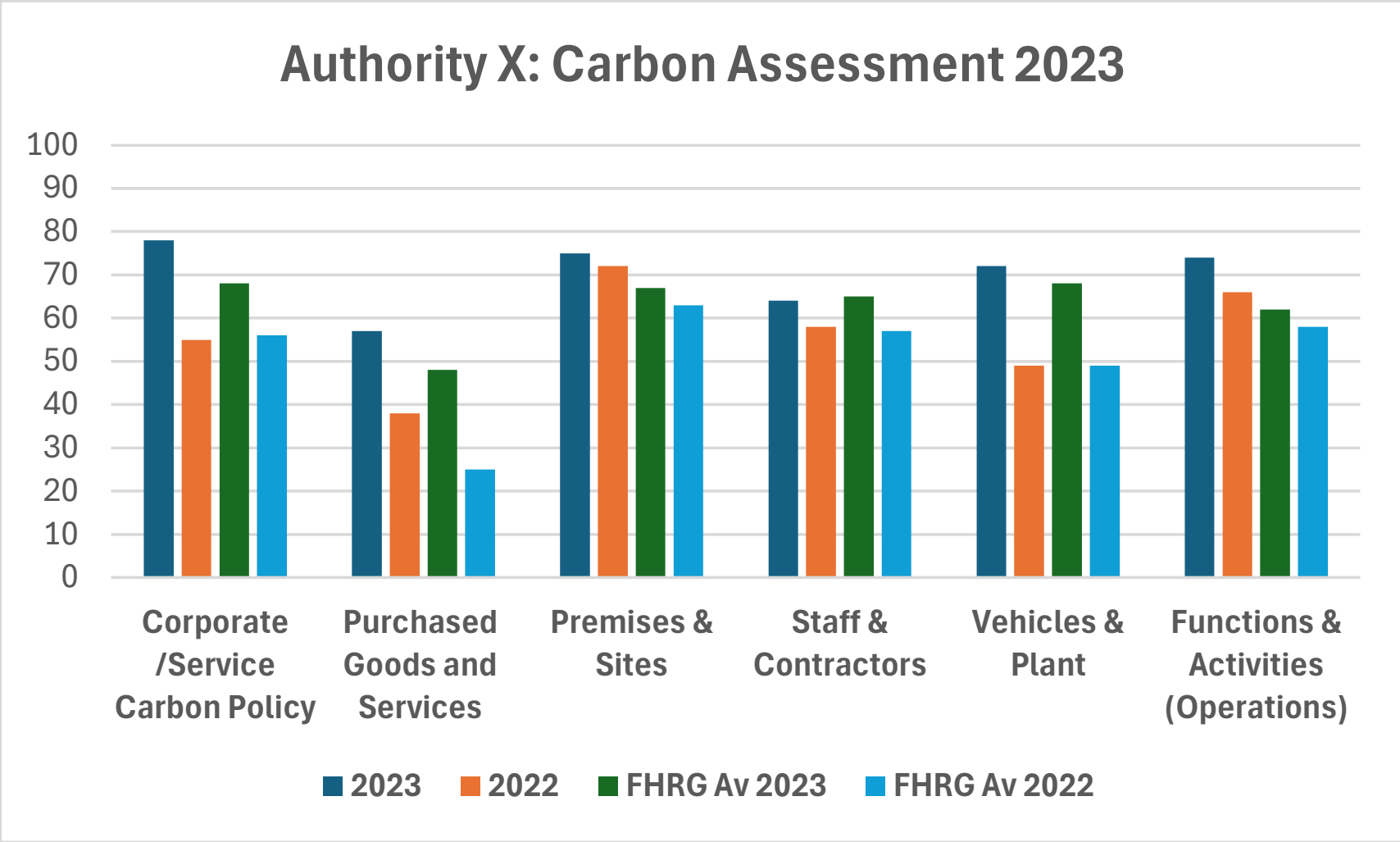
Karen Farquharson

Carbon Management: Best Practice Assessment
Introduction

- **In conjunction with the carbon audit (Comprehensive or Quick Assessment), an evaluation process has been developed that assesses the scope and scale of activity, planned and/or implemented by an authority to reduce its carbon emissions.**
- **The process is based on the FHRG Value for Money Assessment.**
- **6 dimensions and 57 assessment factors have been identified that incorporate the activities that an authority could undertake to reduce its carbon emissions. These have been categorised to incorporate the CCAS dimensions.**
  - Corporate /Service Carbon Policy
  - Purchased Goods and Services (Provider Policy and Management)
  - Premises and Sites
  - Staff and Contractors
  - Vehicles and Plant
  - Functions and Activities (Operations)

Carbon Best Practice

Illustrative Assessment Chart



Best Practice Assessment
Proposed Process

- Hyperlink to Carbon Analyser
- **The proposed assessment process will include:**
  - An initial self-assessment questionnaire.
  - A workshop-based review of questionnaire by Proving and FHRG peer members.
  - A benchmark of carbon reducing activity and progress against other participating authorities.
  - Development of an improvement programme, including future options and activities to improve the service's carbon profile.
  - Proving will facilitate regular FHRG seminars to share the findings and learning from the carbon assessments completed.

Benefits of the Carbon Best Practice Assessment

- **A time and resource efficient assessment that considers actual activity in reducing carbon emission.**
- **Provides an authority-specific checklist and programme for improvement.**
- **Monitors and reports on service /authority progress in reducing carbon emissions.**
- **Encourages shared learning and experience across the FHRG and wider sector.**
- **Builds a detailed summary of activity and progress in reducing carbon across the highways sector which can be shared with interested bodies, such as DfT.**
- **The Carbon Best Practice Assessment process and supporting toolkit can be extended to cover other local authority services.**

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New “Quick Assessments”

Carbon Analyser

What are Quick Assessments (QA)?

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Currently, it takes significant effort to gather the data necessary to complete a Deep Dive (DD) carbon footprint assessment.

Quick Assessments (QA) aim to reduce the time and effort from "months and weeks" to "days".

The key question is, are QAs sufficiently accurate for the purposes of carbon reporting and carbon reduction planning?

Quick Assessments

Simple Questions, Automatic Carbon Calculations

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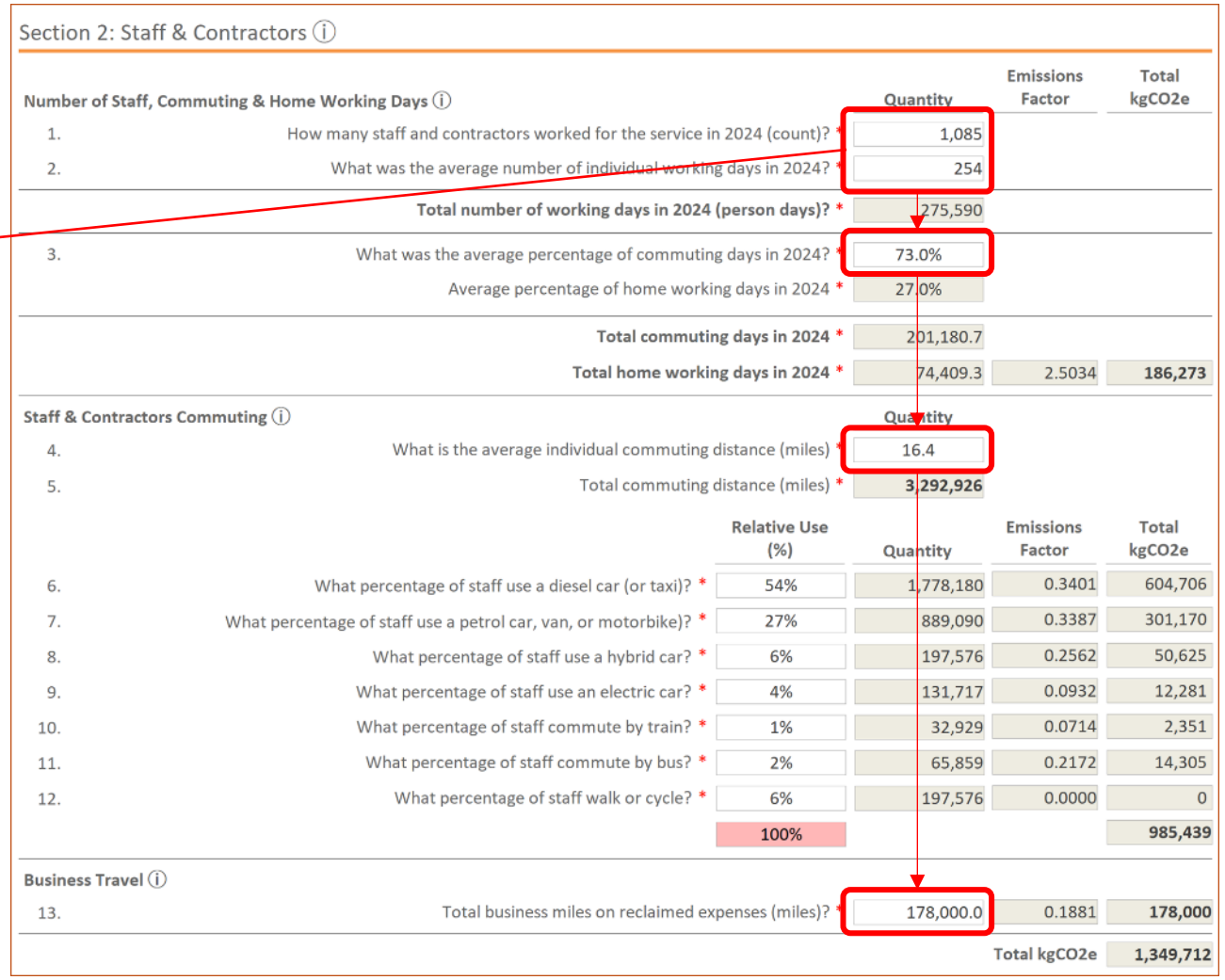
Answer 5 questions to complete an inventory…
Rather than a full staff survey.



Section 2: Staff & Contractors ⓘ

Number of Staff, Commuting & Home Working Days ⓘ		Quantity	Emissions Factor	Total kgCO2e
1.	How many staff and contractors worked for the service in 2024 (count)? *	1,085		
2.	What was the average number of individual working days in 2024? *	254		
	Total number of working days in 2024 (person days)? *	275,590		
3.	What was the average percentage of commuting days in 2024? *	73.0%		
	Average percentage of home working days in 2024 *	27.0%		
	Total commuting days in 2024 *	201,180.7		
	Total home working days in 2024 *	74,409.3	2.5034	**186,273**

Staff & Contractors Commuting ⓘ		Quantity		
4.	What is the average individual commuting distance (miles) *	16.4		
5.	Total commuting distance (miles) *	3,292,926		

		Relative Use (%)	Quantity	Emissions Factor	Total kgCO2e
6.	What percentage of staff use a diesel car (or taxi)? *	54%	1,778,180	0.3401	604,706
7.	What percentage of staff use a petrol car, van, or motorbike)? *	27%	889,090	0.3387	301,170
8.	What percentage of staff use a hybrid car? *	6%	197,576	0.2562	50,625
9.	What percentage of staff use an electric car? *	4%	131,717	0.0932	12,281
10.	What percentage of staff commute by train? *	1%	32,929	0.0714	2,351
11.	What percentage of staff commute by bus? *	2%	65,859	0.2172	14,305
12.	What percentage of staff walk or cycle? *	6%	197,576	0.0000	0
		100%			**985,439**

Business Travel ⓘ				
13.	Total business miles on reclaimed expenses (miles)? *	178,000.0	0.1881	**178,000**
			Total kgCO2e	**1,349,712**

QA Assessments

Overview & Key Considerations

- **The results are slightly better than expected and will be suitable for the majority of FHRG / ADEPT users.**
  - Clarity regarding the carbon hotspots will be retained.
- **The approach for DD and QA for the Premises & Sites inventory is largely the same.**
  - But the QA omits marginal considerations.
- **Staff & Contractor emissions reflect FHRG averages, rather than a direct staff survey.**
  - As the staff survey only needs to be conducted every three years, third-year assessments are likely to be roughly the same.
- **The QA approach for the Vehicles & Plant inventory groups data by vehicle / fuel type.**
  - Which appears to reduce the overall accuracy by 4%.
- **The most significant variance occurs with the scope 3 emissions (for Purchased Products & Services).**
  - The QA approach looks at what is commissioned (i.e. number of grass cuts), automatically calculating the materials used by apply carbon benchmarks created from FHRG datasets.
  - The DD approach assesses all materials and services used across the supply chain; which has higher accuracy but is very time consuming.
  - As the QA approach for this inventory is significantly easier to complete, we will be recommending this approach for the majority of FHRG / ADEPT users.

Initial Calibration Testing

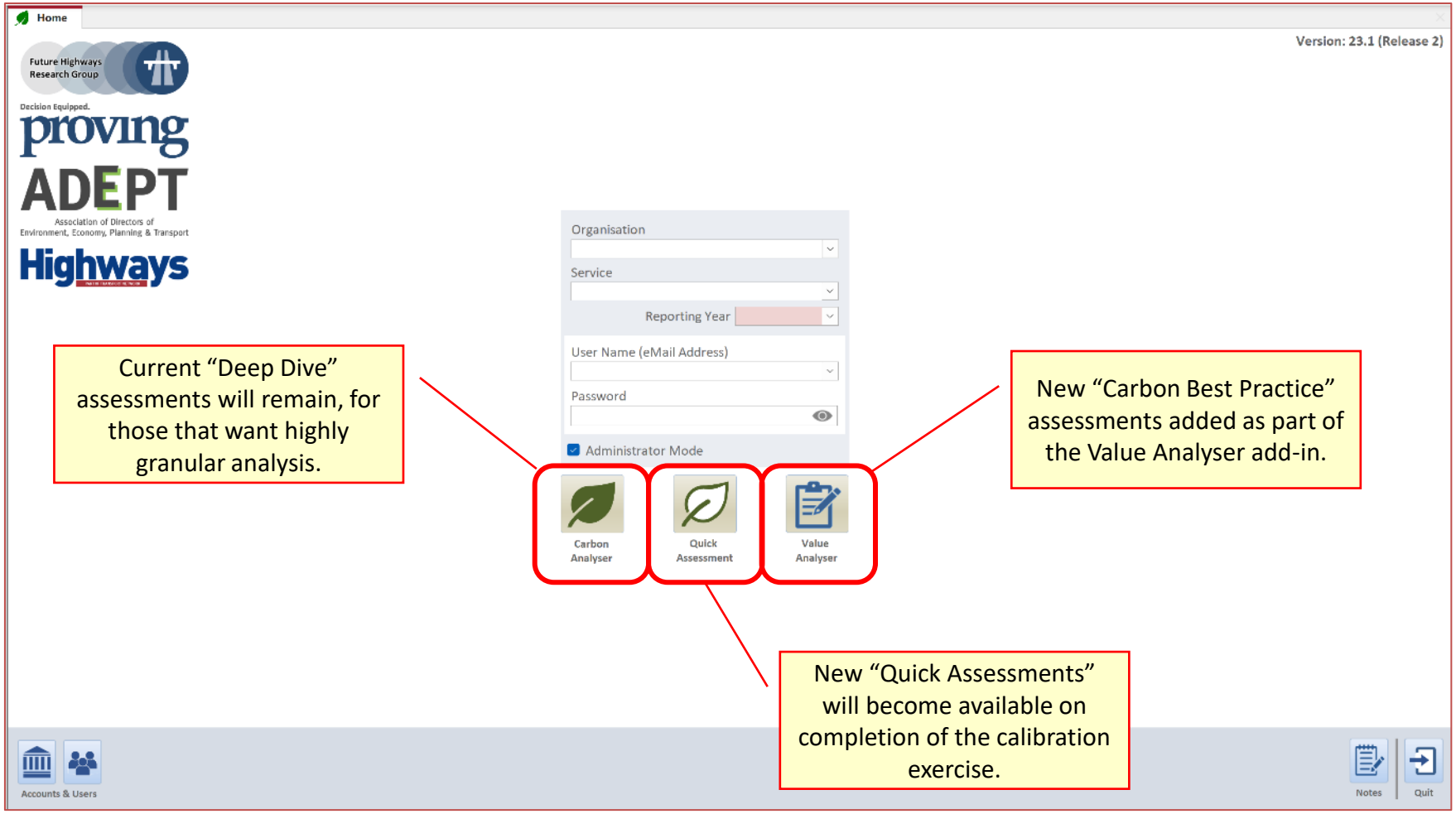
Inventory	Deep Dive Assessment (Benchmark)	Quick Assessment	Variance
Premises & Sites	85%	85%	0%
Staff & Contractors	80%	73%	-7%
Vehicles & Plant	83%	79%	-4%
Purchased Products & Services*	78%	69%	-9%
Averages	**82%**	**77%**	**-5%**

*Scope 3, commissioned highways activities.

- **The bottom line is that QAs, whilst having a lower accuracy and completeness, appear sufficient for the purposes of:**
  - GHG footprint reporting.
  - Decision support purposes.
  - Supply chain tasking purposes.
  - Carbon reduction planning purposes (options portfolio management).

Carbon Analyser

New Features



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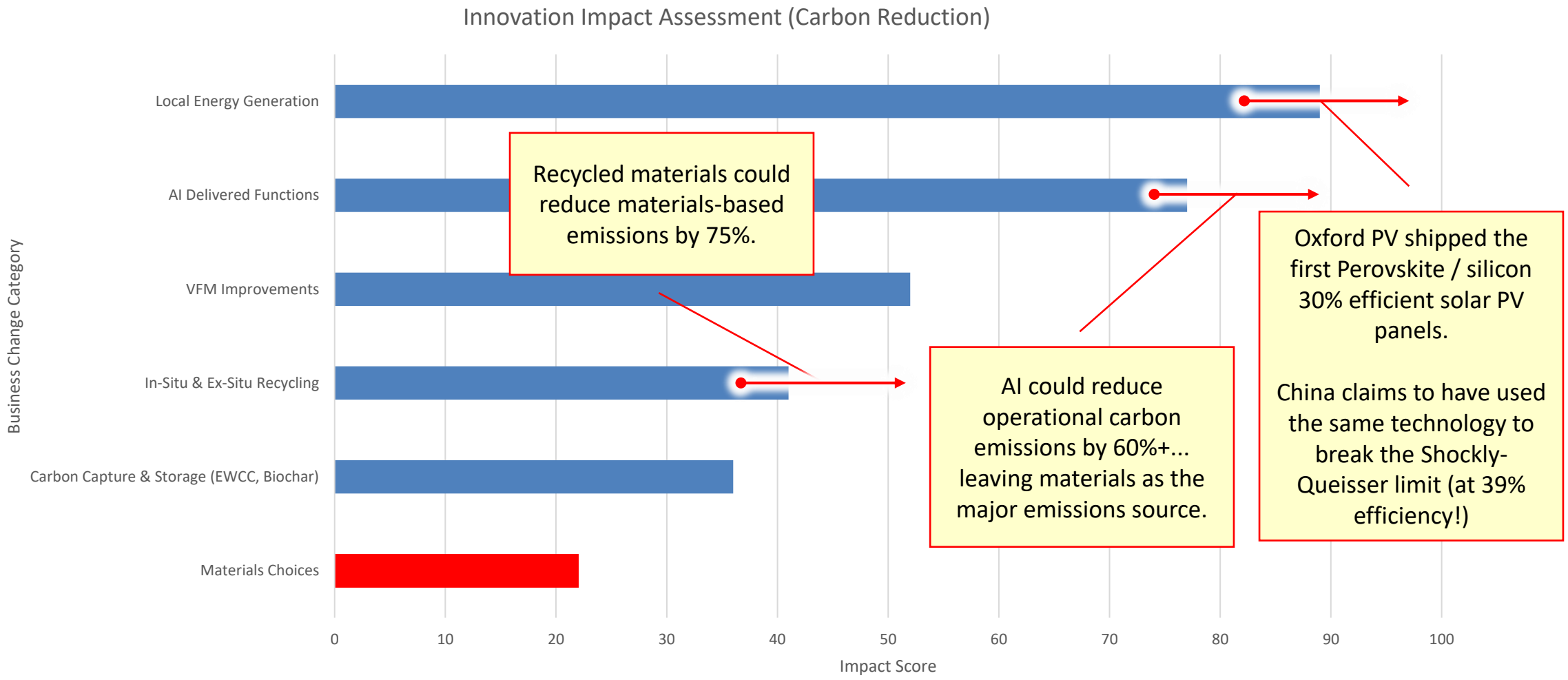
Carbon Reduction Strategies: Options Portfolio Management & Planetary Impact Assessments

Carbon Analyser

Innovation Impact Analysis



LHA Performance Analysis

Clear Correlation Between Carbon Efficiency & VfM

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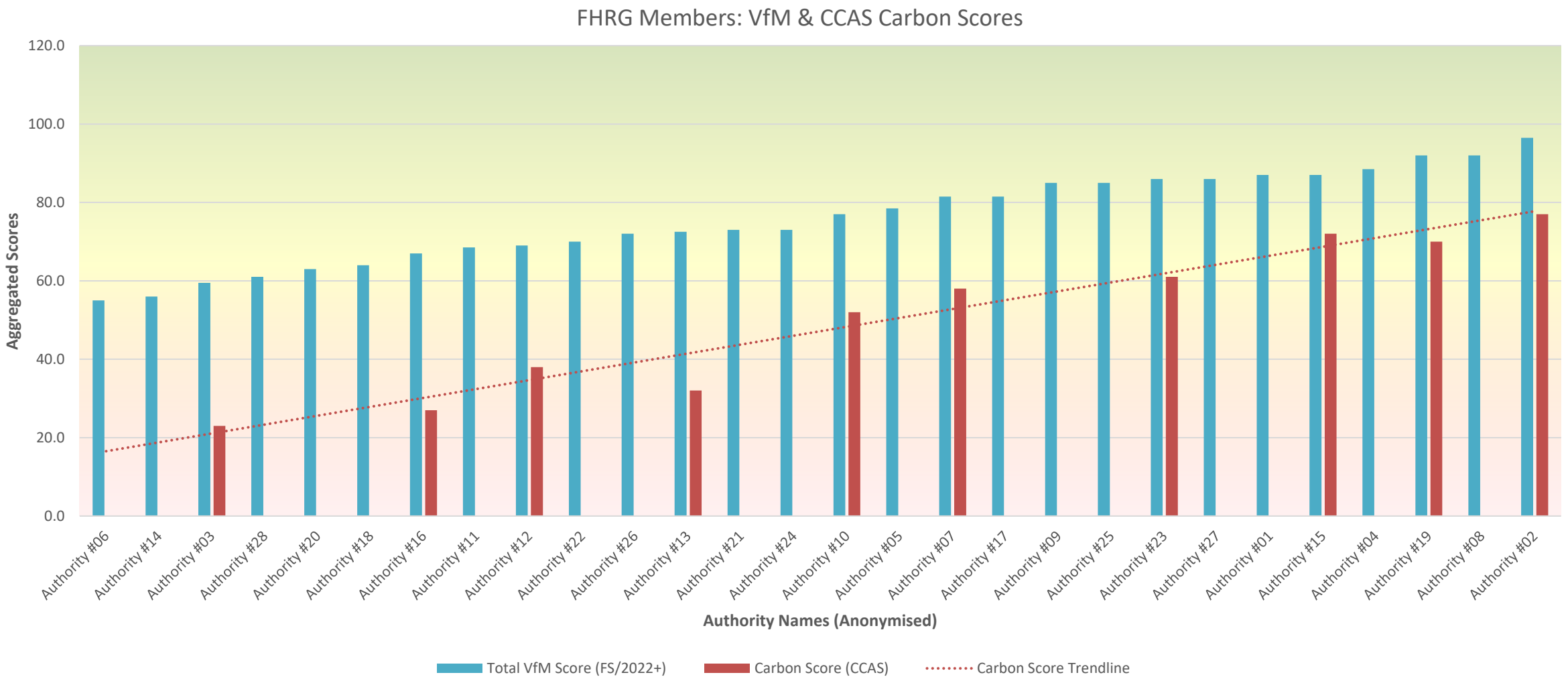

Options Analysis, Prioritisation & Selection

- **Carbon Analyser is being upgraded to handle:**
  - A new strategic options library (shared by all FHRG members).
  - Links to CEDR and Live Labs II carbon profiles and properties sheets.
  - 58 “non-junk” options.
  - Local impact modelling for options deployment.
- **In 2025, Carbon Analyser will include “Planetary Impact Assessments”.**
  - As scorecards, using Value Analyser (for services and schemes).
  - Based on the work of the Wessex Live Lab (working with Circle Economy).
    - As a highways sector specific version of a “doughnut assessment”.

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Future Procurement

Research Programme

Research Theme: Future Procurement

- **Background**
  - Proving was approached by several Highways Maintenance Providers who expressed concerns regarding the current procurement process for major highways maintenance contracts. A small number of authorities and providers were interviewed to sense test the proposed research questions.
- **Proposed Research Questions:**
  - Is the current procurement process fair, transparent and robust?
    - The consensus was ‘Yes’, although improvements could be made to ensure a more cost-effective process, with better outcomes.
  - Following the procurement process, do authorities subsequently believe they have contracted the ‘best’ partner (i.e. cost, quality of work through an effective, trusting working relationship)?
    - Again, generally ‘Yes’, although authorities often have to work through issues/ challenges arising in a 12-to-18-month mobilisation period.
    - Will authorities admit that they may not have procured the right partner?

Research Theme: Future Procurement (cont.)

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- **What could be done to improve the procurement process and achieve better outcomes for the authority and its partners, including *inter alia*:**
  - Procurement Preparation
    - Skills and Resources (Capability and Capacity)
    - Data and Service Requirements and Analysis (Current and Future)
  - Provider Differentiation and Assessment
  - Improving Tender Evaluation
  - Reducing Procurement Cost and Timescales
  - Sector/ FHRG Advice, Guidance and Challenge

Research Focus

- **The potential role of AI in reducing the cost, timescales and resource requirement in the procurement of highways services?**
  - Linked to the AI research theme.
- **The value of a Highways Procurement Support and Guidance Forum?**
  - Offer advice, guidance and challenge.
  - Share documents, processes, learning, good practice and potential pitfalls.
  - Provider performance?
  - Facilitated by the FHRG?
- **The role and value of Regional Procurement (and Delivery).**
  - Sector appetite.
  - Combined highways authorities.
  - Future funding?

Proposed Next Steps

- **Procurement Good Practice**
  - Roundtable discussion.
  - Survey (another one!)
  - Produce a ‘Procurement Good Practice Guide and Checklist’
  - Encourage members to utilise the FHRG forum.
    - Propose to develop a FHRG hub through the ADEPT website
- **Research Themes**
  - Develop outline research briefs.
  - Ask for feedback from FHRG members as to relevance and prioritisation.

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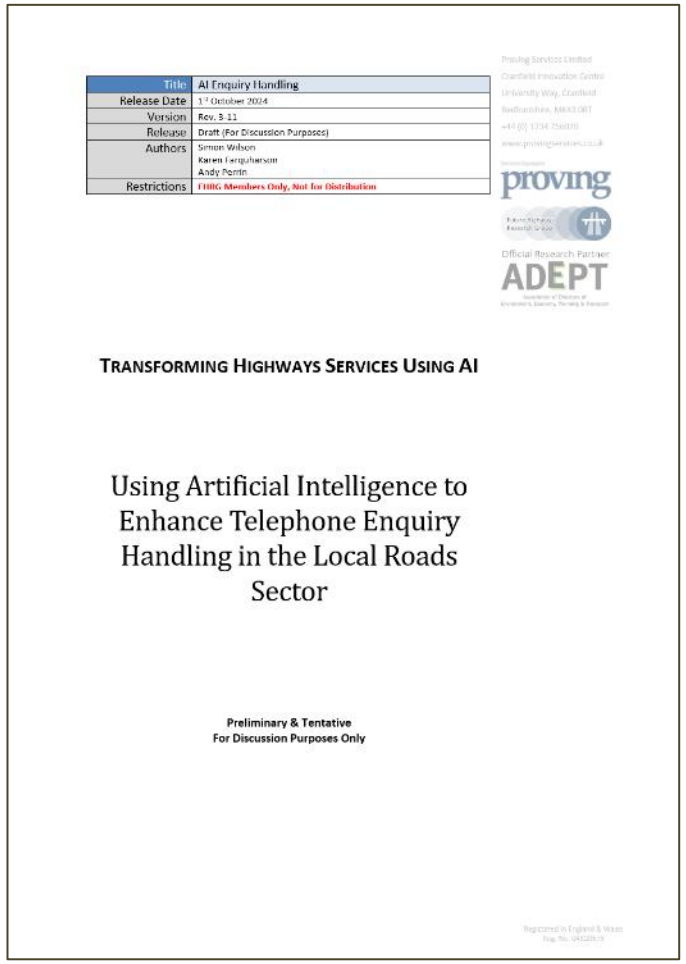
AI In Highways Services:
AI Enquiry Handling

Research Programme

AI Enquiries Handling Research Project



Title	AI Enquiry Handling
Release Date	1st October 2024
Version	Rev. 3-11
Release	Draft (For Discussion Purposes)
Authors	Simon Wilson Karen Fergusherson Andy Perrin
Restrictions	FHRG Members Only, Not for Distribution

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TRANSFORMING HIGHWAYS SERVICES USING AI

Using Artificial Intelligence to Enhance Telephone Enquiry Handling in the Local Roads Sector

Preliminary & Tentative
For Discussion Purposes Only

- **Research proposal released to all members.**
- **10-month project.**
- **Literature review and sector review initiated.**
- **Pioneer group invitations and briefings during October.**
  - Thank you all for your interest!
- **Outline specification during November.**
  - Concepts demonstrator.
- **Initial research partner(s) engagement during November.**

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Overarching Programme:
AI In Highways Services

Research Programme

AI Technology Readiness Levels (TRL)

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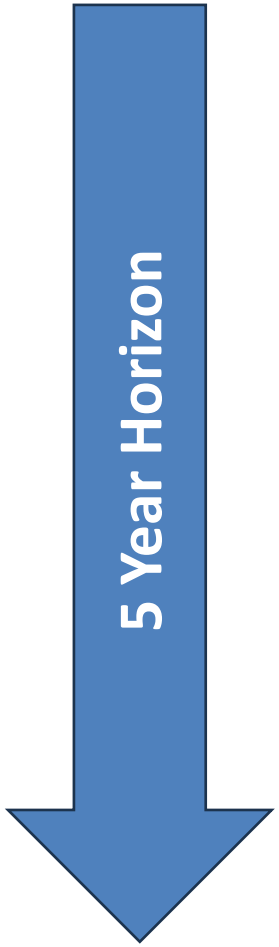
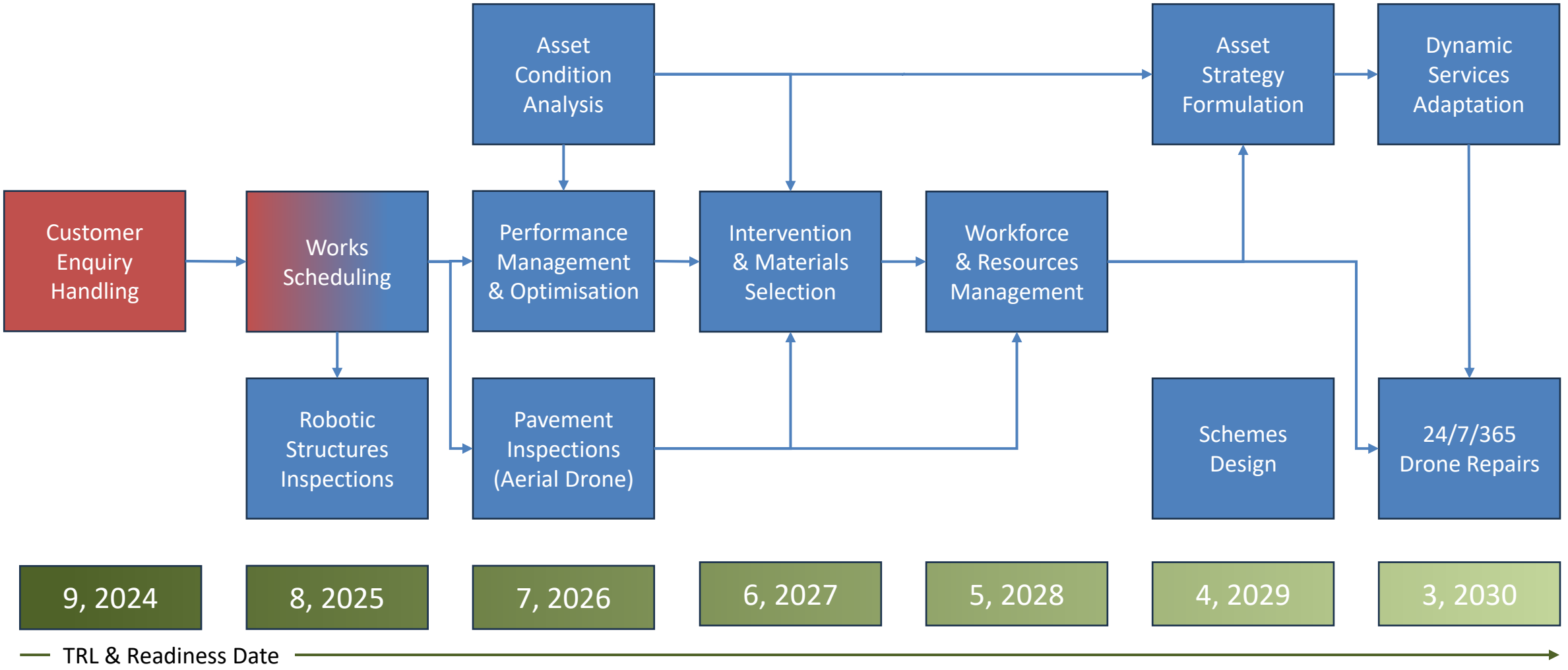


TRL	Description
3	Experimental proof of concept.
4	Technology validated in lab.
5	Technology validated in relevant environment.
6	Technology demonstrated in relevant environment.
7	System prototype demonstration in operational environment.
8	System complete and qualified.
9	Actual system proven in operational environment.

AI/Robotics TRL Timeline



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Research Project #1:
AI Enquiry Handling

Research Programme

Process Profiles Comparison

Using Financial Services Sector Case Studies

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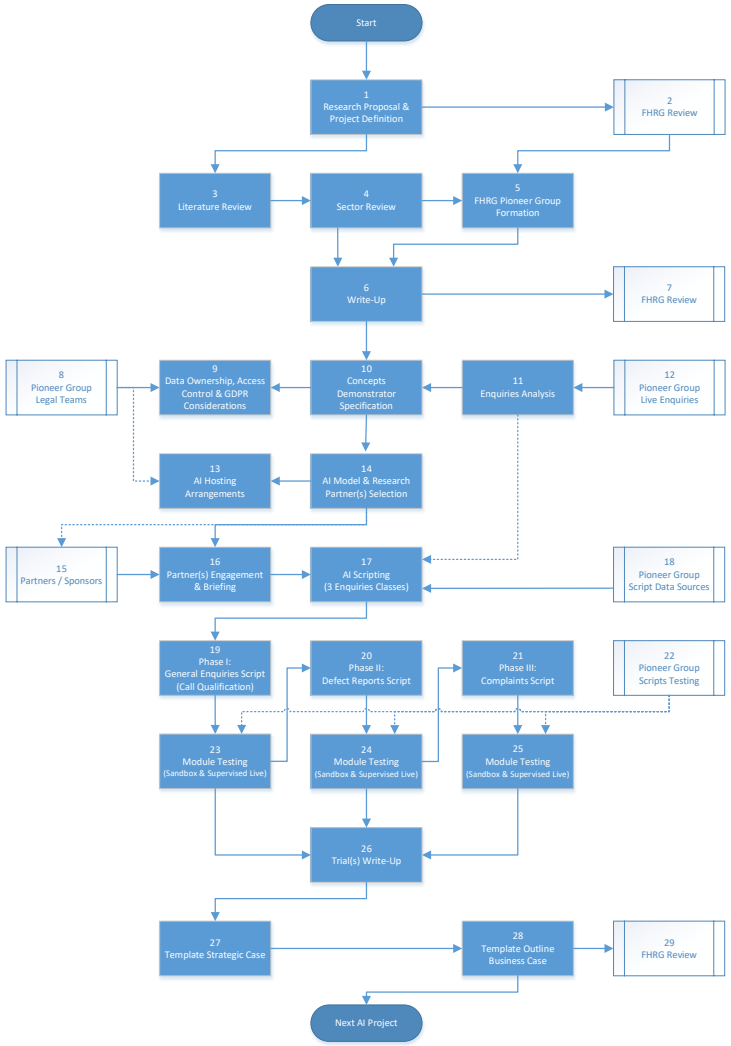
Current Enquiry Handling Processes	AI Enquiry Handling Processes
Availability	
9:00am to 4:00pm, Mon to Fri, Excl. Bank Holidays	24 Hours Per Day, 365 Days Per Year
Supported Languages	
English	English, German, French, Italian, Spanish, Arabic, Hindi
Call Waiting Times	
15 Seconds to 40 Minutes (Based on Demand)	0 Seconds
Staff Costs	
10 Enquiry Handlers + 3 Engineers (£ 512,050)	1 Engineer (Escalated Enquiries) (£ 69,600)
IT/IS Costs	
Computers & Server-Based Services (£ 9,100)	AI Agent (Cloud-Based) (£ 29,750)
Training Costs	
Staff Training Costs (£ 780 Per Employee, £ 10,140 Per Year)	AI Configuration & Training Costs (£ 88,600, Year 1)
Carbon Output (Estimated)	
11,160.8 kgCO2e (Based On 3.38 kgCO2 Per Person / Day)	296 kgCO2e (Single Server, No Green Offsets)
Enquiry Resolution (First Call, Estimated)	
80% (To Be Confirmed)	Unknown (Target 90%, Assumes History Memory)

Target Benefits

Total Savings (Indicative)	
Potential Cost Savings (Year 1)	£ 343,340
Potential Cost Savings (Year 2)	£ 431,940
Five-Year Cost Savings	£ 2,071,100
Performance Increase	+384% (Based On Accessibility / Availability)
Carbon Savings (Year 1)	10,864 kgCO2e
Five-Year Carbon Savings	54,320 kgCO2e

Project Plan

See Research Proposal



- **Stage 1: Scoping & Research Planning** — **November 2024**
- **Stage 2: Data Collection, Collation & Reviews** — **November 2024**
- **Stage 3: Concepts Demonstrator Design** — **December 2025**
- **Stage 4: Prototype Development** — **January 2025**
- **Stage 5: Testing** — **May 2025**
- **Stage 6: Evaluation** — **July / August 2025**
- **Stage 7: Template Business Cases** — **November 2025**

Currently recruiting pioneer group members…

please contact an FHRG team member.

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Coffee Break

15 Minutes

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ADEPT Engineering Board: Climate Change Adaptation

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Scoping the problem…

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Scaling the problem…

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The highest LHA carbon output for roads maintenance is 22.5 million tonnes kgCO2e.

Carbon Analyser assessments 2022/2023.

Assuming all LHA carbon output is the same (which is a sizable overstatement), the LHA maintenance sector is equivalent to 1 hour 17 minutes of the annual CO2e output of India, China and the United States.

All in-flight strategic carbon reduction options (58, "non-junk" options) represent an annual carbon saving of 12.2 minutes on the same scale.

Climate change is coming, regardless of UK carbon emissions.

Are we ready?

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Climate Change Adaptation

Andy Warrington, Arcadis

Climate Adaptation

Local highways

Andy Warrington

October 2024

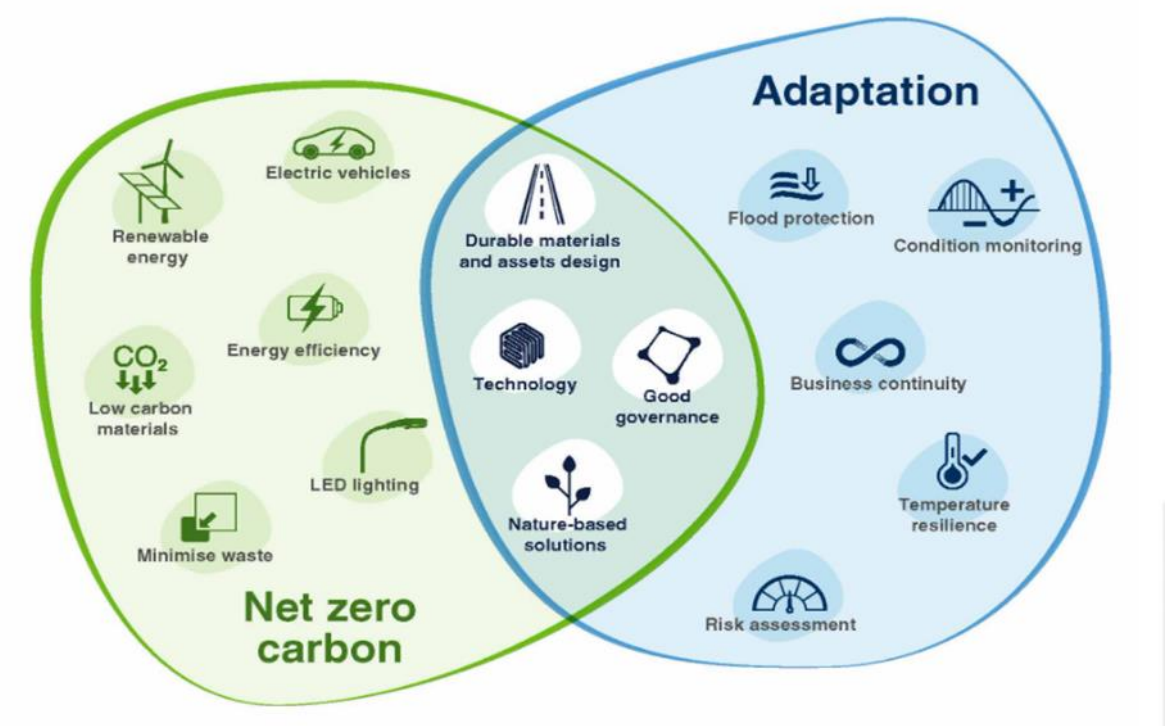
definitions

Decarbonization aims at reducing greenhouse gas emissions by decreasing our reliance on fossil fuels. In 2019, the UK government has committed to reaching Net Zero greenhouse gas emissions by 2050, based on 1990 levels, as part of the Paris Agreement (*1).

Adaptation refers to actions or processes that adjust a system so it can cope with the expected impacts of climate change (*2). Adaptation measures are urgent specific actions taken to minimise and avoid the harmful effects of climate change. It is a local, context-dependent process to reduce vulnerabilities.

Resilience is the property of a system to absorb, adapt to, or quickly recover from disruptive events. It involves anticipating and coping with shocks from hazardous climate events and recovering from their impacts efficiently (*3). Resilience builds resistance and recovery capability over time to cope with impacts and reduce risks, such as the ones associated with climate change, while adaptation is but one of the processes that helps improve resilience. (*4) Building resilience is an ongoing process that enhances the ability to respond flexibly to extreme events and can only be fully understood within the specific local context

Climate Change Act 2008 sets targets and defines adaptation reporting



Our approach to net zero carbon and climate change

(1) The Paris Agreement | UNFCCC
(2) Intergovernmental Panel on Climate Change (IPCC) SYRAR5-Glossary_en.pdf (ipcc.ch)
(3) What is the difference between climate change adaptation and resilience? - Grantham Research Institute on climate change and the environment (lse.ac.uk)
(4) Cañavera- Herrera, 2019, Roads to adaptation: Understanding adaptation planning of urban road infrastructure

Climate Change projections

By the end of the twenty-first century:

- All areas of the UK are projected to be warmer
- Summers will be, on average, hotter and drier
- Winters will be, on average, milder and wetter
- Extreme weather will become more common
- Lying snow will disappear almost entirely; and
- Sea levels will rise, and the increase will be greater in the south and east

Adaptation Focus
Extreme weather will become more common

Rainfall, Heatwave, Storm

Drainage, Structures
Geotechnical, Pavements

Adaptation Focus
Seasonal Change

Re-optimised resources, future contracts

ISO 14090:2019

ISO 14090:2019

Adaptation to climate change principles, requirements and guidelines

Specifies principles, requirements and guidelines for adaptation to climate change. This includes the integration of adaptation within or across organizations, understanding impacts and uncertainties and how these can be used to inform decisions. It supports the development of sector-, aspect- or element-specific climate change adaptation standards.

Draft New PAS

To specify the requirements for developing and applying adaptation pathways within the infrastructure sector to aid adaptation decision-making in the context of climate and uncertainty, including:

- Guidance on choosing appropriate climate change scenarios;
- Guidance on overcoming design life constraints as set out in many design codes;
- A methodology for establishing the co-benefits of adaptation activity alongside net-zero and sustainability considerations;
- Requirements for governance, including roles, responsibilities, metrics and key data to determine adaptation pathways.

Arcadis
1 Whitehall, Riverside
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FHRG Membership Renewal

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Live Labs II: Project Briefings

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Wessex Live Lab

Mike O'Dowd-Jone, Somerset

NET ZERO ROADS
WESSEX LIVE LAB

Progress Update

October ‘24

Department for Transport

ADEPT LIVELABS2 Decarbonising Local Roads

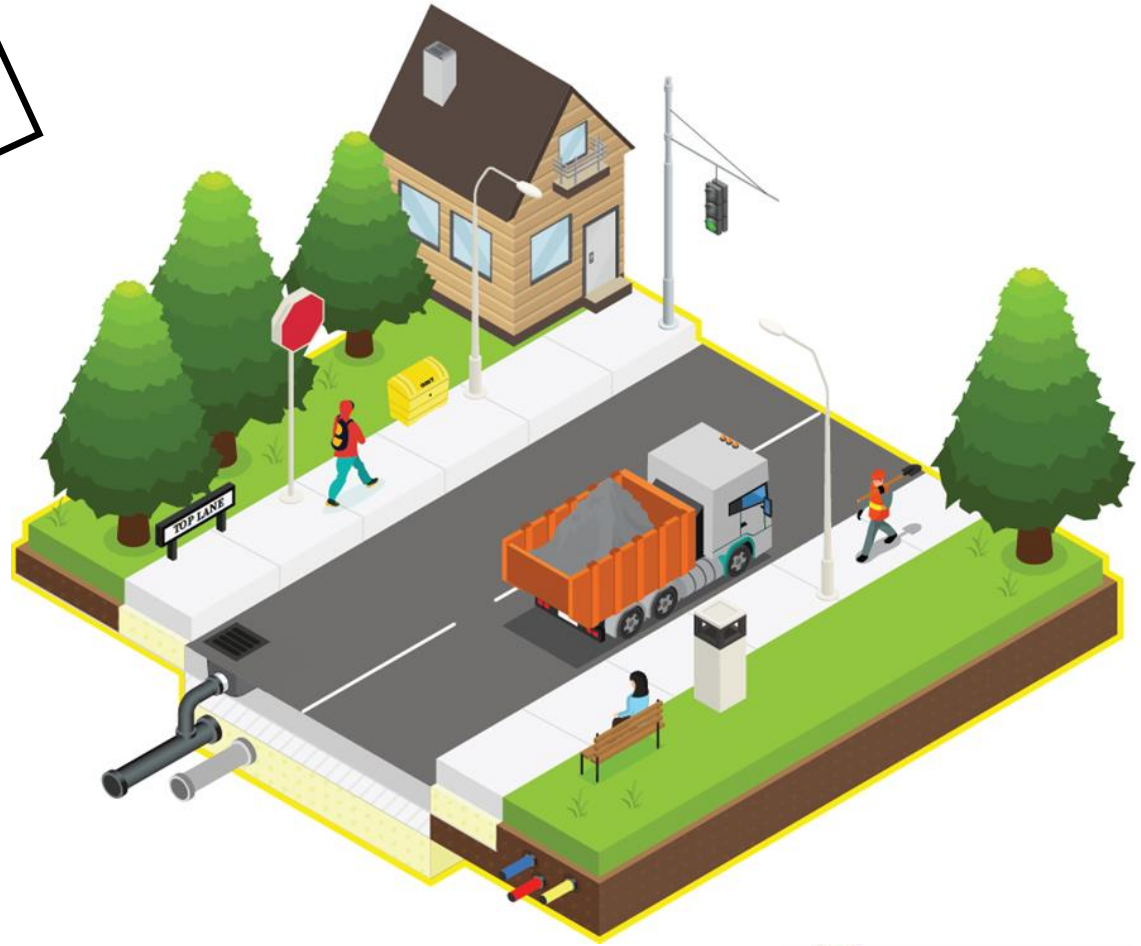
CORNWALL COUNCIL
one and all • onen hag oll

Hampshire County Council

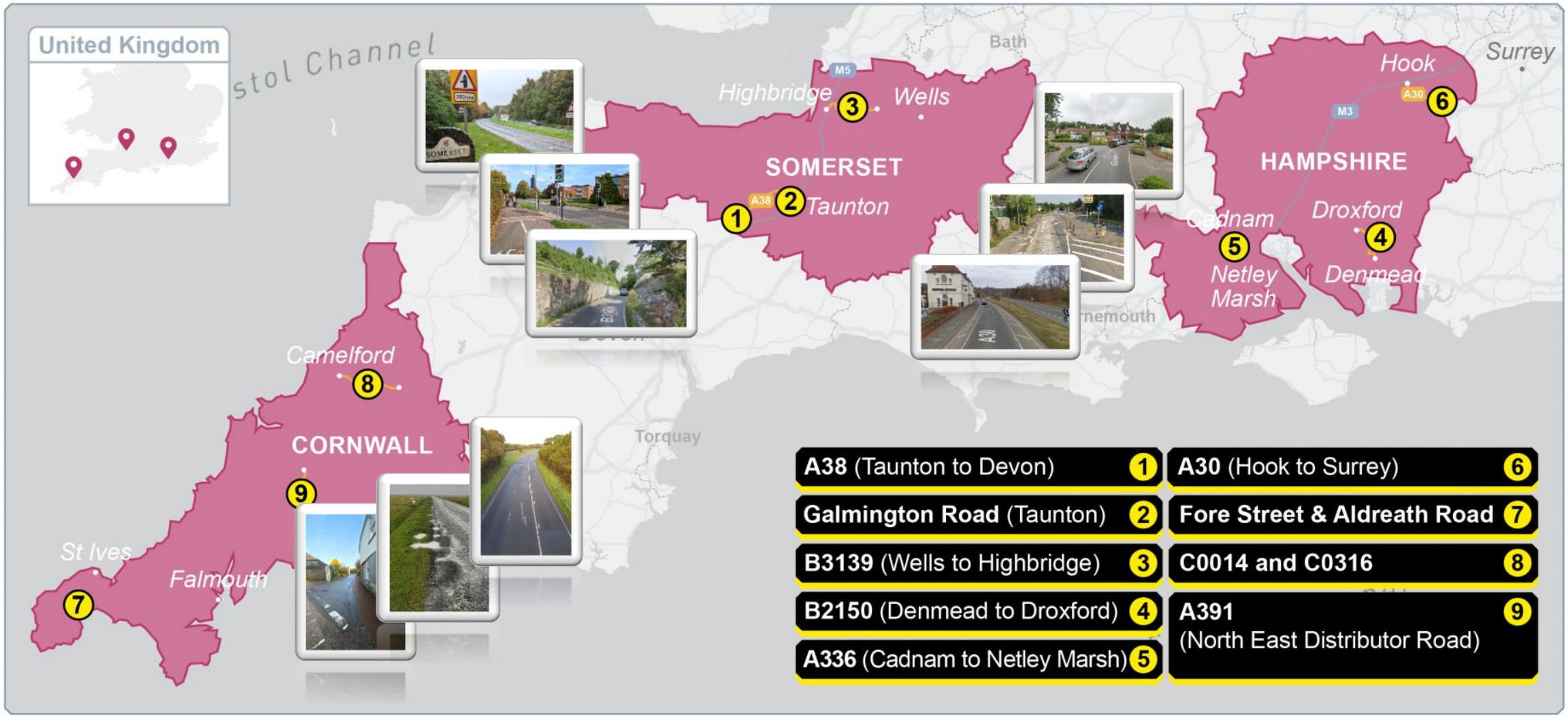
Somerset Council

Business Case scope - the whole service & changing business as usual

- The materials we use
- The products we use
- The plant we use
- How we deliver services – looking at processes & efficiencies
- When and where we deliver them – from the impacts of strategy through to scheduling

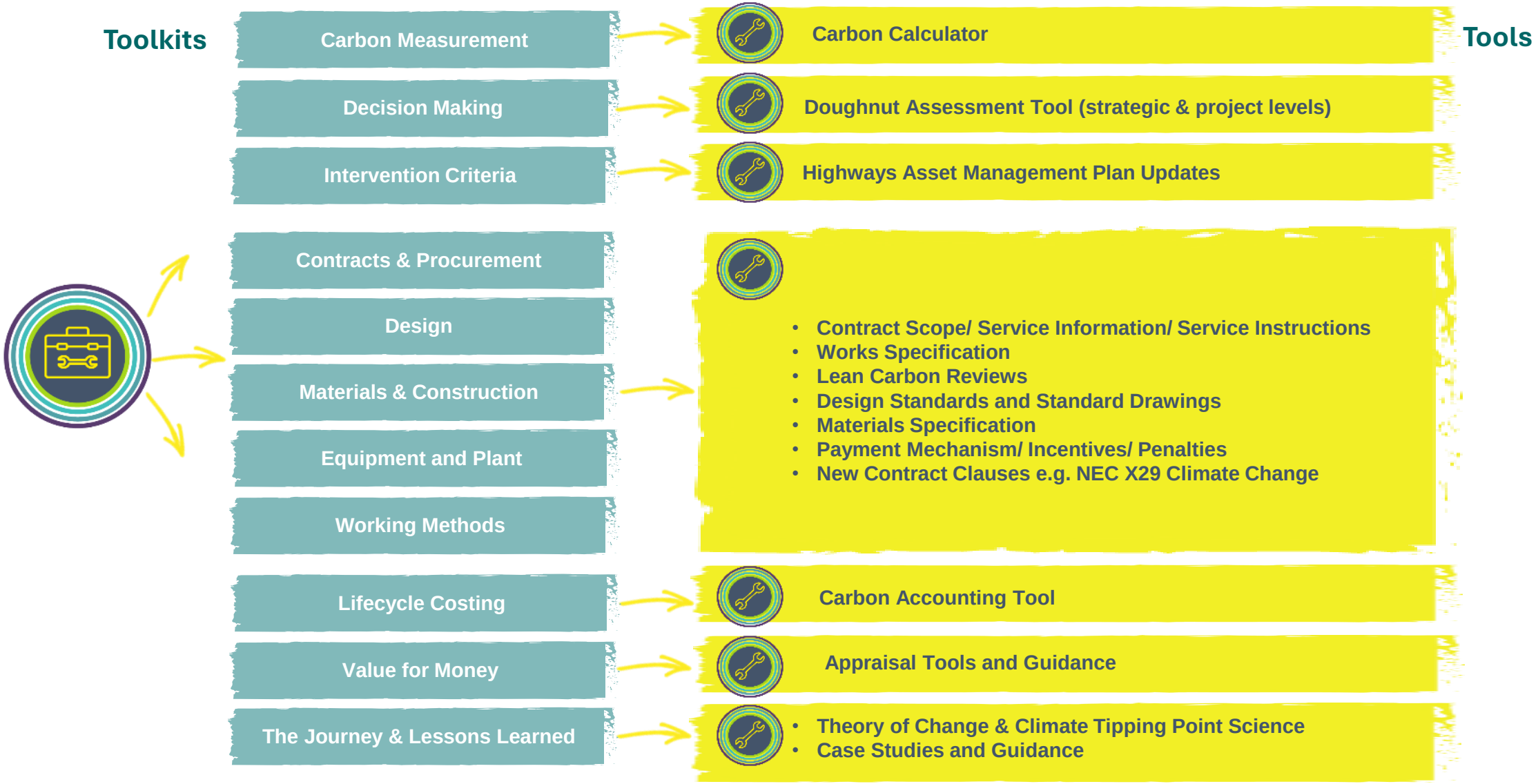


MAP OF THE SOUTH WEST




Project management (Colas)
Carbon data & analysis (FHRG, Brightly)
Carbon budgeting & scenario planning (UoE)
Communications (authorities)
Practice of Change (UoE)
Behaviour change (ADEPT/BIT)
Lean Review Inspections (Bourton Group)
Doughnut Economics – sector & local (Circle Economy)
Demonstrators - corridors (authorities)
NET ZERO ROADS
WESSEX LIVE LAB

Toolkits – will be produced across all workstreams to enable scaling up



WESSEX LIVE LAB WORKSTREAMS

		Financial year 1 (2023 - 24)				Financial year 2 (2024-25)				Financial year 3 (2025-26)			
		Apr-June	Jul-Sep	Oct-Dec	Jan-Mar	Apr-June	Jul-Sep	Oct-Dec	Jan-Mar	Apr-June	Jul-Sep	Oct-Dec	Jan-Mar
Project management													
	Mobilisation – then ongoing project management												
Demonstrators - delivery of net zero corridors													
	Log existing toolkits, guidance & best practice												
	Research & innovation search & selection												
	Corridor demonstrator works												
	Toolkit development, dissemination & final report												
Application of methodologies - Doughnut Economics, Circular Economy & ToC													
	Portraits of Place, DE toolkit development, application to corridors												
	DE toolkit application												
	Refinement and review of Theory and Practice of Change												
Doughnut Economics - sector level and local scalability													
	Develop sectoral toolkit and methodology												
	Participatory process (engagement, networking, research)												
Carbon budgeting and scenario planning led by University of Exeter													
	Establish postdoctoral research programme												
	Undertake and review carbon scenario planning												
	Carbon budgeting - research, development and testing												
Carbon													
	Carbon Baseline Assessments (service, corridor & experimental profiles)												
	Years 1 to 2: Independent Waypoint Assessments												
	Alignment with Doughnut Economics workstream												
Lean Carbon Review													
	Delivery & training												

Delivering carbon data & analysis - driving the journey

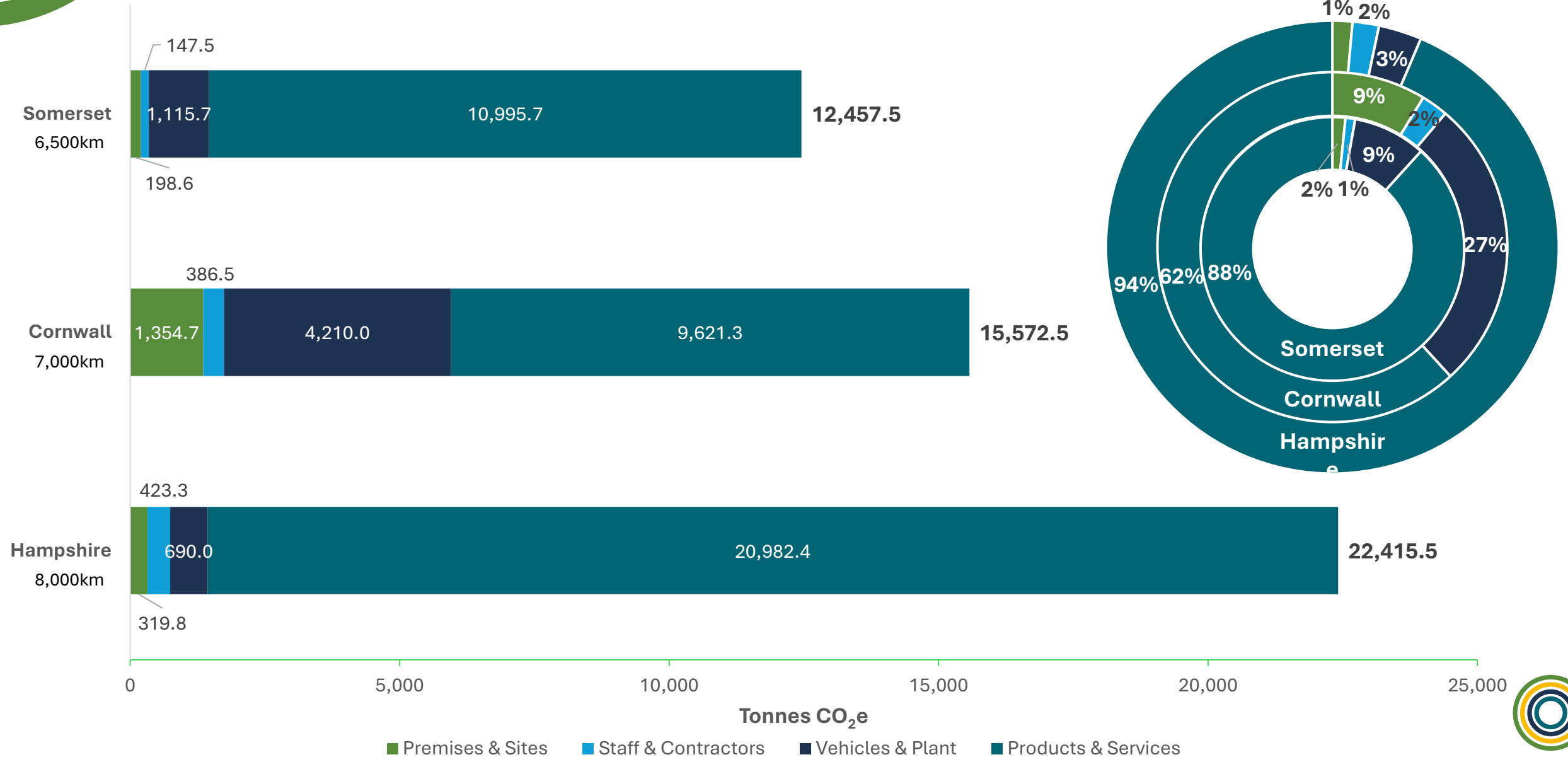
- **Service-level Carbon Baseline Reports** completed for all authorities. Key findings:
    - **Products & Services** the highest-carbon inventory, a**sphalt** the biggest carbon hotspot
    - **Cornwall had higher emissions from Premises & Sites** due to the inclusion of quarry & asphalt plant (high fossil fuel usage).
    - **Due to their contracting model** Cornwall had higher emissions from Vehicles & Plant and lower emissions from Products & Services (less third-party or subcontracted fuel use).
    - **Hampshire had lower emissions from Vehicles & Plant** due to the use of HVO-fuelled plant, but **higher emissions from Products & Services** due to use of purchased materials & fuels by their contractors (particularly asphalt, metals, and diesel).
- **Corridor-level baselining** underway, linking to Confirm data, additional data needed
- **Development of innovation module –** resulting in score Innovation Packs
- **Corridor experimental profiles** being built, based on the selected innovations (physical & simulated)

In 2022-23, the total carbon footprint of Somerset Council's highways maintenance operations was around **12,457.5 tonnes CO_2e**

equivalent to around **7,600 flights** from London to New York!*

*A long-haul flight emits 0.29341 kgCO2e per km for 1 average passenger, including indirect climate effect, according to Greenhouse gas reporting: conversion factors 2024 - GOV.UK (www.gov.uk)
Return distance between Gatwick and JFK airports is approx. 11,167 km.

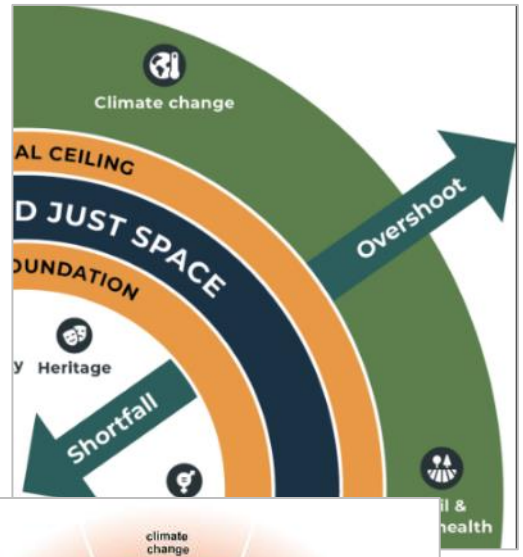
Full-Service Baseline Comparison



Lean Review

- **Lean Travel Review of inspections-related travel**
  - Identification of hotspot and development of scope
  - Unique application of Lean methodology
  - Developing legacy-skills with view to wider roll-out for authorities
  - Defining the customer and the desired outcomes
  - Mapping processes
  - Identifying waste
  - Improving efficiency –carbon and cost
  - 3-month delivery timeline - initial round of interviews being planned

- **Highways Doughnut Assessment/ Decision Tool**
  - Highways Doughnut defined – adapting the model for the sector
  - Strategic and project level assessments
  - Work underway on establishing methodology for application, and production of guidance
  - Scoring system - being developed to support the application
  - Linking up with Cornwall's Decision Wheel
  - Revising strategic documents – HAMP (Cornwall)
  - Local trials – winter service decisions and fuel



- **Sector-level Doughnut**
  - Launching soon!
  - Identifying guardian organisation and sector focus group

Delivering the corridors – iterative learning through Years 2 & 3

Summaries below only reflect current list of works being planned/scheduled to date (black, bold text = unique to Wessex)

These lists do not include all the strategic and overarching innovations to be rolled out

CORNWALL

Corridor 1 - Madron (started June '24)

Milepave with biochar, ***first use in UK of unique bio-resin***, locally sourced aggregate, ***biochar for tree planting***, cold-applied lining, stick-down kerbs, reduction of sign cleaning

Corridor 2 – A391 (due to start Feb '24)

Milepave with bioseal, cold-applied lining, solar road studs, HVO plant, road gully monitors, drone inspections for structures, ***drone biodiversity survey, self-cleaning signs & chevron paving***, cleaning & refreshing filter drain stone, ***biochar drain filter***

Corridor 3 – planning underway

HAMPSHIRE

Corridor 1 – A30 (started Sept '24)

Ex-situ recycling, cold applied lining, coordination of road closures/clearance/cleaning, electric jetter & gritter & mobile power supply, ***ecological surveys & nature-based solutions***

Corridor 2 – A336 (started Sept 24')

Hydrohog, eco cones & traffic management, ***Tarmac half-warm mix***

Corridor 3 – A32 Droxford (starting Sept '25)

Manufactured limestone footway, ex situ recycling

SOMERSET

Corridor 1 – A38 (due to start '25)

Motorway link-road concrete rubblisation

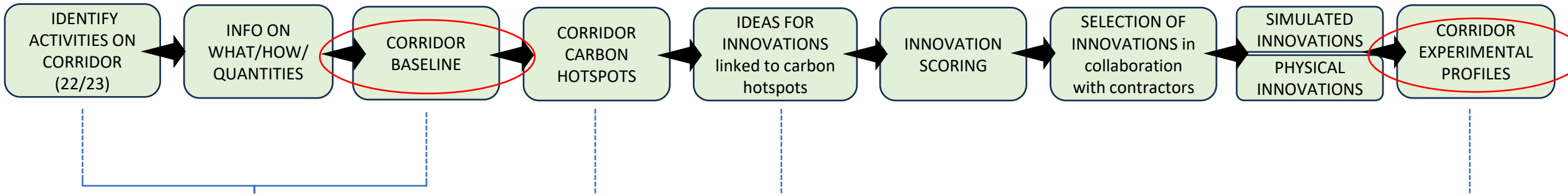
Corridor 2 – Galmington – planning underway

Footway scheme and innovation package in development

Corridor 3 – B3139 – planning underway

Resurfacing scheme (tbc), reduction in grass cuts, electric grass cutting tractor, electric gully emptier

WESSEX CARBON/INNOVATION PROGRESS UPDATE & SPECIFIC CHALLENGES – and starting to build the 'lesson journey' for end-of-project reporting



CHALLENGE
- Data not available from Confirm in the detail/form expected (no download software)
- Quantity/ material data fields not used compreheneively
- Insufficient detail requiring interviews with staff
- Plant/fuel consumption data source unknown
- Some carbon factors missing from Carbon Analyser
- Low accuracy levels (will require estimations/assumptions)

SOLUTION
- Going through data line by line
- KJ meeting authorities' Confirm experts and Teams
- Start with the 'changing activities' to get data asap
- Corridor Master spreadsheets being established to draw all info together
- Need to identify changes to Confirm, and user training for future use in carbon assessment

CHALLENGE
- Requires base data to generate hotspots

SOLUTION
- In interim use service- level hotspots (asphalt, steel, plastic, combusted fuels, concrete)

CHALLENGE
- Lack of affordable/ accessible innovations
- Lack of carbon emissions information for products &large range of assumptions
- Change in contracts (SC)

SOLUTION
- More focus on contractors finding/ proposing innovations
- Produce Corridor Baseline as % of whole service without activity details (less accurate). Do 3 fully, and 6 estimated

CHALLENGE
Require data for BAU and innovations (and the things that change because of innovations)

SOLUTION
Corridor Master spreadsheets filled in by authorities and contractors

NET ZERO ROADS
WESSEX LIVE LAB

Questions?

Department for Transport

ADEPT LIVELABS2 Decarbonising Local Roads

CORNWALL COUNCIL
one and all • onen hag oll

Hampshire County Council

Somerset Council

Future Highways Research Group

Decision Equipped.

proving

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Highways

PART OF TRANSPORT NETWORK

Liverpool Live Lab

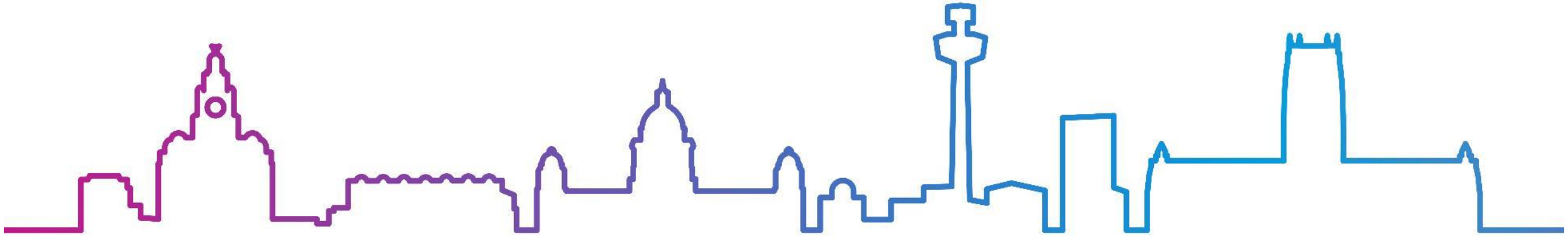
Pam McGuiness, Somerset

Department for Transport

ADEPT LIVELABS2 Decarbonising Local Roads

COLAS WE OPEN THE WAY

Liverpool City Council



Liverpool City Council: Highways ecosystem for scalable low carbon optioneering and full lifecycle decision-making.

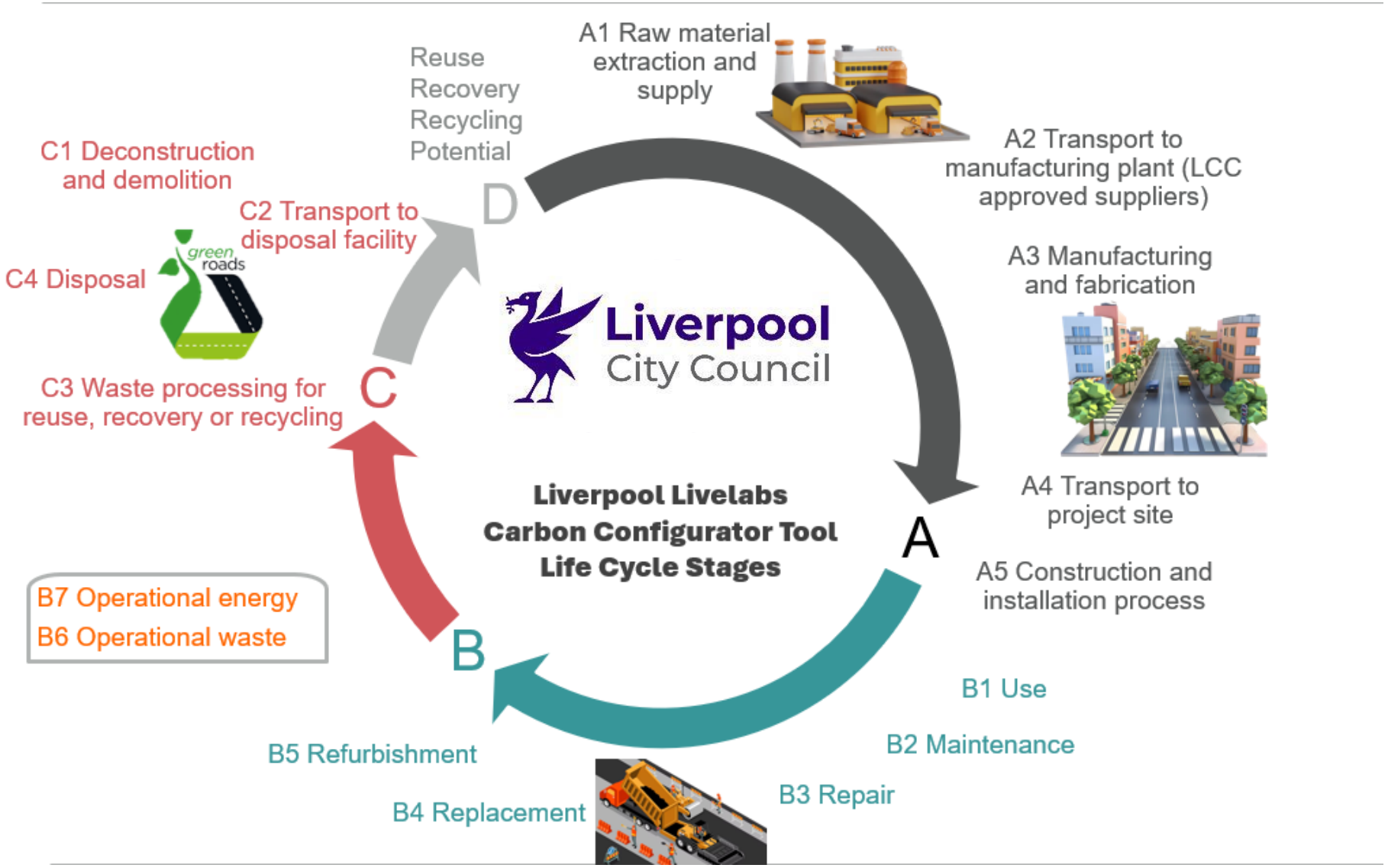
10th October,2024

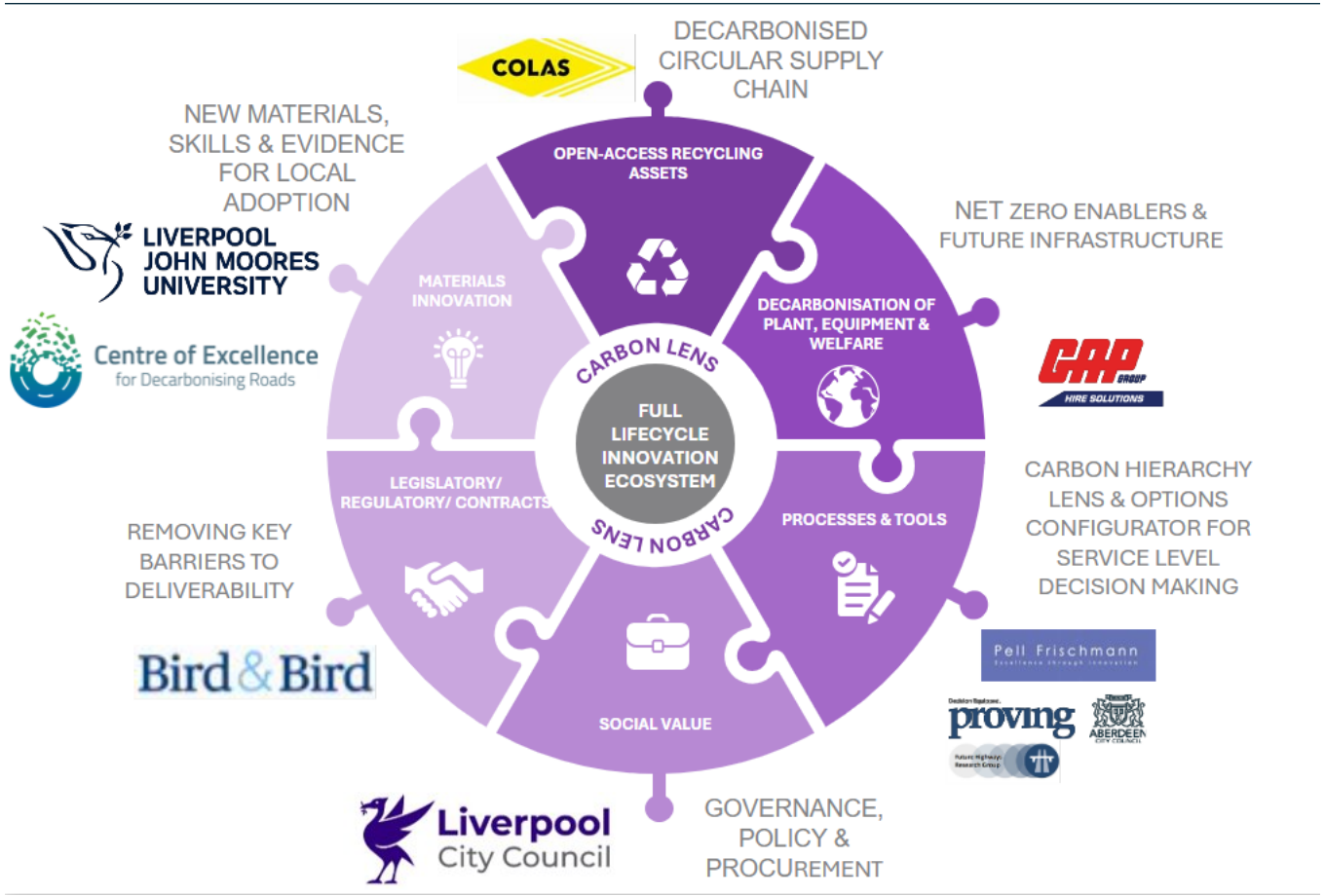
Purpose of Carbon Configurator

- Develops practical and scalable solutions
- Analyse, measure, and reduce the carbon footprint
- It allows for comparative analysis
- Scenario modelling is also a key benefit
- Resource optimisation
- Supports broader sustainability goals

Why is a Carbon Configurator essential for modern maintenance projects?

- It enables data-driven decision-making
- Provides a standardised framework
- Promotes environmental accountability
- Bridges the gap between complex data and useability.


A1 Raw material extraction and supply
A2 Transport to manufacturing plant (LCC approved suppliers)
A3 Manufacturing and fabrication
A4 Transport to project site
A5 Construction and installation process
A
B1 Use
B2 Maintenance
B3 Repair
B4 Replacement
B5 Refurbishment
B
B7 Operational energy
B6 Operational waste
C1 Deconstruction and demolition
C2 Transport to disposal facility
C4 Disposal
C3 Waste processing for reuse, recovery or recycling
C
D
Reuse
Recovery
Recycling
Potential
Liverpool City Council
Liverpool Livelabs
Carbon Configurator Tool
Life Cycle Stages
green roads



Key Benefits:

- Assist Liverpool City Council (LCC) to meet their regulatory requirements and enhancing reputation.
- Cost Savings
- Increased transparency
- Creation of environmentally sound policies
- Economic gain through low carbon opportunities
- Raise a culture of innovation, pushing the boundaries of current practices and encouraging the adoption of new technologies and approaches within the maintenance sector.

Project Programme

Stage 4 - Final product/BAU

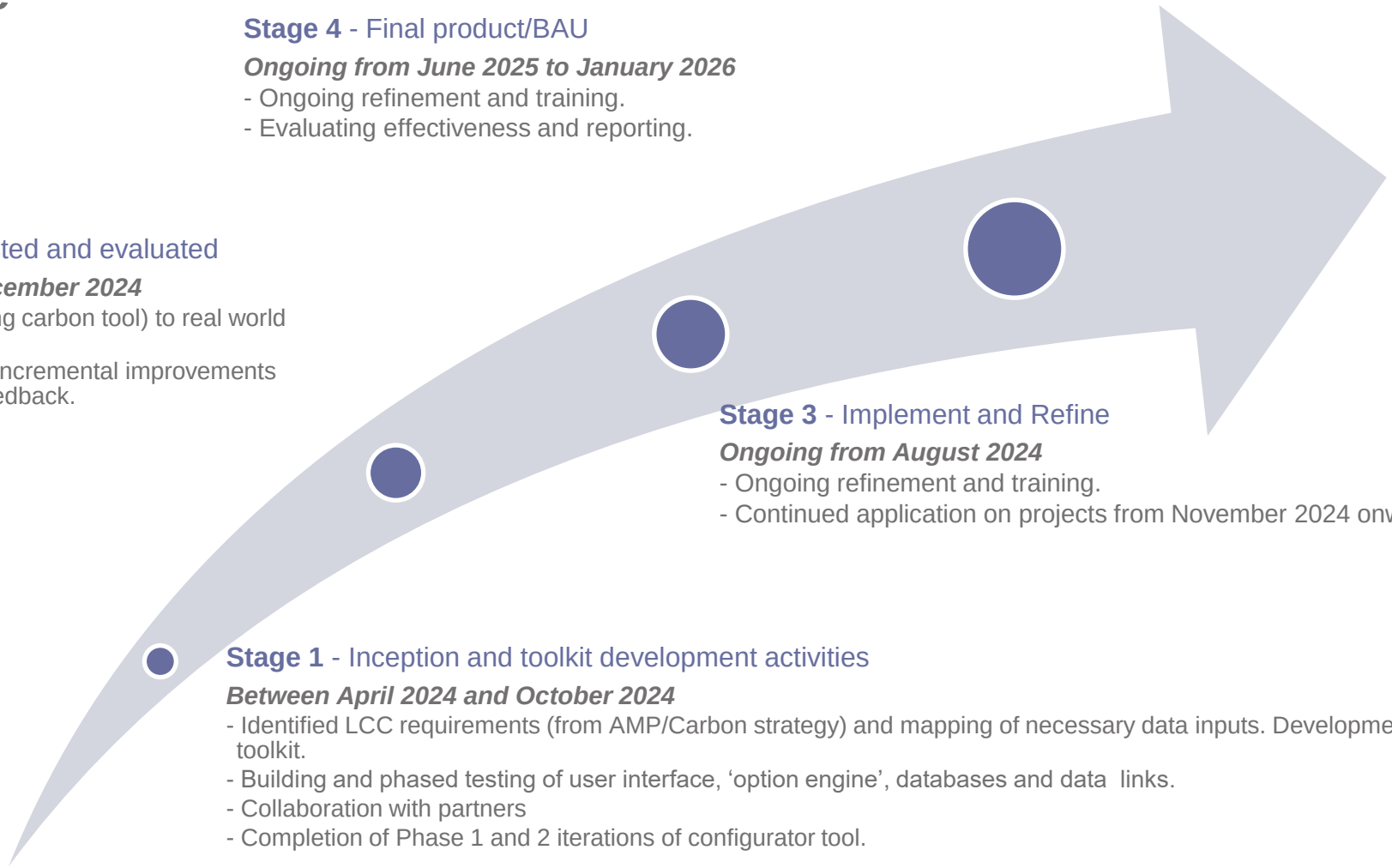
Ongoing from June 2025 to January 2026

- Ongoing refinement and training.
- Evaluating effectiveness and reporting.

Stage 2 - Proof of Concept Tested and evaluated

Between November 2024 to December 2024

- Application of CHL toolkit (including carbon tool) to real world projects to test for effectiveness.
- Ongoing refinement, training and incremental improvements based on LCC and stakeholder feedback.



Stage 3 - Implement and Refine

Ongoing from August 2024

- Ongoing refinement and training.
- Continued application on projects from November 2024 onwards.

Stage 1 - Inception and toolkit development activities

Between April 2024 and October 2024

- Identified LCC requirements (from AMP/Carbon strategy) and mapping of necessary data inputs. Development of CHL toolkit.
- Building and phased testing of user interface, 'option engine', databases and data links.
- Collaboration with partners
- Completion of Phase 1 and 2 iterations of configurator tool.

Challenges

Material Adoption - Hesitation of Clients to adopt new low-carbon materials, largely due to concerns about costs and performance reliability.

Technological Integration – Technical and logistic difficulties, including higher costs, whilst integrating new technologies.

Baseline Data - Obtaining historical data, leading to baselines that may be based on assumptions.

Regulatory Hurdles - The process of navigating the regulatory landscape and ensuring compliance with diverse standards across the LCC region.

Lessons learned

- **Collaboration** - To overcome resistance to adopting new technologies and materials
- **Smaller Pilot Projects assists industry confidence** - Conducting smaller pilot projects to test new material solutions before full-scale implementation, facilitating smoother integration in the future.
- **Flexible Approach** - Adopting a flexible and adaptable approach, open to iterative changes, ensuring that challenges are met with innovative solutions.

Thank you for listening!

- Any Questions?

Future Highways Research Group

Decision Equipped.

proving

ADEPT

Association of Directors of Environment, Economy, Planning & Transport

Highways

PART OF TRANSPORT NETWORK

CEDR: Centre of Excellence for Decarbonising Roads

Joe Kimberley & Lauren SeBlonka

Department for Transport

ADEPT LIVELABS2 Decarbonising Local Roads

Centre of Excellence for Decarbonising Roads

ADEPT Live Labs 2
Update Pack

North Lanarkshire Council · Transport for West Midlands · Amey · COLAS

Why a Centre of Excellence for material decarbonisation?

The transition to low carbon materials is critical for the sector to reach net-zero, but we are currently uncoordinated, siloed and slow to make change across LAs and the wider highways and local roads sector.

Challenges

Inherently high Co2 materials

Un-coordinated materials market and siloed working across LAs

Impending net-zero targets

75% of LAs have declared a climate emergency

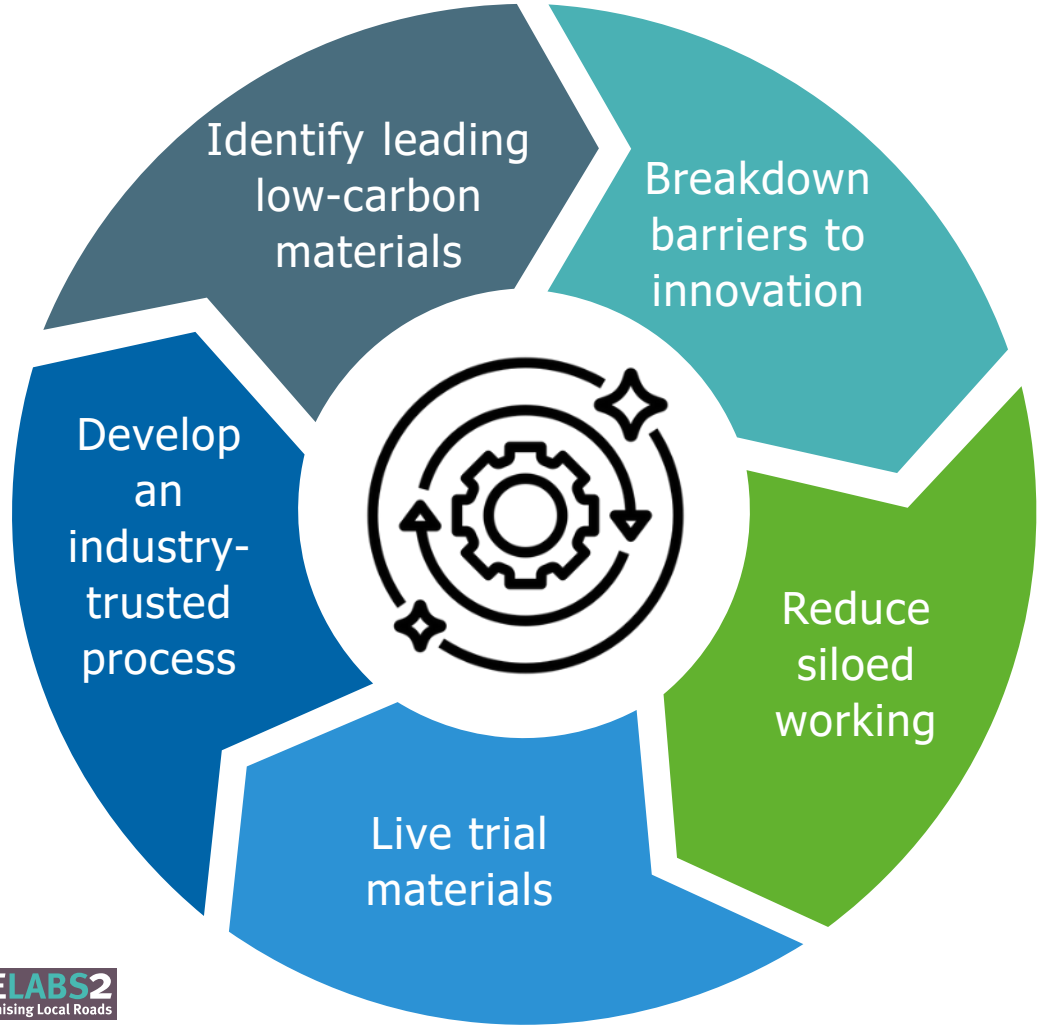
Opportunities

Materials are the highest emitting area of our carbon footprint that is directly within our control

There is a wealth of best practice across the sector ready to be tapped into and shared

Live Labs can be a sector-wide springboard for low carbon materials adoption

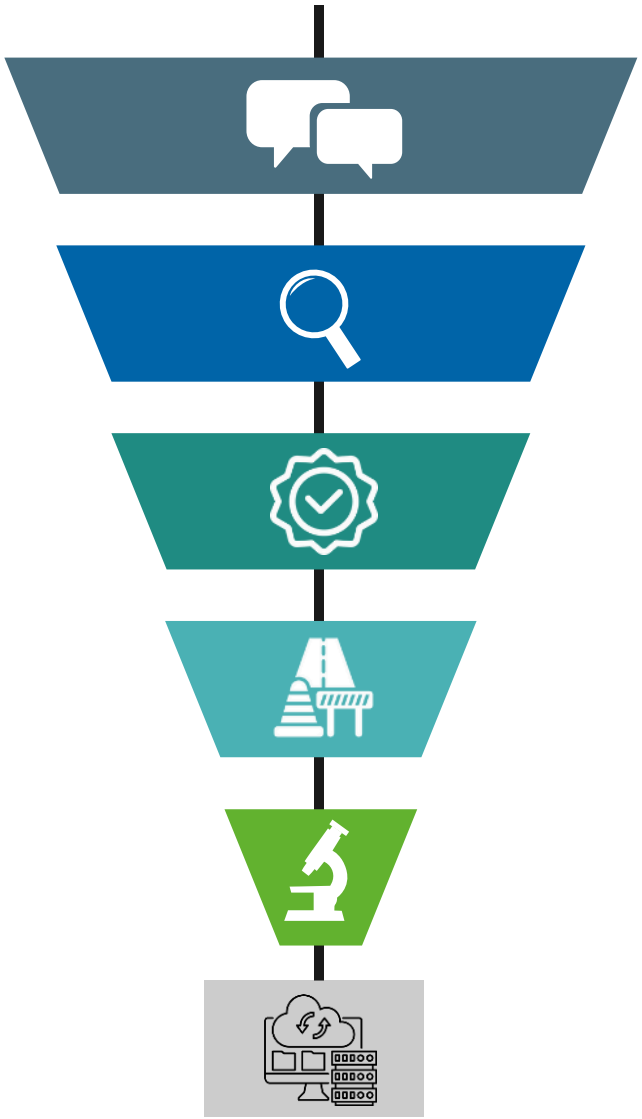
Centre of Excellence
for Decarbonising Roads



Department for Transport

ADEPT LIVELABS2 Decarbonising Local Roads

The Innovation Funnel



	Objective	Progress
Discover	Discover challenges to decarbonisation	• *LA questionnaire* • *Behavioural research*
Identify	Identify leading low-carbon materials	• *Innovation Log with 300+ materials* • *CPC global market scanning completed*
Qualify	Pre-qualify materials	*5 innovation series scorecards completed*
Trial	Trial on NLC and West Midlands roads	*20 material trials across NLC and TfWM*
Evaluate	Technical, carbon and scalability evaluation	*Carbon profiles created for first trials in FHRG Carbon Analyser*
Scale & Share	Embedding in BAU and knowledge bank	*Monitoring & Evaluation of first trials underway*

Selection Scorecard

- Carbon
- Cost
- Operational Performance
- Complexity / Value of Trial
- Scalability
- Safety

Strategic Alignment
Alignment with centre's objectives.
Scale of whole-life carbon reductions.
Scale of future climate change resiliency.
Contribution to wider environmental strategies.
Contribution to social value (wellbeing, opportunities and equality).
Scale of future-proofing for future mobility trends.
Anticipated Operational Benefits (Relative to Baseline)
Cost reductions.
Purchase costs.
Cost of ownership / maintenance.
Asset lifecycle cost.
Performance improvements.
Process efficiency improvements.
Process effectiveness improvements.
Operational longevity.
Constraints
Special insurance considerations.
Current regulatory / standards compliance.
Complexity (Inherent Risk)
Scale of change implied by innovation.
Novelty (uniqueness) of innovation.
Value of live trial to the sector.
Value of live trial to the local authority.
Scalability and Flexibility
Supply-side capacity for upscaling.
Cost implications of innovation trial failure.
Flexibility of innovation (applications and methods).
Safety
Impact of innovation on road user safety.
Impact of innovation on operational safety.

Evaluation Approach

Technical Support

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

TRL

Aston University

Carbon Support

Future Highways Research Group

national highways

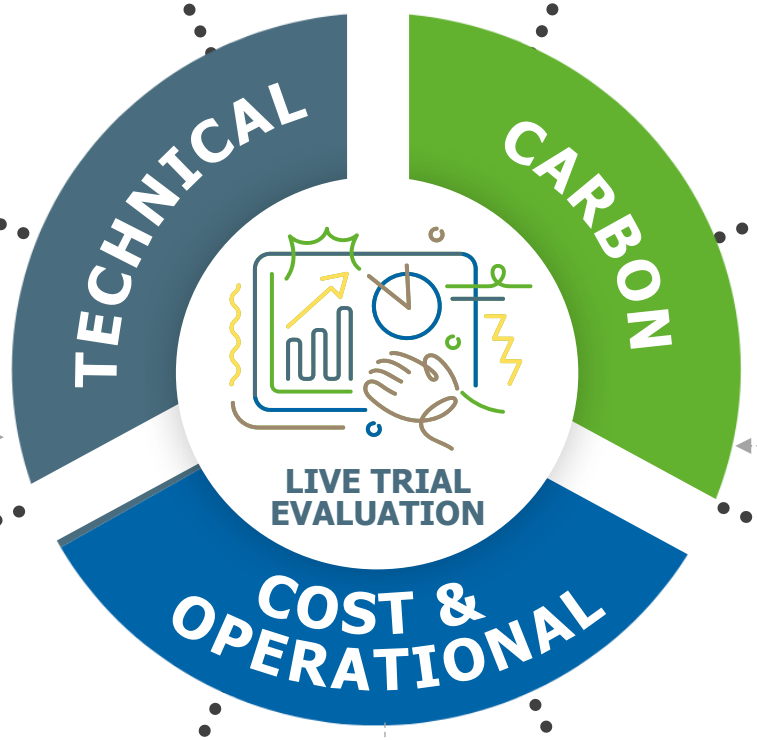
One Click LCA

Cores and Performance Data

FHRG Carbon Analyser Profiles

Pavement Design Analysis

Triangulation with Other Carbon Calculators



Lifecycle Asset Analysis

Carbon Statements and EPDs

Purchase and Whole Life Cost

Contextual Data and Operational Feedback

Operational Support

North Lanarkshire Council

Transport for West Midlands

Amey

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Recent Progress

- Trials of rejuvenators and preservers, biogenic binder, thermal-mapped asphalt, and line-marking materials.
- Completion of draft carbon profiles for pothole repair materials.
- Kick-off of 'barriers to entry' innovation sandbox programme.
- Completion of international market scanning for low-carbon materials.
- Planning for 2025 resurfacing programme started.

Pothole Repair Trials

Carbon

- Carbon profiling with University of Nottingham
- A1-3 embodied carbon being finalised
- Results coming soon

Next Steps

- Project pothole round 2
- Monitoring and evaluation of repair performance over the next 7 years
- Full carbon profiles in Carbon Analyser

Approach

Materials Trialled

- Degafill, Permafyx, Roadpatch (MMA cold-mix)
- Roadmender Elastomac (Rubber mastic screed)
- Velocity (spray injection)
- Colpatch, Thermal RRs, Viafix, SMA,

Trial Methods

- A, B, and C road sites in NLC
- B and C roads in West Midlands
- NLC in-line created potholes
- WMCA wider real network repairs

Control and Benchmark

- Benchmark solutions: SMA and HRA saw cut repairs
- Repairs on same roads where possible,

Operative Feedback

- Health & safety implications of hot-mix mastic asphalt – however easier manual handling
- MMA solutions easily applied but pungent smells and fiddly mixing
- Cold-patch bagged materials are easiest to apply

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Approach

Rejuvenator and preserver Trials

Materials Trialled

- Reclamite, Pentack and Rhinophalt on HRA and SMA roads to compare operational solutions, performance, cost and carbon

Trial Methods

- Treatments applied and evaluated in both campuses, control sections and variety of road classes

Control and Benchmark

- 'Do nothing' control sections, comparing against adjacent road and direct comparison between solutions

Client Feedback

- All solutions trialled look impressive, looking forward to the results to see if it is worth the investment in proactive preventative maintenance

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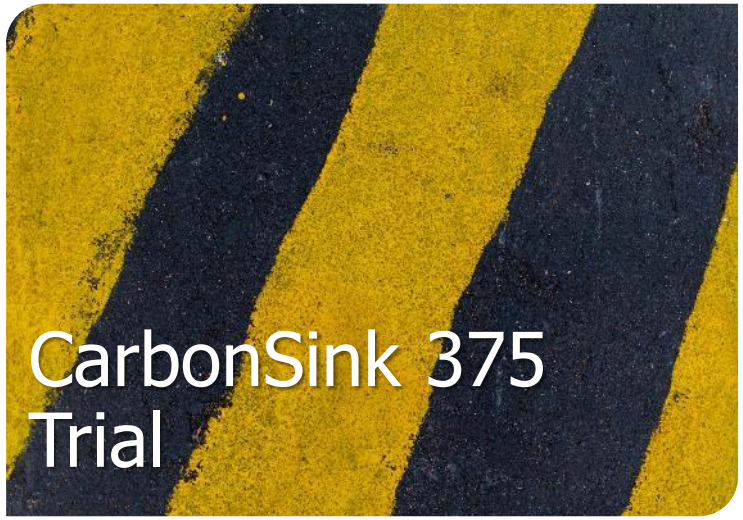
Other CEDR demonstrators



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Transport for West Midlands

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Challenges faced by LAs when trying to understand Carbon

Carbon is a lower focus for many, it is difficult and there is uncertainty about whether the numbers are accurate
We are attempting to address these challenges and make it easier for LAs

Challenges

Variability with emissions factors

Aligning emissions factors when comparing EPDs

Supplier protection of their IP and transparency

Biogenic Absorption factors and carbon neutrality?

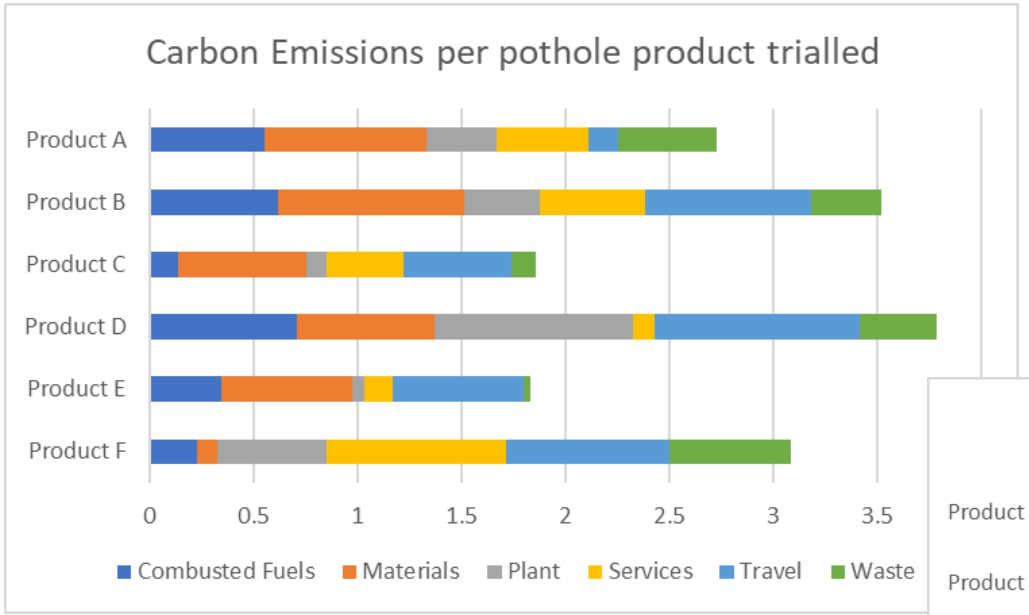
Opportunities

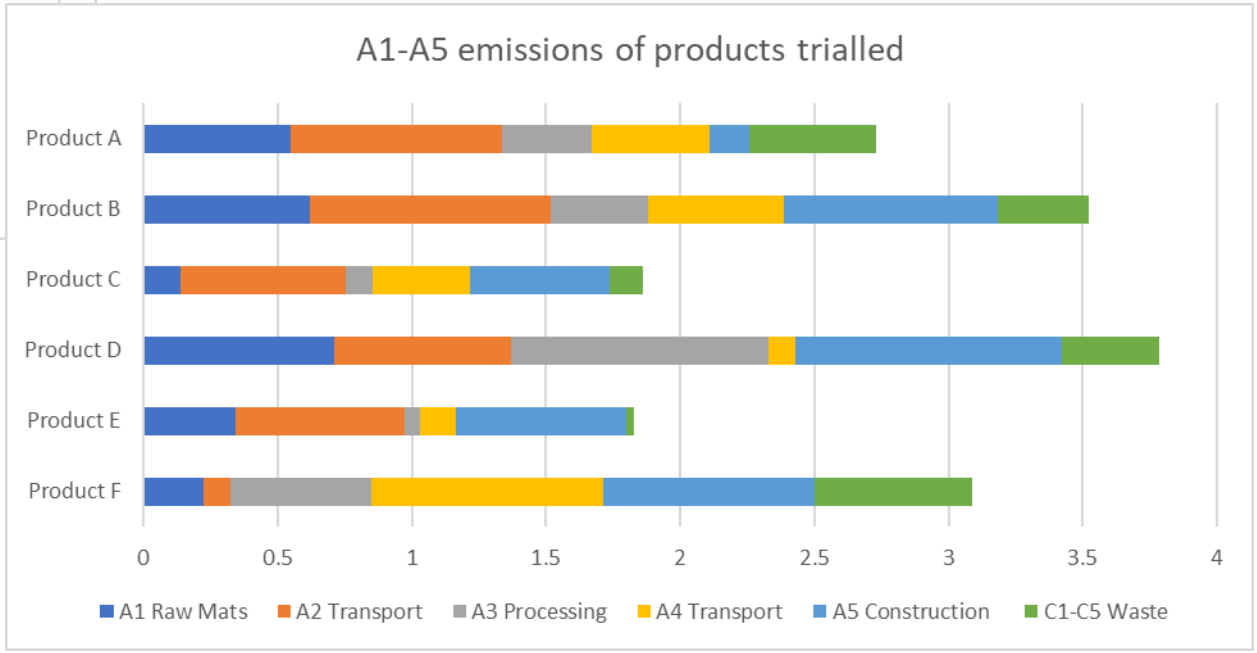
Setting the same emissions factors for common component ingredients across the programme

Working with University of Nottingham to dissect A1-3 emissions on products

Separating out Biogenic absorption factors from embodied product carbon and avoiding combining them (as per GHG protocol)

Results format





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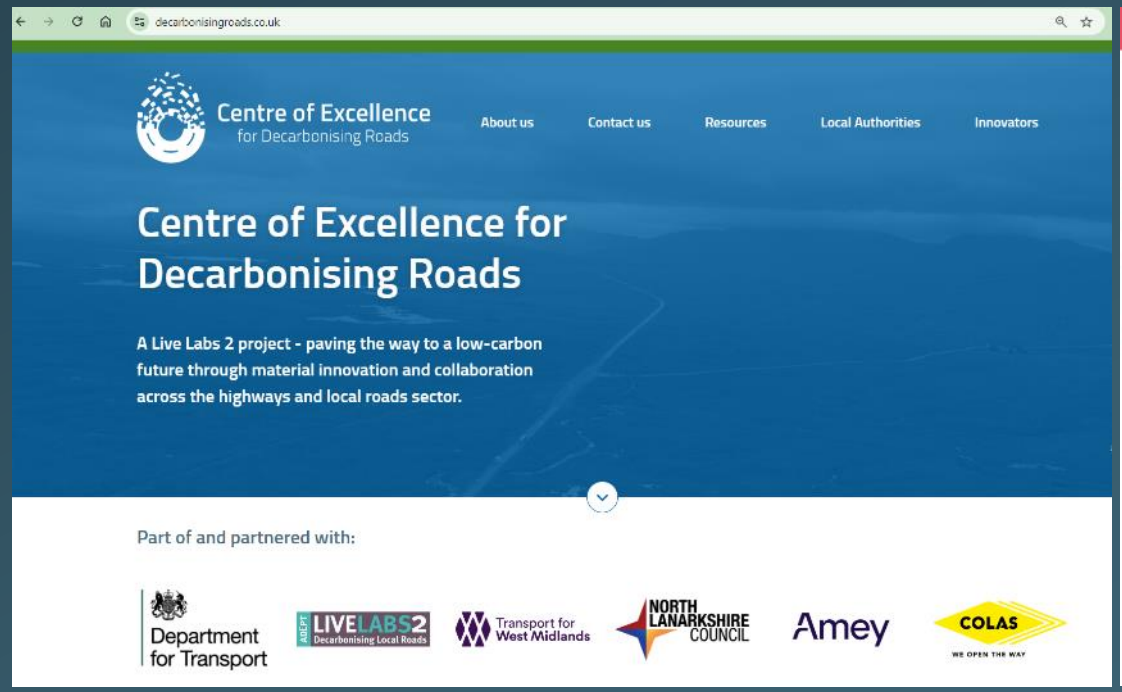
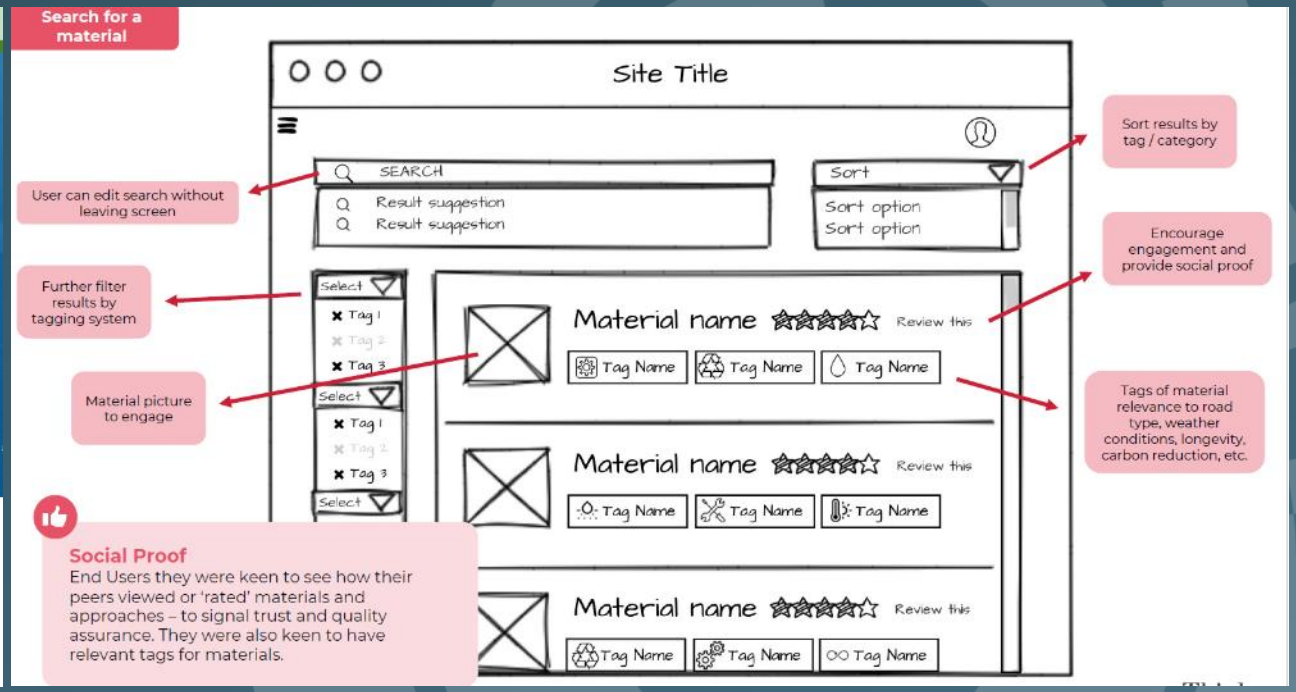
Knowledge Bank





Carbon Evaluation Framework

= Non-generalisable data – specific to live trial/NLC

		Data Type	Indicator	Source
A1 – A5	Product Stage	**Embodied carbon of raw material, manufacture and transport**	• Carbon factor • EPD (preferably third-party verified) • Constituent data, verified by Carbon Lead	• Supplier • NICS database • OneClick LCA database
A1 – A5	Construction Stage	**Transport and construction and installation process**	• Carbon factor • EPD (preferably third-party verified) • Constituent data, verified by Carbon Lead • **Transport data to depot**	• Supplier • NICS database • OneClick LCA database • **Purchase orders/invoices for trial**
B1 – B7	Use Stage	**Use, maintenance, repair, replacement, refurbishment, operational energy and operational water**	• Quantity used (unit dependent on material) • Staff required • Projected lifespan (based on supplier claims, **verified by M&E of trials**) • Required maintenance and/or refurbishment (based on supplier claims, **verified by M&E of trials**) • Energy required (kWH for plant/fleet/tools required to install material) • Water required for installation of material	• Supplier claims and warranties • **Staff required from live trials** and based on common operational experience cited by other trials • **M&E of live trial sites** • Energy usage receipts from plant/fleet • Water usage recorded on-site
C	End of Life Stage	**Deconstruction/demolition, transport, waste processing and disposal**	• Quantity of waste • Deconstruction/disposal process, and any associated energy/water usage	• Live trial data on waste • Supplier claims on disposal/deconstruction process required
D	Beyond the End of Life	**Reuse, recovery and recycling potential**	• Any purported potential to reuse, recover or recycle the material	• Supplier data/recommendations for reuse, recycling or recovery

Technical Evaluation Framework

= Non-generalisable data – specific to live trial/NLC

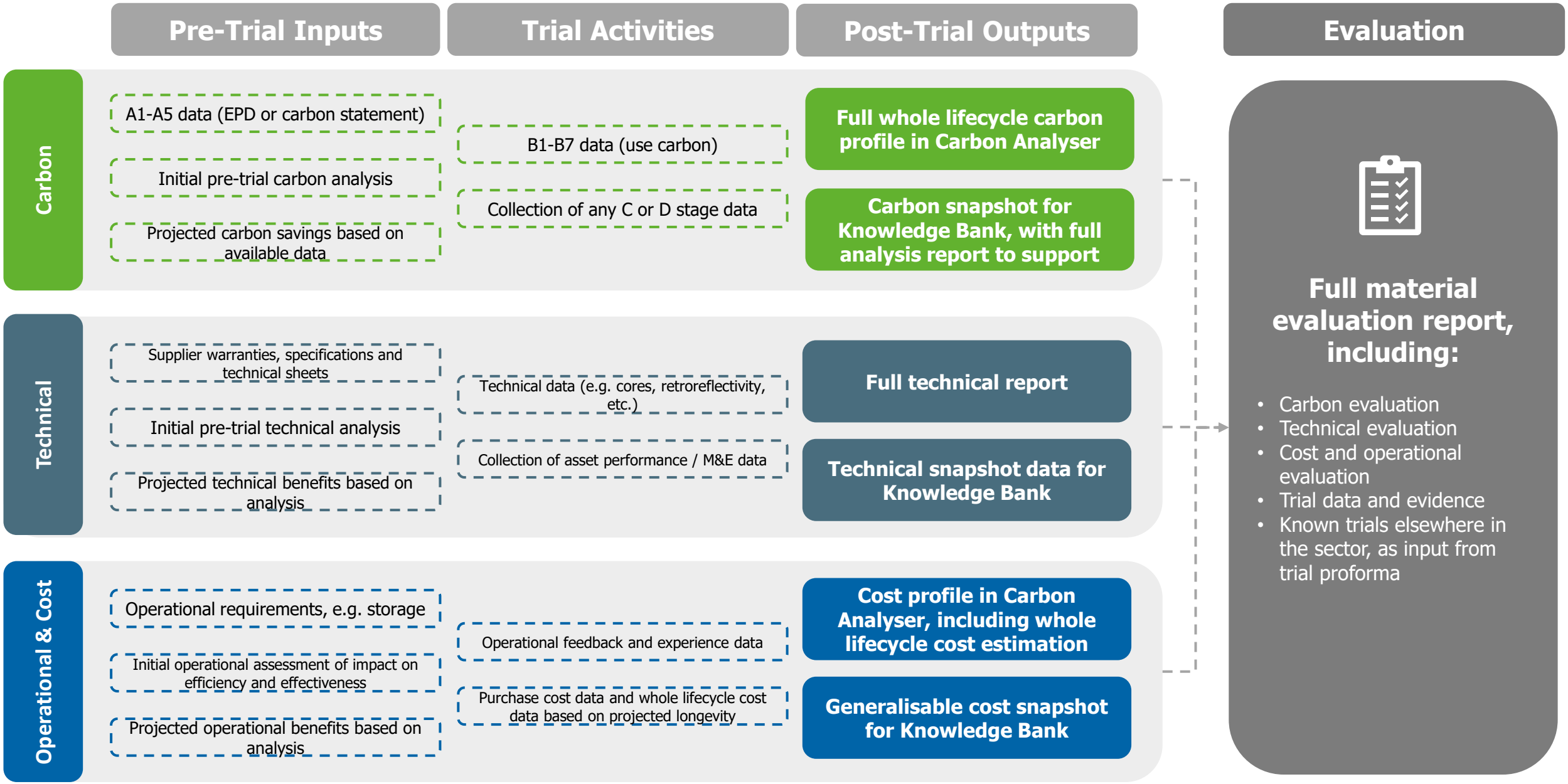
	Data Type	Indicator	Source
Product Stage	**Technical specifications of the solution**	• Projected lifespan • Ingredients or constituent parts • Material type	• Technical sheets • Supplier warranties • Alignment to DMRB/MCHW series
Use Stage	**Technical implications and performance during the use, maintenance, repair, replacement and refurbishment of the solution**	• Trial context and characteristics (please see trial protocols for full detail on data collected) • Analysis of suitability of solution for different contexts, e.g. different road types • Maintenance and repair required over asset lifecycle • Replacement and refurbishment required over asset lifecycle • Key technical performance data specific to material type (e.g. retro-reflectivity for line-marking)	• Supplier claims and warranties • Trial data and property sheets stored in Carbon Analyser • Quantitative data analysis of performance data and trial context • Live trial testing, e.g. cores, retro-reflectivity testing, etc. • **Data from M&E of live trial sites,** such as maintenance, repairs and refurbishments required
End of Life Stage	**Technical implications of construction/demolition, transport, waste processing and disposal**	• Any technical implications of the end-of-life of the solution, including potential negative impacts on surrounding assets • Waste considerations	• Live trial data on waste • Supplier claims on disposal/deconstruction process required • Previous research on impacts from end-of-life (if available)
Beyond the End of Life	**Technical implications of reuse, recovery and recycling potential**	• Any performance benefits or disbenefits from reuse, recovery or recycling of the solution	• Supplier data/recommendations for reuse, recycling or recovery • Previous research on impacts from end-of-life (if available)

Cost Evaluation Framework

= Non-generalisable data – specific to live trial/NLC

	Data Type	Indicator	Source
Purchase cost	**Costs to procure the solution**	• Cost of material and/or method	• Supplier to quote generalisable cost
Operational cost	**Costs to implement the solution**	• Costs to operate – plant/fleet costs • Staff costs • Energy costs • Water usage costs	• Carbon Analyser database for generalisable costs • Quantities for waste, staff, energy and water captured in carbon evaluation
Maintenance cost	**Costs to maintain the solution**	• Costs to perform regular maintenance of the material and/or asset • Energy, plant/fleet and staff costs to perform maintenance	• Carbon Analyser database for generalisable costs • Supplier claims and previous live trial data from other LAs on required maintenance
Cost of disposal/ removal	**Costs to dispose of or remove the solution at the end-of-life**	• Cost for removal/disposal services • Energy, plant/fleet and staff costs if not covered as a whole removal service	• Carbon Analyser database for generalisable costs • Supplier claims and previous live trial data from other LAs on required maintenance
Whole lifecycle cost	**Total costs, incorporating longevity**	[Purchase costs + operational costs + (maintenance cost * required # of maintenance visits over lifespan) + cost of disposal/removal] / expected longevity = cost per year	

Trial Output Mapping



Department for Transport

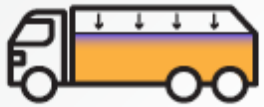
The Fliegl asphalt push-off trailer process

Centre of Excellence for Decarbonising Roads

1. Loading at plant

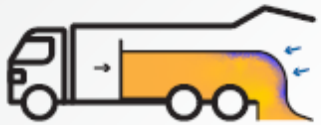
The beginning of our local roads starts at the quarry and then batching plant, where the asphalt mix is unloaded into the trailer. Typically at temperatures of 180–190°C.

Fliegl



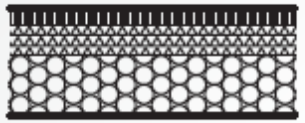
2. Transport to site

When travelling to site, the improved thermal insulation properties of Fliegl trailers reduces temperature loss of the mix.



3. Laying at site

At site, the Fliegl trailer's push-off technology improves the homogeneity of the mix temperature, educing the risk of formation of cold spots when laying.

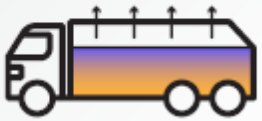


4. Future longevity

The reduced cold spots therefore result in lower risk of future defects on the road, increasing the longevity of the pavement and reducing its whole lifecycle carbon.

- ✓ Improved homogeneity of asphalt temperature.
- ✓ Large volume capacity (26 tonnes).
- ✓ Reduces risk of cold spots when laying and future defects.
- ✓ Improved whole lifecycle carbon of pavement.
- ✗ Less suitable to smaller residential roads.

Traditional



2. Transport to site

When travelling to site, the asphalt mix begins to lose its heat.

3. Laying at site

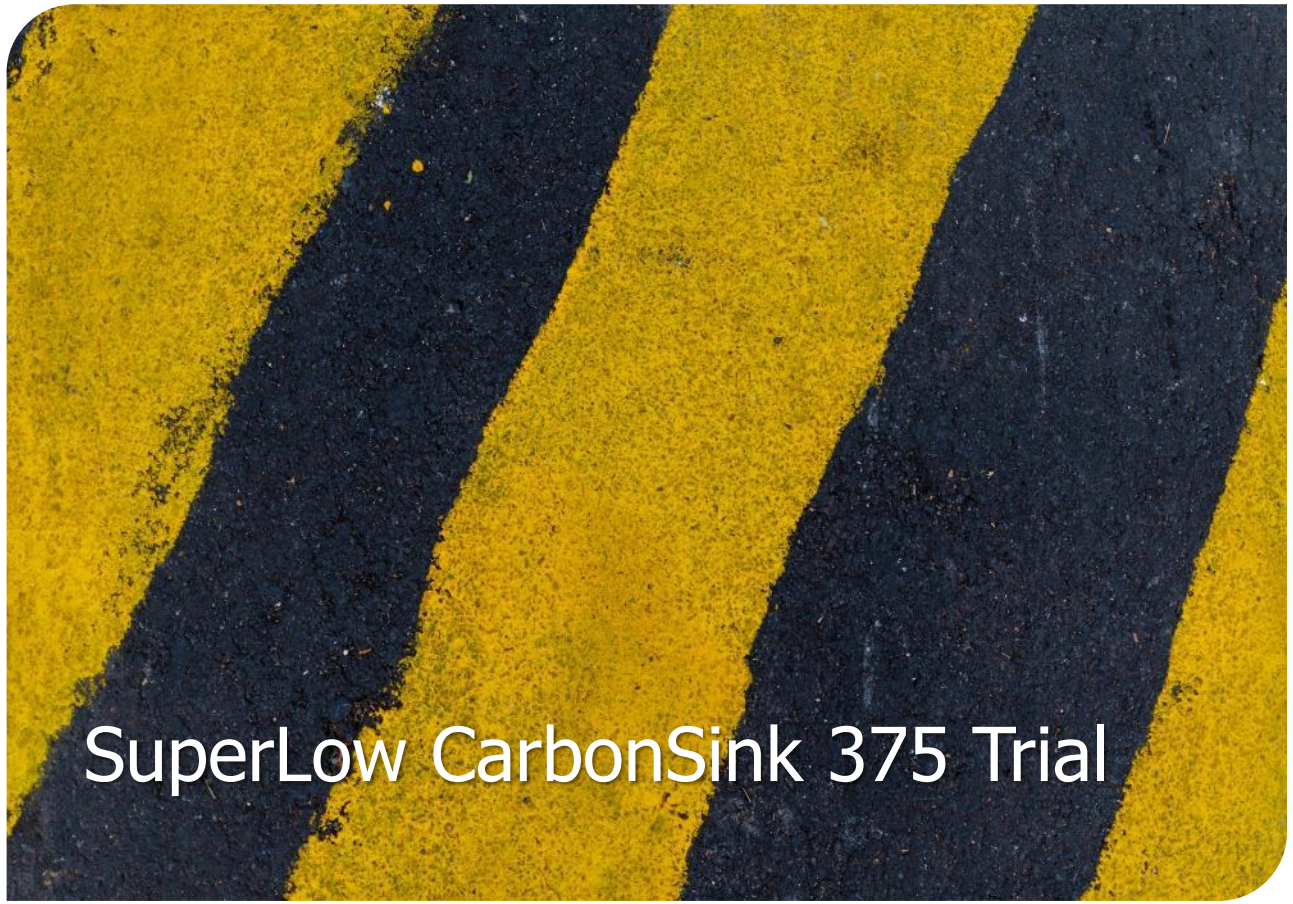
At site, the traditional tip-off trailer results in cooler pockets of asphalt, which reduces compaction when laid. Specification requires material to be min 120–140°C on site arrival.

4. Future longevity

These cold spots increase risk of future defects on the road, such as potholes. This requires additional maintenance and more frequent resurfacing.

- ✓ Suitable for accessing smaller residential roads.
- ✓ Business as usual and widely available.
- ✗ Causes cold spots when laying.
- ✗ Significant temperature loss from plant to site.
- ✗ Higher whole lifecycle carbon of pavement.

www.decarbonisingroads.co.uk
www.adeptnet.org.uk/livelabs2



SuperLow CarbonSink 375 Trial

Next Steps

- Monitoring and evaluation of pavement performance over the next 7 years
- Full carbon profile in Carbon Analyser
- Transition biogenic binders to BAU in NLC and within wider sector

Approach

Materials Trialled

- Shell SuperLow CarbonSink, in partnership with Aggregate Industries
- Trialled in combination with the Fliegl asphalt push-off trailer

Trial Methods

- Trial site alongside second Fliegl trial in NLC
- July 2024
- HRA, A road

Control and Benchmark

- Traditional binder in a resurfacing scheme

Operative Feedback

- Same process as traditional binder

Approach

Materials Trialled

- Abrasion resistant thermoplastic
- 2 biogenic thermoplastics
- MMA
- Water-based paint

Trial Methods

- A, B and C roads in NLC
- June – September 2024
- 9 trial sites (3 A roads, 3 B roads, 3 C roads – transverse, newly resurfaced roads, and existing lines)

Control and Benchmark

- Trialled side-by-side with traditional thermoplastic on each site to reduce variables and improve comparability

Operative Feedback

- Water-based paint would require an adjustment in approach to frequency of line maintenance
- Biogenic thermoplastic is a simple switch from BAU

Case Study

Line-marking Trials

Next Steps

- Monitoring and evaluation of performance over the next 7 years
- Full carbon profiles in Carbon Analyser
- Pending full results, NLC will transition to an asset-based approach to line-marking, considering durability and carbon for each area of the network

Next Steps

Upcoming milestones for 2024/25

Market Scanning & Trials

- Signage – reed-based signage from the Netherlands
- Trial designs for Series 700, 800 and 900
- Footway schemes of UltiFastPath and WinterPave

Material Evaluations

Full carbon and technical evaluations of materials, with support from University of Nottingham, Aston University and FHRG

Industry Playbook

Creation of best practice and guidance for LAs to identify, trial and evaluate low-carbon materials, with support from Connected Places Catapult

Knowledge Bank

Launch of the knowledge bank at the end of 2024, ready for LAs to identify and adopt low-carbon materials

Case Study

NLC Pothole Trials

Initial Results

Carbon: est. 37.5% saving for GreenPatch

Technical: expected increased longevity from 3 out of 4 materials

Next Steps

- Monitoring and evaluation of repair performance over the next 7 years
- Full carbon profiles in Carbon Analyser
- Transition to best performing materials as BAU in NLC

Approach

Materials Trialled

- Degafloor Degafill (MMA-based cold-mix)
- Roadmender Elastomac (mastic asphalt)
- FM Conway GreenPatch (cold-mix with RAP)
- Meon Permafyx (MMA-based cold-mix)

Trial Methods

- A, B, and C road sites in NLC
- 27-28th February and 11th – 12th April 2024
- Creation of 18 simulated potholes and 18 patches 2m apart on 'Amber' roads

Control and Benchmark

- Benchmark solutions: HRA and standard cold-mix material
- Applied on the same road, same size potholes, same operatives, and same weather

Operative Feedback

- Health & safety implications of hot-mix mastic asphalt
- Openness and interest in MMA solutions
- GreenPatch is a simple switch from BAU

Department for Transport

GENERAL

ADEPT LIVELABS2 Decarbonising Local Roads

NORTH LANARKSHIRE COUNCIL

Transport for West Midlands

Amey

COLAS WE OPEN THE WAY

Approach

Materials Trialled

- 13 materials and methods demonstrated, including the same materials as the North Campus, as well as Colpatch, Roadpatch, and Velocity Patching

Trial Methods

- A, B, C and old/new residential road sites across 6 combined authorities in West Midlands
- March 2024
- Tested on 'normal' potholes

Control and Benchmark

- Applied on similar road types, in similar weather, and with oversight from core team

Operative Feedback

- Difficulty with operational ease with some materials due to narrower conditions of use

Case Study

TfWM Pothole Trials

Next Steps

- Monitoring and evaluation of repair performance over the next 7 years
- Full carbon profiles in Carbon Analyser
- Transition to best performing materials as BAU in TfWM LAs

Initial Results

Carbon: est. 37.5% saving for GreenPatch

Future Highways Research Group

Decision Equipped.

proving

ADEPT

Association of Directors of Environment, Economy, Planning & Transport

Highways

PART OF TRANSPORT NETWORK

Next Meeting Date

Future Highway Research Group

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