



Department for Transport

ADEPT **LIVELABS2**
Decarbonising Local Roads

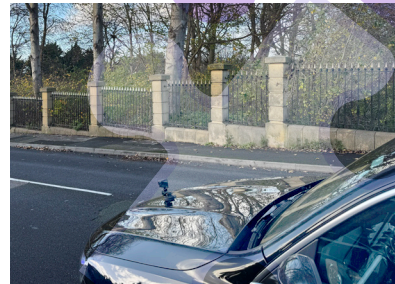
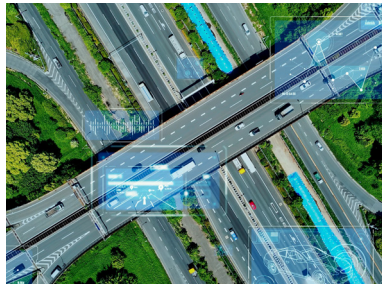


**LIVERPOOL
LIVE LABS**
DRIVING DECARBONISATION

LIVERPOOL LIVELABS

CASE STUDY

This case studies highlight the extensive scope of collaboration with a goal to create a framework for decarbonising local roads in the UK in order to achieve net zero by 2030.



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Liverpool
City Council



**LIVERPOOL
LIVE LABS**
DRIVING DECARBONISATION



WE OPEN THE WAY

Pell Frischmann
Excellence through innovation

Bird & Bird

Decision Equipped.

proving

LIVERPOOL
JOHN MOORES
UNIVERSITY



Newcastle
City Council

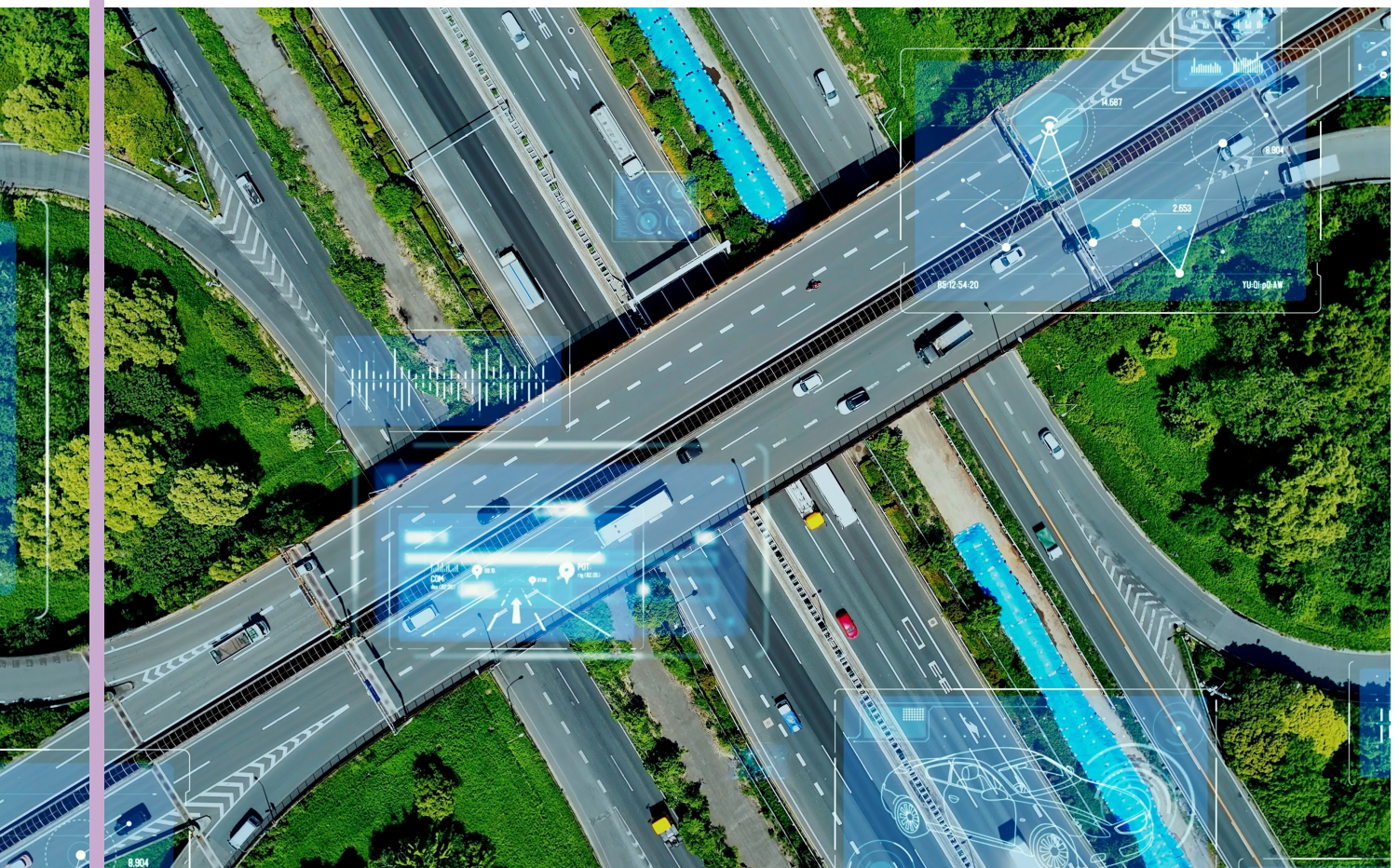


LIVERPOOL LIVELABS CASE STUDY

DECISION MAKING & DATA DRIVEN NETWORK MAINTENANCE

Whole Network Intelligence for Optimised Maintenance

Live Labs 2 is a three-year, £30 million UK-wide programme funded by the Department for Transport, running until March 2026 and followed by a five-year extended monitoring and evaluation period.



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FOREWORD

The ADEPT Live Labs 2: Liverpool programme has been an enriching learning experience for Liverpool City Council, our highways teams, our communities, and the many SMEs that form the backbone of our local innovation ecosystem. Decarbonisation sits at the core of long-term resilience, and with Liverpool's ambitious goal of becoming a net zero city by 2030, this programme has played a critical role in accelerating our progress, alongside our wider evolution as a Council.

Through Live Labs 2, Liverpool is now equipped with a cohort of professionals who are familiar with a nationally accepted carbon assessment and capture methodology – giving us the tools, understanding and confidence to make informed, accountable decisions about carbon reduction across the lifecycle of our highways assets. This capability will long outlast the programme itself, embedding a legacy of informed, data-driven decarbonisation in the city's operations where these have been proved by the programme.

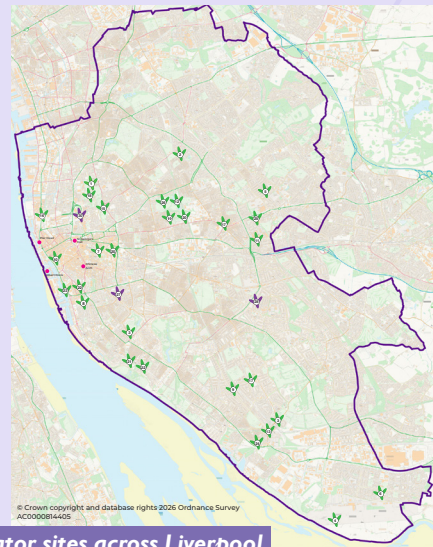
Within the programme ecosystem, we tested 26 innovations, spanning far more than materials alone. These included new processes, toolkits, decision-making approaches, and practical interventions that collectively support our commitment to building a functioning highways decarbonisation ecosystem. Supported by an expert panel, each option was rigorously assessed for its innovation potential and its ability to meaningfully reduce carbon before being adopted. Our ambition from the outset was clear: embrace innovation, remain open to challenge, and work collaboratively to understand what truly moves the needle on carbon reduction.

Despite needing to align with wider changes within the Council, and the challenges faced by nearly all Authority's across the UK, the programme succeeded because of the strength, expertise, and dedication of our partners across the ecosystem. We would like to extend our sincere thanks to the core members of the innovation ecosystem developed through the programme:

- **Colas** – Programme Delivery & Innovation Management Partner, also realising new ways of including carbon impacts into road condition-based Asset Management approaches.
- **Bird & Bird** – Co-developer of a pioneering procurement toolkit.
- **Pell Frischmann** – Developers of the Options Configurator Tool.
- **Proving Services** – Independent testers of our assumptions and carbon assessment approaches.
- **Liverpool John Moores University** – Innovators in materials development.
- **Dowhigh and Huyton Asphalt Civils** – Our committed local contractors installing innovation products and embracing new ways of working.
- **Newcastle City Council and Aberdeen City Council** - Partner cities for demonstrators and vital knowledge sharing.

Another defining strength of the programme was its verge-to-verge scope. This was not limited to resurfacing or traditional asset management innovations. We trialled solutions in road marking, drainage, reuse and recycling, operational processes, and more – reflecting the full complexity and opportunity of the road environment.

From the 26 innovations we trialled, 17 innovations spanning categories such as Decision-Making & Network Management, Road Markings, Intelligent Lighting, Asset Maintenance, Drainage, and People-Focused Street Enhancements have already been adopted or are moving toward becoming business-as-usual, provided the site conditions are suitable. Others are undergoing extended monitoring and evaluation over the next five years to better understand performance, durability, and long-term carbon reduction potential. And while not every innovation delivered the outcomes we hoped for, each trial provided valuable learning - an essential part of any genuine innovation journey.



Demonstrator sites across Liverpool

As we present this suite of case studies, we do so with pride in what can be achieved with a laser-sharp focus, unwavering dedication and a culture of collaboration. These pages represent countless hours of collaboration, problem-solving, curiosity, and shared ambition across partners, teams, and communities.

On behalf of Liverpool City Council, I would like to extend our sincere thanks to the Department for Transport (DfT) and ADEPT as the funding and commissioning bodies, whose support and leadership have been essential in enabling this work. I would also like to thank every partner, every member of our LCC teams, every contractor, SME, academic, and every community voice – big or small – who contributed to the success of this project. Your effort and commitment have not only delivered a highly successful programme but have also helped build the foundations for a cleaner, more resilient, and more sustainable Liverpool.



**Director of Sustainable Transport,
Highways and Parking,
Liverpool City Council**



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CASE STUDY DECISION MAKING & DATA DRIVEN NETWORK MAINTENANCE

Whole Network Intelligence for Optimised Maintenance

INFRACARE BY COLAS

1. Executive Summary

As part of Liverpool Live Lab ambition, Infracare by Colas was deployed across the network to move away from reactive works and towards a fully evidence-based, optimised maintenance programme.

Traditional highway maintenance relies heavily on complaint-driven inspections, reactive repairs, and limited visibility into condition. This creates inefficiencies, high carbon outputs from repeated site visits, and difficulty justifying long-term funding requirements.

Infracare by Colas offers a transformative alternative: a digital, AI-powered pavement assessment and scenario planning tool that delivers a full network condition view, recommends optimised treatments, and integrates a bespoke carbon module to quantify and reduce whole life emissions.

The tool helps Liverpool City Council:

- Prioritise interventions objectively rather than reactively.
- Reduce carbon emissions through targeted, lower-carbon treatment strategies.
- Build robust, data-driven evidence to support future funding and long-term investment decisions.

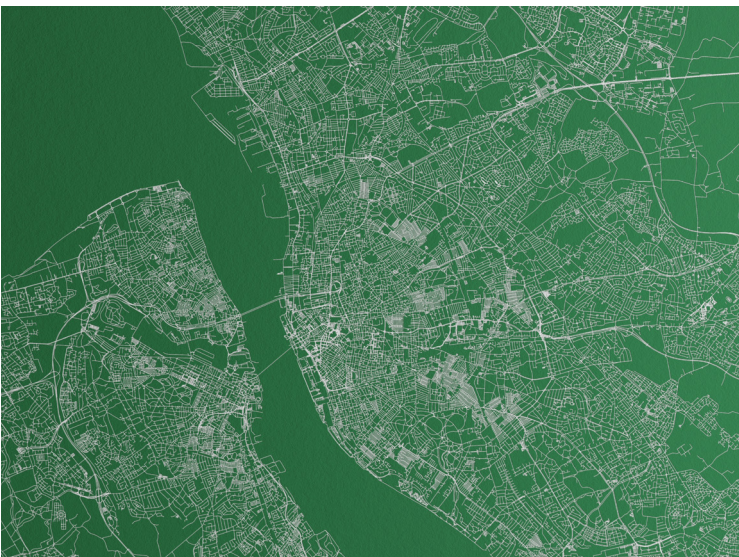
2. Context and Rationale

Infracare by Colas was selected for the Liverpool Live Lab trial because it already provided a proven, full network, AI driven pavement condition platform that could be rapidly extended to integrate lifecycle carbon optioneering. It uniquely enabled the connection between scheme level optioneering and service level asset management, minimised development time and cost, embedded carbon into business as usual decision making, and supported Liverpool City Council's long term sustainability, asset management, and monitoring objectives. The trial of the Infracare carbon module was undertaken to strengthen Liverpool City Council's understanding of road-condition performance across 350 km of its network while embedding carbon considerations into every stage of maintenance decision-making, consistent with the principles of the full network carbon hierarchy.

By building on the existing Infracare platform already using AI-driven, camera-based condition assessment and cost-scenario planning, the project integrated validated carbon-cost ratios into long-term asset management so that maintenance strategies, budget choices, and lifecycle planning could be guided by accurate and transparent environmental-impact data.

The development of the carbon module enabled alignment with the Council's foundational metrics, improved the visibility of carbon impacts through enhanced data visualisation, and supported the adoption of more sustainable practices by evidencing the relative carbon performance of different maintenance options.

Through AGILE development, back-end integration, and progressive network-scale trials, the project demonstrated how carbon-informed optioneering, scenario modelling, and future emissions forecasting could be embedded into normal workflows, ultimately establishing a robust evidence base to help reduce emissions, enhance infrastructure outcomes, and integrate sustainability into everyday operational practice.



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3. Business-As-Usual (BAU) Baseline

Typical Liverpool BAU without Infracare by Colas:

- Complaints-driven inspections.
- Reactive pothole repairs and localised patching.
- Limited visibility of network wide condition.
- Mechanical surveys only covering selected strategic routes.
- Repeated return visits.
- No carbon-based scenario planning.
- Less efficient targeting of preventative works.
- Shorter treatment life, leading to more potholes and surface failures.
- Lack of data for forward planning, making it difficult to justify higher budgets or demonstrate long-term need.

4. Innovation Overview

Type: RCM (Road Condition Monitoring) tool using AI

Location: High-stress network (~350 km), across all highway classes including residential, urban, strategic, and high stress environments

Deployment: Continuous survey and modelling over a period of 8 months

4.1 Innovation Description

Infracare by Colas is an AI powered pavement condition monitoring and asset management platform designed to deliver full network visibility and support long-term, optimised maintenance planning developed by Colas.

The system uses a GoPro mounted on a vehicle to capture continuous road imagery, which is then processed using advanced detection algorithms and Colas' internal engineering expertise.

The platform automatically identifies surface defects, calculates road condition indices, and recommends tailored technical treatments ranging from reinforcement to maintenance, localised repair or monitoring.



Figure 1: Camera setup for Infracare by Colas



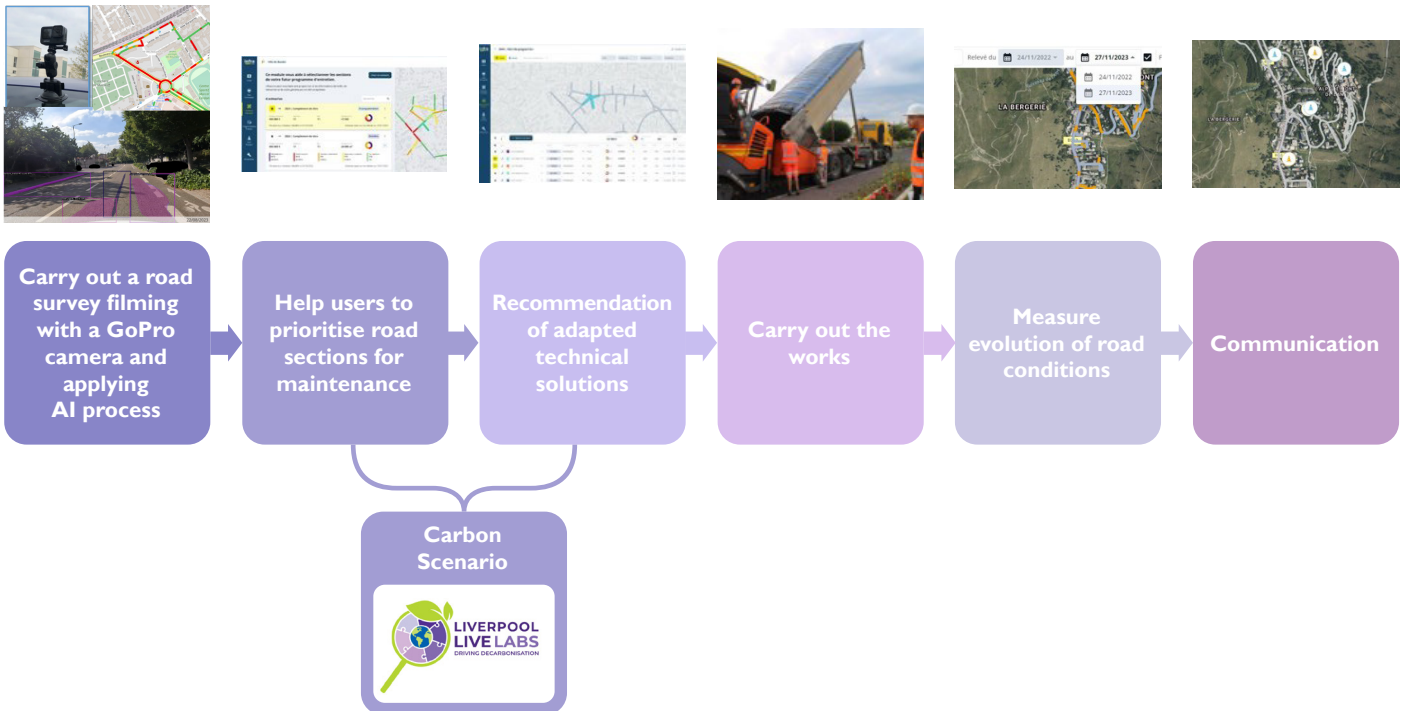
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Infracare by Colas supports users through every stage of the asset life cycle:

- **Survey & detection:** AI analysis of video data to map cracks, defects, edge failures and overall pavement condition.
- **Prioritisation:** Ranking of road sections based on hierarchy, traffic, severity and extent.
- **Scenario planning:** Annual maintenance programmes adjusted for budget, intervention type, and long-term performance needs.
- **Treatment recommendations:** Optimised technical solutions selected from Colas' catalogue of maintenance options.
- **Performance tracking:** Ability to compare annual surveys and measure deterioration or improvement.
- For Liverpool, Infracare was further enhanced with a bespoke carbon module developed specifically for the Live Labs programme, enabling the council to quantify and compare the carbon impacts of maintenance scenarios in real time.

Figure 2: How it works



CASE STUDY DECISION MAKING & DATA DRIVEN NETWORK MAINTENANCE

Whole Network Intelligence for Optimised Maintenance

6. Scalability

The successful deployment of Infracare and its bespoke carbon module in Liverpool demonstrates clear potential for scalability across other local authorities and regional networks.

Because the platform is built on a modular AI driven architecture combining repeatable camera-based surveying, automated defect detection, scenario modelling, and adjustable carbon-ratio inputs it can be rapidly adapted to different network sizes, asset types, and maintenance strategies without requiring major changes to existing workflows.

The ability to integrate new materials, evolving carbon factors, and additional datasets ensures that the system

can mature alongside organisational needs and regulatory expectations. Moreover, its emphasis on full-network visibility, data-driven prioritisation, and whole-life carbon optimisation provides a transferable framework that supports long-term funding cases and consistent maintenance planning across diverse geographies.

As demonstrated in Liverpool, once baseline processes are established, the technology can be scaled to broader corridors, neighbouring boroughs, or even combined regional programmes offering a unified, future-proofed approach to optimised maintenance and decarbonised highways management.

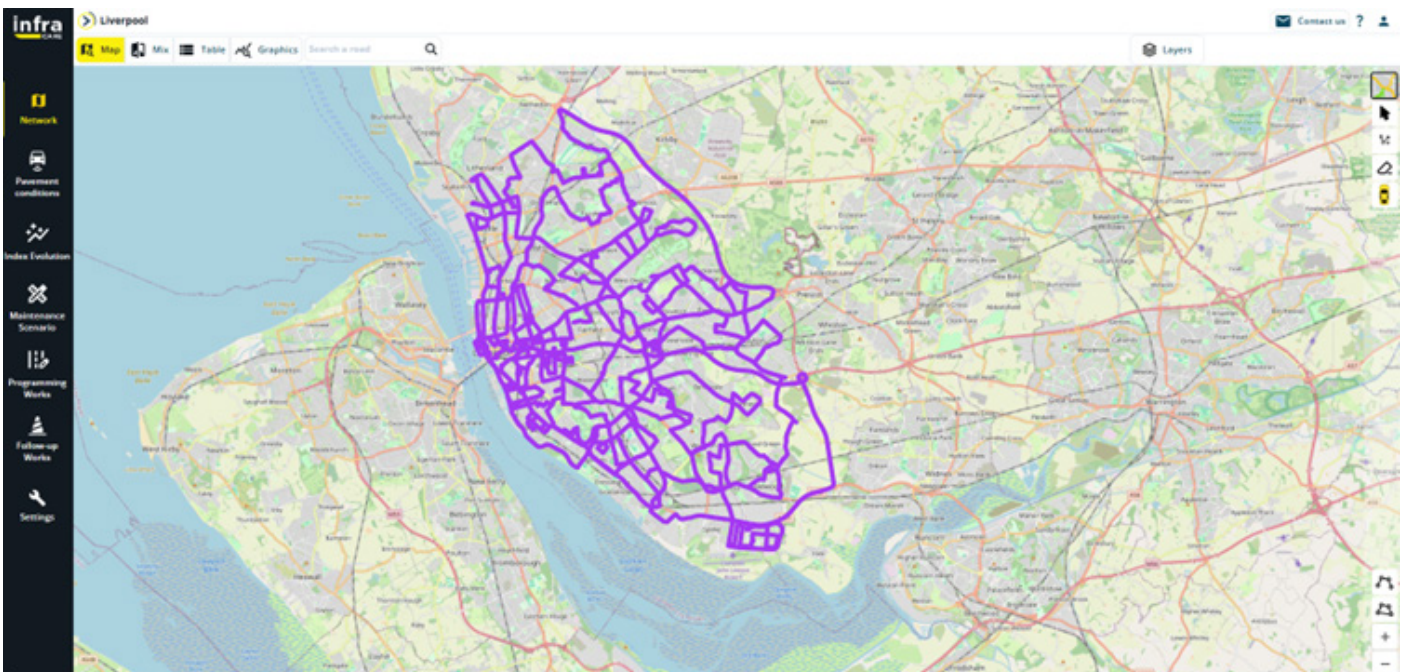


Figure 3: Overview of surveyed routes in Liverpool