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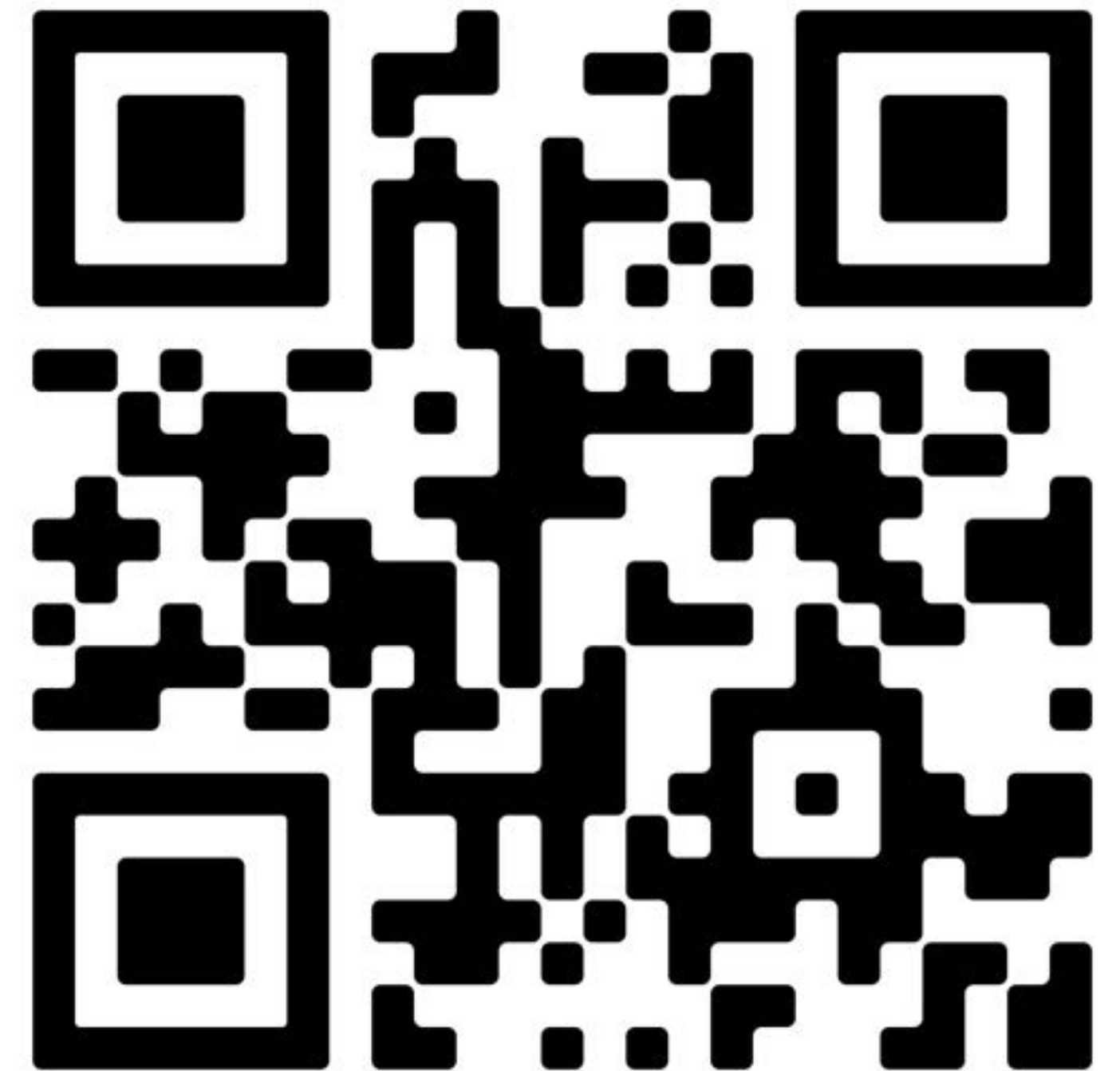
LIVELABS2
Decarbonising Local Roads

Introduction

Caroline Valentine

Head of Business Services, Highways & Transportation

Kent County Council & Live Labs 2 Commissioning
Board member



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UK Centre of excellence for materials

Mark Corbin
Director of Network Resilience

Transport for West Midlands

John Ashcroft
Road & Asset Services Manager

North Lanarkshire Council



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Centre of Excellence for Decarbonising Roads

An ADEPT Live Labs 2 theme



Transport for
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Amey



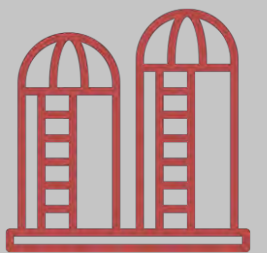
Why a Centre of Excellence for material decarbonisation?

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

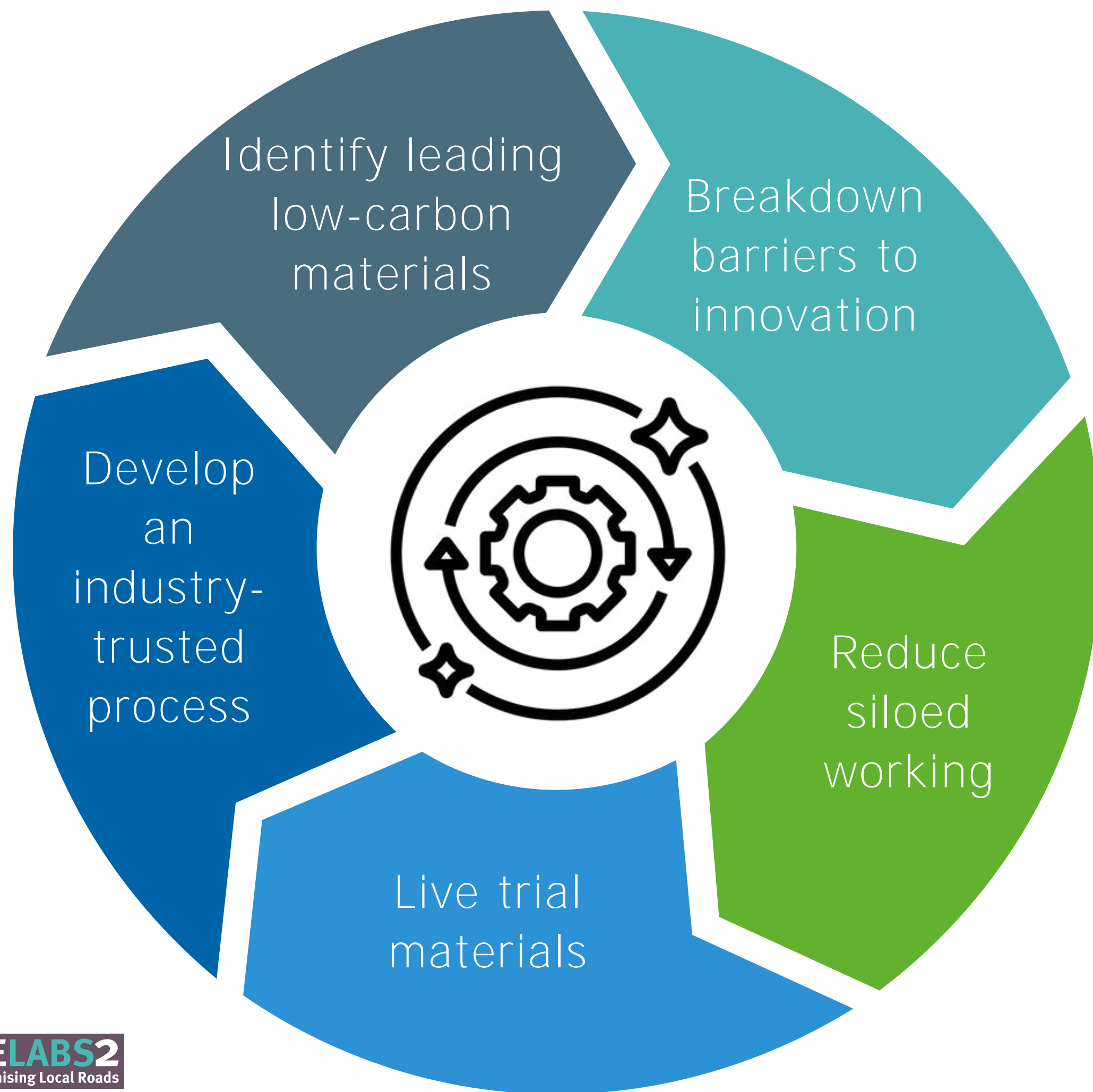


Live Labs can be a sector-wide springboard for low carbon materials adoption



Centre of Excellence for Decarbonising Roads

The key objectives of our theme



Two Campuses, One Theme

Programme Centre



Deliverables Key

 Dual delivery



North Campus – North Lanarkshire

- Live Lab demonstrators
- Challenge-led innovation programme
- Carbon and technical review
- Material knowledge bank
- Innovation sandbox and behavioural change



South Campus – Transport for West Midlands

- Live Lab demonstrators
- Challenge-led innovation programme
- Carbon and technical review
- Carbon literacy via Skills Academy
- Translation of specifications & standards



Our Partner Network

- Convening leaders from across the public, private and academic sectors to support the technical, carbon and strategic elements of the Centre.
- Expert Research Group and Expert Advisory Panel





Next Steps to Achieve our Vision of Success



- Continue live trialling leading low-carbon materials capable of significantly lowering the carbon footprint of local roads



- Develop and embed an industry-trusted approach to evaluating materials – technical and carbon performance



- Create a community of decarbonisation best practice across UK local authorities



- Launch our open-source knowledge bank in 2024





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West Midlands

WE OPEN THE WAY

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

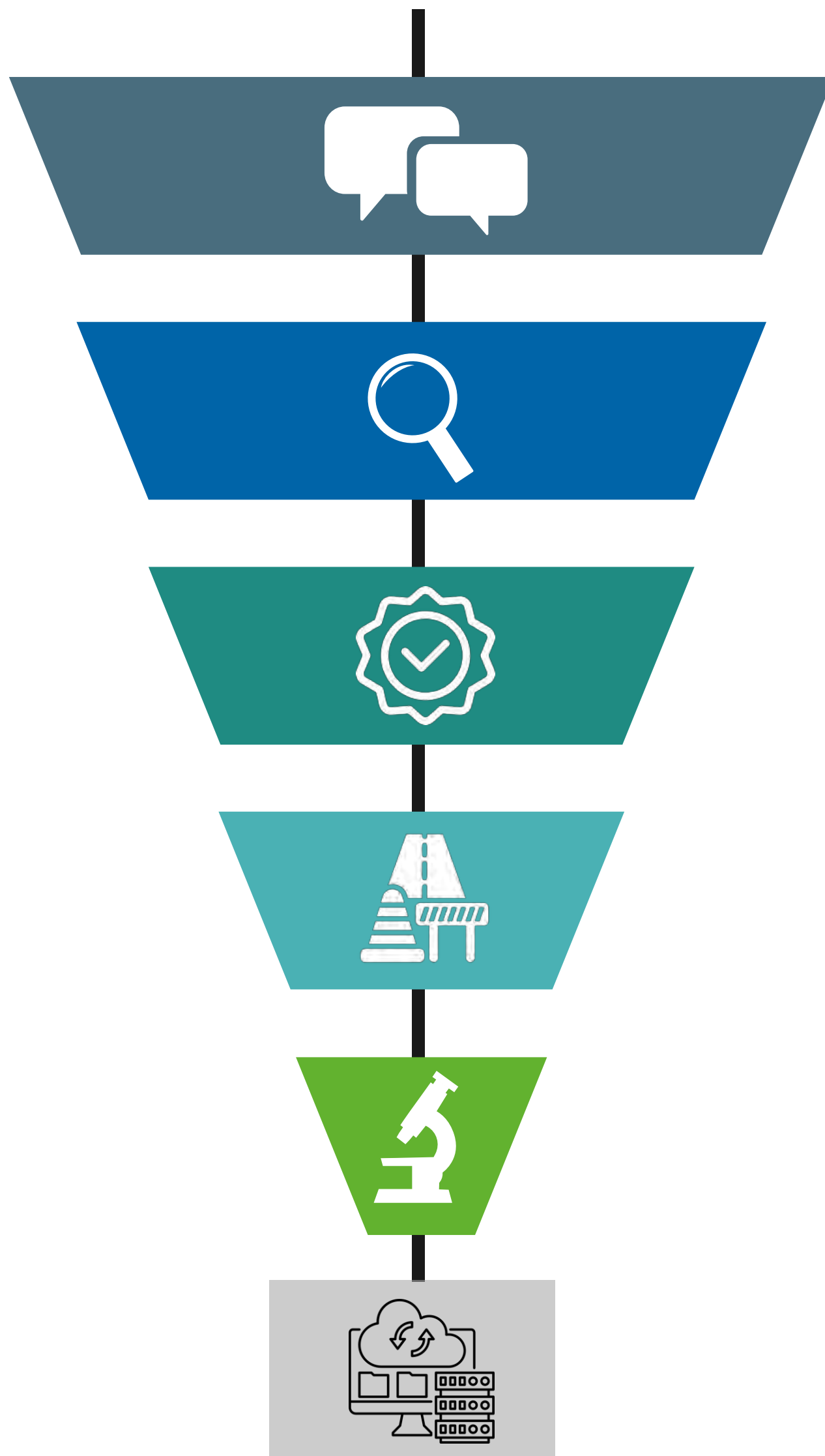


- Aims to reduce siloed working and encourage low-carbon material adoption



- Supported by live testbeds and knowledge bank for LAs

The Innovation Funnel



Discover

Identify

Qualify

Trial

Evaluate

Scale & Share

Objective
Discover challenges to decarbonisation
Identify leading low-carbon materials
Pre-qualify materials
Trial on NLC and West Midlands roads
Technical, carbon and scalability evaluation
Embedding in BAU and knowledge bank

Progress
<ul style="list-style-type: none"> LA questionnaire Behavioural research
<ul style="list-style-type: none"> Innovation Log with 200+ materials CPC global market scanning ongoing
<ul style="list-style-type: none"> 3 innovation scorecards completed
<ul style="list-style-type: none"> 12 trials across NLC and TfWM
<ul style="list-style-type: none"> Carbon profiles created for first trials in FHRG Carbon Analyser
<ul style="list-style-type: none"> Monitoring & Evaluation of first trials underway

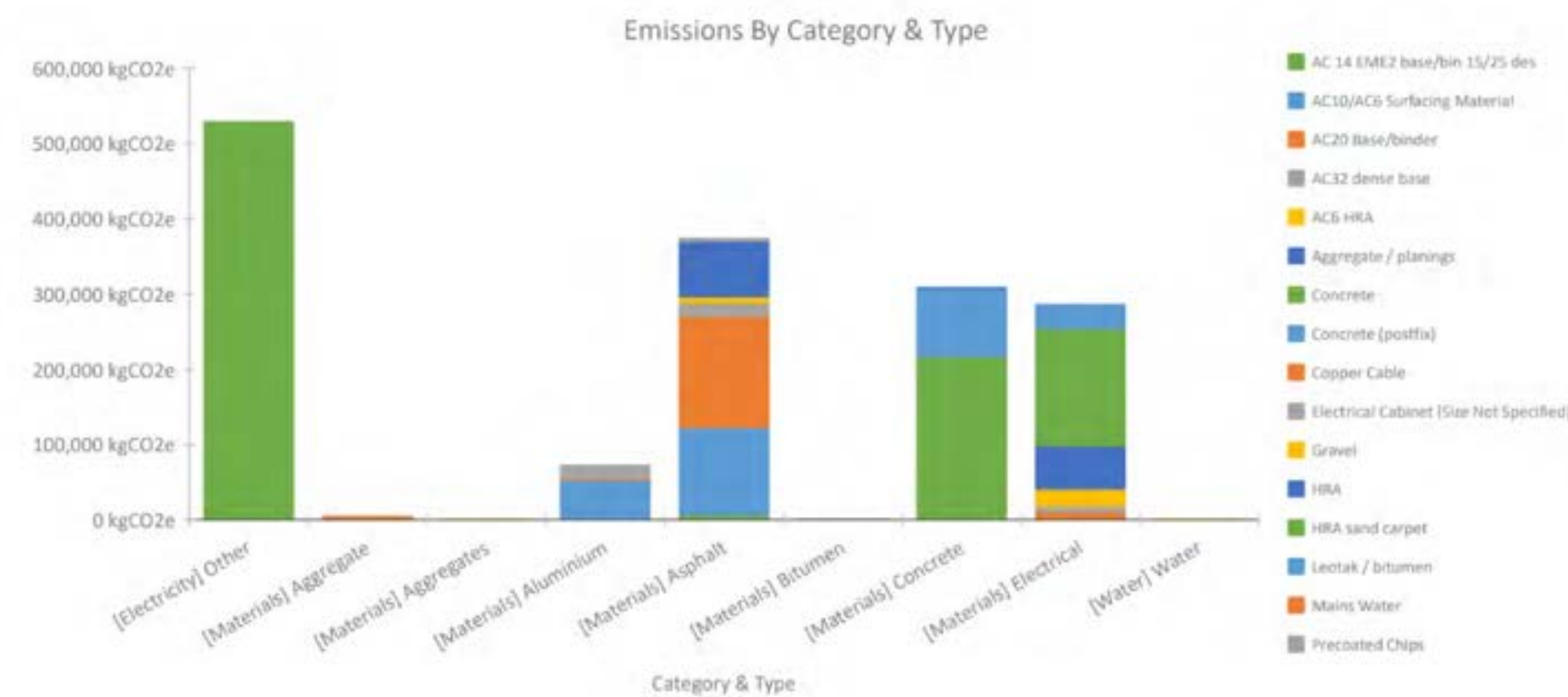
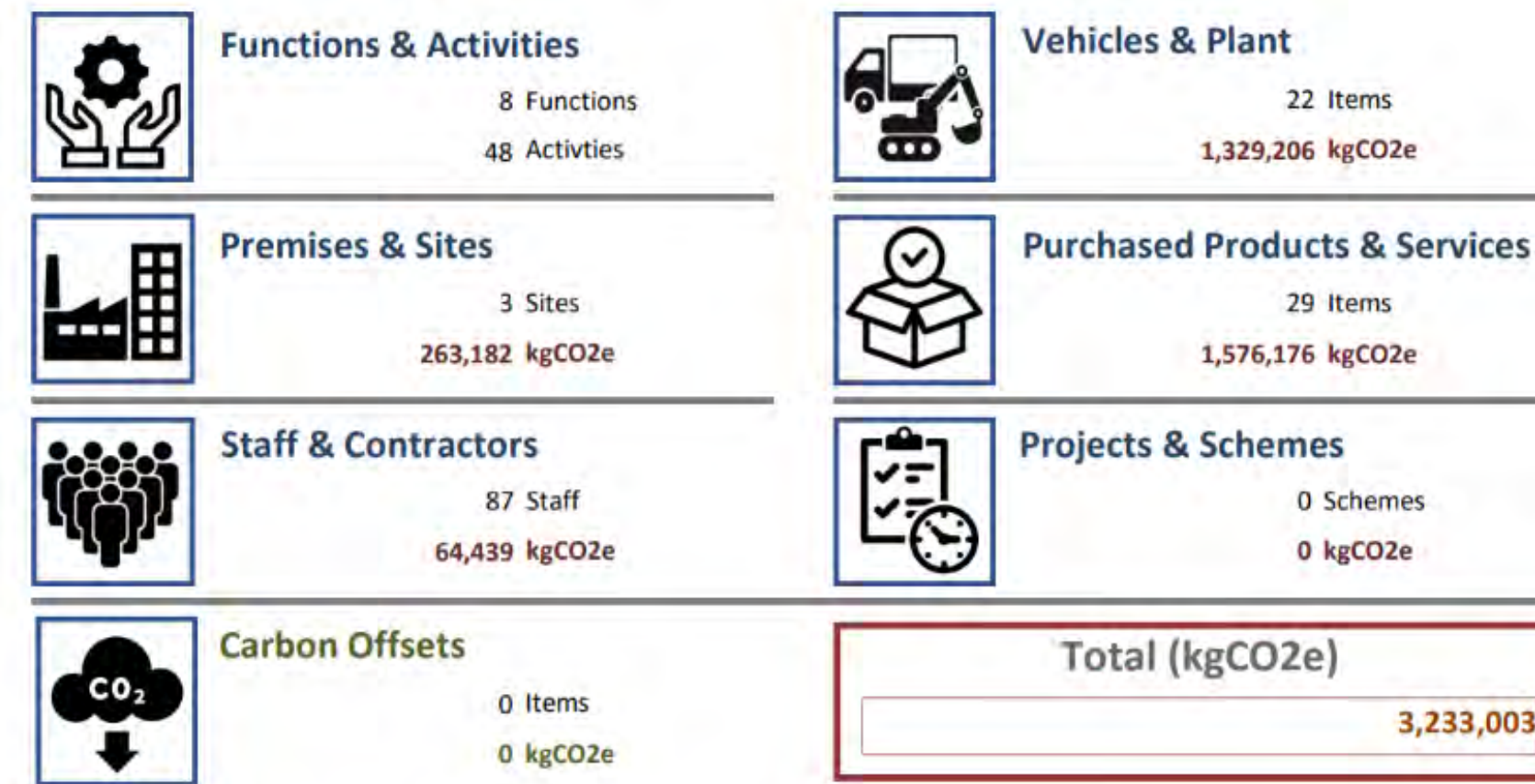
Our First Step: Carbon Baseline of NLC

Calculated for financial year 2022-2023 for all NLC local road services to baseline future carbon savings of the project and identify carbon hotspots

Accounting for carbon emissions across Scopes 1, 2 and 3 for sites & premises, staff & contractors, vehicles & plant, and purchased products & services

Key insights:

Although material carbon is significant, energy transition will be necessary to significantly decarbonise



Our First Step:

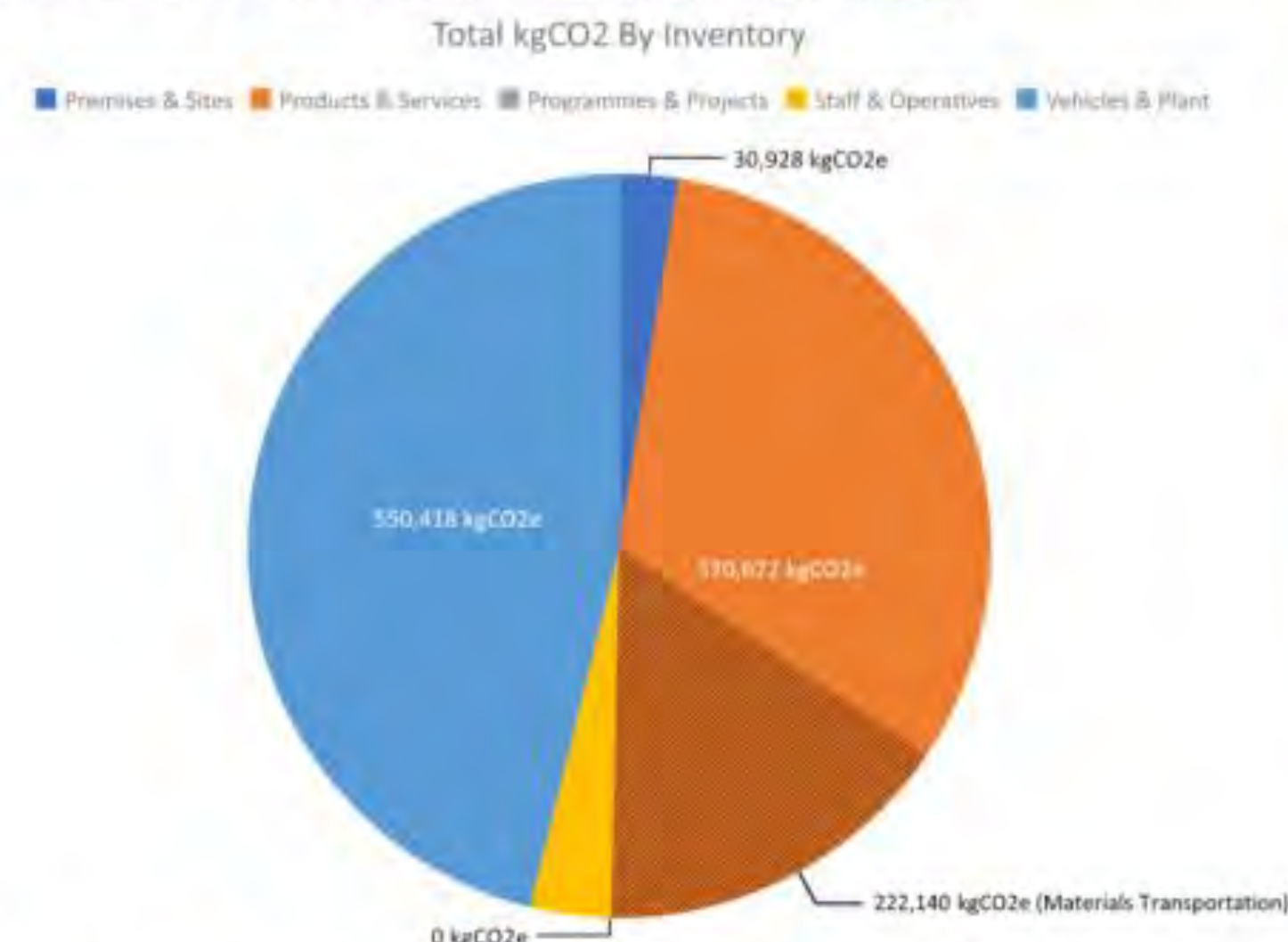
Carbon Baseline of TfWM

▶ Baseline to be carried out with 6 local authorities of the WMCA, around 70% complete – Authority emissions baselined, but supplier data lagging

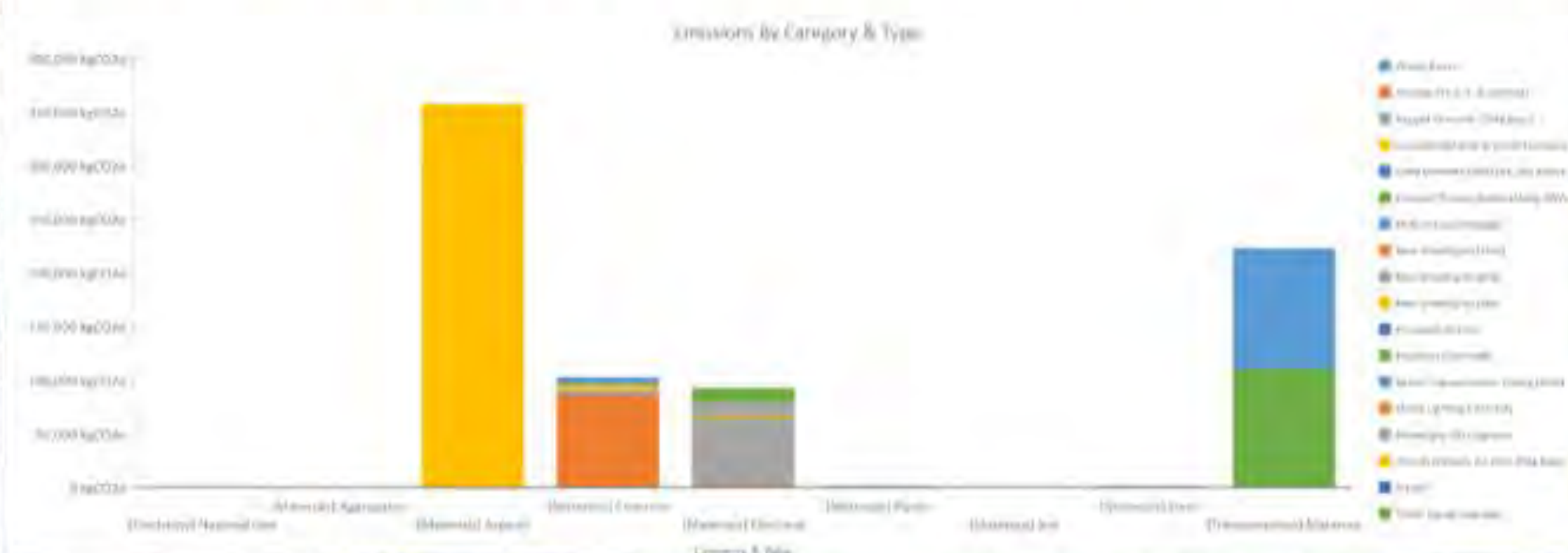
▶ The key challenge for the West Midlands is lack of funding in small MBCs to provide WOMSs for general data collection

▶ If carbon data is a requirement, specific funding should be made available to improve the data systems for small authorities

Carbon Analyser | Solihull Carbon Footprint | Summary of Inventories



Carbon Analyser | Solihull Carbon Footprint | Purchased Products & Services





Case Study

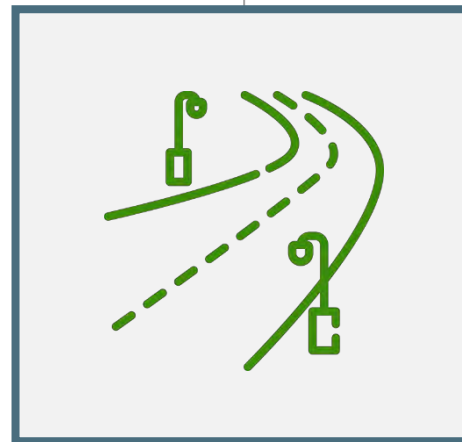
NLC Pothole Trials

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 (Viafix)
- 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

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

- 12 materials and methods demonstrated, including the same materials as the North Campus, as well as Colpatch, Roadpatch, and Velocity Patching and Thermal Road Repair



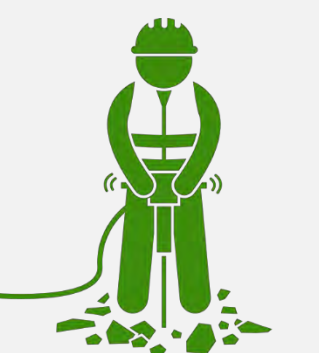
Trial Methods

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



Control and Benchmark

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



Operative Feedback

- Ease of use and application, manual handling improvements, unpleasant odours from some solutions



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

Phase 2

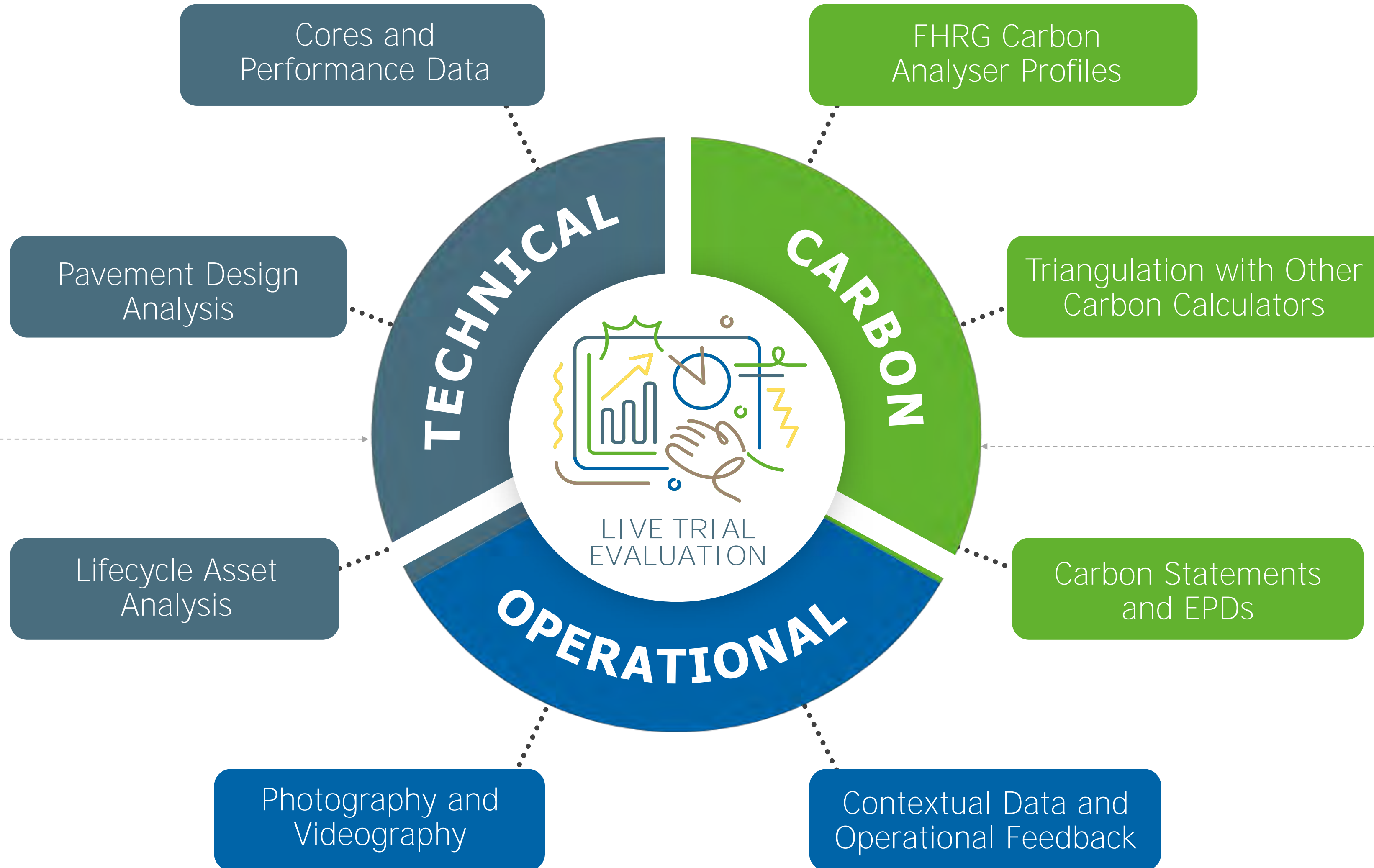
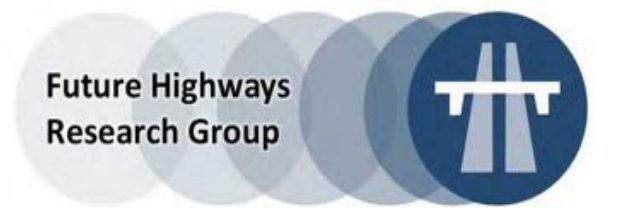
- Returning in Summer for phase 2
- Lessons learned from phase 1 will be incorporated into the methodology for phase 2
- More robust data collection required

Technical Support



Evaluation Approach

Carbon Support

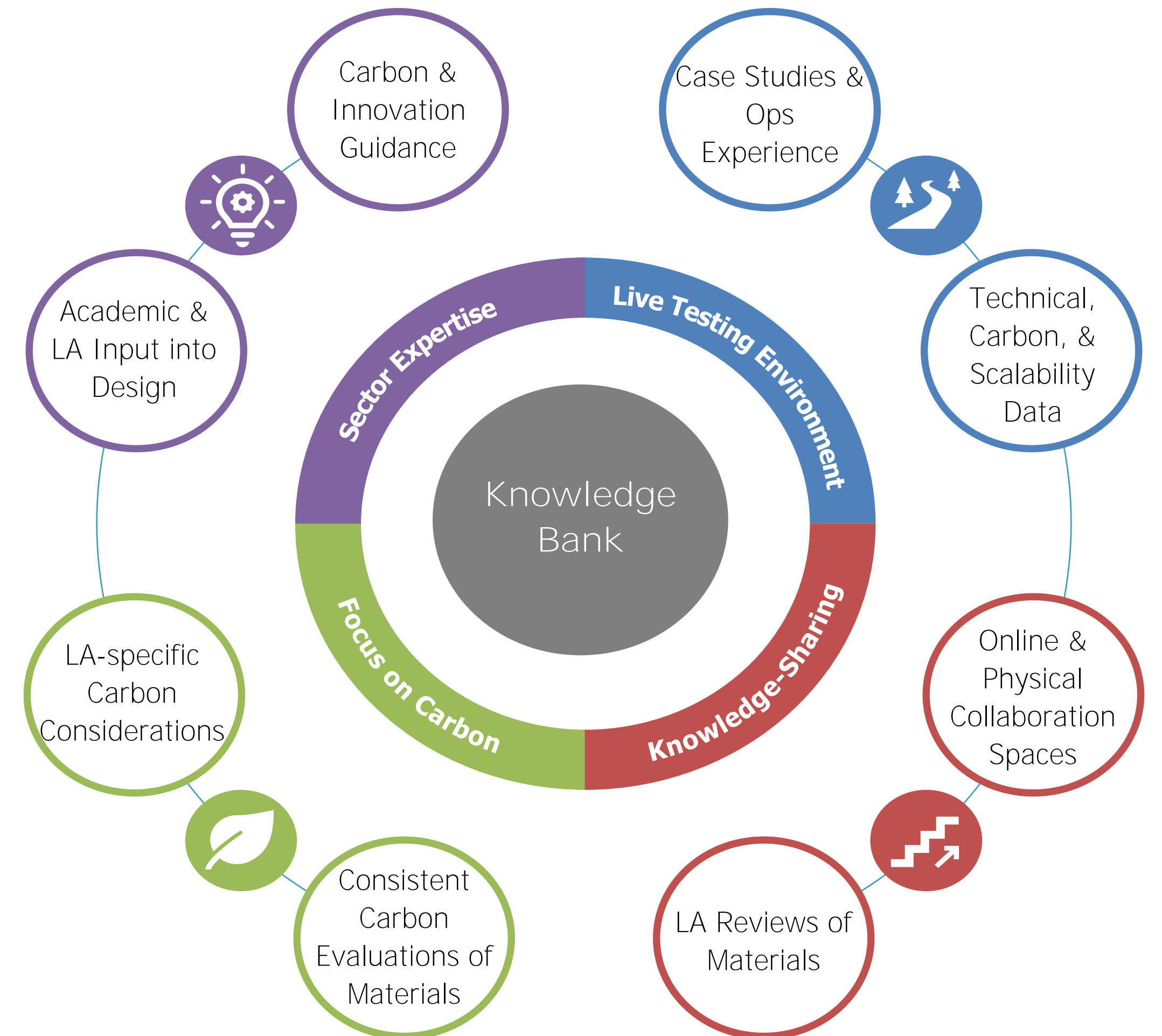


The Knowledge Bank

▶ Key tool for the Centre of Excellence to drive collaboration, reduce siloes, and disseminate trial data and evaluations.

▶ End-user requirements and high-level wireframes completed, with support from behavioural science consultancy, Thinks Insight.

▶ Next steps:
Supplier selection, onboarding and initial prototyping.
Launch at the end of 2024.



Next Steps

Key milestones in 2024

Market Scanning & Trials

- Signage: signposts and signfaces
- Resurfacing and surface treatments
 - Concrete solutions

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 use

How Can You Get Involved?

Join the UK-wide movement to decarbonise road materials

▶ Get in touch to partner with us, share your innovation experiences and get first access to the knowledge bank

▶ Share innovations for materials testing, gaining access to sector leaders and live trial sites

▶ Complete our survey for local authorities so we can provide the most value for the sector through our live trials

✉ info@decarbonisingroads.co.uk

🌐 www.decarbonisingroads.co.uk



End-User Requirements



Behavioural Change

How we are leveraging behavioural science to design a fit-for-purpose knowledge bank

10 qualitative, end-user interviews held with LAs across Scotland and England

Identification of individual, social and material influences on LA behaviour when identifying and adopting material innovations

Operational, informational, organisational, and functional requirements identified for the knowledge bank development based on LA feedback

Full behavioural research report available on our website
 www.decarbonisingroads.co.uk



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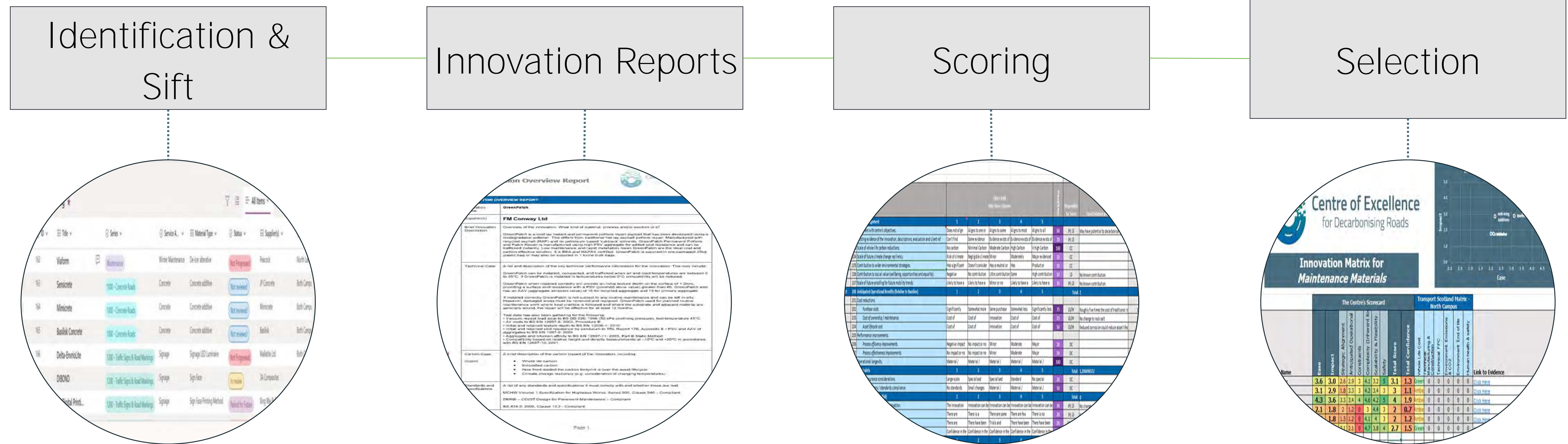
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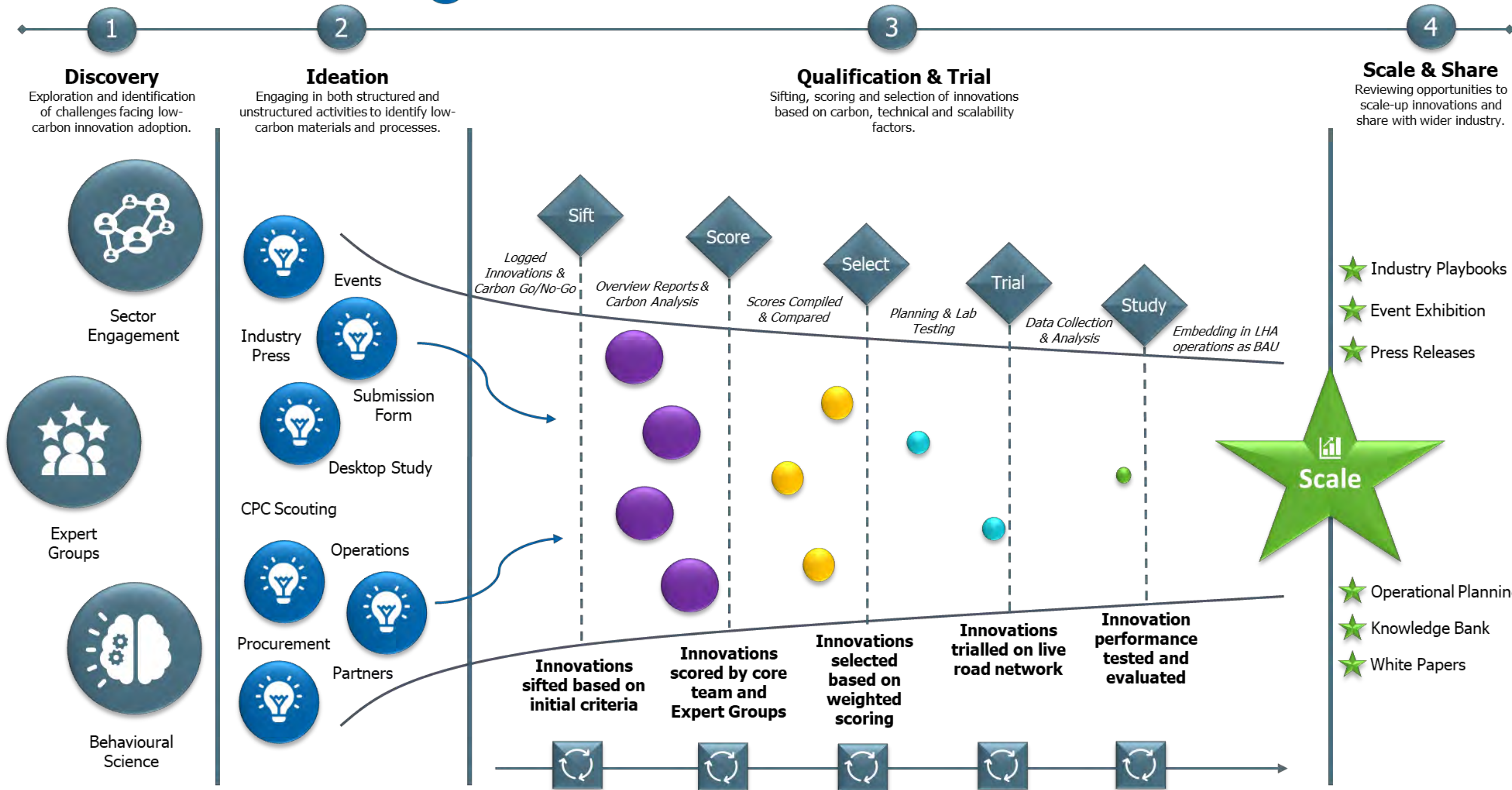
Case Study

Maintenance Materials





Innovation Process





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Corridor and place-based decarbonisation

Beth Lewis

Principal Engineer

Devon County Council

Pamela McGuinness

Innovation Programme Lead

Liverpool City Council

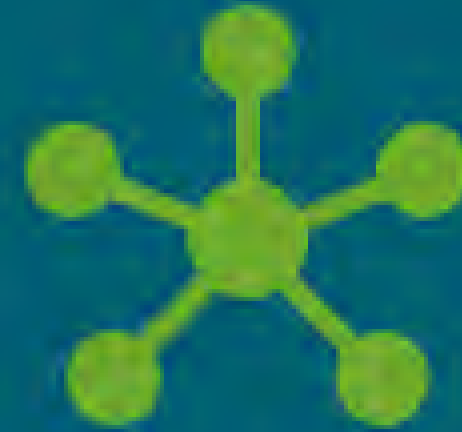
Mike O'Dowd Jones

Service Director for Infrastructure and Transport

Somerset Council



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Corridor & Place Based Decarbonisation LIVE LABS 2 THEMATIC GROUP

17 April 2024

Beth Lewis – Principal Engineer (Devon County Council)

Mike O'Dowd-Jones – Service Director for Infrastructure and Transport (Somerset Council, Wessex Partnership)

Pamela McGuinness – Innovation Programme Lead (Liverpool City Council)

Corridor & Place-based Decarbonisation - Live Labs Thematic Group

Corridor & Place Based Decarbonisation Theme

A382 MAJOR ROAD NETWORK SCHEME: Devon Live Lab

A carbon negative highways construction project across the whole life-cycle of the scheme.



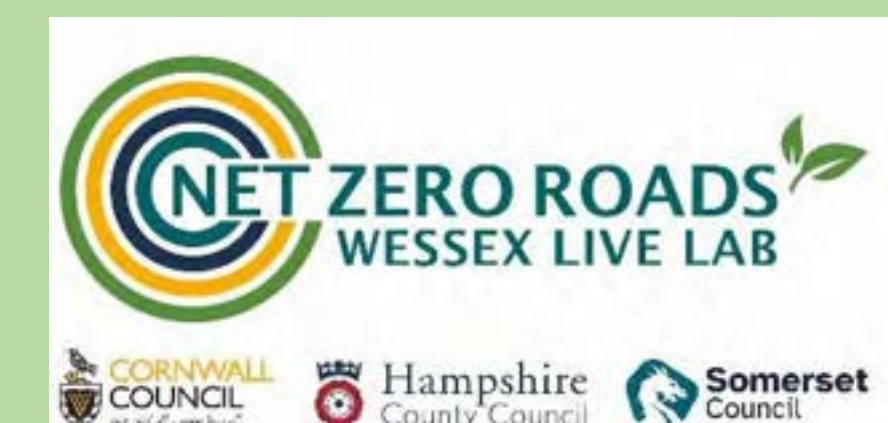
HIGHWAYS ECOSYSTEM: Liverpool Live Lab

Scalable low carbon optioneering and full lifecycle decision-making.



NET-ZERO ROADS: Wessex Live Lab

Pioneering net zero emission roads in Somerset, Cornwall and Hampshire in nine 'Net Zero Corridors', which will act as a proxy for maintenance on all highways.



Corridor & Place-based Decarbonisation - Live Labs Thematic Group



One Theme: Three Different Scales



One Site, One Road



Multiple Sites, One City

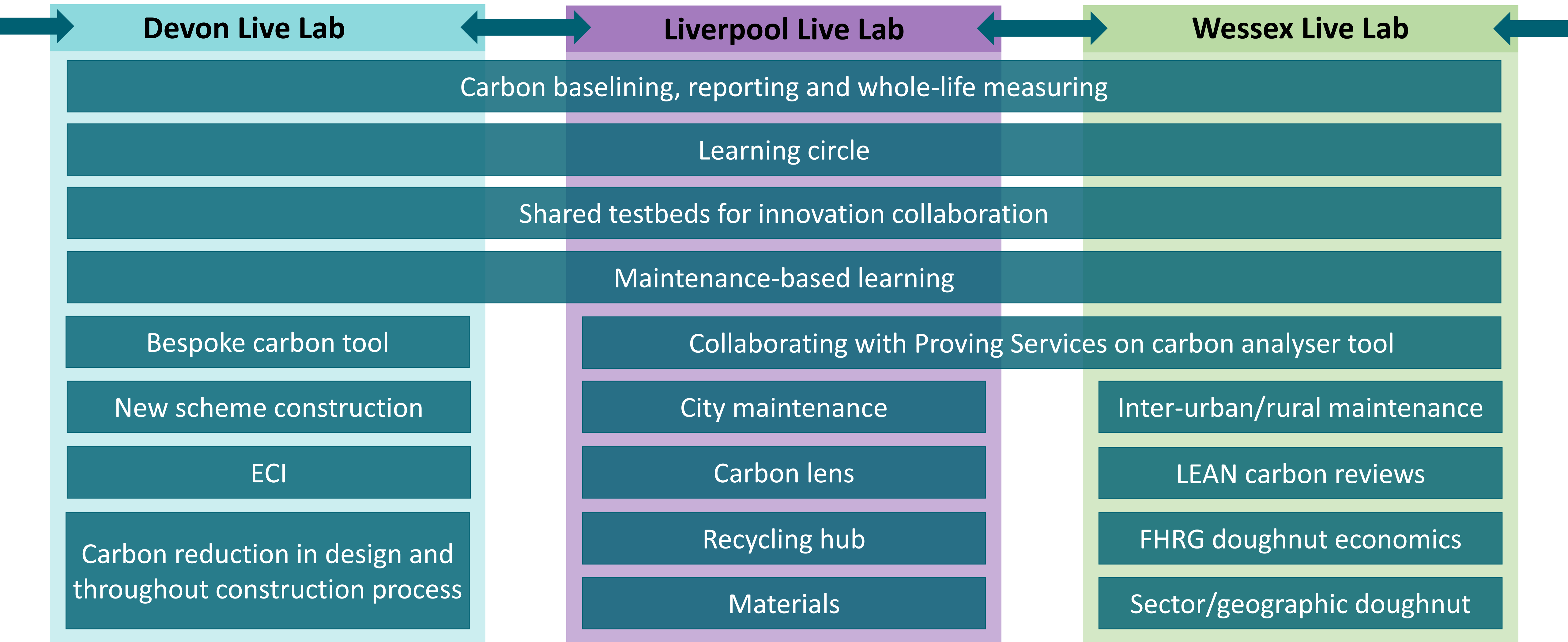


Multiple Sites, Multiple Counties

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Live Lab Synergies



Corridor & Place-based Decarbonisation - Live Labs Thematic Group

Shared Progress to Date



Shared approach to innovation identification and scoring



Maximising scaling-up opportunities with other Live Labs e.g. biochar



Establishing learning circles on key topics e.g. exploring doughnut economics and shared toolkit



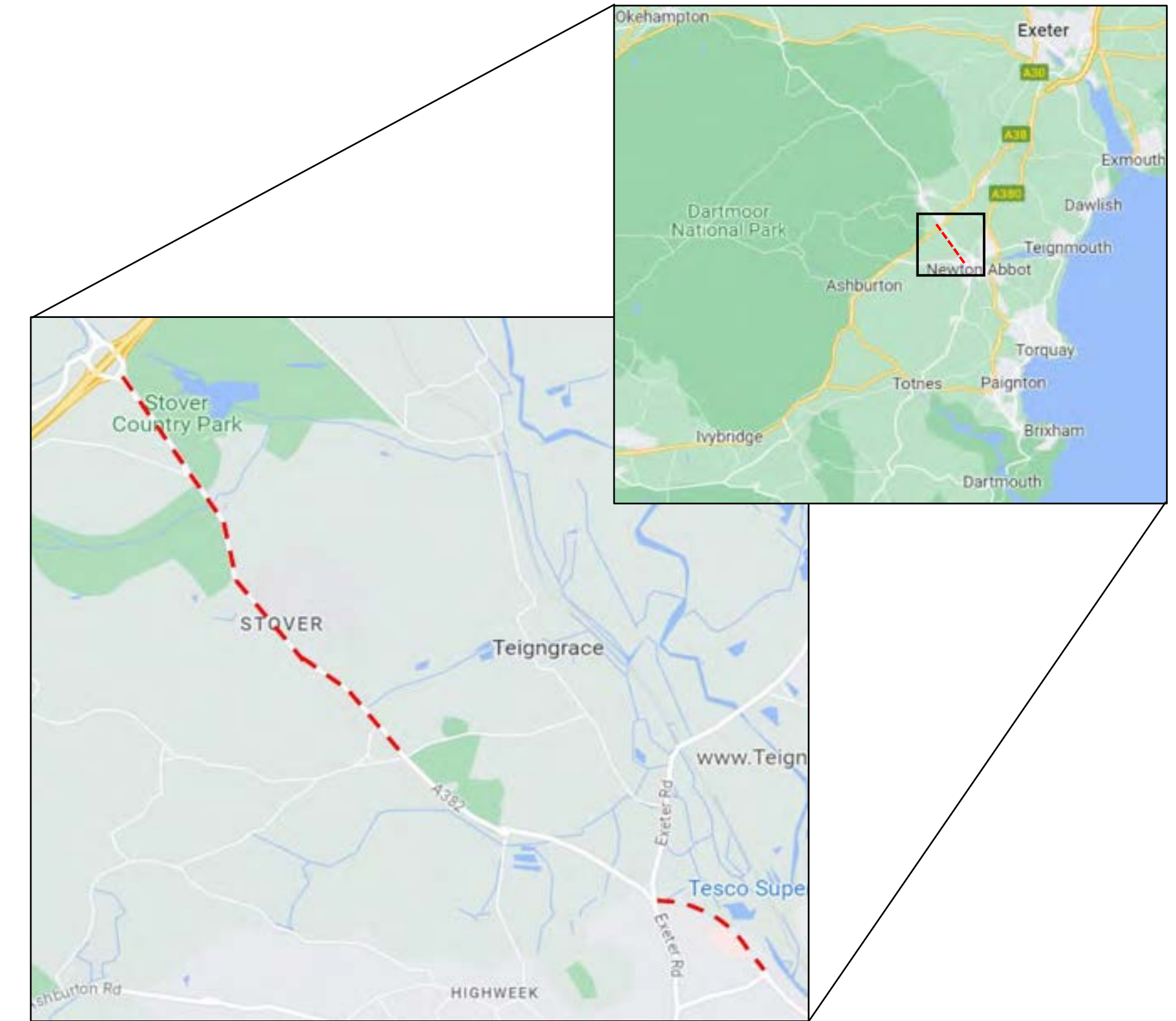
Quarterly Thematic Group meetings to ensure cross-learning

Corridor & Place-based Decarbonisation - Live Labs Thematic Group



DEVON LIVE LAB – Carbon Negative Road

- A382 Major Road Network (MRN) improvement scheme is aiming to improve traffic congestion into Newton Abbot:
 - 2.5 km of improvements (new dual carriageway, widening, realigning)
 - An additional 0.4 km new build link road
 - 3 new roundabouts
- Live Labs 2 funding is being used to fund carbon-reducing innovations on the scheme
- Aiming for **carbon negative** across the whole-life cycle of the construction project
- A baseline of **10,279 tonnes of CO2e** has been calculated



MILESTONE
INFRASTRUCTURE
A part of MIRA Services

Devon
County Council

UNIVERSITY OF
EXETER



Corridor & Place-based Decarbonisation - Live Labs Thematic Group





DEVON LIVE LAB – Innovations Overview

TREE TRANSLOCATION

SAWMILL PROCUREMENT FOR RE-USE OF SITE-WON TIMBER

VOLUMETRIC CONCRETE MIXERS ON SITE

ENHANCED MINERAL WEATHERING

MYCORRHIZAL FUNGI PELLETS

BEHAVIOURAL CHANGE APPLICATION

CREATION OF BIOCHAR

APPROVED INNOVATIONS

Devon County Council | MILESTONE INFRASTRUCTURE

LOW CARBON ASPHALT

'LIVING' ACOUSTIC BARRIERS

LOW CARBON CONCRETE

CARBON NEGATIVE AGGREGATES

RE-USE OF SOILS

CARBON NEUTRAL WELFARE UNITS

LOW CARBON TRANSPORT FOR OPERATORS

ALTERNATIVE FUELS

UPCOMING INNOVATIONS

Devon County Council | MILESTONE INFRASTRUCTURE

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NET ZERO ROADS

WESSEX LIVE LAB



Supported by Wessex Live Lab 'Learning Circle' member

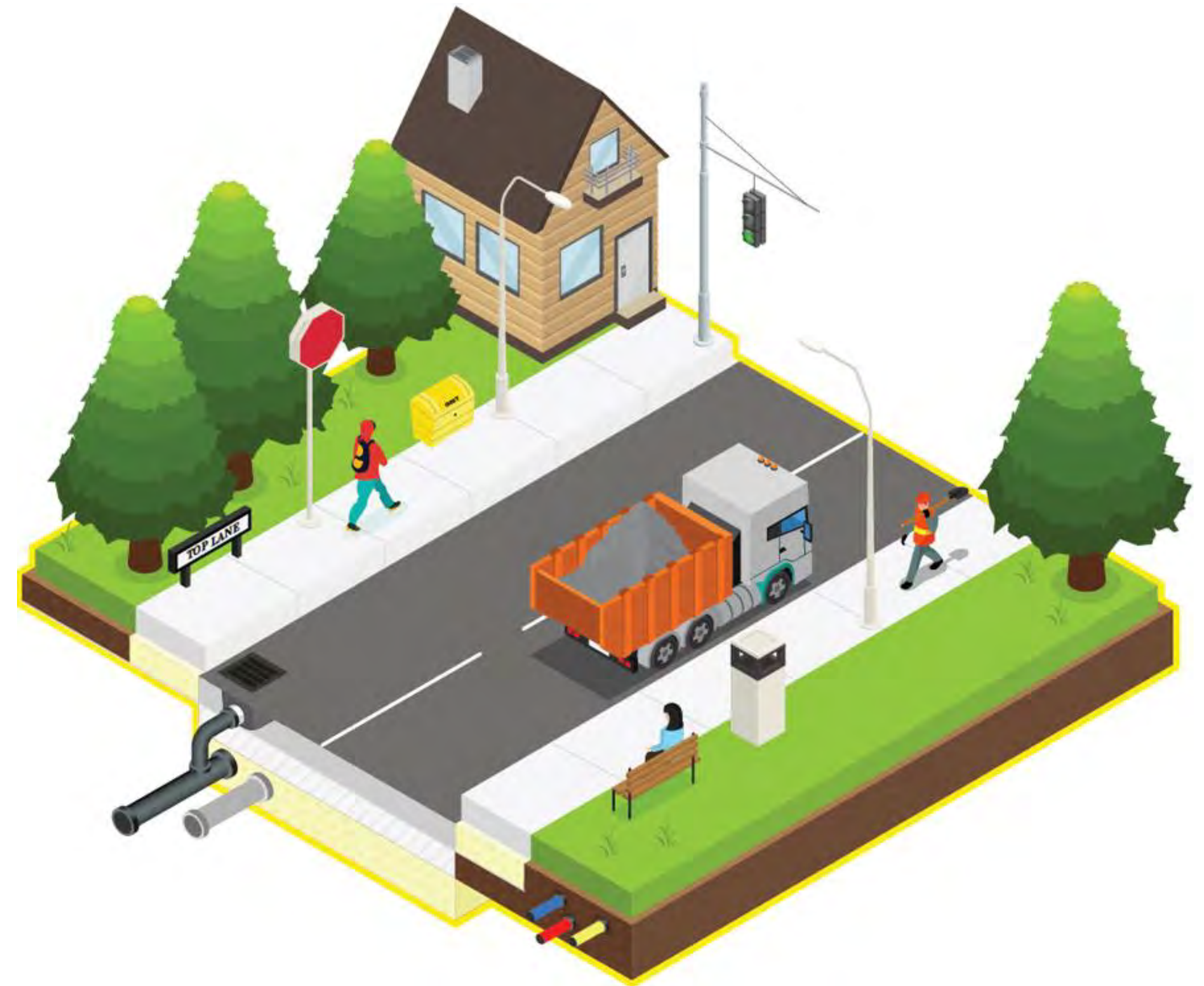


WESSEX LIVE LAB – testbeds for innovating, pioneering, transforming



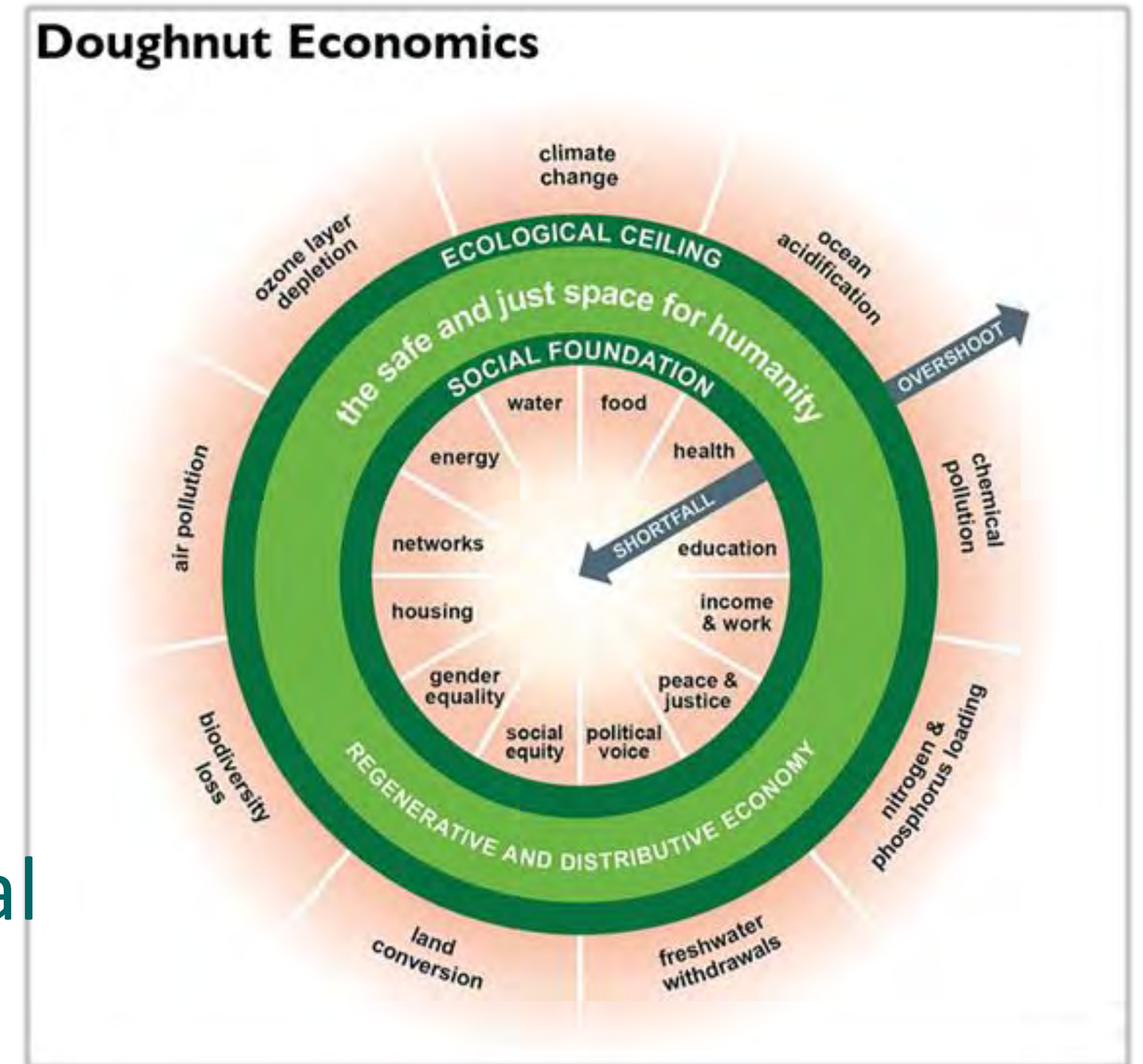
WESSEX LIVE LAB – the whole service & changing business as usual

- ① The materials we use
- ① The products we use
- ① The plant we use
- ① How we deliver services
- ① When and where we deliver them



WESSEX LIVE LAB - using a new lens to look at everything we do

- Data-led decision-making using Carbon Analyser
- Research & development of carbon budgeting & future scenario planning
- Underpinned by Doughnut Economics (impact on wider environmental and social sustainability)



LIVERPOOL LIVE LAB – Our Approach



Partnership across:

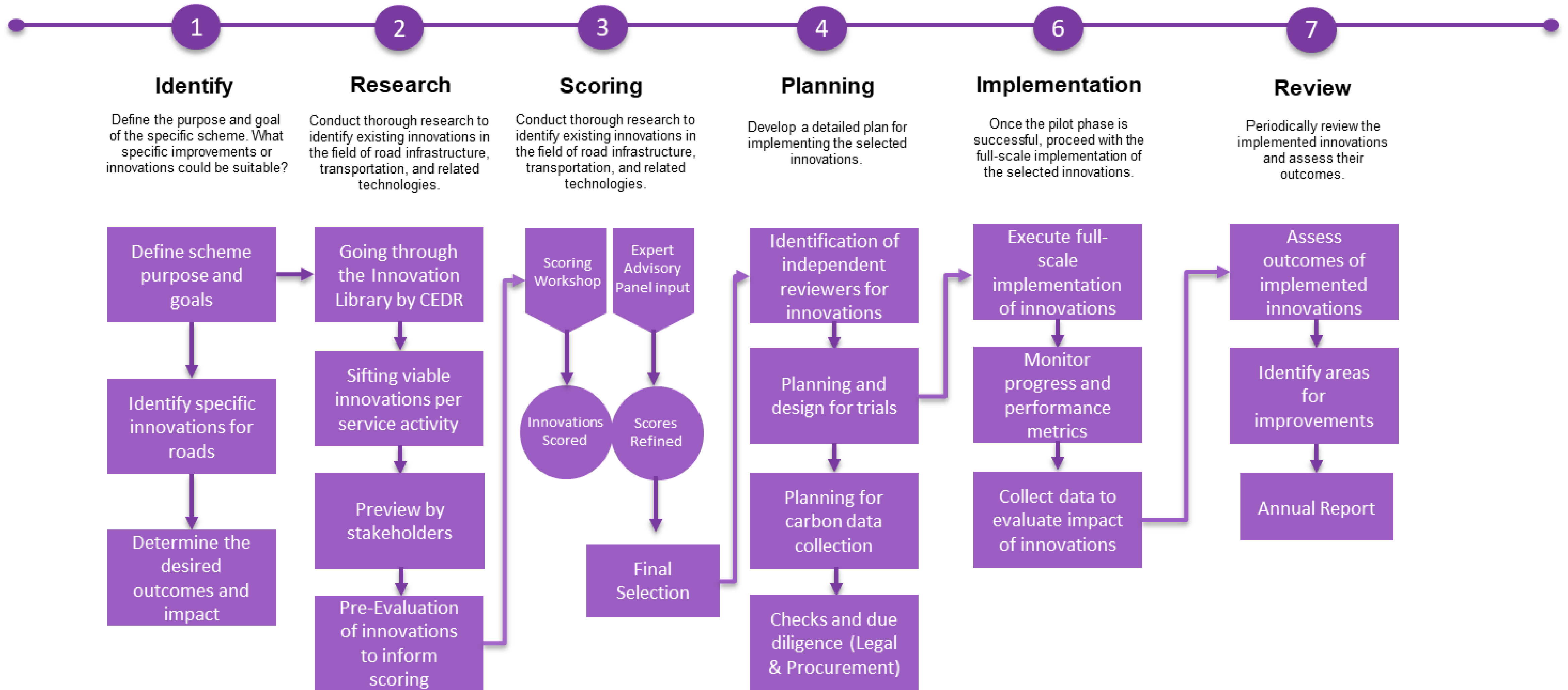
- Local Authorities
- Academia/ Research
- Industry Specialists
- Expert Panel

Using experience/ lessons learnt from across the wider Live Labs cohort

We are not just considering products and operational processes, but also the enablers for new ways of working, policies and behaviour change

Corridor & Place-based Decarbonisation - Live Labs Thematic Group

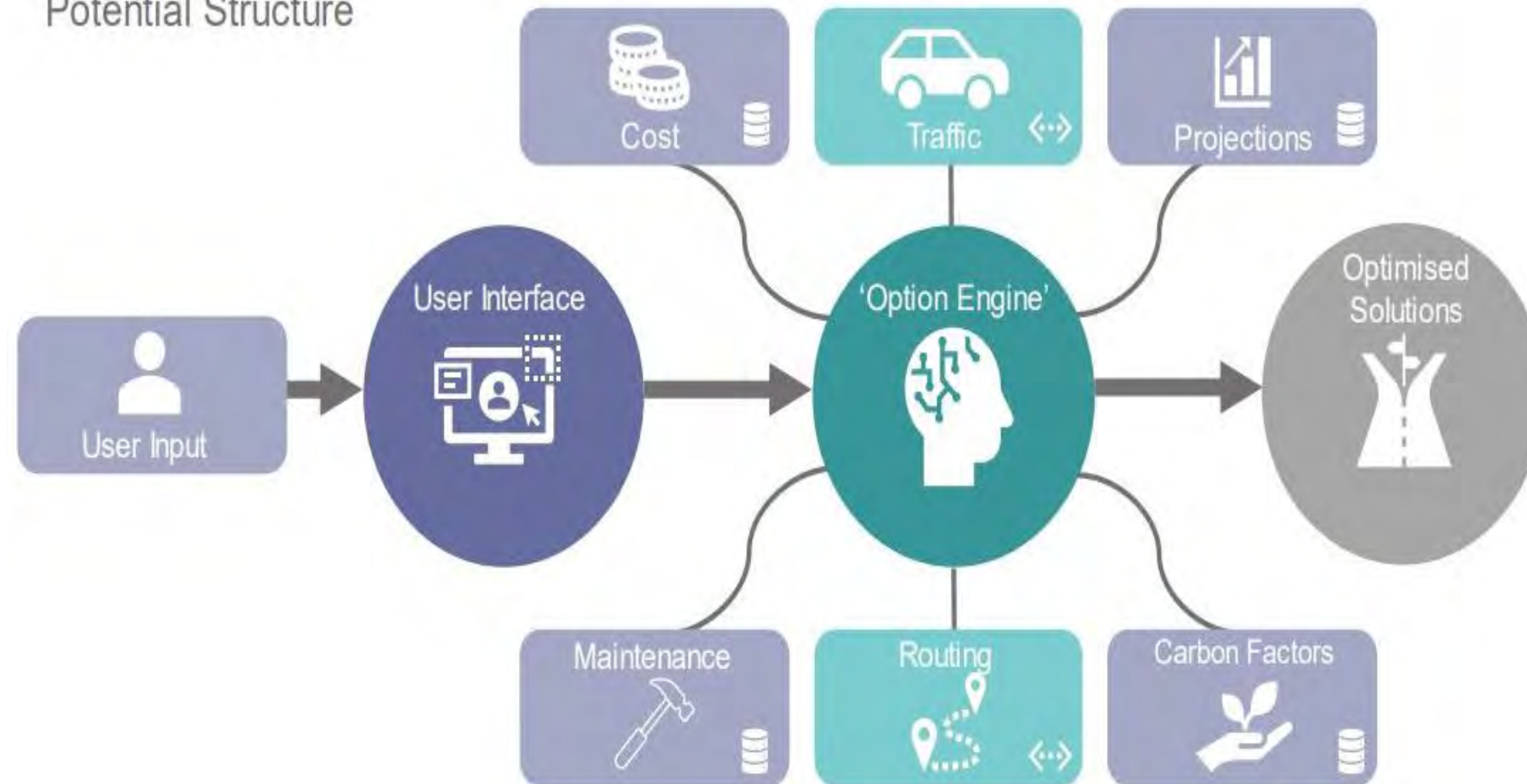
LIVERPOOL LIVE LAB – Innovation Process



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LIVERPOOL LIVE LAB – ‘Options Configurator’ Tool

Configurator tool
Potential Structure

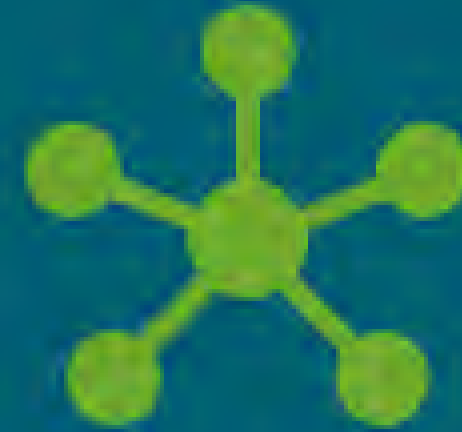


Working with industry specialists to develop a proof-of-concept tool for Options Analysis, Optimisation & Prioritisation to be called the ‘Options configurator’

The ‘Options Configurator’ will enable Liverpool City Council Highways Team to develop and prioritise scheme options utilising new low-carbon innovations; evaluating costs, operational performance, risks, and resource demands prior to any significant investment.

This new approach to optioneering will allow new policies, specifications and materials to be simulated.

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Corridor & Place Based Decarbonisation LIVE LABS 2 THEMATIC GROUP

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Thank you

<https://www.adeptnet.org.uk/livelabs2>

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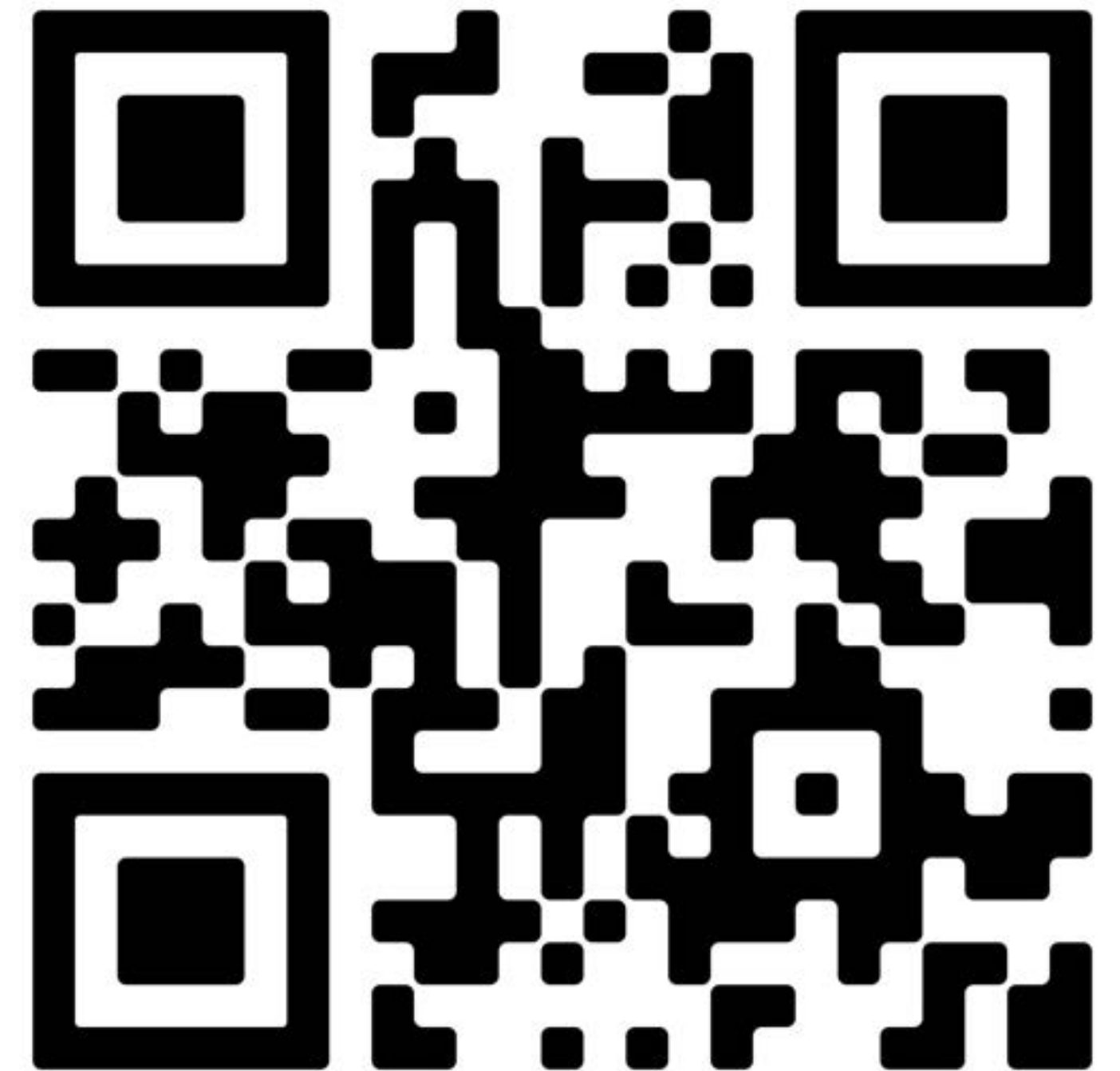
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A green carbon laboratory

Matt Davey

Associate Director Highways Transport and Planning

West Sussex County Council



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Greenprint

A **green carbon laboratory** examining the role that the highways non operational 'green' asset can play in providing a source of materials and fuels to decarbonise highway operations



What it will look like...

Anaerobic digestion



Hydrochar Biochar





Greenprint.

‘A carbon negative systems model for green infrastructure management’

South Gloucestershire Council and West Sussex County Council and partners in scope including:



Four key challenges we face:



A lack of 'systems thinking'



Contractual barriers



Not valuing the green estate

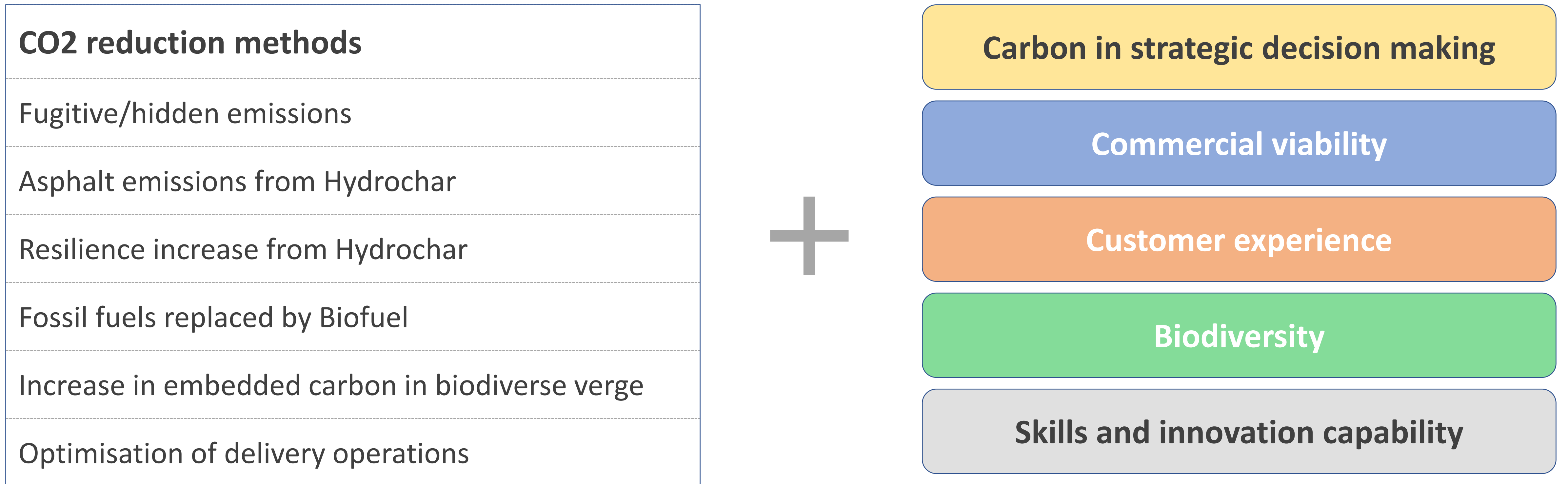


Hidden emissions

Greenprint will **unlock, transform** and **harness** this value

Carbon monitoring and value assessment

The project removes carbon emissions in **six** ways – each of these have distinct measurement and data collection strategies



The live-lab is built with **replication, scale** and **financial viability** as the focus from start



- The Greenprint is a **'how to guide'** and business case for zero-carbon green estate management

- **Replicable** across diverse councils

- **Building** green skills, jobs and tech

- Scaled across **FIVE** more councils in lab

- Regular engagements and knowledge share



It's all about the carbon...



South Gloucestershire and
West Sussex



UK green spaces

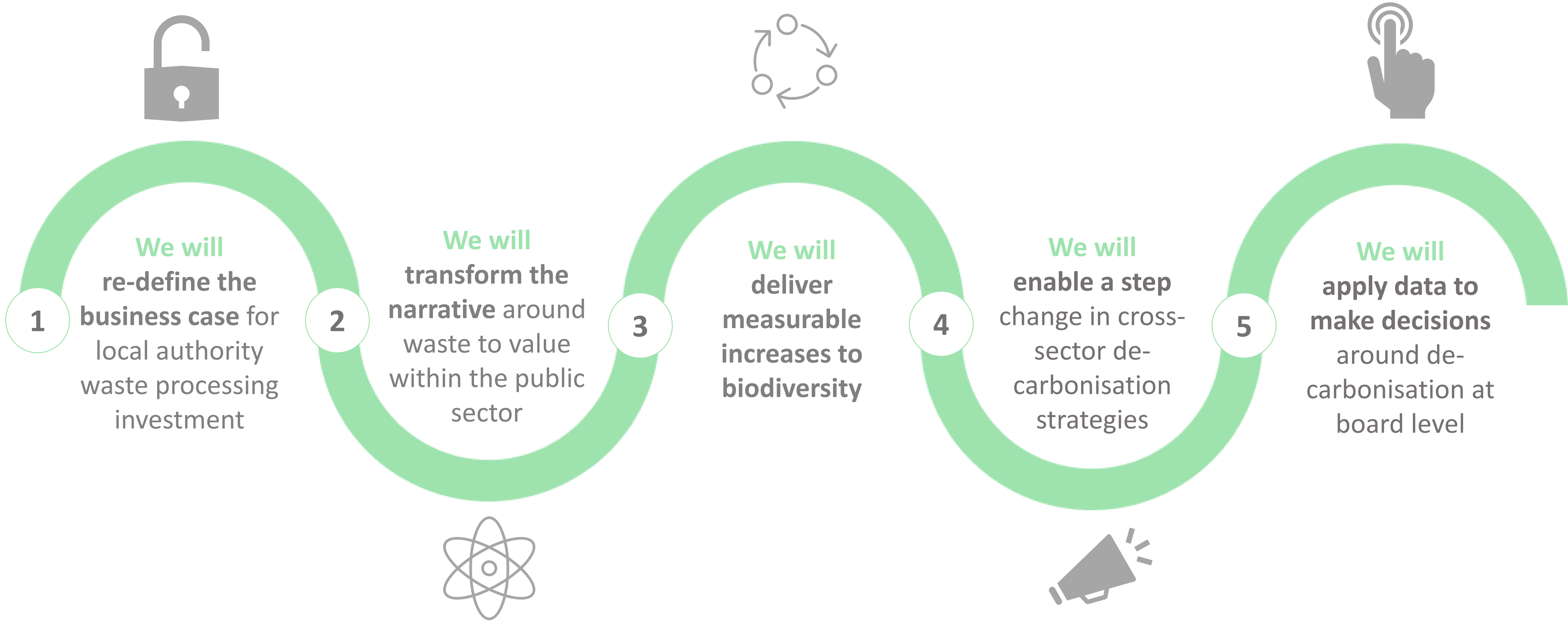
CO2 reduction method	(Tonnes CO2e)	(Tonnes CO2e)
Fugitive/hidden emissions	3,240	540,000
Asphalt emissions from Hydrochar	40	6,360
Resilience increase from Hydrochar	300	16,666
Fossil fuels replaced by Biofuel	260	43,200
Increase in embedded carbon in biodiverse verge	300,000	30,000,000
Optimisation of delivery operations	1000	160,000
Total reduction in tonnes	304,840	30,766,266



Like removing **67k** cars
from the road

Like removing **6.7m** cars
from the road or **5%** of
the entire UK fleet!

... Greenprint delivers so much more



Why us – why now?



Key technologies have matured, that mean this is the right time to invest



You're getting the experts in the field – both councils and their partners sit at the leading edge of this area of innovation

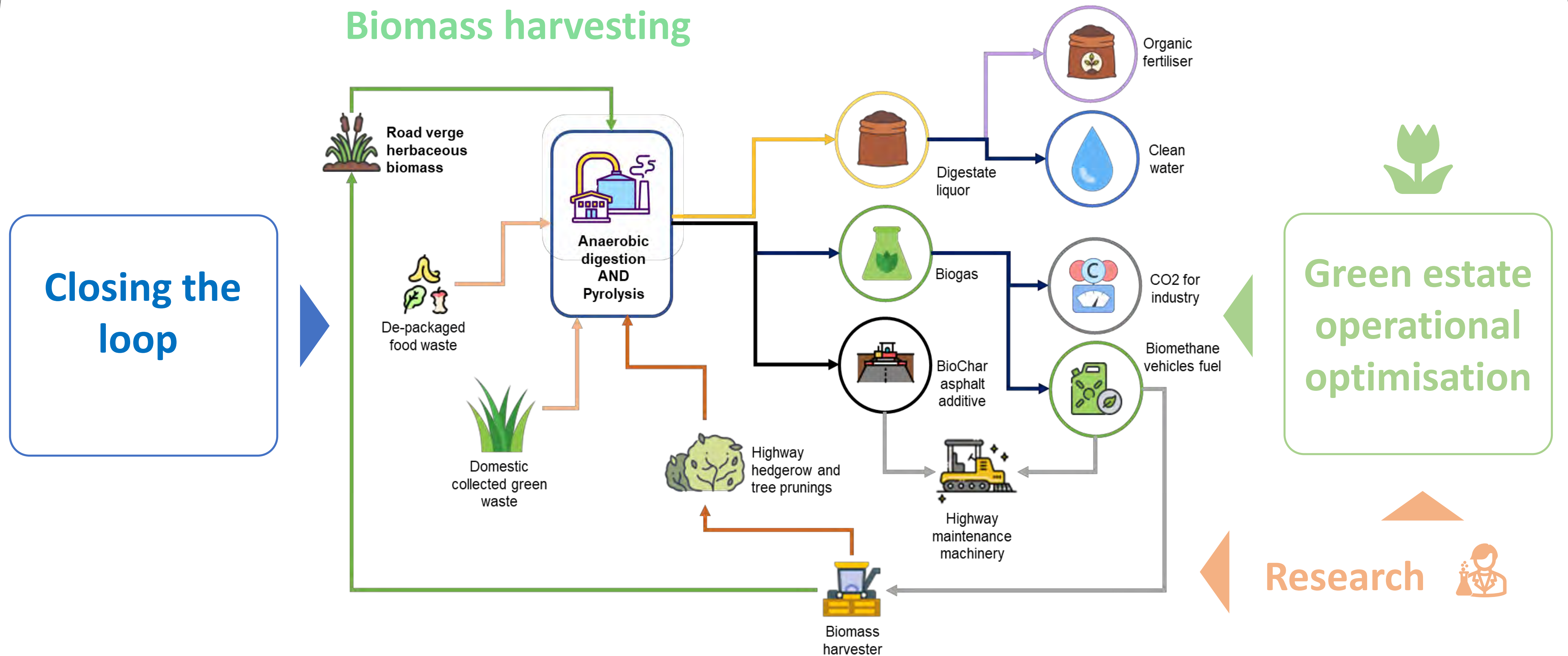


The differing environments of SGCC and WSCC, alongside the Western Gateway presents **the perfect testing environment**

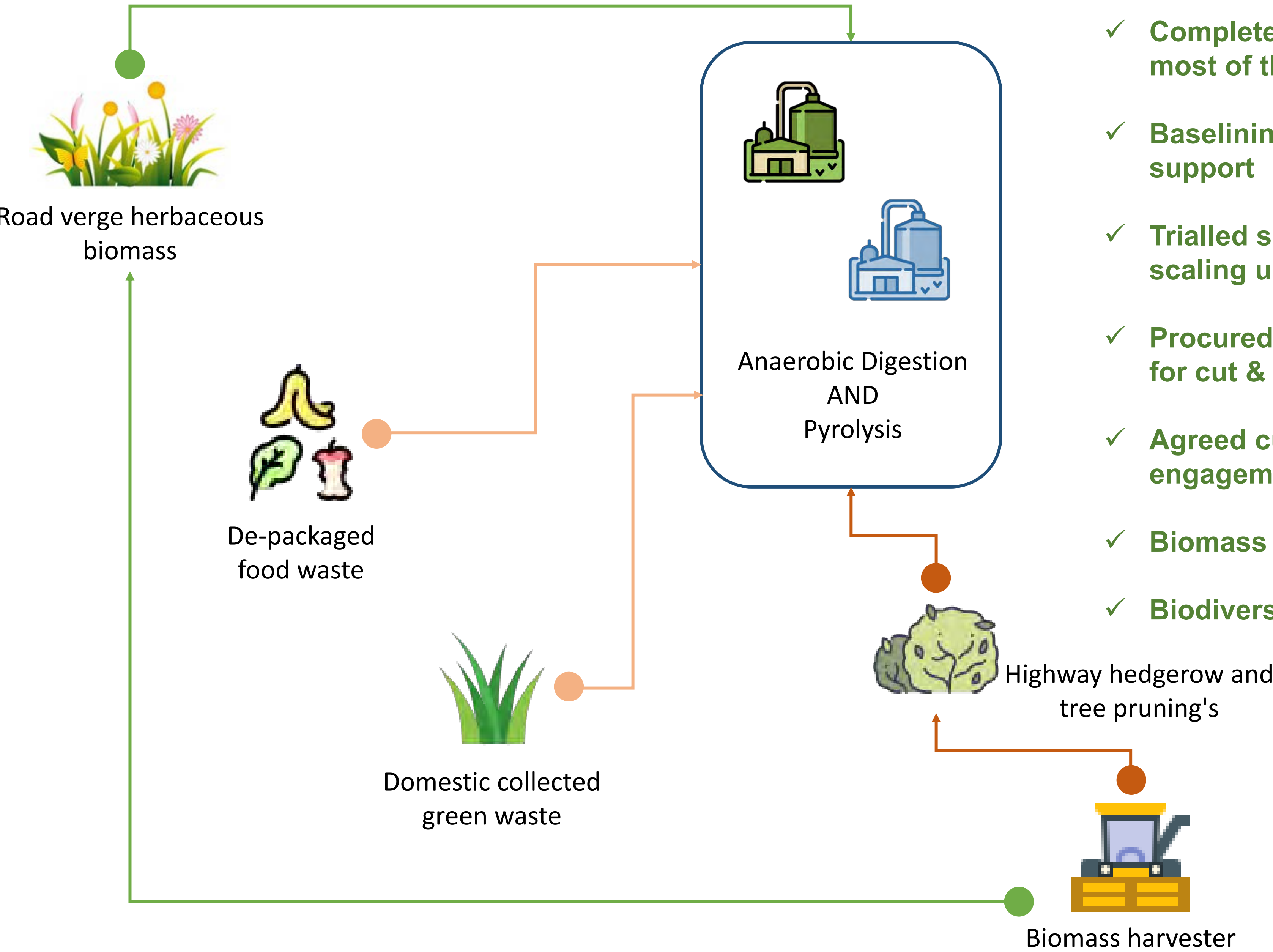


Live-Labs will enable rapid acceleration of this model at a velocity not considered previously possible

A unified programme across both councils

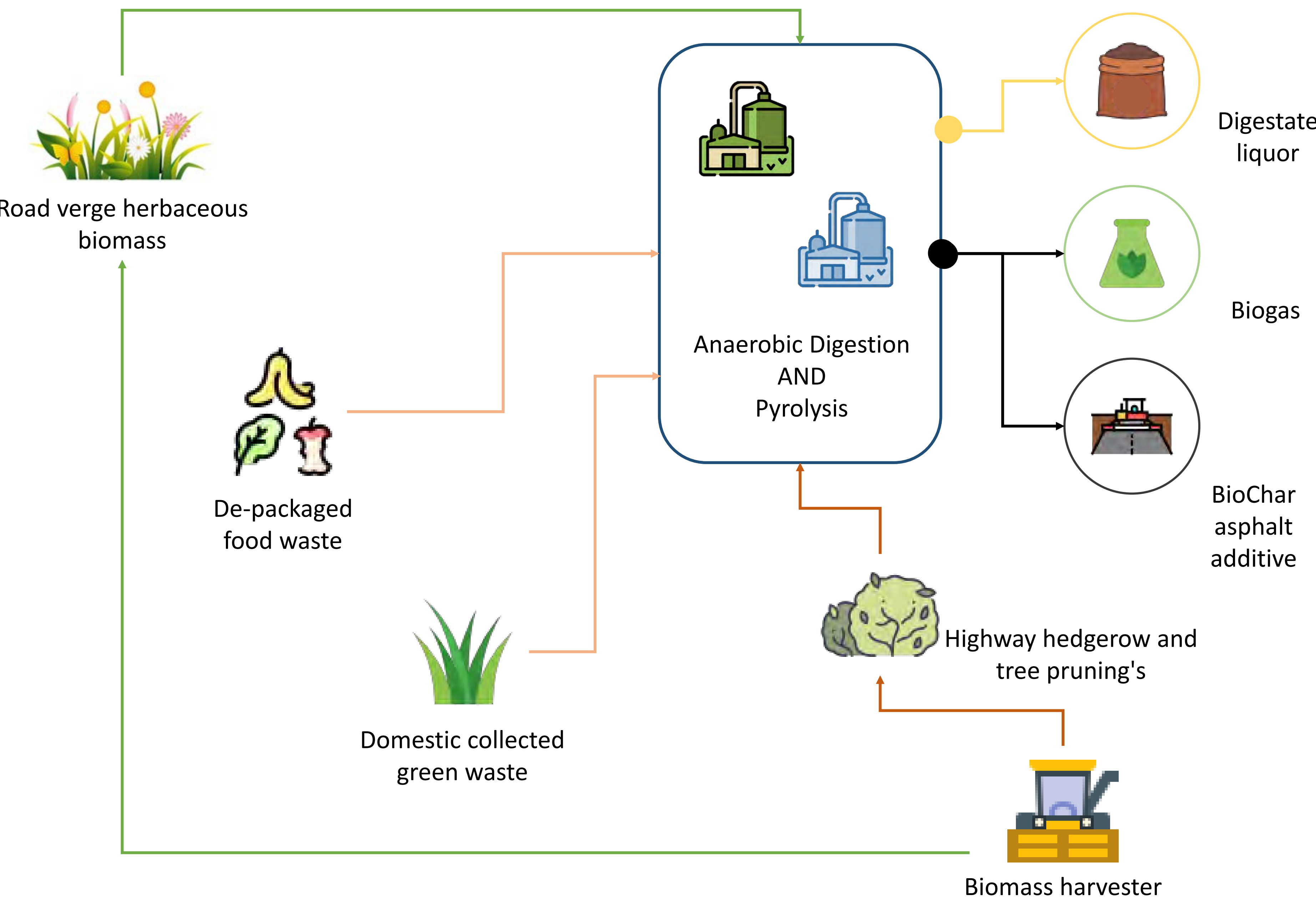


Phase 1 : INITIATION STAGE (Investigations/Research/Design/Small Scale Trials)



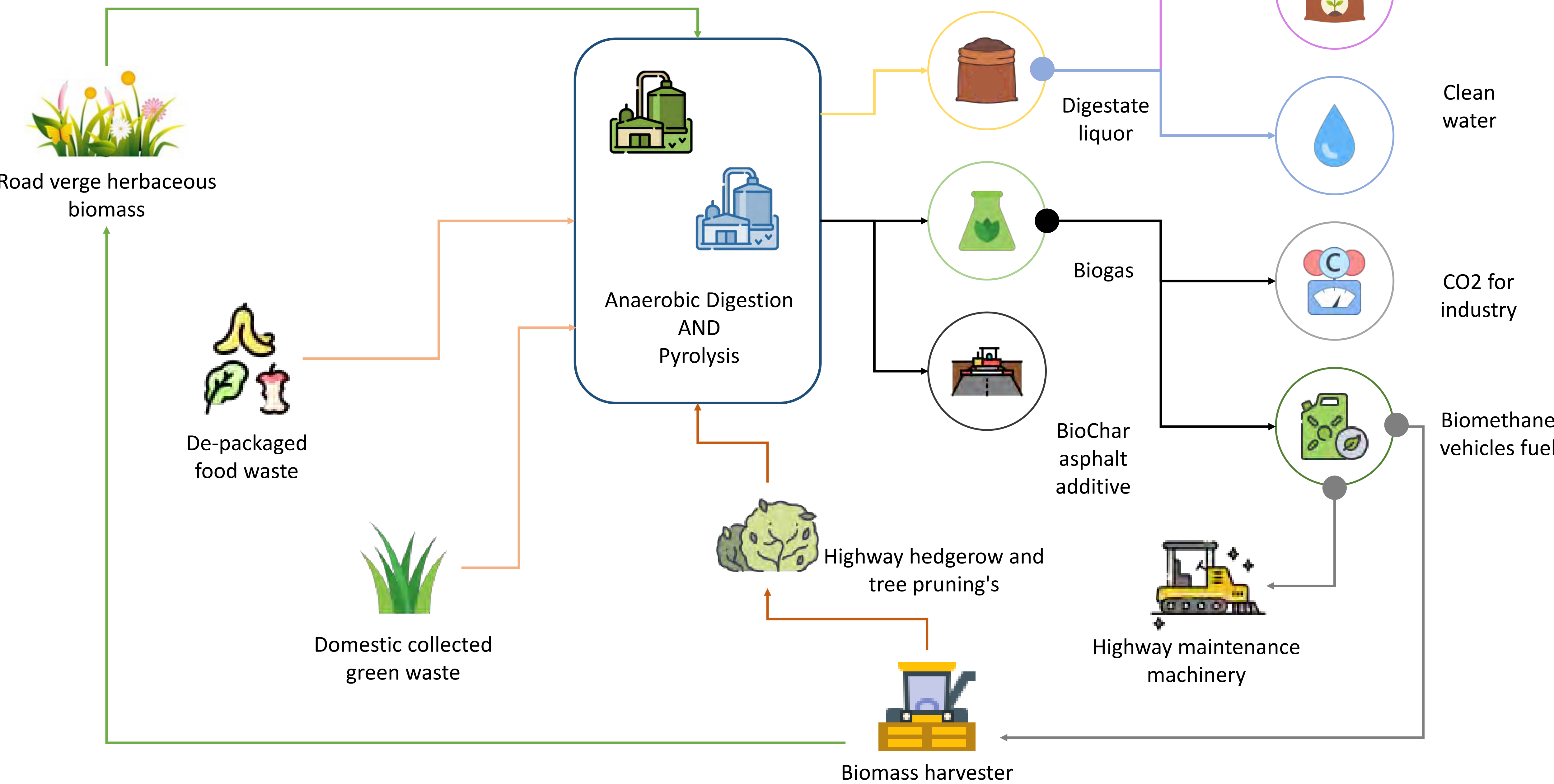
- ✓ Completed procurement of Work Packages leads and most of their activities
- ✓ Baselining the carbon of highways service - with FHRG support
- ✓ Trialled small-scale urban cut & collect equipment & scaling up to a full team
- ✓ Procured machinery and logistics for year 2 scaled up for cut & collect operation 2nd team
- ✓ Agreed cut & collect programme for year 2 - via engagement with parishes and boroughs
- ✓ Biomass Lab testing by UoN
- ✓ Biodiversity optimisation planning

Phase 2 : SCALE UP STAGE



- Test scaled-up urban cut & collect equipment and logistic
- Procurement of University of Nottingham / Invica Industries tests
- Lab scale biomass processing – for hydrochar & biochar characterisation
- Commercial scale biomass processing – tonne quantities of hydrochar & biochar
- Asphalt test programme & road trial
- Assessment of biochar applications
- Full Life Cycle Analysis
- Bio-diversity analysis and optimisation
- Wider engagement with parishes and external local authorities
- Benefit Realisation assessment

Phase 3 : FULL OPERATION (BAU trials)







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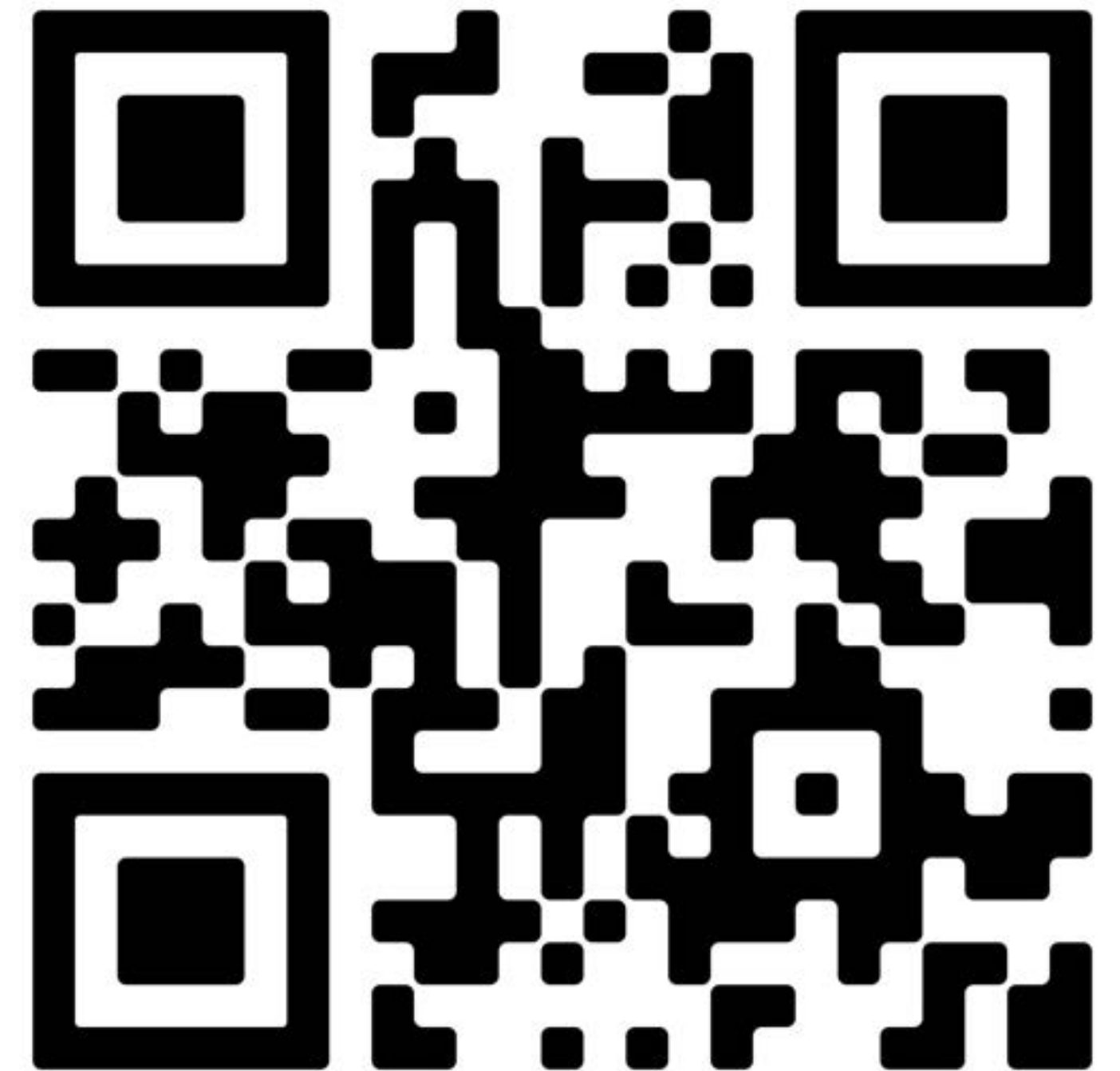
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A future lighting testbed

Karl Rourke

Project Manager – Live Labs 2 East Riding

East Riding of Yorkshire Council



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Association of Directors of
Environment, Economy, Planning & Transport



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High Visual Efficiency for Low Carbon Lighting

Karl Rourke
Project Manager
East Riding of Yorkshire Council





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Project Overview

- Testing standards and entrenched beliefs
- Focussing on lighting in areas where it is deemed a safety mitigation
- 9 Local Authority partners assisting with trials
- Seeking alternative road layouts providing visual information required
- Appropriate lighting for non carriageway users



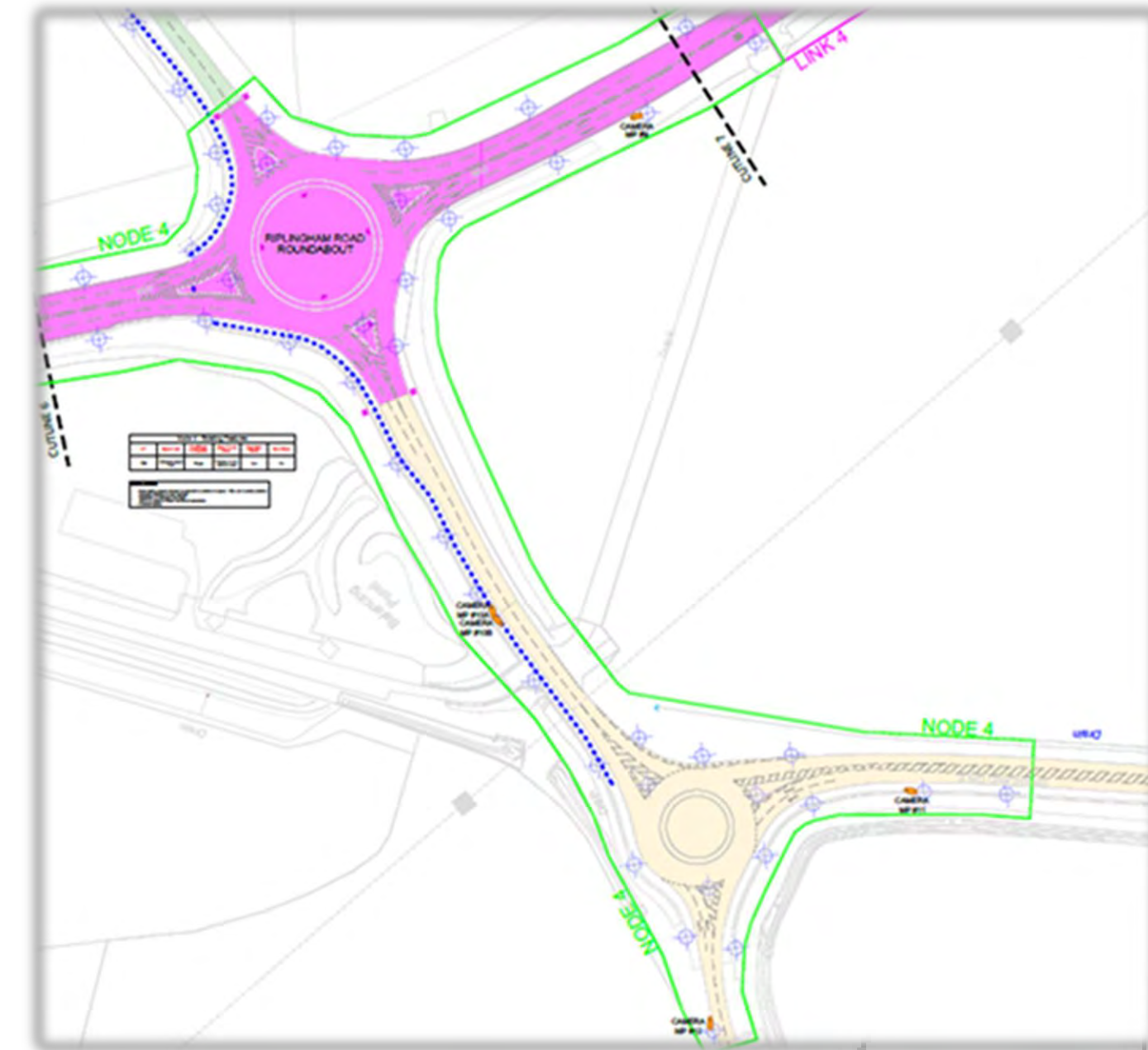


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Key Areas of Work

- Test bed segmentation and assessment
- Condition baselining
- Driver behaviour baselining
- Carbon baselining and assessment
- Driver behaviour and safety monitoring
- Urban lighting test beds





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Carbon Assessment

- Principal element of the program
- Created in conjunction with Leeds University
- Assessment and evaluation tool to assist with design, capital investment and replacement decisions
- Complete by September 2025
- Reliant on accuracy of manufacturers data, EPD's and ISO1400025





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Initial Test Beds

- Three test sites already installed
- Sites identified from capital resurfacing programme
- Sites were in non lit areas but have had illuminated studs and higher reflectivity lining applied along with higher reflectivity signs





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Upcoming Activities

- Full test bed implementation
- Progressing carbon assessment tool
- Driver behaviour baseline and post intervention assessment
- Communication and public engagement
- Urban and night time economy assessment
- Street lighting product development
- Further visual asset surveys





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Thank you

Enjoy the Expo





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Live Labs 2 and reducing carbon

Baselining, measuring and reducing carbon

Jane Anderson

Owner, Construction LCA

Live Labs 2 Commissioning Board member

ADEPT

LIVELABS2

Decarbonising Local Roads



EXPO 2024
Wednesday 17 April 2024

The background features abstract, overlapping geometric shapes in various shades of green, ranging from light lime to dark forest green. The shapes are primarily triangles and polygons, creating a dynamic, layered effect. The central area is white, providing a clean space for the text.

Livelabs2: Carbon Baselines

Dr Jane Anderson,
Carbon Lead, Livelabs 2 Commissioning Board

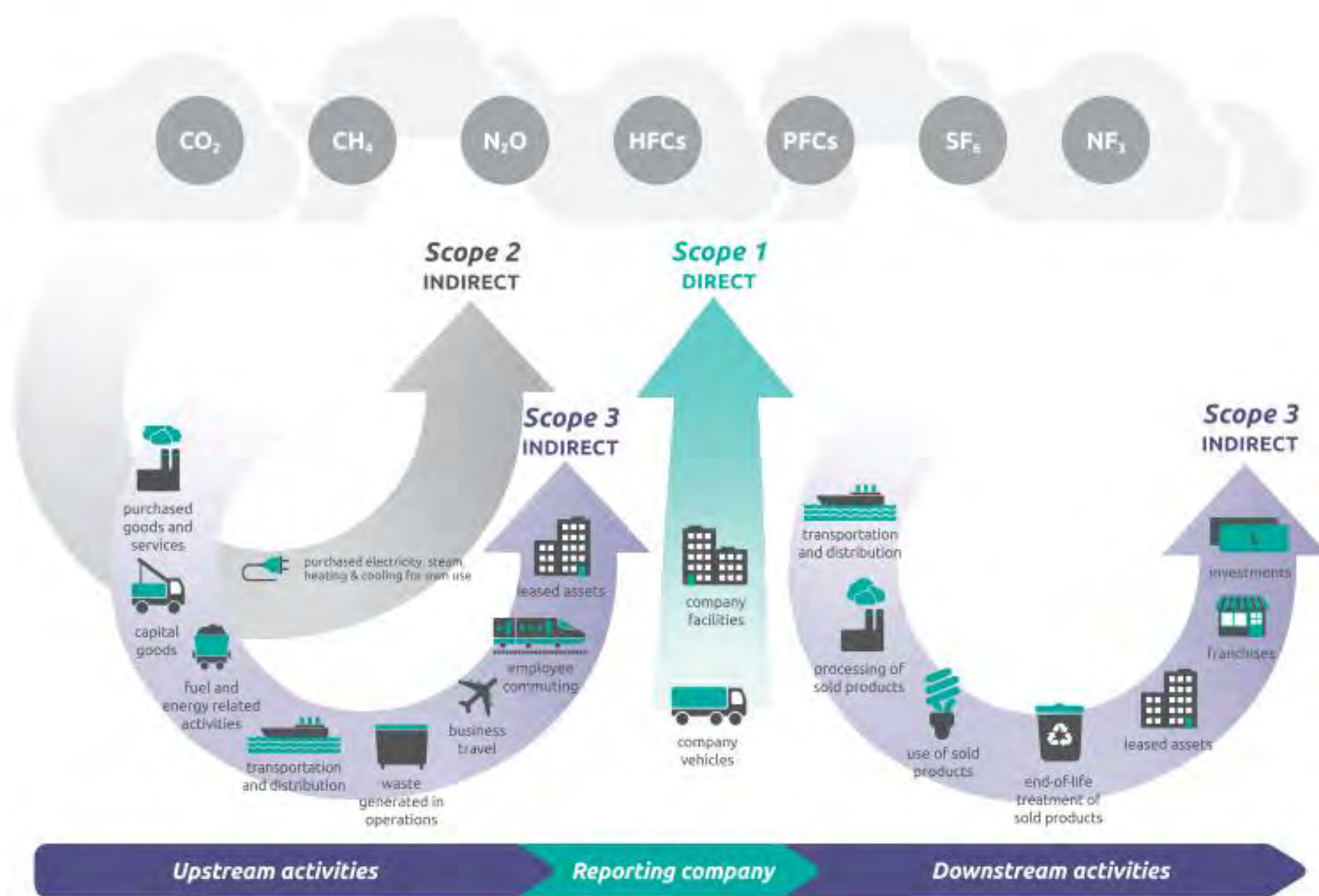
Top down findings

- ▶ Really good to see the engagement of the project teams
- ▶ Great consistency with many of the Livelabs using common tools, datasets and methodologies
- ▶ Agreement on the importance of including scope 3 embodied impacts
- ▶ Really interesting how the different projects have different hotspots

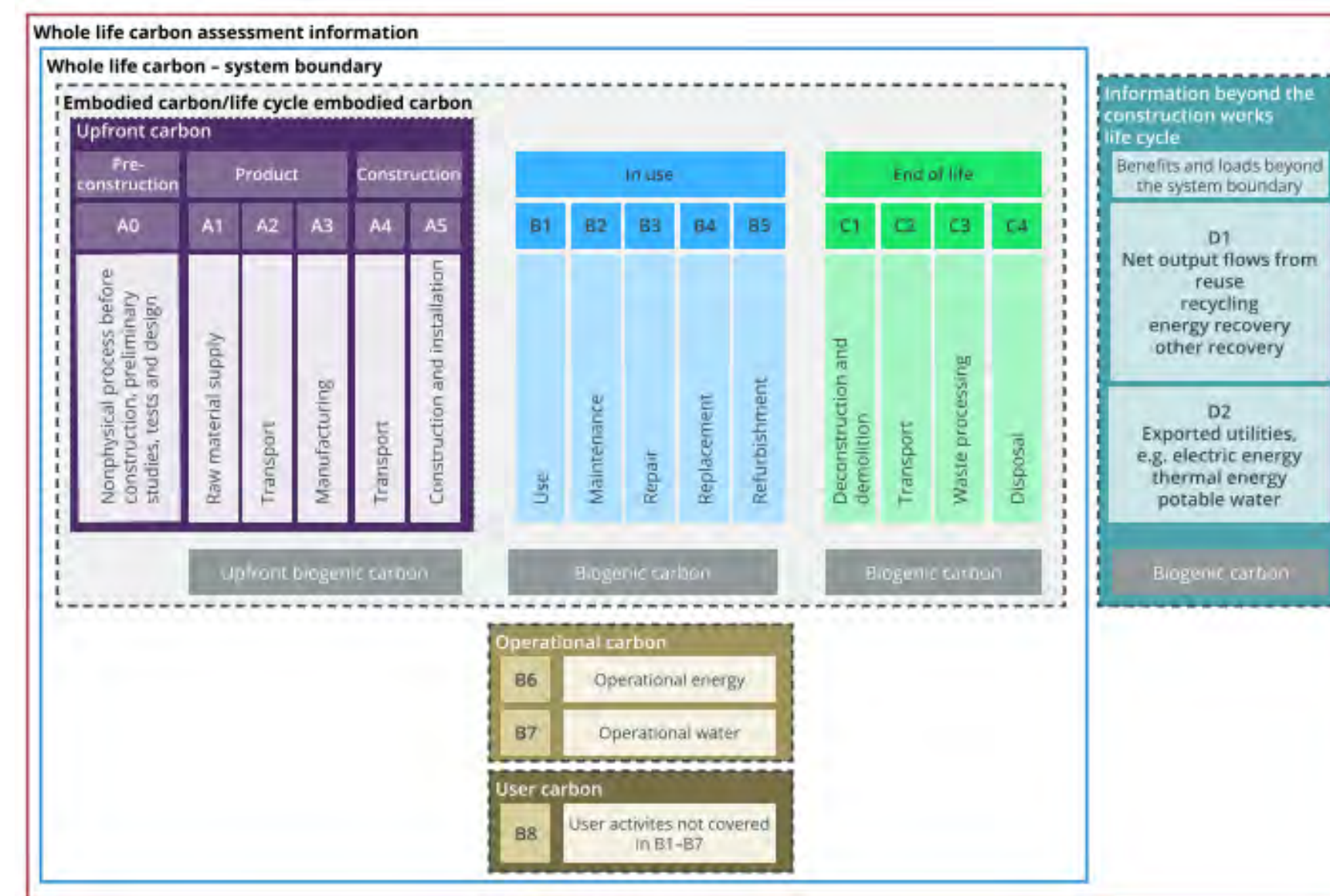
Top down findings

- ▶ GHG reporting v Whole Life Carbon reporting
- ▶ Methodological questions
 - ▶ Biogenic carbon and avoided impacts
 - ▶ Electricity
- ▶ Data questions
 - ▶ Sourcing data
 - ▶ Manufacturer claims and EPD

Types of Assessment



GHG Protocol and Scope 3 Emissions over 1 year



EN 17472 and the RICS Professional Statement on Whole Life Carbon v2 over 120 years

Methodological questions

Treatment of biogenic carbon storage

- ▶ Timeframes
- ▶ System boundary for avoided impacts

Methodological questions

Electricity

- ▶ Location-based or market-based approach to emissions
- ▶ Decarbonisation of the grid

Data Questions

- ▶ Sourcing Appropriate Data
- ▶ Hierarchy of data sources from the RICS Professional Standard v2 using the Carbon Data Quality Matrix and Data Confidence Scores
- ▶ Encourages specific data from manufacturers where it is robust
- ▶ **Discourages use of EPD data as “proxy” data** - generic data should be used if specific data is not available

Data Sources

- ▶ Manufacturer claims need to be interrogated
- ▶ Do they follow EN 15804 when they provide LCA or embodied carbon data?
- ▶ Where are the system boundaries?
- ▶ Is there double counting of benefits
- ▶ Do they include avoided burdens
- ▶ Do they include permanent biogenic carbon storage?
- ▶ Have their claims been peer reviewed or verified?



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Live Labs 2 and reducing carbon

Baselining, measuring and reducing carbon

Simon Wilson

Director

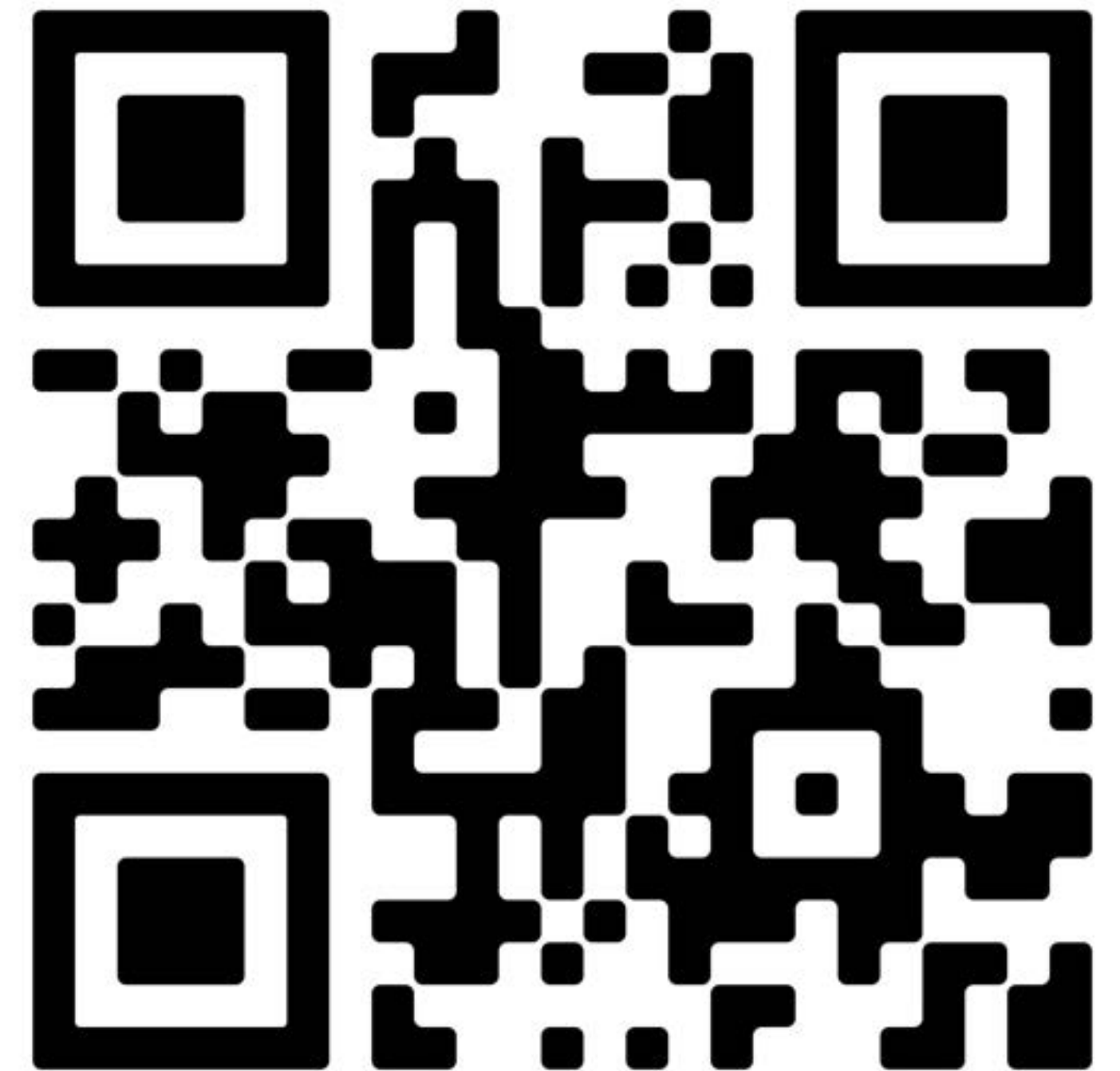
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Decarbonising Local Roads



Future Highways Research Group

Live Labs II Expo

FHRG Support Programme Overview

ADEPT / Proving Research Partnership



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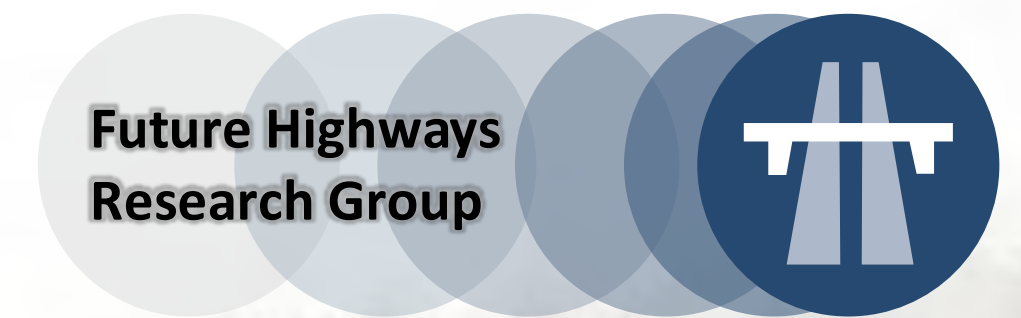
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Inventory-Based Carbon Accounting vs Activity-Based Carbon Analysis

Future Highways Research Group



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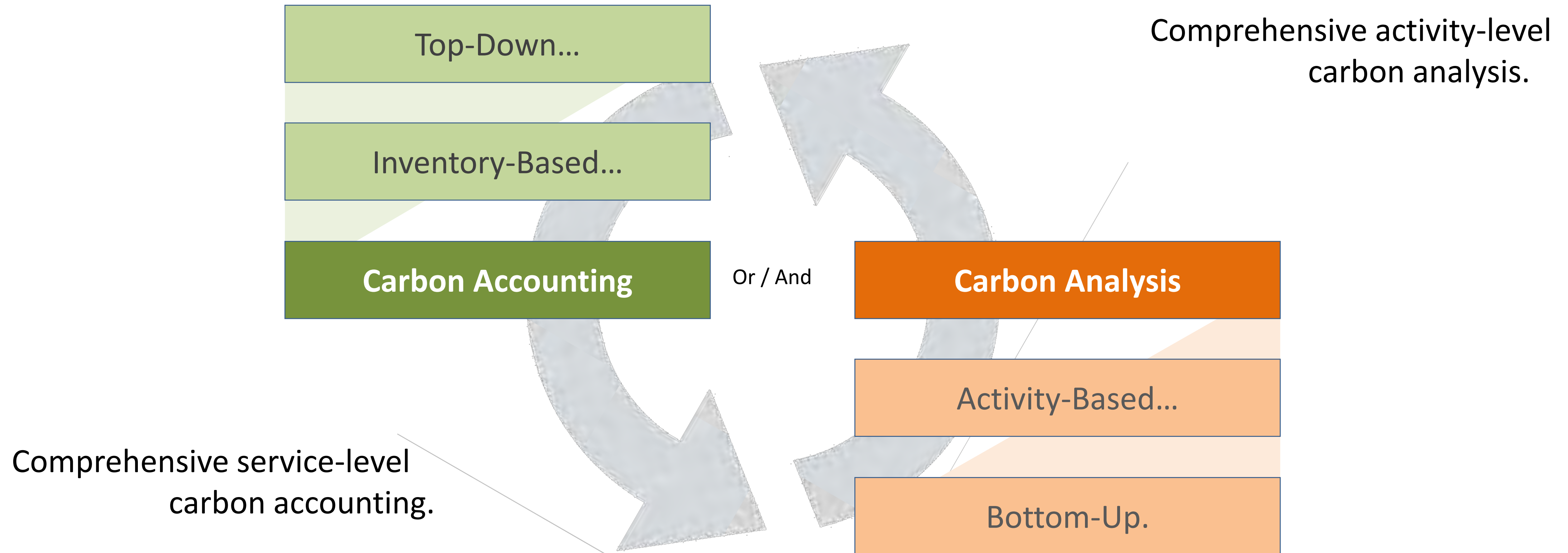
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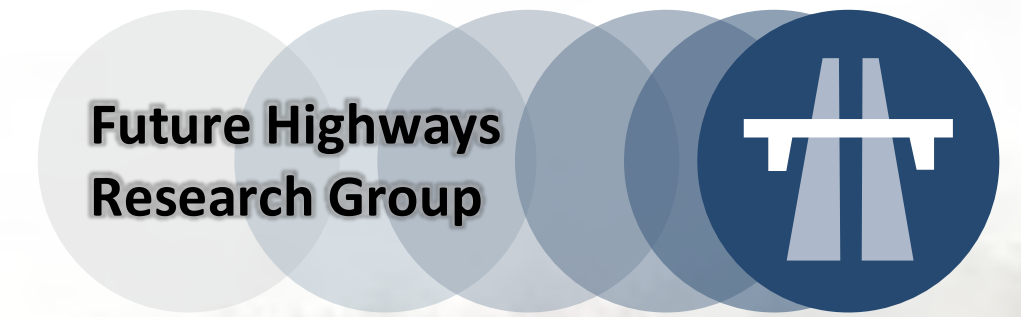
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Carbon Accounting vs Carbon Analysis





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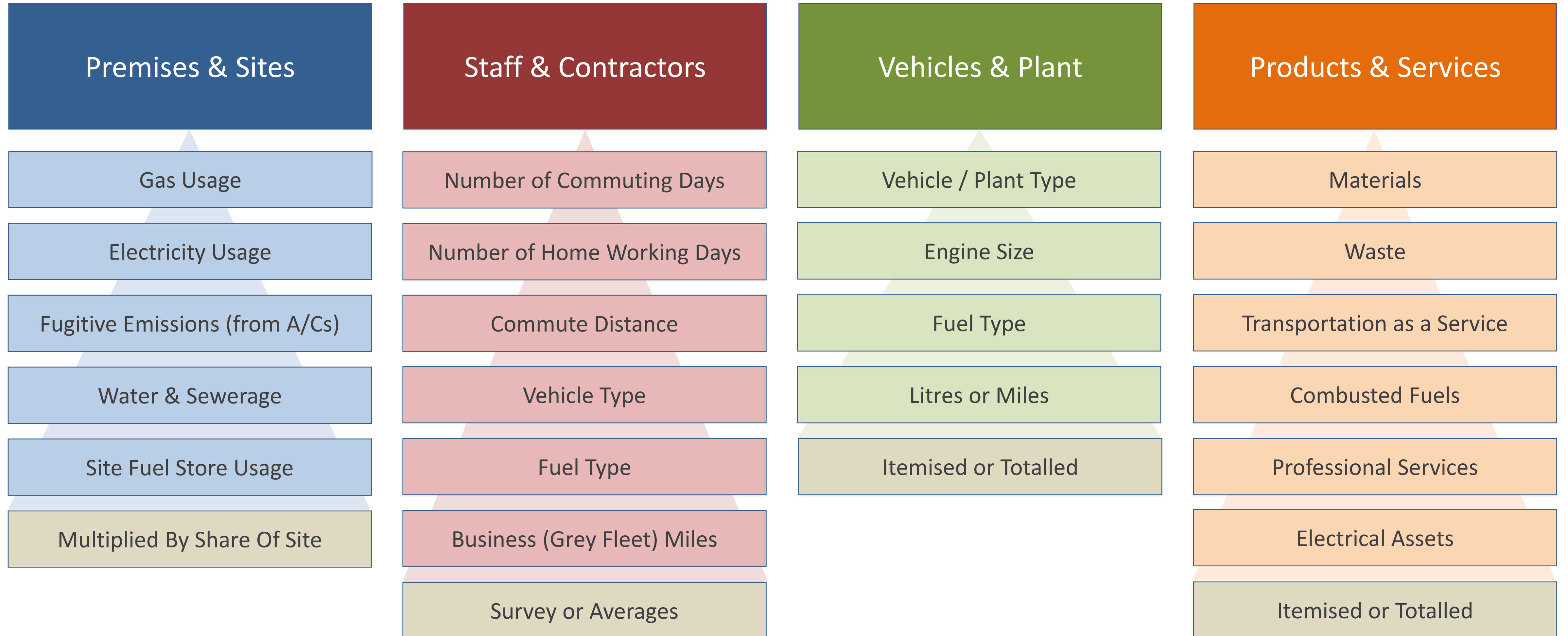
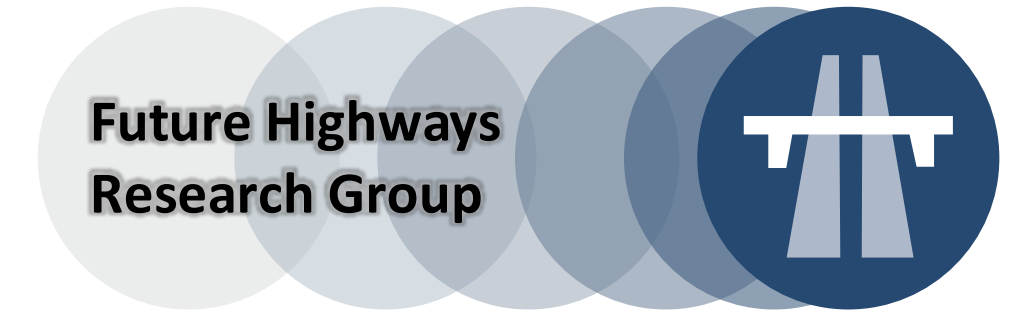
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Inventory-Based Carbon Accounting

Carbon Calculation & Accounting Standard and Carbon Analyser

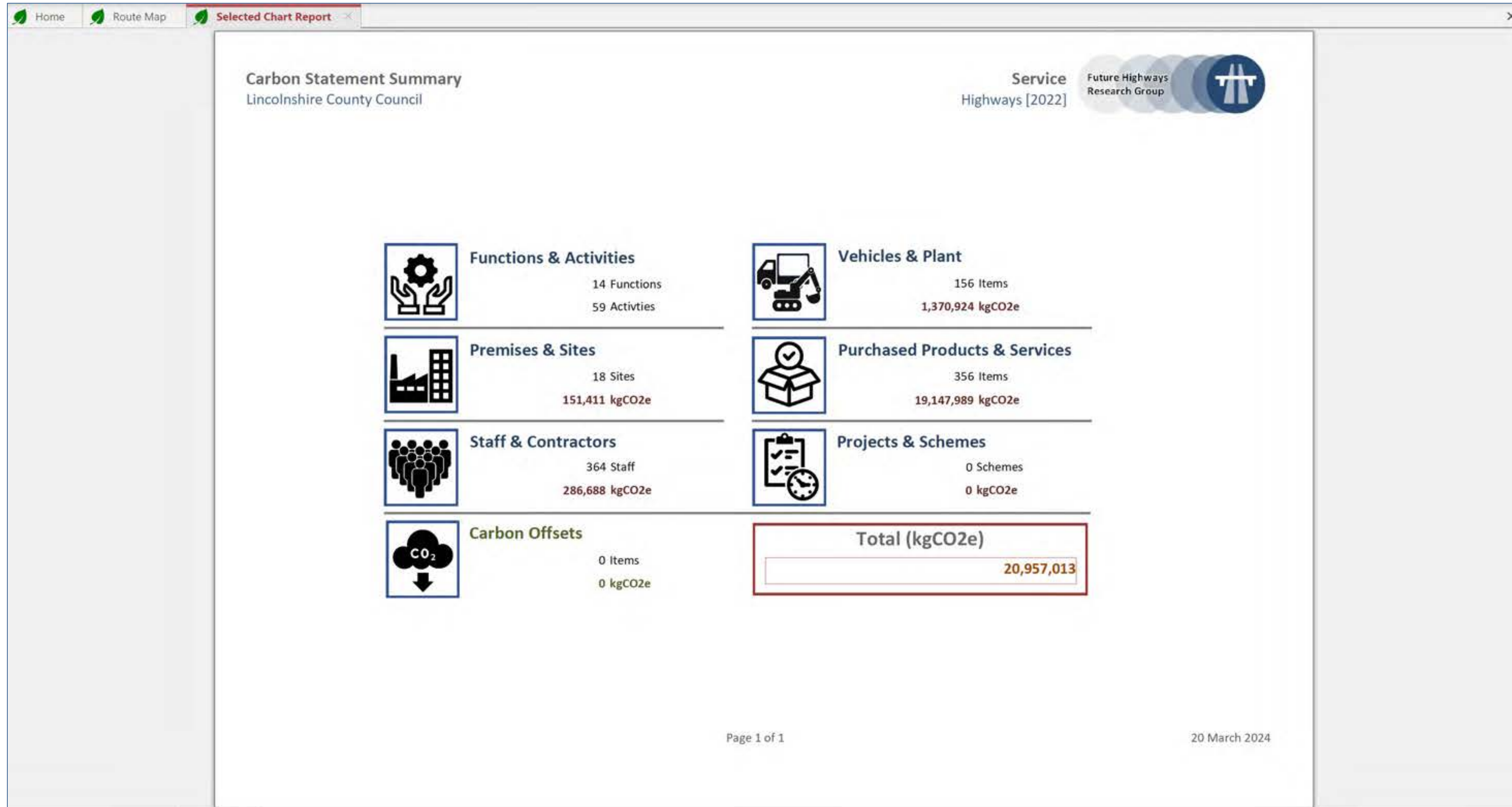
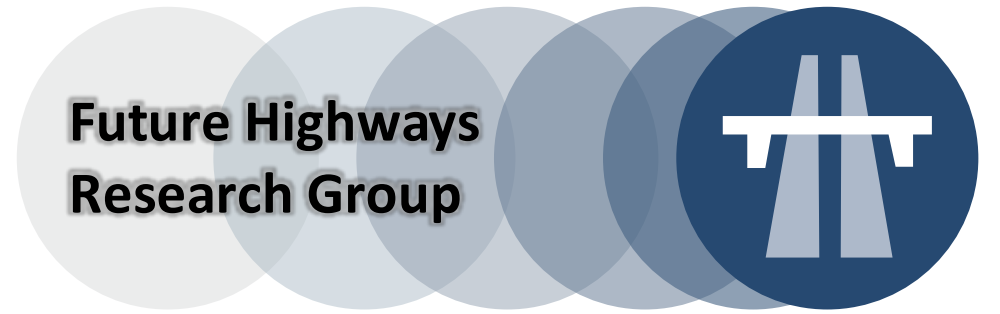
Inventory Based Carbon Accounting

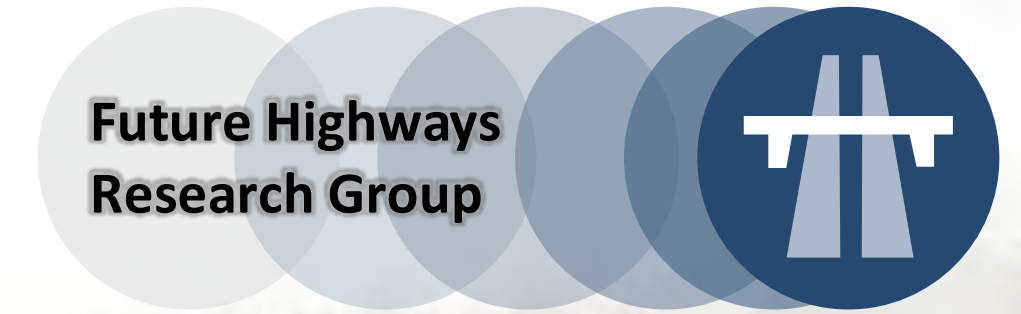
Step 2: Premises & Sites Inventory



Carbon Footprint Statement

Carbon Analyser





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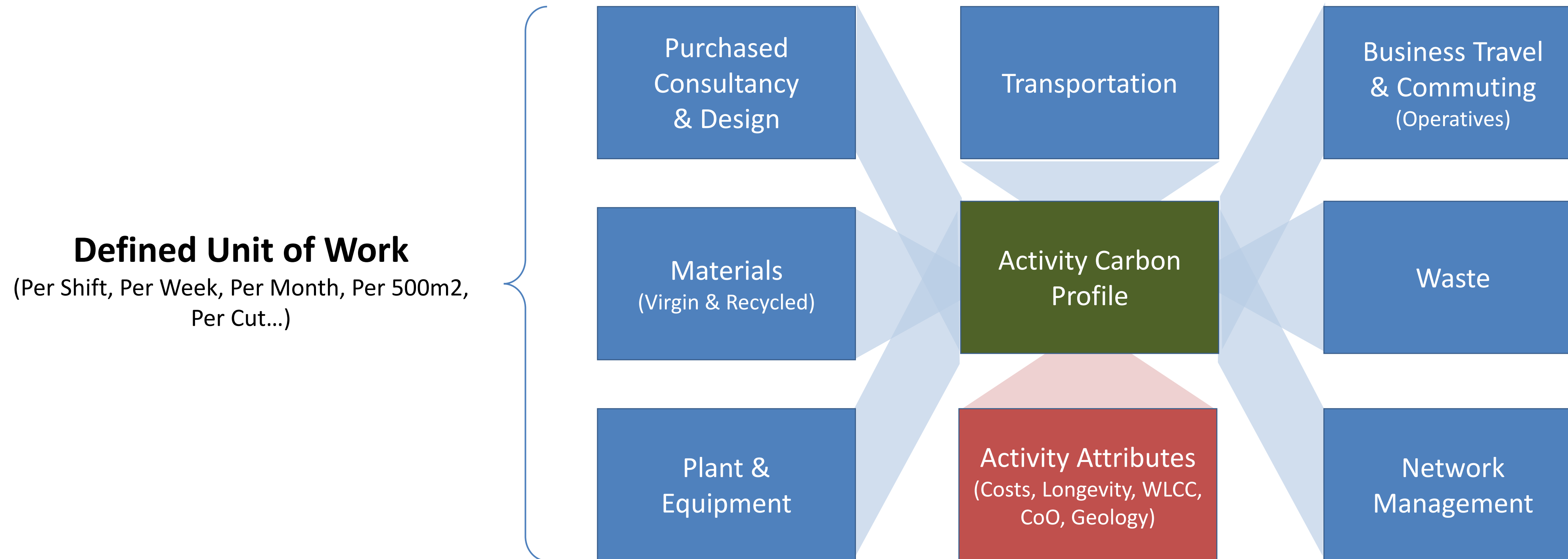
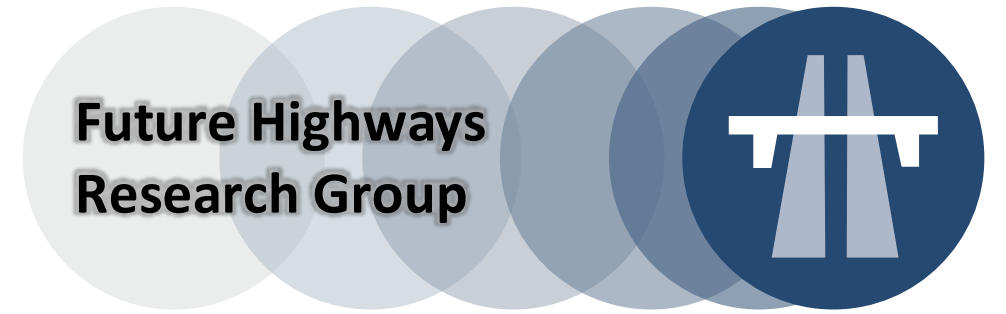
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Activity-Based Carbon Analysis

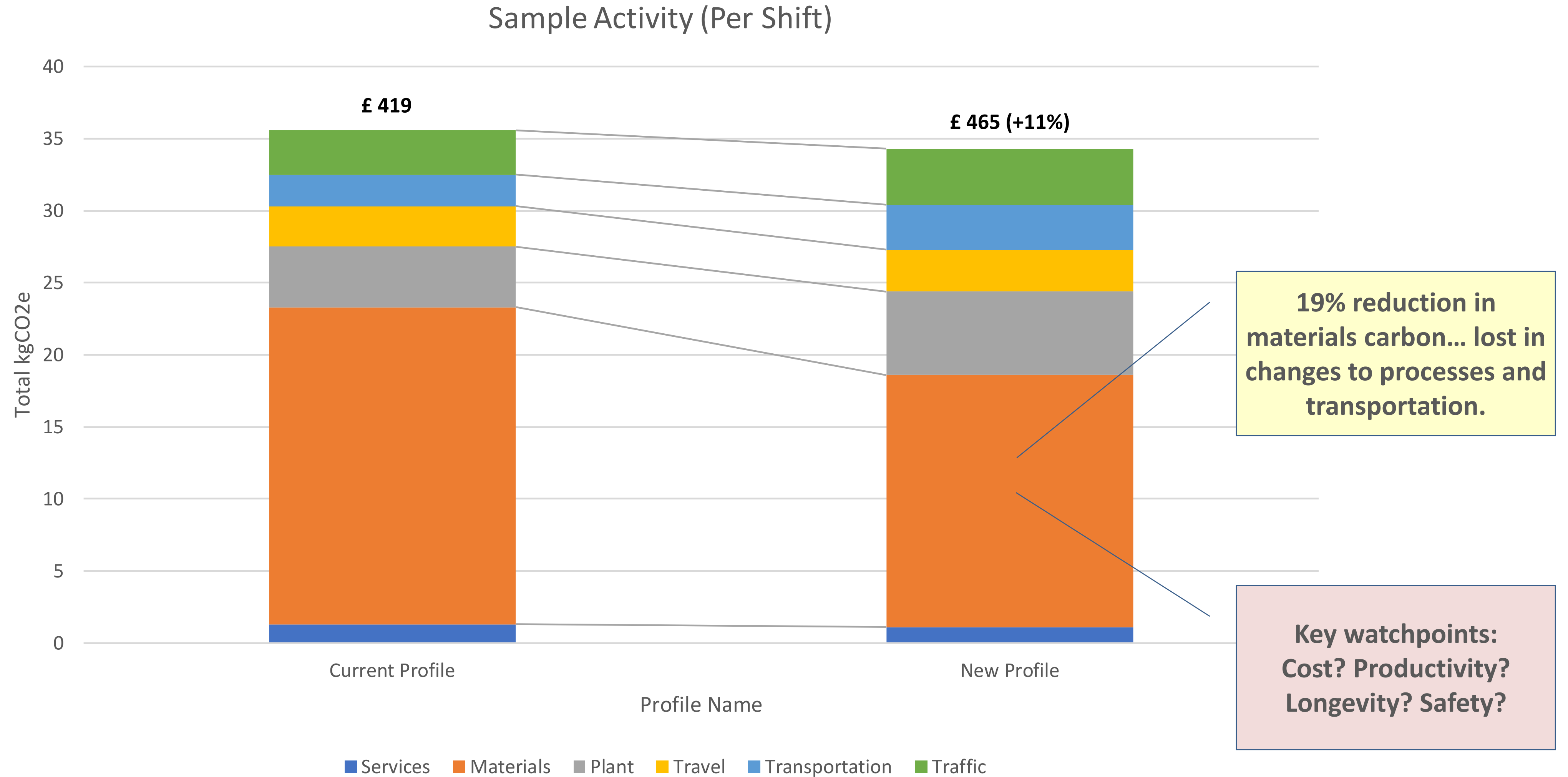
Carbon Calculation & Accounting Standard and Carbon Analyser

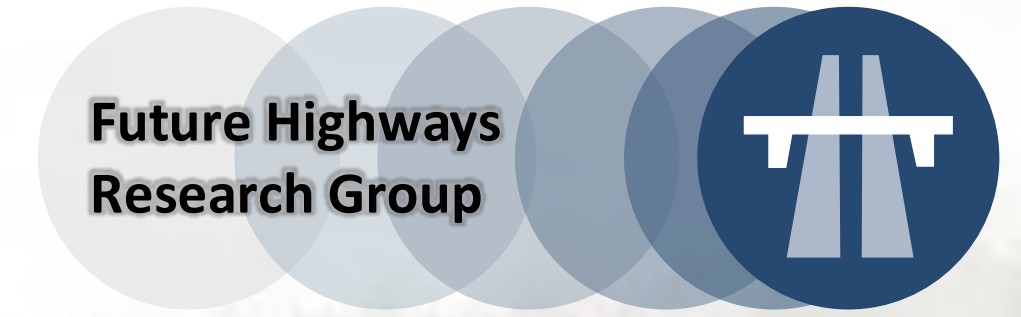
Activity Based Carbon Analysis

Assessing Carbon & Costs at Activity Level



Activity-Level Carbon Assessments & Change Planning





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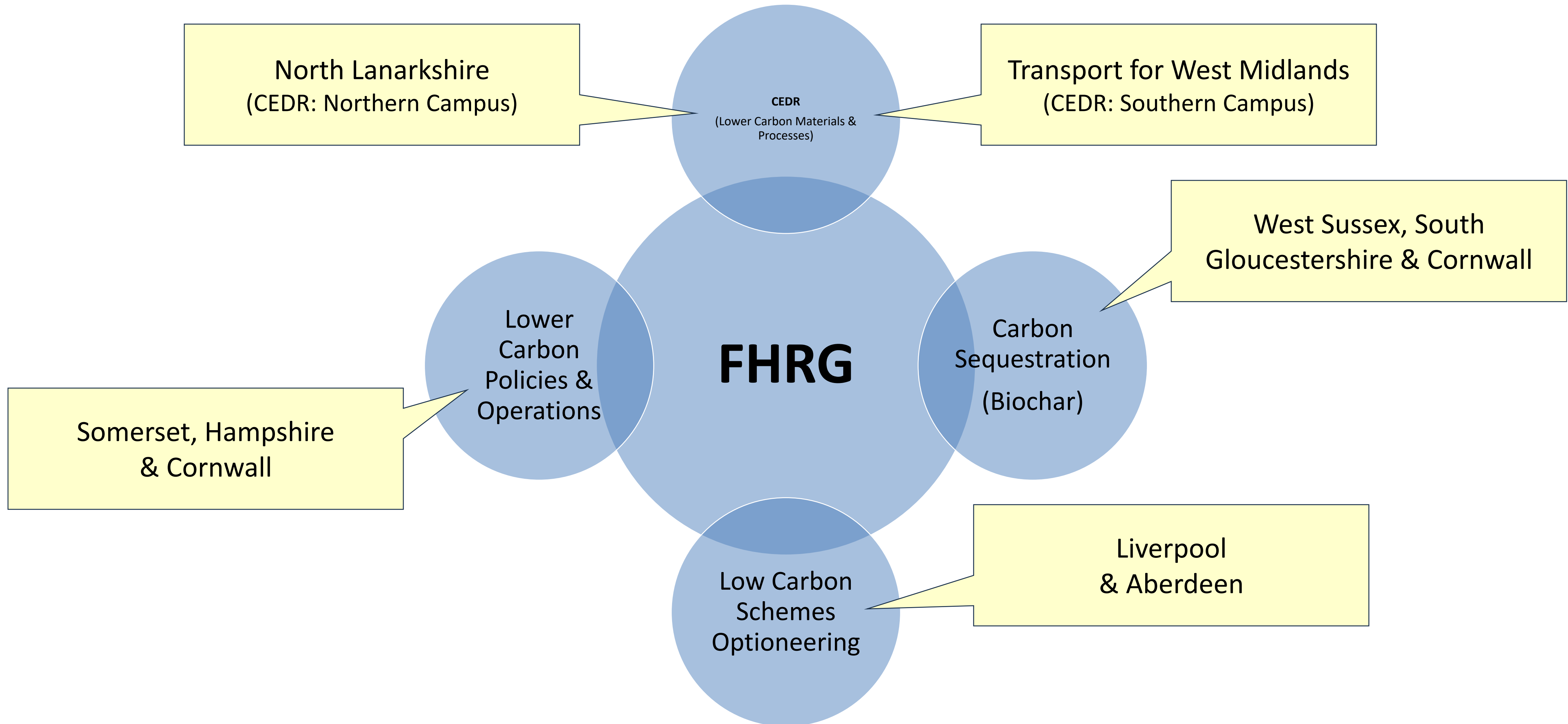
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Live Labs II: Programme

Future Highways Research Group

Supported Programmes: Consistency & Coherence



CCAS & Carbon Analyser: Live Labs II Support Programme

Future Highways Research Group



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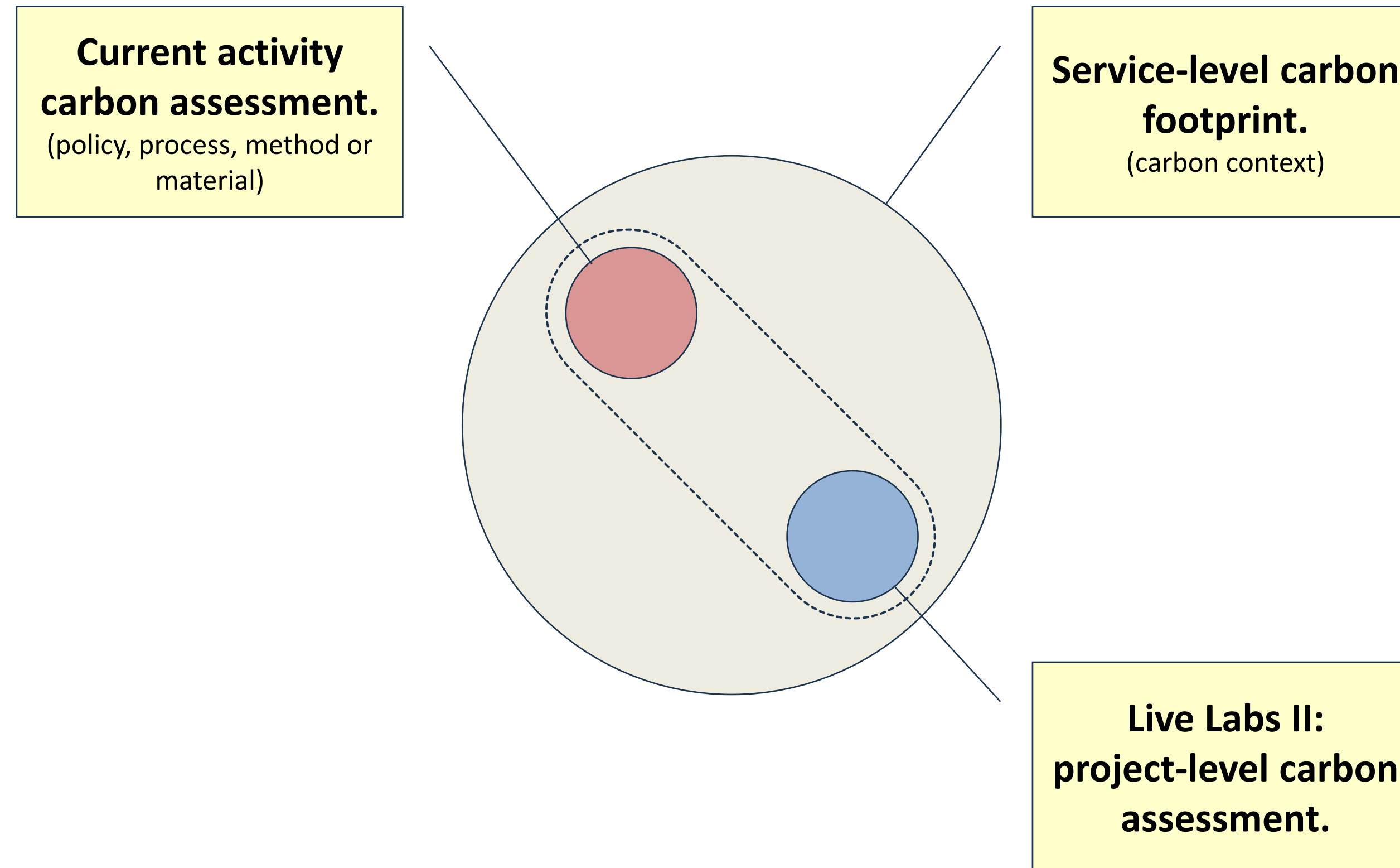
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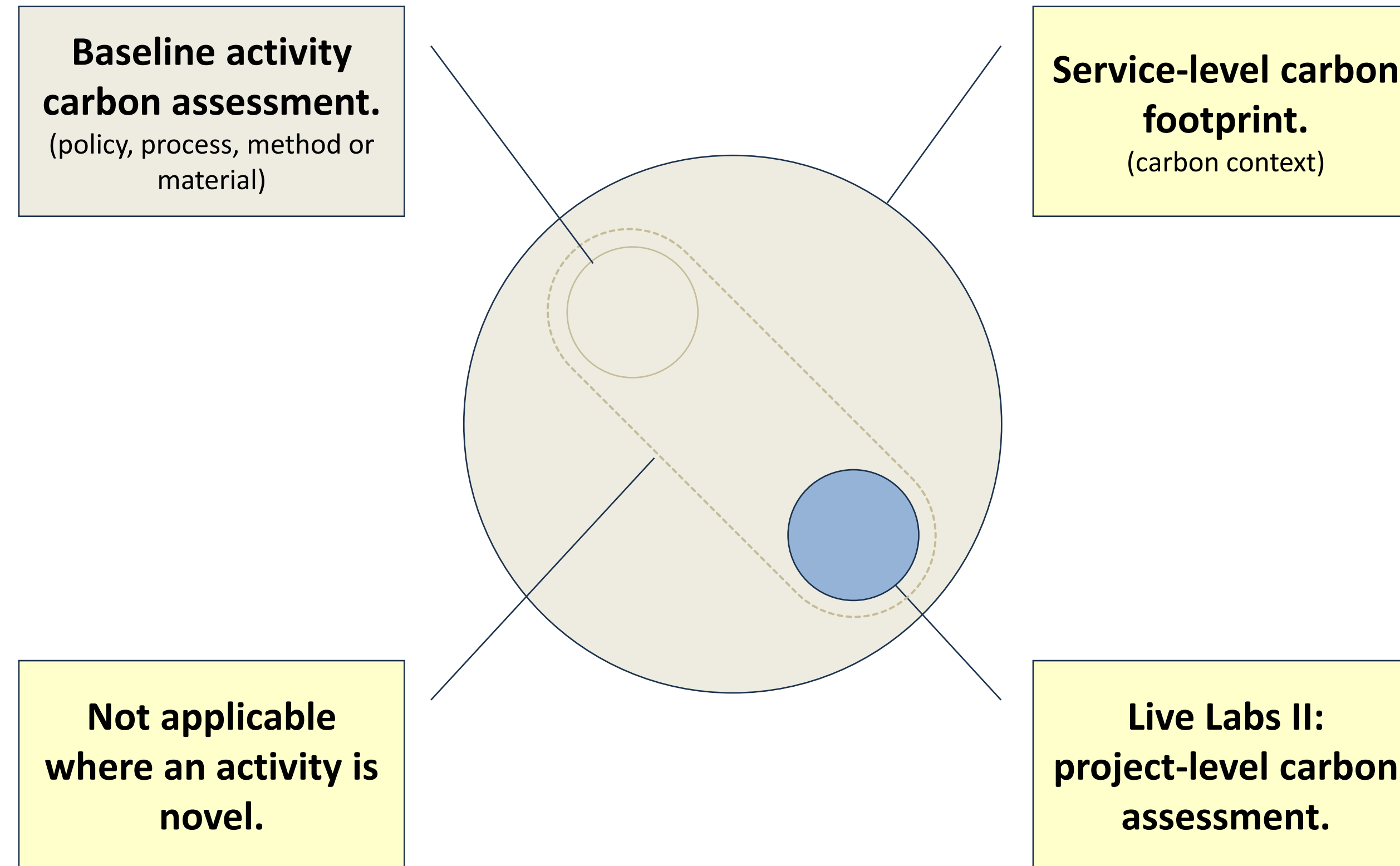
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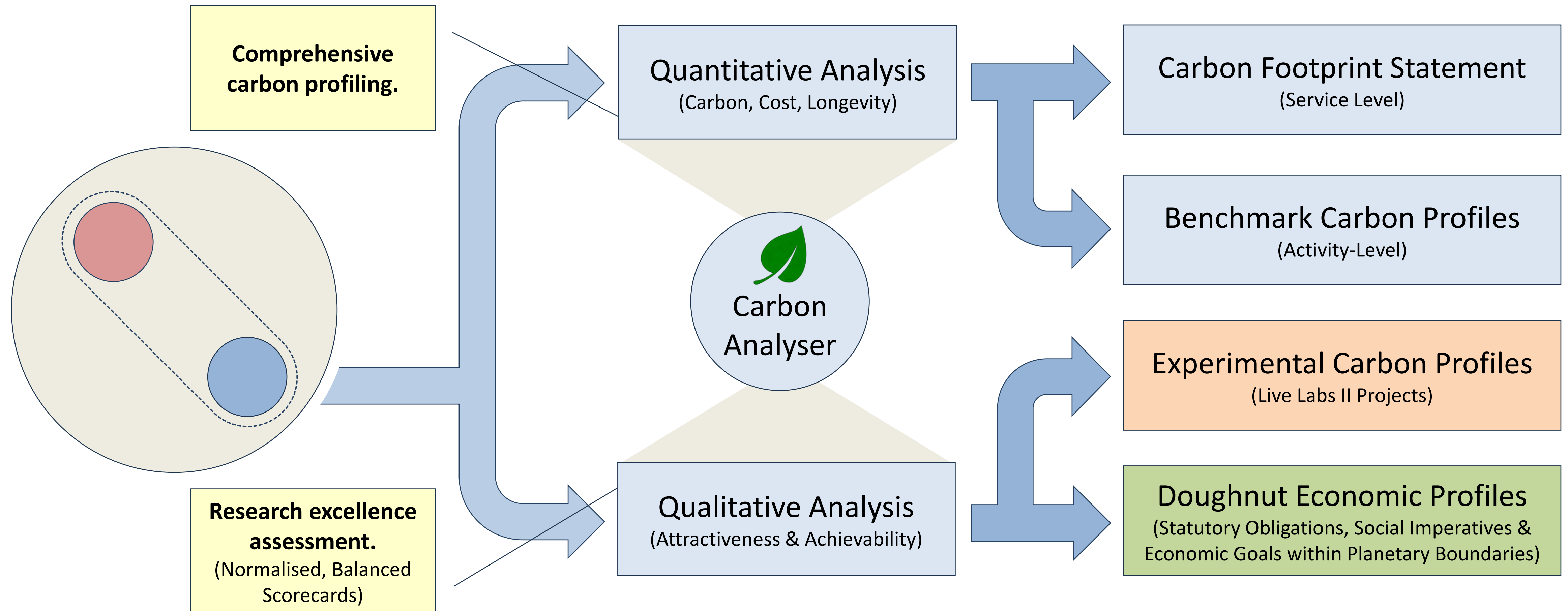
Live Labs II: Carbon Assessments



Live Labs II: Carbon Assessments

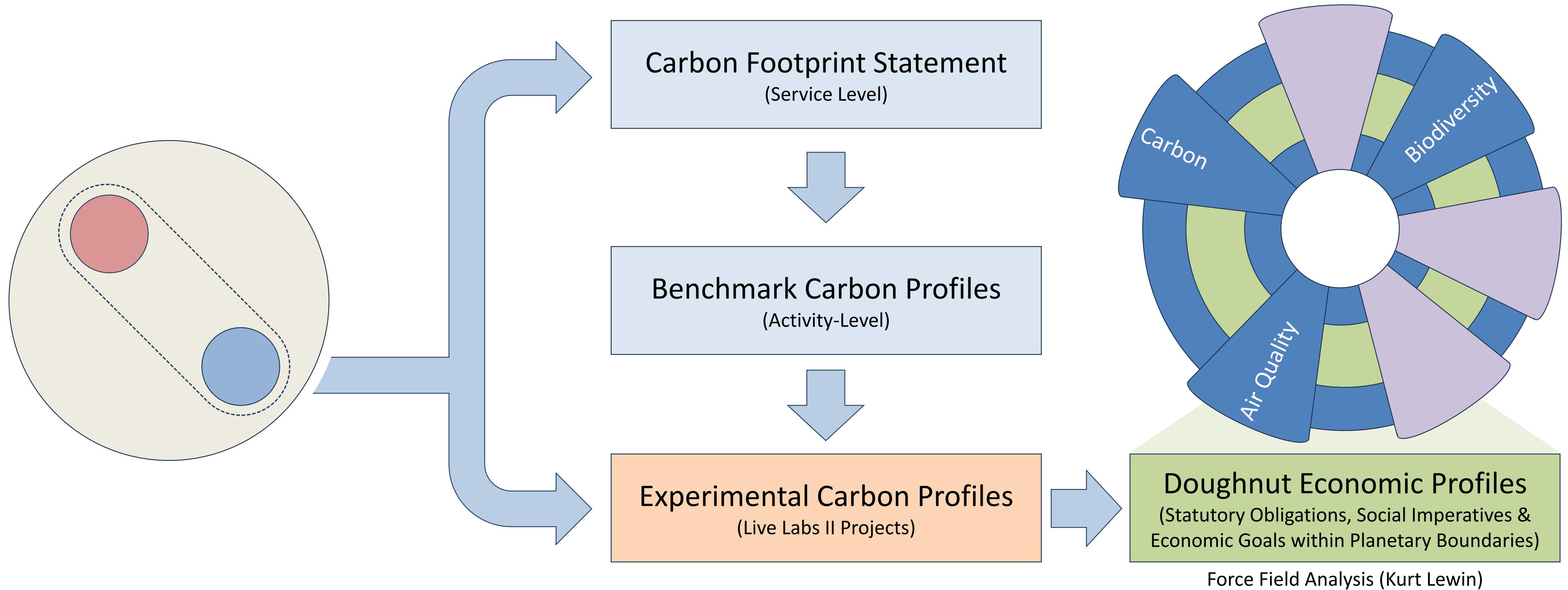


Live Labs II: Carbon Assessments



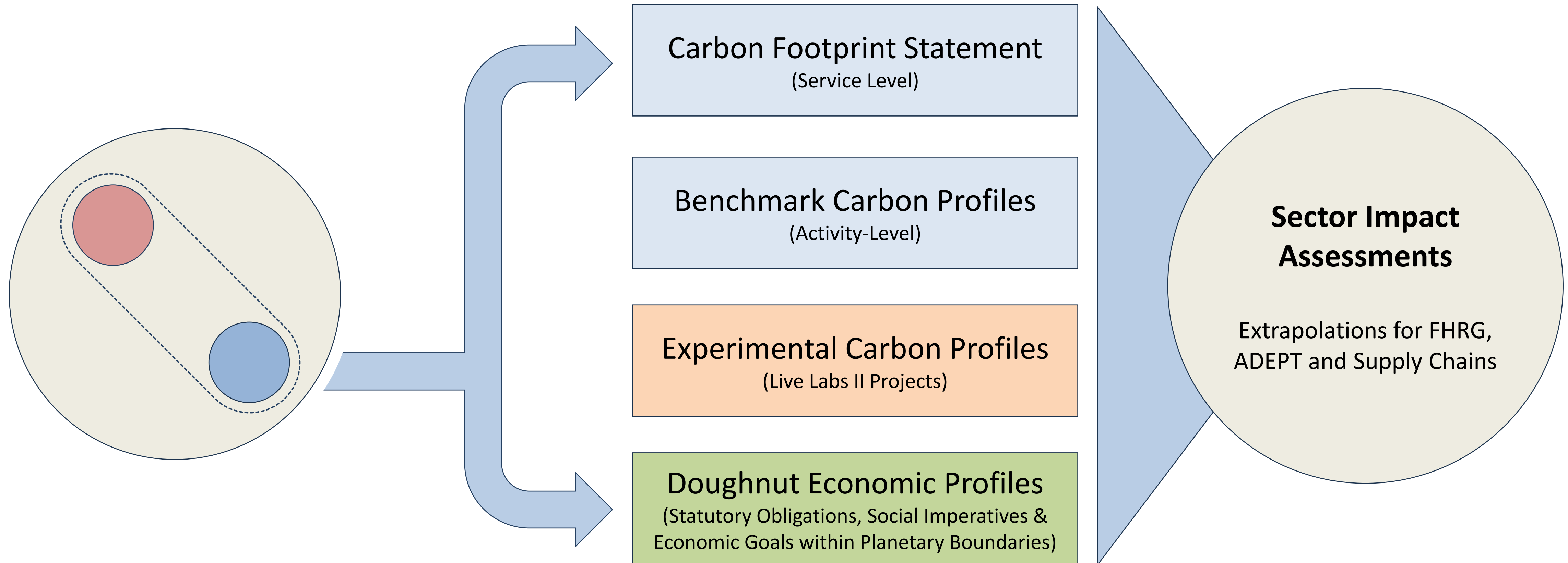
Live Labs II: Carbon Assessments

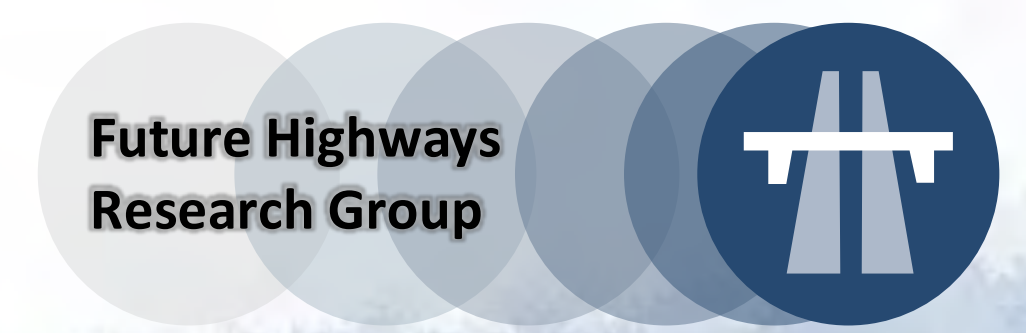
Sector Impact Assessment



Live Labs II: Carbon Assessments

Sector Impact Assessment





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