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Future Highways Research Group

Autumn Innovation Conference: Decarbonising Highways

ADEPT / Proving Research Partnership

Agenda

Future Highways Research Group

- **Welcome & Introductions (Hannah Bartram, COO, ADEPT)**
- **ADEPT News (Hannah Bartram)**
- **Sector News (Dominic Browne, Editor, Highways Magazine)**
- **FHRG Members Updates (Open Discussion)**
  - Issues & Challenges For Highways Authorities In 2022
    - Staff & Resource Shortfalls
    - De-Carbonisation
    - New Services Delivery Operating Models
    - Procurements & Future Contracts
    - Future Services Funding
- **Stage I: GHG Scope 1 & 2 Guidance (Helen Bailey & Emma Pye)**
  - Scope 1 & 2 Guidance Progress & Delivery Timescales
  - Lessons Learnt
    - Literature Review
    - Interviews & Workshops Feedback
  - Draft Guidance Overview (Preview Tour)
  - Guidance Applications
- **Comfort Break**

Agenda
Continued…

Future Highways Research Group

- **Stage II: GHG Scope 3: Sector Review & Scoping (Owen Jenkins)**
  - Sector Review: Research Proposal
    - Research Questions & Objectives
    - Overview of Scope 3 Challenges
    - Scope, Approach & Deliverables
  - Sector Pledges
    - Supporting A Unified Approach to Scope 3
- **Stage III: Scope 3: Guidance (Launch, Simon Wilson & Helen Bailey)**
  - Scope 3: Guidance Research Proposal
  - An "All Member" Research Programme
  - Proposed Timescales, Objectives & Outputs
- **Carbon Calculators: Options Analysis**
- **Carbon Zero Highways: Future Options (Case Studies)**
  - Wendover Bypass (Eurovia)
  - Designing Out Carbon (Atkins)
- **Building a Curated Library of CO2 Reduction Programmes (Simon Wilson)**
- **Upcoming FHRG Meetings & Events**

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ADEPT & Sector News

Hannah Bartram, Dominic Browne & FHRG Members

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Sector Challenges: Open Discussion

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Sector Challenges (Open Discussion)

Current Issues, Impacts & Priorities

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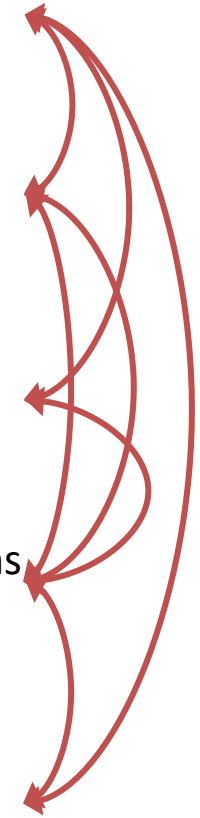
- **Staff & Resource Shortfalls**
  - Capabilities & Capacities (Current & Future)
  - Agency Staff, Contractor Dependencies & Higher Cost
- **De-Carbonisation**
  - Designs
  - Network Operations
  - Materials
- **New Services Delivery Operating Models**
  - Market Crowding (Clients At Contract Renewal)
  - Increasing Mixed Economy Operations
- **Procurements & Future Contracts**
  - Provider Market Consolidation & Provider Expectations
  - Future TMCs
  - Frameworks Utilisation
- **Future Services Funding**
  - Purposes, Scale & Certainty of Funding
  - Timescales for Bidding, Allocation & Spending



How are these issues affecting your organisation?

Which do you think will have the greatest impact?

What ameliorative actions can we, should we, take?

The issues are interdependent, with cascading implications for services and the sector.

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Human Capital Management

Research Programme Launch: December 2021

A Human Capital Crisis?

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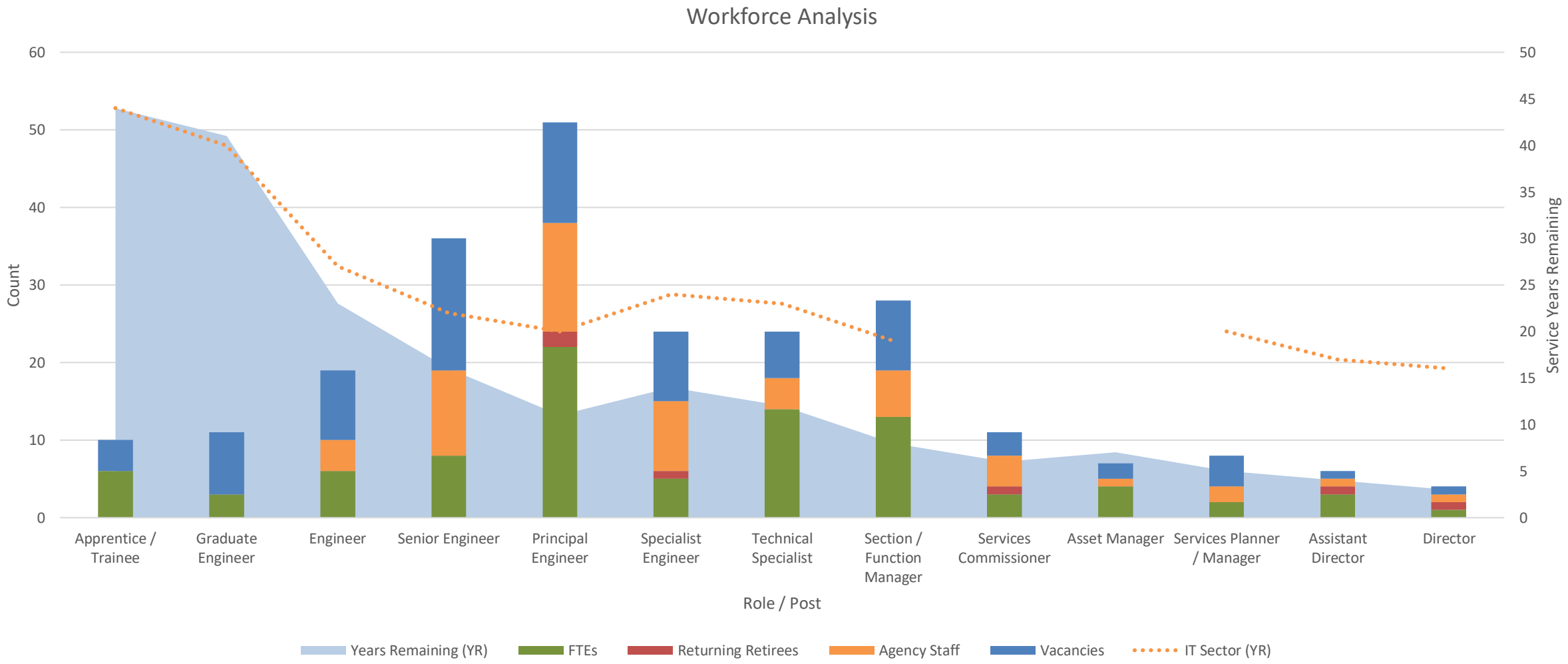
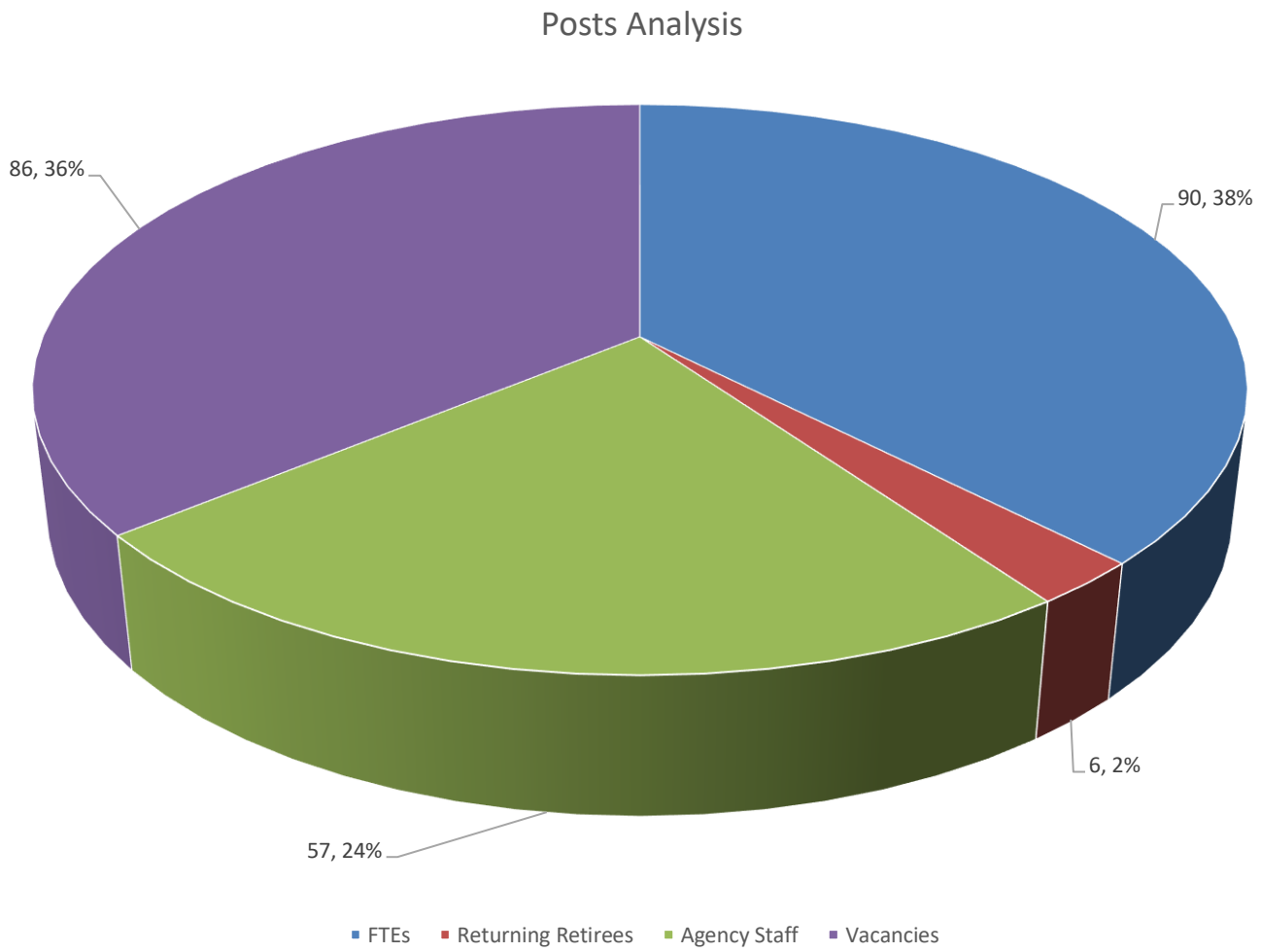


Posts Analysis



Human Capital Assessment & Development

Scope of Research Programme

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FHRG Human Capital Assessment, Development & Retention

Workforce Acquisition	Workforce Development & Retention	Workforce Optimisation
Further & Higher Education Engagement	Resources Development	Secondments, Mentoring & Skills Transfers
Apprenticeships & Workplace Learning	Workforce Retention	Recruitment & Succession Management
Fewer people choosing a career in civil engineering.	Employees poached by (other) private sector organisations.	Poor succession management leaves key roles empty.
Negative perceptions of the sector and employers.	Stagnant skills incompatible with a rapidly changing world.	“Old boy” promotions disenfranchise the next generation.
Unattractive packages and career paths for employees.	Careers become jobs as interesting work is outsourced.	Senior staff made responsible but left unsupported.
Work environments limit candidate diversity.	Staff made to feel part of the problem, not the solution.	Senior staff left to fire-fight with a shrinking resource pool.

Comprehensive Factor Analysis

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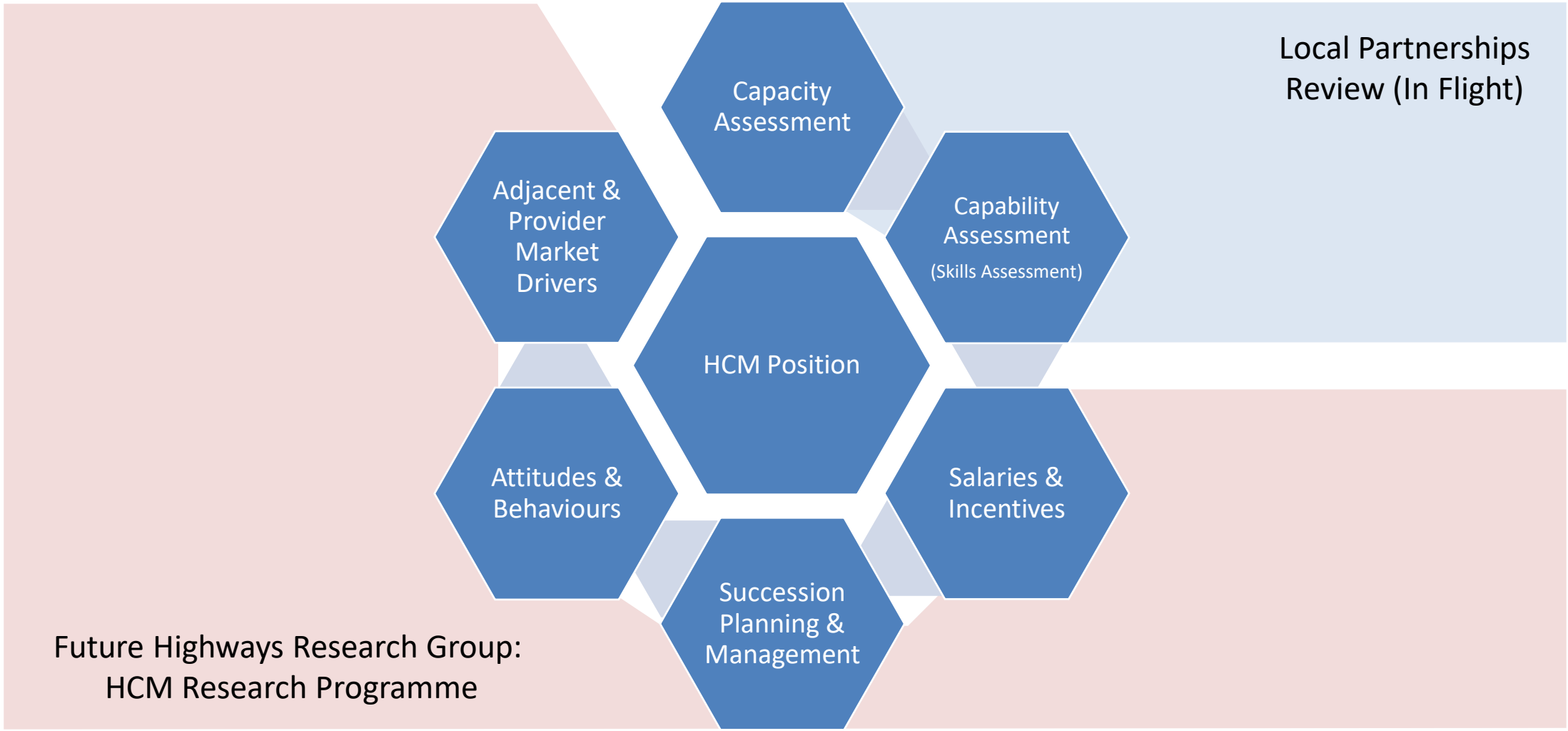

Human Capital Assessment

An All-Sector Research Exercise

- **Led by the members of the Future Highways Research Group.**
  - FHRG members set the scope and research objectives.
- **Wide sector engagement:**
  - LHAs
  - National Highways
  - DfT
  - CIHT
  - CITB
  - IoQ
  - Private Sector Providers
  - Agency Resources Providers
- **Identification of future options for addressing the issues.**
- **All findings freely shared with the sector.**

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Zero Carbon Highways

Programme Route Map

Zero Carbon Highways: Route Map

Measurement, Options Development & Reduction

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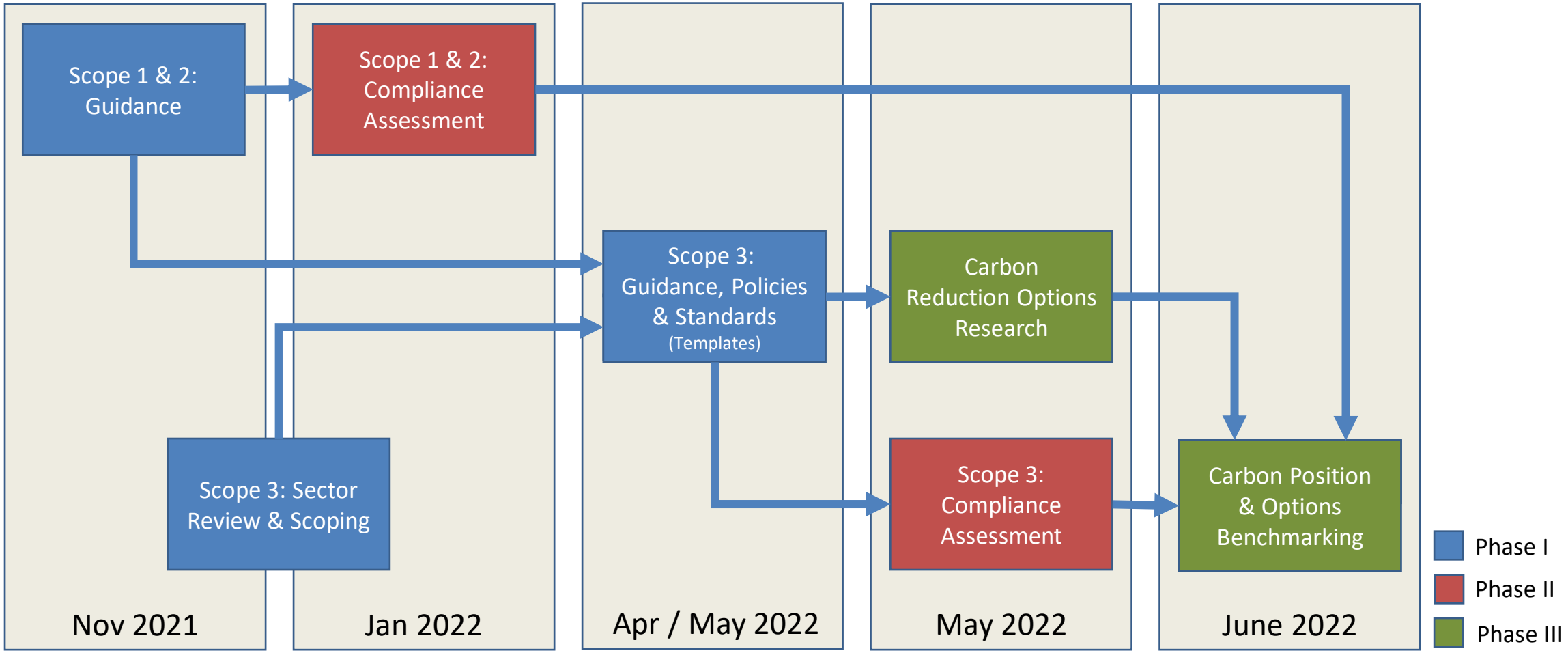

Future Carbon Reduction Options

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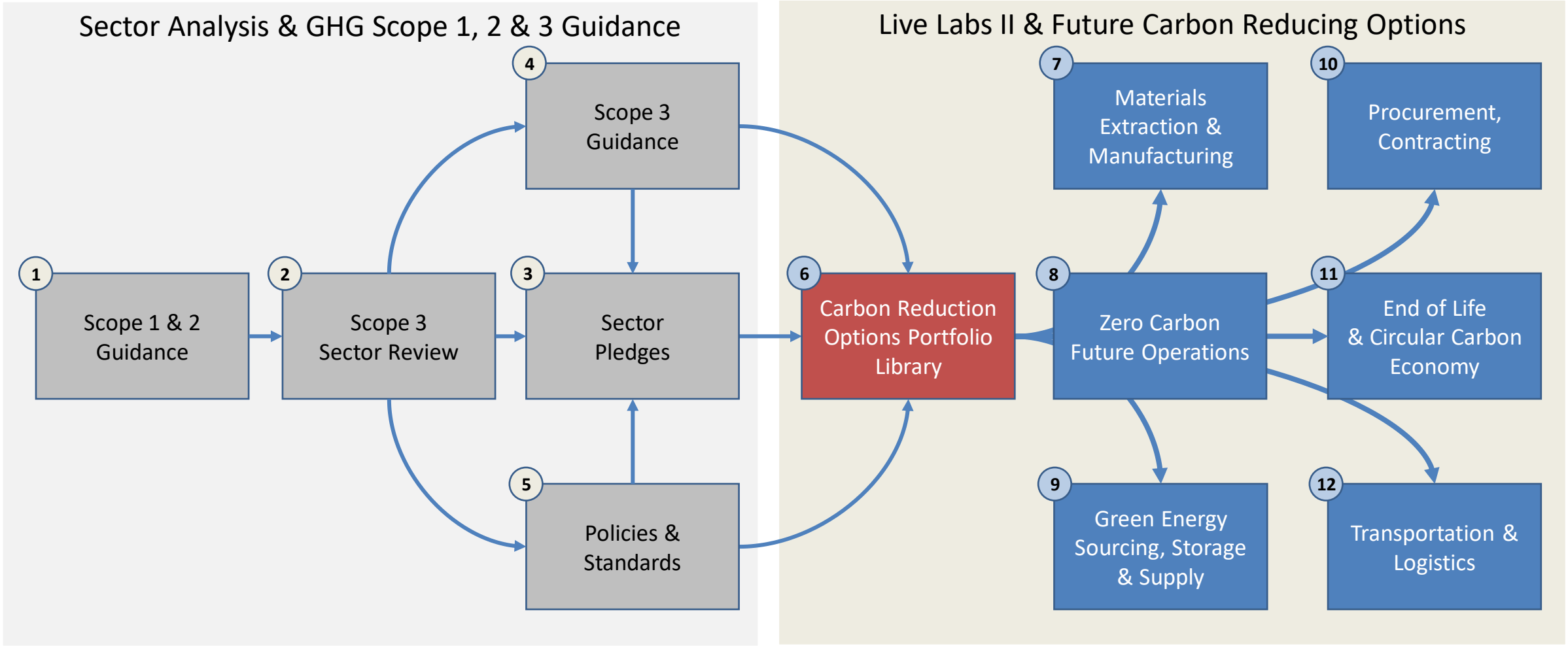

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Scope 1 & 2: Guidance

Progress Update

Project brief* – Scope 1 and 2 guidance development

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- **Identify what has currently been adopted and progress among members.**
- **Define clear boundaries for the activities to be included.**
- **Define the period in which data will be collected (reporting cycle).**
- **Understanding key environmental impacts and the associated emissions.**
- **Define uniform measurement techniques for the identified impacts.**
- **Agree carbon footprint conversion assumptions.**
- **Create benchmarkable standards.**
- **Create an assessment framework.**

***GHG Scope 3 is out-of-scope for this project, as is any form of carbon calculator*.**

Scope 1 and 2 – a reminder

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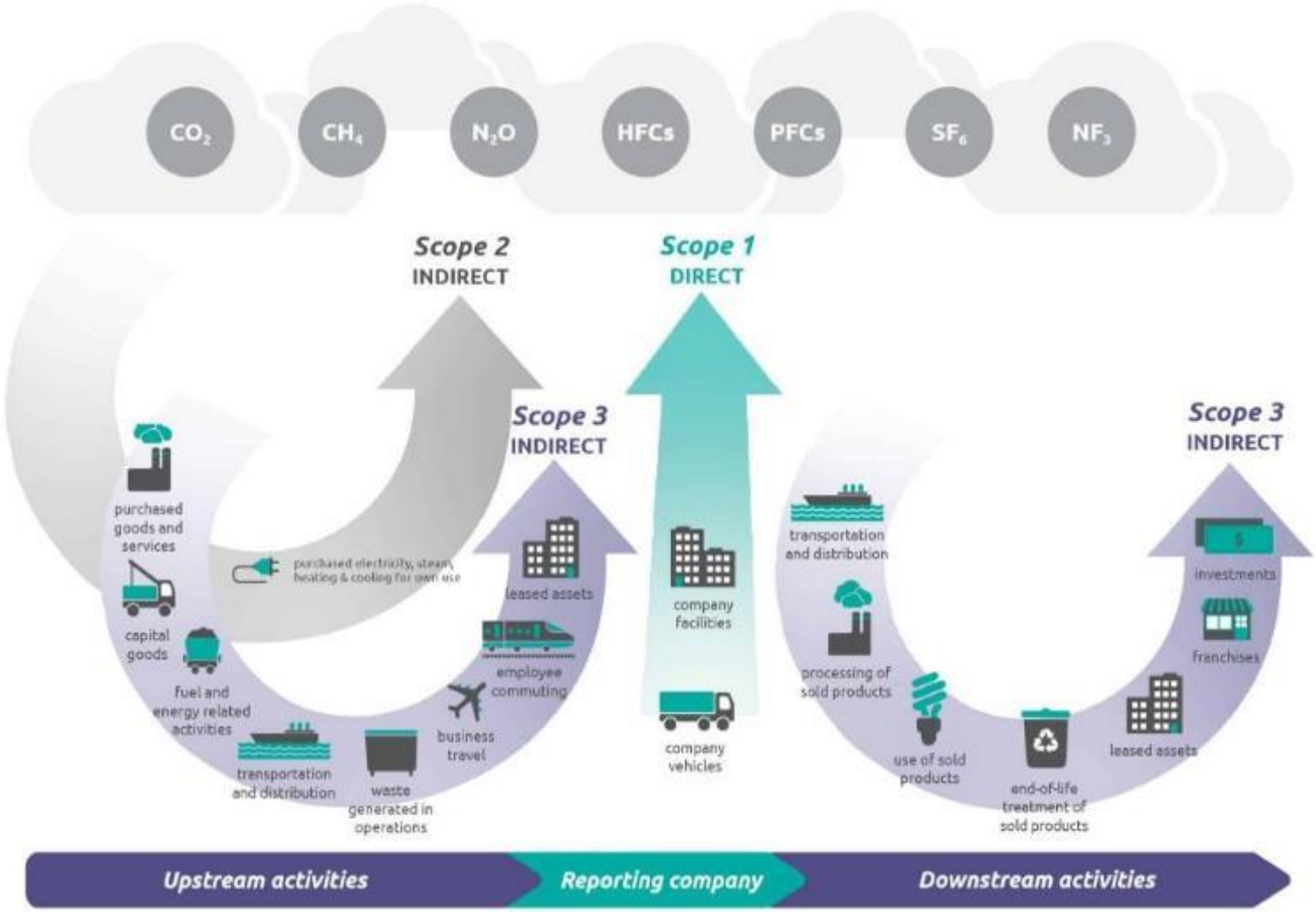

What we've done

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- ✓**Working and steering groups formed**
- ✓**FHRG peer group formed (comprising, coastal, urban, rural, met, borough, county)**
- ✓**Literature review completed**
- ✓**Questionnaire to FHRG members completed**
- ✓**Interviews with peer group completed**
- **-Draft guidance being finalised for peer review**

What we'd like to do today

Future Highways Research Group

- ✓**Provide an update, highlights of the findings from literature and interviews**
- ✓**Share key considerations**
- ✓**Take a tour of the draft guidance**
- ✓**Seeks thoughts and feedback on the draft guidance**

Literature review highlights (1)

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- **Key legislation**
  - Climate Change Act
  - Carbon Budgets
  - IPCC
- **Mandatory reporting (industry)**
  - Where applicable methodology used for reporting must be disclosed and although no methodology is prescribed, it must be robust, transparent, and widely accepted
- **Mapping of current standards and guidance**
  - No current standard or guide specific for the highways sector
  - Current standards have the following limitations:
    - Defining the boundary to be applied
    - Detailing of activities or services to be included.
    - Deciding which approach needs to be taken for monitoring and measurement.

Literature review highlights (2)

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- **Carbon accounting tools and conversion factors**
  - Most used:
    - Department for Business, Energy & Industrial Strategy, Greenhouse gas reporting: conversion factors.
    - Inventory of Carbon and Energy (ICE), Database Version 3
- **Business reporting, procurement implications and opportunities**
  - The local authorities can provide collective leadership to reinvigorate the political and societal consensus and accelerate climate action.
  - Opportunity to influence procurement and take advantage of lessons learnt in Europe

> ***'Assessment of carbon is likely to become a large part of tender assessment soon which will be supported by facts and evidence... warm statements of intent will be a thing of the past'.***
> *(Paraphrased from Traffex 15-17 June 2021: Malcolm Dare, Executive Director, Highways England on their decarbonisation plan).*

Literature review highlights (3)

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- **Highlighted questions for questionnaire**
  - What are the standards and approaches currently being employed to address carbon accounting?
  - Which tools (if any) are local authorities using for carbon footprint calculation?
  - What experience do local authorities have in linking design and specification to carbon reduction?
  - Is there any external verification/assurance schemes e.g., ISAE 3410 currently being adhered to in relation to carbon accounting?

Questionnaire findings

(Questionnaire written following PAS 2080, based on output from literature review)

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- **All respondents apart from one has declared climate emergency**
- **All had net zero target (range 2030 – 2050)**
- **Inconsistencies in uptake of guidance, processes and policy**
- **Mixture of standards and guides used, including tools (some bespoke)**
- **Most as a minimum include scope 1 and 2 in their carbon footprints, however:**
  - Not all activities are included in scope 1 and 2
  - Boundaries still being established
- **Measurement processes not consistent for calculation of carbon footprint, however, most rely on government conversion factors**
- **Ability to monitor carbon footprint varies and continual improvement process are limited**
- **Communication processes in place to staff**
- **Many are still at an early stage in carbon journey**
- **Some authorities looking at carbon as part of design**
- **External verification only starting to be looked at**
- **Early engagement with supply chain beneficial**
- **‘Lot of work still to do’!**

Interview findings

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- **Interviews were carried out with nine authorities.**
- **LA's all at a different stage of producing carbon footprint**
- **Maturity of footprint did not mean a stronger position to those at the beginning of the journey**
- **Data availability a problem, due to leased properties, visibility of bills, third party providers carrying out the works**
- **Large differences regarding work carried out by third party providers**
- **Large focus on scope 3 in relation to carbon reduction**

Key findings and assumptions for the guidance

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Key Findings

- **No standards/guidance specific to highways sector**
- **No highways specific guidance that enables carbon footprints to be comparable**
  - **Baseline year – how to calculate**
  - **Boundary – what activities to include**
  - **Conversion factors – which ones should be used**
  - **Questions to be answered such as**
    - Should home working be included?
    - Is a baseline for a calendar or financial year?
    - How to incorporate activities that are carried out by a third-party provider (scope 1 or 3)

Assumptions

- **To keep it in line with current GHG guidance and other standards available, including terminology, language and aims**

Tour of guidance and live discussion

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Guidance for the application of Scope 1 and 2 in the highways sector.

Oct 2021

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Table of Contents

Tour of guidance and live discussion

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Baseline year – as many activities as possible

6. Baseline

Baseline year

e year is essential. Without the knowledge of baseline emissions, it is impossible to reliably judge the f any remediation efforts.

ning a baseline year is a key first step and for a local authority highways department it should ate as many, if not all, operational activities as possible. Using a baseline year with as many activiti as possible included will make it easier for performance comparison going forward. If this is not possible th year in which targets are set could be used.

An alternative is to take an average of a number of years, this can be used if data is sporadic and therefore some years are more complete than others in different areas. A multi-year average may also help smooth out unusual fluctuations in emissions that would make a single year's data unrepresentative of the company's typical emissions profile.

The baseline year should mirror the financial year (i.e., a twelve-month perio make comparison to spend easier which may have an impact on a footprint in increased spend could have an impact on emissions if there is an increase in v

Once a baseline year is established then subsequent monitoring years must b year to ensure clear comparison. The purpose of normalisation is to enable re

Or average of a number of years

Financial year (April-April)

Tour of guidance and live discussion

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6.2. Boundary

This section identifies the operational activities to be included within the boundary.

This guidance is intended to identify the emissions from the local authority highways department of which it has control or influence. Figure 1 shows the various stages within a construction project.

- Off-site production and transport of materials used for construction
- Project design and construction (civil engineering or building, including demolition and refurbishment, and on-site materials manufacture)
- Project operation (the management and / or use of the final product)

Construction operations only

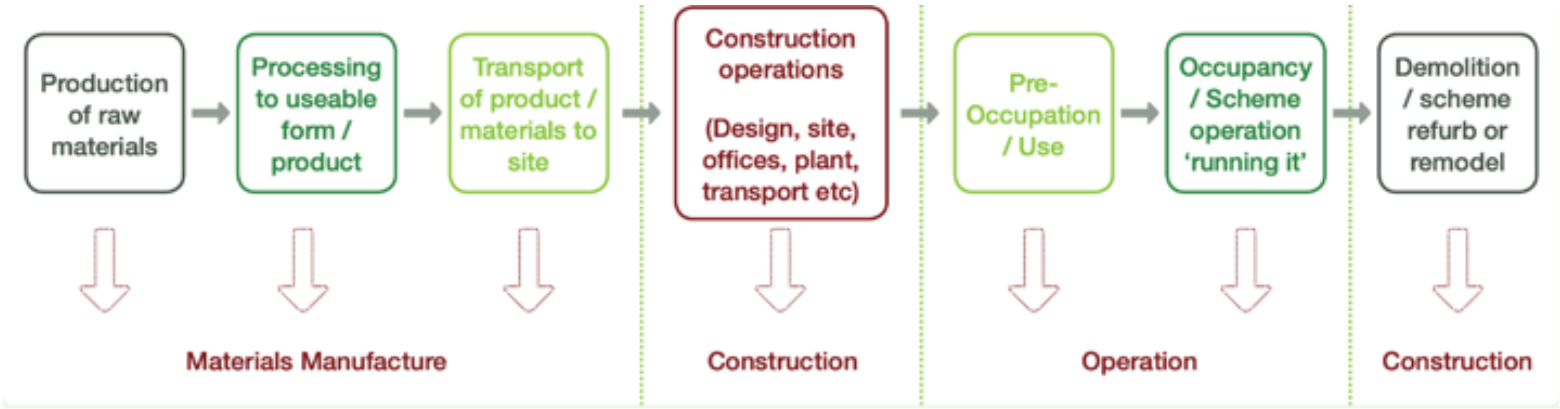

Figure 1. Value chain for a construction project, (ENCORD, 2012)

This guidance looks at the construction operations only and will be following is what the GHG protocol calls the 'operational control approach' and is considered the best fit for the local authority highway model.

Tour of guidance and live discussion

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Operational control approach - Under this approach, a company would record emissions from facilities, sites, or operations over which it or one of its subsidiaries, has operational control, i.e., the authority to introduce and implement its operating policies at the operation. A company accounts for 100% of emissions from operations over which it or one of its subsidiaries has operational control. (ENCORD, 2012)

The local authority highways department should include as many activities as possible which are directly managed by the authority. These activities will be referred to henceforth as **primary activities**.

For those activities that are not carried out by the local authority, these can be identified and referred to as **secondary activities**.

Secondary activity carbon emissions under GHG are classed as scope 3. It is however recommended by the GHG protocol that construction services companies aspiring to meet best practice should aim to measure all relevant scope 3 emissions sources. It has highlighted that scope 1 indirect emissions from third party providers are some of those most relevant and significant emissions and therefore inclusion is key.

This guidance therefore recommends that secondary activities producing scope 1 and 2 emissions are included in the scope 1 and 2 carbon footprint and not scope 3.

Best practice:
Both primary and secondary activities to be included in scope 1

Tour of guidance and live discussion

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A list of activities can be found below which should be automatically included in the carbon footprint boundary for a local authority:

- Preliminaries
- Traffic Management
- Site Clearance
- Fencing
- Vehicle and Pedestrian Restraints
- Drainage and Service Ducts
- Earthworks
- Pavements
- Kerbs, Footways and Block Paved Areas
- Traffic Signs and Road Marking
- Structural Concrete
- Waterproofing for Concrete Structures
- Bridge Deck Expansion Joints and Sealing of Gaps
- Brickwork, Blockwork and Stonework
- Landscape and Ecology
- Service Activity - Landscape Maintenance
- Service Activity - Drainage Cleansing
- Service Activity - Sign Cleaning
- Service Activity - Minor Repairs
- Highway Cleaning
- Winter Maintenance
- Emergency Response
- Restricted Working
- Pavements
- Road Lighting Columns and Brackets
- Electrical Work for Road Lighting and Traffic Signs
- Investigation and Surveys
- Maintenance Painting of Steelwork

Inventory of activities recorded

Primary or secondary recorded

Activities not undertaken recorded

Any activities not undertaken by either the local authority directly or a third party should be documented as not applicable to the operations. This is key for performance monitoring or comparing carbon footprints.

All items that are leased should also be included in scope, this includes premises, plant, machinery, vehicles etc.

Tour of guidance and live discussion

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6.3. Conversion factors

This section looks to provide a simple approach enabling data to be comparable.

To calculate a carbon footprint for the appropriate activities, the carbon emissions first need to be converted into 'activity data' such as:

- litres of fuel used
- kwh of energy used

Please note details of activity data can be found in section 6.2 of this guidance in relation to each emission.

A 'conversion factor' then provides a figure to multiply the activity data against to give a resulting carbon emission figure as shown below:

Activity Data x Emission Factor = GHG emissions

These figures can then be added to produce a total carbon emissions figure.

Following a review of the various carbon accounting tools currently available many calculations default to the use of one of two data sets for credible carbon conversion factors, these are:

- Department for Business, Energy & Industrial Strategy, Greenhouse gas reporting: conversion factors.
- Inventory of Carbon and Energy (ICE), Database Version 3

Default conversion factors

1. BEIS government emissions factors
2. Inventory of Carbon and Energy (ICE)

Tour of guidance and live discussion

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7. Scope 1

This section of the guidance considers scope 1 which covers direct emissions in the context of both owned or controlled sources. This section looks at the following:

- Activities that produce direct emissions
- Sources of the emissions
- Types of fuel are commonly used in the source of emissions
- How to determine what needs monitoring
- Recommendations for monitoring, measurement, analysis, and evaluation,
- Recommendations for when monitoring and measurement should be carried out
- Resources and responsibility for monitoring and measurement

Scope 1 is commonly split into fuel combustion, process emissions, fugitive emissions and company vehicles within various standards and guides. This guidance document follows conventional approaches but does however sub divide fuel combustion into those on premises and those on projects which is an approach adopted by the GHG protocol for the construction sector. This approach has been taken to separate the static fuels versus the fuels used in projects. This approach will help data collation and support the activities described in section 6.2. It will also allow for future changes to operating models, third party providers and home working where applicable.

Subdivision of fuel into premises (static) and projects to maintain alignment with GHG protocol for construction

Approach taken supports any future changes to operating models

Tour of guidance and live discussion

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7.1. Fuel premises

This section of the guidance covers fuel purchased for use at premises which support the company's activities in section 6.2. Premises can include offices, depots, yards, site welfare offices, maintenance facilities, home working.

This section of the guidance is specifically focussed on fuel used in premises such as:

- boilers for heating buildings
- gas furnaces
- gas-fired combined heat and power (CHP) plants.

The most common fuels are natural gas, heating oil, liquified petroleum gas (LPG), gas oil (aka red diesel) and burning oil (aka kerosene).

7.1.1. Determining the scope for fuel combustion

It is vital for a carbon footprint that as much of scope 1 is included as these are direct emissions, therefore it is recommended that local authorities look to include fuel used at their premises within the scope of their footprint. To have an all-encompassing footprint that is comparable and can identify areas for reduction as many activities from section 6.2 should be included and therefore as many premises as possible.

Premises: offices, depots, yards, welfare offices, maintenance facilities AND home working

Tour of guidance and live discussion

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7.1.2. Monitoring and measurement

This section of the guidance looks at how a local authority highway department can monitor and measure its fuel combustion within a premises.

It is vital that firstly the local authority highway department identifies and documents all fuel combustion sources within a premises. An inventory of such will also help with ensuring that all data has been collated.

It is recommended that a monitoring process or procedure is written for each type of fuel combustion source at a premises, this should include access details, location of meters, fuel type, any calculation specific requirements for example: if the meter has been replaced recently. Without such information being recorded then monitoring and measuring accurately each year can vary which can make the data unusable and cause inaccuracies in the final figures.

The process and procedure should also include the frequency of monitoring and if this is directly from the fuel combustion source or from a bill or purchase order. A meter reading is the preferred monitoring process, as this can also help determine discrepancies in bill payments or purchase orders or identify leaks which can increase the carbon footprint.

If a premises is shared occupancy, it is recommended that the emissions data is divided by total FTE (full time employee) number using the location and multiplied by the number of highways FTE.

Monitoring procedure/process recommended

Meter reading preferred method

Home working to be included

The calculation to use is as follows:

Total incremental gas consumption per heating month, UK (kWh) = 800 kWh * (Homeworking FTE * 66.7%)

Note: it is recommended that data collated by the third-party provider should be carried out as per this guidance.

Tour of guidance and live discussion

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7.2. Fuel (projects)

This section of the guidance looks at all fuel purchased by the local authority highways department for use in plant and machinery in use on, or at, a project (including construction sites and managed infrastructure assets) for activities as defined in section 6.2.

Types of fuel include:

- Gas Oil
- Diesel
- Petrol (Gasoline)
- Fuel Oil
- Heating Oil
- Natural Gas
- Liquefied Petroleum Gas (LPG)
- Compressed Natural Gas (CNG)
- Coal

Note: As per figure xyz this section does not include any fuel used in vehicles travelling on the public highway i.e., cars, vans, public vehicles using the network, buses, emergency vehicles etc.

7.2.1. Determining the scope for fuel (projects)

It is vital for a carbon footprint that as much of scope 1 is included as these are direct emissions, therefore it is recommended that local authorities look to include fuel used for their projects within the scope of their footprint. To have an all-encompassing footprint that is comparable and can identify areas for reduction as many activities from section 6.2 should be included.

Fuel used in plant and machinery

Does not include vehicles travelling on public highways

All fuel from activities identified

Tour of guidance and live discussion

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8.1. Determining the scope for scope 2

Using the boundary that was determined for scope 1, this should also be used for scope 2. Premises that have been determined as part of scope 1 and both primary and secondary activities that purchase electricity, steam, heating, or cooling should be included in scope. The premises and activities should be added to the inventory.

Electric vehicles that are used by the local authority highway department for either primary or secondary activities should be included in scope 2.

It is recommended that FTE working from home should also include their electricity and heating usage in scope 2, measurement details are provided in section 8.2.

The Scope 2 guidance from the GHG Protocol (GHG, 2021b), requires companies to use two reporting methods to disclose their scope 2 emissions, namely:

- The market-based reporting method
- The location-based reporting method

The local authority highway department should calculate the emissions from their local power grid, using the location-based method. This method reveals what is physically being put into the air. However, it does not account for any choices made regarding electricity purchases.

The market-based method is to specifically look into the contracts with the electric utility provider. This market-based method really gives insights into the emissions the local authority highways department are responsible for through their electricity purchasing decisions. (Ref GHG Protocol) The market-based method can help communicate the efforts made to reduce the carbon footprint through curbing emissions associated with purchased electricity, steam, heating, and cooling.

It is recommended that local authority highways departments look to calculate their emissions using the market-based approach.

Same boundary as scope 1.
Primary and secondary activities that purchase electricity, steam, heating or cooling plus electric vehicles.

Market based reporting recommended

Tour of guidance and live discussion

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8.2. Monitoring and measurement

Once the agreed approach has been determined as per figure 2 the scope 2 emissions can be calculated.

To calculate scope 2 emissions, the Corporate GHG Standard recommends multiplying activity data (KWhs of electricity consumption) by source and supplier-specific emission factors to arrive at the total GHG emissions impact of electricity use.

Emissions = Activity data (kWh) x Emission factor

Where:

- Activity data is the amount of electricity purchased and consumed in kilowatt-hours (kWh). This value will generally be directly measured, specified in purchase contracts, or estimated.
- Emission conversion factor as per section 6.3.

If the local authority highways department does not have any energy contracts or power purchase agreements, have not purchased renewable energy certificates (RECs), and do not have a utility-specific emission factor available (all instruments that can convey emission rates for market-based reporting). The local authority highways department is still required to report market-based Scope 2 emissions in this situation if a complete inventory is being reported (as per figure XX). However, if any additional information on power purchases is not available, the market-based emissions can be calculated with a regional grid-average emission factor. In this scenario, market-based Scope 2 emissions will be identical to the location-based Scope 2 emissions.

The location- and market-based Scope 2 totals should not be added together when calculating emissions totals.

Emission factors as per section 6.3

Location-based and market-based totals not added together

What's next?

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- **Review by internal team**
- **Date for completion: 26th November 2021**

A closing thought from the literature… (Scope 3)

> Having a single national method of calculating the environmental impact of construction underpins the approach as suppliers understand the requirements and the environmental impact of different proposals can be compared (Reeves et al, 2020).

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Comfort Break

10 Minutes

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Scope 3: Sector Review

Research Proposal

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Research Questions & Objectives

Scope 3 Sector Review & Scoping

Research Objectives

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- **To provide assessment of the sectors readiness to implement a consistent approach to scope 3 reporting.**
- **To provide assessment of the current UK & global methods of carbon calculation within the highways sector, in relation to scope 3 specifically.**
- **Identify the roles and responsibilities of the value chain partners to deliver successful monitoring and ultimately carbon reduction.**
- **Identify the key issues, costs and benefits arising from scope 3 implementation.**
- **To determine recommendations for the approach to engaging the sector and developing guidance for scope 3 emissions.**

Research Questions

Future Highways Research Group

- **What is the level of the sectors readiness to implement a consistent approach to Scope 3 reporting?**
- **How effective are the current UK and global methods of carbon calculation within the highways sector?**
- **What are the roles and responsibilities of the value chain partners to deliver the change?**
- **What will enable the increased use of decarbonised solutions within the UK highways sector?**
- **How can we align the sector to openly collaborate on carbon reduction?**
- **What are the prioritised areas for further work to maximise the carbon reduction options within the UK highway sector across scopes 1, 2 and 3?**

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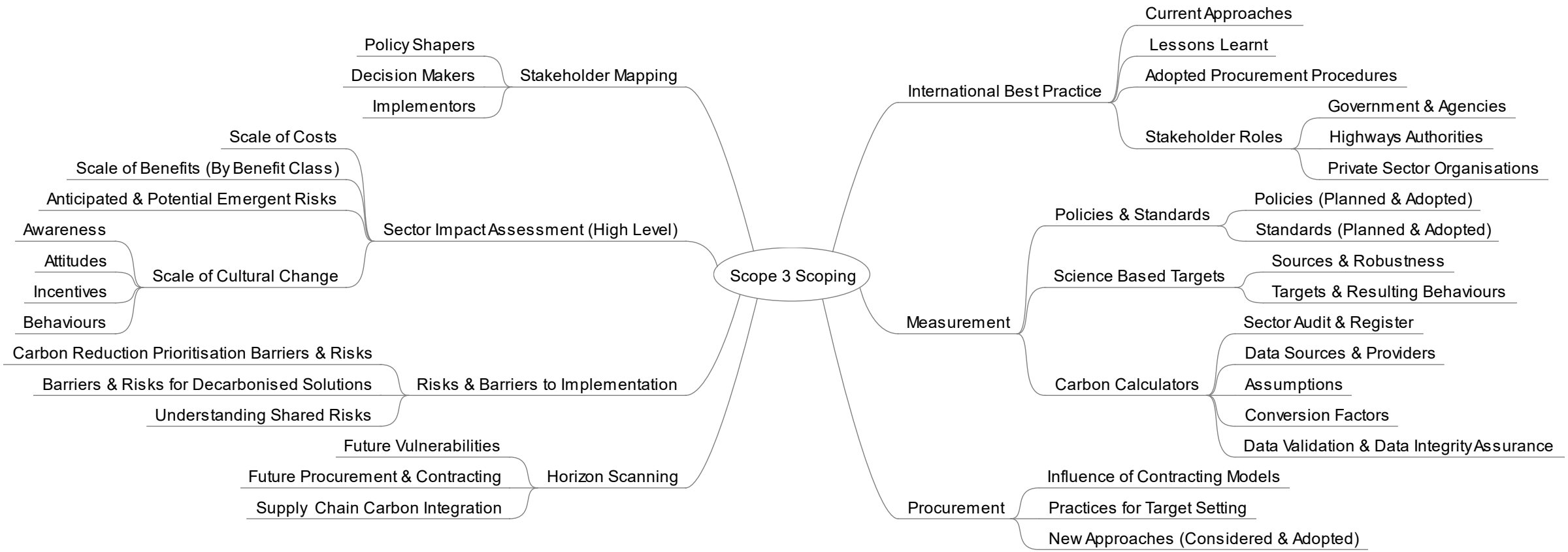
Research Map

Scope 3 Sector Review & Scoping

Research Map



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Sector Pledges

Scope 3 Sector Review & Scoping

Sector Pledges (Proposed Purposes)

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SEEKING SUPPORT FOR THE REVIEW, A SHARED UNDERSTANDING AND A UNIFIED APPROACH	SUPPORT FOR THE DEVELOPED SCOPE 3 GUIDANCE	SUPPORT FOR CONSISTENT MEASURES AND CALCULATORS	SUPPORT FOR FUTURE RESEARCH AND SECTOR-WIDE DEVELOPMENT OF CARBON REDUCTION OPTIONS
• Government and agencies • Highways authorities • Supply chain partners • Downstream services and infrastructure users	• Led by the FHRG and supported by pledge partners	• Coordinated by the FHRG • Creation or sponsorship of a sector-wide carbon calculator	• Led by the FHRG and partners • Development of a central options register • Live Labs 2 Support

1. Agree to take part in the research and to coordinate the activity through the FHRG.
2. Support the research project through the provision of data or taking part in the engagement.
3. Through the research, provide support for down stream activity (funding/time).
4. Agree to support the outcome of the research and associated proposals.

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Carbon Calculators: Options Analysis

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Carbon Calculators: Analysis Route Map

Driving A Multi-Vendor, Open Source Approach

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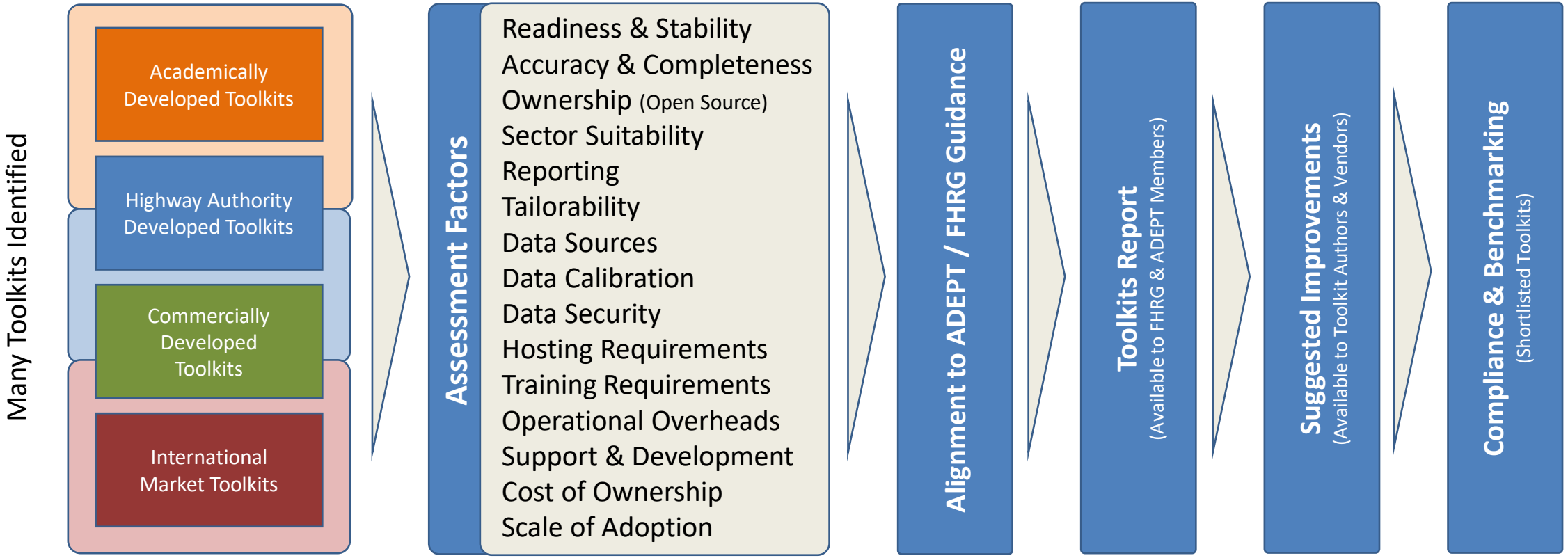

Carbon Calculators: Analysis Route Map

Driving A Multi-Vendor, Open Source Approach

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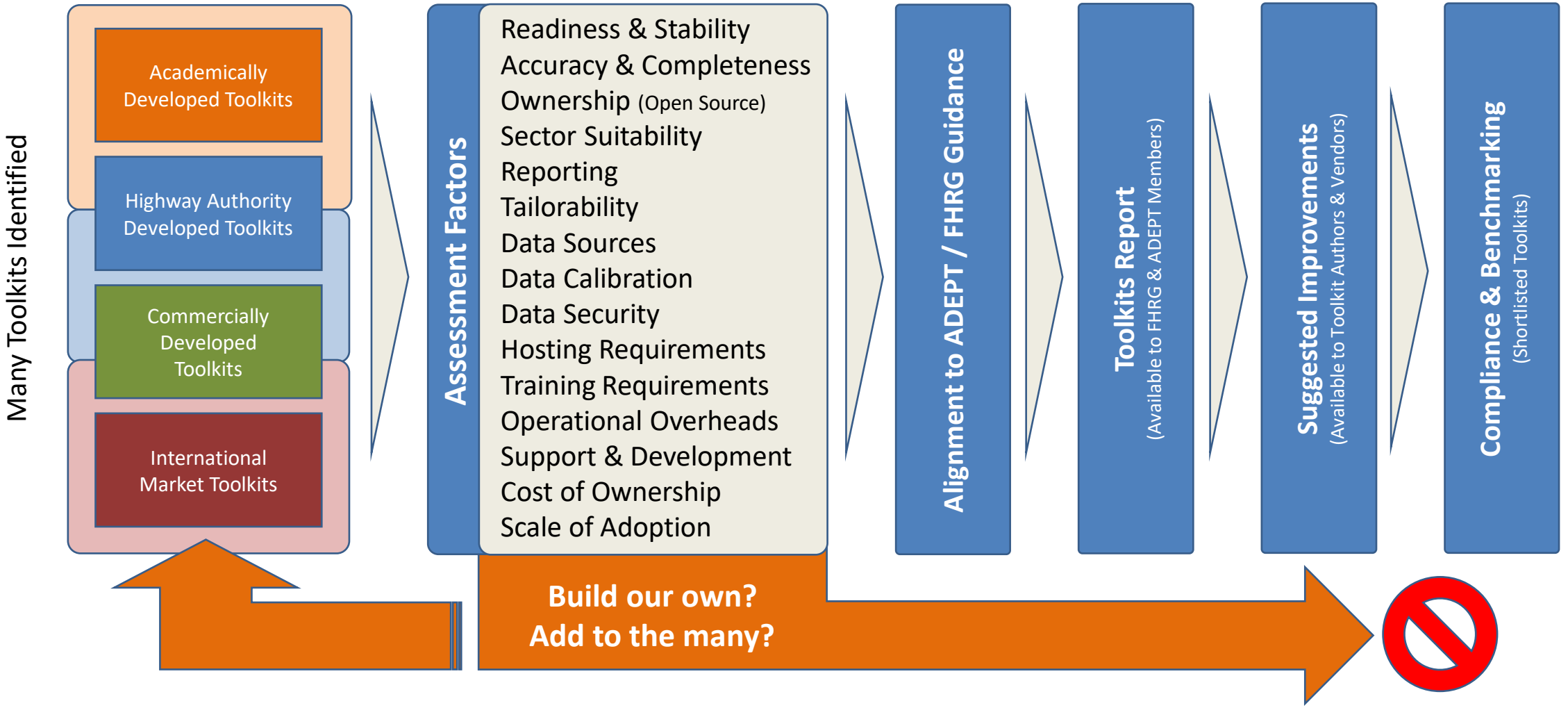

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Scope 3: LHA Guidance

Overview

Scope 3: Highways Authority Guidance

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- **Commence immediately on completion of the Scope 3: Sector Review.**
  - Critical, as most authorities outsource and all have complex supply chains.
  - Informed and shaped by the Scope 3: Sector Review.
- **Create pragmatic, readily deployable, LHA specific guidance.**
  - Simple, thoughtful and consistent step-by-step guides.
  - Published by ADEPT to all members and the wider sector.
  - Reduce the costs, timescales and risks of Scope 3 implementation.
- **Will inform future carbon accounting and management practices.**
  - Both client-side and provider-side.
- **Provide a foundation for compliance assessments and benchmarking.**
  - Based on common frameworks, measures, boundaries, calculations and assumptions.
- **Scope 1, 2 & 3 Guidance documents will be reviewed and updated annually.**
  - As living documents.

Scope 3: Guidance: All Member Research Exercise

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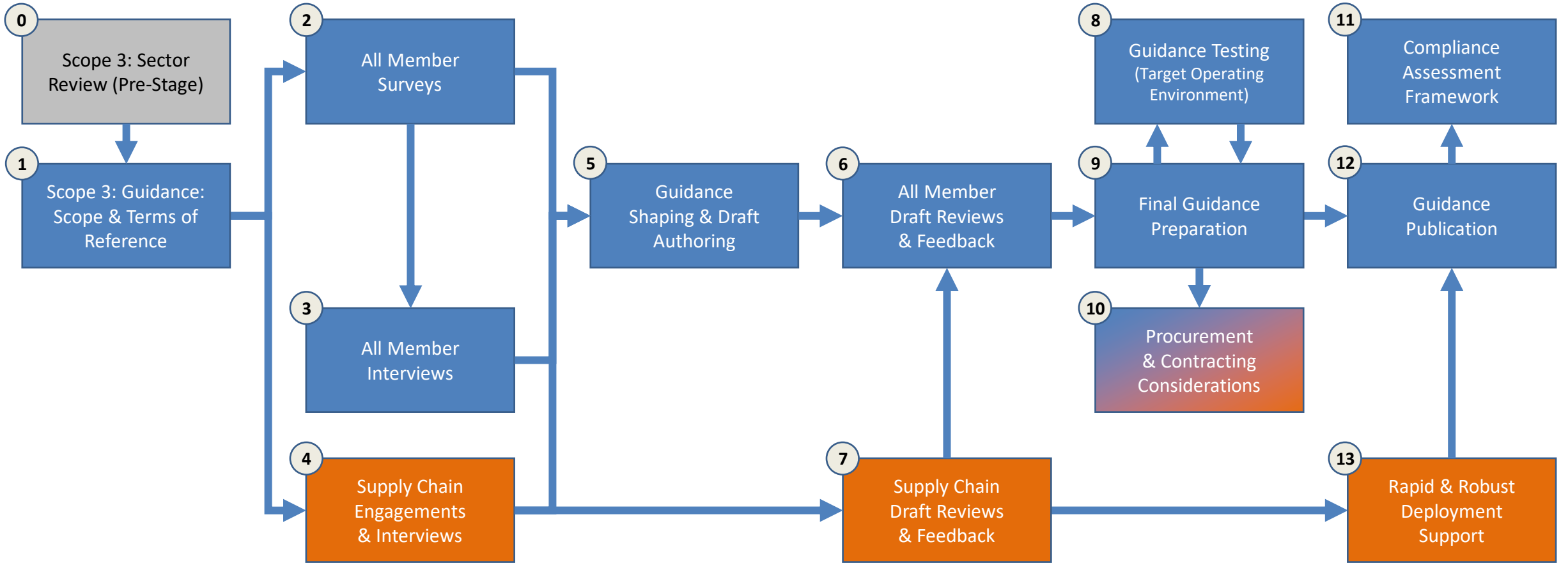

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Zero Carbon Highways: Sector Case Studies

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Case Study #1: Wendover Bypass: Reducing Costs & Carbon

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Wendover Bypass

'An opportunity to reduce our carbon footprint'

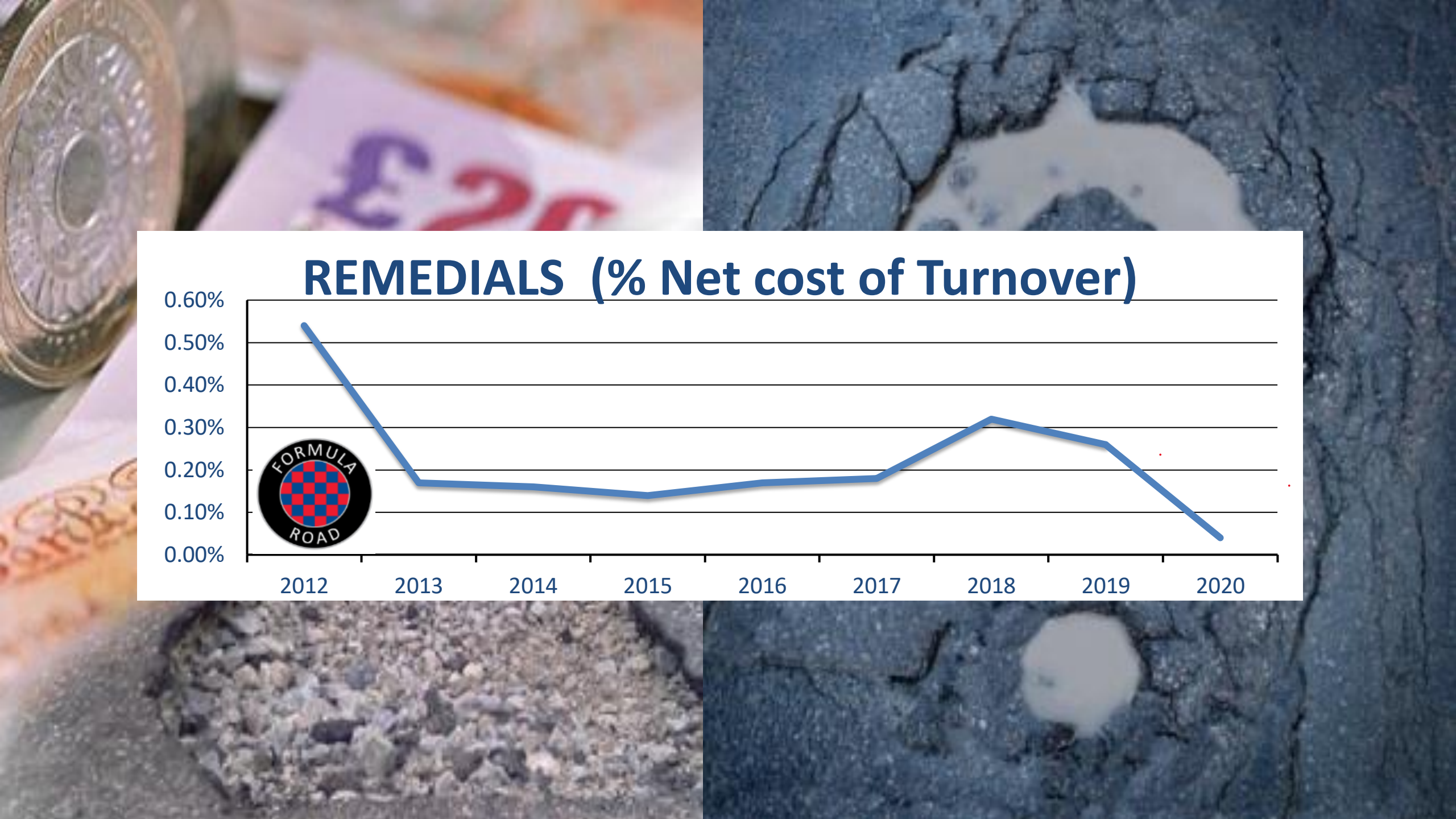
Paul Kidd
Technical Director
Eurovia Contracting

Future Highways Research Group

A world of expertise, **applied locally**

FORMULA
ROAD

FORMULA ROAD


REMEDIALS (% Net cost of Turnover)
0.60%
0.50%
0.40%
0.30%
0.20%
0.10%
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2012
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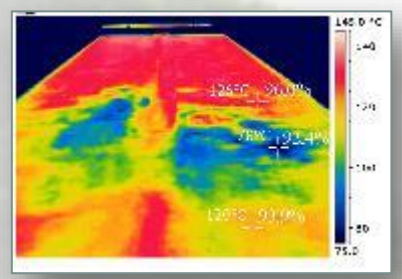
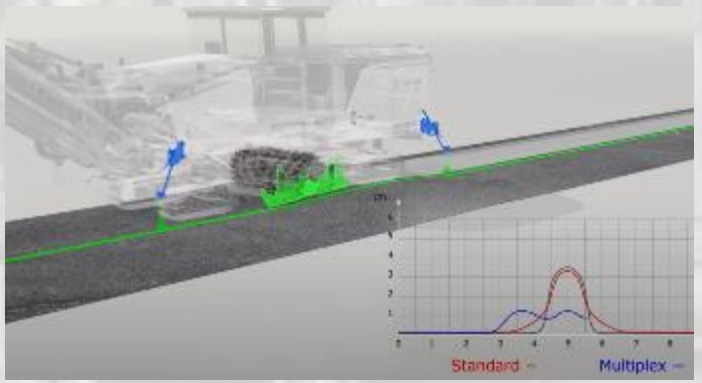
FORMULA
ROAD

Our Formula Road Journey….



AUTOMATED COLD MILLING Mill Assist, Multiplex, WPT



AUTOMATED PAVING Averaging Beams, Spray Jet Technology

USE OF FEEDERS Wide Paving, Rideability & Joint Reduction

INTELLIGENT COMPACTION CONTOL, Hybrid

AUTOMATED QUALITY ASSURANCE, eLOAD+

“DIGITAL TWINS” Thermal Imaging

FORMULA 2.0 ROAD

Wendover Bypass: Case Study

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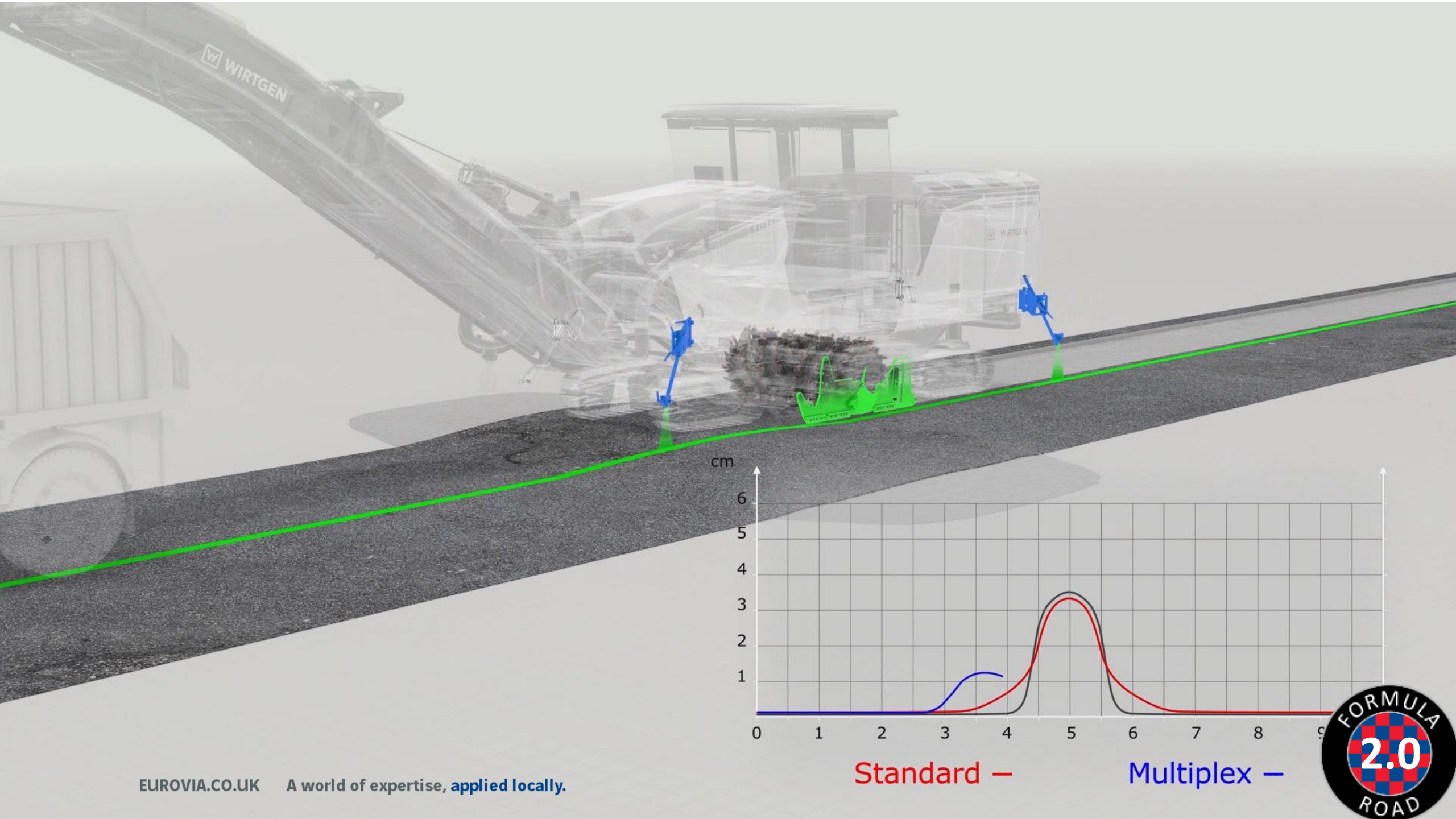
- **Resurfacing:** 2km, 12m wide
- **HS2 Funded:** Circa £1.5m
- **Pavement Design:** Quiet asphalt, -5.0dBa
- **Early Contractor Involvement:** Ringway Jacobs
  - *Design work: Coring, Noise & Rideability (JLUK)*
- **Efficiency Savings:** Outputs & programme
- **Innovations:** Planing, Paving & Compaction
- **Quality Control & Performance**
- **Carbon savings?**

FORMULA 2.0 ROAD


HIGHWAY
FORMULA
2.0
ROAD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Multiplex –
FORMULA
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ROAD


SPRAY-
JET
III
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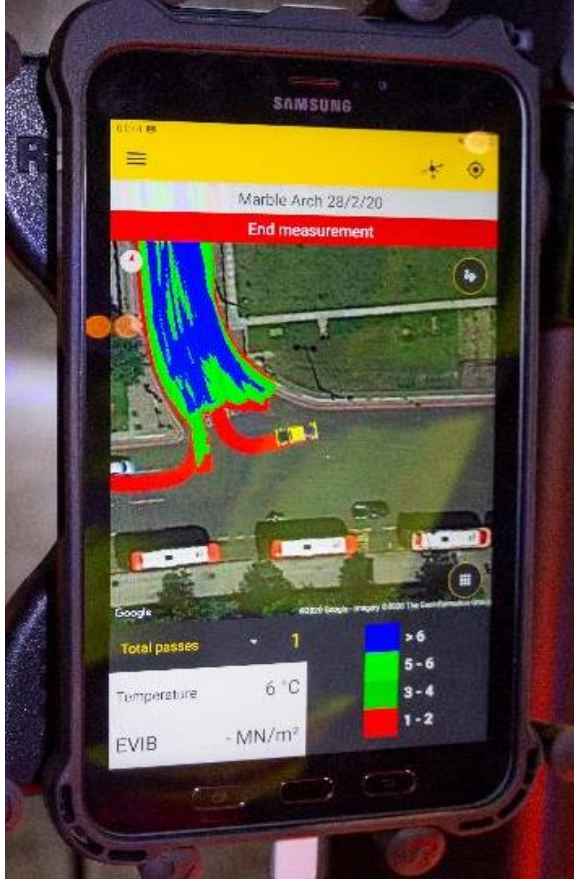
2.0
ROAD



Intelligent Rollers – Continuous Compaction Control

FORMULA 2.0 ROAD

CIHT AWARDS 2021

WINNER
Innovation of the Year

CIHT Awards 2021
Overall Winner

Winner

Transport for Buckinghamshire

EUROVIA SURFACING

RINGWAY JACOBS
integrated expertise

Wendover Bypass – Quiet Asphalt – Benefitting the Local Community

FORMULA 2.0 ROAD

The Measured Benefit?

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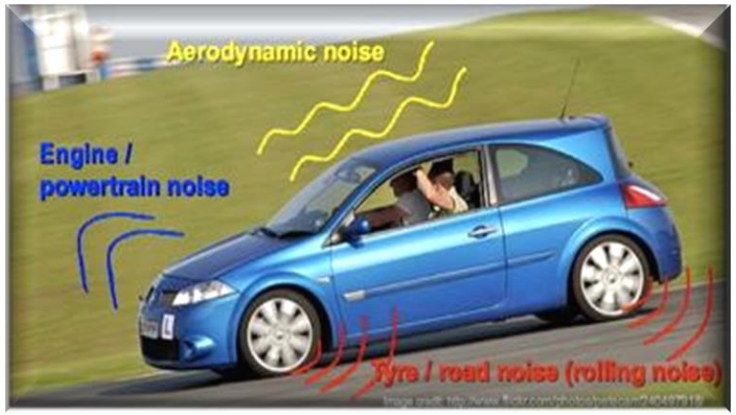
- ✓ Noise Pollution = **reduced by 5.2dB**
- ✓ Financial Budget = **24% reduction, £361K**
- ✓ Carbon Savings = **95,874 $KgCO_2$**



FORMULA 2.0 ROAD


CIHT
AWARDS
2021
WINNER
Innovation of the Year
How Innovative?
✓ Ultra-low noise asphalt saved **1,643t**
✓ Hybrid technology reduced fuel usage by **18%**
✓ Digital & Automation
FORMULA
2.0
ROAD

How Can We Replicate?

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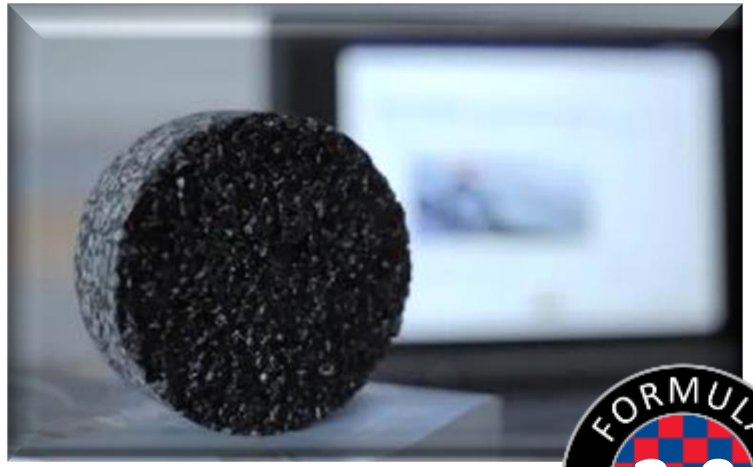
CIHT AWARDS 2021
WINNER
Innovation of the Year

- ✓ Easy Intelligence Transfer
- ✓ In-house Pavement Design
- ✓ Embracing Digital & Plant Innovations
- ✓ Future carbon savings in asphalt?



FORMULA 2.0 ROAD

Asphalt Production

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Drying and Heating Aggregates

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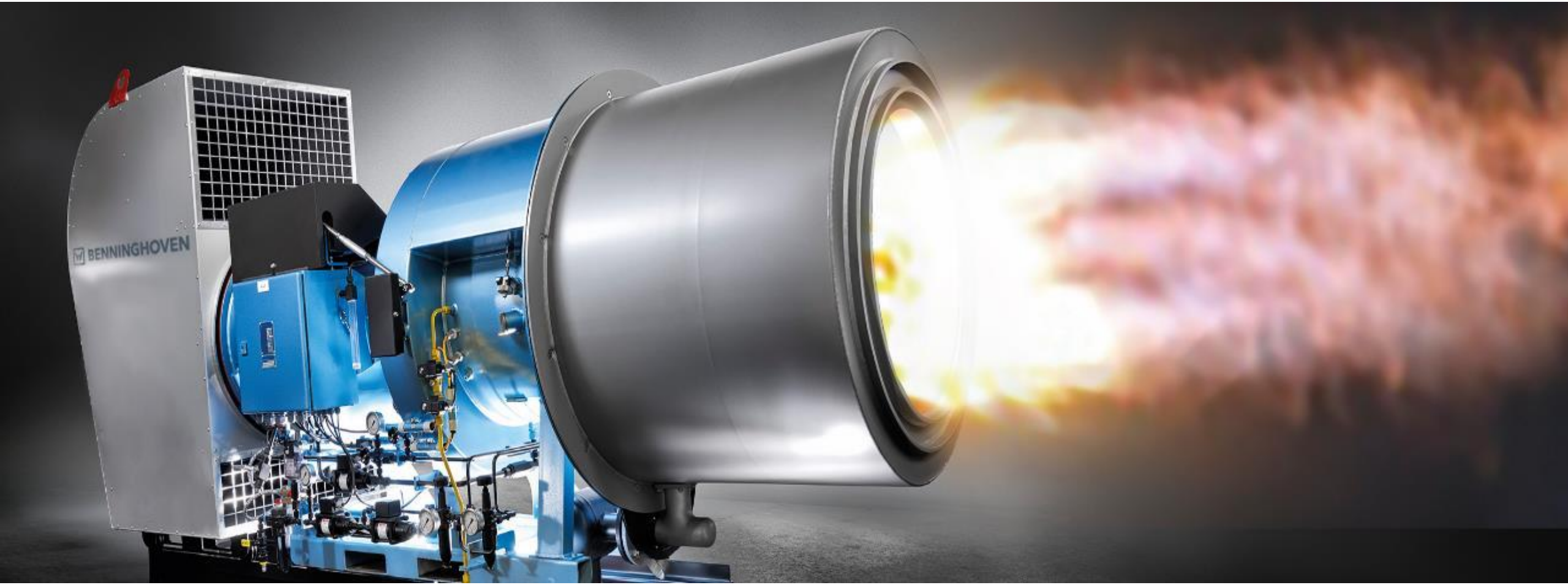

Warm Mix Asphalt

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Eco-Friendly Technologies & Processes

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Thank you for listening

Questions?

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Carbon Case Study #2: Designing Out Carbon

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ATKINS

Member of the SNC-Lavalin Group

FHRG

Introduction to Designing Out Carbon

- **Jon Casey**

Achievements to date

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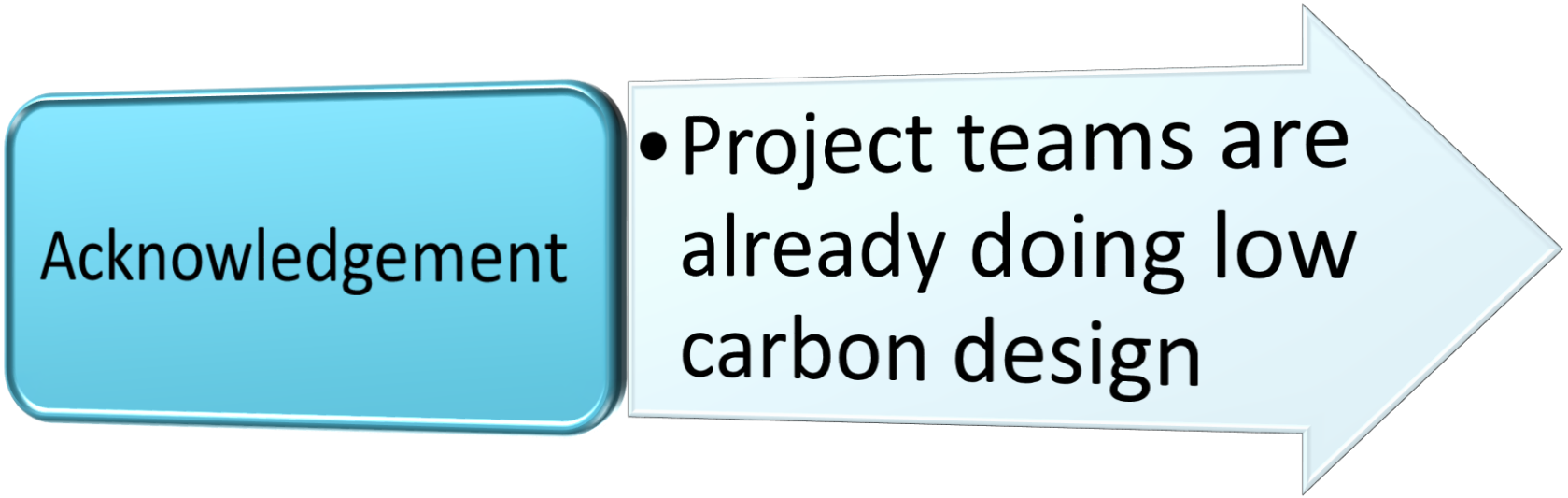

Examples – A57

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Removal of Roe Cross Link	Significant reduction in scope including reduced earthworks, pavement, drainage, lighting and construction of a new junction on Roe Cross Road.
Removal of Cricket Ground Roundabout	Junction no longer needed following removal of Roe Cross Link. Significant reduction in scope including reduced earthworks, pavement, drainage and lighting.
Relocate Mottram Underpass to the east	Previous location of underpass required larger diameter for contiguous piled wall due to presence of geological fault to east of eastern portal. Relocation of underpass to the east reduced diameter of piles needed and reliance on specialist piling plant with limited availability. Minimal impact on overall length of underpass or associated retaining walls.
Replacement of traffic signal controlled roundabout at Mottram Moor junction with a traffic signal controlled crossroads junction	Signal-controlled roundabout replaced with signal-controlled crossroads junction. Significant reduction in junction footprint and extent of earthworks, pavement and drainage infrastructure. Operational performance of junction also improved.
Reduced span at River Etherow Bridge	Span of River Etherow Bridge structure reduced allowing removal of central pier. Flood Risk Assessment work completed to demonstrate no adverse impact on flood plain. Reduction in size of structure to be constructed.

Change

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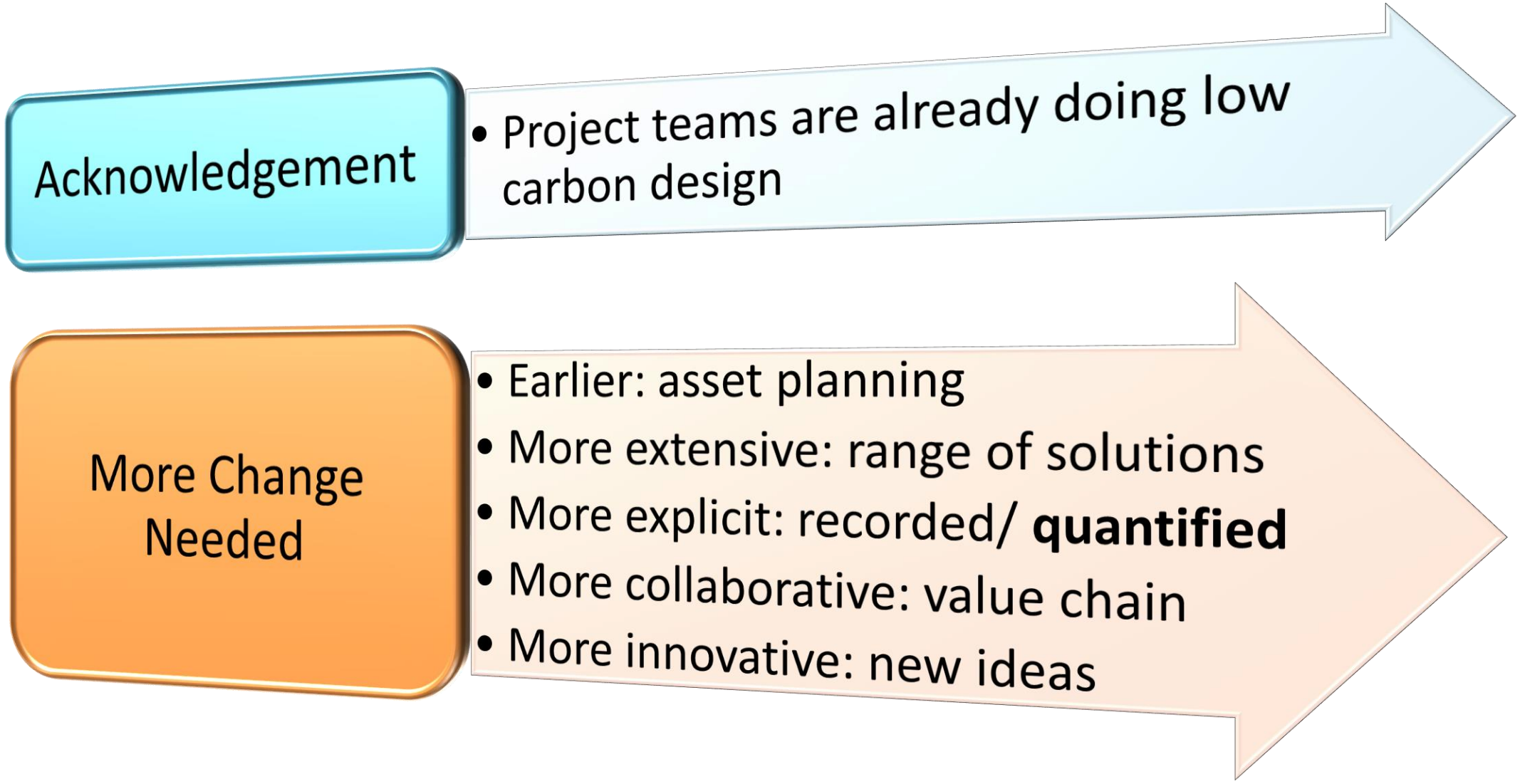

PAS 2080: Apply Carbon Reduction Hierarchy

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Build nothing:

Evaluate the basic need for an asset and/or programme of works and explore alternative approaches to achieve outcomes.

Build less:

Evaluate the potential for re-using and/or refurbishing existing assets to reduce the extent of new construction required.

Build clever:

Consider the use of low carbon solutions (including technologies materials and products) to minimise resource consumption during the construction, operation and user's use stages of the asset or programme of work.

Build efficiently:

Use techniques (e.g. construction, operational) that reduce resource consumption during the construction and operation phases of an asset or programme of work.

Headline Process Changes

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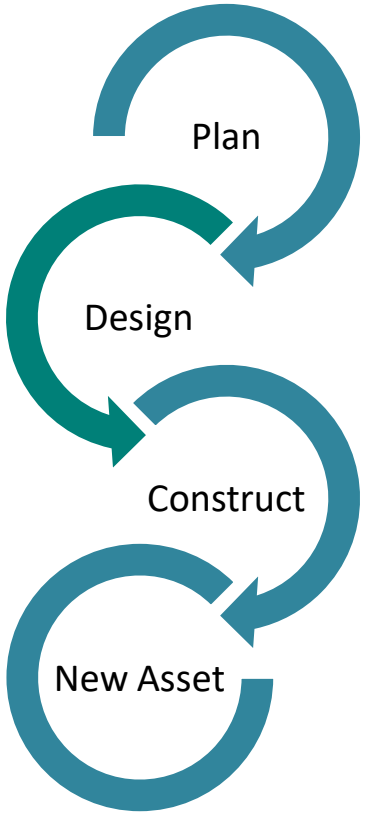
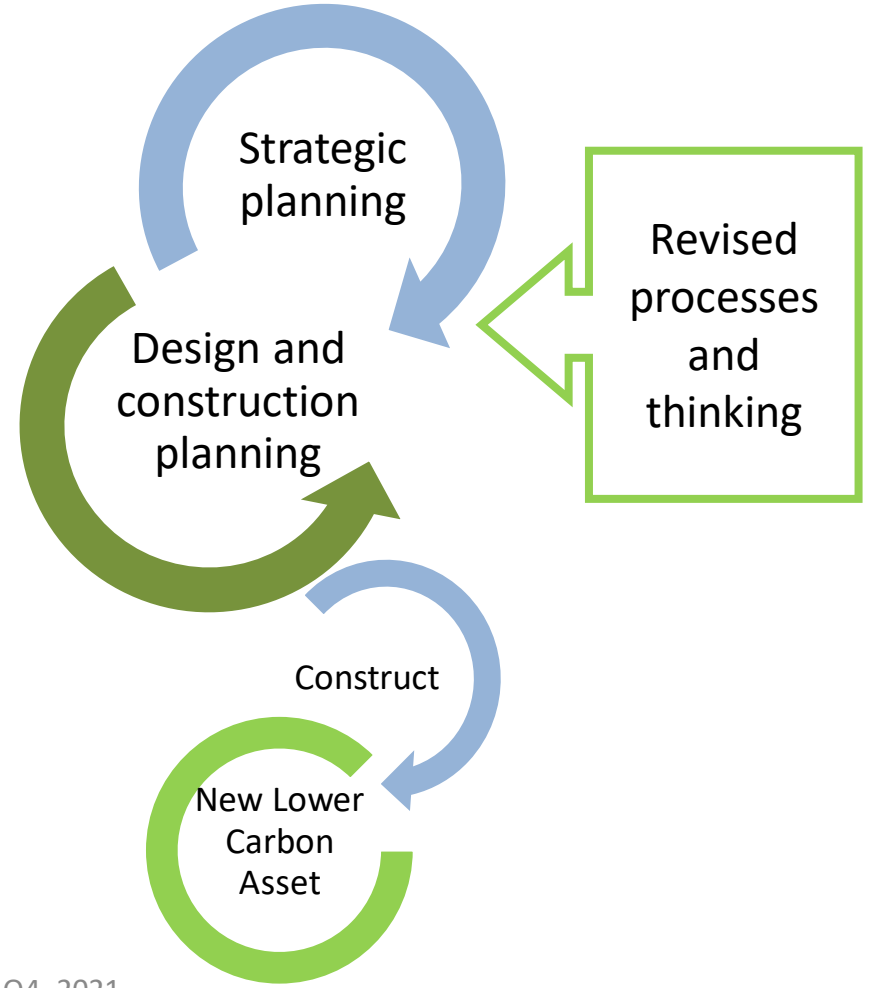
Existing Processes



Core Activities, Roles and Outputs Remain

- Carbon Reduction Hierarchy
- Carbon reduction responsibilities
- Value Chain Input
- Carbon Modelling and Options Assessment

Updated Processes – **PAS 2080**



Think on a Whole Life Cycle Basis

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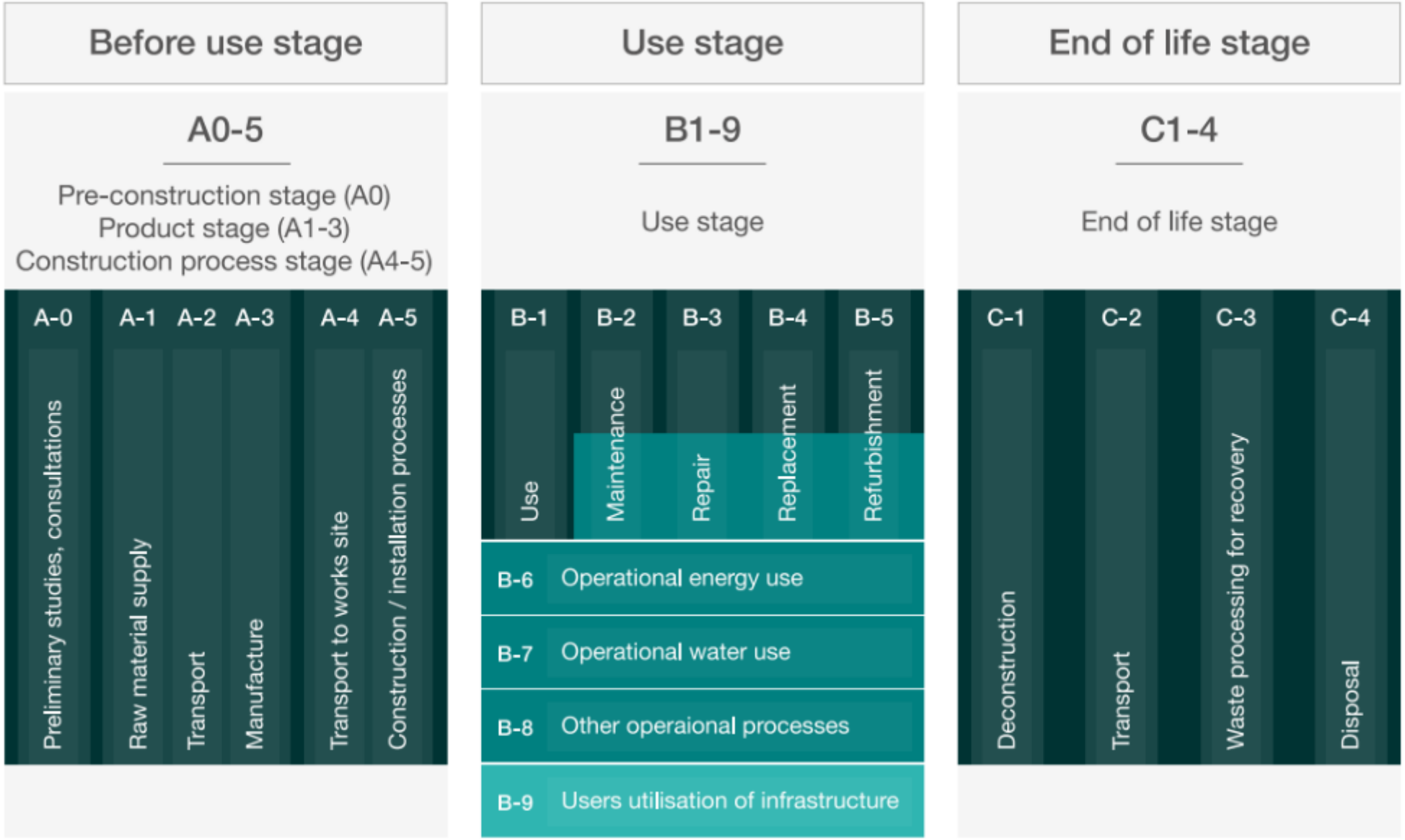

Develop Programme/ Project Processes to Enable Carbon Reduction

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Integrated carbon reduction thinking into asset/ programme/ project processes

- Always be asking, '*what are the carbon implication of this*'?
- Record design developments and decisions that improve carbon performance

Engagement across the project team including client, designer, constructor and materials suppliers to determine best options

- Think and discuss much more broadly on what a solution needs to be

Develop a clear action plan

- Create a focused list of actions to be undertaken to reduce whole life emissions

Ensure that carbon reduction is addressed at all key decision making points

- Make sure knowledge of carbon performance is developed to inform decision making

Apply Innovation and Efficiency Improvements

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Recognise that existing innovations and efficiency improvements are very likely delivering carbon reduction

Recognise that innovation and efficiency improvements are key to carbon reduction going forwards

Assess Carbon Performance

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Assess quickly using materials, plant and energy quantities as proxies

- More concrete in one option vs another will be higher carbon

Calculate carbon for more complex decision making

- This can be quick and high level, as well as more detailed

Calculate to assess hotspots

- Any level of detail

Calculate at end of project stage

- Create a carbon model to show end of stage performance, as required

Calculation case studies:

- www.carboncritical.com/knowledgebase

Report Progress, Achievements, Next Steps

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Produce a project stage output report

- Define carbon management undertaken
- Carbon reductions achieved
- Actions for the next project stage to ensure continuation of reduction initiatives

Our values are the essence of our company's identity.
They represent how we act, speak and behave together,
and how we engage with our clients and stakeholders.

SAFETY	*We put safety at the heart of everything we do, to safeguard people, assets and the environment.*
INTEGRITY	*We do the right thing, no matter what, and are accountable for our actions.*
COLLABORATION	*We work together and embrace each other's unique contribution to deliver amazing results for all.*
INNOVATION	*We redefine engineering by thinking boldly, proudly and differently.*

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Curated Library of Carbon Reduction Options

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Carbon Reduction Options Library

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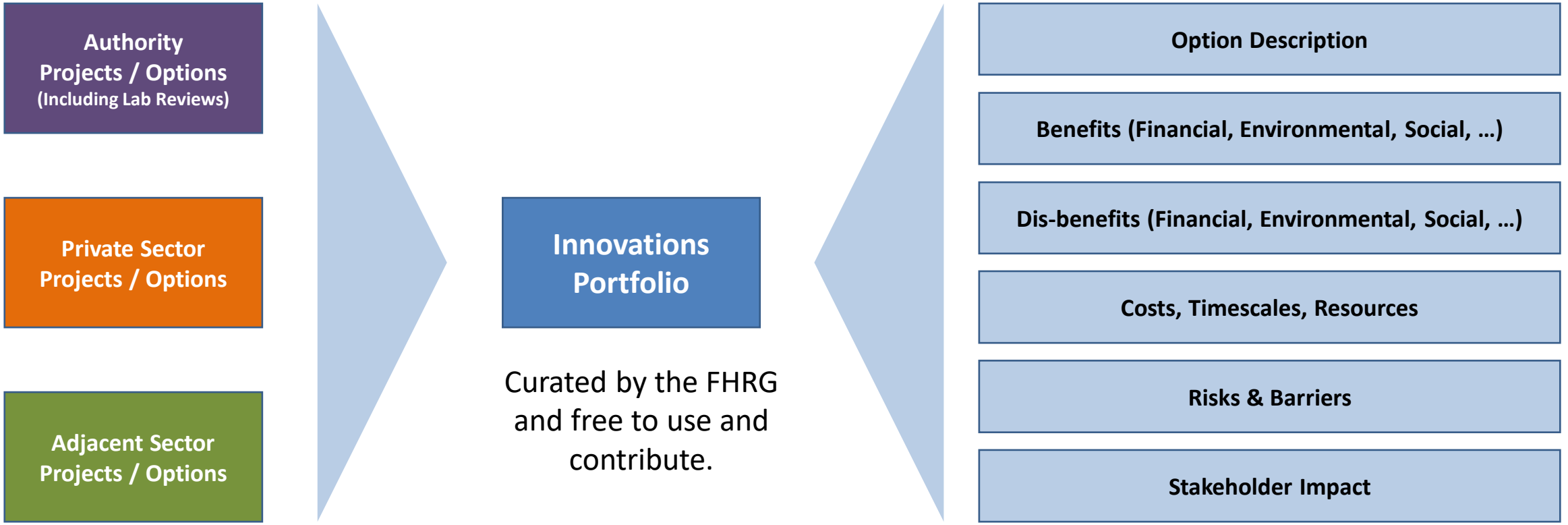

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Upcoming Meetings & Events

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Proposed Upcoming Meetings & Events

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- **Scope 1 & 2 Guidance Publishing**
  - 26th November 2022 (Online Event)
- **Human Capital Research Programme: Roundtable Launch Event**
  - December 2021, To Be Scheduled (Method & Date Poll)
- **Political Engagement: Roundtable Discussion**
  - January 2022, To Be Scheduled (Method & Date Poll)
- **FHRG Meeting (Members Only)**
  - 24th February 2022?, To Be Scheduled (**Cranfield + Virtual, Date Poll**)
- **Scope 3: Sector Review Publishing**
  - March 2022, To Be Scheduled (Online Event)
- **ADEPT / FHRG: Spring Highways Innovation Conference**
  - April 2022, To Be Scheduled (Cranfield + Virtual, Date Poll)
- **Scope 3: Guidance Publishing**
  - May 2022, To Be Scheduled (Cranfield + Virtual, Date Poll)

Return to Cranfield University

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- **Subject to COVID, from Q1-2022 we hope to return to Cranfield University School of Management, CMDC for our conferences and meetings.**
- **We want to provide a forum for networking and sharing ideas.**
- **Cranfield can accommodate both physical and virtual attendees.**
- **The first FHRG meeting will include a pre-event dinner for members.**

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End of Document

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