The role of behaviour change in decarbonising the UK's local highways infrastructure and assets

March 2025

BIT | Department for Transport | ADEPT LIVELABS2 Decarbonising Local Roads

ADEPT Live Labs 2

ADEPT Live Labs 2: Decarbonising Local Roads in the UK is a three-year, UK-wide £30 million programme funded by the Department for Transport that aims to decarbonise the local highway network.

The Association of Directors of Environment, Economy, Planning & Transport (ADEPT) represents county, unitary, metropolitan and combined authorities, along with sub-national transport bodies and corporate partners drawn from key service sectors. Live Labs 2 includes seven projects, grouped by four interconnected themes, led by local authorities working alongside commercial and academic partners. Each project is testing new solutions to decarbonise construction and maintenance across the whole life cycle of the local highway network. The programme is overseen by an independent Commissioning Board, which includes the Department for Transport and other experts from across the public and private sectors.

The project website for ADEPT Live Labs 2 is:
www.adeptnet.org.uk/livelabs2

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Acknowledgement

This report has been commissioned by the Live Labs 2 Commissioning Board via ADEPT. However, the analysis and findings presented are solely those of the authors, the Behavioural Insights Team, and do not necessarily reflect the views of ADEPT or the government.

Foreword

From observations during the early stages of the Live Labs 2 programme, the Commissioning Board identified that there were potential blockers across the public and private sectors in enabling the rapid uptake of new methods and materials that would decarbonise local highway assets.

In addition, early carbon baseline work on Live Labs 2 showed that there was still an element of 'greenwashing' occurring in the industry, as well as variable carbon accounting across the sector as illustrated in the recent baseline reporting and summary.

This study, sponsored by the Live Labs 2 Commissioning Board, has systematically looked across the programme, including its partners, to examine where the institutional and individual blocking behaviours may exist.

With 2024 being the first year that Paris agreement targets were breached, there is an absolute imperative for all of us to act quickly and recognise that whilst tailpipe emissions are being addressed, we are still embedding millions of tonnes of carbon (a figure which the programme is looking to estimate in the coming months) into our local highways infrastructure each year. The majority of Local Highway Authorities have declared Climate Emergencies and as such should be adopting techniques and solutions now to address their carbon impacts. It is within their power to take early action and make a difference.

This report has considered all the organisations that have a role to play in decarbonising the local roads system in the UK. It also considers the actions that the pubic and private sector need to adopt quickly to address the issue of capital carbon.

There is no 'silver bullet' to solving the challenge of embodied carbon, what we need is true 'cathedral thinking' so that we are tackling today's challenges and making our planet fit for future generations.

Neil Gibson – Chair of the Live Labs 2 Commissioning Board

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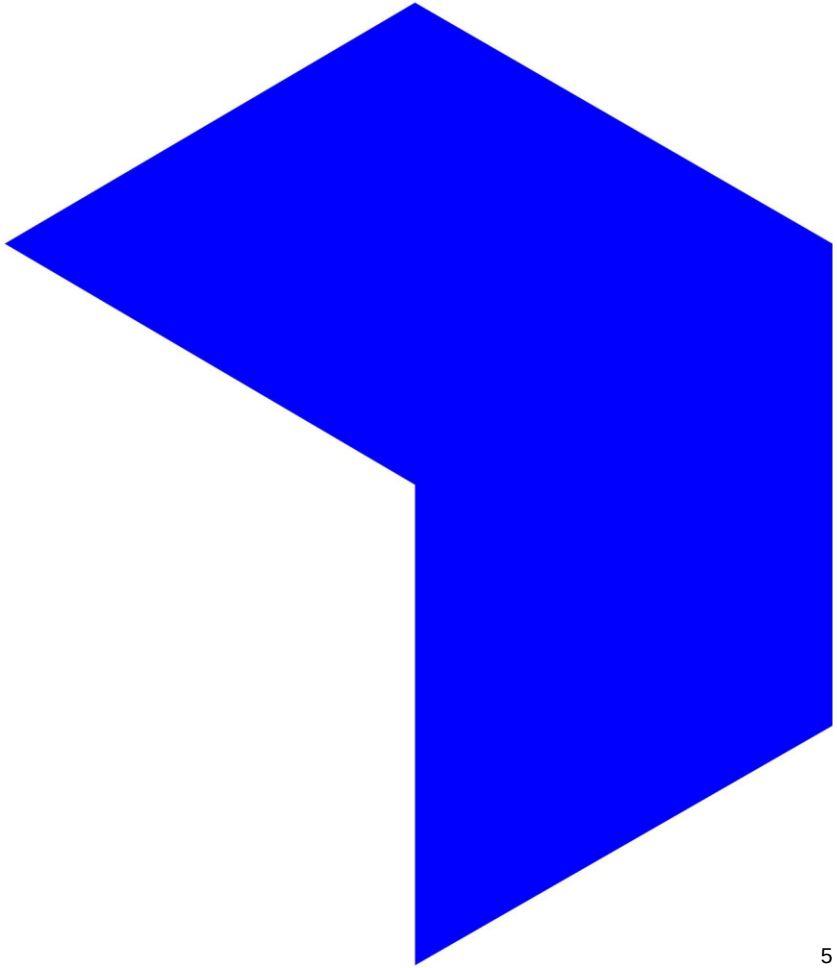

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Executive summary

Project aims and key findings from our research

Aims: the Live Labs 2 Commissioning Board, through ADEPT, commissioned the Behavioural Insights Team (BIT) to investigate the behavioural and systemic barriers to the shift towards low carbon local highways infrastructure, and develop actionable recommendations. Leveraging insights from the Live Labs 2 programme, our aim was **to provide recommendations to drive decarbonisation in local highways infrastructure and assets, with the potential for broader impact across the entire transport infrastructure sector.**

Methodology: we used the seven Live Labs 2 projects as case studies to explore how behaviours throughout the system impact the adoption of low carbon technologies and innovation in the transport sector. Our approach included three key activities: **familiarising ourselves with the Live Labs 2 projects, interviewing stakeholders and solutioning**.

Findings: **Local Highway Authorities (local authorities responsible for operating, maintaining and improving local roads assets) face significant barriers to implementing decarbonisation strategies within transport infrastructure** (see table on next slide for a summary)**.** Financial pressures dominate, causing Local Highway Authorities to prioritise immediate savings over sustainable investments with long-term benefits. Procurement processes are often misaligned, lacking criteria that emphasise carbon reduction or incentives for green practices. Skills and knowledge gaps in areas like carbon accounting and innovation further limit adoption, while deeply entrenched organisational cultures resist change, favouring familiar, lower-risk approaches. Risk aversion is heightened by uncertainties about the performance of innovative materials or public backlash. Additionally, siloed working practices and limited collaboration across authorities hinder knowledge sharing and collective progress. These challenges are compounded by inconsistent leadership support and a lack of statutory incentives or central direction, which together can suppress motivation and capacity for change.

We used the identified barriers as a foundation to develop system-wide solutions, ensuring they addressed not only immediate challenges but also the underlying structural and organisational factors limiting progress. These recommendations provide a starting point for shifting behaviours, but achieving meaningful change will require time, investment, and commitment from organisations. Rather than a simple 'fix,' they necessitate broader organisational change, leadership support, and a collective effort to align behind the vision for a low carbon transport future.

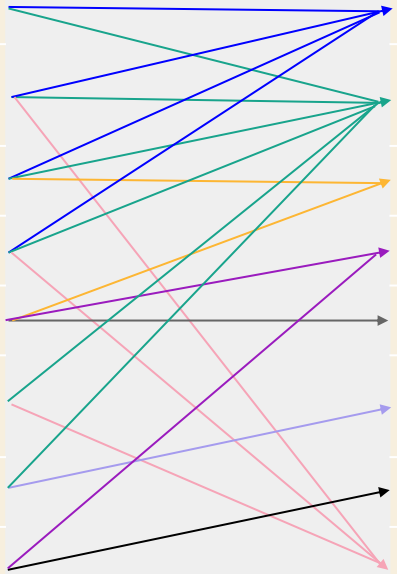
We identified eight key barriers that are likely to have the greatest impact on decarbonising local highways infrastructure

Barriers were categorised as **a key barrier** based on stated prevalence by interviewees, as well as their expected impact on Local Highway Authorities' capability, opportunity and/or motivation to engage in desired behaviours, based on existing evidence.

Theme	Key barrier
Motivation to make green investment	1. Financial pressures lead to the prioritisation of immediate financial savings
	2. Lack of, or misaligned, incentives to decarbonise
Staff capital	3. Skills and knowledge gaps (e.g., carbon literacy; sustainability regulation; innovation)
Procurement challenges	4. Carbon is (generally) not a part of standard award criteria
Organisational culture	5. Entrenched behaviours, reinforcing existing ways of working
	6. Risk averse culture, so hesitant to adopt new materials and practices
	7. Lack of Local Highway Authority leadership support
Collaboration and knowledge sharing	8. Siloed working practices and limited knowledge sharing

We developed solutions to address the key barriers, and recommend eight key solutions to drive innovation and change across the sector

Solutions to prioritise	Key barrier(s) addressed
1. Reduce the use of competitive bidding for funds	Financial pressures
2. A strategic spatial plan for UK local highways infrastructure	Lack of, or misaligned, incentives
3. Communicate funding availability and provide tailored support	Skills/knowledge gaps
4. Legislate for investment decisions to consider the long-term	Entrenched ways of working
5. Create a Local Highways Expertise Hub	Limited knowledge sharing
6. Mandate carbon reporting and targets	Carbon not a part of standard award criteria
7. Incorporate decarbonisation requirements into contracts	Risk aversion
8. Build psychological safety, encourage risk-taking and experimentation, through communications, reward and training	Lack of leadership support



Collaborative action across the system is required to deliver meaningful behaviour change. ADEPT*, through the Live Labs 2 programme, can act as an agent for change in encouraging innovation across the sector in eight key ways

Upstream *Align government and national bodies' policy and funding to address decarbonisation*

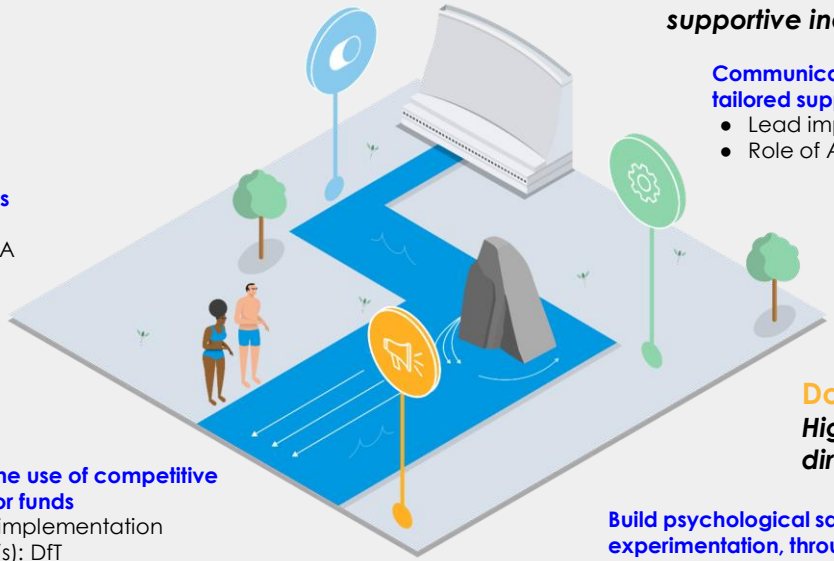
Legislate for investment decisions to consider the long-term
- Lead implementation actor(s): DfT / Cabinet Office
- Role of ADEPT and partners: Advocate

A strategic spatial plan for UK local highways infrastructure
- Lead implementation actor(s): DfT / NISTA
- Role of ADEPT and partners: Enable

Incorporate decarbonisation requirements into contracts
- Lead implementation actor(s): Local Highway Authorities
- Role of ADEPT and partners: Advocate

Mandate carbon reporting and targets
- Lead implementation actor(s): DfT
- Role of ADEPT and partners: Advocate

Reduce the use of competitive bidding for funds
- Lead implementation actor(s): DfT
- Role of ADEPT and partners: Advocate



Midstream *Nurture a supportive industry*

Communicate funding availability and provide tailored support
- Lead implementation actor(s): ADEPT / LGA
- Role of ADEPT and partners: Implement

Create a Local Highways Expertise Hub
- Lead implementation actor(s): ADEPT / DfT
- Role of ADEPT and partners: Enable

Downstream *Empower Local Highway Authorities to take direct action*

Build psychological safety, encourage risk-taking and experimentation, through communications, reward and training
- Lead implementation actor(s): Local Highway Authorities
- Role of ADEPT and partners: Enable

*Action taken by ADEPT is enabled through the funding they receive from the Department for Transport.

Executive summary

Key conclusions and next steps

This project has underscored the complexities and diverse barriers that Local Highway Authorities face in decarbonising local highways infrastructure. These barriers range from financial pressures and procurement challenges to entrenched organisational cultures and siloed working practices. Furthermore, the variability in resources, strategic priorities, and existing capacities among Local Highway Authorities highlights the insufficiency of a one-size-fits-all approach to decarbonisation.

To address these challenges effectively, a multifaceted, system-wide approach is required. Solutions must be adaptable and tailored to the unique contexts of individual Local Highway Authorities, taking into account their specific barriers, opportunities and constraints. Downstream solutions, in particular, often need to be customised to local circumstances to ensure practical implementation and minimise unnecessary burdens, while upstream interventions will need to be carefully designed to ensure they effectively address systemic barriers and align with the broader goals of decarbonisation. Such tailoring will require ongoing collaboration with Local Highway Authorities to refine and optimise prioritised solutions, ensuring they are actionable and aligned with both short-term needs and long-term decarbonisation goals.

Given its strategic position, ADEPT can play an important role as a catalyst for change across the transport infrastructure sector. Through its strong relationships with central government, industry groups, and Local Highway Authorities, ADEPT can act as an agent for change through advocacy and encouraging cross-sector collaboration, ensuring that sector-wide resources, policies, and partnerships are aligned to drive innovation and achieve meaningful and sustained decarbonisation.

Due to the dynamic nature of this landscape, further testing of the proposed solutions and rigorous evaluation of their impacts will be essential. Iterative cycles of implementation and feedback will help identify effective practices, support innovation, and build trust among stakeholders. Additionally, continuous engagement with Local Highway Authorities, industry partners, and policymakers will be vital to adapt solutions to emerging challenges and opportunities, thereby supporting a cohesive and scalable approach to local highways infrastructure decarbonisation.

Next steps: Further prioritise impactful solutions with input from stakeholders, ensuring alignment with barriers and operational realities. Refine and pilot test solutions collaboratively, exploring synergies for greater impact. Implement a phased timeline, starting with quick wins to build momentum and progressing to complex projects. Maintain strong stakeholder engagement to shape interventions, address challenges, and align with policy goals.

Background

Project background

Efforts to reduce carbon emissions in the transport sector have largely focused on tailpipe emissions, often overlooking the substantial emissions generated by transport infrastructure. A significant share of these emissions arises from the construction, maintenance and management of highways infrastructure. For example, this can include adopting low carbon materials, optimising road maintenance practices, improving energy efficiency in assets (e.g., LED streetlights) and leveraging smart technologies to reduce operational emissions. Addressing these emissions requires innovative approaches that integrate sustainability into infrastructure development and operations.

The Live Labs 2 programme represents a series of demonstrator projects being led by Local Highway Authorities working alongside commercial and academic partners in the transport sector. The programme provides an opportunity for ambitious low carbon innovation and adoption; it spans the design, planning, construction, maintenance, and management of local highways infrastructure and assets, including local road networks (highways and minor roads), pavements, verges, and street lighting.

At its core, Live Labs 2 is also a **behaviour-change programme**. Local Highway Authorities and delivery partners are required to challenge the status quo and adopt new mindsets and practices to ensure that low carbon technology and practice is embedded and embraced. This makes the Live Labs 2 programme a valuable case study for decarbonisation; it not only provides valuable lessons when it comes to low carbon adoption in local highways infrastructure and assets, but also across the transport infrastructure sector more broadly.

Project objectives

The Live Labs 2 Commissioning Board, through the Association of Directors of Environment, Economy, Planning & Transport (ADEPT) commissioned the Behavioural Insights Team (BIT) to bring a fresh perspective as behaviour change and net zero specialists. With the aim of exploring the behavioural, social, organisational, and systemic aspects of the shift toward low carbon local highways infrastructure and developing actionable recommendations.

Leveraging insights from Live Labs 2, **our aim was to provide behaviourally-informed recommendations to drive decarbonisation in local highways infrastructure and assets, with the potential for broader impact across the entire transport infrastructure sector.** It is worth noting that these recommendations are based on research conducted with Local Highway Authorities, primarily in England. As such, they are most strongly applicable to the English context, but may also hold relevance for the other three UK nations.

Beyond individual actions, behaviour change within organisations can play a critical role in enabling large-scale transformation. Past work conducted by The Behavioural Insights Team has shown that leveraging behaviour change techniques can transform culture, improve decision making, strengthen collaboration and support innovation - key ingredients for overcoming systemic barriers to change. Building on these insights, this project directly tackles key aspects of the Live Labs 2 Theories of Change, ensuring that recommendations align with the programme's overarching aims while also providing a blueprint for scaling change at speed, with agility and at the level needed to drive meaningful decarbonisation across the transport sector.

Background

Live Labs 2 is a UK-wide, 3-year £30m programme funded by DfT

Live Lab		Scope
1	**Devon County Council: Corridor and place-based decarbonisation**	Focuses on corridor and place-based decarbonisation by implementing carbon-reducing innovations in the construction lifecycle of the A382 Major Road Network improvement project near Newton Abbot, integrating new dual carriageways, roundabouts, and shared paths, all while enhancing road safety, local connectivity, and aligning with local planning policies for future growth.
2	**Liverpool City Council: Corridor and place-based decarbonisation**	Aims to decarbonise highways in complex city contexts by developing an 'Ecosystem of Things', a city-level systems mapping approach that integrates design, public spaces, materials, recycling infrastructure, and crucial legal and procurement processes to normalise decarbonisation efforts across Local Highway Authorities.
3	**Wessex Partnership (net zero corridors): Corridor and place-based decarbonisation**	Sets out to create the UK's first net zero emission roads in Somerset, Cornwall, and Hampshire through nine 'net zero corridors', using collaborative and iterative processes with Local Highway Authorities and academic partnerships to trial and optimise decarbonisation strategies and document them in a Carbon Toolkit.
4	**East Riding of Yorkshire low carbon lighting**	Dedicated to decarbonising the highway visual environment by setting new baselines for energy and cost efficiency in road lighting, signing, and marking, while developing a standardised design methodology to enhance visual perception and reduce carbon emissions.
5	**South Gloucestershire Council and West Sussex County Council greenprint**	Aims to transform the use of raw materials from road verges into sustainable outputs like biofuels, increasing biodiversity, and developing a replicable zero-carbon green asset management methodology through a circular economy and systems thinking approach.
6-7	**Centres for excellence: North campus North Lanarkshire and South campus Transport for West Midlands**	Focuses on identifying and scaling innovations in material decarbonisation, providing an open access platform for information on low carbon materials and best practices, and facilitating an agile innovation funnel to develop and test cutting-edge materials and technologies.

BIT

Source: www.adeptnet.org.uk/livelabs2

Methodology

Overview of our behavioural, systems-led approach

We used the seven Live Labs 2 projects as case studies to explore how individual, organisational, and **system-wide behaviours** impact the adoption of low carbon technologies and innovation in the transport sector. Our approach included three key activities: familiarising ourselves with the Live Labs 2 projects, interviewing stakeholders, and solutioning. These insights shaped our recommendations on how to drive and accelerate decarbonisation.

Activity 1: familiarisation

We carried out desk-research of relevant Live Labs 2 materials and resources such as business cases, progress reports and conference presentation materials. We worked closely with ADEPT to clarify gaps in understanding and verify assumptions. The purpose of this stage was to provide foundational knowledge of each Live Labs 2 project and its scope, informing the focus of our Live Labs 2 stakeholder interviews.

Activity 2: stakeholder interviews

We conducted 25 interviews with Live Labs 2 projects and relevant sector stakeholders. The purpose of our interviews was to explore the barriers and drivers to decarbonisation across the seven Live Labs. Findings were analysed and used to inform our solutioning. We also used later interviews to validate our findings and solicit feedback on our solution ideas.

Activity 3: solutioning

We developed an initial longlist of behaviourally-informed solution ideas through internal and external workshops with project stakeholders. We prioritised ideas based on their impact and feasibility and supplemented them with further desk research.

Stakeholder interviews: design

We conducted 25 semi-structured interviews with stakeholders involved in the Live Labs 2 programme and other Local Highway Authorities. The interviews were conducted in two rounds, each with a specific focus. The first round of interviews aimed to explore the barriers and facilitators to low carbon adoption across the seven Live Labs 2 projects. While the second round of interviews were used to validate our findings from the first round with other Local Highway Authority stakeholders (not involved in the Live Labs 2 programme) and solicit feedback on solutions. Discussions were primarily based on the interviewee's experience and/or perception of their authority's ways of working, the historic/present/planned decision making, and the culture. The interviewer's line of questioning was led by the interviewee's responses to generate unprompted discussion, followed by stimulus-led discussion to probe on other areas (e.g. procurement, legal, comms etc).

Interview round 1 with Live Labs 2 stakeholders	Interview round 2 with Local Highway Authorities
Recruitment Approach We recruited stakeholders on a rolling basis, beginning with Live Labs 2 project leads and then using the findings to identify additional relevant stakeholders such as stakeholders in procurement, communications and other related organisations.	**Recruitment Approach** We recruited stakeholders on a rolling basis, based on recommendations from ADEPT for relevant non-Live Labs 2 'counterfactual' Local Highway Authority representatives to interview.
Research questions 1. What are the main **barriers** to decarbonisation across the Live Labs 2 projects? 2. What factors have **facilitated** successful decarbonisation across the Live Labs 2 projects? 3. What types of **interventions** are necessary to facilitate behaviour change towards decarbonisation across the seven Live Labs 2 projects (and by extension, the sector)?	**Research questions** 1. To what extent do non-Live Labs 2 Local Highway Authorities validate the **barriers** to decarbonisation, which were raised in the Live Labs interviews? 2. To what extent do non-Live Labs 2 Local Highway Authorities support the **interventions** to drive decarbonisation, developed from the Live Labs 2 local authority interviews?

Stakeholder interviews: sample

Live Lab	Authority / Organisation	Number of interviews
Round 1 interviews with Live Labs 2 stakeholders		
Devon County Council: Corridor and place-based decarbonisation	Devon County Council	2
Liverpool City Council: Corridor and place-based decarbonisation	Liverpool City Council	4
	Bird & Bird (law firm)	
Wessex Partnership (net zero corridors): Corridor and place-based decarbonisation	Wessex partnership	2
	Somerset Council	
East Riding of Yorkshire: Low carbon lighting	East Riding of Yorkshire Council	3
	Derbyshire County Council	
South Gloucestershire and West Sussex Council: Greenprint	South Gloucestershire Council	4
	West Sussex Council	
Centres for excellence: North Campus North Lanarkshire and South Campus Transport for West Midlands	North Lanarkshire Council	7
	Amey (infrastructure support service provider)	
	Transport for West Midlands	
	Colas (infrastructure contractor)	
	Transport for West Midlands	
Round 2 interviews with Local Highway Authorities not participating in Live Labs 2		
Cheshire West, Bracknell Forest and Norfolk.		3

Note: our sample consisted primarily of stakeholders involved in the Live Labs 2 programme. This allowed us to gather in-depth insights into the adoption of low carbon innovations and practices. However, it is important to acknowledge that the findings may not fully capture the diversity of perspectives or experiences present in other Local Highway Authorities.

Stakeholder interviews: analysis

To assess barriers and solutions for decarbonising local highways and wider transport infrastructure, we used a **structured thematic analysis approach**. Our analysis aimed to extract actionable insights from stakeholder interviews, categorising relevant themes and refining them to prioritise the most impactful barriers and solutions.

Thematic analysis approach: we employed a standard thematic analysis methodology, adapting an organisational culture change model as an initial framework. The process involved three main stages:

- **Theme identification:** we began with a preliminary list of themes aligned with research questions and the culture change model, iteratively refining the list based on emerging insights.
- **Data coding:** quotes and responses from interviews were coded under identified themes. Coding decisions were made collaboratively, ensuring consistent application across interviews.
- **Theme development:** we further developed themes based on coded data, synthesising them into a refined list of barriers and solutions. This process entailed grouping related codes, clarifying theme definitions, and merging overlapping categories.

Refining and prioritising barriers and solutions: our initial long list of barriers and solutions was refined through several rounds of review, focusing on root causes, underlying psychological factors (such as biases or social dynamics), causal mechanisms, and the potential impact of each theme. Each barrier and solution was evaluated according to specific prioritisation criteria, including:

- **Impact on capability, opportunity, or motivation:** themes were prioritised if they significantly affected Local Highway Authorities' capability, opportunity, or motivation to implement decarbonisation strategies for highways.
- **Frequency of mention:** themes mentioned by two or more interviewees, or identified by Live Labs 2 projects, were given priority, ensuring that we addressed commonly cited issues.
- **Broader relevance:** barriers and solutions were further validated in a second round of interviews with Local Highway Authorities outside of the Live Labs 2 cohort, confirming their relevance beyond the initial sample.

Solutioning

Our approach to developing and refining solutions comprised two key activities:

- **Internal brainstorming sessions with colleagues from across BIT**, who brought subject-matter expertise in key areas such as organisational change, working with Local Highway Authorities and transport and decarbonisation behaviour change. These sessions generated a longlist of solution ideas, which were discussed and iterated. When developing the solutions, we considered the following:
    - The barriers identified from analysis of the stakeholder interviews
    - Solutions suggested during stakeholder interviews
    - A systems perspective
    - Evidence of what works in behaviour change

- **External co-creation workshop with stakeholders from ADEPT, the Department for Transport and the National Infrastructure Commission**. This workshop aimed to evaluate the feasibility and impact of the most promising solution ideas and allowed participants to further develop these solutions, identify relevant actors, and explore any limitations. By engaging directly with stakeholders involved in the implementation of transport infrastructure projects, we ensured that the solutions developed were not only grounded in expert knowledge but also practically viable and tailored to real-world applications.

A model to explore behaviour change at a system-wide level

Achieving decarbonisation at scale, be it in the context of decarbonising local highways, or indeed decarbonising the transport infrastructure sector as a whole, are challenges that necessitate cooperation and involvement across a system in its entirety. In other words, while behaviour change among Local Highway Authorities will play a crucial role in driving decarbonisation through the adoption of low carbon technology and practice, we cannot solely rely on Local Highway Authorities. Actors further upstream across the wider system such as government, industry groups and private sector all play a crucial role, as demonstrated by our research findings.

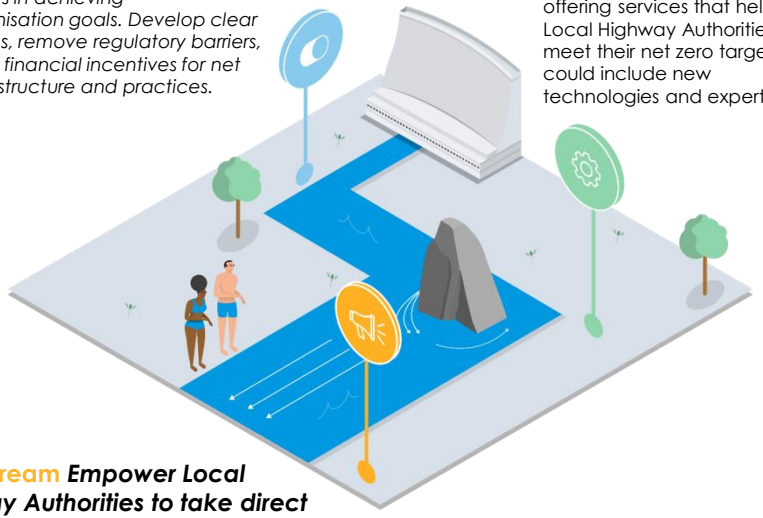
Recognising this, BIT has applied the **upstream/downstream model of behaviour change** to take a systems perspective across our research. More specifically, we used the model to consider the roles of actors in driving decarbonisation. Furthermore, the model is used to structure our solution recommendations, making it clear which actors within our system are best-suited to implement certain solutions while identifying inter-dependencies.

Upstream *Enable government and national bodies' policy and funding alignment for decarbonisation*

Shift national policy and provide funding to support Local Highway Authorities in achieving decarbonisation goals. Develop clear mandates, remove regulatory barriers, and offer financial incentives for net zero infrastructure and practices.

Midstream *Nurture a supportive industry*

Industries collaborate with Local Highway Authorities by providing innovative low carbon solutions, supporting infrastructure projects, and offering services that help Local Highway Authorities meet their net zero targets. This could include new technologies and expertise.



Downstream *Empower Local Highway Authorities to take direct action*

Strengthen the capacity of Local Highway Authorities to take direct actions. Effective collaboration, education, and knowledge-sharing within the council and with other stakeholders to push towards net zero targets.

Research findings

Barriers identified to decarbonising local highways infrastructure

We identified eight key barriers that are likely to have the greatest impact on decarbonising transport infrastructure

Barriers were categorised as **a key barrier** based on stated prevalence by interviewees, as well as their expected impact on Local Highway Authorities' capability, opportunity and/or motivation to engage in desired behaviours, based on existing evidence.

Theme	Key barrier
Motivation to make green investment	1. Financial pressures lead to the prioritisation of immediate financial savings
	2. Lack of, or misaligned, incentives to decarbonise
Staff capital	3. Skills and knowledge gaps (e.g. carbon literacy, sustainability regulation, innovation)
Procurement challenges	4. Carbon is (generally) not a part of standard award criteria
Organisational culture	5. Entrenched behaviours, reinforcing existing ways of working
	6. Risk averse culture, so hesitant to adopt new materials and practices
	7. Lack of Local Highway Authority leadership support
Collaboration and knowledge sharing	8. Siloed working practices and limited knowledge sharing

It is important to recognise that the barriers identified may not apply universally across Local Highway Authorities

Instead, we identified several factors that can influence the way a barrier emerges, or whether it applies at all:

- **Decarbonisation attitudes and understanding among existing staff**
- **Presence or absence of existing innovation practices and/or decarbonisation initiatives**
- **Variability in resources and priorities**: Local Highway Authorities across the UK vary significantly in both their resources and strategic priorities, which directly influences their capacity and willingness to engage in low carbon practices. In local highways infrastructure, this can be heavily influenced by the existing condition of assets. In addition, authorities with larger teams may have more capacity for funding applications.
- **The aspect of local highways infrastructure**: a substantial proportion of ongoing asset maintenance is delivered by long-term contractor(s), meaning innovation and/or decarbonisation initiatives are often at their discretion. When building new assets, Local Highway Authorities can have much more timely control through specifications written into their invitations to tender.

We found the most widely experienced barriers to adoption across Local Highway Authorities are:

- **Financial pressures**: all Local Highway Authorities are contending with financial pressures that prioritise immediate cost savings over long-term sustainability investments. These constraints often limit the capacity to plan for and implement strategies that could yield significant future environmental and financial benefits.
- **Procurement challenges**: a common barrier across many Local Highway Authorities involves procurement processes. The lack of standard criteria that prioritise carbon reduction or the absence of incentives for sustainable procurement complicates the adoption of green practices. We anticipate the forthcoming changes to the Procurement Act may reduce the impact of this barrier by making it easier for authorities to award based on a contract's expected environmental impact.

Theme: Motivation to make green investments

1. Financial pressures prioritising immediate financial savings

Most Local Highway Authorities operate on limited and annual budget allocations, meaning options offering immediate benefits, (e.g. popular resurfacing materials providing economies of scale, or minimum disruption to the road network due to shorter application periods) are often prioritised. However, evidence from HM Treasury indicates that decarbonisation efforts, while requiring higher upfront investment, can lead to significant long-term financial savings through reduced lifecycle costs and operational efficiencies.

Financial pressures can also contribute to an authority's risk averse nature, preferring options that offer security to avoid additional expenditure associated with more innovative practices potentially not meeting their expected longevity.

As a result, if options with carbon savings come at a higher cost or with greater unknowns, then they can be overlooked or dismissed.

Why this barrier may affect decarbonisation behaviour:

- **Present bias** is the tendency to focus on returns received in the immediate future; sustainable alternatives that offer potential significant future benefits but require larger initial investments, may be deprioritised.
- **Mental accounting bias** can explain behaviours resulting in budgets being compartmentalised into 'urgent' versus 'discretionary'; if low carbon investments are perceived to fall under the latter, it can result in them being overlooked.

"Almost every local authority is underfunded… It doesn't matter if you've got the best material in the world, if it's twice the cost no one will use it."

Theme: Motivation to make green investments

2. Lack of, or misaligned, incentives

Authorities may lack the economic, social and/or statutory incentives to procure and use sustainable or low carbon materials (for example, Local Highway Authorities do not have a statutory responsibility for decarbonisation). This may be due to a lack of direction from central government, insufficient internal accountability, and/or the absence of a standard carbon calculator, which makes benchmarking and monitoring carbon impacts unreliable. Therefore an authority's transport infrastructure goals, or wider strategy, may not specify or support decarbonisation aims.

> *"Everyone wants better roads but they need to operate in set budgets - so having to make the case that we need to spend more now to save later, difficult to balance that with other pressing issues in the Local Highway Authority."*

Why this barrier may affect decarbonisation behaviour:

- **Motivation** is the intrinsic or extrinsic reason for pursuing a behaviour; if a reason to decarbonise transport maintenance and assets is lacking, or is not realised, then it is less likely to occur.
- **Status quo bias** is the tendency to maintain existing behaviours; changes from this reference point are considered in terms of their loss or gain. If no gains from decarbonisation are recognised, and the changes are expected to require extra effort or investment, existing behaviours are more likely to be retained.

Theme: Staff capital

3. Skills and knowledge gaps

To undertake many of the desired behaviours that result in decarbonisation, certain capabilities may be required. These capabilities include carbon literacy, carbon accounting, lifecycle analysis, data collection, training on how to use new materials/practices, innovation, low carbon options and/or relevant regulation and guidelines. These capabilities vary largely across authorities, and may in part depend on their workforce size, training budget and/or availability of local talent. If these capabilities are lacking, there will be reasonable knowledge and skills gaps that make it difficult for an authority to identify, assess and adopt practices and materials with lower carbon impacts.

Why this barrier may affect decarbonisation behaviour:

- **Capability gaps** means an authority may not fully understand how their transport infrastructure decisions and/or the impact of their (in)actions, and can reduce their motivation to carry out desired behaviours.
- **Confirmation bias** is the tendency to seek out information that supports existing beliefs, and ignore or reject information that conflicts with this view. If authorities misunderstand their role (and even believe the responsibility does not sit with them), then they may be resistant to engage with initiatives aiming to encourage them to participate.

Theme: Procurement challenges

4. Carbon is (generally) not a part of standard award criteria

Procurement is a key opportunity for Local Highway Authorities to decarbonise their transport infrastructure through awarding suppliers based on their approaches to minimise the contract's carbon impact. However, existing ITT protocols are often weighted towards economic criteria. This is reinforced by procurement legislation (note this research was undertaken prior to the release of The Procurement Act 2023).

> *"There needs to be that incentive for suppliers to actually be developing products which are I suppose, lower embodied carbon."*

Why this barrier may affect decarbonisation behaviour:

- **Opportunity gaps** means there's no visible prompts to consider carbon impacts in award criteria by default, so it can be overlooked by the commissioning authority.
- **Extrinsic motivation** to invest in practices, services and/ or products that lower carbon impact may be low among suppliers, as there is no (explicit) **incentive** within procurement to differentiate from other suppliers on this basis when competing for a Local Highway Authority contract.

Theme: Organisational culture

5. Entrenched behaviours, reinforcing existing ways of working

Deeply ingrained practices and standards within Local Highway Authorities, and among contractors, means there is potentially a lot of resource needed to replace them with new innovations or decarbonisation strategies. Traditional approaches may also become wrapped-up in an authorities' culture, as they become perceived as 'their business as usual'(BAU). This can lead to a reluctance to experiment with materials, technologies, or methods that are deemed as departing too far away from existing practices, as they do not fit with the authority's mental model of 'how they do things'.

> *"It's really difficult to get change quickly because everything is so embedded. You know, how people do things... really long, long-standing ways of working and lots of standards and ways of working that's completely entrenched."*

Why this barrier may affect decarbonisation behaviour:

- **A sunk cost fallacy** may be at play, where teams feel compelled to stick with existing materials / approaches due to past investments in them. Therefore if new practices require (re)investment, past investments may be conceived as a loss, reducing appeal.
- **The familiarity bias** is the tendency to favour tried and tested practices, to avoid the need to expend additional effort considering new options. This may particularly impact authorities with resource constraints and can be further reinforced by risk aversion.

Theme: Organisational culture

6. Risk aversion

Authorities may expect new low carbon practices or materials to fail, receive (negative) media attention / public backlash (especially as decarbonisation efforts are increasingly caught up in 'culture wars'), and/or not meet their claims. This may lead them to conclude that the risk of adoption is above their risk tolerance, which among Local Highway Authorities, is often low.

Risk averse cultures may reinforce Local Highway Authorities not identifying themselves as 'experimenters', 'innovators' or 'scientific thinkers' – which may conflict with how new(er), 'innovative, low carbon initiatives are perceived. Existing training schemes for staff, such as financial training for Section 151 officers, which emphasises caution and discourages risk-taking, likely contribute to risk averse tendencies.

> *"There's resistance because if the new approach doesn't work, we're left wondering: will we have the funding to put things back? Plus, there's the risk of reputational damage - the local press could easily criticise it as a waste of money."*

Why this barrier may affect decarbonisation behaviour:

- **Uncertainty aversion** is the tendency to favour the known over the unknown. This means decision makers within authorities are likely to prefer proven, conservative materials and methods, which have the buy-in of their principle transport engineers.
- **Injunctive norms** are the perception of what others (dis)approve of. If an authority has concerns that new approaches (or impacts due to these approaches, such as longer road closures) would cause issues among influential actors within their social environment (e.g. their jurisdiction, DfT etc.). This may discourage adoption.

Theme: Organisational culture

7. Lack of Local Highway Authority leadership support

In order for an authority to make meaningful impact in lowering their carbon, the senior leadership team (SLT) as well as political leadership (e.g. local councillors) need to be bought in to enact downstream change. Where lacking, decisions to approve new low carbon practices and/or materials may be stalled, any required capacity building may not get signed off, and teams lack internal incentives to make change, hindering the flow of action from upstream policy to local implementation.

Why this barrier may affect decarbonisation behaviour:

- **Authority** figures, such as the SLT, play important roles in establishing organisational norms and encouraging staff to take action; where they are perceived to not support or prioritise decarbonisation initiatives, this can filter down into inaction among the wider Local Highway Authority.

"At first, there wasn't a lot of Local Highway Authority leadership buy-in, which left us miles behind other labs. We were focusing on business as usual, and Live Labs (2) wasn't a priority"

Theme: Collaboration and knowledge sharing

8. Siloed working practices and limited knowledge sharing

Local Highway Authorities are structured in a way that means they have a certain degree of power to choose how they operate their jurisdiction. This can give rise to differences in how authorities operate from one another and default them into siloed working practices. There are also limited collaboration initiatives that are standardised / centrally governed* and Local Highway Authorities are often put into competition with each other for funds and powers.

This can prevent authorities from sharing valuable insights and lessons learned. Where structured collaboration efforts have emerged, stakeholders report benefits such as resource efficiencies (from reduced duplication) and building confidence in non-BAU processes / materials.

There is also evidence from our interviews of suboptimal collaboration across teams / departments within an authority. This can make it more difficult to gain internal buy-in, align decarbonisation aims with BAU, and foster agile ways of working to support innovation.

Why this barrier may affect decarbonisation behaviour:

- **Ingroup/outgroup mental models** may mean an authority dismisses evidence of promise from another authority, due to perceived differences, concluding the same results would not arise within their jurisdiction. This may prevent practices from scaling up across a region.

*We identified a number of examples of collaboration initiatives that have established organically and bring together a subset of authorities. However, these are not standardised or governed centrally.

Additional barriers we identified

Theme	Barrier
Staff capital	Small teams and lack of capacity
	Planning fallacy
Technological factors	Technological advancements (e.g. low carbon street lighting) not fully developed
	Underdeveloped carbon analysis tools
Procurement challenges	Complex procurement rules
	Inflexibility of existing contracts
	Late involvement of procurement teams
	Lack of supporting procurement processes
	Compliance focus
Collaboration and knowledge sharing	Lack of transparency and clarity
Public engagement and perception	Lack of engagement and awareness building
	Lack of confidence in the approach
	Public scrutiny and scepticism about new technologies
Leadership and governance	Ambiguity in officer and political leadership commitment
	Decision making bottlenecks
	Risk aversion by decision boards
	Perceived lack of agency

Recommendations

Solutions for decarbonising local highways infrastructure

Recommendations: overview of the solutions for decarbonising local highways infrastructure

Highways decarbonisation requires system-wide intervention

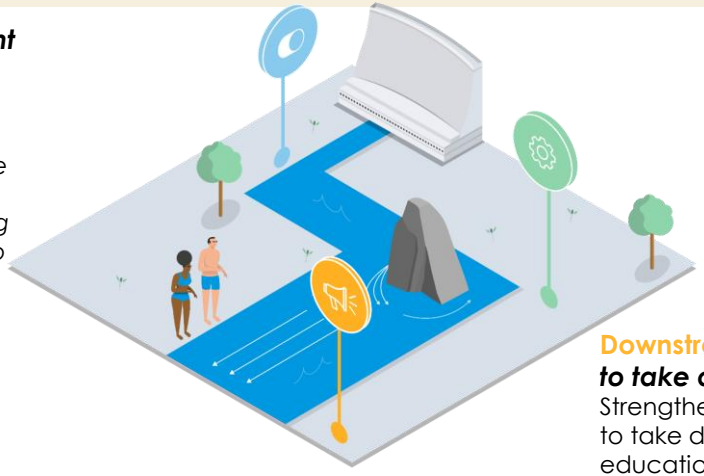
Downstream, Midstream and Upstream

Given the range of barriers to decarbonising local highways infrastructure experienced among Local Highway Authorities, it is evident that behaviour change solutions should not solely be targeted toward and implemented by Local Highway Authorities and private sector service-providers. Rather, a system-wide approach is needed to appropriately consider the available levers for change and the interdependencies between Local Highway Authorities, public and private sectors.

For this reason, **we propose solutions for decarbonising local highways infrastructure through the lens of the upstream-downstream model of behaviour change**. The model provides a framework for understanding behaviour change at three levels: individual, societal, and systemic. It highlights how individual actions are influenced not only by personal motivations and capabilities, but also by the broader social, economic and material environments. The model assumes that achieving large-scale change requires aligning institutional and market systems ('upstream'), creating enabling choice environments ('midstream'), and encouraging individual actions ('downstream'), all of which interplay within a complex societal system.

Upstream *Enable government and national bodies' policy and funding alignment for decarbonisation*

Shift national policy and provide funding to support Local Highway Authorities in achieving decarbonisation goals. Develop clear mandates, remove regulatory barriers, and offer financial incentives for net zero infrastructure and practices.



Midstream *Nurture a supportive industry*

Industries collaborate with Local Highway Authorities by providing innovative low carbon solutions, supporting infrastructure projects, and offering services that help Local Highway Authorities meet their net zero targets. This could include new technologies and expertise.

Downstream *Empower Local Highway Authorities to take direct action*

Strengthen the capacity of Local Highway Authorities to take direct actions. Effective collaboration, education, and knowledge-sharing within the council and with other stakeholders to push towards net zero targets.

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Recommendations: overview of the solutions for decarbonising local highways infrastructure

A number of actors could potentially play a role

Downstream, Midstream and Upstream

Through applying the upstream-downstream model to local highways infrastructure, we can categorise the key actors (ie stakeholders) by the level of the system most relevant to their remit. This helps us to identify which actor may be best placed to implement a particular solution, and what levers may be most appropriate to influence an actor based on the level of the system they sit at.

Upstream

- *Department for Transport*
- *Cabinet Office*
- *HM Treasury*
- *Department for Energy Security and Net Zero*
- *Ministry of Housing, Communities and Local government*
- *National Infrastructure and Service Transformation Authority (NISTA)*
- *National Highways*
- *Transport Scotland*
- *Welsh Government*
- *NI Department for Infrastructure*

Downstream

- *Local Highway Authorities*
- *Live Labs 2 projects*
- *Executives*
- *Senior Officers*
- *Members (Politicians)*
- *Procurement*
- *Planners*
- *Legal*
- *Operations*
- *Communications*
- *Contractors and supply chains*

Midstream

- *Private sector organisations*
- *Department for Infrastructure (Northern Ireland)*
- *Local government Association*
- *Professional bodies*
- *Sub-national transport bodies (STBs)*
- ***ADEPT***
- *Combined Authorities (CAs)*
- *Industry groups and Associations*
- *Universities*
- *Manufacturers*
- *Suppliers*
- *Scottish Chief Officers of Transport Society*
- *County Surveyors Society Wales*

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Recommendations: overview of the solutions for decarbonising local highways infrastructure

Each solution was developed iteratively, and is characterised by: where in the system it would sit, ADEPT's role in enabling change, relevant actors, impact/feasibility, and whether the solution is a quick(er) win

For each solution, we have highlighted where on the upstream-downstream model the solution sits, as well as which actor(s) are most relevant to lead implementation, given their responsibilities, capabilities and resources. This approach ensures that each intervention is matched with the appropriate leadership, supporting accountability and maximising the likelihood of successful delivery.

We have also indicated ADEPT's role for each solution, categorised as **Advocate** (influencing upstream partners to drive legislative change), **Enable** (supporting partners to design and implement interventions), or **Implement** (taking lead responsibility for delivering the solution). This framework provides additional clarity on how ADEPT can encourage other stakeholders across the wider sector to innovate and drive change.

Within the scope of ADEPT's control, certain solutions represent low hanging fruit - actions that can be quickly and easily implemented to generate impact in the shorter term. These quick wins are crucial for building momentum and demonstrating the benefits of broader decarbonisation efforts. Concurrently, we must also focus on advocating for larger, more complex changes that, while requiring greater effort and time to implement, promise substantial long-term benefits.

We have prioritised the solutions based on an initial assessment of their potential impact and feasibility (a relative evaluation based on our expectations of how effectively the solution can overcome key barriers to implementation and drive meaningful progress toward decarbonisation goals compared with other solutions). This prioritisation ensures that resources are allocated efficiently, and efforts are focused on interventions that may provide the most significant returns on investment. Identifying and advancing these strategic initiatives can ensure a pragmatic, yet ambitious path toward achieving decarbonisation goals.

Finally, it is important to recognise the interdependencies among the proposed solutions. Many of the solutions are designed to be implemented concurrently, and the degree to which this is achieved can significantly amplify their overall impact. This synergistic application underscores the need for a coordinated approach, potentially spanning different levels of the system. It leverages the collective strengths of each solution to support a more comprehensive transformation.

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Recommendations: overview of the solutions for decarbonising local highways infrastructure

We recommend the public sector prioritises implementing, enabling or advocating for the following eight solutions

Lead implementation actor(s)	Solutions to prioritise	Adept's role
DfT / MHCLG / HM Treasury	1. Reduce the use of competitive bidding for funds	Advocate
DfT / NISTA	2. A strategic spatial plan for UK local highways infrastructure	Advocate and Enable
ADEPT / LGA	3. Communicate funding availability and provide tailored support	Implement
DfT / CO	4. Legislate for investment decisions to consider the long-term	Advocate
ADEPT	5. Create a Local Highways Expertise Hub	Enable
DfT / CO	6. Mandate carbon reporting and targets	Advocate
MHCLG / DESNZ	7. Incorporate decarbonisation requirements into contracts	Advocate
Local Highway Authorities	8. Build psychological safety, encourage risk-taking and experimentation, through communications, reward and training	Enable

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Note: we provide indication of the specific roles of lead implementation actors within organisations throughout the recommended solutions section.

ADEPT may wish to consider the following solutions (see Annex)

Solutions to consider	
• Advocate for longer-term funding for Local Highway Authorities programmes (and other carbon intensive transport infrastructure) • Support public-private financial partnership models • Create appetite for green materials by evidencing short to medium term benefits • Support Local Highway Authorities to conduct skills audit and organise targeted decarbonisation, innovation, carbon literacy/evaluation and procurement training • Create a low cost, accessible knowledge-sharing platform • Advocate for government subsidies for low carbon discounts in tenders	• Support Local Highway Authorities to build a national network of 'would-be innovators' • Encourage Local Highway Authorities to increase appetite for innovation by starting with lower-cost, lower-risk trials • Develop an innovation impact modelling tool • Advocate for Local Highway Authorities to integrate decarb objectives into SLT performance reviews and organisational accountability structure • Encourage leadership sponsorship and advocacy • Develop and maintain collaboration tools and guidance • Incentivise active knowledge sharing

Recommended solutions to prioritise

Recommendations: solutions to prioritise

1. Reduce the use of competitive bidding for funds

Reducing competitive funding and introducing more formula-based or needs-based funding allocation could help resources to be directed where they are most needed, (e.g. to Local Highway Authorities with highly carbon-intensive assets, or assets in a more critical condition or outdated), rather than favouring authorities with greater capacity for proposal writing.*

This approach could also address the combative nature of competitive bidding, which often hinders collaboration between Local Highway Authorities, by supporting a more cooperative environment through shared or pooled funding activities. NISTA's role in recalibrating procurement and resource allocation models could help streamline this shift, making it easier for Local Highway Authorities to access the necessary funding for decarbonisation. This solution might be paired well with mandatory carbon reporting, as implementing a funding model based on clear carbon reporting and targets ensures accountability while supporting collaboration. Needs-based funding could prioritise those in most need of achieving carbon savings, aligning financial incentives with sustainability goals.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Financial pressures • Lack of, or misaligned, incentives to decarbonise	High	Medium	Upstream	DfT, MHCLG, HM Treasury

*This recommendation is supported by the Independent Review of Net Zero (2023).

2. A strategic spatial plan for UK local highways infrastructure

Create a strategic plan for UK local highways infrastructure that spans to 2050; providing a blueprint for change in the sector, outlining key infrastructure project locations, and integrating other relevant sectors such as energy, transport, and water supply. This would ensure a cohesive approach to planning, reducing project delivery times and overall system costs. By establishing this framework, Local Highway Authorities could better align infrastructure investments with sustainability goals, creating jobs, and improving resilience across the country.

Regular updates, public consultations, and environmental assessments would ensure that the plan is both adaptable and aligned with evolving needs and net zero targets. This idea is similar to the approach taken with the energy sector, aiming to provide long-term stability and certainty for investors while accelerating decarbonisation efforts. This solution would be paired well with legislating for long-term investment consideration: a long-term strategic plan provides the overarching framework and vision, while legislation ensures that Local Highway Authorities are legally required to align their actions with this plan. Together, they drive consistency, accountability, and predictability, enabling better coordination between central and local governments, reducing project delivery times and unlocking investments in sustainable infrastructure.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Financial pressures • Lack of, or misaligned, incentives to decarbonise • Lack of leadership support	High	Medium	Upstream	DfT, NISTA, ADEPT, Transport Scotland, Welsh government and NI Department for Infrastructure

Low hanging fruit

3. Communicate funding availability and provide tailored support

Clearly communicate the availability of decarbonisation funds to Local Highway Authorities, ensuring they are aware of funding and financial support options. Offer tailored assistance, particularly to smaller Local Highway Authorities, by providing guidance and resources to help them successfully navigate the application process and secure the funding needed for sustainability projects. This assistance could be offered as part of a local highways expertise hub or it could involve targeted training for Local Highway Authority legal, finance and project delivery teams, to develop their knowledge of the finance industry. The OECD Innovation Playbook supports this approach by emphasising the need for user-centred, accessible tools to help public officials overcome challenges, while offering guidance on funding and resource allocation.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Financial pressures • Lack of incentives to decarbonise • Skills/knowledge gaps	Medium	High	Midstream	ADEPT, Local Government Association / other membership / industry bodies and Transport Scotland

Recommendations: solutions to prioritise

4. Legislate for investment decisions to consider the long-term

Central government could introduce legislation that requires Local Highway Authorities to consider the long-term environmental implications of their investment decisions, such as introducing a Duty to act in accordance with net zero. For instance, NISTA could advocate for legislation that aligns with its long-term strategic infrastructure focus, ensuring decarbonisation is a mandatory consideration in all infrastructure projects.

The OECD Innovation Playbook supports long-term planning and strategic innovation by offering a framework to guide Local Highway Authorities in aligning investment decisions with sustainable goals. However, given concerns expressed by Local Highway Authorities about a lack of funding, this solution would be paired well with communicating funding availability and providing tailored support, ensuring that Local Highway Authorities can access the funds required to enable an increase in longer-term investments. Alternatively, Local Highway Authorities could be required to develop 20-year infrastructure investment plans assessed on value for money and sustainability criteria, ensuring investments align with both financial and carbon budgets to meet economic and environmental goals. By extending the planning horizon, Local Highway Authorities would be encouraged to think beyond short-term costs and consider long-term benefits, such as reduced costs, unlocked innovation, improved resource efficiency, enhanced competitive advantage and climate change mitigation.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Financial pressures • Lack of, or misaligned, incentives to decarbonise • Lack of leadership support	High	Low	Upstream	DfT, HM Treasury, MHCLG, Cabinet Office

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Recommendations: solutions to prioritise

5. Create a Local Highways Expertise Hub

Establish a centralised Highways Expertise Hub*, similar to Energy System Catapult's Net Zero Go Platform. This Hub would have the overarching aim to inspire and enable Local Highway Authorities to adopt (new) materials and practices that offer optimal return on investment, as well as decarbonisation benefits. The Hub could include the following:

- A collaborative space where Local Highway Authorities, industry experts, and academics can share ideas, insights, and progress.
- Access to best practices, case studies, and resources (e.g. the OECD's innovation playbook), through merging with the two LL2 Centres of Excellence.
- Training units covering; decarbonisation, innovation, and carbon literacy/evaluation to build Local Highway Authority capacity.
- Support with community outreach to help Local Highway Authorities socialise any (disruptive) infrastructure changes with local communities and seek buy-in.
- Knowledge management and research scanning mechanisms to adapt the hub based on stakeholder feedback and new evidence.
- A central body to oversee, and streamline, existing collaboration networks and groups (e.g. ADEPT's Future Highways Research Group).

This solution might be paired well with incentivising knowledge sharing, as this would ensure engagement and utilisation of the hub's resources.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Skills and knowledge gaps • Entrenched ways of working • Limited knowledge sharing	High	Medium	Midstream	ADEPT, professional bodies, universities, private sector organisations and Local Highway Authorities.

*This recommendation is supported by academic research.

Recommendations: solutions to prioritise

6. Mandate carbon reporting and targets

Implement processes requiring Local Highway Authorities to include carbon savings in their annual financial reports, alongside traditional financial metrics.* Additionally, mandate annual carbon saving targets for Local Highway Authorities to drive accountability and ensure continuous progress toward decarbonisation goals. This must be accompanied by:

1. A standardised methodology for measuring and reporting carbon savings.
2. Centralised support (e.g. templates, training) to ensure consistency, accuracy, and ease of implementation across all Local Highway Authorities. This support should build on existing best practices, for instance, the carbon baselining and management standards advocated in ADEPT's Future Highways Research Group.
3. An independent monitoring body, who are responsible for assessing and holding Local Highway Authorities accountable for their performance in meeting carbon targets. This body would track progress, publish regular reports, and provide benchmarking tools to compare performance across regions. It could also offer guidance and recommendations for improvement.

By increasing transparency and comparability, this approach aligns with insights from our report on deshrouding, which highlights how reducing opacity in markets and decision making processes can drive competition, improve quality, and enhance accountability. A relevant example is the UK's mandatory gender pay gap reporting, which has increased employer accountability, reduced pay disparities, and driven structural changes to improve gender equality.

If mandating is challenged, consider developing grant programmes that reward Local Highway Authorities for implementing carbon-tracking measures in their financial reports. NISTA, with its strategic procurement reform, could support the development of these frameworks by ensuring carbon reduction is integral to procurement and reporting standards; this shift could be timely with the upcoming launch of the Procurement Act 2023.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Lack of, or misaligned, incentives to decarbonise • Lack of leadership support	High	Medium	Upstream	Department for Transport and Cabinet Office

*This recommendation is supported by the Climate Change Committee.

Recommendations: solutions to prioritise

7. Incorporate decarbonisation requirements into contracts

As highlighted in the CIHT report on carbon reduction in procurement, there is a need to embed decarbonisation requirements in contracts to drive sector-wide change. The Procurement Act 2023 will enable authorities to award contracts based on non-financial criteria, including environmental impact. While this will likely result in a higher consideration of carbon when commissioning, there will still be cases where it is avoided. We would therefore recommend revising this legislation to require all new and renewed contracts to include specific clauses related to decarbonisation and sustainability.*
For example:

- Contracts could require: submission of carbon management plans, the use of recycled materials or low carbon technologies, or a transportation radius to reduce carbon emissions associated with the delivery of goods and services.
- Additionally, stipulations for using energy-efficient equipment and machinery could be mandated, ensuring that all supplied equipment meets certain energy performance standards.

This solution should be accompanied by centralised support and resources, such as sustainable practices checklists tailored to different commissioning routes, and case studies to illustrate good practice for evaluating based on non-financial criteria. In Scotland, the Aggregates Tax will also directly support this change by encouraging contractors to use recycled materials in construction. Contracts could require adherence to the new tax guidelines, making the use of recycled aggregates a standard practice to minimise cost and support sustainability goals.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Carbon not a part of standard award criteria • Lack of incentives to decarbonise	High	Low	Upstream	MHCLG, DESNZ and Local Highway Authorities

*This recommendation is supported by academic research.

Low hanging fruit

8. Build psychological safety, encourage risk-taking and experimentation, through communications, reward and training

Creating a culture of psychological safety is essential for supporting innovation, as it enables employees to propose, test, and iterate on new ideas without fear of failure or negative consequences. Ensuring that staff feel supported and safe to propose and test innovative ideas will likely require a multifaceted approach that:

- Establishes protections for *approved* experimentation and innovation in operational workplace (e.g. HR / performance) policies.
- Designs, tests and delivers supporting messaging through senior leaders. Senior employees could lead by example by discussing failures publicly and reframing them as opportunities for learning.
- Recognises leaders who actively create supportive environments, such as those who facilitate open discussions, support team experimentation, or respond empathetically to the challenges raised by staff.
- Sets-up 'networks of would-be innovators' to recognise the adoption of low carbon materials/practices.
- Assigns individuals in leadership positions as senior project sponsors for low carbon projects.
- Conducts structured debriefs to identify lessons learned.
- Implement training programs that focus on shifting mindsets around experimentation, emphasising that failure and null results are valuable learning opportunities rather than setbacks. The training would teach Local Highway Authority staff how to design experiments with clear metrics, understand the importance of iterative learning and normalise the idea that risk-taking is a necessary part of discovering effective solutions.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Risk aversion • Entrenched ways of working	Medium	High	Downstream	Local Highway Authorities, professional bodies, ADEPT

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Conclusions and next steps

Conclusions

This project has underscored the complexities and diverse barriers that Local Highway Authorities face in decarbonising local highways infrastructure. These barriers range from financial pressures and procurement challenges to entrenched organisational cultures and siloed working practices. Furthermore, the variability in resources, strategic priorities and existing capacities among Local Highway Authorities highlights the insufficiency of a one-size-fits-all approach to decarbonisation.

To address these challenges effectively, a multifaceted, system-wide approach is required. Solutions must be adaptable and tailored to the unique contexts of individual Local Highway Authorities, taking into account their specific barriers, opportunities and constraints. Downstream solutions, in particular, often need to be customised to local circumstances to ensure practical implementation and minimise unnecessary burdens, while upstream interventions will need to be carefully designed to ensure they effectively address systemic barriers and align with the broader goals of decarbonisation. Such tailoring will require ongoing collaboration with Local Highway Authorities to refine and optimise prioritised solutions, ensuring they are actionable and aligned with both short-term needs and long-term decarbonisation goals.

Given its strategic position, ADEPT can play an important role as a catalyst for change across the transport infrastructure sector. Through its strong relationships with central government, industry groups and Local Highway Authorities, ADEPT can act as a an agent for change through advocacy and encouraging cross-sector collaboration, ensuring that sector-wide resources, policies, and partnerships are aligned to drive innovation and achieve meaningful and sustained decarbonisation.

Due to the dynamic nature of this landscape, further testing of the proposed solutions and rigorous impact evaluations will be essential. This could involve piloting solutions across diverse local contexts to assess feasibility, scalability, and cost-effectiveness. Iterative cycles of implementation and feedback should be used to refine approaches, ensuring they remain adaptive and evidence-based. Continuous engagement with Local Highway Authorities, industry partners, and policymakers will also be critical to align solutions with emerging challenges and opportunities. Incorporating real-time monitoring and reporting mechanisms can further support innovation, stakeholder trust, and a cohesive approach to decarbonising local highways infrastructure.

Next steps

1. **Identify the most viable solutions:** begin by evaluating the prioritised solutions alongside the additional solutions to consider, to sense check the initial impact and feasibility ratings outlined. This prioritisation process should seek to involve stakeholders from across the local highways sector and focus on the potential for solutions to address key barriers and create meaningful change.
2. **Develop these solutions further** by collaborating with sector stakeholders to ensure they are actionable, practically implementable and tailored to the operational realities of Local Highway Authorities and other stakeholders. Red team how they could potentially fail (i.e. critically test the solutions by adopting an adversarial perspective to identify weaknesses or unintended consequences) and build in design and implementation changes to address these possibilities.
3. **Continue exploring synergies between solutions:** explore how different solutions might complement each other and where they could be implemented together for greater impact.
4. **Develop a phased implementation timeline:** create a strategic timeline for implementing solutions, starting with low hanging fruits that can deliver quick wins and build momentum. These early successes will lay the groundwork for tackling more complex, longer-term projects that require additional development and coordination over time.
5. **Conduct pilot testing:** collaborate with Local Highway Authorities to pilot solutions in a controlled environment. Use these pilots to gather data, refine interventions, and build confidence in their scalability.
6. **Plan for full-scale rollout:** based on the results of pilot testing, prepare for a broader implementation of successful solutions. This phase will require careful planning to ensure resources, training, and support mechanisms are in place to sustain long-term impacts.

Throughout these steps, **maintain robust engagement with stakeholders,** including Local Highway Authorities, the Department for Transport, and industry partners. Their input will be critical in shaping interventions, addressing challenges and ensuring alignment with policy goals.

Appendix

Additional solutions to consider

Recommendations: solutions to consider

Provide longer-term funding

Guaranteeing funding for extended periods, rather than short-term grants, would allow Local Highway Authorities to plan strategically, invest in long-term projects, and build capacity, as well as signalling long term commitment from government.* For example, with NISTA prioritising long-term infrastructure strategies, it is likely to encourage longer-term funding settlements, aligning with sustainable infrastructure goals.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Financial pressures • Lack of, or misaligned, incentives to decarbonise	High	Low	Upstream	DfT, HM Treasury and MHCLG.

*This recommendation is supported by the Independent Review of Net Zero (2023).

Recommendations: solutions to consider

Support public-private financial partnership models

Develop a financial model where Local Highway Authorities partner with private investors through performance contracts, guaranteeing that the upfront costs of decarbonisation projects are supported by external financing, with repayments tied to actual carbon and cost savings achieved. The Climate Change Committee states that the role of Local Highway Authorities in driving economic development and attracting private investment aligns with the identified need for significant private sector investment into delivering net zero.

Leading Local Highway Authorities, especially members of Core Cities and the Resilient Taskforce are calling for greater powers to deliver this change. The OECD Innovation Playbook highlights the importance of supporting partnerships, which can be used to support collaboration between Local Highway Authorities and private investors for decarbonisation funding.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Financial pressures • Lack of, or misaligned, incentives to decarbonise	Medium-High	Medium	Upstream	DfT, National Infrastructure and Service Transformation Authority.

Low hanging fruit

Create an appetite for green materials by evidencing short to medium-term benefits

Emphasise (e.g. through written guidance, decision making toolkits, or workshops with senior leaders) the carbon savings, budget benefits and potential for quicker project completion (e.g. faster road reopening) associated with green materials. Additionally, ensure that efforts to promote green materials include clear guidance to address and prevent greenwashing (this was a key concern expressed by Local Highway Authorities in trusting claims around new materials) ensuring that claims about the sustainability of materials are credible, evidence-based, and transparently communicated to build trust and confidence in their use.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Lack of, or misaligned, incentives to decarbonise	Low(er)	High	Downstream	ADEPT and Local Highway Authorities.

Low hanging fruit

Conduct skills audit and provide targeted decarbonisation, innovation, carbon literacy/evaluation and procurement training

As recommended by the Climate Change Committee, support Local Highway Authorities to identify specific skills shortages within local government and offer training programs on key topics (**net zero policy, sustainable transport planning, climate change adaptation, innovation, low carbon technologies, procurement*, carbon accounting and evaluation**) to equip staff with the necessary skills and knowledge and ensure consistent understanding and integration of carbon reduction into decision making. Provide useful resources such as the OECD's innovation playbook to support decarbonisation and innovation efforts.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Skills and knowledge gaps • Entrenched ways of working • Carbon not a part of standard award criteria	Medium	High	Midstream	ADEPT and Local Government Association.

*As recommended by academic researchers, provide training that applies forthcoming changes to the Procurement Act, to the context of local highways infrastructure and assets. This training would help procurement teams understand how to integrate sustainability metrics into their decision making processes, ensuring they are prepared for the new requirements and can maximise the environmental benefits of their investments.

Create a low cost, accessible knowledge-sharing platform

Low cost, accessible knowledge-sharing platforms, such as newsletters, webinars, or workshops can support collaboration and knowledge exchange among Local Highway Authorities. A regular newsletter could showcase technology trends, case studies of successful sustainability projects and practical tips on best practices, procurement strategies and funding opportunities. Webinars and workshops can provide interactive opportunities for discussing challenges, sharing lessons learned and promoting innovation. These platforms can also serve to highlight relevant events, training sessions and resources, ensuring Local Highway Authorities remain informed, engaged and better equipped to overcome entrenched ways of working, skills gaps and limited knowledge sharing.

N.B. if the Local Highways Expertise Hub is established, this platform could be hosted by the Hub.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Skills and knowledge gaps • Entrenched ways of working • Limited knowledge sharing	Medium	Medium	Downstream	ADEPT and Local Highway Authorities.

Recommendations: solutions to consider

Offer government subsidies for low carbon discounts in tenders

Provide government subsidies to Local Highway Authorities, allowing them to offer 'low carbon' discounts in tender processes. Alternatively, building on existing tax incentives like the reduced VAT on energy-saving materials and the super-deduction for energy-efficient investments, the government could further strengthen its support for sustainability by offering targeted VAT reliefs for suppliers and contractors that meet high sustainability standards in their operations and supply chain.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Carbon not a part of standard award criteria • Lack of incentives to decarbonise	High	Low	Upstream	Department for Transport, HM Treasury and Cabinet Office.

Build a national network of 'would-be innovators'

Establish a national network of innovators and risk-takers within Local Highway Authorities, where members can seek support, share advice and exchange experiences on developing and implementing new initiatives. This network would also emphasise the positive identity of being a 'risk-taker', making it rewarding to be seen as an entrepreneur, even when experiments don't always succeed.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Entrenched ways of working • Skills/knowledge gaps	Low	High	Midstream	ADEPT, Local Government Authority, professional bodies and Local Highway Authorities.

Recommendations: solutions to consider

Build appetite for innovation by starting with lower-cost, lower risk trials

Encourage the use of smaller scale pilots to demonstrate the potential benefits of innovations and build confidence before moving on to larger implementations.* Bring in credible experts to present tailored innovation pitches directly to each Local Highway Authority, assessing the unique needs of each council and pitching the most relevant and impactful innovations, providing guidance on how to implement trials effectively. This approach would help build trust, demonstrate the value of innovation and ensure that Local Highway Authorities are equipped with the knowledge and confidence needed to trial new solutions.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Risk aversion	Medium	Medium	Midstream	ADEPT, professional bodies and Local Highway Authorities.

*This recommendation is supported by the Climate Change Committee.

Develop an innovative impact modelling tool

Create a user-friendly modelling tool that allows Local Highway Authorities to input basic metrics and simulate the potential impacts of various innovative interventions. This tool would help visualise the carbon savings, cost reductions, and long-term benefits of adopting new approaches, providing concrete data to support decision making.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Risk aversion • Lack of incentives to decarbonise	Medium-High	Low	Midstream	ADEPT, professional bodies and Local Highway Authorities.

Low hanging fruit

Integrate decarbonisation objectives into SLT performance reviews and organisational accountability structure

Focus on integrating relevant decarbonisation objectives into senior leadership team (SLT) performance reviews and organisational accountability structures. For example, Local Highway Authorities could implement policies requiring SLTs to set and report on specific decarbonisation targets as part of their key performance indicators (KPIs). These KPIs could be tied to measurable outcomes such as reductions in carbon emissions, implementation of sustainable procurement practices, or successful piloting of innovative low carbon projects.

Accountability mechanisms such as quarterly reviews of progress toward net zero goals could be established, with recognition and rewards for achieving milestones. Additionally, SLTs could be encouraged to adopt a 'lead by example' approach, by visibly supporting innovation initiatives and embedding a culture of sustainability throughout their organisations.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Lack of Local Highway Authority leadership support	Medium	High	Midstream	ADEPT and Local Highway Authorities.

Low hanging fruit

Encourage leadership sponsorship and advocacy

Appoint a senior leader as a dedicated sponsor for sustainability initiatives, responsible for championing the project and aligning it with broader sustainability goals. This sponsor should provide guidance to the project team, actively promote the project within the organisation to secure resources and prioritisation, and act as an escalation point for key decisions.

Additionally, a working coalition should be formed around the sponsor, involving departments like communications, HR, and internal champions to support and embed innovation. Finally, encourage clear and consistent communication from leadership to ensure alignment and momentum across the organisation. The OECD Innovation Playbook suggests ensuring messages of support from leadership are public and clear – endorsing, communicating about and supporting innovation.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Lack of Local Highway Authority leadership support	High	High	Downstream	ADEPT and Local Highway Authorities.

Incentivise active knowledge sharing

Create incentives for teams and departments to use shared communication platforms and resources. This could include tying participation in collaborative activities to performance metrics or project funding, ensuring knowledge sharing is prioritised and rewarded. Public recognition programs, such as awards for teams or individuals who contribute valuable insights, could further motivate participation. Regular collaboration events, like workshops or knowledge-sharing sessions, could provide structured opportunities for exchanging ideas and solutions. Accessible, well-designed platforms with clear guidelines can support these efforts by making it easy to share and access resources.

Barriers addressed	Impact	Feasibility	Level of intervention	Possible actors
• Limited knowledge sharing • Skills/knowledge gaps	Medium	High	Downstream	ADEPT and Local Highway Authorities.