

Connected Places Catapult | Urban Transport Group

Decarbonising urban vehicles

Challenges and opportunities for city region
public authorities

July 2022



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Connected Places Catapult and The Urban Transport Group



Connected Places Catapult is the UK's innovation accelerator for cities, transport, and places.

We provide impartial 'innovation as a service' for public bodies, businesses, and infrastructure providers to catalyse step-change improvements in the way people live, work and travel.

We connect businesses and public sector leaders to cutting-edge research to spark innovation and grow new markets. We run technology demonstrators and Subject Matter Expert (SME) accelerators to scale new solutions that drive growth, spread prosperity, and eliminate carbon.

You can find out more about Connected Places Catapult by visiting us at <https://cp.catapult.org.uk/>. Alternatively to discuss any of the themes covered in this report, or any wider transport innovation challenges, please get in touch at Info@cp.catapult.org.uk.



The Urban Transport Group is the UK's network of city region transport authorities.

We work to ensure that transport plays its full part in making our city regions greener, fairer, happier, healthier and more prosperous places.

We make the case for urban transport – in particular for the funding and powers our members need to plan and deliver transport networks that support inclusive and sustainable growth.

We provide thought leadership by making the connections between transport policy and the wider public policy goals of city regions.

We are the professional network for people who work in urban transport in the public sector, and save our members time and resources by accelerating the take up of best practice through sharing knowledge and expertise. Please visit

<https://www.urbantransportgroup.org/> to find out more.

Urban Transport Group Members



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Greater Manchester
Liverpool City Region
London
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Northern Ireland
Nottingham
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Executive Summary and Roadmap

Executive Summary

Transport is the single biggest contributor (by sector) to UK greenhouse gas emissions, responsible for 27% of emissions, with 91% of this from road transport². Decarbonising transport will therefore be vital if the UK's national target of net zero emissions by 2050 is to be met, as well as city region's own net zero ambitions, of which target dates range from 2030 to 2048.

If these objectives are to be met then urban vehicle fleets will need to be decarbonised at pace as part of wider transport decarbonisation strategies that also include promoting modal shift and reducing the need to travel.

The Government has made decarbonising vehicle fleets a policy priority and made significant funding available for this task. However, the report finds that there is a need for greater cohesion of national policy with less fragmentation between both the approach taken to different transport modes (cars, buses, taxis, new mobility and so on) as well as with the provision of supporting green energy infrastructure. If all urban vehicles are to be decarbonised as rapidly and efficiently as possible then there is also a need for government to involve the city regions more closely in the formulation and implementation of policy. Alongside this the report identifies a series of barriers that need to be

overcome at the city region level which includes establishing the organisational capability and capacity commensurate with the scale of the task and greater certainty of sufficient funding. There are also opportunities for authorities to lead the way with decarbonisation of their own vehicle fleets and those in the wider local public sector (such as the health and education sectors).

These conclusions are based on interviews and surveys of local and strategic transport authorities in the city regions – as well as other key players and stakeholders at a national and sub-national level in both the public and private sector.



Executive Summary

The report synthesises thoughts and conclusions into six key themes and makes recommendations for each theme.

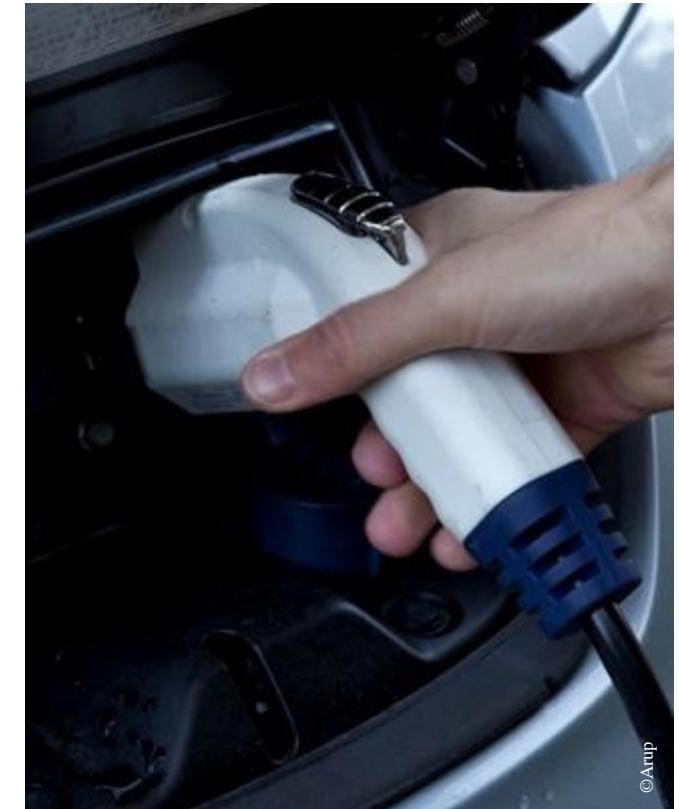
- **People and organisations:** Recognising that city region and local authorities need greater capacity and capability, for instance to capitalise on emerging opportunities around the use of data to encourage and inform investment in decarbonising vehicles.
- **Policy:** There is a tension between equitably supporting the transition of private cars to zero emission technology without encouraging car use. City regions also need to support the effective decarbonisation of public/semi-public vehicle sectors such as buses, taxi and in-house fleets.
- **Infrastructure design:** There are significant technical and commercial barriers to the roll out of charging infrastructure on street, in car parks, at depots and at petrol station style rapid charging hubs that need to be overcome.
- **Funding and business models :** New funding and commercial models are needed that catalyse affordable investment whilst avoiding legacy issues around redundant and poorly maintained infrastructure.

- **Energy generation and distribution:** There is a need to move towards an increasingly place-based approach to managing grid capacity and investment. There is an opportunity for local and city region authorities to encourage and facilitate this collaboration between transport and energy stakeholders.
- **Innovation:** Rapidly evolving technology and systems can create uncertainty and inaction around the best technologies and infrastructure to deploy. City region authorities are well placed to promote tried and tested methods for vehicle decarbonisation as we cannot wait for a technological silver bullet.

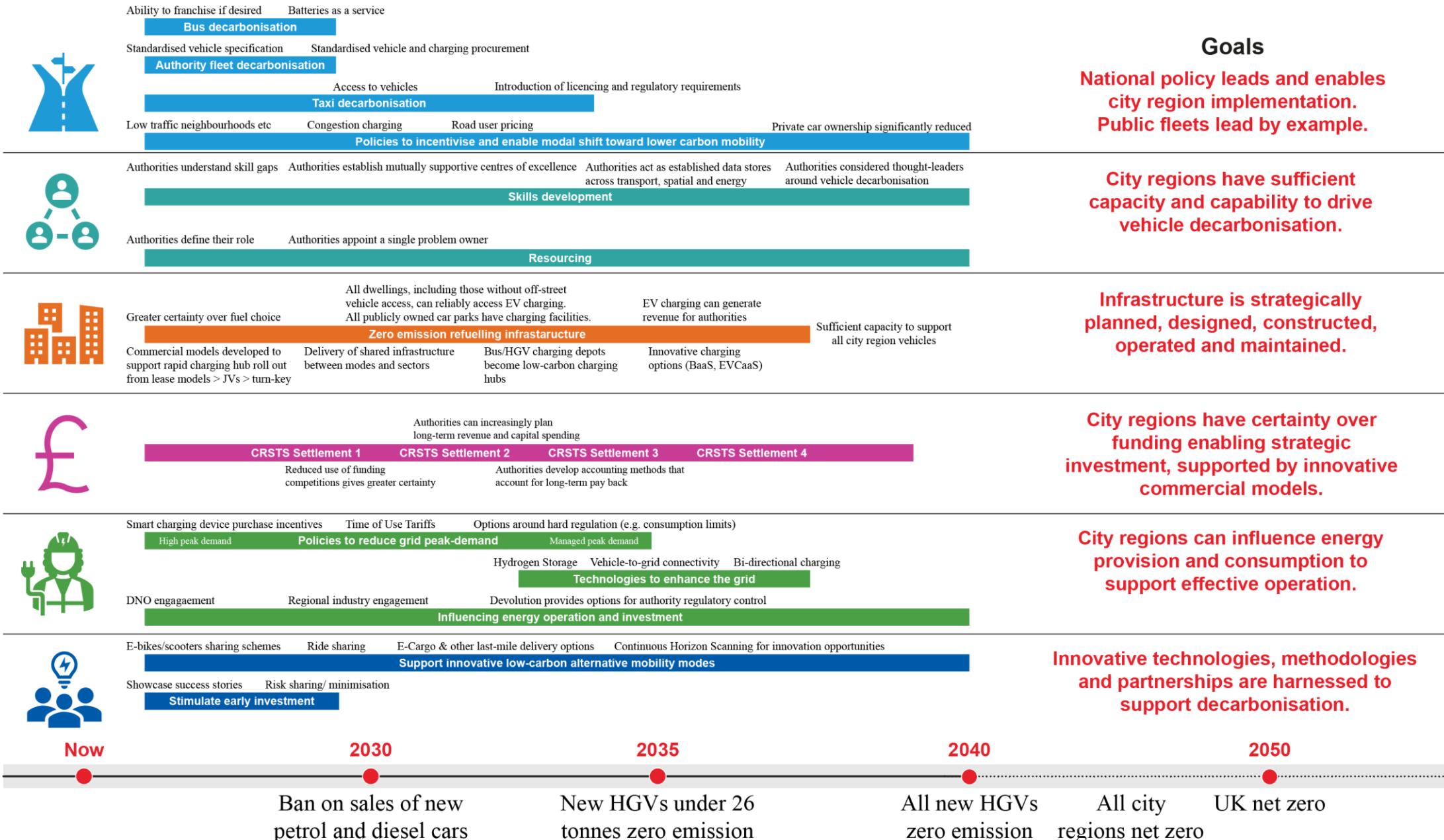
It is clear that urban transport needs to be decarbonised at pace with any inaction or false starts putting ambitious net zero carbon targets at risk. As such, city region and local authorities need to be at the heart of a more cohesive approach to accelerating the uptake of zero emission vehicles in our urban areas - an approach which will require greater support and collaboration between government and the city regions.

A **Roadmap** is included on the following page providing thoughts on goals against each theme as well as supporting activities and milestones. Noting that whilst the context and starting point differs

across city regions many of the challenges and opportunities are consistent.



Roadmap



1. Introduction

Introduction Study objectives

Achieving urban transport decarbonisation is a defining challenge for transport authorities in the coming decades and will act as a central driver of innovation and change.

This report reflects interviews with city region transport officers, and insight gained from an online survey targeting professionals working in the transport and energy sectors. It aims to

- **Identify common challenges to urban vehicle decarbonisation.**

The UK's city regions are unique and it is important to remain mindful of their individual nature and inherent differences. However, many of the challenges facing vehicle decarbonisation are common and identifying these commonalities can help inform solutions.

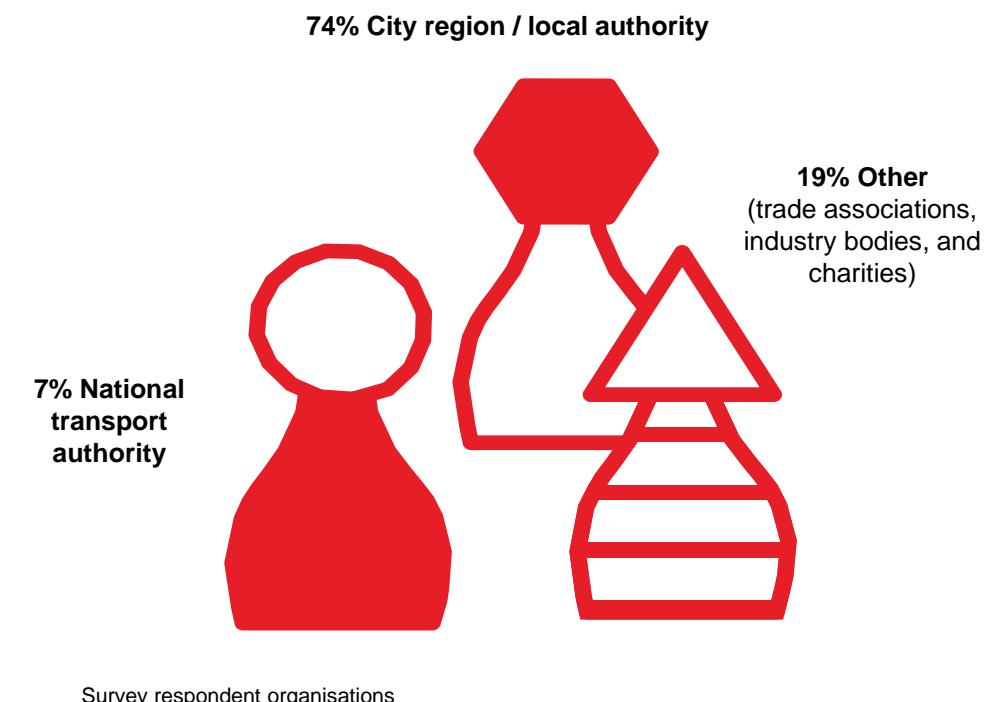
- **Provide practical advice to local and city region authorities.**

Inaction puts net zero ambitions at risk. Local and city region authorities need to make decisions and deploy known approaches now. We provide a set of potential solutions, supporting case studies and a roadmap that supports clarity on ways to move forward.

- **Reflect the views of local and city region officers.**

It is important to understand the views of local and city region transport officers as they will be involved in delivering solutions. However, we understand that local and city region authorities do not operate in a vacuum with all sectors from national government to the private sector having a role to play in vehicle decarbonisation.

Engagement to support this report took place during February and March 2022. This included interviews with officers from all seven full members of Urban Transport Group and with two associate members as well as a number of workshops with experts from Connected Places Catapult. An online survey was also developed which received 27 responses from a range of relevant organisations during this period.



Introduction

Why focus on decarbonising urban vehicles?

Transport must be decarbonised if the UK is to achieve its net zero emissions targets

In response to clear evidence that immediate and deep greenhouse gas (GHG) emissions reductions are required¹ the UK has committed to cutting emissions by at least 68% by 2030 compared to 1990 levels, and achieving net zero by 2050².

In the UK transport was responsible for 27% of GHG emissions in 2019, with 91% of this from road transport². Consequently there is an urgent need to decarbonise transport as the biggest UK domestic emissions source.

To achieve net zero moving away from fossil fuelled powered vehicles is vital

This is challenging as whilst other emissions sectors have seen reductions in GHG emissions those from transport have remained broadly static over the last 30 years, with improved vehicle efficiency and electric vehicle uptake offset by increased journeys and heavier vehicles³.

In support of transport decarbonisation the government has committed to phasing out the sale of new petrol and diesel cars and vans by 2030 and from 2035 all new cars and vans will be zero emission at tailpipe⁴.

It has also recently consulted on the potential application of zero emission mandates to other road vehicles e.g. buses, coaches and heavy goods vehicles⁵.

City region growth must be increasingly sustainable

City regions are the epicentres of economic and population growth. In 2015 UK city regions had over 40% of the UK's population and it is projected that between 2015 and 2025 these city regions will have a combined growth rate 27% higher than that of the rest of the UK.

This urban population growth is illustrated by figures showing that from 2001 to 2019 Inner London and Manchester saw population growth of 27% and 30% respectively⁶.

Decarbonising urban transport is a defining challenge for transport authorities in the coming decades. Achieving it will require innovation and integration across land use and transport planning, energy distribution, digital connectivity, infrastructure investment, economic organisation, technology and societal norms.

The UK's city regions have committed to more ambitious targets than the wider UK, with net zero targets ranging from 2030 to 2041

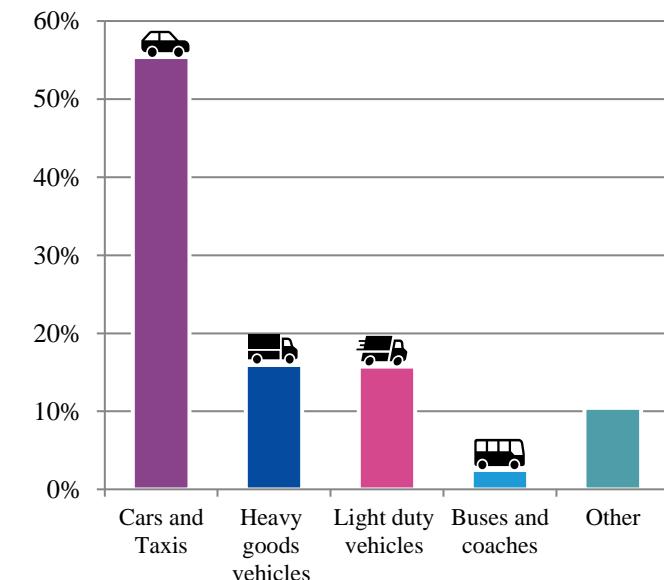


Fig 1

UK Domestic Transport Emissions 2019⁷

Introduction

Decarbonising transport in the UK

There is a need to turn emissions targets into agreed, resourced and financed action plans embedded across all layers of transport governance

Harnessing the ambitions of the city regions is vital to achieving net zero. This is the defining challenge of the next three decades and will act as a central driver of innovation and change.

The '**Avoid, Shift, Improve**' framework is useful in helping to prioritise attention and investment around transport decarbonisation⁸.

This report predominately supports the third **Improve** imperative through its focus on the decarbonisation of urban vehicles. However, it should be noted that many of the challenges related to urban transport e.g. pollution, social exclusion, congestion, road danger and health inequalities are linked to an overdependence on the private car. Therefore, simply switching existing hydrocarbon vehicles to those powered by zero emission fuels will result in a massive missed opportunity.

Avoid, Shift, Improve

In line with the 'Avoid, Shift, Improve' framework the first imperative (**Avoid**) for city regions is to integrate land use and transport planning, supplemented by improvements in digital connectivity to minimise urban travel demand. Due to the pressures on planning authorities there are still too many examples of urban or peri-urban car dependent

developments achieving consent.

The second imperative (**Shift**) is to shift journeys to more sustainable modes focused on increasing levels of active travel and public transport. This bridges transport and spatial planning as compact cities support reduced demand for energy-intensive transport. Linked to this are emerging opportunities around powered micro-mobility i.e. e-bikes and e-scooters which need to be better understood in terms of benefits, risks, infrastructure and legislative requirements. There is also a need to understand how zero emission buses can be financed and operated whilst increasing patronage.

The third imperative (**Improve**) is to improve vehicle efficiency. This includes increasing the quality of public transport e.g. through bus priority measures as well as by adopting of zero emission vehicles which is the focus of this report. As per the first two imperatives this will require integration between land use and transport planning but with an increasing recognition that energy also needs to be planned in tandem. As compared to hydrocarbons the supply of zero emission fuels, predominately focused on vehicle electrification, is less flexible and needs to be considered alongside other factors such as the increasing electrification of heating.

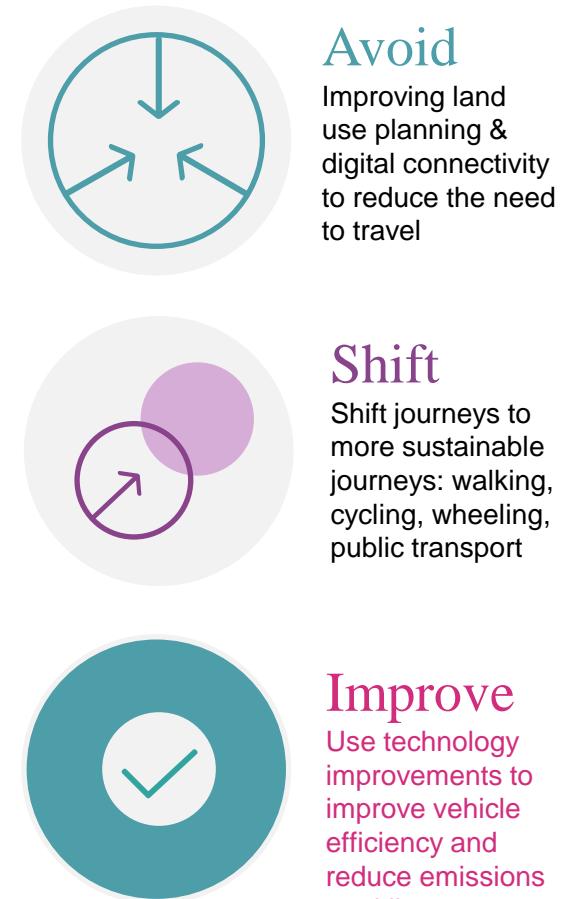


Fig. 2.
Avoid, Shift, Improve⁸

Introduction

Transport and energy governance

Vehicle decarbonisation drives the need for increased integration between transport and energy planning to support the move away from hydrocarbons. As such it is useful to consider how these sectors are regulated, with the below focussing on England's city regions.

City region transport governance

The six largest conurbations outside London are known as the metropolitan areas (Greater Manchester, Liverpool City Region, Sheffield City Region, Tyne and Wear, the West Midlands and West Yorkshire). These areas have all established Combined Authorities (CA) which are legal bodies, increasingly led by directly elected Mayors, enabling collective decision making.

In city regions District Councils remain the highway authorities (although in some areas responsibilities are moving up to the CA level). District Councils are also the planning authorities as urban areas tend to have a single Unitary Authority. All of the metropolitan areas also had a Passenger Transport Executive (PTE) responsible for local public transport planning and delivery. These PTEs have either been absorbed into, or subsumed by the CAs.

Transport governance and funding in the UK is complex and centralised. However, CAs hold devolved powers on highway and public transport and this trend appears to be deepening. The Levelling Up Strategy¹⁰ proposes further devolution, including

trailblazing deals with the West Midlands and Greater Manchester. The funding landscape is also changing with the new City Region Sustainable Transport Settlement (CRSTS) aiming to simplify transport funding by creating a more consolidated devolved model.

Energy governance - electricity

The energy market is regulated through the Office of Gas and Electricity Markets (Ofgem) which is an independent body operating in a statutory framework set by Parliament. There is the potential for change with the recent British Energy Security Strategy¹¹ committing, in response to proposals by Ofgem¹², to establish a Future System Operator to oversee the energy system and drive the transition to net zero.

It is likely that this Operator would be separate from National Grid and provide strategic planning and management of the energy system, with National Grid's role focussing on operation of the national transmission network which carries electricity long distances at high voltages.

District Network Operators (DNOs) are the companies that distribute electricity in the UK and own and operate the infrastructure that brings electricity from the national transmission network to homes and businesses.

The UK is one of the most politically and fiscally centralised countries in the developed world⁹

Energy governance - hydrogen

There is currently no UK regulatory framework for the production, transportation and storage of hydrogen as existing policies were enacted prior to its emergence as a realistic fuel source.

The UK Hydrogen Strategy¹³ recognises the need to introduce a new regulatory framework to support hydrogen's continued development and states that planning and permitting regimes will be in force by 2024.

Currently almost zero low-carbon hydrogen is present in the UK's energy system. In response to which the Hydrogen Strategy also put forward options for a Low-Carbon Hydrogen Standard which has now been defined¹⁴.

2. Approach

Study Approach

Study Themes

The six study themes on the right provided the framework for engagement in this report and were identified through literature review and workshops. These themes are supplemented by the linked key questions which supported thinking and collaboration.

The graphics below shows the types of vehicles this study included but with these examined through the study themes rather than on a case by case basis.



People and organisations:
Do city regions have the necessary resources, skills and relationships?



Policy:
Is there a coherent policy landscape which enables decisions to be made at the right scale?



Infrastructure Design:
What does good infrastructure design look like and how to reshape urban areas for the better?



Funding & Business Models:
How to fund urban vehicle decarbonisation sustainably and equitably?



Energy generation and distribution:
How to ensure urban energy infrastructure is secure, able to cope with demand and that energy is generated in ways which supports emission targets?



Innovation:
How to create a culture of effective innovation and knowledge sharing?



Kick electric scooter



E-bike inc. cargo



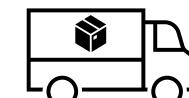
Electric scooter/
moped/ motorbike



Electric car



Taxi and
private hire



Last mile freight



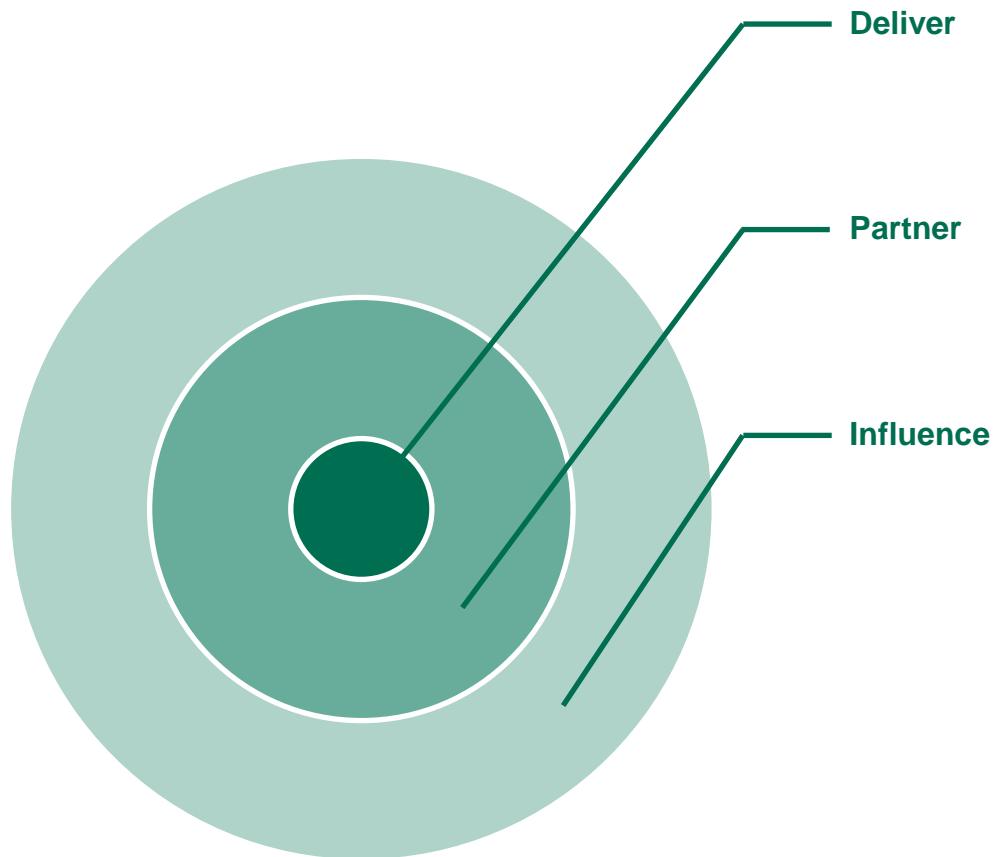
Bus



Public sector fleet

Study Approach

The role of city region and local authorities



Throughout this report we identify potential opportunities for city region and local authorities to overcome barriers and make progress towards vehicle decarbonisation through their own executive action, partnerships and by exerting influence.

Ultimately action of all types at all scales will be needed to succeed and the opportunities currently available will depend on multiple factors such as city region political leadership and progress made to date.

Deliver

What can city region and local authorities deliver on their own e.g. though the decarbonisation of their own internal fleets or through their role as highway and/or public transport authorities? What support is needed to enable this delivery?

Partner

What can city region and local authorities deliver through partnership e.g. with private public transport operators, energy suppliers or other public bodies? What support is needed to enable this delivery?

Influence

What can city region and local authorities influence through either soft or hard measures e.g. education and awareness, infrastructure provision or policy implementation and enforcement. What support is needed to enable this delivery?

Fig 4

Deliver, Partner, Influence

3. People and organisations

People and Organisations

Challenge: City region and local authority staffing capacity

Local and city authorities are responsible for managing highway and public transport in city regions. As such they need to lead the decarbonisation of transport in support of ambitious city region and national targets. However, all respondents discussed that this was hampered by a lack of internal resource with a city region transport officer urging the need for “[a step change in capacity, expertise and resource.](#)” There are clearly issues around local and city authority staffing capacity that needs addressing.

Another frequently raised issue was a lack of clear problem ownership as vehicle decarbonisation can fall between roles as it intersects transport and energy portfolios.

There are a number of contributing factors to this lack of internal clarity, capacity and capability:

- Government funding has tended to favour capital rather than revenue funding¹⁵ which has increased pressure on authorities already facing other challenges such as the COVID response and the provision of social care, with one respondent stating that “[cuts to local authority budgets decimate capacity.](#)”

- Inaction has stemmed from a lack of clarity around the role of the local authority and “[uncertainty over how much public sector intervention is required or appropriate to support vehicle fleet decarbonisation.](#)”
- Vehicle decarbonisation requires integration between a new range of professional and skills, as put by one respondent stating “[while policy-based expertise is relatively well established, specific technical expertise relating to issues such as the types of electric charging points, the siting of these and the potential impacts on the electrical grid, are areas which are less well developed in terms of technical knowledge.](#)”
- Building internal capacity requires training and development across entire authorities as well as their partners and supply chains “[this is not just fleet managers and transport and planning policy writers but financial, procurement, business development and regeneration staff, senior executives and political support staff.](#)”
- City region and local authorities do not have any statutory powers relating to energy planning or investment by the Distribution Network Operators (DNOs).

City and local authorities have sufficient staffing capacity to support urban vehicle decarbonisation

- Agree slightly
- Disagree slightly
- Disagree strongly
- Not sure

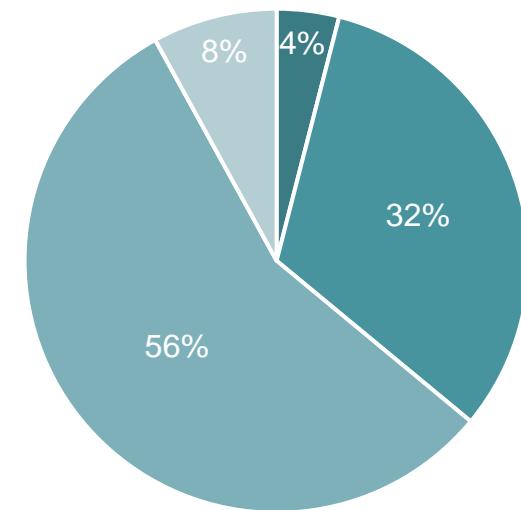


Fig 5

Survey result regarding views on local authority staffing capacity

People and Organisations

Challenge: Data and mapping

Improvements around data capture, development, processing and sharing will be fundamental to supporting urban vehicle decarbonisation. In recognition of this transport has been identified as a key opportunity area within the UK Geospatial Strategy which estimates that better use of location data in the transport sector could unlock up to £2bn per annum of economic value¹⁶.

Good quality data across different sectors at the city region scale is increasingly central to planning where infrastructure and service delivery can bring most benefit in pursuit of strategic objectives. Making sure that investment is informed and targeted correctly is more important for electric vehicles (EVs) than their internal combustion engine (ICE) equivalents since the electricity network is a fixed asset and inherently less flexible than the transportation of hydrocarbons.

City regions are at the right scale at which to combine data across sectors such as land use planning, transport forecasts (both demand and supply) and energy forecasts (both demand and supply). Many of this report's respondents felt that a key role for city region and local authorities is to develop and supply this data in order to inform, convene and catalyse investment.

However, there are recognised local authority concerns which hinder effectiveness around¹⁷

- Data and information gaps
- Specialist data skills gaps
- Complexity of engaging with the energy connections process and the complexity of supporting information required

“This is a huge opportunity, but needs to be done right, and to take into account the needs of the people it serves - rushed, permanent infrastructure doesn't tend to age well.”

City region transport officer, survey respondent

Electric Vehicles: The data landscape

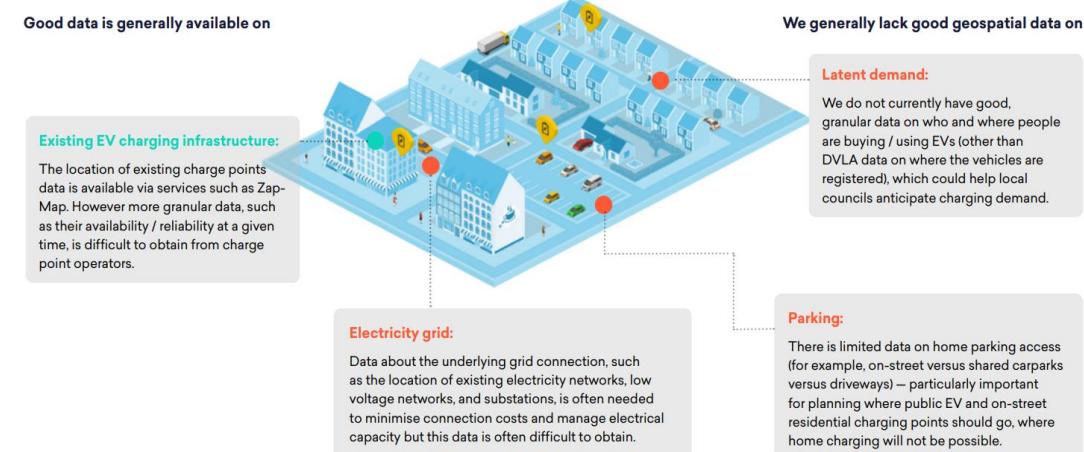


Fig 6

The data landscape, taken from ¹⁷

The above¹⁷ demonstrates the challenge for city region authorities to become the data store and act as a convener of different data sorts to support effective public and private investment that supports vehicle decarbonisation.

People and Organisations Collaboration

The government's EV Strategy¹⁷ acknowledges that delivering charge point provision will involve more than one team within a local authority and require strong collaboration between the different layers of local government. However, it goes further than this. Vehicle decarbonisation will require and drive increased collaboration between city region and local authorities and with partners across the public and private sectors. There is a clear role for both the Urban Transport Group and Connected Places Catapult to support this in terms of both linking across the public sector and also with potential private sector partners.

In part this need is driven by the fact that much of the technology and ways of working is new. For instance whilst standards are being developed for zero emission vehicles there is still more work needed to develop common good practice and to define the expectations that a product or system should meet such as interoperability¹⁸.

This was discussed by respondents. For example, one interviewee discussed the increased joint working required when purchasing zero emission as opposed to diesel buses. They highlighted the need for coordination with the local authority and government funding stream, vehicle manufacturer, charging manufacturer, DNO / hydrogen supplier, as well as with staff and trade unions to support upskilling around operations and maintenance. In this example, and despite this collaboration, interoperability issues arose between the charging infrastructure and buses which were not easily rectified due to the number of parties involved.

“There is a need for local authorities to work collaboratively together to develop coherent charging networks across larger areas to achieve value for money and avoid uneven patchworks of inconsistent infrastructure.”

City region transport officer, survey respondent

The need for collaboration between city region transport authorities has also been recognised by the World Economic Forum which proposed a number of guidelines to structure collaboration between city region authorities and private sectors mobility partners¹⁹, including around the sharing and leveraging of information to optimise commercial operations and allow efficient planning and management.

It is clear that increasing and new forms of collaboration drive the need for new types of commercial agreements. As ensuring that risk, cost and benefit are properly allocated by these agreements is a particular area of challenge for city region and local authorities. It is also an area of opportunity as standardisation of different types of commercial agreements will support increasing private sector confidence.

The Urban Transport Group's role providing thought leadership and networking across public sector urban transport professionals means it is ideally placed to support necessary collaboration across this topic, including for example the development of standardised commercial agreements for adaptation and use by city region and local authorities.

People and Organisations

Case studies



Workplace parking levy:

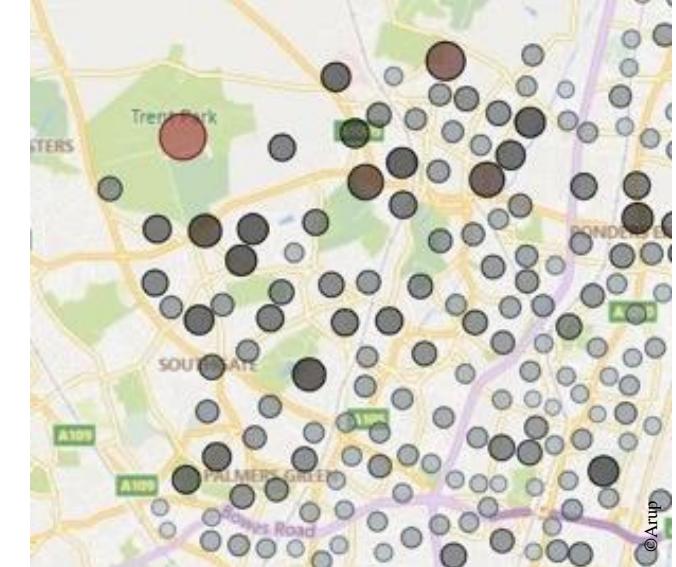
The Workplace Parking Levy (WPL) was introduced into Nottingham in 2012. It is a charge payable by employers who have more than 10 employee parking spaces at their premises. The revenue generated is ring-fenced for local transport improvements. The WPL has helped to fund the construction of two new tramlines, the redevelopment of Nottingham Station and supports a network of electric buses. As well as acting as a demand management tool, the WPL also makes grants available to employers for infrastructure to encourage the use of sustainable travel. These grants have included shower and locker facilities for cyclists as well as secure cycle parking. Independent academic research concluded the introduction of the WPL has had a positive impact on congestion and thus air quality and carbon emissions.



EV & hydrogen bus prioritisation:

A tool was developed for Merseytravel to help determine whether buses should be replaced with electric or hydrogen vehicle options. This data led tool supported technical assessment as follows:

1. Assess duty cycle for each vehicle
 2. Determine energy requirements
 3. Assess vehicles that could not be converted to electric
 4. Quantify the enabling infrastructure required.
- From this it determined whether the fleet / route should be all hydrogen, all electric or a mix. It is hoped that this tool will provide clarity and simplify the bus decarbonisation process.



EV charging infrastructure forecasting as a service:

There can be a lot of uncertainty for authorities when planning EV charging infrastructure. They often want answers to questions like:

- How many EV chargers are needed in an area between now and 2050?
- What type of EV chargers should they be?
- Where should they be placed?

Sheffield City Region has used transport forecast demand data to visualise and quantify potential demand for vehicle charging points in the future and the associated energy demand to inform planning.

People and Organisations Opportunities

Opp	Theme	Opportunity	Enablers	Approach
1	Staffing capacity	Facilitate learning between authorities as some are more established in certain areas than others. For example, Nottingham City Council has significant experience in the procurement of zero emission vehicles and has made its purchasing framework open to other authorities. There is an opportunity for authorities to develop as Centres of Excellence and to foster shared learning. This needs to be considered broadly i.e. not just policy focussed, but to include procurement, legal, energy storage and distribution, technology integration, fleet management etc. There is a clear role for Urban Transport Group to support this opportunity through new or existing forums.	Increased resource funding	Authorities deliver in partnership with each other
2	Staffing capacity	City region and local authorities clearly defining their role in terms of vehicle decarbonisation will give confidence to their officers and potential partners. This should be embedded by the appointment of a singular lead / problem owner who can provide the sponsorship and has the political support to convene the necessary skills and experts.	Local political sponsorship	Authorities deliver
3	Data	City region authorities, supported by the Connected Places Catapult and others, develop a role as 'city data stores' across a range of sectors e.g. transport infrastructure condition and planned investment, forecast transport demand, spatial planning and development, energy forecasting demand and planned investment. The development and maintenance of this repository of spatial data can act as an enabler of private sector investment and innovation whilst also ensuring that public investment is correctly targeted to meet the authority's strategic objectives. For instance with regards to electric vehicles this data could support: <ul style="list-style-type: none"> • Planning new charging infrastructure (micro-mobility and EV) • Bespoke EV routing e.g. for buses and service vehicles (charge points, gradient etc) • Managing grid capacity 	Increased resource funding	Authorities deliver (will require central government support)
4	Collaboration	City region authorities actively engage with and support each other in achieving their net zero ambitions. There is an opportunity to leverage established forums for innovation and collaboration such as those convened by Connected Places Catapult and the Urban Transport Group.	Promotion of established forums	Authorities deliver in partnership with each other

4. Policy

Policy

Clear policy direction

City regions have committed to more ambitious net zero targets than the UK Government. The net zero targets for English city regions falling between 2030 and 2048, and the UK having a net zero target of 2050. There is therefore a need for national government to support and harness this ambition.

A theme emerging from the interviews conducted for this report was a perceived lack of cohesive national policy direction. With some respondents feeling that there was an expectation for city regions to feed information to the centre in what was a fairly one-sided exchange.

Historically government policy has tended to be technologically agnostic in terms of the application of EV or hydrogen to avoid stifling innovation. Some respondents felt that this had encouraged tactical rather than strategic application of technology and wanted a clear policy direction, for example in support of mass EV adoption and focusing hydrogen for specialist vehicles and duty cycles. However, recent announcements around the Electric Vehicle Strategy and Local Electric Vehicle Infrastructure (LEVI) fund will likely help to fill this perceived gap.

Increased devolution has the potential to increase the importance of city region policy relative to national policy. This would likely be received positively as the majority of survey respondents felt that the city region policy picture was clearer than that at the national scale.

“ A major challenge is the... speed of roll-out required to meet local and national decarbonisation targets; and the need to avoid locking-in car dependency through a focus on solely on fleet transition rather than wholesale behaviour change.”

City region transport officer, survey respondent

What roles are most important for city region authorities in supporting urban vehicle fleet decarbonisation?

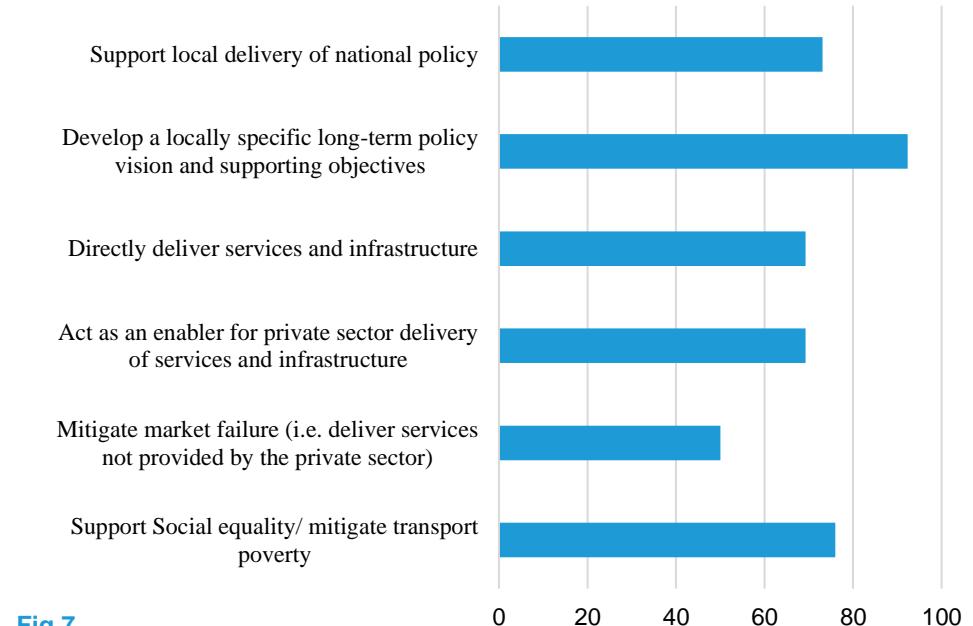


Fig 7

Percentage of respondents saying each role was either important or very important

Policy

The private car and the role of city region authorities

With cars and vans responsible for almost 70% of the UK's annual domestic transport CO₂ emissions²⁰ the carbon and linked air quality emissions from private cars need to be challenged as a priority, this will require a multifaceted approach.

Respondents discussed the need to identify the role of city region and local authorities when it comes to supporting decarbonisation of the private car, to include setting desired outcomes and ensuring that delivery is in pursuit of these. There are a number of particular and linked challenges when it come to city region and local authorities and the decarbonisation of the private car:

- It is not enough for authorities to simply encourage transition ICE to zero emission private cars; they must also encourage mode switch to more sustainable forms of travel. However, at least in the medium-term the private car will remain which results in tension between providing supporting infrastructure without encouraging car use. City region and local authorities must define their strategic objectives and act to meet these, for instance amongst respondents there was a general

consensus that one role of authorities is to support inclusion and equitable access to transport.

- Coupled with this consensus around supporting equitable access and mitigating market failure was an appreciation that previous investment has not always supported this and instead resulted in unintended consequences e.g. subsidising parking/charging in urban centres for the better off. These legacy issues have in part been caused by competitive funding competitions which have driven undesirable tactical rather than strategically planned investment. City region and local authorities need the capacity to develop strategic investment opportunities and then to work to understand the most appropriate funding and delivery mechanism rather than responding tactically to competitive funds.
- Given the 2030 national cut off for the sale of pure ICE vehicles and assuming a ten year average life there is a need to ensure sufficient charging/refuelling capacity for the entire fleet (although uncertainty remains over fleet size) from 2040. There are also signs that much of

this capacity will be needed ahead of time, for example plug-in vehicles comprised more than 25% of overall vehicle sales in February 2022 (+123% year-on-year change)²¹. Highlighting the need for reliable forecast demand data.

- There is also uncertainty around the future of motoring taxation linked to previous subsidies for zero emission vehicles and emerging conversations around road user pricing.

Policy

Taxi and private hire

Respondents discussed that decarbonising taxis was both a priority and a challenge given their high mileage, function, political sensitivity and visibility.

Licensing and regulation

Local authorities, as the licensing authority, do possess levers with which to support the decarbonisation of taxis and private hire vehicles. However, introducing a mandatory cut off after which only zero emission vehicles will be licensed has generally proven politically unpalatable due to the comparatively high price point of zero emission vehicles. Some respondents also discussed issues related to the lack of availability of a full zero emission wheelchair accessible Hackney Carriage vehicle with licensing authorities being reluctant to license alternate vehicles e.g. converted e-vans.

The scale at which regulations are applied to private hire vehicles in particular could also result in issues around cross border hiring. For example, if one authority introduces a zero emission vehicle requirement for private hire vehicles, there is nothing to stop drivers obtaining a licence from another authority and operating wherever they choose. The development of taxi and private hire policies across local authority boundaries e.g. at the city region scale could help to manage this.

Charging

No consensus emerged from interviews or survey responses around whether charging infrastructure should be specifically designed and targeted for a single user group such as taxis or not. Some authorities were developing proposals for separate dedicated networks for different user types whilst others were proposing dynamic allocation e.g. by time period for different users in support of flexibility.



Policy Buses

Buses are the country's most popular form of public transport with more than 4.07 billion journeys in England in 2019/20²², more than twice as many as rail. Despite buses' vital role services outside of London are struggling. Patronage which fell during the pandemic was in decline even before, fares have been rising above inflation and networks have contracted.

This report focuses on decarbonising the bus vehicle. However, there remain separate questions around overall bus organisation and funding which, if resolved, could support increased bus patronage and arguably be more meaningful in terms of overall transport decarbonisation. For instance, the government's decision to stop additional Covid-19 revenue funding in September 2022 has the potential to result in a 30% drop in patronage compared to pre-pandemic levels²³.

It appears that buses will be the first heavy vehicle segment to decarbonise with all city region's engaged in this process, predominately in partnership with one or more of the 'Big Five' bus operators and utilising central government funding such as the Zero Emission Bus Regional Area (ZEBRA) scheme and the All-Electric Bus competition. However, fundamental questions remain around whether swapping diesel for zero emission buses is the most appropriate way forward, or whether routeing, vehicle size and operating models which have all been based on ICE vehicles need rethinking to best utilise new technologies.

For all the city regions outside of London the bus market is unregulated which limits the influence of city region and local authorities on bus operators. A number of mayoral city regions are considering bus franchising in line with London's model, with Greater Manchester having made the most progress to date. However, franchising is a lengthy process and will not be a quick fix.

A number of challenges to decarbonising buses were raised by respondents:

- Comparatively high purchase price of zero emission buses compared to diesels can result in commercial operators seeking public support to fund differential. Linked to this are the potential for State Aid issues if vehicles are purchased using public funds for the sole use of private operators.
- Zero emission bus technology is still relatively new. We haven't seen a full or even half life cycle of many zero emission buses and, as such, there are still a number of unknowns. For instance it is likely that, with current battery technology, heavy duty cycle vehicles like buses will require mid-life battery replacement. However, there is a lack of clarity over what commercial value spent batteries have for recycling or reuse.
- Requires training and upskilling of operational staff e.g. in terms of power management, maintenance etc. This can raise labour issues as staff roles and skill requirements change.
- Zero emission buses have different depot requirements, including strengthened power grid connections and increased size for refuelling in addition to the installation of charging technology.
- Whilst authorities have tended to develop relationships with one or more of the 'Big Five' operators engaging with smaller local operators is more challenging due to their relative lack of resource. This has had implications for competitive bids e.g. the Electric Bus Cities Fund which required the involvement of all local operators.
- More must be done to overcome status quo bias, which is the tendency to choose to change nothing in the face of uncertainty - as some respondents were confident that EV buses were the future whilst others were unsure of the relative merits versus hydrogen. Hesitancy or hedging against both technologies has the potential for inefficiency. Competitive funding bids can also result in a tactical approach to EV versus hydrogen adoption.

Policy

Local authority fleets

All the city region and local authorities engaged with had started the process of transferring their vehicle fleet to zero emission, with some being further along the process than others. Likewise central government has committed that 100% of its cars and vans will be fully zero emission by 2027, which is about 40,000 vehicles.

There was recognition that given the ambitious net zero carbon targets of many city regions there was a need to complete the transfer of internal fleets as soon as possible. For instance, assuming an average vehicle life expectancy of ten years those authorities with carbon neutral targets of 2030 or sooner can no longer reasonably purchase diesel powered vehicle unless they intend to dispose of vehicles prior to end of life.

For some authorities this vehicle segment has been seen as a priority area as the vehicles are entirely within their control and can also act as a local zero emission vehicle demonstrator with local authority fleet officer stating that "*decarbonisation needs to start within the councils own remit and its existing fleet*". However, achieving this brings a number of challenges:

- Local authorities directly control only a small percentage of urban vehicles so whilst it signals intent and acts to showcase the possibilities the impact on city region carbon emission is marginal.
- Developing specifications for specialist vehicle to support procurement is new and challenging. Likewise there is a lack of knowledge around the reliability of zero emission vehicles compared to their better known diesel counterparts and this can reduce investor confidence.

“Why not make exemplars of local authority fleets by giving us the money to decarbonise the vehicles people see every day.”

Local authority fleet manager, survey respondent

- High purchase price of zero emission vehicles compared to diesel alternatives challenges local authority budgets and often relies on elements of national funding. Whilst this is challenging for long term procurement strategies it is particularly acute for unplanned purchases e.g. in response to the unplanned failure of an expensive asset such as a refuse vehicle. The issue of high upfront vehicle costs was raised by a local authority fleet manager who stated that "*local authority finance protocols are unable to consider economics out with the vehicle direct cost. We requires government funding to meet the significant upfront costs of an alternatively fuelled fleet*".
- As with buses and other fleet vehicles, switching to zero emission vehicles requires the training and upskilling of operational staff e.g. in terms of power management, maintenance etc. This can raise labour issues as staff roles and skill requirements change.
- As with other fleet vehicles the switch to zero emission vehicles can impact depot requirements and lead to current facilities being unsuitable or requiring considerable investment e.g. to support strengthened electricity grid connections and/or hydrogen storage in addition to the costs relating to the installation of necessary technology.

Policy Case Studies



Electric transport as a service:

Zenobē, a specialist in EV fleets is beginning a pioneering new partnership with National Express in Coventry. This partnership will involve delivering 130 EV double-decker buses in the UK's largest single EV bus fleet transaction. What makes this partnership so innovative is that Zenobē will be providing Electric Transportation as a Service (ETaaS). This means that Zenobē will finance and manage new vehicles, batteries and their replacements, chargers and their infrastructure as well as full operational support and software. This form of partnership is common in other industries such as rail or shipping.



Reuse of spent batteries to provide back up power:

The Second Life project (Nissan and Enel) recycles used Nissan batteries to enhance the grid stability to the city of Melilla, Spain, which is isolated from the national grid and powered entirely by a conventional power plant. The used batteries are recycled by being put to use alongside new batteries in a large battery storage system. This system can be used during periods of excessive electricity load to provide a boost to the grid. The system can also be used if the power plant experiences issues and can power Melilla's grid for 15-minutes, providing enough time to reset and restart the power plant.



Merseytravel hydrogen bus trial:

Merseytravel has developed an innovative pilot to introduce a fleet of Hydrogen buses across the city region. They will be the first buses in the region to utilise the new, clean and sustainable technology. Emitting nothing but water from the exhaust pipe, the buses will make a significant contribution to the city region's ambitions to improve air quality and work towards a zero-carbon economy by 2040. With the low-carbon economy already worth more than £2 billion a year in Liverpool, the project aims to demonstrate the commercial viability of hydrogen and act as a catalyst to develop a future network of hydrogen refueling stations.

Policy

Case Studies

Metropolitan bus model:

The Metropolitan bus model was originally developed in 2011 as an enhancement of the DfT's National Bus Model, and subsequently updated in 2015, and 2021. This model is available to Urban Transport Group's full members.

This is an aggregate model which aims to forecast the impact of high level exogenous factors (e.g.: population, employment, GDP, car ownership, fuel prices, public funding) on bus patronage, operator behaviour, fares, mileage and public funding. This tool was originally developed to illustrate to central government the likely impact on local bus services, patronage and fares of funding reductions. It has subsequently been used by our members to support policy and strategy work including as part of outline business cases for bus franchising and partnership schemes.

While not developed specifically to support decarbonisation ambitions, the model includes indicators on the fleet share of alternatively fuelled buses and the greenhouse gas emission implications. More generally, it is a useful planning tool for supporting bus services in city regions, a vital part of delivering decarbonised transport systems and encouraging modal shift away from private cars. Developing this model collectively for full Urban Transport Group members avoids each transport authority having to develop their own tools, further demonstrating the value of collaboration between authorities.

Wireless charging of electric taxis:

The WiCET project aims to demonstrate the commercial and technical viability of deploying wireless charging for electric Hackney Carriages in medium and large cities.

Nine vehicles will be part of the demonstrator and will be fitted with wireless charging hardware for a six month period. This will allow for an understanding of how taxi rank based charging can work and how the billing system will have to operate to be developed.

The project aims to develop a vehicle interface that will allow systems to be either retrofitted onto an existing electric vehicle or to be fitted as a "factory option" when the vehicle is built. A billing system is also being developed that will ensure the correct vehicle and driver is charged for the electricity used.

Simulate Programme:

The SIMULATE programme is a partnership between Staffordshire County Council, Amey, Connected Places Catapult and Keele University brought about to investigate and demonstrate the feasibility of an integrated Mobility Hub model through live trialling of solutions to improve mobility and air quality.

Pop-up electric vehicle chargers, green walls and electric scooters were among the systems tested as part of a project exploring how the transport hub of the future could look and function. Connected Places Catapult supported the programme delivery through access to technical and commercial experts, knowledge sharing workshops, networking opportunities and an investment readiness programme.



OUTLINE

Policy Opportunities

Opp	Theme	Opportunity	Enablers	Approach
5	Devolution	Devolution of funding and powers. Trailblazing devolution deals for Greater Manchester and West Midlands could provide examples of devolution that incentivise strategic delivery; for instance devolution of powers around energy generation, distribution and investment allowing better integration with transport.	Devolution of funding and powers	Government with authority influence
6	EV charging	Focus investment on those vehicles types / segments of the urban fleets that do the highest urban mileage to get best return e.g. taxis, private hire, delivery van fleet (instead of or in addition to focus on consumer EV charging).	Local political sponsorship and supporting data	Authorities deliver
7	Taxi & private hire	Potential for opportunities for local authorities linked to their role regulating taxis and private hire vehicles e.g. consider different Hackney Carriage vehicle types (converted small vans) and/or consider phased deadlines mandating use of zero emission vehicles.	Local political sponsorship	Authorities deliver in partnership with taxi operators
8	Bus fleets	Development of different zero emission bus ownership models to more closely match approaches in the rail and aviation industries e.g. batteries as a service.	Collaboration: bus operator and authority	Authorities deliver in partnership with bus operators

Policy Opportunities

Opp	Theme	Opportunity	Enablers	Approach
9	Data	Development of consistent modelling approach and tools to assess benefits/costs of EV versus hydrogen for bus routes and fleets.	Resource funding	Authorities deliver in partnership
10	Data	Development of consistent approach to support prioritisation of buses / routes to be switched to zero emission.	Resource funding	Authorities deliver in partnership
11	Franchising	Bus franchising and other opportunities for greater local authority control over vehicles, routes, frequency and quality.	Resource funding and local political sponsorship	Authorities deliver
12	Investment	Development of different models e.g. factoring vehicle cost over a longer time period to reduce initial purchasing disincentive. To also consider ring fencing any savings on maintenance and fuel to support reinvestment.	Financial model development	Authorities deliver
13	Procurement	Local authorities to agree common design of specialist vehicles and procure together to support increased purchasing power and certainty for manufacturers in pursuit of standardisation and lower vehicle costs.	Collaboration: with other authorities	Authorities deliver in partnership

5. Infrastructure design

Infrastructure design

On-street parking

Finding solutions for those without off-street charging is a challenge shared by all authorities. Research by Field Dynamics found that ~25% of people do not have access to off-street parking at their home and so charging infrastructure will have to be carefully planned to ensure all EV users have and are aware of charging options²⁵.

The government's Electric Vehicle Infrastructure Strategy states that "local authorities are fundamental to successful charge point rollout, particularly for the deployment of widespread on-street charging. They are ideally placed to identify the local charging needs of residents, fleets and visitors. But the current picture is mixed. Some are driving the agenda forward at pace, others are short of dedicated resource and expertise. Planning permission delays are often cited as a major brake on the speed of deployment, and the interaction between local parking and charging policies is not fully resolved".

Some respondents interviewed discussed how their city region authority was moving away from a focus on providing on-street charging infrastructure and pivoting toward delivery of rapid charging hubs. These 'petrol station' style facilities would allow

vehicles to be charged in under 30 minutes.

On-street charging can also have further challenges which additionally caused authorities to be hesitant in promoting or supporting on-street charging projects. The health and safety risks from cables trailing over pavements was commonly mentioned. Additionally, some authorities mentioned the challenge of allocating space. In busy areas, allocating space for electric vehicles to charge, may not be popular as those without electric vehicles would find the areas they could park in further reduced. This would be exacerbated when also trying to find space to store active travel solutions (such as storage for shared bikes). Overall kerb side management is an increasing issue which needs to be resolved in terms of the many demand, including vehicle charging.

There may be benefit in local authorities (as the highway authority) responding to the recent Electric Vehicle Infrastructure Strategy focus on on-street charging provision in accordance with other plans around kerb side management. Whilst city region authorities focus on provision of rapid charging hubs strategically positioned to serve the needs of the wider city region.

One respondent's answer when asked about the biggest infrastructure challenges faced when decarbonising urban transport:

“ Providing charging infrastructure in areas of high density housing where there is limited off street parking - without obstructing pedestrians, cyclists and those with mobility impairments... ensuring adequate grid capacity. ”

Infrastructure design

Rapid charging hubs

Through the Electric Vehicle Infrastructure Strategy government aims to make charging easier and cheaper than refuelling a petrol or diesel car. To achieve this £500 million (£450m of this from the LEVI fund which isn't necessary aimed at rapid charging hubs) will be invested to implement charge points across the UK²⁴.

In order to switch vehicles, drivers need to be confident that there will be accessible and effective charging infrastructure to enable their mobility needs. Rapid-charging points, which enables refuelling mid-journey without excessive wait times, will be important in helping to overcome range anxiety.

Rapid charging hubs are locations where multiple vehicles may quickly charge their vehicles at once. These hubs are often described as the electric version of a petrol station, where drivers can visit and get their vehicle charged in under half an hour. These hubs are seen by some authorities as a potential alternative to the mass provision of on street charging infrastructure.

With charging infrastructure growing rapidly (at a rate of 60% a year²⁴) it is also vital to address the unequal distribution of electric vehicle charging. Rapid charging hubs could help with equitable

access by allowing those who rent, live in apartments or have no access to off street parking to have easy access to vehicle charging. However, charging at rapid charging hubs will likely be more expensive than home charging and could disproportionately impact those without the ability to charge at home.

A number of the authorities engaged with were assessing the potential for joint ventures or partnerships with private charging sector operators to support the delivery of rapid charging hubs with varying goals and objectives discussed such as:

- Avoiding charging “deserts”
- Removing the financial risk of the long pay back period for charge point operators to catalyse investment
- Capitalising on local authority land assets.

Ensuring there is sufficient grid capacity for these hubs is a challenge shared by all authorities as the cost for upgrades can be large. Many authorities discussed the need for increased funding to help address this as well as the development of new business models to support partnership with the private sector.

“Funding has been limited to on-street charging, which is not where the early wins or least regret options can happen.”

Respondent discussing challenges.

Support social equality/ mitigate transport poverty

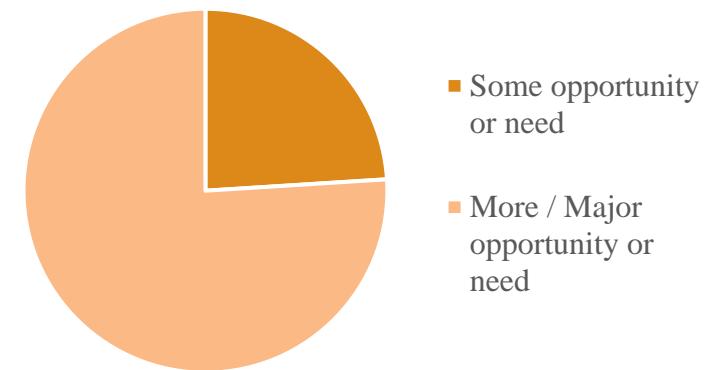


Fig 8

Graph showing the proportion of respondents who found that supporting social equality/ mitigating transport poverty was an important role that city region authorities could provide.

Infrastructure design

Shared infrastructure

Shared infrastructure is a new and innovative method for providing charging infrastructure. It could work in many ways such as creating charging depots for use by freight, taxis and buses or by creating infrastructure which is dynamically allocated to different user groups e.g. by time of day. Because of its immaturity shared infrastructure was discussed little within the interviews. However, there was a recognition that infrastructure needs to be as flexible as possible to utilisation and avoid duplication.

Shared infrastructure does have challenges. Because of the fluid way that assets are used it can be a challenge to know how to charge for the electricity used without creating additional barriers. Additionally, it may be difficult to communicate and enforce who can use the infrastructure and when.

Transport for London discussed how they initially built taxi dedicated charge points around the city. However, they have decided to focus on the delivery of shared infrastructure as a means of avoiding the uneven demand dedicated infrastructure can encourage.

When surveyed it was seen that authorities views on shared infrastructure were mixed, with respondents split over whether they thought dedicated or shared infrastructure was the most effective. This is likely a result of the immaturity of this approach. There was a general consensus around proposed rapid charging hubs that the civil designs etc will be developed to allow use by a range of vehicle types e.g. for last mile freight vehicles to create flexibility. Designs also needs to cater for users with disabilities.

“ Future proofing for changes as the technology develops. The identification of land to be utilised for charging in a way that also allows alternate and mixed usage now and in the future. ”

Respondent discussing one of their infrastructure challenges.

Supporting infrastructure e.g. charging is most effective when designed and focused on a single user group

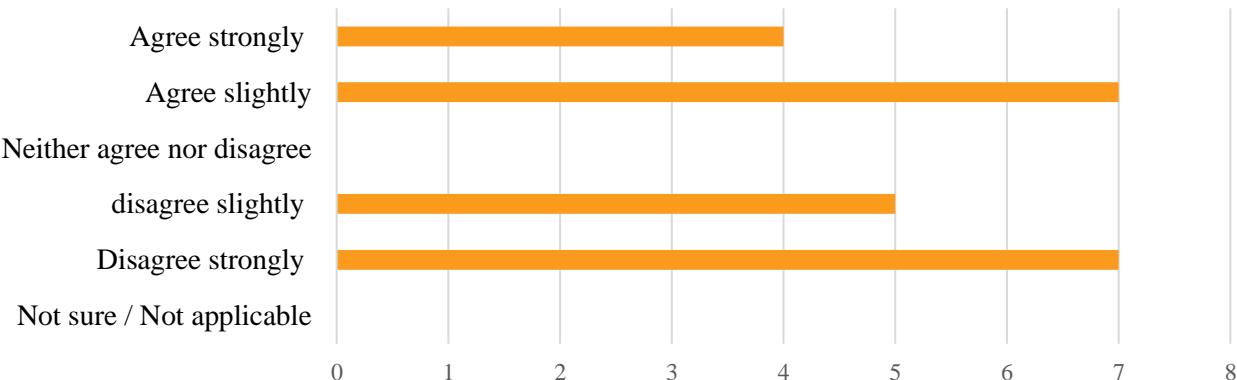


Fig 9

Proportion of respondents agreeing or disagreeing with the above statement

Infrastructure design Local authority car parks

Authorities discussed the challenge of providing charge points in easily accessible locations. This can be difficult as it can be hard to source land or to forecast utilisation. To help solve this problem there was discussion of partnering with the private sector to provide charging facilities in existing local authority car parks. There may also be an opportunity that these sites could provide local off-peak / overnight fast charging for areas without off-street charging potential.

There may be challenges with using local authority car parks though as this may place the ownership of pricing, branding and promotion onto the private sector. Authorities would therefore have to work to ensure that the infrastructure delivered on their land fits with their transport vision (for example, is affordable, well maintained and easy to find).

Additionally, authorities should ensure that a focus on agreeing the approach to operations and maintenance (and related monitoring) alongside infrastructure design and delivery. This would help avoid issues seen with unproductive or poorly maintained assets on local authority land.

There is a challenge around the long pay back period on charge point infrastructure and the resultant long contracts private sector operators request from authorities (10+ years). These long contracts introduce risks around carparks being left with unproductive / legacy assets if technology improves as well as potentially introducing penalties should the authority want to develop the site to more productive use.

“The need to provide charging in a location with competitive parking demands can be achieved. Including provision for a growing number of users of zero emission vehicles with disabilities, especially where off street parking is not available.”

Respondent discussing one of their innovation challenges.



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Infrastructure design

Bus and local authority depots

Adapting bus depots to support a decarbonised fleet is challenging. For instance many respondents report finding government funding streams for decarbonising buses disjointed which can result in tactical rather than strategic behaviours e.g. rather than developing a clear strategy around bus planning and fuel options (battery or electric) bidding for competitive pots where they think they can be successful.

The depot requirements of hydrogen and electric buses vary but operators can face space constraints when using either fuel. Currently buses are commonly parked end-to-end to maximise the number of vehicles that can be stored in a depot. It is therefore a challenge to fit new charging infrastructure or fuelling infrastructure in without reducing depot capacity.

There was discussion around innovative responses to depot capacity issues e.g. pantograph charging via cantilever at depots meaning vehicles could be charged from above, but this had not been trialled by respondents.

Upskilling of staff is a crucial requirement of both types of decarbonised depots as the maintenance and operational needs of hydrogen / electric buses are different from diesel / petrol buses.

Additionally, if using hydrogen as a fuel, upskilling is also required to ensure that hydrogen's stringent health and safety requirements are met.

Respondents did discuss some issues around resultant engagement with trade unions and impacted wage expectations.

When upgrading a depot to enable electric bus charging there can be issues with grid capacity. Some respondents discussed how their current bus depot locations would be expensive to upgrade and it may be more economical to build a new depot in an area with high grid capacity. Along with this some respondents suggested that in future depot locations should be chosen based on an areas grid capacity instead of its location to buses duty cycles. Although this needs further thought as there may be a clear impact on efficiency and empty running if buses depots are not associated with routeing and duty cycles.

There was little mention within the interviews of opportunity charging or buses sharing charging infrastructure with freight or local authority fleets. These areas need further examination as they may present options to reduce infrastructure costs through sharing with other fleet operators.

To what extent is the national policy picture supporting urban vehicle decarbonisation clear and coherent?

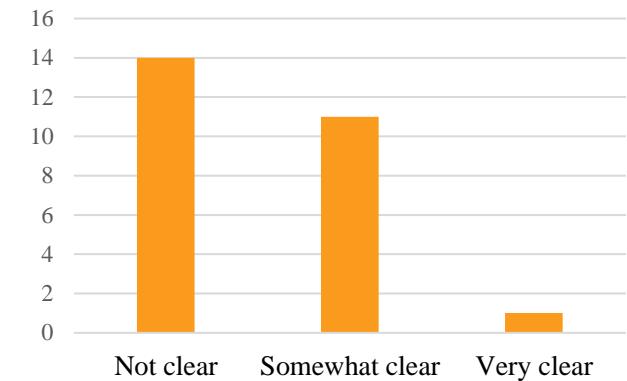


Fig 10
Proportion of respondents who found the national policy picture clear and coherent.

“[There is] funding to decarbonise private sector bus fleets but nothing for public sector (local authority) fleets.”

Respondent discussing funding challenges.

Infrastructure design

Fuel choice

There is a lack of clarity over the balance of decarbonised fuels in the future. Trends show that electric vehicles will dominate the decarbonised vehicles market for small and medium sized vehicles, with hydrogen fuel cell vehicles being more dominant in freight and bus sectors. This is in line with analysis by the DfT which showed that, due to the UK's relatively clean electricity mix, battery electric cars are estimated to save ~65% GHG emissions compared to an equivalent petrol vehicle²⁶ which is significantly more efficient than comparable hydrogen vehicles. By 2030 and 2050 these reductions are expected to increased to ~76% and ~81% respectively.

However, hydrogen also shows promising future savings for larger vehicles with fuel cell electric lorries predicted to save 73% GHG emissions compared to a diesel lorry.

Respondents were broadly aligned that local authority vehicles, buses and privately owned vehicles will be predominately electric rather than hydrogen fuel cell, with a general consensus that hydrogen will likely be used for particular use cases e.g. rural or long distance duty cycles.

Using hydrogen for decarbonisation can be challenging as there is a lack of green hydrogen available on the UK market. Currently, less than 1% of hydrogen production within the UK is classed as green hydrogen²⁶. Furthermore, accessing green hydrogen can require long distance transportation, thus making the cost prohibitive. It is likely that the UK's green hydrogen supply will grow in the coming years.

Overall, authorities lack clarity over how much to invest in hydrogen reporting that they engage in hydrogen projects based on the funding available, or that they are waiting for government steer before they pursue hydrogen projects.

Which of the following do you agree with?

We await a national strategy and steer before pursuing Hydrogen Fuel Cell projects.

The respective advantages and uses of Hydrogen Fuel Cell versus Battery Electric Vehicles are clear and drive the implementation of these technologies

Hydrogen Fuel Cell is a niche technology with little opportunity for urban transport

Hydrogen Fuel Cell and Battery Electric Vehicles projects are pursued opportunistically without a supporting policy framework

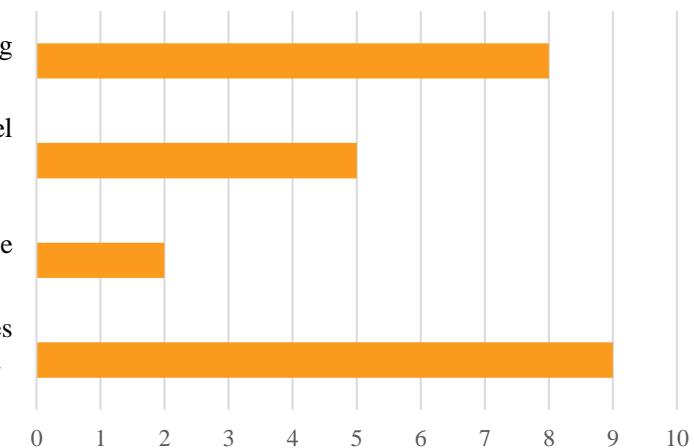


Fig 11

Bars represent the number of respondents who agreed with each statement

Infrastructure design

Freight and other large fleets

The Government has ambitious freight emission targets having announced that all new HGVs will be zero emission by 2040 and that all new non-zero emission HGVs up to 26 tonnes will be phased out by 2035²⁸.

However, HGVs are commonly referenced as an inherently difficult vehicle type to transition. This is due to their large power requirements, long travel distances and lack of downtime. In response to which the focus on HGV decarbonisation falls to hydrogen.

There was little discussion from authorities on strategies to reduce freight emissions. There instead appeared to be a consensus that this will need to be delivered by private freight operators. However, with the increasing prevalence of e-commerce first and last mile freight in city regions cannot be ignored.

The number of delivery vehicles on the road is expected to increase by 36% from 2019 to 2030²⁷. Due to their high mileage delivery vehicles make significant contributions to air quality and highway efficiency and so ensuring their transition to decarbonised vehicles will be essential for both environmental and air quality targets.

The freight industry can be perceived as a challenging industry to engage with. It is highly fragmented with depots, vehicles and warehouses commonly owned by different companies.

Additionally, freight companies may be hesitant to change without significant customer pressure due to profit margins and complex working practices. Engagement is essential, however, as inefficiencies in the industry are causing significant environmental impacts. In 2014 29% of the miles covered by HGVs were done by empty trucks, if this was slightly reduced to 26% (the levels from 2001) CO2 emissions would reduce by 720 million tonnes²⁷.

There are potential opportunities for first and last mile freight relating to freight consolidation and efficient onward transport but commercial and operational issues have tended to act as barriers to successful widespread adoption.

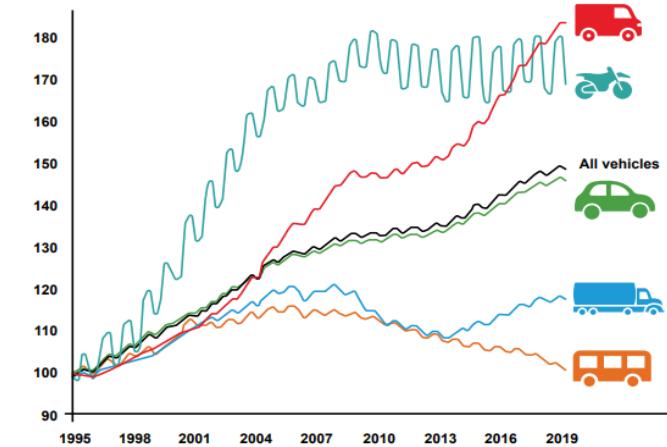


Fig 12

Index of Licensed Vehicles by Vehicle type (DfT Transport Statistics 2019)

“ Recognition of the needs of commercial vehicles as being different from cars. For public charge points they need larger physical spaces and also access to public charging in residential areas - for drivers that take their vans home and also tradespeople who work in domestic properties. ”

Respondent discussing organisational challenges.

Infrastructure design Case studies



Stourton Park & Ride:

Stourton Park & ride is the UK's first fully solar powered park & ride, giving Leeds City Council an innovative way to improve their EV charging network and work towards their 2030 net zero target.

The park is made up of Y shaped solar car ports, allowing vehicles to park in a covered spot while solar panels generate energy. Tesla batteries were integrated to alleviate the peaks caused by simultaneous charging or limited energy supply due to "grey weather" days. This system was required as the site was constrained in terms of existing grid capacity.

TfGM eHUBS:

eHUBS is a year-long pilot set to give people in parts of Greater Manchester innovative electric alternatives to private cars, to help people make more sustainable travel choices. The hubs offer a range of affordable ways to hire electric e-cargo bikes and electric car club vehicles.

Enterprise Car Club uses eHUBS electric cars which are available at East Didsbury Metrolink Park and Ride with more electric car eHUBS will be going live in Prestwich and Bury town centre in 2022.

Future-proofing Railway Station Car Parks:

In the coming years electric vehicles will become more and more common. But, by how much is hard to predict, this makes planning charging infrastructure a challenge as it will be hard to predict both the charging behaviour of EV users and how many EVs will be on our roads. Connected Places Catapult, Energy systems Catapult and the University of Hertfordshire worked together to produce a report preparing railway car park for future EV users. They found the following:

- Charge points in long stay car parks would be the most important type of EV provision for railway stations
- Charge point pricing needs to be carefully balanced so that the cost of charging is accessible but does not encourage over-charging
- Rapid charging facilities could help to encourage taxi and private hire vehicles to transition to EVs
- The proportion of EV owners with access to charging at home will be the most important factor in predicting future EV car park charging requirements

Infrastructure design Case studies

Nottingham City Council Eastcroft Depot:

Nottingham City Council are currently upgrading their main depot, which dates back to the Victorian era. This depot currently houses the majority of its electric fleet, including electric refuse vehicles, along with many charging infrastructure and a renewable energy and battery storage project. This scheme will make a carbon saving of 45tCO₂e per year.

It has been identified that a new electricity supply to the site is required to allow for further electric vehicles to be based from the depot. As the current infrastructure does not allow for further charging to be installed or for any expansion.

By upgrading the depot, the following will be possible:

- All depot fleet can be converted to electric vehicles, with sufficient power available to charge them all
- The possibility of transitioning all refuse collection vehicle to electric
- Vehicle-to-grid and battery storage technologies will be able to be installed on site
- Depot expansion will be possible.
- These upgrades will cause local air quality to improve, carbon emissions to reduce, renewable energy generation to increase and energy costs to reduce.

This is a good example of a two-stage depot upgrade, whereas the first stage makes best use of existing grid capacity to house electric vehicles at low cost to support initial fleet transition, followed by a more substantial upgrade to energy supply and depot design to allow full transition once the case is made.

Rural Innovation for Sustainable Environments (RISE):

This Connected Places Catapult project funded by the DfT looked at measures to decarbonise road freight, using integrated agent-based and emissions modelling to assess the impact of electrification, consolidation and mode shift on emissions generated from last mile deliveries in rural areas in the North East of England.

Results suggest that if 40% of commercial fleets switch to e-vans by 2035, a 50% reduction (against 2021 levels) in emissions from last mile deliveries is achieved. However when combined with the introduction of consolidation centres the model shows a 96% reduction in carbon emissions from last mile deliveries in 2035 when compared to the 2021 baseline. This supports the development, alongside the shift towards electrification, of a strategic network of consolidation centres to support last mile deliveries.



Infrastructure design Opportunities

Opp	Theme	Opportunity	Enablers	Approach
14	Revenue	Rapid charging hubs could lead to a revenue stream for authorities (depending on the business model). They could also be used to cross subsidise sites which perhaps lack an economic incentive but support inclusivity and city region wide access.	Collaboration: private sector and land availability	Authorities deliver in partnership with private sector
15	Business models	To develop effective business models and contracts which allow the authority to break without significant cost should technology move on or the site be required for redevelopment.	Increased resource funding	Authorities deliver in partnership with private sector
16	Sharing infrastructure	Sharing facilities e.g. different users sharing depot's facilities and/or opportunity charging, as well as adjacent sites sharing grid connections	Development of use cases and business models	Authorities deliver in partnership with private sector
17	Energy gen/storage	Potential for local energy generation on local authority estate and/or storage including vehicle to grid technology linked to potentially having large numbers of large vehicles being located at one site	Increased capital funding	Authorities deliver in partnership with DNO
18	Business models	Placing responsibility for vehicles and charging equipment in the same contract to de-risk interoperability issues.	Collaboration: private sector	Authorities deliver in partnership with private sector
19	Modelling	Develop tools which inform whether bus/commercial vehicle routes are more economical fuelled via EV or hydrogen.	Increased resource funding	Authorities deliver in collaboration with bus/commercial operators
20	Fuel choice	The removal of uncertainty around fuel choice could catalyse investment sooner as there would be certainty in the country's direction.	National political sponsorship	Government with authority influence

6. Funding and business models

Funding and Business Models

Funding Sustainability

EV funding

Vehicle decarbonisation will require a strategic and coordinated approach; future risks need to be managed through long-term continuous planning to ensure adequate funds are accessible and sufficient and the information needed to utilise them is consistent and well disseminated.

Currently the public funding available to support vehicle decarbonisation mostly does not have these characteristics; local government funding is both complicated and fragmented, originating from a range of streams and ad hoc sources (e.g. council tax, business rates retention and central government).

Very few survey respondents indicated that there was clarity on future funding streams (**Fig 13**).

Funding Competitions

Competitions are increasingly becoming one of the main means for local councils to obtain funding for vehicle decarbonisation. Between 2016 and 2019, 82% of the short-term funding made available by government required councils to bid competitively.

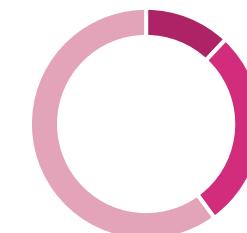
Although there may be merit to some funding competitions from an innovation and value-for-money perspective, respondents stated that if funding routes are not diversified, competitive funding could be detrimental to rollout:

- Competitions tend to be opportunistic and lack consistency, meaning authorities are required to act reactively to obtain money when it becomes available, rather than planning strategically over the long-term.
 - Competitions can drive tactical behaviours aimed at quickly developing bids that meet specific criteria rather than developing long-term strategic proposals. Especially as some funding pots seem to emphasise novelty ‘first of a kind’ experimental innovations rather than tried and tested approaches and technologies.
 - The resource-intense nature of bidding and competitions diverts already over-burdened staff to activities that they cannot guarantee will be productive, creating continual uncertainty and making it difficult to plan efficiently and build in-house expertise.
 - Many funding competitions require proof of a robust business case, this results in an uneven spread of funding between urban and rural areas, despite higher car dependence and fewer alternative modes in low-density rural areas.
- For a zero emission vehicle rollout that is efficient, consistent and equitable in both the short and long term, it is clear that a more coordinated approach with greater focus on regional authorities

collaborating, rather than competing, ought to be developed.

For local authorities to have confidence that they will receive long-term financial support, funding needs to be coherent with overarching policy and flexible enough to allow for collaboration and agile implementation. This may be achieved via an increasing shift to regular cyclical grant funding.

There is clarity on future funding streams i.e. size, targeting and where they will come from



- Agree Slightly
- Disagree Slightly
- Disagree Strongly

Fig 13

Funding and Business Models

Business models for zero emission refuelling infrastructure

Opportunistic Business Models

Current approaches to funding the delivery of zero emission refuelling infrastructure, mostly EV charging, can result in business models that lack coordinated strategic thinking. For instance, if a large funding pot is suddenly made available, authorities may utilise this to quickly deliver infrastructure without properly considering the longer term implications. This can result in sub-optimal asset design or placement and failure to fund operations and maintenance, ultimately creating poor performing or stranded assets that fail to provide public value.

Commercial Approaches

City region and local authorities need to identify appropriate funding and business models to plan, design, develop, operate and maintain their charging infrastructure. Different approaches have varying costs, risk allocation, potential returns and opportunities.

Survey respondents most supported a public-private joint venture model and least supported leaving it to

market forces alone, with support for end-to-end ownership lying in the middle.

End-to-End

Full operation of the EV charging infrastructure gives authorities the autonomy to direct all facets of the charging network whilst owning all risks.

Lease Model

Leasing can provide a low-cost route for authorities to support EV charging in areas where they hold suitable land assets for reuse. However, it can leave areas deemed by the market as attractive vulnerable to exclusion.

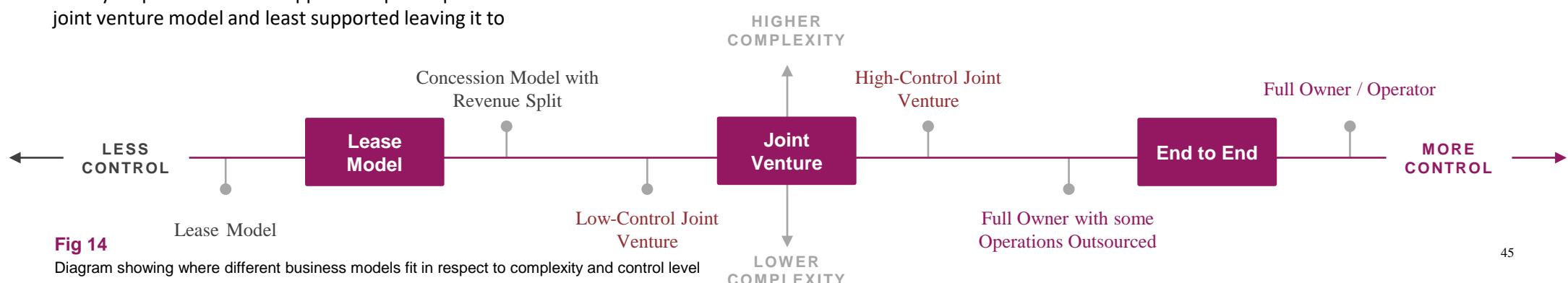
Joint Ventures

Joint ventures can provide a middle-ground that authorities can navigate with the private sector to reach a solution that matches their vision, resource and appetite for risk.

Adaptive Business Models

All approaches contain inherent benefits and trade-offs; the figure below summarises the spectrum of control and complexity. The approach taken by an authority will ultimately depend on their appetite for risk. However, this is unlikely to remain static as funding arrangements change and organisations will mature and build knowledge, experience and skills. It will be important that authorities are agile to adopting new business models as circumstances change.

It is also important that any models chosen are sustainable given the long-term nature of this infrastructure, particularly in terms of properly considering location, specification, operations and maintenance.



Funding and Business Models

Availability and cost of zero emission vehicles

Costs for EV Deployment

From both critics and advocates alike, costs are one of the most-cited barriers for zero emission fleet transition. Notable public costs for transition include; electric fleet vehicle purchase, charging infrastructure, grid modification, energy demand and public funded consumer incentives (e.g. the £2500 EV grant).

Total Value Approach

The high initial upfront investment in vehicles and infrastructure can seem financially unviable, thwarting rollout schemes at the first hurdle. Taking a broader lifetime perspective to costs can help to justify initial investment, particularly if additional indirect economic benefits and social value are accounted for.

Whole-life cost analysis reveals that EVs can save up to £107 per year compared to ICE equivalents, helping to offset initial higher investment through lower running costs and tax reductions²⁹, e.g. Nottingham City Council reporting significant fleet operational savings following EV transition³¹.

Wider benefits from zero emission vehicle uptake, such as improvements in air quality and associated health gains could ultimately reduce public spending in the medium term.

Alternative Ownership Arrangements

Electric Transport as a Service (ETaaS) seeks to implement a similar mode as used in industries with high vehicle costs such as aviation and rail. In ETaaS private companies will enter into a contract with an operator to provide an electric vehicle fleet, with the private company bearing the risks and costs of purchasing and maintaining the fleet while the operator focuses on operations and customer experience.

This contractual arrangement is already being successfully piloted, earlier this year Zenobe entered a contractual arrangement with National Express to provide 130 electric busses on an as-a-service basis³⁰.

Service-based ownership could also extend to swappable batteries (e.g. BaaS); battery subscription models carry the potential to help overcome multiple challenges surrounding range and charging infrastructure.



Funding and Business Models

Case studies

Zero Emission Bus Regional Areas (ZEBRA) scheme:

The UK Government announced in November 2021 that it will support five local transport authorities with funding worth nearly £71m towards 335 zero emission buses under the ZEBRA scheme:

- Cambridgeshire and Peterborough Combined Authority: a grant award of £4.3m to help provide zero emission replacements for the first proportion of bus fleet in operation on the urban and interurban bus network.
- Kent County Council: funding of £9.5m to cover the purchase of 33 electric single-decker buses and associated infrastructure. This investment is for the existing Kent Thameside network and the new Dover Fastrack service, due to start in 2023. It will make Fastrack Kent's first zero emission bus service.
- Leicester City Council: funding of £19m for the introduction of new electric buses which will operate on the city's main routes. The council will work in partnership with operators to provide match-funding contributions towards the electric bus programme.
- Milton Keynes Borough Council: the £16m fund will lead to introduction of electric buses and an upgraded overnight charging depot facility. An additional £16m will be available through a special finance arrangements that will be offered to the council, making the scheme's total cost £32m.
- Warrington Borough Council: the grant of £21.5m will be used for the entire fleet of 120 diesel buses replaced by new electric buses.

Independently of ZEBRA, the council has committed to deliver a new bus depot at a purpose-built new facility on Dallam Lane.

Energy Accelerator:

The Energy Accelerator, which is funded by the Leeds City Region Growth Deal and the European Investment Bank's European Local Energy Assistance (ELENA), is an innovative programme designed to help low-carbon and energy efficient projects in Leeds City Region, helping the city region achieve their aim of being a net zero carbon economy by 2038.

The project also provides technical, commercial and legal services to the public, private, academic and community sectors to develop low-carbon projects in four areas:

- Installation of commercial and domestic retrofit technologies onto buildings that will improve energy efficiency, decrease energy demand and/or use renewable energy
- Integration of renewable energy sources into buildings such as solar thermal collectors and biomass
- Upgrading street lighting and traffic signals
- Renovating, extending or building new district heat and cooling networks using renewable heat sources to reduce carbon emissions and increase carbon efficiency.

This is an example of an authority developing strategic investment priorities and opportunities then looking to deliver and fund these, rather than tactically capitalising on competitive funding pots.

Funding and Business Models

Case studies

Leeds City Council low emission vans:

Leeds City Council has the ambition to transition its whole vehicle fleet to zero or ULEV by 2025 and already has over 380 electric vehicles in its corporate fleet. In addition, they have made a further 54 electric vehicles available to small to medium sized enterprises, public sector, third sector and other businesses including private hire drivers to trial for up to two months.

This enables both people and organisations across the city to experience using an EV and to understand how it could work for them. The trial launched in September 2020. 193 organisations have taken part so far, and according to partial feedback 39 electric vehicles have been purchased post trial with another 35 businesses having plans in place to purchase one.



Funding and Business Models Opportunities

Opp	Theme	Opportunity	Enablers	Approach
21	Funding	Devolution and the move toward cyclic grant funding, departing from reliance on funding competitions, could support better development of in-house expertise and the delivery of city region's objectives. Funding cycles can be timed to align with existing mechanisms (e.g. CRSTS)	Funding certainty	Government with authority influence
22	Business model	Conduct analysis on a case-by-case basis to understand the relative costs and benefits for varying degrees of private sector involvement the deployment of electric vehicle charging infrastructure (e.g. from lease models to end-to-end/turn-key provision).	Increased resource funding	Authorities deliver in partnership with private sector
23	Business model	Ensure planning and business model timescales align with lifetime of the assets, to support reliable long-term operation and maintenance and to ensure costs beyond the initial investment are accounted for.	Increased resource funding	Authorities deliver
24	Cost	Explore alternative as-a-service ownership models; e.g. batteries as a service, electric mobility as a service.	Case studies, trials & pilots	Authorities deliver in partnership with private sector
25	Cost	City region and local authorities or others combining purchasing power based on a common vehicle specification. City region and local authorities sharing experience, expertise and routes to market e.g. procurement frameworks.	Regional workshops, communication tools	Authorities in collaboration with each other

7. Energy generation and distribution

Energy Generation and Distribution Grid Capacity

An Electric World

As urban regions strive to reduce their dependency on energy derived from fossil fuels, there is growing pressure on the electricity grid to fill growing demand. One contribution to this shift in consumption is demand for EV charging, with road transport electricity demand forecast to increase by 15%-25% by 2050³³.

Electricity is not only filling the demand for cars, buses and trains that were traditionally powered by fossil fuels, but also for bikes, scooters and other forms of micro-mobility that were once powered by humans. Furthermore, transport is just one of numerous sectors increasing their electricity demand, for example with the increased electrification of heating.

The current trajectory towards a low-carbon, electric-powered future presents major challenges for the electricity grid. Especially when considering the tight timescales required to mitigate the worst impacts of climate change and reach the UK's net zero targets.

Electric Vehicles and the grid

Many survey respondents indicated that one of the most significant challenges to the uptake of an electric urban vehicle fleet was "*ensuring*

adequate grid capacity". Stakeholders were concerned that grid capacity could become an increasingly limiting factor for EV investment and deployment - especially as current solutions lack the flexibility of hydrocarbons, requiring long term-planning and costly infrastructure, as encapsulated by the following quote: "*grid capacity is a major constraint to decarbonisation at scale. The cost of addressing power constraints can be huge*".

EV charging is likely to be clustered in specific areas depending on the type and purpose of vehicle; for example power demand for private EVs will be greater in dense residential areas and electric fleet vehicles will require energy at depots and transit hubs. Similarly, charging is likely to be clustered around certain peak times (e.g. 5-7pm)³¹. This clustering of energy demand will put greater pressure on the grid, however regulatory tools, incentives and smart chargers can partially mitigate this peak demand³².

Bi-directional vehicle-to-grid charging can help to balance the grid; this enables the grid to draw energy from vehicle batteries, and vice-versa, effectively decentralising electricity storage throughout the EV stock.



© Arup



- Agree Slightly
- Disagree Slightly
- Disagree Strongly
- Not Sure

Fig 15

There are adequate plans in place to support the increased electrification of urban energy demands

Energy Generation and Distribution Engagement and Influence with DNOs

DNOs are responsible for maintaining, operating, distributing and investing-in the electricity network within a given geography. This makes them instrumental to the deployment of urban electric vehicles at scale.

Regional city authorities need the ability to partner with, engage and influence DNOs, and other energy and electricity stakeholders. As this can support an efficient, resilient and strategically distributed charging network to enable the deployment of urban electric vehicles at scale.

DNOs have a deep knowledge of the regional electricity network, understanding important parameters like costs, current capacity and capacity limits, and have the tools and foresight to reduce risk by reinforcing or altering the network, or strategically distributing charging points³⁴.

Survey respondents indicated that "*consistent DNO support*" and "*DNO performance*" are notable challenges to city region and local authorities for EV deployment. This is partly due to their statutory obligations and regulations imposed by Ofgem.

The deployment of EVs is a challenge that requires a cross-disciplinary solution that falls at the intersection between transport, energy and city planning. There is currently a lack of clarity in the most effective ways for city regions to influence and engage with DNOs, and other stakeholders in these sectors, making it difficult to implement cross-sectoral solutions.

Sufficient integration exists between city region authorities role in terms of land use and transport planning and the energy sector



- Agree Slightly
- Disagree Slightly
- Disagree Strongly
- Not Sure

Fig 17

Respondent's views on the above statement

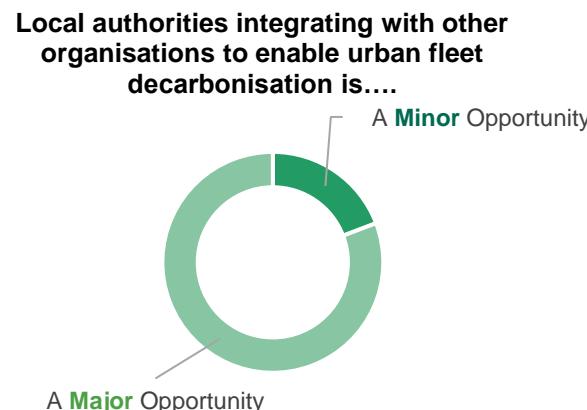


Fig 16

Respondent's views on the above statement

Energy Generation and Distribution

Taking a Place-Based Approach

Context Appropriate Planning

Supplying electricity to enable EVs is a complex challenge, as such prescribing a one-size-fits-all blanket solution will not be effective.

Ensuring the correct energy supply depends on a myriad of factors at the local and regional scale, such as; population distribution, grid constraints, regional energy generation, grid balance, peak demand times/distribution, land use, electricity storage capacity and other significant localised energy demands (e.g. industrial clusters).

Intimate knowledge of the local urban landscape will help to avoid risks and challenges to grid balance, and can also identify mutually beneficial opportunities such as infrastructure sharing, operational efficiencies or shared investment.

Therefore, taking a place-based approach which appreciates a locality is appropriate when planning and executing energy supply for EV charging, as described by one city region transport officer:

"A...clear process for the development of land use sites and the provision of energy to those sites is needed when discussing the likely impact of the (decarbonised) fleet"

The Role of City Region Authorities

Fewer than 25% of survey respondents considered "leaving it to the market" as an option for vehicle decarbonisation. This suggests there is support for city region and local authority oversight and intervention to support the uptake of zero emission vehicles.

Providing sufficient energy to meet EV charging demand can be complex and costly. To deliver most benefit, local and city region authorities must influence and form partnerships with a range of private and public sector organisations, combining the resources and specialist skills of other sectors with their own local knowledge and oversight.

This could be achieved in several ways;

- Development of Local Area Energy Plans (LEAPs) to support the integration of land use, transport and energy integrated planning.
- A devolved statutory consultee role for city region authorities around energy network management and investment.



Energy Generation and Distribution

Case studies

West Midlands Regional Energy System Operator (RESO) project:

The RESO project looked to explore the advantages of a new kind of energy system operating at a city scale. This will include local low-carbon energy generation, storage and management and will integrate future mobility assets such as electric vehicles into its overall envelope.

The RESO project team is led by Energy Capital, part of the West Midlands Combined Authority (WMCA). The total project value is £2.6m, of which £1.5m is directly grant funded by Innovate UK. This forms part of a wider investment in the West Midlands to become global leaders in smart energy.

The project will link energy supply, storage and use, and design ways to power heating and transport that will improve efficiency and reduce costs. Working with Coventry City Council, the project explores ways of generating and storing low-carbon energy on a city-wide scale, such as harnessing unused energy in electric vehicles, as well as integrating large scale, clean energy assets.

Energy Capital West Midlands:

Energy Capital is the energy partnership for the West Midlands. They are the single point of contact for Government, regulators, investors, funders and businesses across the West Midlands geography, and they aim to make the West Midlands one of the best locations to be able to develop and deliver innovative clean energy systems and associated businesses.

The Energy Capital team are based within the West Midlands Combined Authority and are responsible for both the delivery of the regional energy strategy and in securing the investment and powers needed to enable this.

The West Midlands aim to be the country's first net zero Pathfinder region, meaning they will lead the way in establishing clean energy systems, and sharing best practices and lessons learnt from these to both Government and other authorities.

West Midlands Combined Authority funding will enable the Energy Capital team to do the following over the next 2 years:

- Establish a Sustainable Market for Affordable Retrofit Technologies to support authorities to access and effectively target retrofit funding.
- Support the decarbonisation of commercial buildings
- Establish a net zero Demonstrator Neighbourhood by delivering £2 million of capital investment.



Energy Generation and Distribution Opportunities

Opp	Theme	Opportunity	Enablers	Approach
26	Grid Capacity	Deploying a range of incentives, smart technology and possibly hard-regulation can ease the burden on the grid during peak charging hours. The National Grid have proposed a Time of Use Tariff (TOUT): A weighted charging system that incentivises EV drivers to charge outside of peak demand time (17:00-19:00) ³³ .	Energy market evolution and consumer buy-in	Government with authority influence
27	Grid Capacity	The energy storage capability of Hydrogen cells could alleviate some challenges with intermediary storage and energy balance of renewable energy on the electric grid. There is potential to unlock the benefits of shared hydrogen infrastructure through partnerships with other transport uses or with local urban industrial clusters.	Increased hydrogen capabilities	Government with authority influence
28	Grid Capacity	Utilising the energy storage capacity of EV batteries, through enabling technologies like bidirectional charging and smart technologies, can help to balance energy storage in the grid. Vehicle-to-grid connectivity could save up to £10 billion per year by 2050 by reducing the amount of generation and network needed ⁵ . As EV uptake grows, the flexibility given to the grid from decentralised EV batteries could lead up to 32GW of peak-demand reduction by 2050 ³³ .	Use cases and affordable technology	Government with authority influence
29	DNO Engagement	DNOs and other energy stakeholders could make their network capacity data open-source, to allow for more collaboration in finding solutions for urban charging infrastructure. This can alleviate the burden on the grid by strategically locating charging infrastructure to not cluster high energy demand in certain areas	DNO engagement	Government with authority influence
30	Place-Based	Local authorities can bring together the relevant stakeholders from transport, energy and city planning organisations to create a context-appropriate and coordinated strategy to electric vehicle charging	DNO engagement	Government with authority influence
31	Place-Based	Due to their familiarity with regional ambitions and risks, local authorities ought to play a more significant role in energy network management and investment.	DNO engagement	Government with authority influence

8. Innovation

Innovation

Rapidly evolving technology is creating uncertainty and undermining action

The transport sector is currently experiencing a rapid pace of innovation, with different technologies competing to be the dominant ‘green fuel of the future’.

The primary competition is between hydrogen and electricity, with a diverse range of providers offering different approaches. Battery and charging technology is evolving rapidly, while there are unresolved questions about the optimal location, ownership and administration of charging infrastructure. Hydrogen power also has its technological challenges, ranging from the optimum generation method (blue, green or grey) through to technical complexities around storage and distribution network. This creates a challenging landscape for those wishing to invest in the sector or select a technology for their transport needs. Where technology options are evolving rapidly, there will inevitably be winners and losers and nobody wants to invest heavily in assets that become redundant.

Local commitment to transport decarbonisation in the UK is further undermined by questions about national generation mix, with less than 40% of electricity generated from renewable resources²².

Consequently, any transition to electricity or hydrogen for motive power effectively relocates up to 60% of vehicle emission reductions to thermal power stations across the national grid (unless the new fuel source has dedicated renewable energy generation).

“The biggest innovation challenge is supporting no regret investment (and) avoiding early adopter regret.”

City region transport officer, survey respondent



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Innovation

Authorities need new ways of information sharing, investing and collaborating to share risk

Local and city region authorities are keen to be involved in the introduction of renewable energy solutions for the transport sector. However, their participation is constrained by resource constraints (financial and human) and compounded by high levels of financial accountability.

They tend to be risk averse when it comes to innovative approaches and major investments⁴. This means local authorities are often slow to commit to emerging technologies (particularly those with relatively recent investments in advanced diesel technologies). This has been described as wanting to be 'leading edge' but not 'bleeding edge'.

While this reluctance can be mitigated by central government funding, the UK government is not currently offering substantive support to de-risk local government investment in transport decarbonisation. The high up-front investment cost associated with charging infrastructure can deter direct investment, while commercial providers can be unattractive as they seek to share risk by seeking long leases whilst charging high fees and termination costs.

Urban areas face major constraints to large scale deployment of charging infrastructure for private vehicles, due to challenges associated with space availability, land ownership and planning constraints. While local and city region authorities will be key players in addressing these challenges, they can also be directly involved in the greening of public transport and public sector fleets. Local authorities can also contribute to greening transport by reducing transport demand (such as by using development planning to reduce the distance between home, work and key services).

While there is no shortage of technical innovation in transport, there remain substantial opportunities for innovation in the way authorities collaborate. More effective collaboration should focus on information sharing and standardising approaches to financing, specification and procurement, to achieve economies of scale and share risk. In this there is clear opportunities for organisations such as Connected Places Catapult and Urban Transport Group to add value.

The prospect of in-road charging systems presents a major innovation opportunity for local authorities that can overcome the practical challenges of other technologies³⁶, but up-front investment requirements will be substantial.

“I’m not convinced the technology is sufficient yet.”

City region transport officer, survey respondent

City regions have access to sufficient information regarding emerging innovations

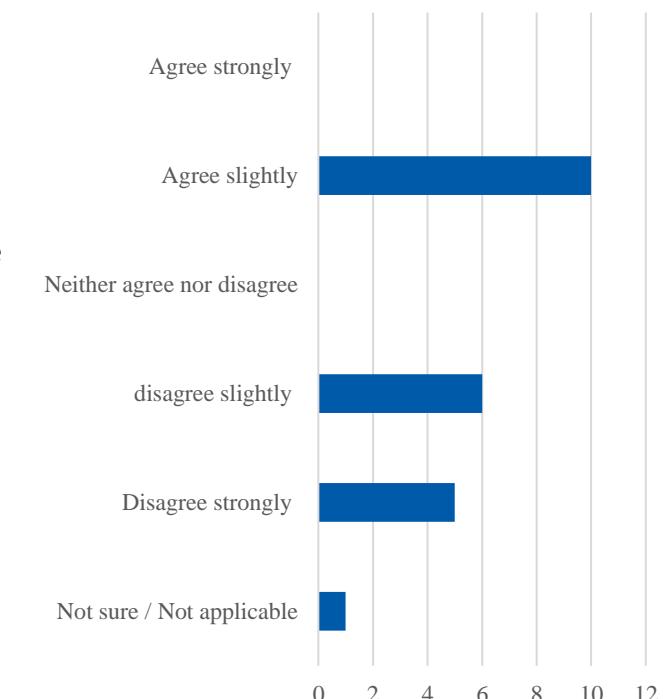


Fig 18

Respondent's views on the above statement, showing there is no clear consensus on whether authorities have access to information on innovation

Innovation Case studies

Cargo bikes for local delivery trials:

Research into the opportunities presented by cargo suggests that:

- 51% of all freight journeys in European cities could be effectively replaced by cargo bikes
- E-cargo bikes can deliver goods 60% faster than vans in London
- 50% of cargo bikes sold in the UK are for commercial uses

As such, E-cargo bikes are seen as a promising solution to decarbonising freight vehicles in towns and cities. This is because e-cargo bikes help to cut congestion and improve road safety as well as providing environmental benefit.

The delivery company Evri (formerly Hermes UK) have begun a trial of electrically assisted cargo bikes. These bikes are made from natural fibre composite materials, recycled plastics and metals and boast an 89% reduction in final-mile carbon emissions.

The Evri trial is taking place in Driffield, where an Evri courier is using the e-cargo bike to deliver their usual rounds, to enable a like-for-like comparison.



DeMAND project:

The Connected Places Catapult DeMAND project works to understand the demand for the introduction of New Shared Mobility Services in urban areas. This is done by understanding the complex nature of travel through looking at mobile network data to map journeys. This project looked at 650,000 people in the North East of England for an average weekday in March 2018. The data shared allowed analysis of social characteristics, demographics, spatial information and daily schedules.

From this, a model was developed which represented how people move, their transport choices and their preferences, and allowed testing of different mobility services. Examples of this include calculating areas where there is a high demand for transport services. This model is hoped to help with future planning of mobility services to ensure that the services introduced will both make a positive impact and be used by residents.

Innovation Case studies

Mobility on demand:

The Mobility on Demand Laboratory Environment (MODLE) project aims to demonstrate and provide transport solutions and to show that mobility service providers can run profitable services that create opportunities for authorities and public transport operators. To achieve this aim MODLE is developing “affordable, direct, spontaneously available, commercially sustainable, door-to-door transport services” that can compete with the cost and convenience of a car. It is hope that these solutions will help to reduce congestion and improve access to employment and services.

The project developed a service called Buzz. This is an e-hailing minibus service that hopes to improve mobility within an area that strongly relies on private cars and has poor accessibility. The catchment area of the service is north of the river Avon and north of the A420 in the east but the model extends across Greater Bristol.

The introduction of the Buzz project was simulated in detail and showed that if Buzz was introduced the following benefits would be received:

- Reduction in congestion
- Improvement in access to employment and services

- Increase in the number of longer journeys made sustainably
- Improvement in the accuracy of local authority interventions



Innovation Opportunities

Opp	Theme	Opportunity	Enablers	Approach
32	Innovation	For Connected Places Catapult, Urban Transport Group and others such as sub-national transport bodies to engage with city region authorities in a joined up and transparent way, fostering knowledge sharing and promoting innovation opportunities and approaches.	Resource funding for innovation connectors	Authorities deliver in collaboration with partners

Summary and Next Steps

On people and organisations...

City region and local authorities require sufficient capacity and capability to meet the challenge. With this being broader than transport policy and fleet management but also encompassing procurement expertise, regeneration and political support staff etc. When considering the capabilities required thought is needed around the opportunities for data to influence investment.

Due to the breadth of expertise required authorities should consider appointing a single transport decarbonisation owner ensuring sufficient political sponsorship and buy-in.

On policy...

City region and local authorities should develop a clear vision for the decarbonisation of all segments of the vehicle fleet. This includes overcoming the challenge of supporting EV transition without incentivising car use.

They need the capacity to develop and deliver strategic investment opportunities, as opposed to tactically bidding into competitive funding pots.

On infrastructure design...

City region and local authorities need to clearly define their role and aspirations in terms of supporting those without off street parking. This does not necessarily

mean a technological fix to avoiding trailing cables but articulating desired outcomes in terms of kerb side management. As depending on the aim the solutions will be different - a focus on car clubs and rapid charging hubs rather than lamppost chargers for instance. This will require an integrated approach between city region and constituent highway authorities.

Clear guidance is needed from government on fuel choice to support investment. It is likely that EVs will be predominant with hydrogen used where there is a particular use case e.g. local generation or particular duty cycles.

Focus is also needed on developing opportunities around shared infrastructure and how to most cost effectively encourage the transition of fleet vehicles housed in depots.

On funding and business models...

City region and local authorities need funding confidence that will likely only be achieved by an increased shift to regular cyclical grant funding in place of funding competitions.

Robust commercial models need to be established that allow the effective planning, roll out, operation and maintenance of EV charging infrastructure. Authorities will make different decisions on the role

of the private sector depending on maturity, concerns around social equity, land holdings and aspirations for long-term income generation.

On energy generation and distribution...

Grid capacity and the cost of necessary upgrades will become increasingly important in supporting transport decarbonisation. City region authorities need greater influence over DNOs and investment decisions to support a place based energy approach which aligns energy with land use and transport planning. Greater devolution may support this e.g. through the creation of a city region statutory consultee role.

On innovation...

City region and local authorities can be risk averse due to their role and limited resources. There is therefore a real challenge to develop no regret investment opportunities. They need support to develop the skills and confidence to deploy known technologies at scale whilst also supporting emerging approaches and innovation.

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