Local Transport Plan (LTP) Carbon Assessment Part 2: Carbon impacts

Briefing Note

August 2025

Executive Summary – Potential impact of the LTP on carbon emissions

Summary of the key points on the potential impact of the LTP on emissions

Summary – Transport decarbonisation and the role of LTPs

Transport decarbonisation is widely recognised to be a significant challenge that requires action from a range of stakeholders, including national and local government, industry and the public**.** If the action taken does not close the transport sector's identified emissions gap, it will mean that other sectors will need to increase their already challenging rates of decarbonisation to meet carbon reduction commitments and contribute to limiting climate change.

It is useful to understand the extent of the potential influence of LTPs as **the relevance and influence of local transport measures, and therefore LTPs, varies between aspects of decarbonisation**. For instance, national action (by both government and industry) is needed to drive the uptake of zero emissions vehicles (ZEVs) that is anticipated to deliver much of the required emissions reduction. LTPs can play a supporting role through roll-out of charging infrastructure, raising awareness and supporting uptake.

LTPs and local transport measures also have a supporting role in delivering other measures to decarbonise freight and trips passing through the authority area. Decarbonisation measures for these trip types need to be driven by national, regional and sectoral action as decisions about the trips are informed by influences beyond the authority area.

In contrast, **LTPs have greatest potential to directly influence emissions from car and van trips to, from and within their authority area,** particularly urban trips for which more options exist to improve transport and accessibility choices. Rural trips are recognised to be particularly challenging to decarbonise due to their dispersed patterns and lengths.

Significant decarbonisation of local car and van trips will also involve action from individuals, organisations and other sectors (for instance for planning measures). However, **LTPs have the potential to set out the framework and measures to widen travel choices and change travel behaviour**, contributing to decarbonisation, whilst ensuring that measures also deliver other benefits, such as air quality, accessibility and congestion improvements.

This potential scope of influence for LTPs aligns with the fact that the DfT's Transport Decarbonisation Plan identified an important role for local authorities in developing place-based decarbonisation measures. The Climate Change Committee (CCC) also identifies that mode shift (particularly to bus and cycle) will need to achieve significant emission reductions, particularly in the short to medium term (accounting for about 20% of estimated emissions reductions relative to the national baseline in 2030).

Summary – Potential impact of LTP on Net Carbon

At this stage, the **net impact of the LCCA LTP on carbon emissions is uncertain** as measures have not been developed in sufficient detail to enable a full assessment of impacts (which would require detailed understanding of scheme proposals, as well as the existing travel options and conditions).

In particular, the **impact of the LTP on transport user emissions is uncertain**. Whilst the **LTP includes a wide range of possible measures that would reduce emissions** through the Avoid, Shift and Improve approaches, it also **includes some measures to support the Stronger Economy and Fairer Opportunities objectives that could increase emissions** by increasing road travel.

The net impact of the LTP on user emissions will depend on the balance, scale, intensity and timescales of potential measures implemented. Depending on these factors, the net impact on user emissions could range between a small reduction and an increase.

Whilst the impact on user emissions is uncertain, the direction of impact on emissions from other lifecycle stages is clear. **LTP measures will inevitably generate capital and operational emissions** from new infrastructure, fleet and equipment. This will increase the likelihood of the LTP causing a net increase in emissions when considered from a whole lifecycle perspective. Even if user savings are achieved, the capital and operational emissions may offset them.

The next sections provide more detail on the factors affecting the LTP's potential influences on user and wider lifecycle emissions.

Summary – Potential impact of LTP on user emissions

As described above, the LTP's impact on user emissions will depend on the relative increases and decreases caused by different measures.

Measures to support the Stronger Economy and Fairer Opportunities objectives that cause **increased road travel will inevitably increase emissions**. The extent will depend on the level of increase in traffic and the proportion of freight traffic

A wide range of potential LTP **measures would reduce emissions.** For some measures, the LTP's influence is relatively limited. For instance, many **Avoid measures to reduce travel rely heavily on action from other stakeholders** (e.g. planning authorities to improve local service provision). The emissions impact of LTP measures is hard to differentiate and could be considered limited.

Similarly, although an important component, possible LTP **measures to support EV uptake play a relatively limited role** in the overall range of action needed to encourage rapid uptake. Other action, particularly at the national level, is more important.

Possible LTP **mode shift measures** have a more direct impact on emissions. However, if they are **implemented in an incremental, standalone manner** as has been typical in the past**, emissions reductions are likely to be limited** in most area types.

This is because, whilst they will improve capability and opportunity to use sustainable modes, **the measures will not necessarily provide motivation**. As outlined in Section 2, the COM-B model highlights that providing motivation is a key component of achieving mode shift.

Achieving the motivation for significant mode shift would require concerted **parallel action to change the balance of perceived costs and convenience** between sustainable modes and car use (e.g. parking management and/or changes to pay per use car use).

Without these wider measures, the emissions impacts of measures would be limited as car owners are likely to continue to consider car as the cheapest, most convenient option for most trips. This means they will have limited motivation to change habits, shift mode and reduce car use.

A **wide range of integrated measures would be needed** to deliver the scale of change needed. These are most likely to be delivered in the context of a clear vision to reduce road travel and emissions to provide the basis for delivering the integration and pace of change required.

Plans also need to recognise that the **impact of measures varies by area type** with mode shift most likely on urban corridors where dense trip patterns often make public transport options more viable and car travel less convenient. The dispersed nature of travel in rural areas typically makes public transport less attractive.

Summary – Potential impact of LTP on non-user emissions

LTP infrastructure and public transport measures will inevitably generate capital and operational emissions from new infrastructure, fleet and equipment.

The level of emissions generated will be determined by the amount and type of infrastructure, fleet and equipment required to deliver the LTP measures selected. Factors such as the choice of route (and associated implications such as requirements for earthworks) will also be important.

The application of the LTP's sustainability design principle would help to **limit these emissions by applying carbon management** to reduce emissions through approaches such as making best use of existing infrastructure (rather than building new) and using low carbon materials and processes.

Summary – Future steps

This review of the potential impact of the LTP has highlighted that **delivering a significant reduction in user emissions through the LTP would be likely to require a wide range of integrated measures**. Emissions reductions will also need meaningful action through wider economic and planning policies in Lancashire, along with action from central government to accelerate decarbonisation of transport.

Achieving the necessary scale of emissions reduction will likely depend on establishing a clear and shared priority to reduce road transport emissions across local and national government. Such a priority would guide stakeholders in delivering a coordinated set of measures that support more sustainable travel choices, including Avoid and Shift measures which support reducing the overall miles travelled by car. The scale and pace of decarbonisation needed in the car, goods vehicle and public transport fleets - Improve measures - will also require significant action by industry as well as central government.

To make a meaningful contribution to closing the emissions gap, a full range of measures would need to be prioritised and supported by a strong commitment to implementation. Securing broad political, public and stakeholder support would be essential.

Framing these actions within a widely supported vision would help maximise their effectiveness while ensuring that improvements to road travel do not inadvertently increase emissions. Without this shared direction, the potential for positive emissions outcomes may be significantly diminished.

This means that the LTP's estimated **emissions impact will need to be revisited** in more detail as the implementation plans are developed and the balance of measures to be implemented is known.

Initially this high-level review of potential impacts will be updated to account for feedback from the Core Strategy consultation. The further detail provided by the implementation plans will then support estimation of emissions impacts in line with the anticipated DfT Quantified Carbon Guidance. User emissions impacts will be estimated from projected impacts on local travel patterns and emissions factors. Non-user emissions are likely to be estimated through carbon benchmarks applied to the scale and type of proposed infrastructure and fleet.

Irrespective of balance of LTP schemes adopted in the implementation plans, it will be important to **continue to take a whole lifecycle carbon perspective during scheme development** to reduce emissions over the life of the LTP.

Contents of the report

Summary of the key points on the potential impact of the LTP on emissions

Contents of this briefing note

This briefing note provides a review of the factors that would influence the impacts of the LTP on carbon emissions

The remaining sections are structured as follows:

1. **LCCA's carbon context**: A summary of key points on baseline transport emissions in the LCCA area (building on the LTP's first carbon Briefing Note, March 2025).
2. **The impact of transport measures on emissions**: An overview of the routes through which transport measures can influence emissions across their lifecycle. A summary of the Avoid, Shift and Improve categories of measures to reduce emissions - to provide context for reviewing the potential impact of possible LTP measures.
3. **The role of LTPs in transport decarbonisation**: A summary of the scope for local transport measures to contribute to decarbonisation in the context of action by other stakeholders.
4. **Factors influencing the impact of the LCCA LTP on carbon emissions:** An overview of the ways in which the range of possible measures identified in the Core Strategy could influence emissions and the factors that would affect their scale of impact and so the net impact of the LTP on emissions.
5. **Future steps**: A summary of the ways in which the next steps in LTP development will influence the emissions impacts and the need for further emissions assessment.

The note is supported by **five appendices** providing supporting detail and analysis as follows.

A) Carbon emissions in scope for LTP influence

B) Logic-based review of potential LTP measures

C) Carbon Assessment Playbook tests

D) Current travel levels

E) DfT Local Transport Infrastructure Carbon Benchmarking Tool analysis

Section 1: Lancashire's carbon context

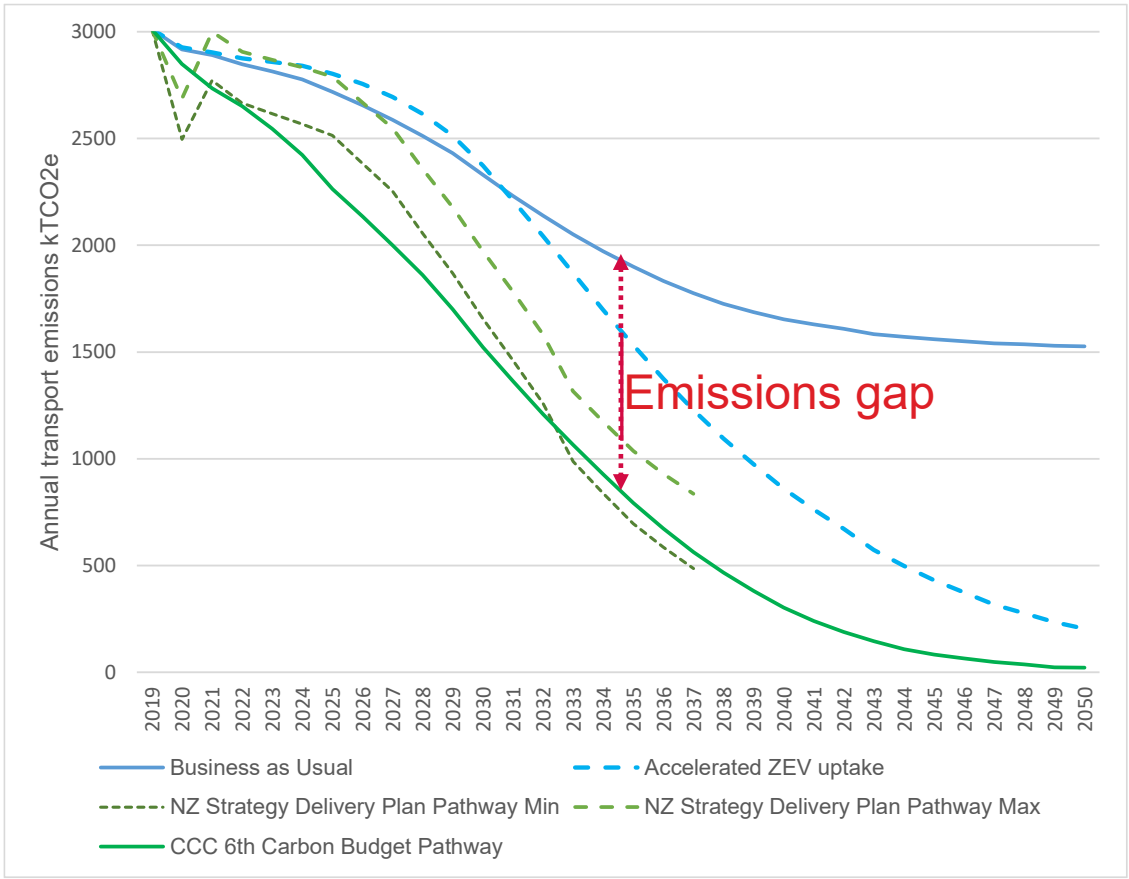
Key points relating to transport carbon emissions in Lancashire

Carbon emissions in the LCCA area

The first Carbon Briefing Note (March 2025) reviewed baseline emissions within the LCCA area, highlighting a number of key points:

- An emissions gap exists between projected LCCA emissions and pathways identified by the government and Climate Change Committee to meet decarbonisation commitments, even with accelerated Zero Emissions Vehicle (ZEV) uptake. Figure 1.1 illustrates the gap at the LCCA level. In 2035 it varies between 0.5 and 1.2 $MtCO_2e$ p.a., implying an emissions reduction of 30% to 60% from the baseline to close the gap.
- High levels of car use are a key driver of emissions in Lancashire.
- Baseline vehicle emissions vary significantly between districts, reflecting the diverse geography and travel patterns within and through Lancashire. For instance, car usage per person is typically higher in rural areas.
- There is substantial freight and through traffic in Lancashire (generating approximately 20% and 15% of LCCA emissions respectively) with levels varying by district.
- Spatial planning will be critical in delivering housing and economic growth ambitions whilst achieving decarbonisation.
- Policy options to decarbonise travel will need to reflect the diverse geography of the county.

Figure 1.1 - LCCA projected transport emissions and decarbonisation pathways



Source: Carbon Assessment Playbook

Section 2: The impact of transport measures on emissions

Summary of the routes through which transport measures can influence carbon emissions and summary of Avoid, Shift and Improve categories of measures to reduce emissions

Drivers of transport user emissions

To provide context for understanding the potential impacts of LTP measures on transport user emissions, it is useful to understand the key drivers of emissions and potential influences on them. This helps to understand the types of measures that are likely to decrease user emissions and those that are likely to increase emissions.

At a high level, the influences on transport user emissions are simple. There are two key drivers: the number of vehicle kilometres (distance) travelled by vehicle type and the average emissions per vehicle kilometre by vehicle type (as shown in Figure 2.1).

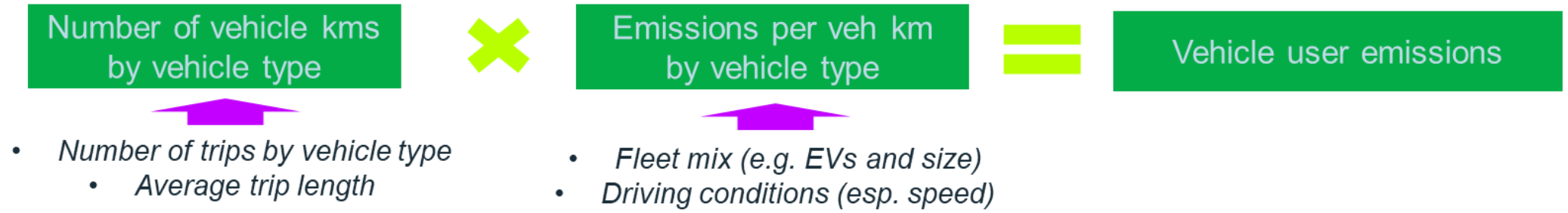
The net impact of LTP measures on transport user emissions therefore depends on the balance between their impacts on vehicle kilometres and on emissions per vehicle kilometre.

Measures to reduce user emissions will need to:

- Reduce vehicle kilometres and/or
- Reduce carbon emissions per vehicle kilometre.

Conversely, transport measures that increase vehicle kilometres travelled will increase emissions unless the increase is balanced by a decrease in emissions per vehicle kilometre and visa versa.

Figure 2.1 – Key drivers of transport user emissions



Source: Summary of standard approach to emissions calculation used by bodies including the Department for Transport and Department for Environment, Food and Rural Affairs

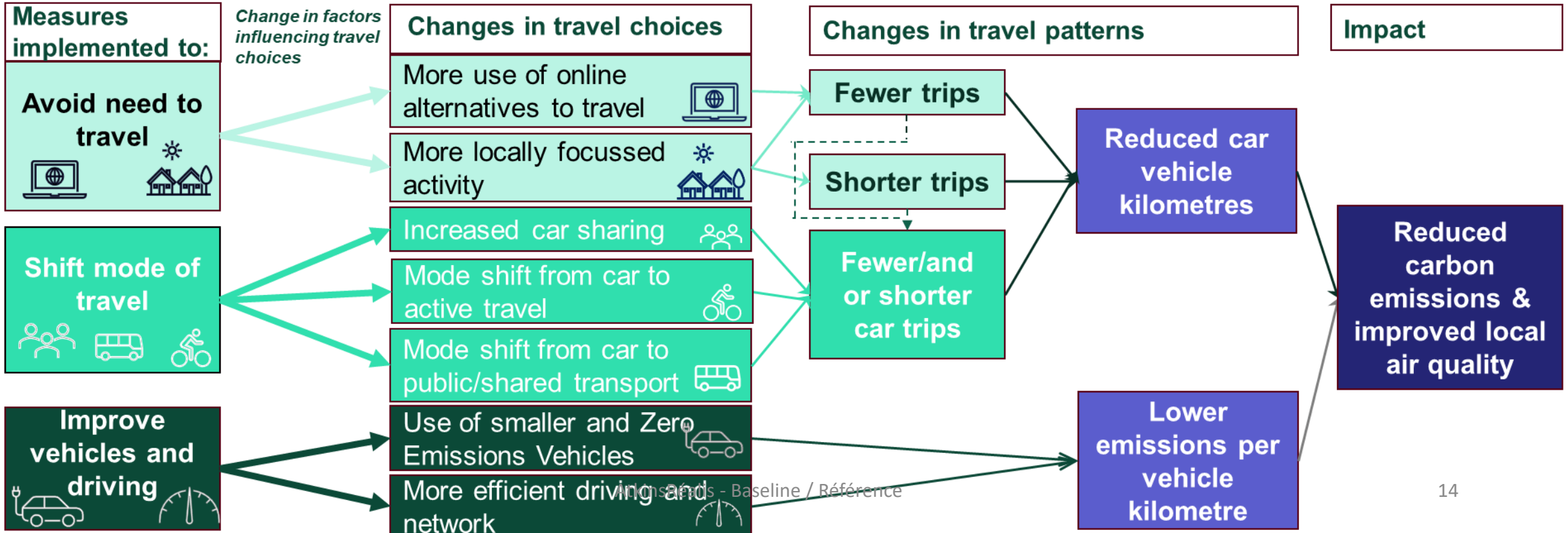
Routes to reducing transport user emissions

Measures to reduce user emissions are often considered in terms of the **Avoid, Shift, Improve framework** shown in Figure 2.2. The second column highlights seven main travel choices. The first five choices reduce emissions by reducing vehicle kilometres by Avoiding the need to travel so much (through supporting shorter or fewer journeys) or Shifting mode away from road vehicles use.

The last two travel choices reduce emissions per vehicle kilometre by Improving the emissions intensity of travel through improving fuel efficiency or changing the vehicle fleet used.

The following sections provide more detail on Avoid, Shift and Improve measures.

Figure 2.2 – Measures to reduce user emissions structured in the Avoid, Shift, Improve framework



Avoid measures

Avoid measures include the transport measures of freight consolidation and travel planning to plan more efficient combinations of journeys. However, most Avoid measures rely largely on actions from outside the transport sector to improve access to activities and services (e.g. healthcare) through means other than improving transport.

The triple access model of accessibility shown in Figure 2.3 highlights that improving accessibility does not need to rely only on transport measures to improve physical mobility. Accessibility can also be increased by improving digital connectivity or spatial proximity.

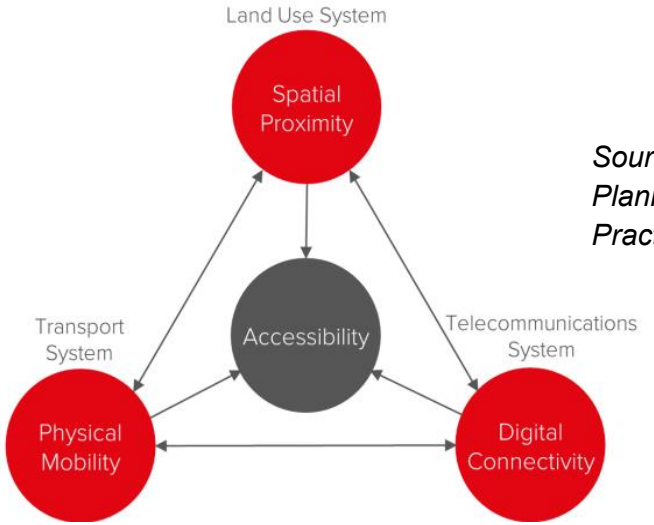
Improved digital connectivity involves ensuring widespread provision of high-quality internet connectivity to homes and organisations and increasing the number of services and activities that can be accessed online, e.g. health appointments.

From a transport perspective, caution is needed as there is the potential for some rebound effects that increase travel and offset some of the gains of Avoid measures, particularly additional deliveries being made.

Improved spatial proximity involves land use planning to increase density and bring people and services/activities closer together so that people can access equivalent services and activities more locally, reducing average trip length.

These principles need to be applied in designing and identifying locations for new development. However, new development only accounts for a relatively small proportion of trips made and therefore it is important that the principles are also retrofitted into existing development, for instance repurposing existing buildings to improve services.

Figure 2.3 - Triple Access Model of Accessibility



Source: Triple Access Planning Handbook for Practitioners

Shift measures

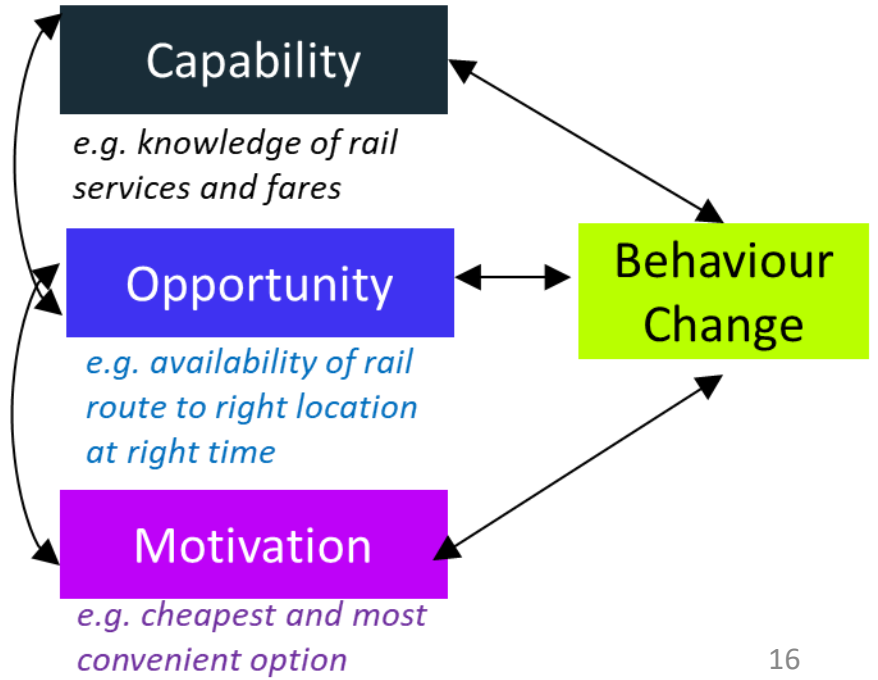
Shift measures encourage a shift in travel from more to less carbon intensive modes. To effectively reduce carbon, the mode shift needs to be achieved on medium and long-distance trips as short trips account for only a limited proportion of emissions, despite representing a large proportion of trips. (For instance, in 2024 trips under 5 miles long accounted for nearly 65% of car trips in the North West but less than 20% of car emissions. Source; DfT: National Travel Survey, 2024).

Achieving mode shift depends on influencing travel choices and behaviour of people and organisations. To achieve the change, providing attractive public transport and active travel alternatives to road travel is a key requirement . However, it is not enough alone, due to the range of influences on travel behaviour.

The COM-B model of behaviour change (see Figure 2.4) helps to understand the influences on travel behaviour, highlighting that to make a change in behaviour, people need all three of:

- **Capability** – i.e. capacity to use the transport system, including having relevant knowledge and skills, e.g. understanding fares systems and how to pay.
- **Opportunity** – external factors making it possible to use the transport system, e.g. a bus service running from the relevant origin to destination at the relevant time for the trip required.
- **Motivation** – people's decision-making process - including emotional responses and analytical decision making, e.g. dislike of certain modes and perceptions of relative cost and convenience of different options.

Figure 2.4 - COM-B Model of Behaviour Change



Source: Michie, S., Van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. Implementation Science, 6(1).

Shift measures

Transport measures often focus on providing Capability and Opportunity to travel by public transport and active travel.

Motivation can be the hardest element to achieve, particularly where car ownership levels are high. Fuel costs (the main cost likely to be considered on a per trip basis) are only about 40% of the typical annual cost of owning a car (see Figure 2.5) and parking costs only apply to a small proportion of trips. Other costs of car use are upfront (purchase/ depreciation), annual (e.g. insurance and tax) or sporadic (e.g. maintenance). This means that, once someone has invested in owning a car, the extra costs of driving per trip are perceived as relatively low, particularly where parking charges are low or absent.

Car trips also rate highly for convenience, particularly as cars and road vehicles are typically prioritised in the allocation of road space and provision of convenient parking space. This improves convenience by reducing time and costs associated with finding and paying for parking and walking to a destination.

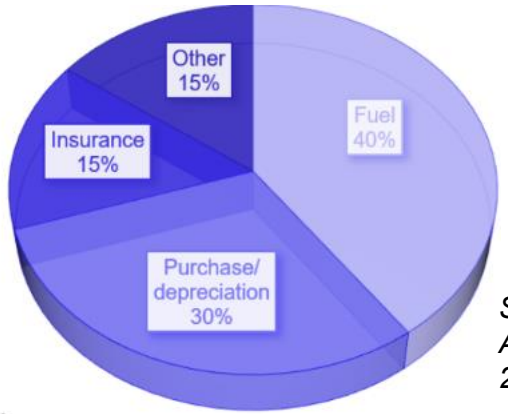
Day to day travel decisions are often made on the basis of either habit or the cost and convenience of different options. This means that once people own a car, in current conditions, it becomes the default choice to drive for nearly all trips, even if other options are available, and it is difficult to provide motivation for mode shift.

In order to achieve a significant mode shift away from car, to reduce emissions, a range of measures are likely to be needed to level the balance between modes by:

- Improving the provision of sustainable alternatives; and
- Balancing up the cost and convenience of travelling by road with other modes.

More explanation on the range of changes required is provided below.

Figure 2.5 - Average car costs per year



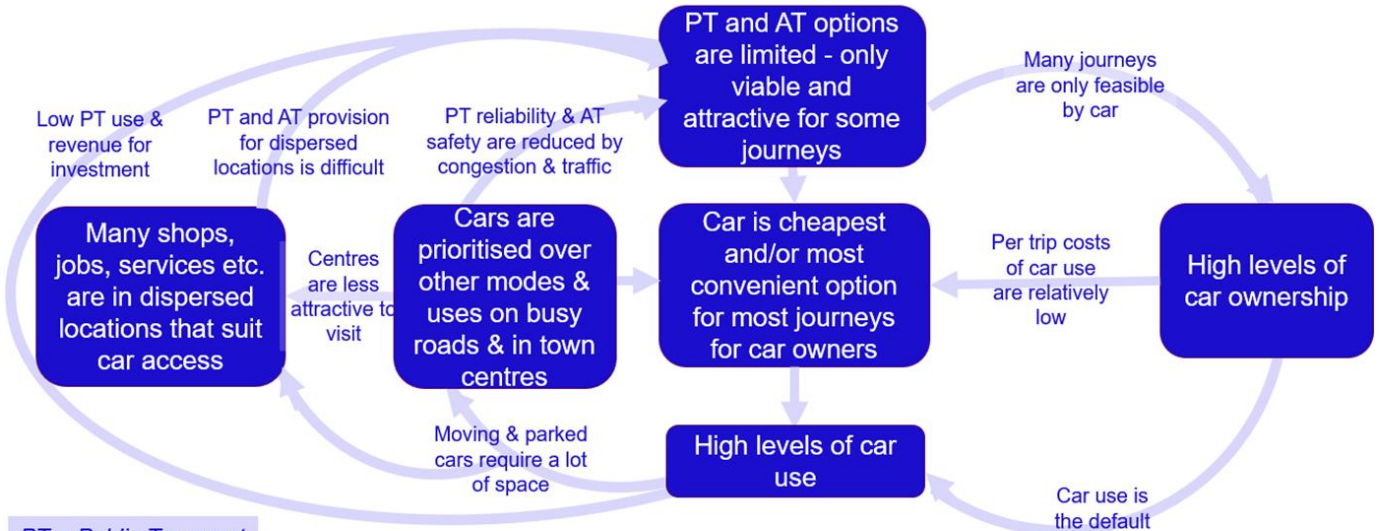
Source: Nimblefins (2024) Average Cost to Run a Car UK 2024

Barriers to reducing car use through mode shift

The web diagram in Figure 2.6 shows the self-reinforcing cycle of transport, planning and social factors that lead to high car usage and limit mode shift because car is viewed as the most convenient and/or cheapest option for most journeys by car owners.

The top blue box shows that a key influence in the cycle is the fact that public transport and active travel are only viable and attractive for a percentage of journeys. The percentage varies and is typically higher for trips within urban areas. However, the diversity of many people's travel patterns means at least some of the trips they want or need to make for personal or work reasons are not feasible by other modes.

Figure 2.6 - Drivers of car use in Lancashire



This feeds into the right-hand box of high car ownership. Ownership levels partly reflect social factors with cars being seen as assets that people want to own and most people being able to afford them. However, levels are also influenced by the previous box, which means that, even when it is financially challenging, people feel that they need to own a car because there are some journeys that they need to make that are not possible by other modes. Once people own a car, the additional costs per trip are relatively low (as outlined in the previous section).

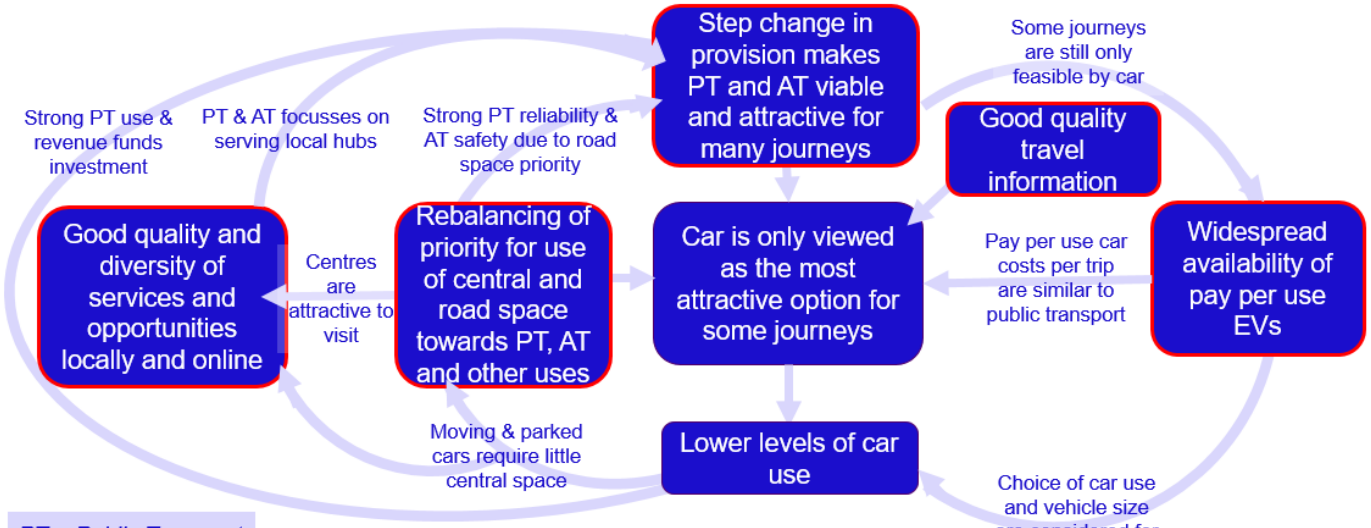
The left-hand side of the web shows how this situation is reinforced by prioritisation of space for cars and parking and location of jobs, shops, services and housing in dispersed, low-density locations. These factors make car use more convenient for many journeys and less convenient for public transport and active travel. This in turn reduces the viability of providing public transport, contributing to the top box identifying the limits to public transport provision.

Range of measures needed to encourage mode shift

The number of interacting factors shown in Figure 2.6 indicates the intervening with measures that influence only one part of the web will not be enough to encourage mode shift and reduce high levels of car use.

The version of the web diagram in Figure 2.7 shows five types of measure (with red outlines) that are needed to change the balance and influence travel choices to encourage mode shift and reduce car use. At the top of the diagram are changes relating to significant improvements in public transport, active travel and travel information to provide good quality, reliable, affordable, attractive services, giving people the opportunity and capability to use other modes for more of their journeys.

Figure 2.7 System level interventions needed to



The right box highlights a change in approach to car usage, moving to pay per use rather than ownership. This change gives people the opportunity to use a car for those journeys for which there is no alternative without owning a car. It also puts the costs of car use on a per trip basis, similar to public transport. Decisions between modes for each trip can then be made on a comparable basis, making it more likely that there is motivation to use an alternative to car on cost and convenience grounds.

The boxes on the left highlight the changes in space prioritisation, planning and parking provision needed to help further balance the convenience and cost of travelling by car and by other modes to help to encourage mode shift. This includes changing the hierarchy of road users, as set out in the Highway Code 2022, prioritising pedestrians, cyclists and other users above motorists and so helping to change the balance of convenience of travelling by car and other modes.

Improve measures

Improve measures to reduce emissions per vehicle kilometer travelled fall in two categories:

- Measures to improve operating efficiency of existing vehicles.
- Changes of fleet to lower emissions and zero emissions vehicles (ZEV) which in turn relies on supporting measures to raise awareness and provide incentives to change, and a supporting system of fuelling/ charging infrastructure.

Emphasis is often placed on ZEV uptake being the main route to transport decarbonisation. However, for multiple reasons, ZEVs and Improve measures cannot close the emissions gap alone. The challenges include the fact that:

- There is a limit to the uptake rate that is possible through purchase of new vehicles. New cars bought each year only equate to approximately 6% of the total car fleet. So even if all new cars bought between 2025 and 2030 were EVs they would only account for about 35% of the fleet in 2030. There are also practical limits on the number of vehicles that it will be possible to build and supply over that time frame.
- Emissions reductions depend on availability of sufficient decarbonised electricity.
- The construction of ZEVs generates embodied emissions
- ZEVs also bring other challenges including equity issues due to the relatively high purchase cost and continued traffic congestion and elements of local air pollution.

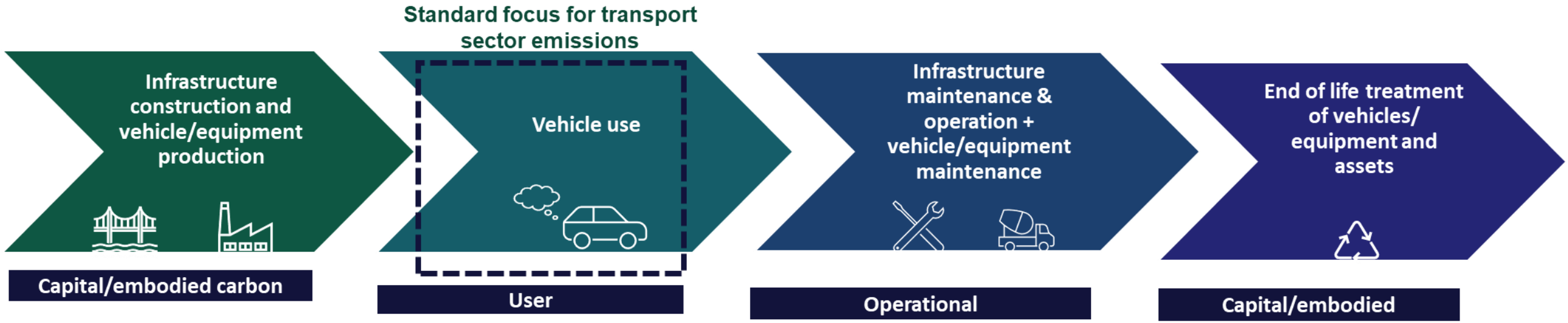
Improve measures are therefore not sufficient alone. In order to reduce emissions rapidly, action would also be needed across the Avoid and Shift dimensions to reduce vehicle kilometres.

Importance of a whole life cycle perspective

Statistics and targets relating to emissions from the transport sector, such as the pathways shown in Figure 1.1, usually relate to transport user emissions, i.e. the emissions generated by the use of vehicles of all types. However, in identifying measures to reduce emissions, it is important to recognise that transport decisions also have wider impacts on emissions through building infrastructure, equipment and vehicles ('capital or embodied carbon'), maintaining them ('operational carbon') and dealing with them at the end of their lives.

Figure 2.8 below shows a simple representation of the transport lifecycle. Emissions generated by stages outside the dotted box will contribute to sectors other than the transport sector (e.g. industry). However, they will all contribute to national emissions totals and will be directly affected by transport decisions. It is therefore important that transport decision making for LTPs and in other contexts takes a whole life cycle perspective when considering emissions.

Figure 2.8 Simple summary of the transport lifecycle



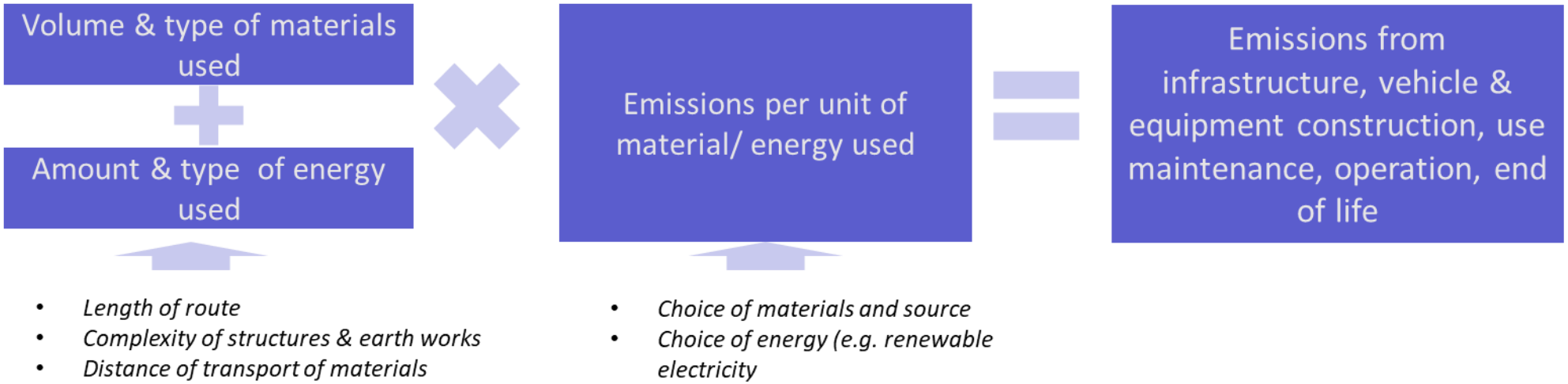
Drivers of whole lifecycle (WLC) emissions

At a high level, the influences on emissions from all lifecycle stages can be summarised in terms of the amount and type of materials and energy used and the emissions intensity of the materials and energy used (as shown in Figure 2.9).

Measures to reduce all non-user WLC emissions (capital/embodied and operational) associated with transport infrastructure, fleet and equipment therefore need to:

- Reduce the amount of materials and energy used and/or
- Change the type of materials/energy used to be less emissions intensive.

Figure 2.9 Key drivers of whole lifecycle emissions



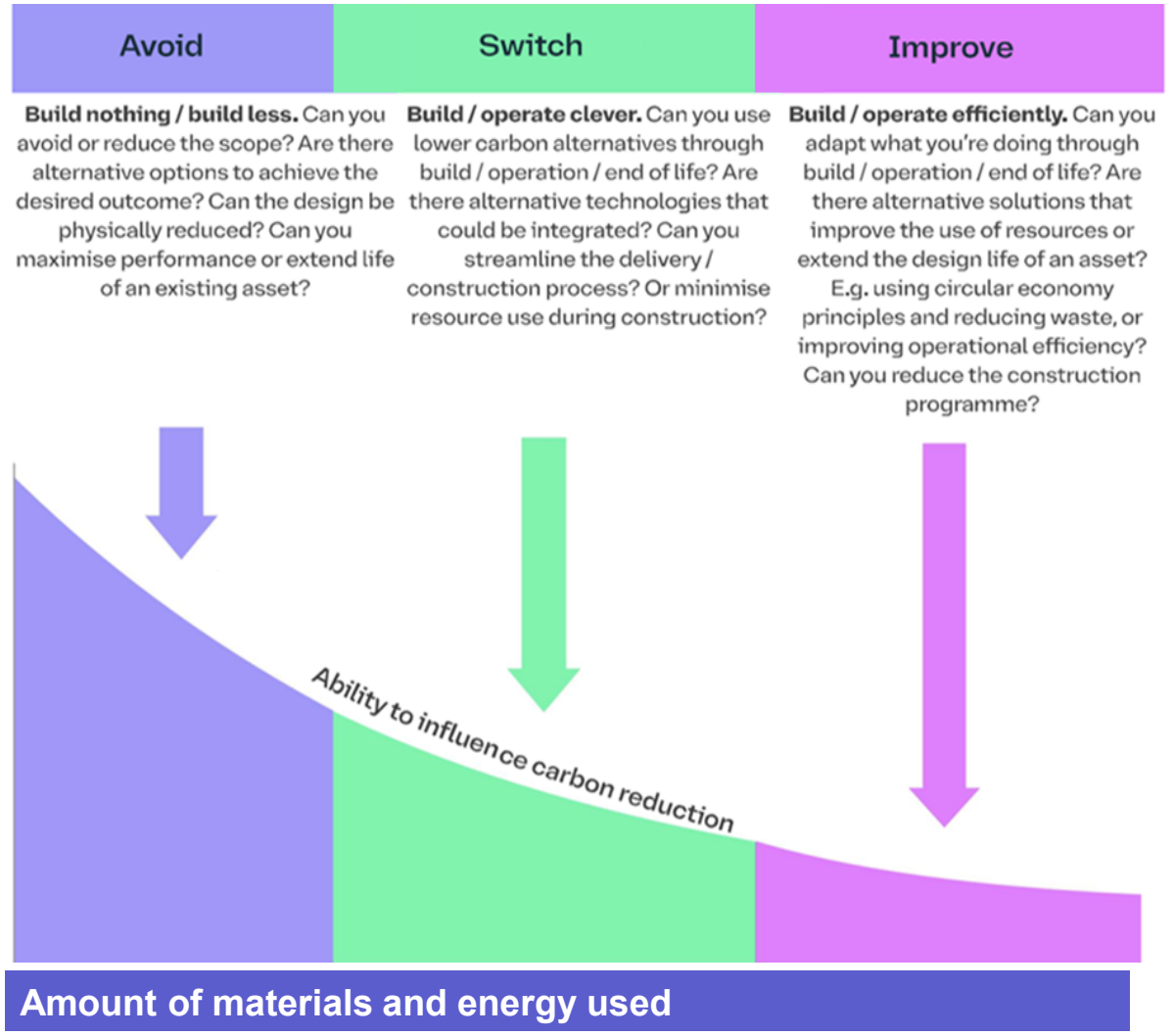
Routes to emissions reduction

Potential measures to reduce wider lifecycle emissions are considered in terms of the Avoid, Switch, Improve hierarchy (from the PAS2080 standard). This hierarchy focuses on reducing emissions associated with infrastructure and assets (in contrast to the similarly named Avoid, Shift, Improve framework introduced at the beginning of the section, which focuses on reducing transport emissions).

The hierarchy is shown in Figure 2.10 and has the following components:

- **Avoid**: involves challenging the need for a new asset – for instance whether a smaller design could work or an alternative approach not needing a new asset, e.g. a bus lane using the existing road rather than a new lane.
- **Switch**: relates to adopting alternative solutions to reduce whole life emissions (e.g. alternative scope, design approach, materials, technologies for operational carbon reduction etc.).
- **Improve**: involves solutions that improve the use of resources and design life of an asset/network, e.g. re-use materials in situ or review materials choice.

Figure 2.10 Avoid, Switch, Improve framework



Section 3: The role of LTPs in transport decarbonisation

An overview of the potential for LTPs to contribute to decarbonisation and the emissions categories over which it will have most influence

The role of LTPs in transport decarbonisation

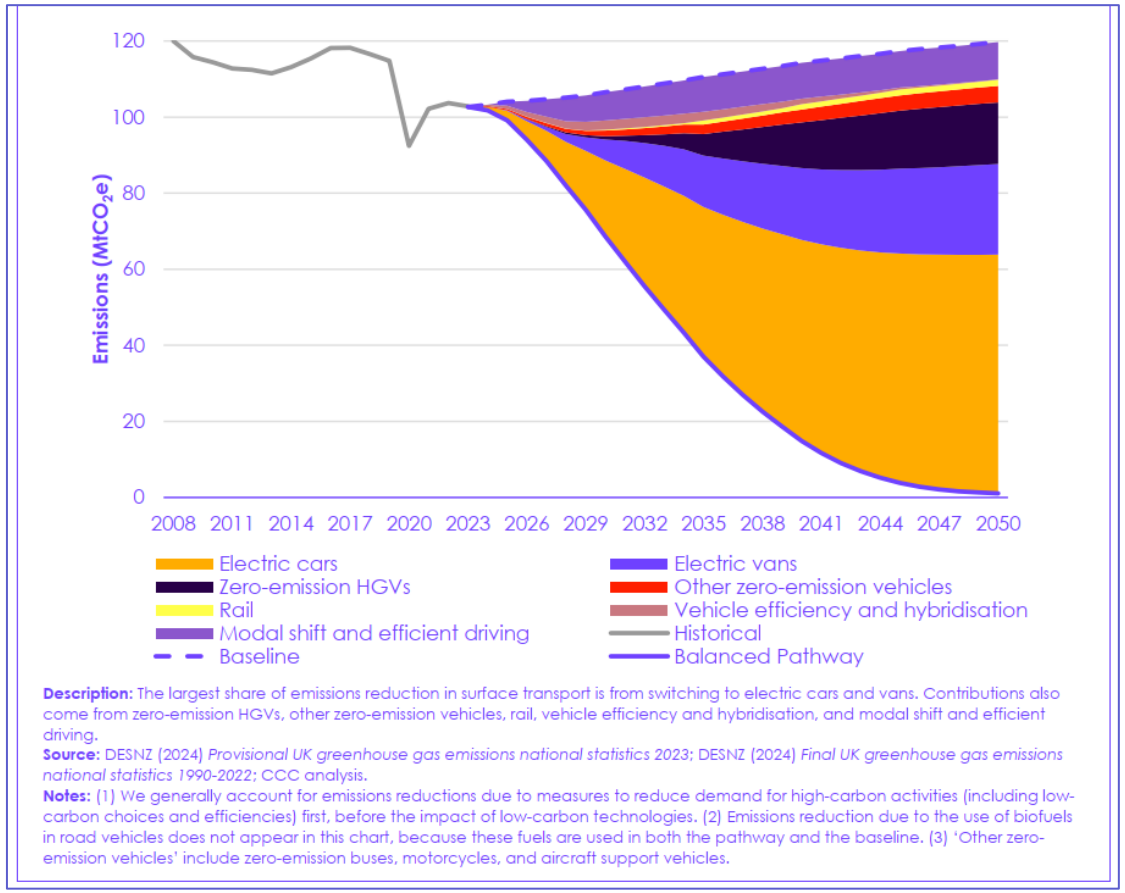
The need for rapid decarbonisation of the transport system is widely recognised to be a significant challenge.

The scale and pace of change needed means that action will be needed from a wide range of stakeholders. For instance, to deliver rapid uptake of EVs, national government action plays an important role in providing the framework for roll-out and uptake. Other key stakeholders and roles include the automotive industry producing sufficient suitable vehicles, individuals and organisations deciding to buy and use the EVs, local authorities and private providers supporting uptake and providing charging points and electricity providers providing sufficient, low carbon electricity.

Many sources expect rapid uptake of EVs and other ZEVs to achieve the majority of the required reduction in emissions, as illustrated in Figure 3.1 (drawn from the recent Climate Change Committee, CCC, report on the Seventh Carbon Budget).

However, as outlined in the previous section, ZEV uptake cannot close the emissions gap alone. An important role is also identified for transport behaviour change, particularly through mode shift to public transport and active travel. The CCC report indicates that mode shift is expected to account for nearly 20% of the reduction in emissions in 2030 (relative to the baseline assuming current EV levels and future traffic levels).

Figure 3.1 Sources of abatement in the CCC Balanced Pathway for surface transport



Source: Climate Change Committee, Seventh Carbon Budget, 2025

The role of LTPs in transport decarbonisation

The mode shift required is likely to be largely achieved through local transport measures, particularly as the CCC indicates that public transport mode shift will largely be to bus (as rail improvements are likely to take too long to deliver).

The DfT's Transport Decarbonisation Plan in 2021 also identified an important role for local transport measures and the implementation of place-based measures to reduce emissions.

The local transport measures delivered through LTPs therefore have a role to play in contributing to meeting decarbonisation commitments. However, there are limits to LTPs' scope of influence, as the largest emissions reductions are reliant on action by the national government, private sector and individuals. The impact of the LTP depends on how much influence local action can have on different types of trips. This, in turn, depends on how much trip choices are shaped by the transport options available within Lancashire, and how feasible it is to identify local measures that can encourage changes in travel behaviour for each trip type.

LTP measures will generally have greatest scope to influence emissions from private car and van trips, particularly trips:

- That start or end in Lancashire or are wholly within the county; and are
- Between or within urban areas - the density of trip patterns in urban corridors mean that there is often more scope to provide attractive, viable alternatives to car use and often makes car use less convenient (due to congestion and demand for parking).

In contrast, LTP measures are unlikely to significantly influence:

- Through car and van trips - as choices about mode, vehicle type and routing for the trips are mainly driven by factors outside Lancashire.
- Freight trips - as they are largely cross-boundary and mainly influenced by commercial decisions made in the private sector and by national action. LTP measures are likely to be limited to influencing local delivery legs.

Based on these considerations, analysis using the NoHAM transport model indicates that the LTP would have scope to influence approximately 70% of total transport emissions in the area (the proportion generated by car and van trips inbound, outbound and within the LCCA area, see Appendix A). The greatest scope for influence would be on the nearly 25% of that proportion of emissions that occur within and between urban areas.

Beyond the focus on reducing user emissions, the LTP also has an important role to play in ensuring a whole lifecycle carbon perspective is taken in developing transport measures. This approach will help to limit the capital and operational carbon emissions from new infrastructure, fleet and equipment and is explored further at the end of section 4.

Section 4: Factors influencing the impact of the LCCA LTP on emissions

Overview of the influences affecting the potential emission impact of the LTP

Introduction

The Department for Transport (DfT) highlights the importance of understanding the carbon impact of proposed transport strategies and schemes and has been developing guidance on relevant approaches over recent years. The resulting Quantified Carbon Guidance (QCG) is due to be published in August 2025. It will provide guidance on using carbon analysis to support the development of transport strategies and schemes and builds on the Quantified Carbon Reduction (QCR) guidance previously published in draft form.

The QCG is expected to reflect some changes in emphasis from the draft QCR guidance, with greater focus on considering the whole lifecycle carbon impacts of strategies and schemes (rather than focusing on user carbon) and recognition that not all schemes in a programme or strategy will reduce carbon.

The main emphasis of the guidance remains the importance of transport strategy and scheme development being informed by a good evidence base and understanding of:

- Baseline transport carbon emissions in an area; and
- The carbon impact of proposed measures and schemes.

The first LCCA LTP Carbon Briefing Note (March 2025) provided a summary of the baseline carbon evidence base for the LCCA area. This section reviews the potential carbon impact of the LTP measures.

It is not possible to undertake a detailed carbon assessment at this stage as the LTP measures have not been developed in sufficient detail to support a quantitative assessment (which would require an understanding of the extent, intensity, locations and contexts of implementation). Further assessment will take place later in the LTP delivery planning process.

Instead, this section sets out the key issues to consider in assessing the carbon impacts of the LTP.

It provides an overview of:

- The ways in which different types of measure could influence emissions, building on the routes through which emissions could be influenced (as outlined in Section 2).
- The range of factors that are likely to influence the impact of different types of measure and therefore the net impact of the LTP on carbon emissions.

Emissions are considered from a whole lifecycle perspective.

Introduction

This section provides:

- A summary of a logic-based review of the routes through which the range of possible measures mentioned in the LTP Core Strategy could influence carbon emissions.
- An overview of the key influences on the emissions impacts of different types of measure and their implications for the overall impact of the LTP. This overview draws on a number of high-level benchmarks and metrics that are presented in more detail in the Appendices:
  - Evidence on the balance of current travel volumes and implications for impact of mode shift.
  - The results of a series of high-level indicative tests run with the Sub National Transport Bodies' Carbon Assessment Playbook (CAP).
  - Evidence on the relative scale of embodied emissions for example infrastructure types using data from the DfT's Local Transport Infrastructure Carbon Benchmarking Tool (LTICBT).

Potential routes for LTP measures to influence emissions

The LTP Core Strategy mentions over 150 example types of measure that could be introduced to support delivery of the identified policies across the four workstreams. These can be grouped into 34 broad categories (as listed below) to help consider likely routes through which the measures could potentially impact on carbon emissions. The categories of measure that would contribute to user emissions reduction are grouped according to the main route for reduction (Avoid, Shift or Improve). The categories that would not directly reduce user emissions are grouped according to their type (i.e. Road improvement, Safety, Design and broader Context measures). Several of the types and categories of measures could contribute to supporting more than one Core Strategy (CS) policy as shown in the final column below.

Table 4.1: Categories of LTP measures

Broad category		Measure category	CS Policies
Avoid	1	Support digital connectivity improvements	CL6
Avoid	2	Support improved online opportunities	CL6
Avoid	3	Improve local services and amenities (in existing and new developments)	SV4;FN7
Avoid	4	Introduce freight consolidation and micro consolidation	FN7
Avoid/Shift	5	Roll out travel planning - e.g. event, business, school	TC4;FN3
Shift	6	Support sustainable transport modes in new developments	CL1;SV4
Shift	7	Improve bus/tram services - coverage and/or quality, frequency, reliability, safety/security and accessibility	CL2;CL3;CL5;TC1; TC7;SV1;SV2;FN3
Shift	8	Improve rail services - coverage and/or quality, frequency, reliability, safety/security and accessibility	CL1;CL2;CL3;CL5; TC2;TC7;SV2
Shift	9	Improve rail freight facilities	CL2
Shift	10	Improve/extend active travel provision - including routes, wayfinding and facilities	CL1;CL4;TC3
Shift	11	Improve access to bikes (e.g. shared schemes)	TC3;TC7
Shift	12	Improve integration between modes e.g. mobility hubs	CL1;CL3;TC5;TC7; FN6
Shift	13	Improve fare levels and ease of ticket purchase/ provide incentives	TC2;TC8;SV2
Shift	14	Improve information on transport options and fares	TC1;TC4;TC8;FN1
Shift	15	Improve public realm at destinations - accessibility, safety and attractiveness	SV1;SV3
Shift	16	Apply road use hierarchy and appropriate speed limits	SV1;FN6
Shift	17	Improve provision for coaches at key destinations	TC7
Shift	18	Improve provision of accessible/reliable taxi service	TC6
Shift	19	Support community and demand responsive transport	TC5;SV2
Shift	20	Support car sharing/pooling	TC5;FN2
Shift	21	Review parking management	FN6
Improve	22	Roll out EV buses and taxis	TC6
Improve	23	Support EV for private use, company fleets and last mile freight delivery	FN2;FN7
Improve	24	Support for EV charging infrastructure	FN2
Improve	25	Support rail electrification	CL5
Improve	26	Implement targeted road measures to reduce congestion	CL4;FN3
Road	27	Implement measures to increase road capacity	CL1;CL4
Safety	28	Provide safety information provision and raise awareness	TC4
Safety	29	Implement design changes/upgrades to improve safety/security	SV1
Design	30	Implement resilient and nature based design measures	FN4
Design	31	Implement low carbon design measures	FN4
Design	32	Implement whole life asset management	FN5
Context	33	Undertake consultation, review and research activities to support other measures and future measures	TC1;SV1;SV3;FN2; FN1;FN7
Context	34	Contribute to wider strategy development with implications for transport	CL1

The potential for each category of measure to either increase or decrease carbon emissions has been reviewed. A high level, logic-based approach was used for the review, identifying which of the routes to emissions reduction or increase described in Section 2 each measure is likely to contribute to and the key influences on the potential overall scale of impact. Examples of the review are provided on the next page, and more detail is provided in Appendix B.

Potential routes for LTP measures to influence emissions

The table below summarises the review of potential routes through which the **Avoid** categories of potential measures indicated in the LTP could influence user and embodied emissions. It also shows the key influences on their potential scale of impact. The shading in the tables distinguishes between clear routes to increasing or decreasing emissions (darker colours) and less certain potential routes (lighter colours). The shades do not indicate relative scale of impact between different measures.

Equivalent reviews were undertaken for the other 29 categories of measure and are summarised in Appendix B.

Table 4.2: Review of potential emissions

			User emissions							Embodied
			Key influences	Avoid Trip numbers & length		Shift Shift from road to other modes		Improve ZEV uptake & improved traffic conditions		
Broad category	Measure category	CS Policies		Travel by individuals	Freight/coach	Car veh km	Freight veh km	ZEV uptake	Improved traffic conditions	
Avoid	Support digital connectivity improvements	CL6	Scale of coverage of improvements - population, number and length of trips affected	Fewer trips	N/A	N/A	N/A	N/A	*Reduced trip numbers may alleviate congestion*	*Possible new digital hubs*
Avoid	Support improved online opportunities	CL6	Range of opportunities and applicability - number and length of trips affected	Fewer trips	More deliveries	N/A	N/A	N/A	*Reduced trip numbers may alleviate congestion*	N/A
Avoid	Improve local services and amenities (in existing and new developments)	SV4;FN7	Number of centres affected, range of services provided (no of trips affected) and alternative location (length of trips avoided)	Shorter trips and fewer (combined trips)	*Possibly more deliveries*	Shorter trips encourage mode shift	N/A	N/A	*Reduced trip numbers/trip length may alleviate congestion*	*Possible new buildings or amendments to provide new services/opportunities*
Avoid	Introduce freight consolidation and micro consolidation	FN7	Number of centres and number and length of trips consolidated	N/A	Shorter and fewer trips	N/A	*Last mile trips more likely to use cargo bikes*	*Last mile trips more likely to use ZEV*	*Reduced freight deliveries may alleviate congestion*	Consolidation centre buildings
Avoid/ Shift	Roll out travel planning - e.g. event, business, school plans	TC4;FN3	Number of people, businesses and trips affected by the plans and scale of impact (uptake of sustainable modes and/or change in trip numbers and lengths) and longevity of impacts (support from ongoing measures)	Shorter and fewer (combined trips)	N/A	Mode shift	N/A	N/A	*Reduced trip numbers may alleviate congestion*	N/A

Key: Impact on emissions

Clear increase
Potential increase
Potential decrease
Clear decrease

Range of impacts of LTP measures on emissions

Overview

The review of emissions impacts of the 34 categories of potential measures mentioned in the LTP highlights that at this stage there is uncertainty over the net impact of LTP on emissions.

The potential measures identified will unavoidably generate capital and operating emissions through the introduction of new infrastructure, fleet and equipment. This will be discussed at the end of this section.

However, the overall impact on user emissions is uncertain and will depend on the scale, balance, timescale and intensity of implementation of the range of proposed measures across the county.

Whilst many of the possible measures mentioned in the Core Strategy have the potential to reduce user emissions, others have the potential to increase emissions.

Measures that could increase user emissions

A number of the possible LTP measures to support the overarching Stronger Economy and Fairer Opportunities objectives would be likely to increase user emissions, particularly by increasing vehicle kilometres travelled.

In particular, in the absence of mitigation measures, emissions are likely to be increased by possible measures to:

- Support strategic growth sites – even where there is a high sustainable mode share, growth will generate car and freight trips.
- Improving connections with neighbouring regions – the improved connections are likely to lead to longer trips, replacing more local trips, and may potentially encourage new trips.
- Improve reliability of strategic and major roads – previous evidence indicates that schemes to improve road capacity will typically induce additional traffic by making driving more attractive.

Range of impacts of LTP measures on emissions

Measures that could reduce user emissions

The range of possible measures mentioned in the LTP that could reduce user emissions include measures from across each of the Avoid, Shift and Improve dimensions, such as:

- **Avoid** measures to reduce the need to travel so far and/or so often include supporting high-speed broadband and improving access to local amenities and services.
- **Shift** measures include a range of possible measures to improve public transport and active travel provision.
- **Improve** measures include possible support for EV charging and zero emissions buses.

Measures with limited impact on user emissions

Other possible measures mentioned in the LTP as playing an important role in supporting other objectives will have relatively limited direct impact on user emissions. For instance, safety schemes targeted at reducing collision rates would be likely to have only a minor indirect impact on emissions through potentially supporting mode shift to active travel as a result of improved perception of safety.

Influences on emissions impacts of different measure types

The following sections provide more explanation on the potential influences on the user emissions impact of:

- Measures that could increase emissions; and
- Measures that could reduce emissions - looking separately at Avoid, Shift and Improve measures.

The range of potential influences outlined indicate the extent to which the net user emissions impact of the LTP could vary with different approaches to implementation of different potential measures.

Influences on measures that could increase emissions

The measures that could increase user emissions would do so largely by increasing road vehicle kilometres travelled as a result of:

- Improved road conditions and routing options;
- Additional trips generated by growth sites; and
- Increased emphasis on longer-distance connections (for instance inter-regional) rather than local connections.

The emissions impact would be increased if the measures also lead to significant additional freight trips and increases in freight trip length as HGV emissions are many times higher than car emissions per kilometre. The emissions differential will increase into the future as uptake of ZEVs in the freight sector is projected to be slower than uptake in the light vehicle fleet.

The emissions impacts of these measures could potentially be reduced if other measures are implemented in parallel to ensure that there are attractive options to make equivalent journeys by sustainable modes.

However, as outlined further in the next section, measures to improve sustainable modes are unlikely to achieve significant mode shift from car in conditions where car ownership is high and car parking and use is convenient.

In the case of measures introducing new road capacity, the balance between the convenience of car use and other modes could be levelled to some degree by allocating some of the additional road space to provide priority to other modes (such as bus lanes) or by setting lower speed limits to make active travel more attractive.

Influences on measures that could reduce emissions

Many of the possible measures in the LTP have the potential to support reductions in transport user emissions, alongside supporting other goals. However, it is widely recognised that achieving significant reductions in carbon emissions through local transport measures is challenging.

Large-scale emissions reductions are most likely to be achieved where measures are selected and planned in the context of a clear vision focussing on the need to significantly reduce the level and emissions intensity of car and freight travel.

Plans to achieve the vision would provide a framework for integrated and intensive application of measures to achieve a step change in travel choices, through a wide range of Avoid, Shift and Improve measures. The range and pace of action required would involve involvement from diverse stakeholders and the measures would need to be targeted to reflect varying place types.

However, typically measures have previously been implemented in a more individual, less integrated and more incremental way across the country, rather than in the context of a vision. The available evidence indicates that emissions impacts of measures implemented in this way are usually limited.

A useful recent source of evidence on impacts is the Carbon Assessment Playbook developed by the Sub National Transport Bodies. The Playbook drew on an extensive literature review (supplemented by modelling using National Travel Survey data) to develop an evidence base on the scale of impact of typical examples of different types of decarbonisation measure, considered in the six broad categories of:

- Active travel,
- Public transport,
- Parking and traffic management,
- Integrated planning policy,
- Behavioural change, and
- Fleet upgrade.

Influences on measures that could reduce emissions

Evidence from the Playbook indicates the potential scale of emissions reduction that the types of measures considered in the Core Strategy might achieve if implemented through the conventional, incremental approaches used previously.

A range of simple, indicative Playbook tests were run for the LCCA area. The tests were not intended to represent the LTP Core Strategy. Instead, they illustrate the broad scale of possible impact from the types of decarbonisation measures that are being considered as part of the LTP, drawing on the evidence of the impacts of typical schemes of each type in the Playbook.

The tests represent highly generalised scenarios, assuming that all identified measures types in each of the six categories listed on the previous page (such as public transport) are applied across between 10% and 30% of the LCCA area (covering all area types proportionally). The levels of application are simple illustrative assumptions to reflect different levels of ambition, with the upper end reflecting an ambitious level of roll out across the full LCCA area. Further detail on the tests is given in Appendix C.

The results indicate that, even assuming a relatively high level of implementation, the combination of measures across all six categories would reduce transport user emissions in the LCCA area by only a few percent by 2035, only a small proportion of the 30% to 60% reduction in emissions needed to close the emissions gap (shown in Figure 1.1).

The measure categories with the estimated greatest potential impact in the tests were acceleration of EV uptake and behaviour change programmes (such as travel planning for individuals and businesses), followed by extensive public transport improvements.

The category with the smallest estimated impact was active travel improvements, reflecting the short average trip length affected and the challenge of achieving mode shift from car to other modes.

The difficulty of achieving mode shift from car in situations of high car ownership is one of the main factors behind the limited emissions impact of incremental implementation of decarbonisation measures. The next section provides further information on the factors influencing the emissions impact of possible mode shift measures and the implications of different approaches to implementation. The following section then provides further information on the factors influencing the scale of emissions impact of possible Avoid and Improve LTP measures.

Influences on the emissions impact of Shift measures

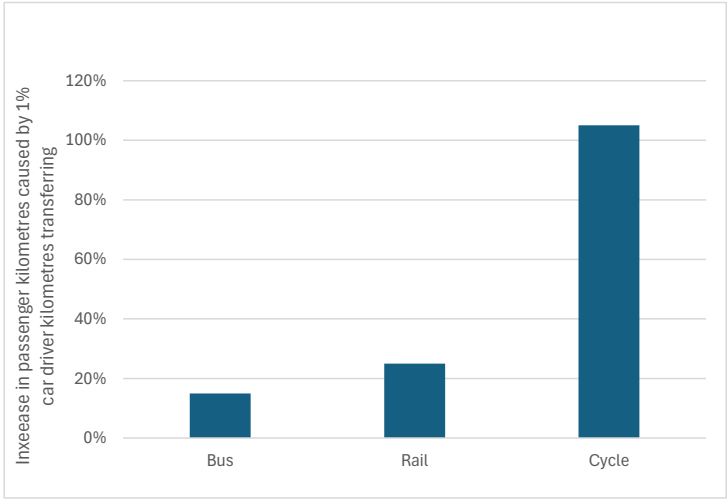
One practical dimension of the challenge of achieving significant mode shift from car is the relative scale of travel by different modes. The number of kilometres travelled by car (drivers and passengers) is approximately 15 times the number of bus passenger kilometres, approximately 25 times the number of rail passenger kilometres and over 100 times the number of cycle kilometres (see Appendix D for more detail on the estimates).

This existing balance of levels of travel between modes means that even a small reduction in car traffic through mode shift would result in a significant percentage increase in public transport patronage or cycling levels.

Figure 4.1 illustrates this by showing the percentage increase in existing travel by each mode that would be caused if 1% of current kilometres travelled by car switched to each of the other modes (i.e. 1% each to bus, rail and cycling). The graph highlights that even though a 1% reduction in car kilometres would only make a minor contribution to closing the emissions gap in Lancashire it would have a significant impact on travel on other modes.

The Lancashire and Blackburn with Darwen BSIP indicates a target increase in patronage of 10% by 2030 (relative to 2018/19). This is a relatively ambitious patronage target but, even if the full

Figure 4.1: Percentage increase in travel by other modes caused by a switch of 1% of car kilometres



increase was achieved directly through mode switch from car, it would result in a reduction in car vehicle kilometres of less than 1%.

In practice, the percentage reduction in vehicle kilometres would be lower as some of the BSIP patronage increase would result from people also switching from walking, cycling or not travelling.

Achieving material reductions in car vehicle kilometres through mode switch to active travel would be more challenging as existing levels are lower and trips are shorter.

Influences on the emissions impact of Shift measures

The current levels of travel by mode outlined on the previous page reflect high levels of car ownership which in turn represents the main challenge to achieving mode shift. As outlined in Section 2, most costs of car ownership are up-front or occasional. This means that the additional per trip costs of car use are relatively low, particularly where parking is convenient and low cost and road space allocation favours private vehicles. This means that, for car owners, a car is likely to be perceived as the most convenient and low-cost option for most trips.

Many of the possible LTP measures would improve the quality and range of public transport and active travel options. They will bring a number of benefits for Lancashire, including increased accessibility. However, in most areas, they are unlikely to deliver significant mode shift from car if delivered in an incremental way, as outlined above.

Whilst the measures will provide improved capability and opportunity to shift modes, for many drivers the changes would not be sufficient to provide the motivation (as identified in the COM-B model in Section 2). Potential responses would vary between area types. Motivation for mode shift is more likely on urban corridors where density of trip patterns makes attractive public transport options more viable and limited space makes car trips slower (due to congestion) and parking more difficult. In rural areas more dispersed trips and greater relative convenience of car travel makes mode shift more difficult to achieve.

The difference between area types highlights the importance of the wider context in achieving mode shift. The web diagram in Figure 2.7 showed that integrated action across five broad types of measure would be needed in most area types to change the balance of perceived cost and convenience between modes and encourage mode shift.

In addition to improvements to public and active travel options and information, Figure 2.7 shows that planning changes would be needed. Changes would involve relocating services and activities to be more readily accessed by public transport and active travel and reallocating space in prime central areas away from parking and private vehicle use to other purposes and modes.

Changes in approach to car use would also be needed. In particular, a change to pay per use would make a valuable contribution. This approach would allow people to use cars for those trips that are not possible by other modes without needing to own a car. The full costs of car travel per trip would also be considered, comparable with other modes (in contrast to car owners perceiving low per trip costs).

These wider changes in the context for travel choices are, in most areas, essential to achieving significant mode shift from car.

Influences on the impact of Avoid and Improve measures

Avoid measures

The patterns described above relating to convenience of car use for owners also influence the impact of Avoid measures. They limit the ability to reduce vehicle kilometres by reducing trip length as the extra cost and time of longer trips to reach a service or shop may not be perceived as significant when the journey is made by car. This reduces the appeal of local options.

The emissions impact of possible Avoid LTP measures would also be influenced by the pace at which planning changes allow the improvement of local services and activities and the fact that new development accounts for a relatively small proportion of trips. Even if new developments include exemplar travel patterns and mode share, the net impact on trips across Lancashire will be limited. It is therefore important that the principles are also retrofitted into existing development, for instance repurposing existing buildings to improve services

The scale of impact of Avoid measures also depends on action by other stakeholders. Possible LTP measures would play a role in reducing travel through increases in online and local activity, however significant change will also require measures to be delivered by other parties. For example, collaboration with internet providers would be needed to improve high-speed broadband coverage, and with businesses and other organisations to increase levels of online activity. The range of stakeholders involved adds risk and uncertainty to delivery.

Improve measures

Similarly, the impact of possible Improve measures included in the LTP will depend on action by other stakeholders including individuals, organisations and other sectors.

For instance, roll-out of charging points is a necessary component of encouraging EV uptake but charging point availability is only one of many factors affecting the choice to buy or use an EV. Other possible LTP measures could help to raise EV awareness and provide opportunities for uptake (such as through car clubs and supporting corporate fleet uptake). However, several other influences beyond the scope of LTP (such as travel patterns, perceptions of vehicle types and affordability and vehicle production and availability) will also affect the decisions by individuals or businesses over whether to use EVs.

It is also important to note that the rate of EV uptake assumed as a reference case (in the Playbook and by the DfT) is relatively rapid. Proposed LTP measures such as charging points may be needed to support the reference case rate of change rather than achieving a further acceleration and reduction in emissions.

Influences on the potential impact of LTP on WLC emissions

Looking beyond user emissions to whole lifecycle (WLC) emissions, local action will be important in limiting the capital and operating emissions of transport interventions. This will involve ensuring that careful carbon management is undertaken to make best use of existing infrastructure and limit the capital and operational carbon of any new infrastructure, equipment or fleet.

This approach is important because any LTP measures involving new and extended infrastructure, vehicle fleets and equipment will inevitably generate wider lifecycle emissions: capital emissions through the production of materials and energy used in construction and production, and operational emissions through ongoing maintenance and operation.

The level of capital and operational emissions generated will depend on a range of factors including:

- The routes and designs chosen, including the extent of use of existing infrastructure and assets (rather than building new).
- The approach to design and choice of materials for construction/ production. Locally sourced materials and low carbon and nature-based design reduce emissions.
- The choice of construction machinery and energy sources.

The whole lifecycle impact of measures on emissions will reflect the combined effect of user, capital and operating emissions impacts.

For proposals that are intended to reduce road travel or emissions per kilometre, the net lifecycle emissions impact will depend on the balance between capital emissions of construction and production, operational emissions and the ongoing user savings. The balance can be considered in terms of a 'payback period' - the time taken for the user savings achieved year on year to offset the upfront capital carbon and operational carbon.

For proposals that increase road travel, there will be a whole lifecycle increase in carbon emissions generated through both the user and non-user stages.

The DfT's Local Transport Infrastructure Carbon Benchmarking Tool (LTICBT) provides high-level estimates of capital carbon for a range of types of transport measures. Comparing the figures against typical user emissions highlights a series of useful messages to be considered in reviewing the potential emissions impact of the LTP, summarised in the next section.

Influences on the potential impact of LTP on WLC emissions

The key messages drawn from assessment of example LTICBT capital carbon estimates (see Appendix E) include the following:

- Capital carbon will be a significant component of the net emissions impact of the LTP.
- Significant and sustained mode shift from car will be needed to 'pay back' the capital carbon of bus and cycle lanes.
    - As the car fleet becomes electrified it will become increasingly challenging for the upfront capital carbon in infrastructure to be 'paid back' through user savings achieved through mode shift unless there are substantial reductions in the carbon intensity of construction.
- A 'low infrastructure' approach can bring more rapid pay-back times.
    - For instance, the LTICBT estimates indicate that, if cycle priority can be achieved through light segregation, a mode shift of 100 trips from car per day (in each direction along the full lane length) could pay back the capital carbon of segregation within about 2 years. In contrast, the same level of mode shift would take 40 years to pay back the capital emissions in a fully-kerbed cycle track or over 60 years for a stepped cycle track. The fully segregated option would be more likely to meet the LTN1/20 standards and would bring safety benefits. It is also likely to bring encourage a higher level of mode shift than the lightly segregated option. However, from a carbon perspective the 'high-infrastructure' approach would considerably increase payback periods.
- User emissions are the most significant component of the lifecycle emissions of a road where road construction is relatively simple. In the examples given in the LTICBT the capital emissions are equivalent to about 5 years of car use emissions or less (using DfT TAG assumptions on uptake of EVs in the car fleet) .The number of years would be lower for busier roads or if emissions associated with freight vehicles were also accounted for).
- However, when there is a need for complex structures such as bridges, capital carbon increases significantly as a proportion of the total lifecycle emissions. The capital carbon per kilometre for the two example 15 m wide bridges provided in the LTICBT are equivalent to more than 60 years of car traffic emissions on each kilometre (assuming uncongested traffic conditions).

When detailed LTP measures are proposed for implementation, it will be important to understand the impacts from a whole lifecycle perspective. This will help to ensure that measures proposed to reduce user savings are not undermined by significant capital and operational carbon implications.

Section 5: Future steps

Summary of the ways in which the next steps in LTP development will influence the emissions impacts and the need for further emissions assessment

Summary – Future steps

This review of the potential impact of the LTP has highlighted that **delivering a significant reduction in user emissions through the LTP would be likely to require a wide range of integrated measures**. Emissions reductions will also need meaningful action through wider economic and planning policies in Lancashire, along with action from central government to accelerate decarbonisation of transport.

Achieving the necessary scale of emissions reduction will likely depend on establishing a clear and shared priority to reduce road transport emissions across local and national government. Such a priority would guide stakeholders in delivering a coordinated set of measures that support more sustainable travel choices, including Avoid and Shift measures which support reducing the overall miles travelled by car. The scale and pace of decarbonisation needed in the car, goods vehicle and public transport fleets - Improve measures - will also require significant action by industry as well as central government.

To make a meaningful contribution to closing the emissions gap, a full range of measures would need to be prioritised and supported by a strong commitment to implementation. Securing broad political, public and stakeholder support through engagement and clear communication would be essential.

Framing these actions within a widely supported vision would help maximise their effectiveness while ensuring that improvements to road travel do not inadvertently increase emissions. Without this shared direction, the potential for positive emissions outcomes may be significantly diminished.

This means that the LTP's estimated **emissions impact will need to be revisited** in more detail as the implementation plans are developed and the balance of measures to be implemented is known.

Initially this high-level review of potential impacts will be updated to account for feedback from the Core Strategy consultation. The further detail provided by the implementation plans will then support estimation of emissions impacts in line with the anticipated DfT Quantified Carbon Guidance. User emissions impacts will be estimated from projected impacts on local travel patterns and emissions factors. Non-user emissions are likely to be estimated through carbon benchmarks applied to the scale and type of proposed infrastructure and fleet.

Irrespective of balance of LTP measures adopted in the implementation plans, it will be important to **continue to take a whole lifecycle carbon perspective during scheme development** to reduce emissions over the life of the LTP.

Appendices

Supporting information

Appendix A

Carbon emissions in scope for LTP influence

Carbon emissions in scope for LTP influence

There will be greatest scope for LTP measures to influence emissions from car and van trips for private purposes. Freight trips are largely cross boundary and mainly influenced by commercial decisions made in the private sector and by national action. LTP measures are likely to be limited to influencing the local delivery leg of freight journeys. Measures can improve local pollutant emissions and traffic conditions but have limited impacts on carbon emissions because they only influence a small proportion of HGV mileage.

Cars currently account for nearly 65% of road transport emissions in the LCCA area, LGVs for just over 15% and HGVs for nearly 20%.

These proportions will change in the future as projected uptake of ZEVs in the HGV fleet is slower than in the car and LGV fleet. By 2040, HGVs are projected to account for 35% of emissions (cars for 45%, LGVs for 20%) in the Business-as-Usual scenario identified by TfN in their Carbon Baseline Dashboard (left graph)

In the Accelerated Zero Emission Vehicle uptake scenario identified by TfN (right graph) emissions reduce considerably faster through time. As in the BAU, HGVs account for an increasing proportion of emissions through time, but the rate of change is slower (with HGVs accounting for 30% of emissions by 2040, cars 50%, LGVs 20%).

Figure A.1:Road emissions within LCCA by vehicle type – BAU

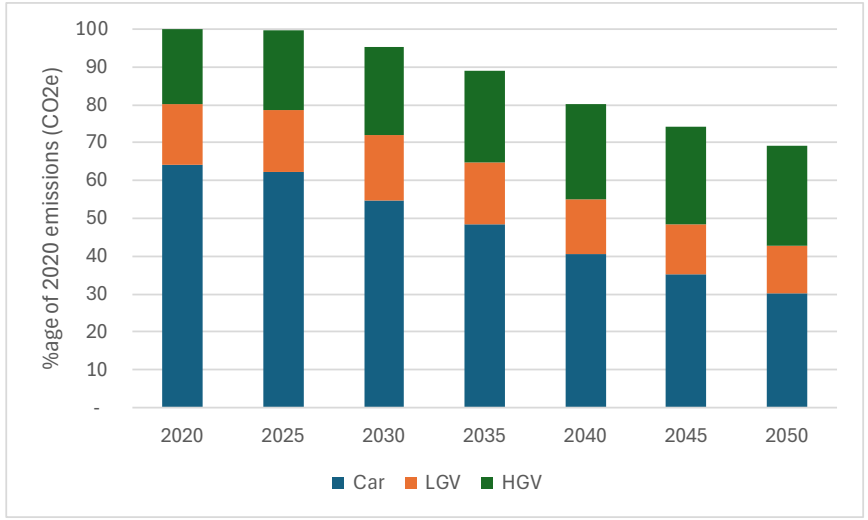
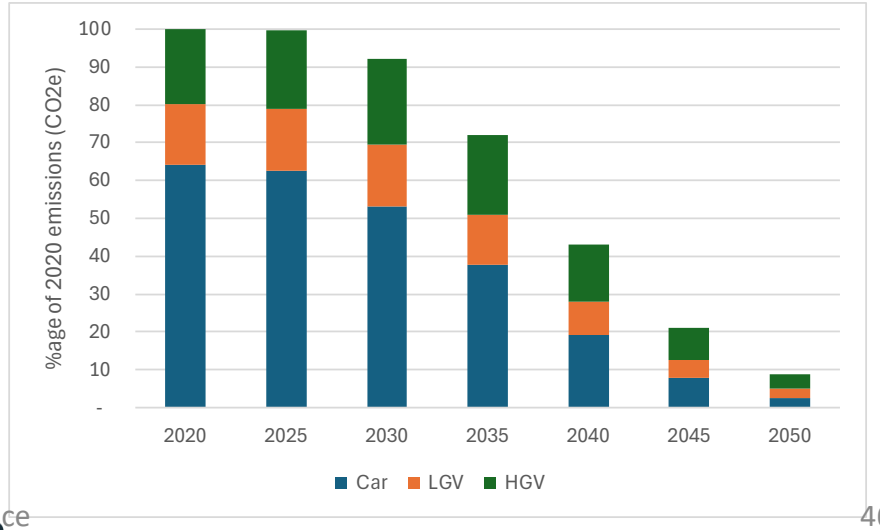


Figure A.2: Road emissions within LCCA by vehicle type – accelerated ZEV



Note private road vehicles account for approximately 95% of surface transport emissions with rail and bus accounting for the majority of the rest.

Source: TfN Carbon Baseline Dashboard (both graphs)

Carbon emissions in scope for LTP influence

The potential for LTP measures to influence car and van trips will also vary according to the origin and destination of the trip.

LTP measures are likely to have the greatest influence over journeys which are wholly within the LCCA area meaning that measures can influence travel choices at both the trip origin and destination.

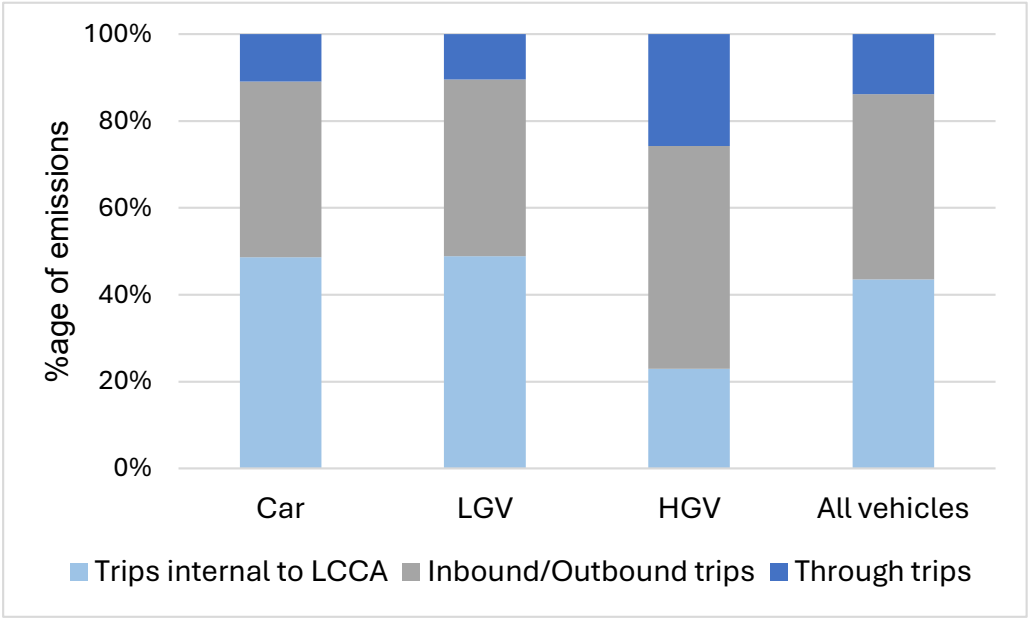
Analysis using data from NoHAM (TfN's Northern Highway Assignment Model) indicates that trips wholly within the LCCA area are currently estimated to account for nearly 50% of car and LGV emissions (25% of HGV emissions, nearly 45% all vehicle types).

LTP measures will also have the potential to influence many of the journeys which start or end within the LCCA area (travelling outbound or inbound). These trips can potentially be affected by measures which influence factors such as parking provision or access to cross-boundary public transport routes.

The NoHAM analysis indicates that inbound and outbound trips account for just under 45% of transport emissions within the LCCA (just over 40% of car and LGV emissions and just over 50% of HGV emissions).

The remaining nearly 15% of emissions (approximately 10% of car and LGV emissions and 25% of HGV emissions) are generated by trips passing through the LCCA area. LTP measures are generally unlikely to significantly affect through trips as choices about mode, vehicle type and routing for the trips are mainly driven by factors outside the LCCA area.

Figure A.3: Contribution of trip types to emissions within LCCA



Source: NoHAM (TfN's Northern Highway Assignment Model)

Carbon emissions in scope for LTP influence

The analysis in the previous two sections indicates that LTP measures have the potential to influence approximately 70% of transport emissions within the LCCA – comprising the nearly 40% of emissions that are currently generated by car and LGV trips wholly within the LCCA area and a further just over 30% of emissions from car and LGV trips inbound and outbound to the LCCA area. This proportion will decrease through time as the car and LGV fleet electrifies more quickly than the HGV fleet.

Within this total there will be variation in the potential for the LTP to influence emissions for different trip types. It is widely recognised that there is more scope to influence trips within and between urban areas than in less densely populated areas. The density of trip patterns and lengths of trips within urban areas means that it there is more scope to provide attractive, viable alternatives to car use.

Over 25% of car vehicle kilometres on trips to, from or within the LCCA area are on trips within the Central Belt or Bay Area or between the two (see Table A.1, area types based on mapping in the Core Strategy). The LTP will have greatest scope to reduce emissions on these trips.

The scope to reduce emissions on the remaining car kilometres will be lower as one or both ends of the trip are in less densely populated areas or outside the LCCA area.

Table A.1: Proportion of car vehicle kilometres within LCCA by origin and destination sector

a) Including through trips

Origin/Dest	1	2	3	4	5
1. Rural North	1%	4%	1%	1%	3%
2. Central Belt	3%	20%	5%	1%	10%
3. Connected South	1%	5%	3%	0%	5%
4. Bay Area	1%	1%	0%	1%	2%
5. Beyond LCCA	3%	11%	5%	2%	11%

b) Excluding through trips

Origin/Dest	1	2	3	4	5
1. Rural North	1%	4%	1%	1%	3%
2. Central Belt	4%	22%	6%	1%	12%
3. Connected South	1%	6%	4%	0%	6%
4. Bay Area	1%	1%	0%	1%	2%
5. Beyond LCCA	3%	12%	6%	2%	

Source (both): NoHAM (TfN's Northern Highway Assignment Model)

Appendix B

Logic-based review of potential LTP measures

Logic-based review of potential LTP measures

The LTP Core Strategy mentions over 150 example types of measure that could be introduced to support delivery of the identified policies across the four workstreams. These can be grouped into 34 broad categories of measure when considering likely routes through which the measures may impact on carbon emissions. Several of the types and categories of measures could contribute to supporting more than one Core Strategy policy as shown in the list in Section 4.

The potential for each category of measure to either increase or decrease carbon emissions was reviewed. A high level, logic-based approach was used for the review. This involved working through step by step to identify which of the routes to emissions reduction or increase described in Section 2 the category is likely to contribute to, given the impacts on travel related choices measures in that category would have. The key influences on the potential scale of emissions impact of each category of measure were also identified on the same basis.

The following tables summarise the results of the review process. Each column represents one of the routes to emissions reduction or increase described in Section 2. The rows represent the 34 categories of potential measures mentioned in the LTP. The entries in the table indicate the potential routes through which each category of measure could influence user and embodied emissions and the key influences on their scale of impact.

The shading in the tables distinguishes between clear routes to increasing or decreasing emissions (darker colours) and less certain potential routes (lighter colours). The shades do not indicate relative scale of impact between different measures.

For clarity of presentation in the table, the measures have been grouped following the review according to their main route to emissions impact (Avoid, Shift, Improve), where relevant or by other category (Road, Safety, Design, Context) for those measures that are unlikely to have a direct emissions reduction impact.

Potential routes for LTP measures to influence emissions

Table B.1 Review of potential emissions impacts of measures

			User emissions							Embodied
			Key influences	Avoid Trip numbers & length		Shift Shift from road to other modes		Improve ZEV uptake & improved traffic conditions		
Broad category	Measure category	CS Policies		Travel by individuals	Freight/coach	Car veh km	Freight veh km	ZEV uptake	Improved traffic conditions	
Avoid	Support digital connectivity improvements	CL6	Scale of coverage of improvements - population, number and length of trips affected	Fewer trips	N/A	N/A	N/A	N/A	*Reduced trip numbers may alleviate congestion*	*Possible new digital hubs*
Avoid	Support improved online opportunities	CL6	Range of opportunities and applicability - number and length of trips affected	Fewer trips	More deliveries	N/A	N/A	N/A	*Reduced trip numbers may alleviate congestion*	N/A
Avoid	Improve local services and amenities (in existing and new developments)	SV4;FN7	Number of centres affected, range of services provided (no of trips affected) and alternative location (length of trips avoided)	Shorter trips and fewer (combined trips)	*Possibly more deliveries*	Shorter trips encourage mode shift	N/A	N/A	*Reduced trip numbers/trip length may alleviate congestion*	*Possible new buildings or amendments to provide new services/opportunities*
Avoid	Introduce freight consolidation and micro consolidation	FN7	Number of centres and number and length of trips consolidated	N/A	Shorter and fewer trips	N/A	*Last mile trips more likely to use cargo bikes*	*Last mile trips more likely to use ZEV*	*Reduced freight deliveries may alleviate congestion*	Consolidation centre buildings
Avoid/ Shift	Roll out travel planning - e.g. event, business, school plans	TC4;FN3	Number of people, businesses and trips affected by the plans and scale of impact (uptake of sustainable modes and/or change in trip numbers and lengths) and longevity of impacts (support from ongoing measures)	Shorter and fewer (combined trips)	N/A	Mode shift	N/A	N/A	*Reduced trip numbers may alleviate congestion*	N/A

Key: Impact on emissions

Clear increase
Potential increase
Potential decrease
Clear decrease

Potential routes for LTP measures to influence emissions

Table B.1 Review of potential emissions

			User emissions							Embodied
			Key influences	Avoid Trip numbers & length		Shift Shift from road to other modes		Improve ZEV uptake & improved traffic conditions		
Broad category	Measure category	CS Policies		Travel by individuals	Freight/coach	Car veh km	Freight veh km	ZEV uptake	Improved traffic conditions	
Shift	Support sustainable transport modes in new developments	CL1;SV4	Scale of new development (number of trips) and the balance between of cost and convenience of travel by car and sustainable modes	N/A	N/A	Mode shift (compared to reference case development)	Mode shift (compared to reference case dev)	Greater uptake of EVs/car club EVs (compared to reference case)	*Reduced trip numbers may alleviate congestion*	*Possible new infrastructure e.g. bus lanes and stops/stations*
Shift	Improve bus/tram services - coverage and/or quality, frequency, speed, reliability, safety/security and accessibility	CL2;CL3;CL5;TC1;TC7;SV1;SV2;FN3	Scale of improvement, number and length of trips in scope and the resulting balance between of cost and convenience of travel by car and bus/tram	N/A	N/A	Mode shift	N/A	*Potential switch to ZEV (see separate entry below)*	*Reduced trip numbers may alleviate congestion*	Likely new vehicle fleet and stops/stations and possible new bus lanes/tram infrastructure
Shift	Improve rail services - coverage and/or quality, frequency, speed, reliability, safety/security and accessibility	CL1;CL2;CL3;CL5;TC2;TC7;SV2	Scale of improvement, number and length of trips in scope and the resulting balance between of cost and convenience of travel by car and rail	N/A	N/A	Mode shift	N/A	N/A	*Reduced trip numbers may alleviate congestion*	Likely new vehicle fleet, stations and new track/infrastructure
Shift	Improve rail freight facilities	CL2	Scale of improvement, number and length of trips in scope and the resulting balance between of cost and convenience of travel by HGV and rail	N/A	N/A	N/A	Mode shift	N/A	*Reduced trip numbers may alleviate congestion*	New buildings and potential new sections of track
Shift	Improve/extend active travel provision - including routes, wayfinding and facilities	CL1;CL4;TC3	Scale of improvement, number and length of trips in scope and the resulting balance between of cost and convenience of travel by car and rail	N/A	N/A	Mode shift	N/A	N/A	*Reduced trip numbers may alleviate congestion - very limited impact due to short length of trips*	Likely new capacity (e.g. cycle lanes) and other facilities e.g. signage, storage
Shift	Improve access to bikes (e.g. shared schemes)	TC3;TC7	Number of bikes and location - influencing number of trips in scope	N/A	N/A	Mode shift	N/A	N/A	*Reduced trip numbers may alleviate congestion - very limited impact due to short length of trips*	New bikes and likely new stands/ storage
Shift	Improve integration between modes e.g. mobility hubs	CL1;CL3;TC5;TC7;FN6	Scale and location of improvement (e.g. number of mobility hubs), number and length of trips in scope and the resulting balance between of cost and convenience of travel by car and PT/active travel for those	N/A	N/A	Mode shift	N/A	N/A	*Reduced trip numbers may alleviate congestion*	Buildings for mobility hubs and other physical forms of integration
Shift	Improve fares levels and ease of purchase/ provide incentives	TC2;TC8;SV2	Scale of improvement, number and length of trips in scope and the impact on the balance between of cost and convenience of travel by car and public transport	N/A	N/A	Mode shift	N/A	N/A	*Reduced trip numbers may alleviate congestion*	N/A

Potential routes for LTP measures to influence emissions

Table B.1 - Review of potential emissions impacts of measures

			User emissions							Embodied
			Key influences	Avoid Trip numbers & length		Shift Shift from road to other modes		Improve ZEV uptake & improved traffic conditions		
Broad category	Measure category	CS Policies		Travel by individuals	Freight/coach	Car veh km	Freight veh km	ZEV uptake	Improved traffic conditions	
Shift	Improve information on transport options and fares	TC1;TC4;TC8; FN1	Scale of improvement, number and length of trips in scope and the impact on the balance between of cost and convenience of travel by car and public transport	N/A	N/A	Mode shift	N/A	N/A	*Reduced trip numbers may alleviate congestion*	N/A
Shift	Improve public realm at destinations - accessibility, safety and attractiveness	SV1;SV3	Location of improvement (local destination or larger centre), scale of improvement and integration with other measures. Number and length of in scope to be attracted to improved destination and location of alternative destination.	Possible increase or decrease depending on whether local or longer distance trips are attracted by improvements	N/A	Mode shift to walking/cycling at destination	N/A	N/A	Reduced trip numbers may alleviate congestion - although may be partly offset if people are attracted to make longer trips to more attractive destinations	Public realm improvements
Shift	Apply road use hierarchy and appropriate speed limits	SV1;FN6	Location of measures. Balance between potential mode shift, traffic rerouting and congestion impacts	*Possible increase in car vehicle kms due to rerouting to avoid speed limits and reduced capacity due to road space reallocation to other modes*	*Possible increase in freight vehicle kms due to rerouting to avoid speed limits and reduced capacity due to road space reallocation to other modes*	Mode shift to modes with improved priority or attractiveness due to reduced speed limits	N/A	N/A	Reduced trip numbers may alleviate congestion -although rerouting resulting from changed road space allocation and speed limits may increase congestion elsewhere	Minor impacts of more signage etc.
Shift	Improve provision for coaches at key destinations	TC7	Number and routes of coaches affected and number and length of trips in scope	N/A	*May attract additional coach trips to improved destination*	Mode shift to coach from car	N/A	N/A	Reduced car trip numbers may alleviate congestion - additional coach trips to destination may offset improvement unless well managed	New buildings, facilities and signage etc
Shift	Improve provision of accessible/reliable taxi service	TC6	Scale of improvement and whether improvements provide options for journeys that wouldn't previously have been made	Likely to encourage some extra journeys that wouldn't previously have been made	N/A	N/A	N/A	N/A	Negligible	*Possible new buildings and vehicles*
Shift	Support community and demand responsive transport	TC5;SV2	Scale of improvement and trips in scope and whether improvements provide attractive alternative to car travel for any journeys and/or provide options for journeys that wouldn't previously have been made	Likely to encourage some extra journeys that wouldn't previously have been made adding to DRT distance travelled	N/A	Possible minor shift away from car (particularly if DRT reduces need for car ownership)	N/A	N/A	Negligible	New vehicles and possible supporting facilities

Potential routes for LTP measures to influence emissions

Table B.1 - Review of potential emissions impacts of measures

			User emissions							Embodied
			Key influences	Avoid Trip numbers & length		Shift Shift from road to other modes		Improve ZEV uptake & improved traffic conditions		
Broad category	Measure category	CS Policies		Travel by individuals	Freight/coach	Car veh km	Freight veh km	ZEV uptake	Improved traffic conditions	
Shift	Support car sharing/pooling	TC5;FN2	Scale of support and number and length of trips affected	N/A	N/A	Shift to shared transport	N/A	Increased use of EVs through EV car clubs	*Reduced trip numbers may alleviate congestion*	*Potentially fewer vehicles required*
Shift	Review parking management	FN6	Scale of review, number of parking spaces affected, nature of parking changes and their implications for the balance of cost/convenience between car and other modes	Potential increase in trips if parking becomes easier/more convenient or decrease if costs are levelled and parking relocated to less central locations	N/A	Potential mode shift to car if parking becomes easier/more convenient or away from if costs are levelled, parking relocated to less	N/A	*Possible incentivisation of EVs/smaller vehicles through parking charges*	Potential increase or decrease in congestion depending on the change in trip numbers and location of parking	*Possible additional parking spaces, equipment, signage*
Improve	Roll out EV buses and taxis	TC6	Number of vehicles affected and mileage covered	N/A	N/A	*Possible minor impact as result of higher quality buses attracting shift*	N/A	Increased use of EV buses and taxis	N/A	New vehicles and charging infrastructure
Improve	Support EV for private use, company fleets and last mile freight delivery	FN2;FN7	Number of vehicles affected and mileage covered	N/A	N/A	*Possible shift away due to lower costs of EV possible parking advantages and car club access*	N/A	Increased use of EV cars and delivery vehicles	*Reduced trips by large freight vehicles on last mile may alleviate congestion*	New vehicles and charging infrastructure
Improve	Support for EV charging infrastructure	FN2	Number of vehicles affected and mileage covered	N/A	N/A	N/A	N/A	Increased use of EV cars and delivery vehicles	N/A	New charging infrastructure and potential new vehicles
Improve	Support rail electrification	CL5	Length of track and number of services affected	N/A	N/A	*Possible minor impact as result of higher quality rail services*	*Possible minor impact as result of change in rail services*	Increased use of electric trains	N/A	New rolling stock and charging infrastructure
Improve	Implement targeted road measures to reduce congestion	CL4;FN3	Number of locations and amount of through traffic affected	Possible changes in trip length through rerouting either to longer, now quicker routes or back to shorter, more direct routes once congestion alleviated		*Possible minor negative impact if improved road conditions cause switch back to car*	N/A	N/A	Reduced emissions due to reduced congestion	New infrastructure and potential signage

Potential routes for LTP measures to influence emissions

Table B.1 Review of potential emissions impacts of measures

			User emissions								Embodied
			Key influences	Avoid Trip numbers & length		Shift Shift from road to other modes		Improve ZEV uptake & improved traffic conditions		
Broad category	Measure category	CS Policies		Travel by individuals	Freight/coach	Car veh km	Freight veh km	ZEV uptake	Improved traffic conditions	
Road	Implement measures to increase road capacity	CL1;CL4	Number of locations and amount of through traffic affected	Increase in trip numbers due to increased capacity and improved travel times. Potential changes in trip length: either increases due to trips attracted to longer, quicker routes or reductions if improvements provide shorter routes		Potential mode shift back to car due to improved car travel times	Potential mode shift back to road due to improved road travel times	N/A	Likely reduced emissions due to reduced congestion - possibly offset by increased emissions due to more traffic travelling at higher speed	New infrastructure and signage
Safety	Provide safety information provision and raise awareness	TC4	Number of trips in scope	N/A	N/A	*Possible mode shift if active travel perceived to be safer*	N/A	N/A	N/A	N/A
Safety	Implement design changes/upgrades to improve safety/security	SV1	Scale of additional infrastructure	N/A	N/A	*Possible mode shift if active travel perceived to be safer*	N/A	N/A	N/A	New infrastructure and signage
Design	Implement resilient and nature based design measures	FN4	Scale of implementation	N/A	N/A	N/A	N/A	N/A	N/A	Reduction in infrastructure requirements
Design	Implement low carbon design measures	FN4	Scale of implementation	N/A	N/A	N/A	N/A	N/A	N/A	Reduction in emissions intensity of infrastructure
Design	Implement whole life asset management	FN5	Scale of implementation	N/A	N/A	N/A	N/A	N/A	N/A	*Possible reduction in infrastructure requirements*
Context	Undertake consultation, review and research activities to support other measures and future measures	TC1;SV1;SV3; FN2;FN1;FN7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Context	Contribute to wider strategy development with implications for transport	CL1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Appendix C

Carbon Assessment Playbook tests

Illustrative emissions impacts by type of measure - CAP

The Carbon Assessment Playbook (CAP) produced by the Sub National Transport Bodies provides an indication of the relative scale of impact of different transport decarbonisation measures. The full set of 29 measures included in the Playbook is listed at the end of this Appendix.

The CAP draws on a summary of available evidence on the typical scale of impact that could be expected from each measure type, based on an international evidence review and modelling based on data from the National Travel Survey. The impacts focus largely on vehicle kilometre reductions achieved and are estimated for trips that are considered to be 'in scope' to be influenced by each intervention type (e.g. for a new bus service, car trips made for journeys served by the bus route are considered to be 'in scope').

The estimated impacts reflect the available evidence on variation of impacts of measures by broad area type (particularly between urban and rural areas). However, they do not reflect location-specific impacts such as different approaches to parking management or characteristics of the existing public transport system.

The estimated impacts should therefore be considered as illustrative of typical levels of impact only as the impacts of individual measures depend strongly on the transport context in which they are implemented. For instance, a bus lane would achieve more mode shift and emissions reduction if implemented on a busy corridor serving several bus routes than on a low traffic corridor with few routes.

Impacts of measures also depend on the intensity of implementation and the area over which they are implemented and therefore the volume of trips in scope to be influenced. The combination of measures implemented together also influences impacts. For instance, bus measures are likely to achieve more mode shift if implemented alongside changes to parking availability and cost.

Although generalised, the CAP outputs provide a useful sense of the relative scale of impact of different types of measure. A series of high-level simple tests have therefore been undertaken using the CAP to provide additional metrics to help understand the influences on the potential scale of impact of LTP on emissions.

Illustrative emissions impacts by type of measure - CAP

Seven high-level tests were run using the CAP. Six tests illustrated the impact of each of the different categories of measure included in the CAP. The seventh test assumes that all the measures in the previous six tests are applied in combination.

For simplicity, the tests made two simplifying assumptions. Firstly, an ambitious assumption was made that all measure types in each category would be fully applied by 2030 (recognising that in practice this implementation timescale would be very challenging for some of the measure types).

Secondly, a range of levels of application of measures was assumed to reflect differing levels of ambition. Simple illustrative assumptions were made that measures were applied across between 10% and 30% of the LCCA area (covering all area types proportionately), applied to relevant trip types only (e.g. business travel plans applied to commuting from LCCA and trips from LCCA businesses). This means, for example, that the upper end active travel test assumes that on average 30% of trips across all area types would benefit from improved pedestrian and cycling infrastructure and e-bike hire schemes. In practice, it would be more difficult to achieve the 30% level of implementation for some measures (e.g. new public transport services) than others (e.g. fare changes). Additionally, implementation of measures would in practice tend to be focused on area types where the greatest impact could be achieved.

The tests were run by applying the measures in each of the CAP measure categories, assuming that each was applied at 100% intensity across 100% of the authority area by 2030. The scenarios were run separately for Lancashire, Blackburn with Darwen and Blackpool (following the CAP structure), using the local ZEV scenario as a baseline. The emissions with and without the measures were exported for each scenario for each authority and then combined to give a full LCCA emissions impact.

To estimate the lower end scenario in which the measures were assumed to be applied across 10% of the LCCA area (proportionately by area type) the difference between the without and with measures emissions from the full test was multiplied by 10% and added to the baseline. The equivalent approach was applied for the upper end scenario of 30% application. This produced the results presented on the next page.

The estimated emissions impacts in 2035 are presented in Section 8. 2035 was selected as this is within the LTP time window but allows time for implementation whilst avoiding the greater uncertainty over issues such as behaviour change and EV uptake over longer time frames

Illustrative emissions impacts by type of measure - CAP

The scenarios included nearly all of the measures in the CAP. The main exceptions were the charging measures (Road user charging/tolls, Cordon-based charges and restrictions and Workplace parking levy) which it has already been identified will not form part of the LTP.

Some of the EV uptake support measures were also excluded. The CAP user guide indicates that the different measures to represent approaches to accelerate EV uptake each take the same approach of assuming that EV uptake is accelerated by a year. The guide advises against combining different measures as they are unlikely to produce an amplified effect in practice. On the basis of this guidance, only the EV charging infrastructure measure was included (Campaigns for switch to LEV fleets and Support EV uptake in corporate fleets were not included in the scenarios).

The tests were not intended to represent the Core Strategy. Instead, they illustrate the potential scale of impact of the types of measure that are being considered for the LTP. The upper end of the range represents an ambitious upper bookend of the likely scale of impact that LTP decarbonisation measures might achieve. As the CAP focusses on decarbonisation measures, the tests do not account for measures that would increase emissions. The indicative test results are shown in the table.

Table C.1 - Results of illustrative CAP tests

Category of measures	Reduction in CO_2e in 2035 (range) 10% LCCA	Reduction in CO_2e in 2035 (range) 30% LCCA	Measures included
Active travel	<0.1%	<0.1%	Walking and cycling infrastructure & e-mobility hire schemes.
Public transport	1%	2%	Bus priority measures, improved bus/LRT frequency, mobility hubs, reduced fares, DRT, extended public transport network, new rail station/line and integrated ticketing, information and MaaS.
Parking & traffic management	<0.5%	1%	On and off-street parking measures and liveable neighbourhoods.
Fleet	1%	3%	EV charging infrastructure and low emissions public transport fleet.
Integrated planning policy	<0.5%	1%	Local service provision and high-density developments.
Behavioural change	1%	2%	Area wide travel planning, EV car clubs, incentive-based apps, business & school travel plans & support for car sharing.
Combined	2%	6%	All above combined.

Impact of different types of measure on user emissions

The results shown in the table illustrate that even the indicative ambitious level of implementation (across 30% of the LCCA area) has a relatively limited impact on emissions. The overall scenario assuming that all measures are applied is estimated to reduce emissions by approximately 6% by 2035.

The category of measure indicated to have the greatest potential to reduce emissions is further EV uptake including electric public transport fleet (Improve measures). The CAP represents EV support measures through the assumption that they accelerate EV uptake in the fleet by a year. In practice it would take widespread action to achieve this change across 30% of trips in the LTP area because the reference scenario used in the CAP already assumes relatively rapid EV uptake. Support and measures such as EV charging point roll-out are likely to be required to achieve the reference case levels of uptake before achieving any acceleration.

Within the Avoid and Shift measures considered in the CAP, the greatest indicated potential for emissions reduction is through extensive behavioural change and public transport improvements. The tests are ambitious and implementation in practice would face considerable funding and delivery challenges as it would take significant activity and expenditure to achieve the level of change in public transport provision and behavioural change programme implied by the tests across 30% of the LCCA's population.

Even if the change was achieved, the CAP indicates that the mode shift and travel change achieved by each category of measure would only equate to around 2% reduction in emissions per year by 2035. This reinforces the earlier point highlighting the challenge of significantly reducing emissions through mode shift to reduce car vehicle kms. The results indicate that the category of parking and traffic management measures fall in the middle of the impact range, using the average values in the CAP. Impacts in individual locations would depend on factors including the extent of change in parking costs and provision and the options available for travel by other modes.

While it is essential to integrate sustainable transport and travel planning into new developments, integrated planning measures are also estimated to have a relatively low impact. This reflects that new development accounts for a small proportion of trips and local service provision have more significant impacts in urban areas than rural areas.

The active travel category of measures is projected to have a considerably lower impact than any of the other categories tested. This reflects the fact that, whilst the measures are important for meeting a range of objectives such as improved accessibility and health, they often achieve relatively little mode shift from car and the mode shift that does occur is from short trips. Impacts are increased where the active travel provides good connections to local centres (avoiding longer trips) and public transport, providing the first leg of longer trips.

CAP measures – Part 1

The tables on this page and the next page list the full set of measures included in the CAP by category. The last column in the table illustrates the Core Strategy policies that the measures could contribute to, indicating that several of the measures could contribute to more than one policy.

Measure	A-S-I	Category	Relevant Core Strategy Policies
BC5 Business Travel Plans	Avoid	Behavioural change	TC4
BC6 Support for car sharing	Avoid	Behavioural change	TC5; FN2
IP1 20-Minute neighbourhoods	Avoid	Integrated planning policy	SV4
IP2 High density developments	Avoid	Integrated planning policy	CL1; SV4
AT1 Improved pedestrian infrastructure	Shift	Active travel	CL1; TC3; TC7; SV3; SV4
AT2 Improved cycling infrastructure	Shift	Active travel	CL1; TC3; TC7; SV3; SV4
AT3 (e-)Mobility hire schemes	Shift	Active travel	TC3; TC7
BC1 Area-wide travel planning/mobility management	Shift	Behavioural change	TC4; FN3
BC7 School Travel Plans	Shift	Behavioural change	TC4; SV1
BC2 EV car clubs	Shift	Behavioural change	FN2
BC3 Incentive based apps	Shift	Behavioural change	TC2
PC1 Road user charging/tolls	Shift	Parking, charging & traffic management	na
PC6 Cordon based charges and restrictions	Shift	Parking, charging & traffic management	na
PC2 Off-street parking measures	Shift	Parking, charging & traffic management	FN6

Source: Interventions – Carbon Assessment Playbook

CAP measures – Part 2

Measure	A-S-I	Category	Relevant Core Strategy Policies
PC3 On-street parking measures	Shift	Parking, charging & traffic management	FN6
PC4 Workplace parking levy	Shift	Parking, charging & traffic management	na
PC5 Low Traffic Neighbourhoods (LTNs)	Shift	Parking, charging & traffic management	na
PT1 Bus priority measures	Shift	Public transport	CL4; CL5; TC1; FN3
PT2 Improved bus/LRT frequency	Shift	Public transport	CL2; CL3; CL5; TC1
PT3 Mobility hubs	Shift	Public transport	CL1; CL3; TC5; SV4; FN6
PT4 Reduced public transport fares	Shift	Public transport	SV2
PT5 Demand responsive transport (DRT)	Shift	Public transport	TC5; SV2
PT6 Extended public transport network	Shift	Public transport	CL1; CL2; CL5; TC1; SV2
PT7 New rail stations/line opening	Shift	Public transport	CL1; CL3; CL5
TE1 Integrated ticketing, information & Mobility as a Service	Shift	Technology	TC1; TC2; TC4; TC7; TC8; SV2; FN1
BC4 Campaigns for switch to LEV fleets	Improve	Behavioural change	FN2
LE1 Low emission public transport fleets	Improve	Low emission vehicles	FN2
LE2 EV Charging infrastructure	Improve	Low emissions vehicles	SV4: FN2
LE3 Support EV uptake in corporate fleets	Improve	Low emissions vehicles	FN2

Source: Interventions – Carbon Assessment Playbook

Appendix D

Current travel levels

Current travel levels

The estimates of relative passenger kilometres by mode used in Section 4 were derived from National Travel Survey data analysed by Transport for the North as part of the data that they offer Local Authorities to support in LTP development (as described further in Appendix 1 TfN Offer.pdf).

The TfN analysis reviewed trips to, from and within the LCCA area over the years from 2007 to 2023, grouping trips by mode, distance band and origin/destination type (within LCCA or external to LCCA). For the analysis presented in this report, it was assumed that on average 50% of the length of trips into and out of the LCCA would fall within the LCCA area, apart from trips in the longest distance bands of over 200 kms (for which an average of 20% within the LCCA was assumed). This provided an estimate of the number of passenger kilometres travelled within the LCCA area by each mode for the sample of trips covered in NTS data.

The results were cross checked against the NTS 2023 statistics on travel distance by mode for the North West region, DfT traffic statistics, NoHAM model data and DfT bus statistics on number of trips by local authority area.

Further details on all data sources are provided on the next page.

Current travel level data sources

All modes:

- National Travel Survey Trip Length Distribution by mode and O/D area type – LCCA – from Dataset code 01201 (NTS Analytics Trip Length Distribution, NTS 2002 to 2021) from the TfN Data Offer for Local Authorities (as described in the brochure mgConvert2PDF.aspx)
- Assumptions about proportions of trips of in each distance band falling within authority boundary
- National Travel Survey, 2023, Table: NTS9904a: Average distance travelled by mode and region of residence (miles per person per year): England: National Travel Survey: 2023 - GOV.UK

Bus:

- DfT Bus Statistics: Table Bus01e - Passenger journeys on local bus services by local authority: England, Source: Bus statistics data tables - GOV.UK

Car:

- NoHAM Select Area Analysis – pcukms by origin, destination within and through LCCA area from Dataset code 02101 (Select Area Analysis, NoHAM 2018) from the TfN Data Offer for Local Authorities (as described in the brochure mgConvert2PDF.aspx)
- DfT Transport Statistics Table TRA8905: Motor traffic (vehicle kilometres) for selected vehicle types by Local Authority in Great Britain, Source: Road traffic estimates (TRA) - GOV.UK – used for cross check

Appendix E

DfT Local Transport Infrastructure Carbon Benchmarking Tool analysis

Influences on the potential impact of LTP on WLC emissions

The **DfT's Local Transport Infrastructure Carbon Benchmarking Tool (LTICBT)** provides estimates of capital carbon per unit or kilometre for different types of transport infrastructure. The left-hand four columns of the table present some of the LTICBT entries on carbon per kilometre of cycle lanes, bus lanes and roads of different types.

The right hand two columns provide a comparison calculated for this report showing how the **equivalent amount of emissions could be generated through car trips**. The comparisons are expressed in terms of:

- the **number of years** it would take to generate the emissions; through
- the **identified number of car trips per day** travelling a kilometre (at an assumed average speed of 45 kph).

The calculations assume the DfT TAG car fleet and EV uptake projections (from the May 2025 databook) and an opening year of 2028.

For the cycle and bus lanes, the figures could also be seen as the number of years it would take to save the equivalent of the capital emissions by saving the identified number of car trips per day through mode shift, i.e. an indication of the pay-back period for each scheme type.

Table E.1 LTICBT capital carbon estimates & user carbon comparators

Scheme Type	Benchmark	Carbon Units	A1-A5 Emission Factor (tCO2e)	Equivalent Car trips per day each way per km	Years
Cycle Lane	Light segregation	tCO2e/km	7	100	~2
Cycle Lane	Stepped cycle track	tCO2e/km	104	100	>60
Cycle Lane	Fully kerbed cycle track	tCO2e/km	57	100	~40
Cycle Lane	Cycle track (new track)	tCO2e/km	36	100	~15
Bus lane	Reallocation to bus lane	tCO2e/km	276	1000	~10
Bus lane	Widening to bus lane	tCO2e/km	597	1000	~40
Bus lane	Partial widening to bus lane	tCO2e/km	508	1000	~30
Road	Local Street	tCO2e/km	218	1000	~5
Road	Primary Road	tCO2e/km	674	7500	~1
Road	Prestressed Concrete Beam Bridge, ~. 15m	tCO2e/km	6324	7500	>60
Road	Steel-Concrete Composite Bridge, approx. 15m wide	tCO2e/km	12664	7500	>60