Wiltshire Council
Local Transport Plan 4
Draft LTP4 Carbon paper
October 2024

Wiltshire Council

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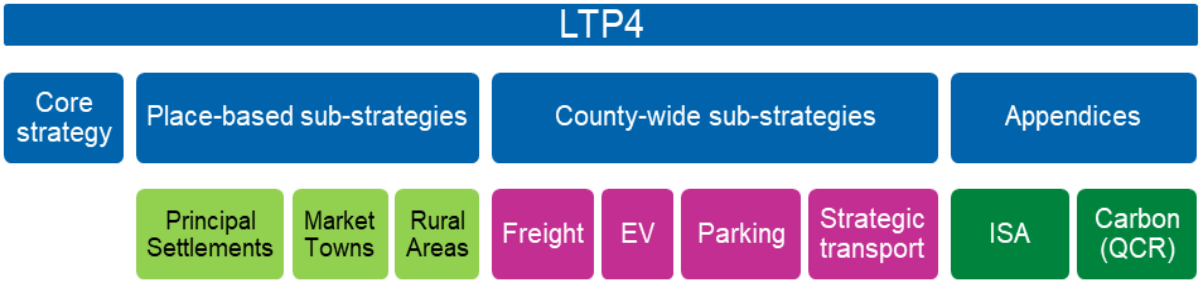
Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised
1.0	Full draft for Officer and Member review	TM	GR	PB	LB
2.0	Updated draft in line with Officer and Member feedback	TM	PB	JS	LB
3.0	Updated draft in line with wider Cabinet feedback	TM	PB	LB	LB
4.0	Updated draft in line with further wider Cabinet feedback	TM	PB	LB	LB
5.0	Updated draft in line with further wider Cabinet feedback	TM	PB	LB	LB

1. Introduction

This Appendix to Wiltshire Council's LTP4 provides wider context and supporting detail for the consideration of greenhouse gas emissions within the rest of the LTP documents, as shown in Figure 1-1.

Figure 1-1 – LTP4 structure



The analysis and assessment presented in this Appendix align with draft LTP Quantifiable Carbon Reduction (QCR) guidance produced by the DfT for consultation, but never finalised or formally published (explained further in Annex A). The term carbon is used throughout the document as a shorthand for transport greenhouse gas emissions, as carbon dioxide accounts for nearly all of the greenhouse gas emissions from transport (see Box 1).

Box 1: Carbon, CO_2, CO_2e and greenhouse gases

The terms carbon, carbon dioxide, CO_2, CO_2e and greenhouse gases (GHGs) are often used interchangeably.

Climate change is driven by a range of GHGs including carbon dioxide (CO_2). CO_2 is the dominant greenhouse gas, particularly for the transport sector (accounting for 99% of transport GHG emissions). Other GHGs can be expressed in terms of the amount of CO_2 that would cause the same level of warming, in which case totals are expressed as CO_2 equivalent or CO_2e.

The term carbon emissions is often used as shorthand for CO_2 and CO_2e emissions by organisations such as the DfT (for instance in their Quantifiable Carbon Reduction guidance). The term is used in this way in this report.

The remainder of this Appendix comprises the following sections:

- **Section 2** provides context to explain the importance of considering carbon in the LTP4, setting out:
  - An overview of **international and national context,** the climate emergency and the role of the transport sector in generating the greenhouse gas emissions that cause climate change. A summary of the UK national response to the need for decarbonisation is given including the DfT's draft QCR guidance on including carbon considerations in LTPs.
  - A summary of **Wiltshire's response to the climate emergency** and the transport decarbonisation challenge that the LTP4 needs to contribute to addressing. Key aspects of the **sources of transport emissions within Wiltshire** are outlined, along with an analysis of **the scale of the emissions gap** between projected transport emissions baselines and a decarbonisation pathway that would align with national decarbonisation commitments.

- **Section 3** provides a summary of the ways in which transport decarbonisation can be achieved and the role of the LTP4 in supporting emissions reduction, setting out:
  - The **key drivers of transport carbon emissions** and their implications for the types of measure required to reduce emissions and the **need to account for whole lifecycle carbon implications** of any transport system changes proposed in the LTP4.
  - The **role of carbon considerations in the development** of Core LTP4 Strategy and sub-strategies, through including carbon in the LTP vision and objectives and using the need for decarbonisation to structure the four policy areas identified.
  - The **proposed LTP4 measures** within each policy area, illustrating the way in which they support carbon reduction as well as delivering wider benefits.
  - An **estimate of the scale of the potential emissions reduction that could be supported by the proposed LTP4 measures**, if implemented in combination with action from individuals, organisations and other sectors; and the proportion of the emissions gap between projected emissions and the identified decarbonisation pathway that the reduction is likely to close.
  - A review of the types of **additional action, beyond the measures included in the LTP4, that could contribute to closing the remainder of the emissions gap**.
- **Section 4** provides a concluding summary.

The report is supported by three Annexes:

- **Annex A** provides a summary flow chart from the draft Department for Transport LTP Quantifiable Carbon Reduction guidance.
- **Annex B** provides more detail on the estimation of baseline transport emissions in Wiltshire.
- **Annex C** provides more detail on the assumptions informing the estimate of the carbon reductions supported by the LTP4 measures.

2. Climate change and net zero challenge

2.1. Climate emergency and international and national response

2.1.1. Overview

It is widely agreed that climate change due to global warming caused by greenhouse gases (GHG) poses an unprecedented threat globally. Action is required across all dimensions of society to reduce GHG emissions to mitigate the levels of warming and climate change projected, to limit the significant international environmental, social and economic impacts of the projected change. The scale of the challenge was communicated by the Intergovernmental Panel on Climate Change's (IPCC) Sixth Assessment Report, which states that 1.5°C of warming (from pre-industrial times) is now unavoidable, but that strong action can still limit climate change and, with radical action, temperatures could stabilise in 20 to 30 years.[1]

On a global level, 2023 was the hottest year on record. The UK is also experiencing rising temperatures and, according to the UK Government, between 2012 and 2021 the UK was on average 1°C warmer than the 1961 to 1990 average. All 10 of the warmest years in the UK have occurred since 2003, with 2022 being the UK's hottest year on record.

Global temperature rises are likely to have significant impacts in the UK. For instance, according to the Climate Change Committee's (CCC) 2021 risk assessment report[2], it is expected that flooding risk will increase considerably in future. Average winter precipitation will increase, both in terms of the intensity of the rainfall, and in terms of the number of wet days. Summers are expected to get drier, but the intensity of summer precipitation (when it does occur) will increase. More properties will face the risk of flooding, and areas already at risk will face more frequent flooding. Current flood defences will be subject to additional pressure which increases risk for further flooding events.

In response to growing awareness of the Climate Emergency, in June 2019 the UK Government passed legislation committing to achieving net zero GHG emissions by 2050. Legal commitments have also been made to carbon budgets which set an upper limit to cumulative national GHG emissions over five-year periods.

The budgets currently cover the period to 2037 and reflect the fact that it is cumulative emissions rather than emissions levels in any one year that are the key driver of climate change. GHG emissions stay in the atmosphere for decades causing warming once released and therefore decarbonisation pathways indicate that rapid reductions in GHG emissions to limit cumulative emissions are needed to limit climate change, rather than late 'just-in-time' action to meet the 2050 target.

The UK's national commitments were followed by decarbonisation routemaps for different sectors of the economy which were described in the previous Government's 'Build Back Greener Strategy'[3], published in 2021.

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[1] Anthesis (2022) Wiltshire Carbon Emissions Baselines and Reduction Pathways

[2] CCC (2021) Independent Assessment of UK Climate Risk. Available at: Independent Assessment of UK Climate Risk - Climate Change Committee (theccc.org.uk)

[3] HM Government (2021) Net Zero Strategy: Build Back Greener: Available at: https://www.gov.uk/government/publications/net-zero-strategy

Summary of global and UK commitments to reduce greenhouse gas emissions[1]

	The Paris Agreement set the international target to limit global temperature rise to well below 2°C with the aim of limiting the rise to 1.5°C above pre-industrial levels. The IPCC's follow up report stated that this requires a global reduction in GHG emissions of 45% by 2030. Governments have strengthened their commitments at subsequent Conference of Party (COP) meetings for the agreement.
	The Climate Change Act 2008 introduced a legally binding target for the UK to reduce GHG emissions by 80% by 2050 relative to 1990. In June 2019, the target was updated to reaching net zero by 2050. In addition the UK Government have committed to six five year carbon budgets. The most recent, sixth, carbon budget (to 2037), was agreed in June 2021 and involves reducing all sector emissions by 78% by 2035 compared to 1990 levels.

2.1.2. UK transport sector

2.1.2.1. Transport decarbonisation challenge

The DfT's Transport Decarbonisation Plan (TDP)[4] was the transport sector's routemap (published in July 2021). It sets out the steps that Government, local government, businesses and society need to take to deliver the significant emissions reduction needed across all transport modes to contribute to meeting decarbonisation pathways and the carbon budgets and achieving net zero carbon emissions across the transport sector by 2050.

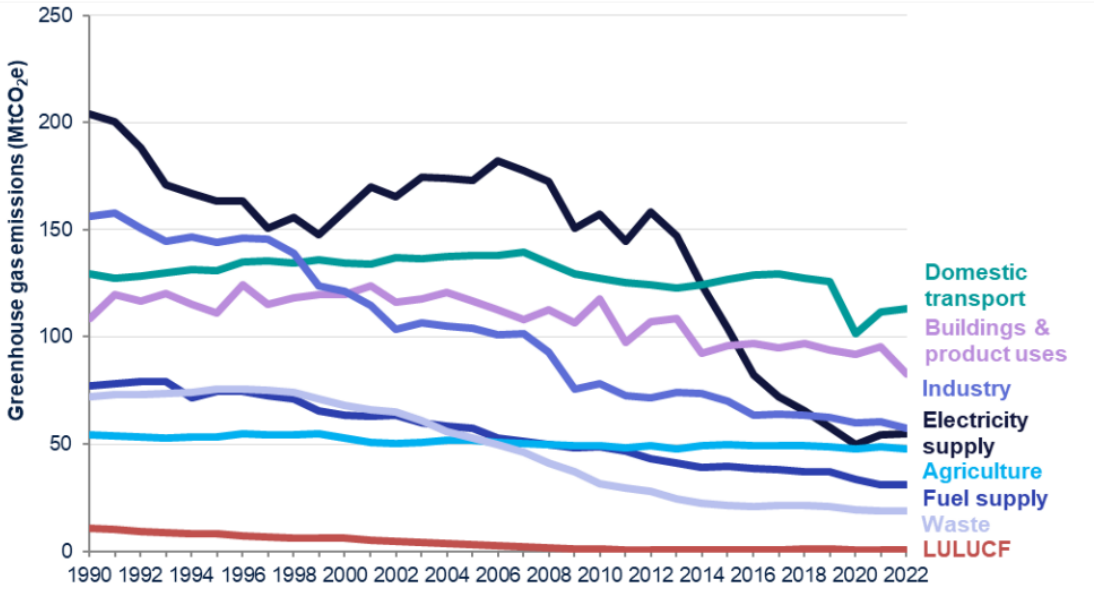
The transport sector has an important role to play in meeting national decarbonisation targets as it accounted for 28% of UK domestic greenhouse gas emissions in 2022 and has produced more emissions than any other UK sector each year since 2016[5]. As shown in Figure 2-1, transport sector emissions have remained consistently high since the 1990s (apart from a drop during the COVID-19 pandemic) whilst emissions from other sectors have generally decreased over the same timeframe.

The consistently high levels of emissions from the transport sector have been caused by growing population, a growing economy, and increased propensity to travel. Whilst vehicle efficiency has improved considerably over this timeframe, this has been largely offset by a sustained move by drivers to choose larger vehicles, particularly Sports Utility Vehicles (SUVs).

[4] DfT (2021) Decarbonising Transport: a better, greener Britain. Available at: https://www.gov.uk/government/publications/transport-decarbonisation-plan

[5] DESNZ (2024) Final UK greenhouse gas national statistics, 1990 to 2022. Available at: Final UK greenhouse gas emissions national statistics: 1990 to 2022 - GOV.UK (www.gov.uk)

Figure 2-1 – Territorial UK greenhouse gas emissions by sector, 1990-2022 (MtCO2e)

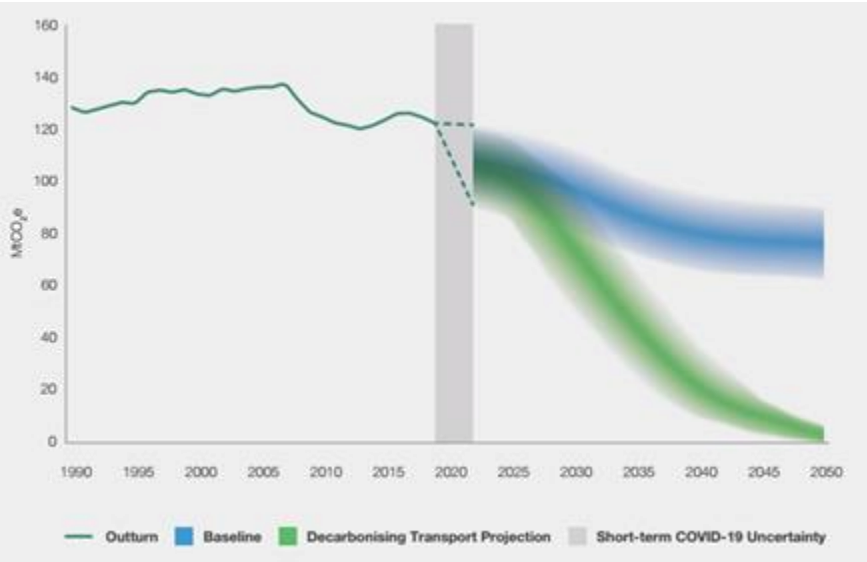


Source: Table 1.2, Final UK greenhouse gas emissions national statistics 1990-2022 Excel data tables
Note: LULUCF is land use, land use change and forestry.

Source: UK greenhouse gas emissions national statistics, 2022[6]

The need for rapid reduction in transport sector emissions was identified in the Climate Change Committee's (CCC) Sixth Carbon Budget report[7], the TDP[4] and the Government's subsequent Net Zero Strategy[8]. Figure 2-2 shows the TDP's pathway for the required reduction in emissions from the transport system.

Figure 2-2 – DfT Transport Decarbonisation Plan domestic transport decarbonisation pathway (GHG emissions projections versus baseline projections)



Source: DfT Transport Decarbonisation Plan: https://assets.publishing.service.gov.uk/media/610d63ffe90e0706d92fa282/decarbonising-transport-a-better-greener-britain.pdf

[6] ibid
[7] CCC (2020) Sixth Carbon Budget Report. Available at: Sixth Carbon Budget - Climate Change Committee (theccc.org.uk)
[8] HM Government (2021) Net Zero Strategy. Available at: Net Zero Strategy: Build Back Greener - GOV.UK (www.gov.uk)

2.1.2.2. DfT draft LTP and QCR Guidance

The TDP recognises that diverse action at a range of scales will be required to achieve the pace and scale of transport decarbonisation required in the transport sector. The importance of local action is highlighted, and the plan includes a commitment to:

'…drive decarbonisation and transport improvements at a local level by making quantifiable carbon reductions a fundamental part of local transport planning and funding.'

The TDP highlights that as LTPs are statutory documents that set out improvements to transport networks they need to show how local authorities will deliver ambitious carbon reductions. To support this process, the DfT committed to providing guidance to local authorities for producing LTPs that contain measures that will result in quantifiable carbon reductions.

Draft content of the LTP guidance was shared with local authorities. It was accompanied by Quantifiable Carbon Reduction (QCR) guidance which included a flow chart (shown in Annex A), setting out four steps to be followed in developing a LTP that delivers a quantifiable carbon reduction, involving:

- Estimating current and projected future transport emissions, including identifying the main sources of emissions.
- Establishing a local transport decarbonisation pathway to understand the emissions gap between projected emissions and the pathway.
- Considering carbon in the generation and appraisal of intervention and policy options for an LTP (using a light touch approach and considering whole-life carbon).
- Estimating the carbon impact of the proposed LTP measures.

The development and release of the guidance was paused and no final guidance has been published. It remains unclear whether the guidance will be launched. However, the draft documents available provide a useful framework for decarbonising transport and have informed the development of Wiltshire's LTP4, as set out in this document.

2.2. Wiltshire's decarbonisation challenge

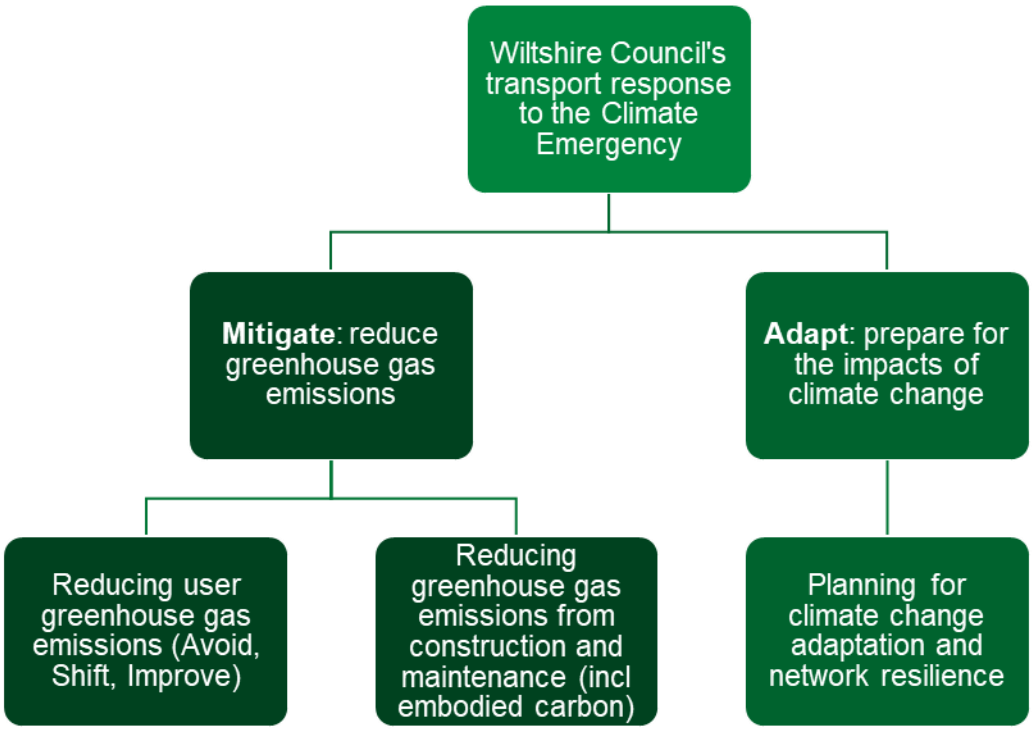
2.2.1. Wiltshire's response to the climate emergency

Following on from the announcement by the UK Government accelerating the path to net zero carbon, a number of councils recognised the need to acknowledge a Climate Emergency and commit to decarbonisation targets, including achieving net zero carbon emissions by 2050. Wiltshire Council acknowledged a Climate Emergency in February 2019 and has committed to making the council a carbon neutral organisation by 2030 and identified the ambition to seek to make Wiltshire a carbon neutral county by 2030. The LTP4 and several other council plans and policies are relevant to contributing towards achieving these commitments.

As shown in Figure 2-3, Wiltshire Council has identified two parallel elements to its transport response to the Climate Emergency: reducing greenhouse gas emissions to limit climate change (**mitigate**) and planning for the likely impacts of climate change (**adapt**).

This Appendix focuses on the mitigate element and the need to reduce carbon emissions to limit climate change. However, the importance of the adapt element is well recognised and reflected as part of the theme of sustainability that underpins LTP4.

Figure 2-3 – Wiltshire Council's transport response to the Climate Emergency



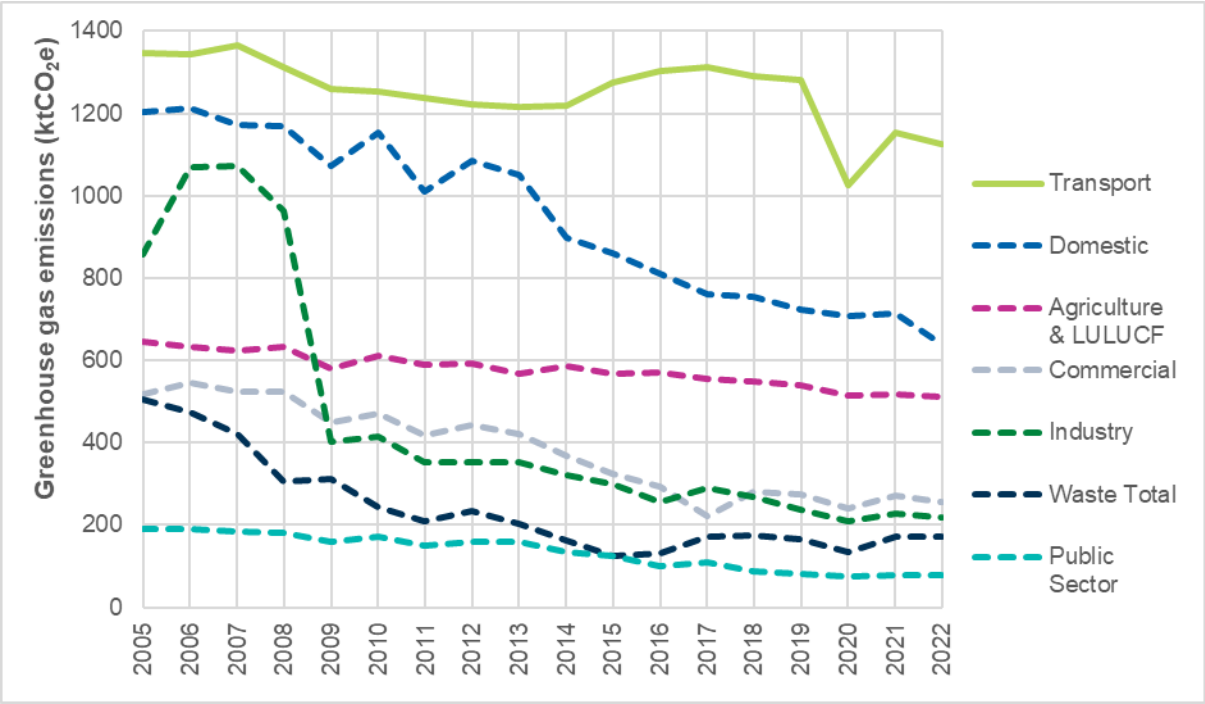
Source: Core LTP4 Strategy

2.2.2. Current transport emissions in Wiltshire

Data from the Department for Energy Security and Net Zero (DESNZ) summarised in Figure 2-4 shows that the transport sector has generated more greenhouse gas emissions than any other sector in Wiltshire since data collection started in 2005. Similar to the national picture, transport emissions have stayed consistently high (apart from during the COVID-19 pandemic) whilst emissions from other sectors have generally decreased over the same time period.

In the most recent year for which data is available, 2022, the transport sector contributed 38% of the 3000 kilotonnes of carbon dioxide equivalent (kt CO_2e) of greenhouse gas emissions that were generated from all sectors in Wiltshire. This is markedly higher than the equivalent proportion of transport accounting for 28% of national greenhouse gas emissions (as set out in Section 2.1.2.1), highlighting the importance of decarbonising the transport sector in Wiltshire.

Figure 2-4 – Greenhouse gas emissions by sector in Wiltshire ktCO2e p.a.



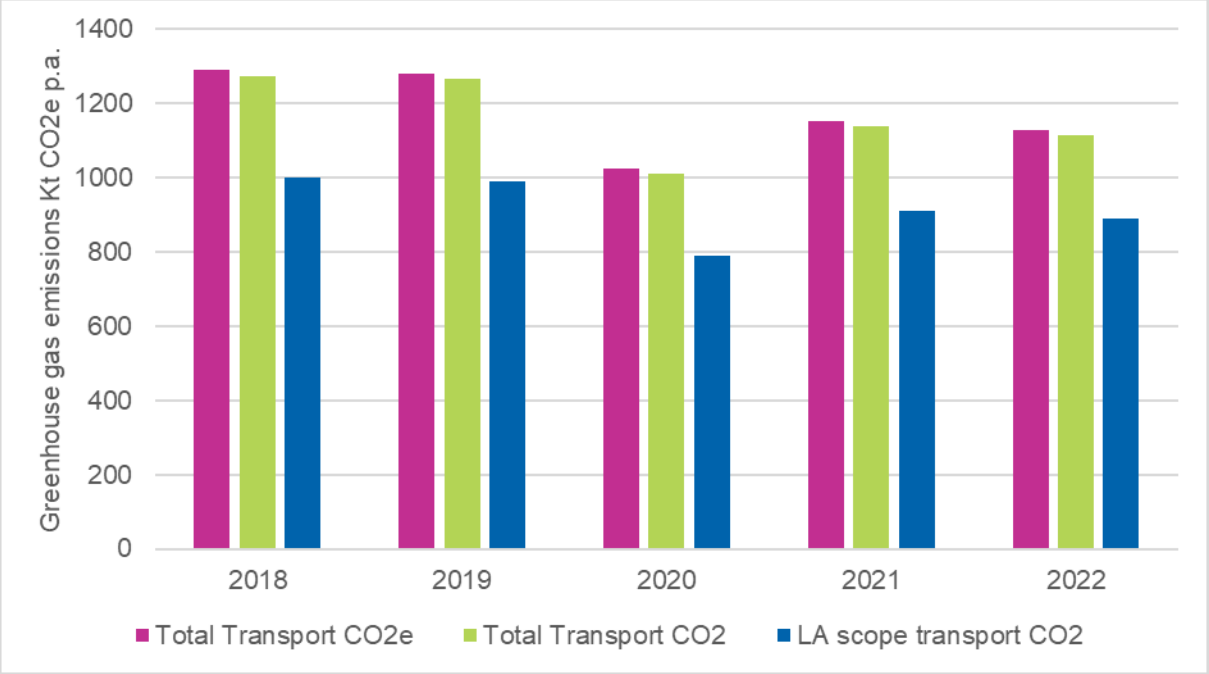
Source: DESNZ, 2024, UK local authority and regional greenhouse gas emissions statistics [9]

The DESNZ dataset also provides an indication of carbon dioxide emissions[10] that are considered to be within scope of local authority influence. For transport this excludes emissions in the authority boundaries that are associated with rail and motorway use. For other sectors, it excludes sources such as large industrial sites.

Figure 2-5 presents the data for the last five years of available data showing total transport greenhouse gas emissions in Wiltshire, total carbon dioxide emissions in the county and carbon dioxide emissions identified by DESNZ as being within scope for local authority influence. The figures highlight that carbon dioxide accounts for 99% of transport greenhouse gas emissions, and that emissions considered to be within scope of local influence (i.e. primarily emissions from traffic on A roads and minor roads) account for nearly 80% of total transport emissions. Transport accounted for 41% of total all sector emissions considered within scope for local authority influence in Wiltshire in 2022.

[9] DESNZ (2024) UK local authority and regional greenhouse gas emissions statistics. Available at: UK local authority and regional greenhouse gas emissions statistics - GOV.UK (www.gov.uk)
[10] The dataset covers carbon dioxide emissions only, no other greenhouse gases.

Figure 2-5 – Transport sector greenhouse gas and carbon dioxide emissions in Wiltshire – $ktCO_2e/ktCO_2$ p.a.



Source: DESNZ UK local authority and regional greenhouse gas emissions statistics[11]

2.2.3. The source of Wiltshire's transport emissions

An understanding of the main sources of transport emissions within Wiltshire provides a useful basis for identifying the types of LTP4 measures likely to be required to reduce transport emissions.

The following sections highlight some key points about the main sources of emissions in terms of:

- Vehicle type
- Road type
- Trip type and
- Population type

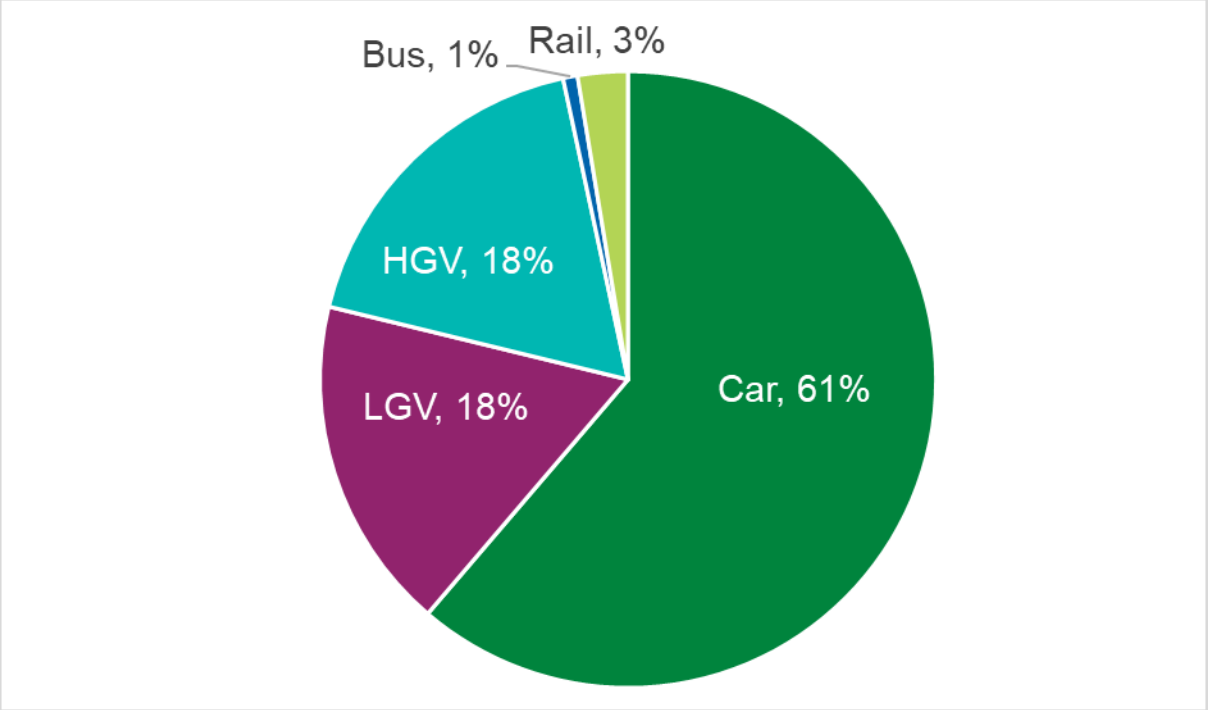
[11] DESNZ (2024) UK local authority and regional greenhouse gas emissions statistics. Available at: UK local authority and regional greenhouse gas emissions statistics - GOV.UK (www.gov.uk)

Emissions by vehicle type and road type

Current and future transport user emissions in Wiltshire have been estimated, in line with QCR Step 1, using outputs from the Wiltshire Traffic Model and a spreadsheet carbon model (as described further in Section 2.2.4 and Annex B).

Figure 2-6 summarises analysis from the carbon model indicating that cars accounted for approximately 61% of Wiltshire's transport emissions in the base year of 2018, followed by HGVs accounting for 18%, LGVs 18%, rail 3% and buses 1%. These figures are consistent with those for the UK in 2019 where cars accounted for 61% of total land transport emissions, HGVs for 17%, LGVs for 18%, rail for 3% by rail and buses for 2%[12].

Figure 2-6 – Transport CO_2e emissions within Wiltshire by vehicle type, 2018



Source: Carbon modelling for LTP4 using Wiltshire Traffic Model

The traffic model analysis also indicates that just under 20% of road emissions are generated on motorway travel and approximately 45% on travel on A roads and 35% on travel on B roads and more minor roads[13].

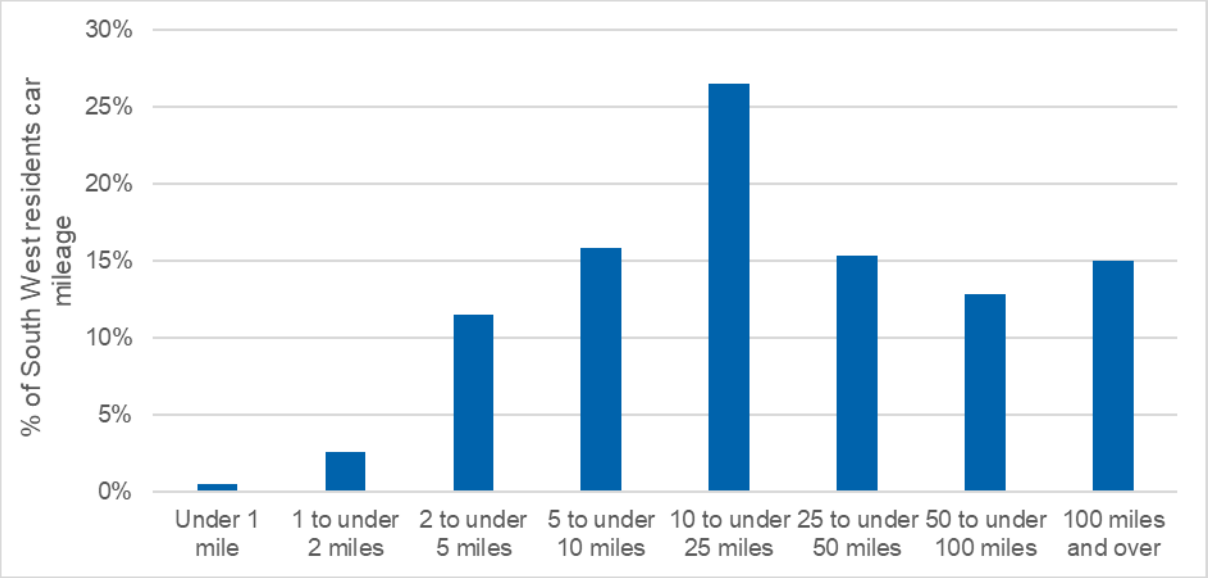
[12] As quoted in the Transport Decarbonisation Plan: DfT (2021) Decarbonising transport: A better, greener Britain. Available at: Transport decarbonisation plan - GOV.UK (www.gov.uk)

[13] The DESNZ local authority greenhouse data also provides a disaggregation of emissions by road type and shows the same pattern. DESNZ (2024) UK local authority and regional greenhouse gas emissions statistics. Available at: UK local authority and regional greenhouse gas emissions statistics - GOV.UK (www.gov.uk)

Emissions by trip type

Trip length is an important influence on carbon emissions with long trips making a significant contribution to emissions despite accounting for a relatively low proportion of trip numbers. Recent National Travel Survey data[14] summarised in Figure 2-7 indicates that trips under 5 miles long only accounted for 15% of car vehicle miles driven by residents in the South West region (and therefore emissions generated by cars[15]), despite accounting for the majority of car trips. Trips over 10 miles long accounted for 70% of car vehicle miles driven by residents (and therefore emissions generated) and trips over 25 miles for nearly 45% of vehicle miles.

Figure 2-7 – Car/van mileage driven by South West region residents by trip length, 2019



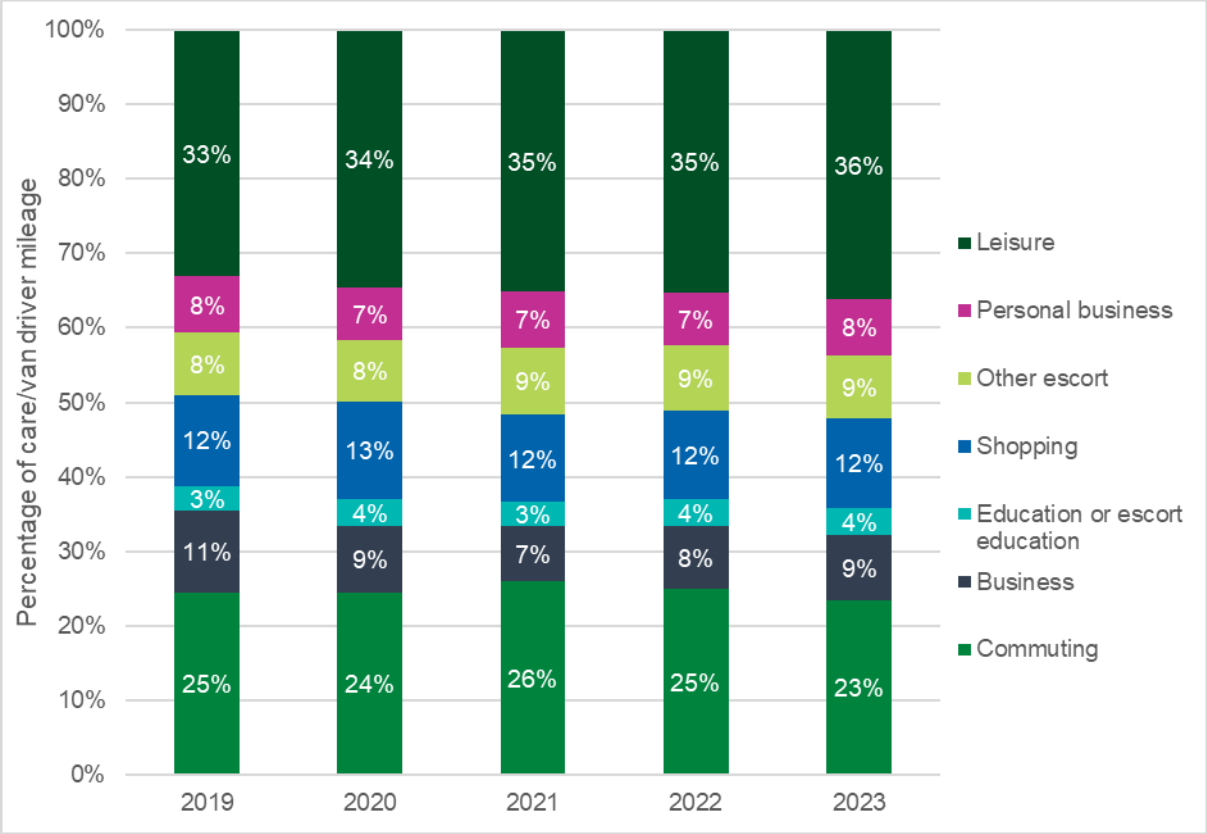
I

[14] NTS (2024) Table NTSQ01008: Average miles travelled by mode, region and Rural-Urban Classification of residence and trip length: England, 2018/2019. Available at: Ad-hoc National Travel Survey analysis - GOV.UK (www.gov.uk)

[15] This analysis effectively assumes a standard average emissions rate per vehicle mile on all trips. In practice, emissions rates will vary according to the size of vehicle typically used on different journey types and with higher emissions for slower, more congested travel and high-speed journeys. These variations will influence all trip purposes and lengths to some extent, and they are unlikely to change the pattern shown significantly.

It is also useful to understand the extent to which trips for different purposes contribute to total emissions. National Travel Survey data on national average car/van mileage by journey purpose[16] shows that, although total mileage has varied between years over the last five years as a result of the travel impacts of COVID-19, the split between purposes has stayed broadly consistent. In 2019 leisure trips (including entertainment, holiday and visiting friends and family) accounted for approximately 33% of car travel, commuting trips for 25%, shopping for 12%, business for 11% and personal business and other escort each for approximately 8%. By 2023, the pattern is still similar, with a slight reduction in the proportion of travel for commuting and business trips and increase in the proportion for leisure trips.

Figure 2-8 – Car/van mileage driven by journey purpose



[16] NTS (2024) Table NTS0409b: Average distance travelled by purpose and main mode (miles per person per year): England, Available at: National Travel Survey - GOV.UK (www.gov.uk). National data was used as the NTS reports do not provide the equivalent data at more disaggregate levels

Emissions by population category

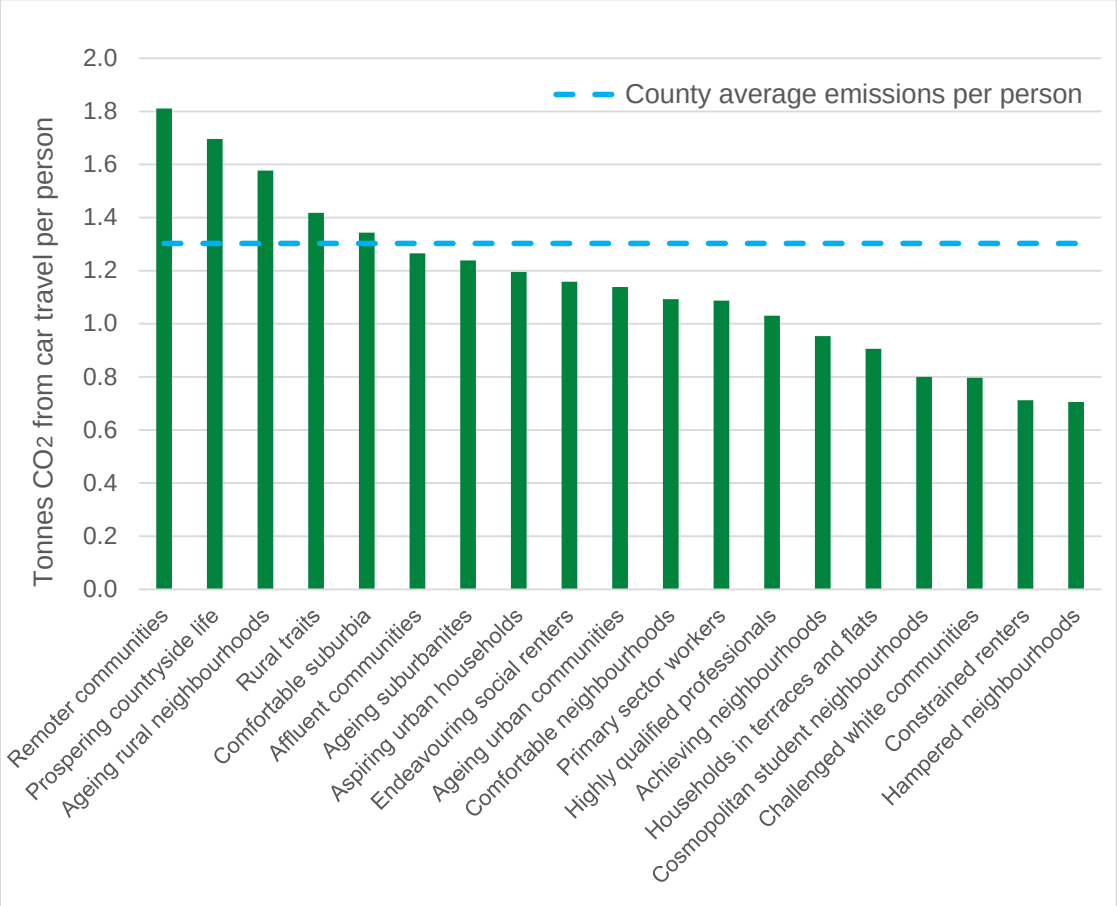
In developing decarbonisation measures, it is also important to understand how carbon emissions vary by location, reflecting the characteristics of the place and its population. The Centre for Research into Energy Demand Solutions (CREDS) place-based carbon tool[17] provides estimated emissions from car driving by ONS population segment in Wiltshire in 2018. The data highlights that emissions per resident tend to be increased by living in more remote, rural locations and where residents have above average incomes. In contrast, those living in towns and those with lower incomes tend to travel less by car.

Figure 2-9 illustrates these contrasts, summarising the average annual emissions from car travel generated per resident in each of the 20 ONS population segments identified within Wiltshire, using the segment labels used by CREDS.

The bar heights show the average annual emissions from car travel generated per person in each segment and the blue dotted line shows the average across the total county population. The variation in emissions between the most emitting of the population segments and the least emitting is significant. Annual emissions generated by car use by residents in the highest emitting segments, Remoter Communities and Prospering Country Life, are two to two and a half times the emissions generated by residents in the least emitting segments, Constrained renters and Hampered neighbourhoods, and over 30% greater than the county average emissions per person.

[17] CREDS Place-based carbon calculator). *Source: Morgan, Malcolm, Anable, Jillian, & Lucas, Karen. (2021). A place-based carbon calculator for England. Presented at the 29th Annual GIS Research UK Conference (GISRUK), Cardiff, Wales, UK (Online): Zenodo. A place-based carbon calculator for England | Zenodo)*

Figure 2-9 – Average CO_2e emissions from car travel p.a. per person for population segments, Wiltshire, 2019. (Source: CREDS carbon tool)[18]



2.2.4. The scale of Wiltshire's transport decarbonisation challenge

In addition to understanding the source of current emissions, it is important to understand the projected scale of the future transport emissions and the 'emissions gap' that needs to be closed, to help understand the type of transport decarbonisation measures needed. The gap indicates the difference between projected baseline emissions by year and the decarbonisation pathway that annual emissions would need to follow in order to meet decarbonisation commitments.

There is uncertainty over the scale of the emissions gap because of uncertainty over a number of key variables (see Box 2). However, an estimate can be made on the basis of assumptions about the key variables. Figure 2-10 illustrates the scale of the projected emissions gap in Wiltshire in 2030 and 2035, estimated on the basis of assuming:

- The midpoint of the TDP range for the decarbonisation pathway (the green line on the graph). Following a carbon workshop with Wiltshire Council officers, this was selected as the pathway to adopt for LTP4 as it aligns with draft DfT LTP QCR guidance on the most appropriate approach for Step 2 for authorities without a locally defined pathway. (Further detail on alternative decarbonisation pathways is provided in Annex B section 4.3.B.6.1)
- Three different projections of future baseline emissions (shown as blue lines) developed on the basis of output from the Wiltshire Traffic model and best practice emissions

[18] *Ibid.*

factors, as outlined in Box 3 at the end of this section and in more detail in Annex B. These projections:

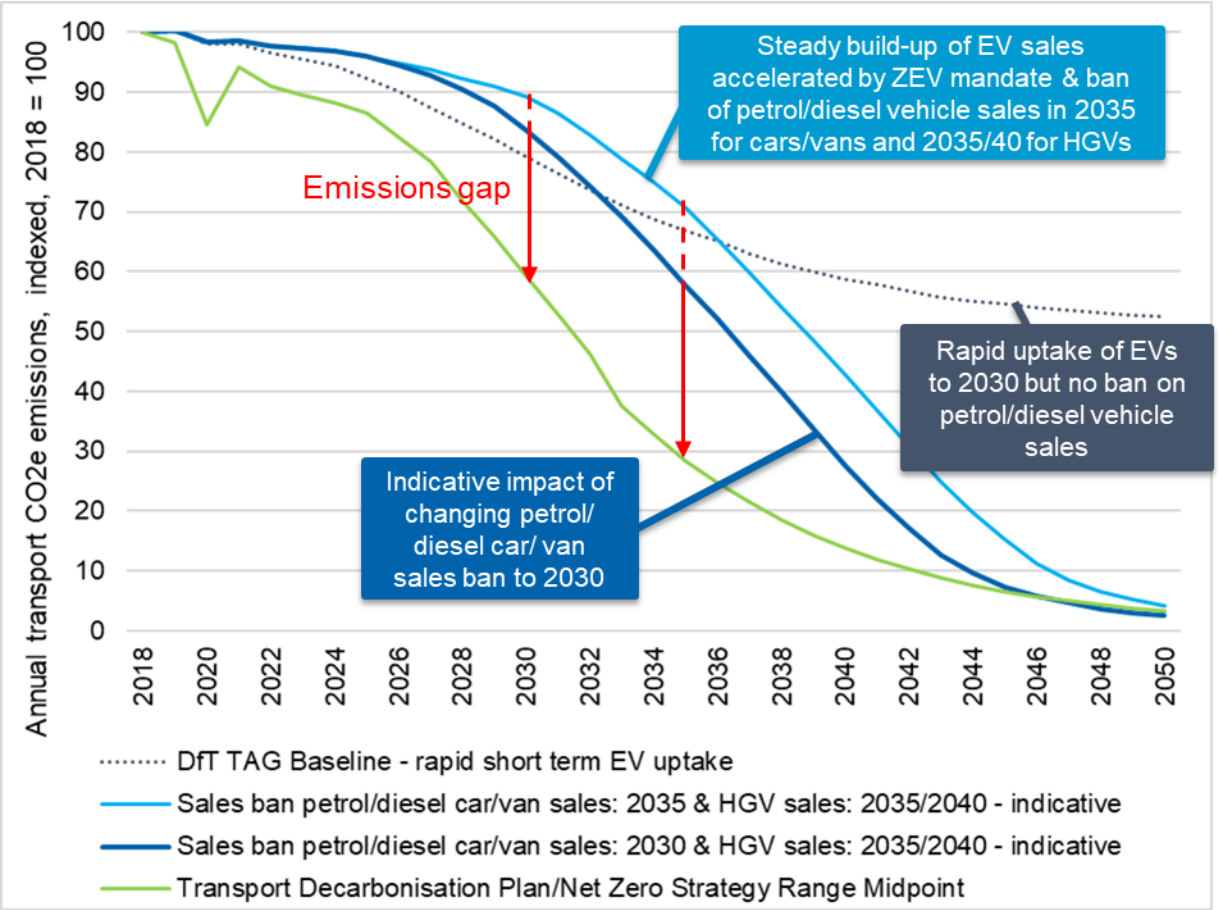
- Were all based on traffic growth from the Reference Case scenario in the Wiltshire Traffic model. These traffic model forecasts were developed before COVID-19, and this approach effectively assumes that the trend for car traffic to grow at an above average rate to return to pre-COVID-19 projections continues (see Box 2).
- Used three different scenarios of electric vehicle (EV) and zero emission vehicle uptake:
  - Rapid uptake of EVs to 2030 but no ban on petrol/diesel vehicle sales (in line with DfT's Transport Analysis Guidance assumptions).
  - Steady build-up of EV sales, accelerated by the zero emissions vehicle mandate and a 2035 sales ban on petrol/diesel cars and 2035/2040 sales ban on diesel HGVs[19] (reflecting current government policy).
  - Steady build-up of EV sales, accelerated by the zero emissions vehicle mandate and a 2030 petrol/diesel car/van sales ban and 2035/2040 sales ban on diesel HGVs (reflecting previous government policy which may be reinstated by the new government).

Box 2: Key areas of uncertainty influencing the scale of the emissions gap include:

- The appropriate decarbonisation pathway to follow – different bodies identify different relevant pathways on the basis of different views of the carbon budgets allocated to the UK, Wiltshire and/or the transport sector. Annex B provides more details on a number of different potential pathways.
- Traffic growth rates, including recovery from the reduction in car travel caused during the COVID-19 pandemic. Car traffic in Wiltshire remained approximately 8% lower than in 2019 in 2023 but had grown rapidly from 2022 (according to DfT Local Authority traffic statistics, table TRA8905). If similar rates of growth continue, traffic will be back to the levels projected before COVID-19, including growth, by about 2028.
- Rate of fleet change through time, particularly the uptake of electric vehicles and other zero emissions vehicles

[19] The government initially announced a 2030 date for the ban on sales of petrol and diesel cars and vans in November 2020 and a 2035 ban for HGVs under 26 tonnes and 2040 ban for HGVs over 26 tonnes in November 2021. The car/van sales ban date was delayed until 2035 in September 2023 by the previous government and has not yet been changed back to 2030 by the new government, although the possibility has been raised. HGV sales ban dates have remained unchanged

Figure 2-10 – Wiltshire's estimated transport emissions gap



The red arrows on the graph indicate the emissions gap between the blue emissions projections and green decarbonisation pathway. The comparison indicates that closing the gap in 2030 would require approximately a further 30% reduction in transport emissions from the projected baselines. This equates to approximately a 35% reduction from current emissions levels. In 2035, closing the gap would require approximately a further 55% reduction in emissions relative to projected baselines (equivalent to approximately a 70% reduction from current emissions levels).

As outlined in Section 2.1.2.1, closing the emissions gap is important as it is cumulative emissions that drive climate change. Each year in which emissions remain above pathway levels adds further to cumulative emissions. This then makes it harder for emissions to get back to the levels required to meet climate change commitments. If decarbonisation pathways are not met globally and cumulative emissions continue to rise, temperatures will continue to rise, increasing the wide-ranging risks associated with climate change, as summarised in Section 2.1.1.

The gaps identified in Figure 2-10 are substantial and are consistent with the scale of gaps seen for other authorities and nationally. They clearly highlight the scale and pace of transport emissions reduction that would be required to meet the decarbonisation pathway. The scale of change needed is made more challenging by the fact that the baselines used to estimate the gaps already assume significant uptake of EVs and zero emissions vehicles in response to national action.

This decarbonisation challenge sets the context for the need to fully consider carbon impacts in the development of LTP4.

Box 3: Estimate of baseline carbon emissions projections

A carbon spreadsheet model was developed to estimate projected surface transport emissions within Wiltshire's boundary (in line with Step 2 in the DfT's draft QCR guidance). The estimate was based primarily on:

- Detailed model data from the SATURN Wiltshire Traffic Model, providing volume and type of traffic by vehicle category (cars, vans, goods vehicles, buses) on the roads in the modelled years of 2018 and 2036
- An estimate of traffic levels on minor roads not captured in the traffic model (using DfT traffic counts and GIS road length data)
- The composition of the fleet for each vehicle category (in terms of the proportions of vehicles of different sizes, efficiency, and power source, testing a number of different scenarios using data from the DfT's Transport Analysis Guidance and other sources, explained further in Annex B).
- Emissions factors (grammes of carbon emitted per vehicle kilometre) by vehicle type and speed band.

Emissions estimates represent well to wheel carbon dioxide equivalent (CO_2e) emissions.

A year-by-year trajectory of emissions through time was derived by supplementing the modelled data for 2018 and 2036 with estimates of traffic for the additional years at 4 to 5 yearly intervals to 2050. These estimates were derived through interpolation and extrapolation of the data for the two modelled years, informed by the DfT's National Road Traffic Projections 2022 which provides Reference Scenario traffic forecasts at 5-year intervals to 2050 for the South-West by road type and vehicle type.

The estimated traffic forecasts for these years were combined with relevant fleet composition and emissions factors to provide emissions estimates in each year to inform the trajectory.

Further detail on the approach to calculating emissions is provided in Annex B.

3. Routemap for transport decarbonisation

3.1. Overview

This section outlines the ways in which transport emissions reductions can be achieved to help address the decarbonisation challenge highlighted in the previous section and identifies the role of the LTP4 in supporting emissions reduction.

The following sections set out:

- **Routes to transport decarbonisation** – setting context by summarising the key drivers of transport carbon emissions and their implications for the types of measure required to reduce emissions, along with the need to account for whole lifecycle carbon implications of any transport system changes proposed in the LTP4.
- **The role of carbon considerations in developing LTP4** - setting out the role of carbon considerations in the development of the Core LTP4 Strategy and sub-strategies, through including carbon in the LTP4 vision and objectives and using the need for decarbonisation to structure the four policy areas identified.
- **The proposed LTP4 measures** within each policy area, illustrating the way in which they support carbon reduction as well as delivering wider benefits.
- An estimate of the scale of the **potential emissions reduction that could be supported by the proposed LTP4 measures,** if implemented in combination with action by individuals, organisations and other sectors; and the proportion of the emissions gap between projected emissions and the identified decarbonisation pathway that the reduction is likely to close.
- A review of the types of **additional action, beyond the measures included in the LTP4, that are likely to be needed to close the remainder of the emissions gap.**

3.2. Routes to transport decarbonisation

3.2.1. Transport user emissions

Transport user carbon emissions are the direct result of two influences:

- **The number of miles travelled** by each vehicle type
- **The average emissions produced per mile** by each vehicle type

This means that, at the simplest level, any measures to reduce user emissions and close the emissions gap identified in Section 2 need to:

- **Reduce the number of vehicle miles travelled** by:

Avoiding unnecessary travel by giving people and businesses the choice to make fewer and shorter journeys.

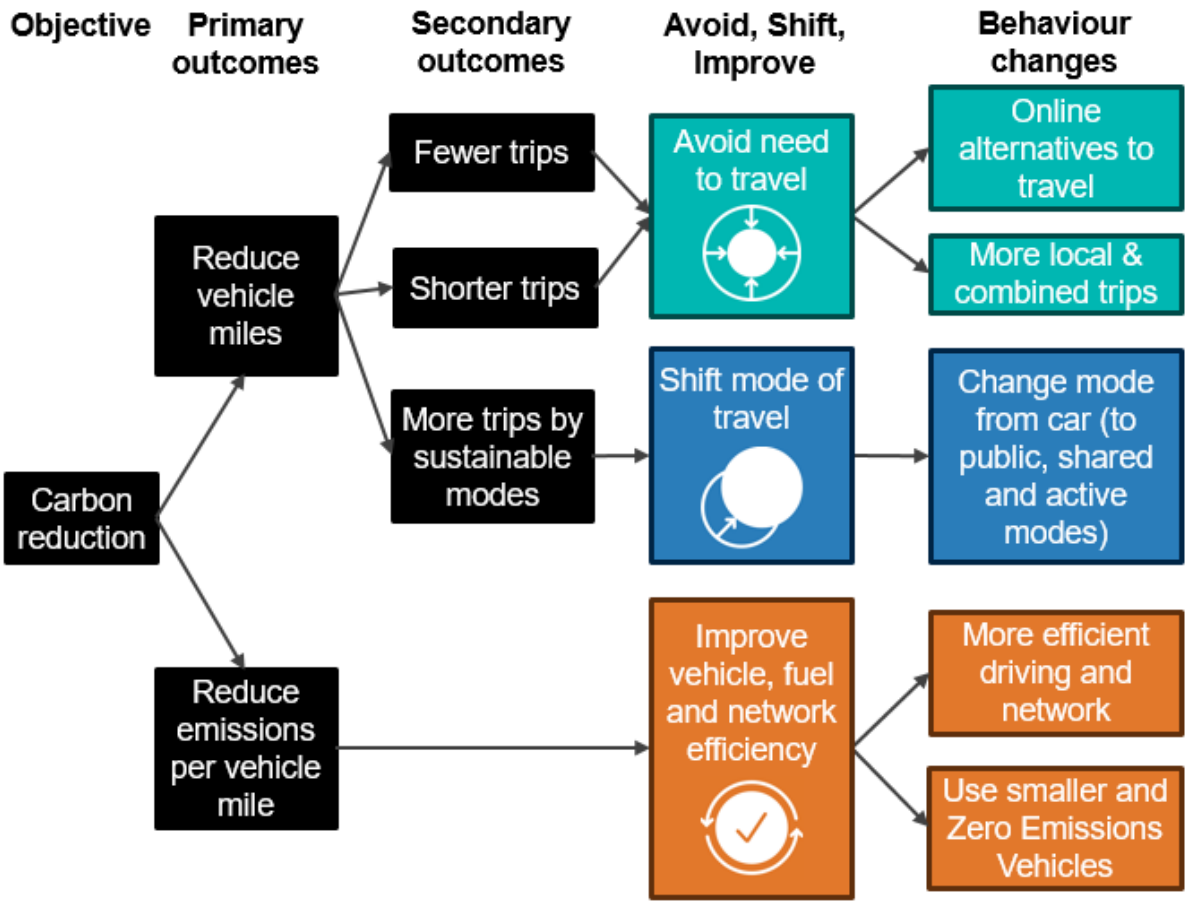
Shifting travel from use of road vehicles by improving the relative attractiveness of options for using more sustainable modes.

- And/or **Reduce average emissions per vehicle mile** by:

Improving vehicle fuel and network efficiency through increasing: the efficiency of driving style and network conditions, the use of smaller vehicles and the rate of uptake of low and zero emission vehicles, mainly electric vehicles (EVs).

Figure 3-1 summarises the five main types of travel behaviour change required to deliver emissions reductions, focussing on passenger transport emissions and grouped in terms of Avoid, Shift and Improve.

Figure 3-1 – Behaviour changes needed to reduce passenger transport user emissions



Closing Wiltshire's transport sector emissions gap will require significant change in each of these areas of behaviour for passenger travel, alongside equivalent changes in freight travel choices.

There is often a focus on Improve measures and particularly EV uptake as offering the solution to closing the emissions gap. However, it is important to recognise that, although EV uptake will have an important role in transport decarbonisation, it cannot be the single route to closing the gap.

This is partly for practical reasons. The uptake required cannot be achieved through purchase of new vehicles alone, as the number of new cars bought each year typically only equates to approximately 6% of the fleet. This means that even if all new cars bought between 2025 and 2030 were EVs they would only account to about 35% of the fleet by

2030. There are also practical limits on the number of vehicles that will be built and available for purchase over that timeframe.

EVs also bring their own challenges including embodied carbon in the production of EVs (which equates to emissions from about 4 to 5 years of petrol mileage for each vehicle); continued traffic congestion and particulate (air) pollution (from tyres, brakes and road wear) as well as high purchase costs (with social exclusion implications).

The practical issues and limits to the potential rate of EV uptake, combined with these wider challenges, highlight that Improve measures cannot be the sole route to closing the emissions gap. A balance of measures from across Avoid, Shift and Improve would be required to deliver the pace and scale of decarbonisation needed to close the emissions gap and follow the decarbonisation pathway.

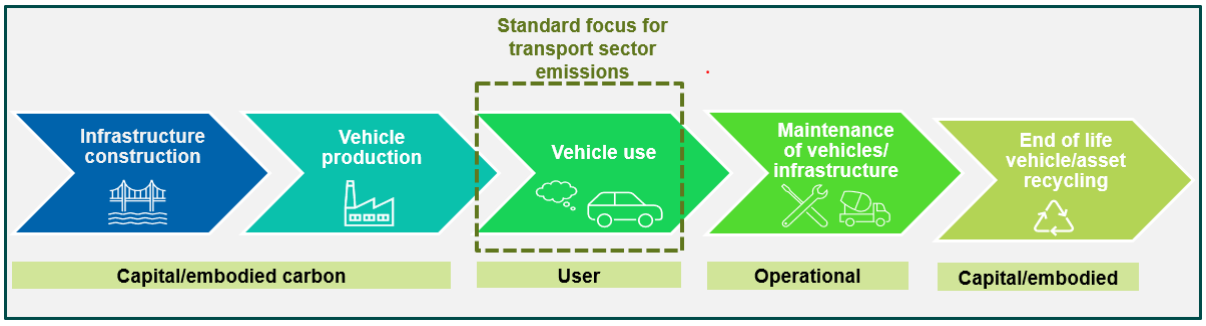
3.2.2. Whole lifecycle emissions of the transport system

The transport sector emissions included in the emissions statistics and decarbonisation pathways summarised in Section 2 relate to emissions produced by vehicles.

In developing measures to reduce transport user emissions, it is important to remember that decisions that influence the transport system have whole lifecycle carbon emissions implications. Figure 3-2 summarises the transport lifecycle highlighting that, as well as influencing transport user emissions, transport decisions also have emissions impacts by influencing the carbon required to build infrastructure, equipment and vehicles ('capital or embodied carbon'), maintain them ('operational carbon') and deal with them at the end of their lives.

Although these emissions are not allocated to the transport sector, they are the result of transport decisions and it is important that decisions related to transport measures take a whole lifecycle perspective, to ensure that intended transport user emissions savings are not offset by wider lifecycle emissions implications.

Figure 3-2 – Whole lifecycle carbon emissions of the transport sector



3.3. The role of carbon considerations in developing LTP4

LTP4 has the potential to support transport decarbonisation in Wiltshire by:

- Supporting and promoting measures to reduce transport user emissions through Avoid, Shift and Improve as described above; and
- Establishing the importance of considering whole lifecycle carbon implications in transport decision making.

Recognising the importance of the decarbonisation challenge for transport, carbon considerations have informed the development of LTP4, to ensure that the measures

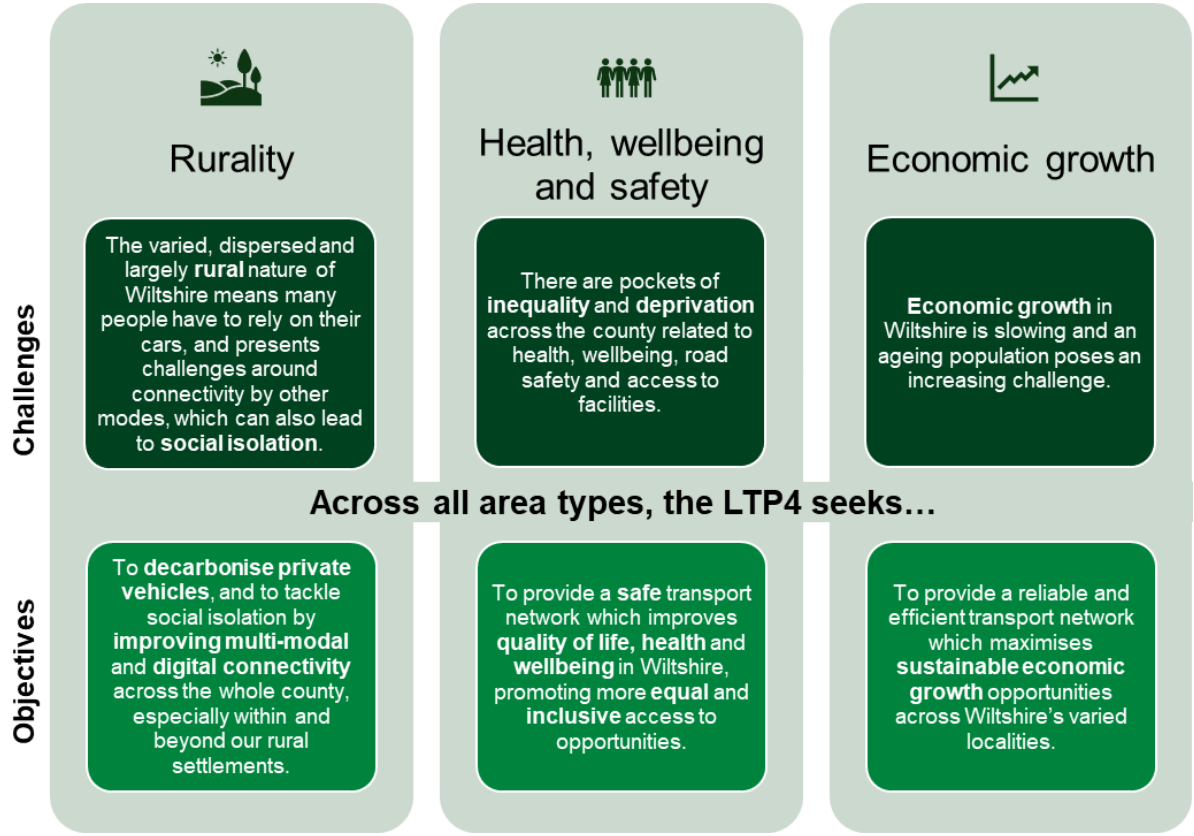
identified are aligned with the need for decarbonisation and will support wider action by individuals, organisations, other sectors and national government to decarbonise transport.

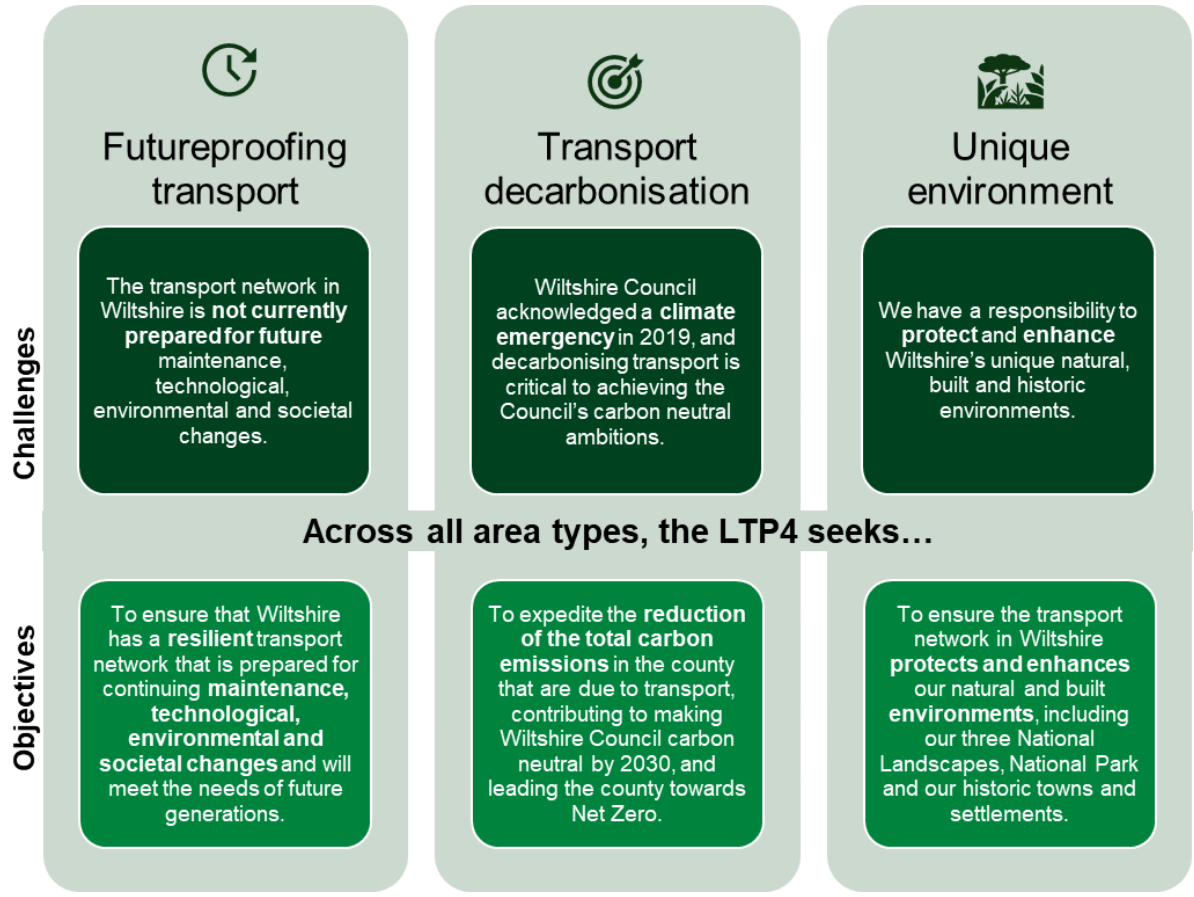
At the highest level, the importance of decarbonisation is reflected in the long-term aspiration for transport in Wiltshire to 2038 and beyond as set out in the LTP4 Vision:

> A safe and connected transport system which protects the county's unique built, natural and historic environment making this accessible for all, supports sustainable economic growth across Wiltshire's communities and contributes to a **low carbon future**.

Decarbonisation is also one of the six objectives defined to help guide the LTP4 in addressing identified challenges and defining priorities for transport in the county, as shown in Figure 3-3.

Figure 3-3 – Summary of challenges and objectives for LTP4





Consideration of decarbonisation issues has therefore informed the development of Core LTP4 Strategy and sub-strategies, based on a sound understanding of the carbon context and scale of the decarbonisation challenge (as summarised in Section 2) and an understanding of the potential scale of emissions impact of LTP4 measures, aligning with Step 3 of the draft QCR guidance. These issues have been considered alongside those associated with the other objectives, including the potential challenges of reducing car use in a county with a largely rural, dispersed population.

The need to reduce transport user carbon emissions underpins the structure of the policies and measures identified for the LTP4 which are framed around three policy areas reflecting the Avoid, Shift and Improve routes to emissions reduction, as introduced in Section 3.2.1 and summarised below. The fourth policy area of Support includes the broader policies and measures that act to support and enable action in some, or all, of the areas of Avoid, Shift and Improve.

Avoid unnecessary travel – giving people the choice to reduce the number and length of car trips needed through promoting digital connectivity; locating services, jobs and other destinations within closer reach; and combining journeys.

Shift to more sustainable modes of transport – providing better and more accessible options for travel via active travel (walking, wheeling, cycling and horse riding), shared transport, and public transport.

Improve vehicle, fuel and network efficiency – through roll out of electric vehicles and charging infrastructure, alternative fuels and technology improvements.

Support and enable delivery of the Avoid, Shift and Improve policy areas – both now and into the future.

Figure 3-4 summarises how the LTP4 vision, objectives, policy areas and policies have fitted together to ensure that decarbonisation considerations have informed the development and form of the LTP4:

- **The vision and six objectives** are at the core of the LTP4: they summarise the LTP4's purpose and ambition.
- **The four policy areas** set out the approach for achieving the LTP4 vision and objectives. Each policy area supports multiple objectives, including decarbonisation.
- Under each policy area, **several policies** have been identified which provide further detail as to how these aims will be achieved.

Figure 3-4 – LTP4 Vision, objectives, policy areas and policies

The four LTP4 policy areas focus on measures to improve transport choices and change travel behaviour and they therefore influence transport user emissions. The consideration of the whole lifecycle implications of changes to the transport system introduced through the LTP4 measures is captured by the underpinning focus on sustainability that runs throughout the LTP4 (as shown around the edge of Figure 3-4). This focus informs the design principles, as set out in the Core LTP4 Strategy, which will ensure that LTP4 delivery is underpinned by a holistic approach to sustainability.

The principles recognise the need to integrate Whole Life Carbon Management (WLCM) considerations into LTP4 and future transport programmes. This means considering both the user carbon impacts of measures (through reductions in vehicle miles or emissions per vehicle mile) and the 'carbon costs' of embodied carbon in new infrastructure, equipment and vehicles needed to unlock these benefits.

In practice, this whole lifecycle perspective is likely to lead to measures that limit the implementation of new infrastructure, instead identifying options to improve journey quality and travel choices through making better use of existing infrastructure.

This is consistent with the approach to carbon management in PAS 2080[20], which advocates an 'Avoid-Switch-Improve' approach to delivery of new infrastructure.

- **Avoid:** reduce the need for new infrastructure in the first place.
- **Switch:** redefine solutions to make better use of existing assets, or consider smaller-scale solutions.
- **Improve:** re-use materials in-situ or review materials choices (for example, low-carbon asphalt).

The focus on sustainability underpinning the LTP4 and its design principles also incorporate the need to adapt to climate change. This involves adapting the transport system and building in resilience to the likely impacts of climate change.

3.4. LTP4 Measures

3.4.1. Scope of influence

The LTP4 includes a wide range of measures with the potential to support transport carbon emissions reductions whilst also contributing to other LTP4 objectives. Many measures contribute to decarbonisation alongside improvements in the local environment, through reduction in traffic leading to reduction emissions of local pollutants and greenhouse gas emissions. Measures that improve wellbeing by enhancing accessibility, travel options and health through increased levels of active travel, also often have the potential to support decarbonisation by reducing vehicle mileage.

The balance of measures reflects the fact that there is most scope for the LTP4 to influence emissions generated by car trips to, from or within Wiltshire. Wiltshire Council has limited potential to influence emissions from car trips made through the county as choices about mode, vehicle type and routing for the trips are mainly driven by factors outside the county's boundaries. The main opportunity for influence on these trips is therefore by collaborating with neighbouring authorities, transport operators and other bodies on cross boundary measures.

[20] BSI (2023) Carbon Management in Infrastructure and Built Environment - PAS 2080. Available at: PAS 2080:2023 Carbon Management in Infrastructure | BSI (bsigroup.com)

There is also only limited scope for LTP4 measures to influence emissions from heavy goods vehicle freight trips because choices about freight trips, most of which are cross boundary, will largely be driven by commercial decisions made in the private sector and by national government action. The greatest potential is in influencing the 'last mile' of deliveries through measures such as consolidation centres. These measures can have significant impact on local pollutant emissions and traffic conditions in towns and urban areas but their impacts on carbon emissions are limited because they only influence a small proportion of mileage.

The following sections provide an overview of the proposed measures in each of the four policy areas, identifying the ways in which they could support user emissions reductions, particularly for car trips.

3.4.2. Avoid measures

Avoid unnecessary travel – giving people the choice to reduce the number and length of car trips needed through locating services, jobs and other destinations within closer reach; providing digital options; and combining journeys.

Avoid measures to provide the opportunity to reduce unnecessary travel generally include collaboration beyond the transport sector, to increase options to reduce travel by undertaking activities online or more locally.

Online options remove the need to travel at all, whilst increased local opportunities provide the potential to reduce average trip length (also increasing likelihood of mode shift) and combine journeys, further reducing travel and emissions.

The LTP4 will influence and support measures to Avoid the need to travel so much through increases in both online and local activity. However, many of the measures will need to be funded, supported or delivered by other parties (as set out in Section 5 of the Core LTP4 Strategy). For example, collaboration with internet providers would be needed to improve ultrafast fibre coverage, and with businesses and other organisations to increase levels of online activity. Table 3-1 lists the Avoid measures included in LTP4 by place type and county-wide theme. The measures largely target reductions in car travel but a number of measures focus on reducing the travel associated with deliveries, for instance through consolidation centres and parcel pick up points.

Whilst many of the measures are relevant across the county and different place types, the emphasis will vary between places. For instance, improved coverage of fibre broadband connection is mainly required in Rural Areas, whilst the nature of local services and amenities provided will vary between Principal Settlements and Rural Areas.

Table 3-1 – Avoid measures by place type and county wide strategy

Policy area	Measure	Place-based sub-strategies				County-wide sub-strategies			
		Principal Settlements	Market Towns	Rural Areas	Overarching	Freight	Parking	EVs	Strategic Transport
Avoid unnecessary travel 	**A1** Reduce the need to travel as often through combining journeys and providing digital options								
	A1.1: Improving ultrafast fibre coverage to enable access to online services			✓					
	A1.2: Review of consolidation centres					✓			
	A1.3: Planning for HGV deliveries in new developments					✓			
	A2 Enabling access to services, jobs and other destinations within closer reach								
	A2.1: Co-working spaces	✓	✓	✓					
	A2.2: Provide local services and amenities to reduce travel	✓	✓	✓					
	A2.3: Ensure design requirements are met for new developments	✓	✓						
	A2.4: Parcel pick-up points at local hubs		✓	✓					

3.4.3. Shift

Shift to more sustainable modes of transport – providing better and more accessible options for travel via active travel (walking, wheeling, cycling and horse riding), shared transport, and public transport.

Shift measures aim to reduce emissions from travel by car or road freight by encouraging a shift to make journeys instead by rail, bus, shared transport, or active travel. The measures also improve the options available to those already using sustainable modes.

Table 3-2 lists the proposed Shift measures included in LTP4 by place type and countywide strategies. They include a range of actions to:

- Encourage mode shift to active travel by increasing provision of new cycling and walking routes, facilities and interchange and making walking and cycling environments more attractive and safer. These measures are important in providing an integrated, multi-modal, low carbon transport system. The potential impact on carbon emissions of individual trips shifting from car to active travel is relatively low as they are short trips which only account for a small proportion of emissions (as outlined in Section 2). However, the potential influence increases when active travel is used as the first or last

leg of longer public transport journeys and when combined with measures to encourage more local activity, resulting in shorter and more combined trips.

- Encourage mode shift to public and shared transport by improving the coverage, frequency, quality and range of services provided and improved interchanges and accessibility and fares. These measures have the potential to encourage mode shift for longer journeys and are likely to be focussed particularly on serving journeys to and from the Principal Settlements and Market Towns. It is difficult to provide viable public transport options for the dispersed journeys in rural areas, although there may be more scope to develop shared transport options.
- Measures to encourage mode shift for freight through supporting measures to help wider moves to encourage shift to rail and more local moves to encourage shift to options such as e-cargo bikes for the last or first mile of delivery.

These measures reflect the fact that achieving successful mode shift relies on providing attractive alternatives to car use. The ability to achieve this varies by place type, with more scope in towns where dense populations and trip patterns provide more viable opportunities for providing public transport and active travel options.

The LTP4 measures will play a key role in delivering improvements in travel options by sustainable modes bringing a range of benefits, including improvements in accessibility and wellbeing. However, the potential to achieve greenhouse gas emissions reductions through these measures is limited by the well-recognised fact that it is challenging to encourage car owners to shift mode from using car to other modes, even where good options exist. This is discussed further in Section 3.6.

Table 3-2 – Shift measures by place type and county wide strategy

Policy area	Measure	Place-based sub-strategies				County-wide sub-strategies			
		Principal Settlements	Market Towns	Rural Areas	Overarching	Freight	Parking	EVs	Strategic Transport
Shift to more sustainable modes of transport 	**S1** Enable active travel to be the preferred choice for shorter journeys (or as part of a longer journey) by improving journey safety, access and quality								
	S1.1: Deliver the infrastructure improvements identified in our LCWIPs	✓	✓	✓					
	S1.2: Public realm improvements	✓	✓	✓					
	S1.3: Wayfinding	✓	✓	✓					
	S1.4: Cycle parking	✓	✓	✓					
	S1.5: Safer movement for active travel	✓	✓	✓					
	S1.6: Reduced vehicle speeds where appropriate, especially in or adjacent to residential areas	✓	✓	✓					

Policy area	Measure	Place-based sub-strategies				County-wide sub-strategies			
		Principal Settlements	Market Towns	Rural Areas	Overarching	Freight	Parking	EVs	Strategic Transport
	S1.7: Cycle hire schemes	✓	✓	✓					
	S1.8: Freight kerbside delivery management					✓			
	S2 Provide more public and shared transport options, and improve service quality								
	S2.1: Bus infrastructure and service improvements on key corridors								✓
	S2.2: Implementation of new DRT services								✓
	S2.3: Ride sharing, including shared taxis	✓	✓	✓					
	S2.4: Support for more frequent or new direct rail services								✓
	S2.5: Support for rail capacity upgrades								✓
	S2.6: Supporting availability of train servicing facilities								✓
	S3 Provide better access to public and shared transport services								
	S3.1: Improve access to and from public transport stops and stations by sustainable modes of travel	✓	✓	✓					
	S3.2: New stations		✓						
	S3.3: Improved waiting and interchange facilities at bus stops and stations								✓
	S3.4: Provision of real time passenger information at bus stops								✓
	S3.5: Rail station upgrades								✓
	S3.6: Mobility hubs	✓	✓	✓					
	S3.7: Explore the role and function of Park and Ride								✓
	S3.8: Smarter ticketing and payment on buses								✓
	S3.9: Accessible and inclusive buses and infrastructure								✓

Policy area	Measure	Place-based sub-strategies				County-wide sub-strategies			
		Principal Settlements	Market Towns	Rural Areas	Overarching	Freight	Parking	EVs	Strategic Transport
	S3.10: Lower and simpler bus fares								✓
	S3.11: Multi-modal ticketing								✓
	S3.12: Coach parking								✓
	S4 Influence the demand for private car use, ensuring improved access and journey time reliability for those who need it most								
	S4.1: Improved car parking signage						✓		
	S4.2: Provision and consistency of disabled parking						✓		
	S4.3: Review of parking payment methods						✓		
	S4.4: Review of parking charges						✓		
	S4.5: Review of our existing parking assets						✓		
	S4.6: Resident permit zones						✓		
	S5 Encourage and enable shift to more sustainable modes for freight								
	S5.1: Micro-consolidation and use of alternative modes for first/last mile					✓			
	S5.2: Shifting freight from road to rail					✓			
	S5.3: Safeguarding land for rail and consideration of rail freight interchange site					✓			

3.4.4. Improve

Improve vehicle, fuel and network efficiency – through roll out of electric vehicles and charging infrastructure, alternative fuels and technology improvements.

Improve measures aim to reduce the emissions per vehicle mile travelled. Table 3-3 lists the proposed Improve measures included in LTP4 which aim to achieve this change through two main routes:

- Facilitating and encouraging the move to low and zero emissions vehicles through routes including expanding the coverage of EV car clubs, roll out of relevant charging infrastructure and more general support for upgrade of fleets, including buses and coaches, freight and rail (through electrification).
- Encourage and enable safer, more efficient driving and operation of road networks including measures to ease congestion resulting in more efficient driving conditions, decreasing emissions rates.

Many of these measures would be particularly focussed on the Principal Settlements and Market Towns where new charging infrastructure and car club vehicles would be accessible for more journeys and congestion is more likely to exist.

The LTP4 will be able to support and influence Improve measures but impact on carbon emissions will also require action from individuals, organisations and other sectors to fund, support and/or deliver the measures. For instance, the LTP4 measure to 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 an EV. Other LTP4 measures will also help to raise awareness and provide opportunities for uptake (such as through car clubs). However, a number of other influences beyond the scope of LTP4 (such as travel patterns and perceptions of vehicle types) will also affect the decisions by individuals or businesses over whether to use EVs.

Table 3-3 – Improve measures by place type and county wide strategy

Policy area	Measure	Place-based sub-strategies				County-wide sub-strategies			
		Principal Settlements	Market Towns	Rural Areas	Overarching	Freight	Parking	EVs	Strategic Transport
Improve vehicle, fuel and network efficiency 	**I1** Facilitate and encourage move to low and zero emission vehicles								
	I1.1: Roll out public on-street residential charging at scale, focusing provision for residents with no off-street parking							✓	
	I1.2: Encourage and facilitate EV charging provision in new developments and refurbishments							✓	
	I1.3: Ensure that public EV charging is located through robust data analysis and community consultation, employing technology appropriate to its context							✓	
	I1.4: Support the roll out of rapid charger hubs by the commercial sector, ensuring chargers are appropriately located and minimise any associated risks							✓	

Policy area	Measure	Place-based sub-strategies				County-wide sub-strategies			
		Principal Settlements	Market Towns	Rural Areas	Overarching	Freight	Parking	EVs	Strategic Transport
	I1.5: Investigate the use of cable channel products to enable safe cross-pavement on-street home charging							✓	
	I1.6: Support EV uptake in corporate fleets and car clubs							✓	
	I1.7: Support and publicise regional and national schemes which help make EVs more financially accessible							✓	
	I1.8: Explore adopting policies and support to increase the number of EV taxis							✓	
	I1.9: Ensure that new EV chargers maximise accessibility for both drivers and footway users							✓	
	I1.10: Ensure new public EV charging includes provision for deprived areas and rural locations							✓	
	I1.11: Support for low emission freight					✓			
	I1.12: Expand EV car club coverage	✓	✓	✓					
	I1.13: Support of cleaner, modernised buses and coaches, and related charging infrastructure								✓
	I1.14: Support rail electrification								✓
	I2 Enable safer, more efficient driving and operation of road networks								
	I2.1: Improve our use of technology in traffic and congestion monitoring	✓	✓						
	I2.2: Engage with and prepare for the rollout of new transport technologies	✓							
	I2.3: Improvements to on-road signage on our strategic and major roads								✓

Policy area	Measure	Place-based sub-strategies				County-wide sub-strategies			
		Principal Settlements	Market Towns	Rural Areas	Overarching	Freight	Parking	EVs	Strategic Transport
	I2.4: HGV parking and rest stops					✓			
	I2.5: Moving traffic offences					✓			
	I2.6: Targeted road infrastructure or junction improvements to relieve congestion								✓

3.4.5. Support

Support and enable delivery of the Avoid, Shift and Improve policy areas – both now and into the future.

Support measures are broad measures intended to support successful delivery of the Avoid, Shift and Improve measures. Table 3-4 lists the proposed Support measures in LTP4 which include:

- Measures that improve knowledge of and ability to use travel options available through awareness raising, training and measures to incentivise change in travel mode (such as apps, mobility credits and the introduction of Mobility as a Service to provide easy access to information on and booking for different travel options) and measures to encourage more efficient driving choices such as the use of efficient driving techniques.
- Activity to work in partnership with Government bodies and stakeholders to support wider measures that need collaboration to progress.
- Activity to develop more detailed plans to progress the proposed measures, such as establishing and managing a road classification, road layout and road user hierarchy.

These measures are generally county-wide and overarching, rather than being focussed on particular place types.

Table 3-4 – Support measures by place type and county wide strategy

Policy area	Measure	Place-based sub-strategies				County-wide sub-strategies			
		Principal Settlements	Market Towns	Rural Areas	Overarching	Freight	Parking	EVs	Strategic Transport
Support and enable delivery of the Avoid, Shift and Improve policy areas 	**SU1** Empower people will the skills, knowledge and motivation they need to safely access more sustainable and healthier transport								
	SU1.1: Raise awareness of sustainable travel options				✓				
	SU1.2: Travel plans				✓				
	SU1.3: Raise awareness of local facilities, amenities and services				✓				
	SU1.4: Incentives for physical activity				✓				
	SU1.5: Interventions for older road users				✓				
	SU1.6: Cycle training to improve skills and confidence				✓				
	SU1.7: Roll out of safety apps				✓				
	SU1.8: Mobility credits				✓				
	SU1.9: Implement Mobility as a Service (MaaS)				✓				
	SU1.10: Reduced carbon intensity of travel via more efficient driving				✓				
	SU1.11: Multi-modal marketing								✓
	SU1.12: Ticketing incentives								✓
	SU2 Work in partnership with Government bodies, stakeholders to improve transport for all								
	SU2.1: Working with businesses to facilitate home working and flexible working				✓				
	SU2.2: Providing, or supporting applications for, grants to businesses and community groups for active travel facilities				✓				
	SU2.3: Work collaboratively with our key stakeholders								✓
	SU2.4: Supporting Community Rail Partnerships								✓

Policy area	Measure	Place-based sub-strategies				County-wide sub-strategies			
		Principal Settlements	Market Towns	Rural Areas	Overarching	Freight	Parking	EVs	Strategic Transport
	SU3 Develop more detailed plans for how our LTP4 Vision and Objectives will be delivered								
	SU3.1: Coordination of street works and roadworks				✓				
	SU3.2: Network maintenance				✓				
	SU3.3: Establish and actively manage a road classification, road layout and road user hierarchy				✓				
	SU3.4: Support for Masterplanning				✓				
	SU3.5: Adopt 'Vision Zero' ambition and Safe System approach				✓				
	SU3.6: Freight Assessment and Priority Mechanism (FAPM)					✓			
	SU3.7: Define route restrictions through Advisory Freight Routes					✓			
	SU3.8: Develop a detailed parking operation and delivery plan						✓		
	SU3.9: Refresh our transport policies and plans					✓			

3.5. Potential emissions impact of LTP4

3.5.1. Overview

This section outlines an indicative estimate of the scale of carbon emissions reduction that could be supported by the impact of the LTP4 measures outlined above, if implemented in combination with related action by individuals, organisations and other sectors.

Section 3.5.2 provides a summary of the approach used to develop the estimate, in line with Step 4 of the draft QCR guidance.

The subsequent sections then discuss how the policy areas contribute to the emissions reduction, the extent to which the estimated reductions could close the identified emissions gap and the type of further action that would be needed to close the remaining gap.

3.5.2. Emissions impact estimate

Inputs used

The indicative estimate of the potential reduction in emissions supported by the proposed LTP4 measures drew on a range of inputs including:

- The baseline transport emissions projections for Wiltshire, developed using data from the Wiltshire Traffic Model, as outlined in Section 2.2.4 and Annex B.
- Details of current and projected travel levels and patterns from sources including DfT Bus Statistics[21], Office for Road and Rail station usage statistics[22], DfT Cycling Statistics[23] DfT traffic estimates[24], DfT TEMPRO software[25] and the National Travel Survey.[26]
- Parameters and values from sources including the DfT Transport Analysis Guidance databook.[27]

The estimates of emissions reductions were made relative to the baseline for 2030, calculated for the baseline and pathways analysis set out in Section 2.2.4.

Approach to assessment and input assumptions

Given the relatively broad level at which the LTP4 measures are specified at this stage, it was not feasible to develop a detailed assessment of emissions reductions, which would require information about the location and characteristics of individual proposed interventions and the patterns of travel in impacted areas. Instead, the estimate was developed to provide an understanding of the scale of change that the combined Avoid, Shift, Improve and Support measures could potentially support, if implemented in combination with related action from individuals, organisations and other sectors (such as individuals and businesses choosing to use EVs, and planning and business support for digital and local activity).

The assessment was based on high-level estimates of the scale of change in travel behaviour and choices that could potentially be supported by the measures by 2030, assuming that they are implemented with a focus on improving available options for travel and alternatives, rather than introducing a step change in the balance between the costs and convenience of using car and other modes. The assumptions used are set out in Table 3-5 and focus mainly on reductions in emissions from car travel, reflecting the balance of measures outlined in the previous section.

The estimate focusses on the impact in 2030 since the degree of uncertainty around issues such as rates of behaviour change increases further into the LTP4 period.

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[21] DfT (2024) Bus statistics. Table Bus01e: Passenger journeys on local bus services by local authority. Available at: Bus statistics data tables - GOV.UK (www.gov.uk)

[22] Office for Road and Rail (2024) Table 1415: Time series of passengers' entries exits and interchanges by stations. Available at Estimates of station usage | ORR Data Portal

[23] DfT (2024), Walking and Cycling Statistics. Available at: Walking and cycling statistics - GOV.UK (www.gov.uk)

[24] DfT (2024), Traffic Estimates Table TRA8905: Motor vehicle traffic by local authority and selected vehicle type in Great Britain Road traffic estimates (TRA) - GOV.UK (www.gov.uk)

[25] DfT Trip End Model Presentation Programme (TEMPRO 8.1). Available at: Trip End Model Presentation Program (TEMPro) download - GOV.UK (www.gov.uk)

[26] DfT (2023) National Travel Survey 2022. Available at: National Travel Survey - GOV.UK (www.gov.uk)

[27] DfT (2024) Transport Analysis Guidance Databook: May 2024. Available at: Transport analysis guidance - GOV.UK (www.gov.uk)

Table 3-5 – Assumptions on changes in travel behaviour and choices supported by LTP4 measures

Avoid

- Maintenance to 2030 of up to a 5% reduction in car travel from the reductions in travel still seen following the COVID-19 pandemic. Reduction is primarily assumed to be the result of reduced trip numbers due to more online activity resulting from digital trends accelerated by COVID-19 restrictions, supported by some localisation of activity.

Shift

- The target 10% growth in bus patronage by 2030 (from 2019) identified in the 2021 Wiltshire BSIP is assumed to be achieved, along with similar levels of growth in rail patronage and cycling.
- 2% to 5% increase in car sharing by 2030.
- 1% reduction in van emissions in 2030 due to last mile mode shift offsetting growing deliveries.

Improve

- Improved efficiency of car and van travel as a result of eco-driving or improved network management for up to 5% of travel in 2030.
- A further acceleration of the rapid uptake of EVs assumed to be in addition to the uptake occurring in the baseline projections as a result of national action. Uptake is assumed to accelerate by approximately 6 months to 1 year compared to levels achieved by national action alone by 2030. This equates to approximately an additional 10% to 15% of car and LGV mileage by EVs in 2030 in addition to the assumed impact based on national action.

Further detail on the basis for the assumptions set out in Table 3-5 is provided in Annex C.

Estimated impact

The estimate based on the assumptions outlined above and in Annex C indicates that the combination of LTP4 measures and relevant action from individuals, organisations and other sectors could support changes in travel behaviour and choices with the potential to reduce carbon emissions by approximately 5% to 10% by 2030 (relative to the projected baseline).

The mid-point of the range would close approximately one quarter of the identified emissions gap in 2030 (fully closing the gap would require an emissions reduction from the baseline of approximately 30%, as outlined in section 2.2.4). This indicates that the LTP4 measures, in combination with relevant action from individuals, organisations and other sectors, would support a positive contribution to decarbonisation and progress towards a low carbon transport system for Wiltshire. However, the indicated reduction leaves a significant emissions gap that would need to be closed if transport emissions are to be brought in line with the identified decarbonisation pathway that meets national decarbonisation commitments. The next section provides further discussion on the contribution to the estimated emissions reduction from Avoid, Shift and Improve measures, and Section 3.6 discusses the types of additional action beyond the measures included in LTP4 that would be likely to be needed to close the emissions gap

It is important to recognise that there are limits to the scope of emissions that LTP4 measures are able to influence. As outlined in Section 3.4.1, there is limited potential for

LTP4 measures to influence emissions from freight and through trips. For instance, HGV traffic accounts for nearly 20% of transport emissions in Wiltshire but local measures largely influence only the last leg of delivery. The measures have an important impact on local air quality, traffic and town environment, but a more limited impact on carbon emissions as the trip stage affected accounts for only a small proportion of overall HGV travel.

3.5.3. Contributions to estimated emissions reduction

Balance between Avoid, Shift and Improve measures

The LTP4's greatest potential for supporting emissions reduction through reduced vehicle mileage is through supporting the **Avoid** measures, which encourage the continued reductions in levels of car travel that have persisted since the COVID-19 pandemic, particularly for commuting, business and shopping purposes. This involves continuing to support action by businesses and other sectors to encourage and enable online activity and the localisation of trips to reduce average trip lengths and increase their scope to be combined or shift to other modes.

These measures account for approximately 40% of the estimated emissions reduction (of 5% to 10%). As outlined in Section 3.4, relevant measures to support these changes fall in the categories of:

- **A1** Reduce the need to travel as often through combining journeys and providing digital options
- **A2** Enabling access to services, jobs and other destinations within closer reach

Improve measures to accelerate EV uptake and improve efficiency of car travel also have the potential to contribute to emissions reduction by reducing emissions per vehicle mile.

These measures account for approximately 50% of the estimated emissions reduction (of 5% to 10%). Measures to deliver the changes fall within the following categories:

- **I1** Facilitate and encourage move to low and zero emission vehicles
- **I2** Enable safer, more efficient driving and operation of road networks

As outlined above, LTP4 measures could support action by individuals, organisations and other sectors to promote EV uptake. However, it is important to recognise that achieving the increases in EV uptake assumed compared to the baseline would need significant action, as the baseline projections used to calculate the emissions gap already assume relatively rapid uptake of EVs as a result of national action, which would already require support from local action such as roll out of electric charging points.

To support the additional uptake, a particular area of emphasis would need to be on encouraging EV uptake amongst vehicles with above average mileage, including company cars and car club vehicles. This approach would help to ensure that greater mileage is converted to electric power with each new vehicle, helping to overcome issues associated with limited supply of vehicles and the embodied carbon associated with their construction.

The wide range of measures in the LTP4 to encourage mode **Shift** by improving the alternatives to car use (and to a lesser extent road freight) would also make a contribution to emissions reduction and move towards a low carbon transport system, through measures in the following categories:

- **S1** Enable active travel to be the preferred choice for shorter journeys (or as part of a longer journey) by improving journey safety, access and quality.
- **S2** Provide more public and shared transport options, and improve service quality.

- **S3** Provide better access to public and shared transport services.
- **S5** Encourage and enable shift to more sustainable modes for freight.

The relatively small scale of the estimated emissions reduction achieved by Shift measures (approximately 10% of the total estimated reduction) is consistent with the impact of previous programmes of measures to increase travel by sustainable modes (see Box 4) and highlights the challenge of achieving significant reductions in carbon emissions through mode shift in areas of high car ownership. This issue is discussed further in the next section.

Box 4: Local Sustainable Travel Fund Impact

Recent research by bodies such as Transport Scotland and NatCen has highlighted that evidence of the impact of integrated measures to increase travel by sustainable modes is very limited. However, one valuable source is the evaluation of impacts of the Local Sustainable Travel Fund (LTSF) through which the DfT provided £540 million of funding to local authorities between 2011 and 2015. Funding was used to make sustainable modes more attractive and improve bus and rail patronage and active travel. Measures ranged from new infrastructure to new services and training programmes and were focussed in urban areas and on 'pull factors' to attract those travelling to move to public transport rather than 'push factors'. Evaluation of the impact of the fund indicated the measures achieved a 2.3% reduction in car mileage per person and a 2.2% reduction in carbon compared to comparator locations.

Transport Scotland (2021) 20% Reduction in car km by 2030

Natcen (2020) Impact of interventions encouraging a switch from cars to more sustainable modes of transport. A rapid evidence review.

Transport for Quality of Life (2017) Impact of the Local Sustainable Travel Fund. Synthesis of Evidence

The challenge of achieving emissions reduction through mode shift

The key issue underlying the challenge of achieving significant reductions in emissions through mode shift can be illustrated by the current relative levels of travel by each mode. The number of miles travelled by car drivers in Wiltshire was estimated to be over 50 times the number of miles travelled by bus passengers in 2019 (and over 70 times by 2023 due to the post COVID-19 decline in bus patronage). For rail, the equivalent ratio was 30 to 40 in 2019 and 2023. For cycle the ratio was over 70 in 2019 (i.e. the number of car driver miles is estimated to be over 70 times the number of cycling miles).

These relative levels of travel mean that a 1% decrease in car vehicle miles through mode shift would cause in increase in bus patronage of over 50%, or an increase of over 30% in rail patronage and of over 70% in cycling levels (assuming that the car trips diverted directly to bus, rail or cycling trips of the same length).

Consequently, although the target 10% increase in public transport use assumed is relatively ambitious, the impacts on scale of car travel will be limited. Impacts on traffic levels will be further limited by the fact that, in practice, a significant proportion of the 10% increase in use of sustainable modes is likely to come from other modes, car passengers or new trips, rather than diverting from car driver trips.

These large differences in current levels of travel by mode reflect high levels of car ownership and the fact that, once people own a car, driving becomes the most convenient and cheapest option for the majority of trips. This balance between the cost and convenience of different modes represents the major challenge in delivering decarbonisation through mode shift.

Fuel costs (the main cost of car use likely to be considered on a per trip basis) only account for approximately 40% of the annual costs of owning a car on average[28] 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 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, which reduces 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.

COM-B model of behaviour change

The COM-B model of behaviour change[29] (see Box 5) illustrates this issue. The Model identifies that, in order to make a change in travel behaviour, people need all three of the Capability, Opportunity and Motivation to change. Most of the proposed LTP4 mode shift measures focus on providing Capability (e.g., improved travel information and accessibility of services) and Opportunity (e.g., improved services serving more routes) by providing attractive alternatives to car use. It is acknowledged that without elements to provide the Motivation to change, the measures are not likely to achieve significant mode shift from car drivers and therefore emissions reductions from reduced car use. Delivering motivation is likely to require a change in the balance of the costs and convenience of travelling by different modes. For Wiltshire, this approach would be considered as a secondary step once alternative travel opportunities exist.

Box 5: The COM-B theory of behaviour change suggests that three conditions need to be met for a person to change their travel behaviour:

- **Capability** - the person's psychological and physical capacity to undertake the relevant activity (such as taking a bus). It includes having the necessary knowledge and skills *(such as awareness of public transport timetables, routes and fares).*
- **Opportunity** - all of the external factors beyond a person's influence that make the behaviour possible or prompt it *(such as the availability of bus services at the relevant time and serving the relevant route).*
- **Motivation** - defined as the brain processes that energise and direct behaviour. They include habits, emotional responses and **analytical** decision-making *(including deciding on using the bus based on relative cost and convenience of available*

[28] Source: Research by the Nimblefins financial advice website: Nimblefins (2024), Average Cost to Run a Car UK 2024. Available at: Average Cost to Run a Car UK 2024 | NimbleFins.

[29] 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). https://doi.org/10.1186/1748-5908-6-42

Differences between place types

The indicative emissions reductions supported by Avoid, Shift and Improve actions set out above are broad countywide averages. The balance will differ by place type.

Transport decarbonisation requires measures that reduce vehicle miles and emissions per vehicle mile in all place types. The range of relevant measures required to achieve emissions reductions will therefore be similar for each place type and it will be important to plan and implement measures in an integrated, efficient way across the county. However, the variation in characteristics between place types will mean that the impacts of measures will vary, as will the balance required between measures that reduce car miles and measures that reduce emissions per mile.

Density of population and trip attractions is a key influence on the likely balance of measures by place type. This affects the likely viability of attractive public and shared transport and active travel alternatives, and the possibility of providing and expanding local services and therefore the potential to provide suitable capability and opportunity to change travel behaviour away from car use. In Rural Areas with dispersed populations there is less potential to deliver viable alternatives to car travel which would provide the opportunity for a mode shift away from car. Therefore, measures in Rural Areas are likely to need to focus more on the need to improve the vehicles used for any travel undertaken (through increased use of more efficient and electric vehicles) and to avoid the need to travel as often and/or as far.

3.6. Closing the emissions gap

Closing the emissions gap in 2030 would require approximately a further 20% to 25% reduction in emissions in addition to the reductions supported by the LTP4 measures (in combination with relevant action by individuals, organisations and other sectors), estimated on the basis of the assumptions set out in Table 3-5.

Closing this gap would require national and regional action to address emissions from trips over which LTP4 measures have limited influence. In particular, action would be needed in relation to freight trips (for which decisions are largely driven by commercial and national Government influences) and trips passing through the county.

Wider national action would also be needed to achieve further reductions in emissions from passenger trips to, from and within the county. Achieving the level of emissions reduction required would likely necessitate an underlying change in approach to private travel and car usage. This would involve measures beyond those included in LTP4 and which are likely to be most effective if introduced at the regional or national level.

Assuming that the additional emissions reductions to close the gap are split evenly between reductions in vehicle miles (Avoid and Shift measures) and reductions in emissions per vehicle mile (Improve measures), closing the emissions gap would involve:

- 10% to 15% reduction in emissions through Improve measures.
- 10% to 15% reduction in emissions as a result of a reduction in vehicle miles through Avoid and Shift measures.

Other balances of measures could be applied instead of this even split. For instance, an even split between Avoid, Shift and Improve measures could be assumed. However, as outlined in Section 3.2.1, it is important to note that there are limits to the scale of change that can be achieved through Improve measures and the uptake of EVs alone. Practical limits are imposed through the rate at which the vehicle fleet can physically change and the rate at which new vehicles can be built and supplied. There are also important whole

lifecycle carbon implications of building new, relatively carbon intensive EVs. Additionally, EVs do not address other negative impacts of car traffic such as congestion, social exclusion, road maintenance, and some elements of air pollution.

Therefore, although, EVs are often cited as the solution to transport decarbonisation, they cannot close the emissions gap alone. A balance of measures from across Avoid, Shift and Improve would be required in addition to those included in the LTP4 to deliver the pace and scale of decarbonisation needed to close the emissions gap and reach the decarbonisation pathway.

The implied changes required to further close the emissions gap beyond LTP4 measures would require substantial changes in travel patterns and behaviour.

Achieving the further 10% to 15% reduction in emissions through **Improve** measures, in addition to the baseline rate of EV uptake already assumed and the impact of LTP4 measures, would be challenging. A change in approach to car use towards pay per use (car clubs) could support the acceleration needed. Widespread availability of pay per use EVs would accelerate their uptake more effectively than if the vehicles were privately owned, since each car club vehicle is estimated to replace about 25 private vehicles on average and drivers would not face the off-putting upfront cost of buying an EV. Pay per use vehicles would also support the use of smaller, more efficient vehicles[30] as drivers would be able to hire the most appropriate vehicle for a given journey rather than have a car chosen to be large enough to accommodate occasional journeys (like holidays) that is used for all journeys, regardless of size requirements.

A further reduction of approximately 10% to 15% in emissions through a reduction in vehicle miles in 2030 achieved by **Avoid and Shift** measures, in addition to the changes supported by LTP4, would represent a significantly larger reduction in car travel than has been achieved through transport plans in the past (see Box 4). The reduction would involve considerable changes in travel behaviour and choices, including substantial mode shift away from car use.

As outlined in Section 3.5.3 changes of this scale would likely require a change in the approach to car use to provide the motivation needed.

Measures to change the approach to car use have the potential to accelerate EV uptake and bring the change in balance of the cost and convenience of different modes that is needed to bring about significant mode shift and contribute to decarbonisation. Many of the measures involved are most likely to be effective if implemented at the regional or national scale.

Any measures considered would need to be carefully designed and implemented to ensure that they do not have negative impacts on issues such as wellbeing and accessibility. For instance, in Rural Areas dispersed populations and trip patterns make it challenging to provide the viable public and shared transport services which would be needed to provide the capability and opportunity for individuals to switch away from car use, without being potentially affected by a loss of accessibility.

Taking a whole lifecycle carbon perspective, any measures developed would also need to account carefully for lifecycle carbon impacts. This is likely to involve focussing on making best use of existing infrastructure and limiting the amount of new infrastructure (with

[30] Using a small car rather than a medium or large car can save ~ 30% emissions per km on average based on emissions factors by vehicle in the DESNZ Greenhouse Gas Conversion Factors 2024

associated embodied carbon).The LTP4 Avoid, Shift and Improve measures seek to improve travel choices by sustainable modes, and provide the foundation for making more sustainable travel possible. They would provide a good basis for any future wider action and would support and enhance the decarbonisation impacts of any such measures introduced.

Overall, addressing decarbonisation is a shared challenge and the scale of decarbonisation required to close the emissions gap will need action both at and beyond the local level. National and regional level action will be needed both to achieve larger reductions in passenger transport emissions and to address the majority of freight emissions.

The identified Support measures of working in partnership with Government bodies and stakeholders therefore provide an important route through which the LTP4 will support decarbonisation working to address this shared challenge.

4. Concluding summary

4.1. Context and scale of the decarbonisation challenge

Decarbonising the transport sector is recognised to be an important and significant challenge for Wiltshire, as it is for other authorities, nationally and internationally. The transport sector generated 38% of Wiltshire's greenhouse gas emissions in 2022 and emissions have remained at similar levels for decades, whilst emissions from other sectors have decreased. Car use accounts for approximately 60% of these emissions, with longer trips and travel by more rural and wealthier households contributing above average levels of emissions.

Projected baseline transport carbon emissions for Wiltshire indicate that, without further decarbonisation action, there will be a substantial 'emissions gap' between projected emissions and the identified decarbonisation pathway (the midpoint of the DfT's Transport Decarbonisation Plan pathway). Closing the emissions gap would require reductions of emissions from the baseline projections of approximately 30% in 2030 and 55% in 2035. These decreases are in addition to the emissions reductions already included in the baseline projections as a result of relatively rapid take up of EVs achieved by national action such as the Zero Emissions Vehicle mandate and bans on the sales of new petrol and diesel vehicles.

4.2. Role of LTP4

In recognition of the scale of the decarbonisation challenge, carbon considerations are part of the LTP4 vision and objectives and have informed the development of the LTP4, alongside the issues associated with other objectives, including the challenges of reducing car use in a county with a largely rural and dispersed population. The policies and measures developed for the LTP4 are categorised in terms of Avoid, Shift and Improve approaches to supporting carbon emissions reductions, along with a broader category of Support measures.




The importance of incorporating whole lifecycle carbon considerations and management for any changes to the transport system resulting from the LTP4 measures is recognised in the LTP4's sustainability principles.

The high-level assessment presented in Section 3 indicates that the combination of LTP4 measures with relevant action by individuals, businesses and other sectors, could potentially support transport sector emissions reductions that would close approximately one quarter of the emissions gap in 2030. This reduction is largely driven by Avoid and Improve measures to reduce the need to travel and accelerate the uptake of EVs, building on national action (for instance through a focus on upgrading high mileage vehicles and fleets).

The LTP4 measures will therefore support decarbonisation and progress towards a low carbon transport system for Wiltshire. They will also make significant contributions to the other five LTP4 objectives including benefits for health, wellbeing, safety and our unique environments through reductions in traffic levels and improved travel options.

However, the measures will not close the emissions gap to reach the decarbonisation pathway which has been identified to meet national carbon budgets and commitments. If carbon budgets are not met globally, temperatures will continue to rise, increasing the wide-ranging risks associated with climate change, as summarised in Section 2.1.1.

It is important to recognise that there are limits to the influence of LTP4 and its ability to close the emissions gap. For instance, LTP4 measures have limited opportunity to change travel choices and emissions for most freight trips (which are largely driven by commercial and national government influences) or trips passing through the county. As an example, HGV traffic alone accounts for nearly 20% of transport emissions in Wiltshire but local measures largely influence only the last leg of delivery. The measures have an important impact on local air quality, traffic and town environment but a more limited impact on carbon emissions as the trip stage affected accounts for only a small proportion of overall HGV travel.

4.3. Closing the emissions gap

Closing the remainder of the emissions gap **beyond the influence of the LTP4**, would require wider national and regional action to address emissions from trips over which LTP4 measures have limited influence, particularly freight trips and trips passing through the county.

In addition, achieving the level of emissions reduction required would likely necessitate an underlying change in approach to private travel and car usage, changing the balance of cost and convenience between car and other modes. This would involve measures beyond those included in LTP4 and which are likely to be most effective if introduced at the regional or national level.

Any measures considered would need to be carefully designed and implemented to ensure they do not have negative impacts on issues such as wellbeing and accessibility and that all six of the LTP4 objectives continue to be met. For instance, in Rural Areas dispersed populations and trip patterns make it challenging to provide the viable public and shared transport services which would be needed to provide the capability and opportunity for individuals to switch away from car use, without being potentially affected by a loss of accessibility.

Measures developed would also need to account carefully for lifecycle carbon impacts. This is likely to mean making best use of the existing transport system and limiting the amount of new infrastructure (with associated embodied carbon).

The LTP4 measures to support Avoid and Improve measures and increase and improve travel choices by sustainable modes, provide the foundation for making more sustainable travel possible. They would provide a good basis for wider action and would support and enhance the decarbonisation impacts of wider measures introduced.

Overall, decarbonisation is a shared challenge, and the scale of decarbonisation required to fully close the emissions gap will need action both at and beyond the local level. National and regional level action will be needed both to achieve larger reductions in passenger transport emissions and to address emissions from freight.

The identified Support measures of working in partnership with Government bodies and stakeholders therefore provide an important route through which the LTP4 will support decarbonisation, working together to address this shared challenge.

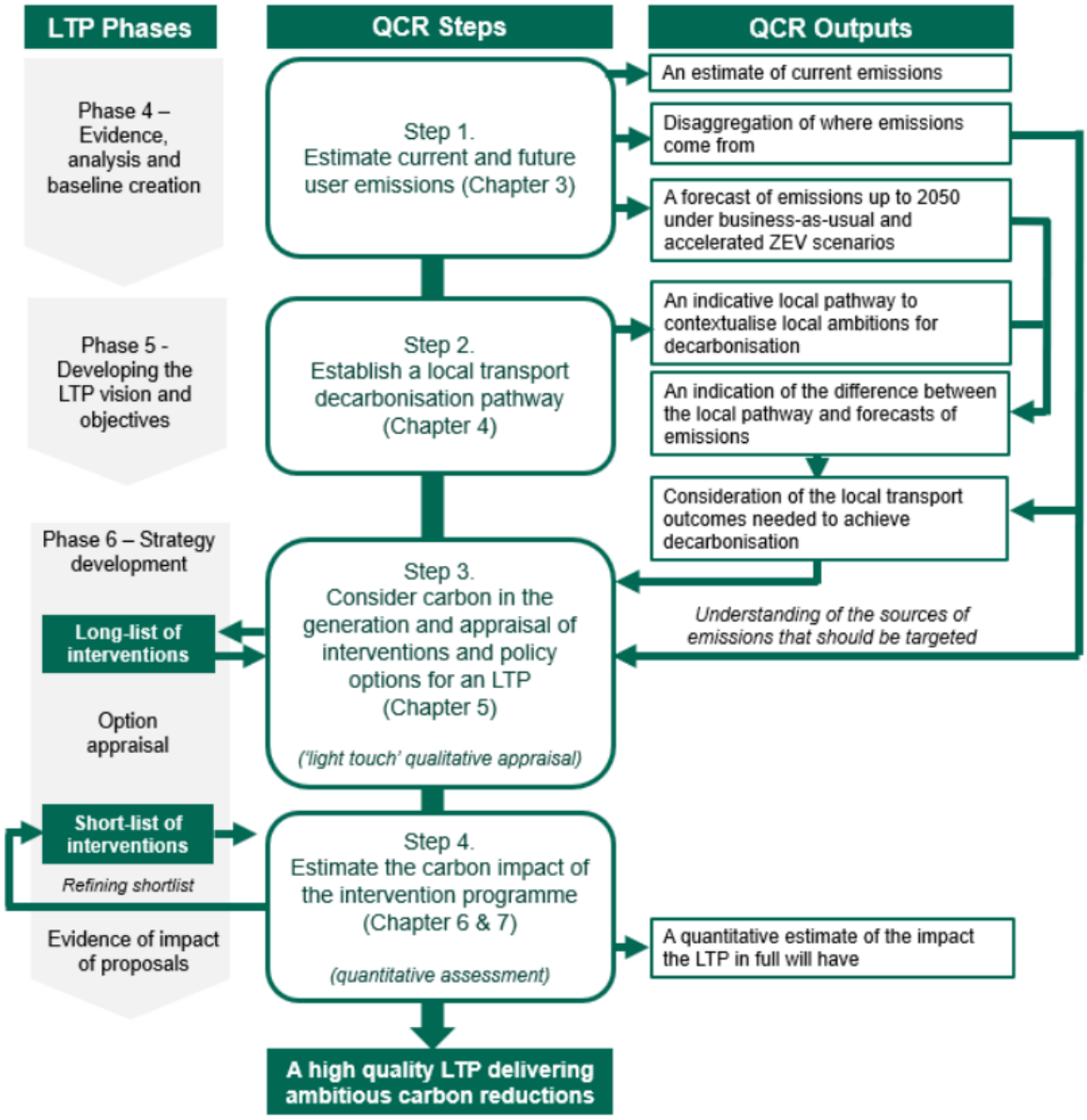
Annex A. DfT Draft Quantifiable Carbon Reduction assessment guidance

Following the publication of the Transport Decarbonisation Plan in 2021, the Department for Transport (DfT) started to produce guidance on developing LTPs. The early drafts indicated that transport decarbonisation should be an important component of updated LTPs, considering both transport user emissions and the embodied carbon associated with infrastructure, equipment and vehicle fleet.

Alongside the LTP guidance, the DfT was also developing guidance on Quantified Carbon Reduction (QCR). Early versions of the guidance, circulated amongst the local government community, included a flowchart (shown in Figure A-1), setting out the steps that should be followed in considering carbon issues within a Local Transport Plan.

The development and release of the guidance was paused, and it is not yet whether the guidance will be released. Nevertheless, the draft provides a useful framework for considering transport decarbonisation and has informed the development of Wiltshire's LTP4.

Figure A-1 – Draft DfT QCR Guidance



Annex B. Carbon assessment approach

B.1. Overview

This Annex provides further detail on the assessment approach used to estimate projected baseline transport emissions in Wiltshire as a basis for identifying the estimated emissions gap that LTP4 needs to contribute to closing.

The baseline represents surface transport emissions within Wiltshire and is based primarily on:

- Detailed Wiltshire Traffic Model (WTM) data on the volume and type of traffic on the roads in the county, by road link; and
- Emissions factors (grammes of carbon emitted per vehicle mile) by vehicle type and speed band.

Emissions estimates were produced for WTM's two modelled years of 2018 and 2036 and represent well to wheel carbon dioxide equivalent (CO_2e) emissions within Wiltshire's boundary.

The remainder of this Annex sets out:

- The data sources used for the 2018 base emissions estimate
- The additional data sources used for the future year estimates
- The calculation steps undertaken
- An overview of the baseline emissions estimates produced
- The emissions gaps implied by the baseline emissions forecast

Well to wheel, well to tank and tank to wheel emissions

Well to wheel (WTW) emissions include emissions associated with extracting, generating and transporting the fuel or energy to the vehicle (**well to tank, WTT**) as well as the emissions generated directly by vehicle use i.e. tailpipe emissions (**tank to wheel, TTW**). Many summaries of transport sector emissions focus on TTW emissions to avoid double counting (e.g. with the industrial sector of the emissions associated with diesel production). However, it is important to understand the WTT component to understand the full emissions impacts of travel, particularly for EVs which have no tail pipe (TTW) emissions. Well to wheel is consistent with the 'End user' definition of emissions used by DESNZ in their local authority emissions statistics.

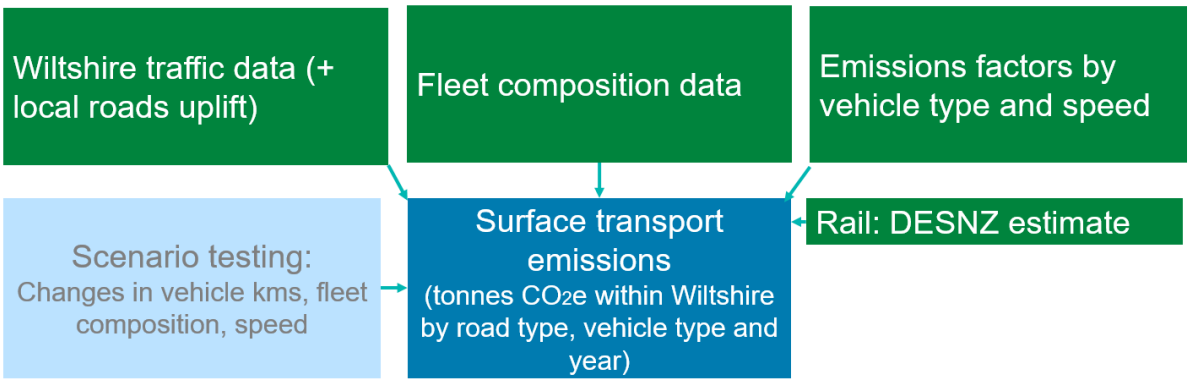
B.2. Data sources for 2018 emissions estimate

Figure B-1 provides a simple summary of the carbon calculator used to produce the carbon baseline estimates. The green boxes highlight the main inputs which fall in four main categories:

- Wiltshire Traffic Model data
- Fleet composition data
- Emissions factors
- Department for Energy Security and Net Zero (DESNZ) rail emissions estimate

Each input category is discussed in more detail in the following sections.

Figure B-1 – Summary of carbon calculator



B.2.1. Wiltshire Traffic Model data and local roads uplift

WTM traffic data for each modelled road link within Wiltshire formed the primary input to the carbon calculations.

The key inputs were traffic flows, distances, and speeds by speed band (each band covering a range of 5 mph) for each vehicle type (car, LGV and HGV), for each Wiltshire road link and for each modelled time period.

The model data was supplemented by an uplift to represent the traffic on minor roads that are not captured in the traffic model. The uplift was based on Ordnance Survey GIS data and DfT road length statistics providing length of unmodelled road links[31] and DfT traffic count data for average traffic flows on minor roads in Wiltshire.[32]

As bus services are not fully modelled in the WTM, bus vehicle kilometres used in the calculations were also uplifted to be consistent with the levels recorded for Wiltshire in DfT's Bus Statistics.[33]

B.2.2. Fleet composition data

For the 2018 base year, fleet composition data (i.e. the proportions of vehicles by fuel / energy type) was taken from the DfT's Transport Analysis Guidance (TAG) data book (May 2024 version) [34], which is also consistent with the assumptions used in the National Atmospheric Emissions Inventory (NAEI)).

B.2.3. Emissions factors

The emissions factors (in gCO_2e/vehicle km) were derived from three key components:

- Estimates of fuel consumption/electricity use:
  - Tank to wheel energy consumption (in litres or kWh per vehicle km for each vehicle type in each speed band) using functions from the DfT TAG databook, which relate fuel consumption or electricity use to vehicle type, fuel type, speed, year, and

[31] DfT (2023) Road length statistics. Available at: Road length statistics (RDL) - GOV.UK (www.gov.uk)
[32] DfT traffic count data. Available at: Map Road traffic statistics - Road traffic statistics (dft.gov.uk)
[33] DfT (2024) Bus statistics. Table Bus01e: Passenger journeys on local bus services by local authority. Available at: Bus statistics data tables - GOV.UK (www.gov.uk)
[34] DfT (2024) Transport Analysis Guidance. Available at: Transport analysis guidance - GOV.UK (www.gov.uk)

distance of travel and are drawn from the European COPERT[35] (Calculation Of Pollutant Emissions from Road Transport) emissions model (and are also consistent with the factors used for the NAEI[36]).

- Carbon intensity factors to convert fuel and electricity consumption estimates to estimated emissions impacts - using kg CO_2e / litre of fuel from the DfT's TAG databook and kg CO_2e / per kWh of electricity from the Department for Energy Security and Net Zero (DESNZ) appraisal dataset[37] [38].
- Well to tank uplift factor to apply to tank to wheel emissions from petrol, diesel, and electricity - using the uplift factors from DESNZ Greenhouse Gas Conversion Factors[39].

B.2.4. Rail emissions estimate

The rail emissions estimate for 2018 was drawn directly from the DESNZ Local Authority carbon emissions estimate for Wiltshire for 2018[40].

B.3. Data sources for 2036

The 2036 reference case emissions estimates were calculated in the same way as the 2018 estimates, accounting for the two key variables influencing future transport emissions i.e.:

- Changes in the number of vehicle miles travelled by different categories of vehicles (cars, vans, goods vehicles, buses etc.), reflecting changes in trip numbers, trip lengths, and mode choice; and
- The composition of the fleet for each vehicle category (in terms of the proportions of vehicles of different sizes, efficiency, and fuel / energy source), determining emissions produced per mile travelled.

Forecast vehicle miles were obtained from the WTM Reference Scenario for 2036[41].

For fleet composition, five different baseline fleet scenarios were produced to reflect different assumptions regarding changes through time, in particular in relation to the uptake of zero emissions vehicles, as follows:

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[35] COPERT is a programme, financed by the European Environment Agency (EEA), developed to calculate air pollutant emissions from road transport implementing the approaches from the European EMEP/EEA air pollutant emission inventory guidebook

[36] The NAEI is compiled by the National Environmental Technology Centre on behalf of the Department for Environment, Food and Rural Affairs (DEFRA), it is the standard reference air emissions inventory for the UK and includes emission estimates for a wide range of pollutants https://naei.beis.gov.uk/

[37] DESNZ data tables to support the Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions. Available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal.

[38] Using domestic grid average intensity from the DESNZ dataset as recommended by the DESNZ for calculation of baseline emissions rather than marginal electricity intensity, which is recommended in the TAG databook to appraise changes in energy use.

[39] DESNZ (2024) Greenhouse gas reporting: conversion factors. Available at. Greenhouse gas reporting: conversion factors 2024 - GOV.UK (www.gov.uk)

[40] DESNZ (2024) UK local authority and regional greenhouse gas emissions statistics. Available at UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2018 - GOV.UK (www.gov.uk)

[41] Scenario 1 from the traffic modelling for the Local Plan was used, including a Do Minimum allowance for Local Plan growth

- **DfT TAG baseline scenario** – rapid short term EV uptake scenario reflects the current DfT TAG databook assumptions on EV uptake[42]. Since November 2022, TAG figures have assumed rapid EV uptake rate to 2030, e.g. assuming 15% of car vehicle kms will be undertaken by EVs by 2025 (the proportion previously estimated for 2030) and 36% by 2030. The rate of uptake is explained as being due to more stringent 2025 to 2030 CO_2 regulations for manufacturers and reductions in battery prices. However, the assumptions already appear ambitious (e.g. assuming 5% of car miles by EVs in 2022, and 11% in 2024, when only 1.9% of licenced cars were battery EVs nationally by the end of 2022). The forecast does not account for the bans on petrol/diesel car, van and HGV sales initially announced in November 2020 and November 2021 by government, because they are not yet considered committed. Consequently, EV uptake is assumed to slow in the 2030s.

- **National fleet action scenarios** reflect a view of the impact of the Government's sales bans for petrol and diesel vehicles.
    - **Original national sales ban scenarios** reflect a view of the impact of the Government's initially announced dates for the sales bans for petrol and diesel vehicles (2030 for cars and vans and 2035/2040 for HGVs). The scenarios are based on forecasts produced in 2021 and assume a slower rate of EV uptake to 2030 than the most recent TAG forecasts (but more rapid than the previous TAG forecasts). The uptake forecasts are then more rapid than TAG forecasts after 2030. Two scenarios show the sequential impacts of bans on different vehicle types as follows:
        - **Petrol/ diesel car/ van sales ban 2030**, which reflects the potential impact on uptake of EVs of the national action to ban petrol and diesel car and van sales in 2030, as originally announced in November 2020. The fleet forecast is based on the Society of Motor Manufacturers and Traders (SMMT) Central Forecast published in June 2021. The HGV fleet is assumed to remain as in the baseline, i.e. a fully diesel fleet with some efficiency improvements through time.
        - **Sales ban for all petrol/ diesel vehicles 2030 onwards**. This scenario builds on the car/ van sales ban scenario to include a representation of the impact of the diesel HGV sales bans that were confirmed by Government in November 2021. The sales ban dates are 2040 for vehicles over 26 tonnes and 2035 for vehicles under 26 tonnes and the scenario assumes that the uptake of ZEV in the HGV fleet will occur in line with the forecasts in the CCC's Sixth Carbon Budget Balanced Pathway.
    - **Delayed sales ban scenarios**. In September 2023 the Government announced a delay to the date for the ban on sales of petrol and diesel cars and vans to 2035. This remains the announced date for the ban (although it is possible that the new Government will revert to the 2030 date). The last 2 fleet scenarios tested adjust the 2030 ban based scenarios to reflect the potential impact of the delay (recognising that the Zero Emissions Vehicle mandate remains in place with an 80% target for 2030). The date of the HGV sales ban is assumed to remain unchanged.
        - **Petrol/ diesel car/ van sales ban 2035**
        - **Sales ban for all petrol/ diesel vehicles 2035 onwards**

[42] DfT (2024) Transport Analysis Guidance Databook. Available at: TAG data book - GOV.UK (www.gov.uk)

For all five fleet scenarios, the change in carbon intensity of electricity generated was derived from the DESNZ projections, as used in the TAG databook.

Areas of uncertainty influencing future surface transport emissions

There are a number of areas of uncertainty in forecasting future transport emissions including:

- Levels of traffic demand.
- Rate of uptake of electric cars and vans.
- Future trends in purchase of SUVs and large cars.
- Rate of development and uptake of zero emissions HGVs.
- Speed of decarbonisation of the electricity grid.

The data used for the baseline scenarios are intended to be central forecasts to provide a robust estimate. The calculations also allow for sensitivity testing as needed.

B.4. Calculations

B.4.1. Modelled year calculations

The calculations of emissions totals for both modelled years involved the following steps:

1. Calculation of vehicle miles travelled by road type, vehicle type (car, LGV, HGV), time period, and speed band (each band representing a 5 mph range).
2. Application of an uplift to allow for traffic on the minor roads that are not captured in the model, based on road length from OS Open Roads mapping layer and DfT Road Length statistics[43] and average traffic counts for B roads, C roads, and unclassified roads for 2015 to 2018 in Wiltshire from DfT traffic count data[44].
3. Calculation of fuel consumption/electricity use for traffic within Wiltshire for 2018, for each vehicle type, each speed band, and each time period. The calculations used the TAG fuel consumption formulae which relate fuel consumption to vehicle type, fuel type, speed, year, and distance of travel.
4. Expansion of the fuel and electricity consumption estimates (in litres and kWh respectively) for the modelled time periods to represent:
    a. Full weeks - using the Wiltshire Traffic Model expansion factors.
    b. Full years - on the assumption of 245 working days per year and the rest of the year being weekend days or bank holidays.
5. Conversion of fuel and electricity consumption estimates to estimated emissions impacts by year using the DfT and DESNZ carbon intensity factors (kg CO_2e / litre of fuel or kWh of electricity) by year.

B.4.2. Calculations for emissions trajectory

To provide an emissions trajectory for comparison with target decarbonisation pathways, the modelled data for 2018 and 2036 was supplemented with estimates of traffic for the additional years of 2021, 2026, 2031, 2041, 2046, and 2050. These estimates were derived through interpolation and extrapolation of the data for the two modelled years, and informed

[43] DfT (2023) Road length statistics. Available at: Road length statistics (RDL) - GOV.UK (www.gov.uk)
[44] DfT traffic count data. Available at: Map Road traffic statistics - Road traffic statistics (dft.gov.uk)

by the DfT's National Road Traffic Projections 2022[45] which provides Core Scenario traffic forecasts for the South West by road type and vehicle type.

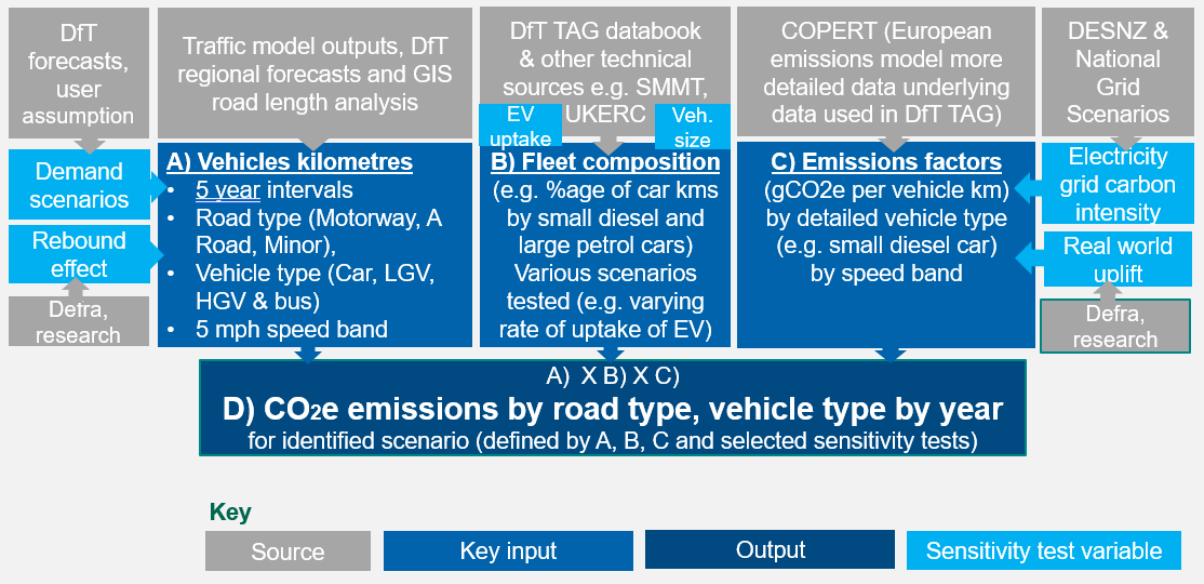
The estimated traffic forecasts for these years were combined with relevant fleet composition and emissions factors to provide emissions estimates in each year.

B.4.3. Calculation summary

Figure B-2 provides a summary of the calculations in the carbon tool, including a number of inputs that allow sensitivity testing:

- Electric vehicle uptake rates.
- Rebound effect (reflecting the tendency for people to drive more when costs are lower, for instance when driving EVs).
- Real world uplift for emissions (reflecting the fact that observed vehicle emissions in real life driving conditions are typically greater than the rates estimated in test conditions).
- Rate of decarbonisation of electricity provision.

Figure B-2 – Summary of carbon calculations



B.5. Baseline emissions

B.5.1. 2018 emissions

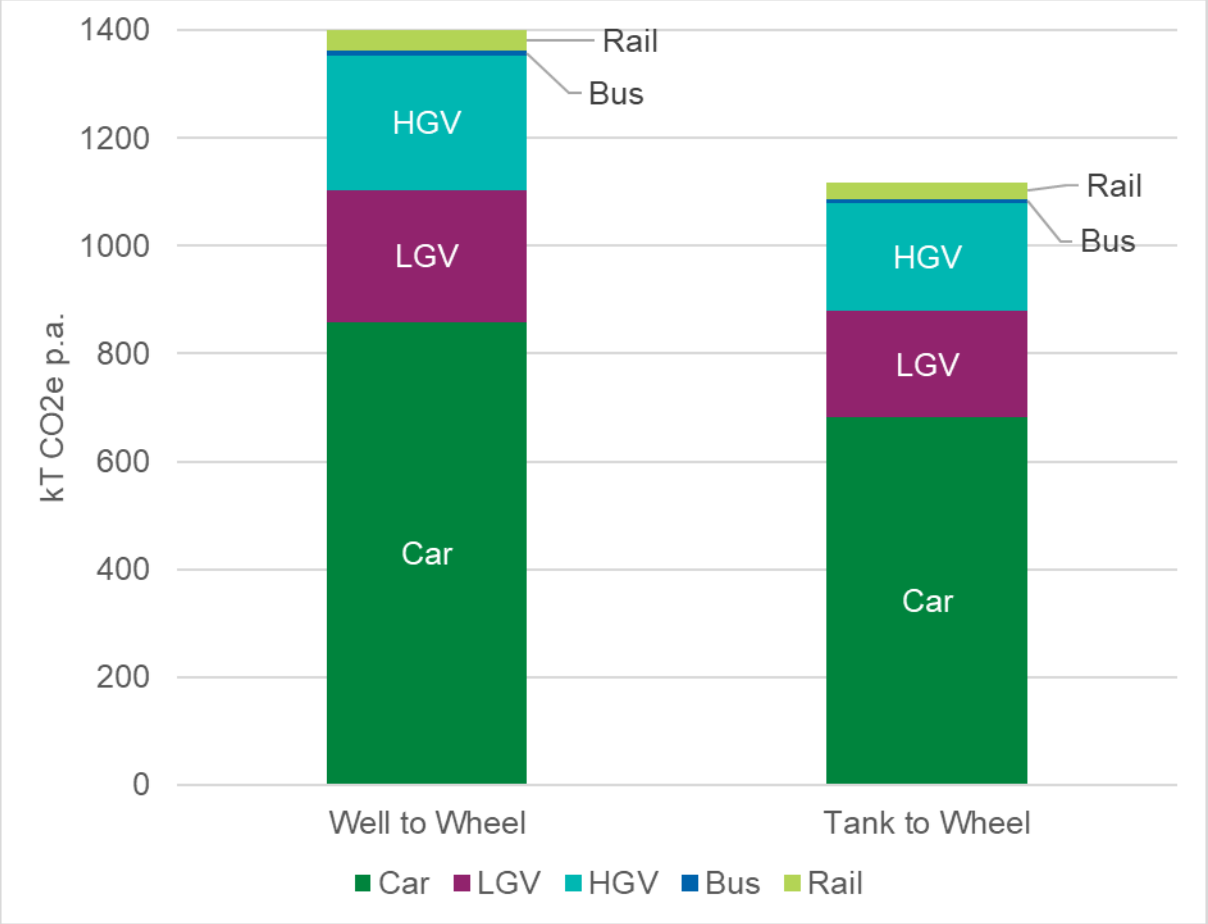
The estimated baseline transport emissions for 2018 are summarised in Figure B-3, disaggregated by vehicle type and shown separately for tank to wheel and well to wheel emissions. Total estimated emissions are approximately 1400 kilotonnes (kT) p.a. (well to wheel), with the well to tank component accounting for about 20% of the total.

Cars are estimated to account for 61% of the 2018 emissions, followed by HGVs accounting for 18%, LGVs 18%, rail 3%, and buses 1%.

[45] DfT (2022) National Road Traffic Projections. Available at: National road traffic projections - GOV.UK (www.gov.uk)

Of the road total, emissions from motorway travel account for just over 20% of the total, A roads for approximately 45%, and minor roads for approximately 35% of total emissions.

Figure B-3 – Estimated surface transport emissions, Wiltshire, 2018 (kT CO_2e)



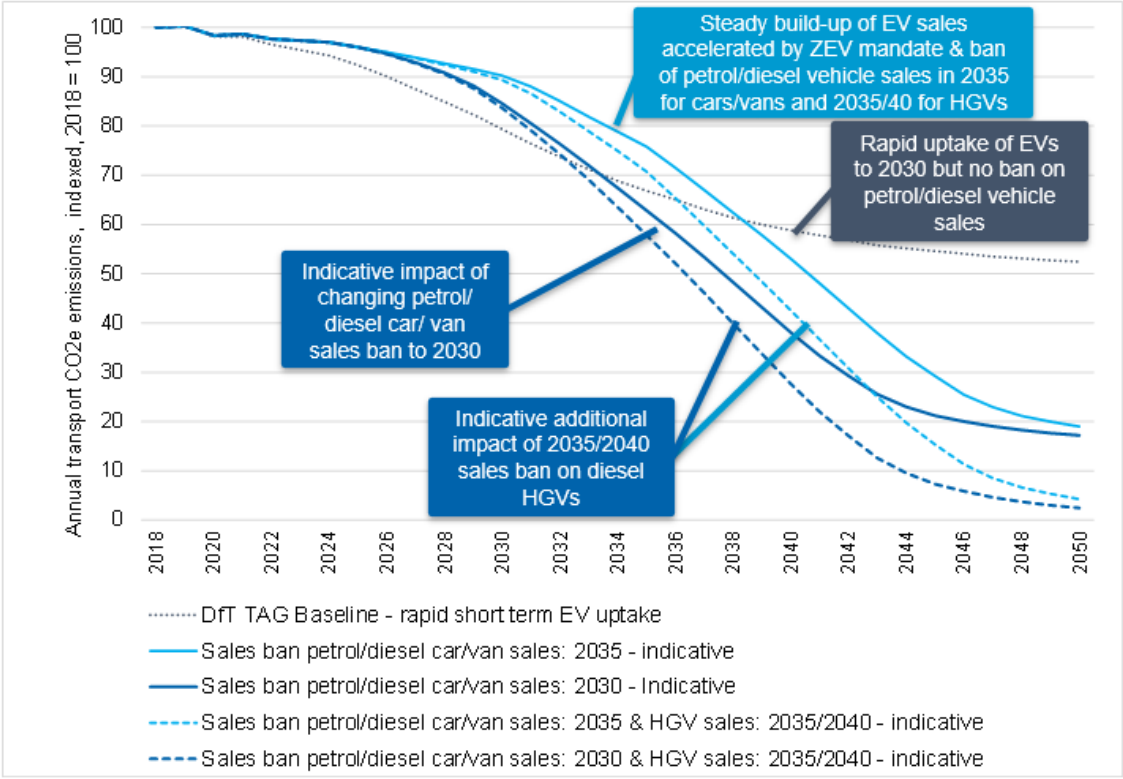
A sense check on the emissions estimate produced was undertaken, comparing the 2018 emissions estimate against the DESNZ local authority emissions estimate for Wiltshire for 2018[46]. The calculated figure for the county was just under 110% of the DESNZ total. The differences are likely to be largely explained by minor differences in the process of estimating traffic totals and the distribution of traffic by speed band and in the Tank to Wheel to Well to Wheel conversion factor used.

B.5.2. Future reference case emissions

Figure B-4 shows forecast future emissions assuming reference scenario traffic growth and the five different fleet change scenarios outlined above.

[46] DESNZ, 2024, UK local authority and regional greenhouse gas emissions statistics. Available at: UK local authority and regional greenhouse gas emissions statistics - GOV.UK (www.gov.uk)

Figure B-4 – Projected surface transport emissions, Wiltshire, indexed (2018 = 100)



All of the scenarios show reductions in emissions over the time period to 2050. In the 2020s reductions are fastest in the TAG baseline scenario due to the rapid short term uptake in EVs assumed. However, by the early 2030s emissions reductions in the scenarios assuming a 2030 car and van ban date overtake the TAG scenario and by the mid-2030s the delayed sales ban scenarios catch up with the TAG scenario.

Decreases in emissions are slower in the 2030s and 2040s in the TAG scenario whilst they accelerate for the sales ban scenarios as uptake of EV and other ZEV's picks up speed. By the second half of the 2040s emissions levels are at very low levels for both scenarios assuming a ban on diesel HGV sales as very few petrol and diesel vehicles remain in the fleet.

B.6. Identifying the emissions gap

B.6.1. Transport decarbonisation pathways

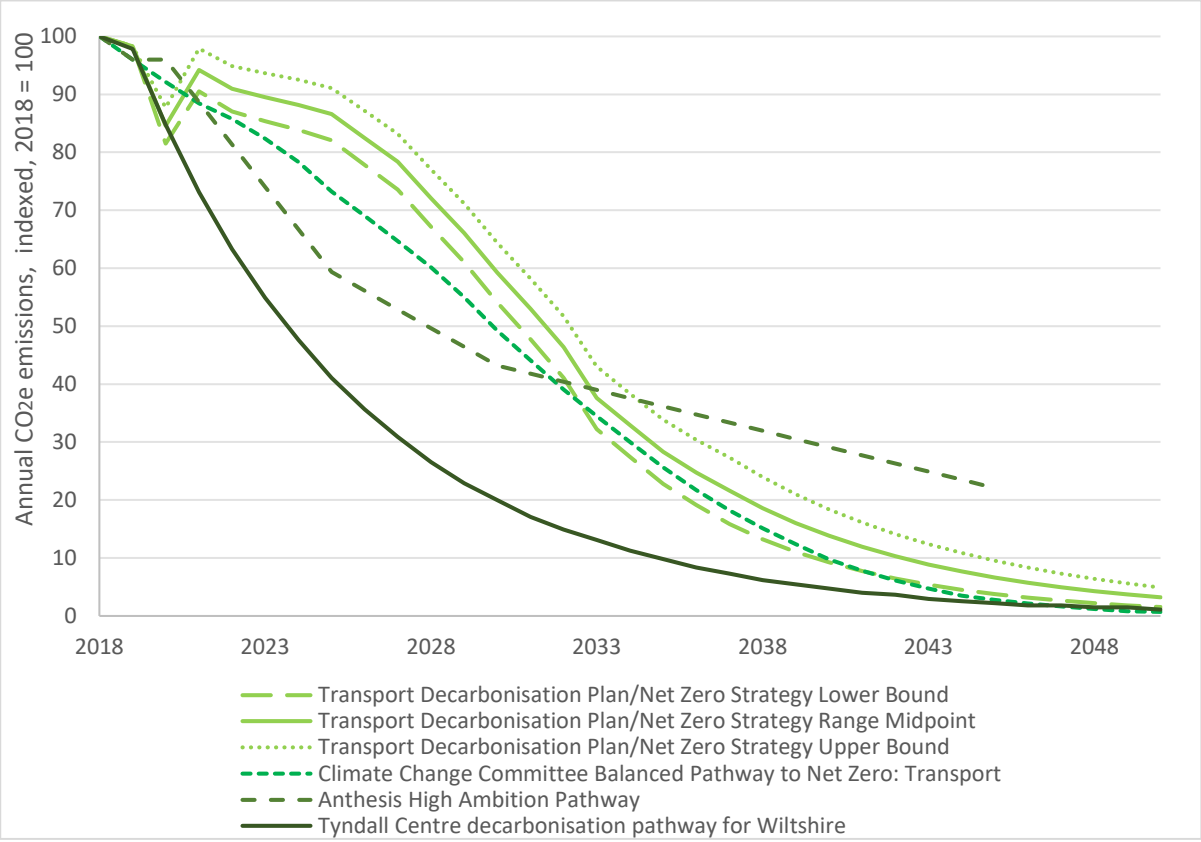
Figure B-5 shows six trajectories (decarbonisation pathways) that illustrate different views on the scale of decarbonisation required by the transport sector in Wiltshire over the decades to 2050 in order to meet decarbonisation commitments at the local and national level.

Decarbonisation pathways and targets are specified on the basis of total 'budgets' or upper limits of cumulative emissions to 2050 that are identified by climate scientists to limit the risk of serious climate change

The pathways highlight that the timing of action is important as well as meeting the challenging 2050 Net Zero target. Once emitted, carbon emissions (and other greenhouse gases) remain in the atmosphere for decades, continuing to cause warming. Cumulative emissions are therefore the main driver of climate change and limiting cumulative emissions to meet identified carbon budgets is the key requirement for achieving climate change

commitments. This means that initial rapid decarbonisation is important for successfully delivering climate change commitment and the rate of emissions reduction year-on-year will matter more in limiting climate change than meeting an identified net zero carbon target date.

Figure B-5 – Target decarbonisation pathways for Wiltshire (kT CO_2e, indexed, 2018 = 100)



The top three parallel lines represent the lower and upper bounds and midpoint of the broad decarbonisation pathway for surface transport shown in the DfT's Transport Decarbonisation Plan (TDP)[47] and the Government's subsequent Net Zero Strategy[48].

The next trajectory shows the Balanced Pathway to net zero carbon by 2050 from the Sixth Carbon Budget report, which was published by the Climate Change Committee (CCC) in December 2020[49]. It represents the surface transport component of the CCC's most recent view of a feasible and balanced pathway to achieving the UK's net zero carbon and intermediate emissions reductions targets and budgets and align with the CCC's view of the UK's contribution to the Paris Agreement commitments[50].

[47] DfT (2021) Decarbonising Transport: a better, greener Britain. Available at: Transport decarbonisation plan - GOV.UK (www.gov.uk).

[48] BEIS and Department for Energy Security and Net Zero (2022) Net Zero Strategy: Build Back Greener. Available at: Net Zero Strategy: Build Back Greener - GOV.UK (www.gov.uk) The figures shown in the graph are taken from the supporting data provided with the report which provided data for the lines annually to 2037 and then for 2050 – the figures for 2038 to 2049 have been estimated on the assumption of a steady annual rate of decrease in emissions.

[49] Climate Change Committee (CCC) (2020) The Sixth Carbon Budget. Available at: Sixth Carbon Budget - Climate Change Committee (theccc.org.uk)

[50] Note that the CCC Balanced Pathway represents all sector emissions pathway and follows a similar path but with a slightly less steep reduction in emissions to 2040.

The next dotted line shows the High Ambition Pathway identified by Anthesis in their Carbon Emissions Baselines and Reductions Pathways work for Wiltshire[51]. Rather than being based on the allocation of an identified carbon budget, this pathway is based on the maximum emissions reductions that were judged to be feasible, based on an assumption that action is not hindered by any funding, policy, skills or other local constraints.

The lowest, solid green line shows the most ambitious decarbonisation pathway, which represents the view of academic experts at the Tyndall Centre for Climate Change Research on the rate of decarbonisation required to stay within Wiltshire's remaining carbon budget[52.]. The budget covers all emitting sectors and reflects their estimate of Wiltshire's proportionate share of a remaining global budget of carbon emissions. The global budget has been estimated as the level that would limit cumulative global emissions enough to achieve a high probability of meeting the global target of limiting temperature increase to 1.5°C from pre-industrial times. The Tyndall Centre take a more stringent view than the CCC on the remaining budget allocated to countries such as the UK, after taking into account issues such as international equity and the need to avoid over reliance on future carbon removals technology[53]. This leads to a lower budget for the UK requiring a more rapid decarbonisation pathway as shown in Figure B-5.

Both the Tyndall Centre and Anthesis pathways relate to all-sector emissions (reflecting the combined effect of emissions from transport and other energy using sectors, such as buildings). The TDP and CCC pathways are both for surface transport emissions only.

All of the pathways show rapid initial decarbonisation in order to meet identified targets and budgets. The TDP range upper and lower bounds indicate that between approximately a 65% and 75% reduction in emissions would be required between 2019 and 2035. The midpoint of the range indicates a reduction of approximately 70% over the same time period. The CCC Balanced Pathway indicates a similar reduction of 70% whilst the High Ambition Pathway indicates a 60% reduction. The Tyndall Centre pathway is considerably more ambitious indicating a required emission reduction of nearly 90% over the 2019 to 2035 timeframe.

B.6.2. Projected emissions and the emissions gap

Following a carbon workshop with Wiltshire Council officers[54], the decision was made to use the midpoint of the TDP pathway to provide an understanding of the scale of the emissions gap between projected annual emissions and the levels required to meet decarbonisation commitments. This selection was in line with the approach suggested in the draft DfT QCR guidance for local authorities without a locally derived pathway. Although the Anthesis pathway was developed for Wiltshire, it is now considered out of date due to the rapid pace of development in the field and work is likely to be undertaken to update the analysis to reflect developments since the pathways were originally produced.

Figure B-6 presents the TDP pathway midpoint alongside the five baseline projections described above to illustrate the scale of the emissions gap between projected emissions and the potential pathway that needs to be followed to meet decarbonisation commitments.

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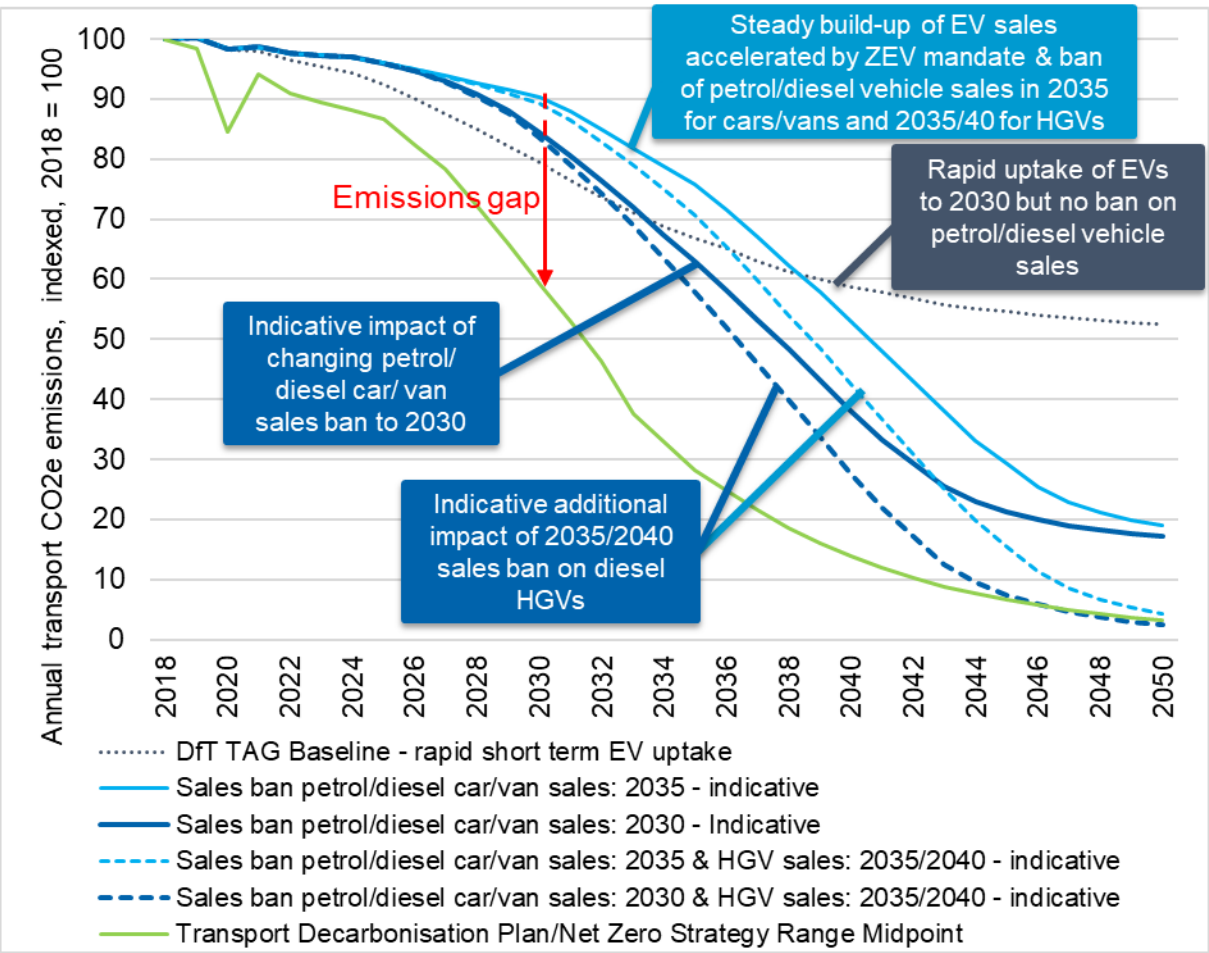
[51] Anthesis, 2022, Wiltshire Carbon Emissions Baselines and Reductions Pathways

[52] Tyndall Centre for Climate Change Research (undated) Available at: Tyndall Carbon Budget Reports (manchester.ac.uk).

[53] For instance: Anderson, K. et al. (2020) A factor of two: how the mitigation plans of 'climate progressive' nations fall far short of Paris-compliant pathways, Climate Policy. Vol 20.

[54] The workshop was attended by relevant members of the Climate and Environment, Sustainable Transport and Highways teams at Wiltshire Council.

Figure B-6 – Illustrative emissions gap for Wiltshire



The comparison between the baselines and pathway in Figure B-6 highlights that, even with ambitious national action on moving to a zero emissions fleet in the baseline projections, a substantial gap remains between the projected emissions in the baseline scenarios and the target TDP pathway.

As outlined above, the emissions gap is important because it represents additional emissions being released each year beyond the target pathway emissions level, adding to the cumulative total of emissions released. The emissions gap (illustrated by the red arrow) therefore needs to be closed if Wiltshire is to make its contribution to national carbon reduction targets. This would involve a further reduction in emissions from the baselines of approximately 30% in 2030 and 55% in 2035 (as discussed further in Section 2.2.4 of the main text).

Annex C. Assumptions informing carbon reduction estimate

Table C-1 provides further detail on the basis for the assumptions informing the carbon reduction estimate, as set out in Table 3-5 of the main report.

The estimate drew on a range of inputs including:

- The baseline transport emissions projections for Wiltshire, developed using data from the Wiltshire Traffic Model, as outlined in Section 2.2.4 and Annex B.
- Details of current and projected travel levels and patterns from sources including DfT Bus Statistics[55], Office for Road and Rail station usage statistics[56], DfT Cycling Statistics[57] DfT traffic estimates[58], DfT TEMPRO software[59] and the National Travel Survey.[60]
- Parameters and values from sources including the DfT Transport Analysis Guidance databook[61], the Propensity to Cycle Tool[62] and DESNZ Greenhouse Gas Conversion Factors 2024.[63]

Table C-1 – Assumptions informing estimated carbon reduction

Measure	Assumption	Comment/basis for assumption
Avoid		
	Up to 5% reduction in car travel maintained due to increased online activity and localisation of activity	The 5% reduction equates to retaining approximately half of the reduction in car travel still seen in 2023 relative to projected baseline before the impacts of COVID-19. Car traffic levels in Wiltshire remain over 8% below 2019 levels but have grown rapidly between 2021 and 2023 and, if growth trends continued, would rejoin previous projections (including growth) by approximately 2028. The reduction in car travel is assumed to be primarily as a result of reduced trip numbers

[55] DfT (2024) Bus statistics. Table Bus01e: Passenger journeys on local bus services by local authority. Available at: Bus statistics data tables - GOV.UK (www.gov.uk)
[56] Office for Road and Rail (2024) Table 1415: Time series of passengers' entries exits and interchanges by stations. Available at Estimates of station usage | ORR Data Portal
[57] DfT (2024), Walking and Cycling Statistics. Available at: Walking and cycling statistics - GOV.UK (www.gov.uk)
[58] DfT (2024), Traffic Estimates Table TRA8905: Motor vehicle traffic by local authority and selected vehicle type in Great Britain Road traffic estimates (TRA) - GOV.UK (www.gov.uk)
[59] DfT Trip End Model Presentation Programme (TEMPRO 8.1). Available at: Trip End Model Presentation Program (TEMPro) download - GOV.UK (www.gov.uk)
[60] DfT (2023) National Travel Survey 2022. Available at: National Travel Survey - GOV.UK (www.gov.uk)
[61] DfT (2024) Transport Analysis Guidance Databook: May 2024. Available at: Transport analysis guidance - GOV.UK (www.gov.uk)
[62] Propensity to cycle tool Available at: The Propensity to Cycle Tool About Page (pct.bike). Source: Lovelace, R., Goodman, A., Aldred, R., Berkoff, N., Abbas, A., Woodcock, J. (2017) The Propensity to Cycle Tool: An open-source online system for sustainable transport planning. Journal of Transport and Land Use. 10:1, 505–528.
[63] DESNZ (2024) Greenhouse gas reporting: conversion factors. Available at. Greenhouse gas reporting: conversion factors 2024 - GOV.UK (www.gov.uk)

Measure	Assumption	Comment/basis for assumption
		due to more online activity resulting from digital trends accelerated by COVID-19 restrictions, supported by some further localisation of activity causing further reduction in levels of travel through encouraging shorter, combined trips (also supporting mode shift). For instance, a further 5% reduction in car travel could be achieved through an extra 5% of commuting, business and personal business car trips being avoided due to online alternatives and approximately 10% of shopping, personal business, leisure and escort car trips reducing by approximately one third in length as a result of more local activity.
Shift 		
Bus	10% increase by 2030	BSIP 2021 target for 2030
	Baseline bus passenger miles	DfT Bus Statistics providing bus passenger miles in Wiltshire for 2019 to 2023 and DfT TEMPRO 8.1 Core scenario providing trip growth rates for 2030 and 2035 for Wiltshire for bus.
	Proportion of additional bus passenger miles assumed to switch from car driver trips	35% - based on the DfT TAG diversion factors from car driver for bus (TAG A5.4.6)
Rail	10% increase by 2030	Equivalent to bus
	Baseline rail passenger miles	ORR station usage statistics for 2019 to 2023 for Wiltshire stations and assumption of average trip length within county of approximately 20 miles (based on analysis of the busiest movements). DfT TEMPRO 8.1 Core scenario providing trip growth rates for 2030 for Wiltshire for rail.
	Proportion of additional rail passenger miles assumed to switch from car driver trips	25% - based on the DfT TAG diversion factors from car driver for rail (TAG A5.4.6).
Cycle	10% increase by 2030	Equivalent to bus
	Baseline cycle miles	Propensity to Cycle Tool estimates for Wiltshire for commuting trips, uplifted for relative levels of cycling for different purposes derived from National Travel Survey cycling data

Measure	Assumption	Comment/basis for assumption
	Proportion of additional cycle passenger miles assumed to switch from car driver trips	65% - based on diversion rates assumed in the PCT for commuting and NTS based adjustments for other purposes
Car sharing	2% to 5% increase in the proportion of car driver trips that are shared by 2030	Assumptions on potential scale of growth in car sharing
	Current levels of single occupancy car driver trips	~ 65% sourced from National Travel Survey table NTS0905
Freight mode shift	1% reduction in van emissions due to last mile/first mile mode shift offsetting increasing van deliveries in 2030.	Assumptions on potential scale of impact recognising the small proportion of emissions in scope for LTP4 measures
Improve		
	More efficient driving for 5% of vehicle miles as a result of eco driving and targeted network management improvements by 2030.	Assumptions on potential pace and scale of uptake of efficient driving and network management measures
	Scale of impact of eco driving measures and more efficient driving conditions on emissions levels	~8% long term reduction in vehicle emissions based on estimate and evidence set out in CCC Sixth Carbon budget report[64]
	Acceleration of EV uptake by approximately 6 months to 1 year relative to national action by 2030	~10% to 15% increase in proportion of car and LGV miles by EV in 2030 equivalent to 20% to 30% of the difference between Central and High EV uptake scenarios identified by the Society of Motor Manufacturers and Traders[65] in 2030
	Emissions impact of change in vehicle fleet composition	Carbon spreadsheet model established to estimate projected carbon baseline and gap.

[64] CCC (2020) Sixth Carbon Budget Report. Available at: Sixth Carbon Budget - Climate Change Committee (theccc.org.uk).

[65] SMMT (2021) New Car Market and Parc Outlook to 2035. Available at: SMMT new car market and parc outlook to 2035, by powertrain - SMMT.

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