CARBON ASSESSMENT PLAYBOOK

Decarbonisation Baseline Report for Buckinghamshire

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1. INTRODUCTION

This report provides an overview of current and future user emissions through to 2050, providing the baseline upon which future interventions may be defined to support Buckinghamshire with reaching net zero across the transport network.

The report has been designed to help users inform the development of policy scenarios that seek to contribute towards realising both local and national net zero commitments by providing tailored information on the interventions most likely to be effective based on the place types that are present within the local area.

The report first provides an overview of current emissions within Buckinghamshire and how they are expected to change over time in response to national commitments and background factors.

These emissions are then presented in the context of various decarbonisation pathways, providing an indicative approximation of the rate of decarbonisation needed locally to achieve net zero in line with carbon budgets.

Finally, the report sets out the interventions expected to reduce emissions most effectively within Buckinghamshire, drawing on the local baseline, place type geography and estimates of impact derived from the Carbon Assessment Playbook produced by England's Subnational Transport Bodies.

The approach adopted aligns with that currently proposed in the Department for Transport's draft Quantifiable Carbon Reduction (QCR) guidance, which remains awaiting ministerial approval (as of October 2023).

2. ESTIMATE OF CURRENT USER EMISSIONS

2.1 BASELINE PREPARATION

The baselines included in this report have been prepared based on extensive local and national data including Department for Transport statistics, local and regional transport models, factors from the TAG data book and other industry-recognised sources.

Total emissions set out in this report have been calibrated to the UK's Greenhouse Gas Emissions Inventory published by the Department for Energy Security & Net Zero (previously the Department for Business, Energy & Industrial Strategy) to ensure consistency with wider national reporting, both within and beyond the transport sector.

Often referred to informally as a 'sliced and diced' approach, this constitutes a disaggregated network-based approach to modelling baseline emissions. Use of local and regional transport models provides the ability to disaggregate emissions by road type, vehicle type, journey purpose, trip length and place type, affording a better understanding of the source of emissions and a resulting ability to isolate those emissions in scope of particular interventions.

2.2 TOTAL EMISSIONS

Total user emissions for Buckinghamshire in 2019 are 1.417 $MtCO_2$ per annum. These reflect all emissions bounded by the local transport authority area and comprise:

- 0.339 $MtCO_2$ from trips made wholly within Buckinghamshire
- 0.690 $MtCO_2$ from trips starting or ending within Buckinghamshire that are destined to, or originating from, another local transport authority area
- 0.334 $MtCO_2$ from trips wholly passing through Buckinghamshire, without an origin or destination locally

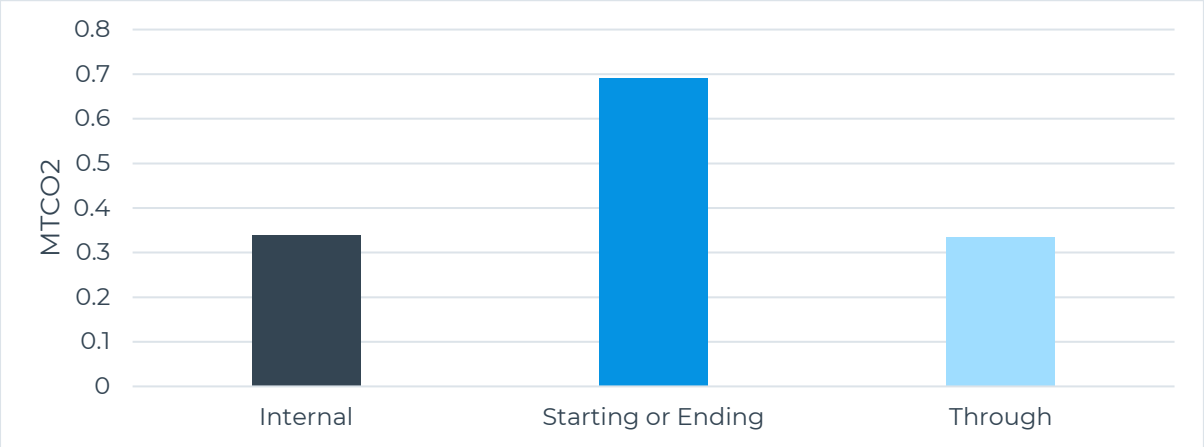

Figure 1: Total emissions in Buckinghamshire by trip genesis (2019)

2.3 EMISSIONS BY VEHICLE TYPE

User emissions in Buckinghamshire in 2019 derive from the following vehicle types:

- 0.917 $MtCO_2$ from trips made by car
- 0.051 $MtCO_2$ from trips made by bus or public transport
- 0.233 $MtCO_2$ from movements made by heavy goods vehicles (HGVs)
- 0.213 $MtCO_2$ from movements made by light goods vehicles (LGVs)

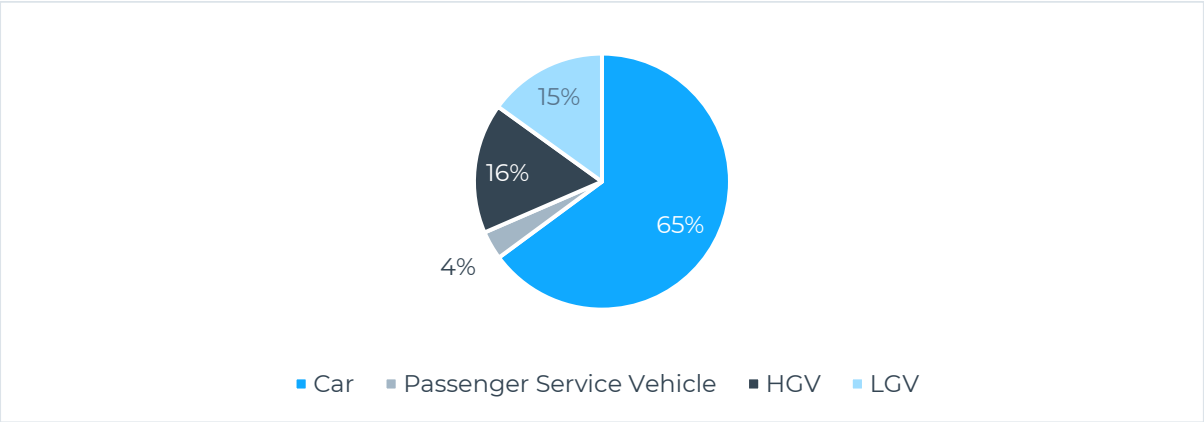

Figure 2: Proportion of emissions in Buckinghamshire by vehicle type (2019)

2.4 EMISSIONS BY JOURNEY PURPOSE

User emissions in Buckinghamshire in 2019 derive from the following journey purposes:

- 0.252 $MtCO_2$ from trips made for commuting
- 0.613 $MtCO_2$ from trips made for business
- 0.497 $MtCO_2$ from trips made for other purposes

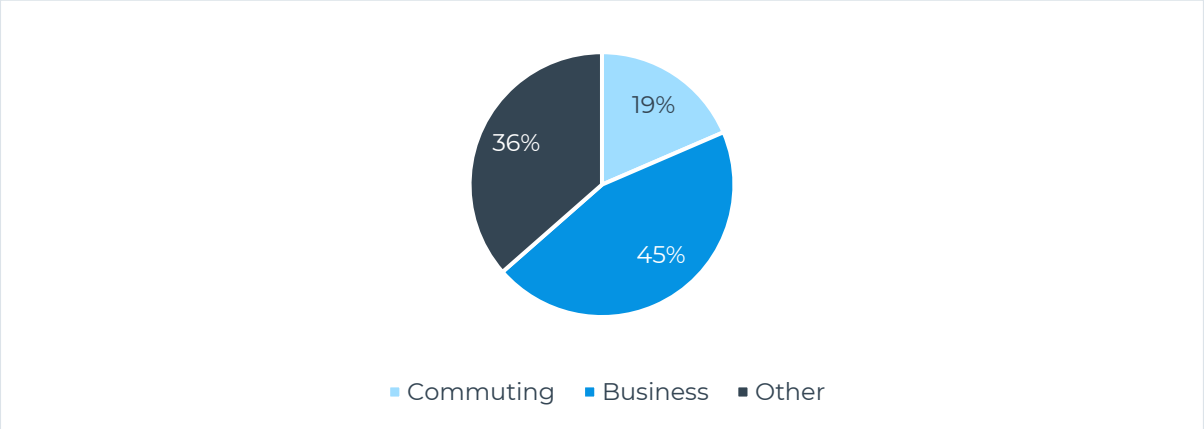

Figure 3: Proportion of emissions in Buckinghamshire by journey purpose (2019)

2.5 EMISSIONS BY TRIP LENGTH

Trip length is an important consideration when determining the source of emissions and suitability of interventions to address them, with longer distance trips that generate higher emissions often some of the hardest to decarbonise.

For trips that originate in Buckinghamshire in 2019, the resulting user emissions derive from the following trip lengths:

- 0.007 $MtCO_2$ from trips of less than 1 mile
- 0.115 $MtCO_2$ from trips of between 1 mile and 5 miles
- 0.200 $MtCO_2$ from trips of between 5 miles and 10 miles
- 0.350 $MtCO_2$ from trips of between 10 miles and 25 miles
- 0.108 $MtCO_2$ from trips of between 25 miles and 50 miles
- 0.071 $MtCO_2$ from trips of over 50 miles

These emissions include the full length of trip, including where trips extend beyond the local transport authority boundary (to a maximum range defined by the boundary of the Subnational Transport Body).

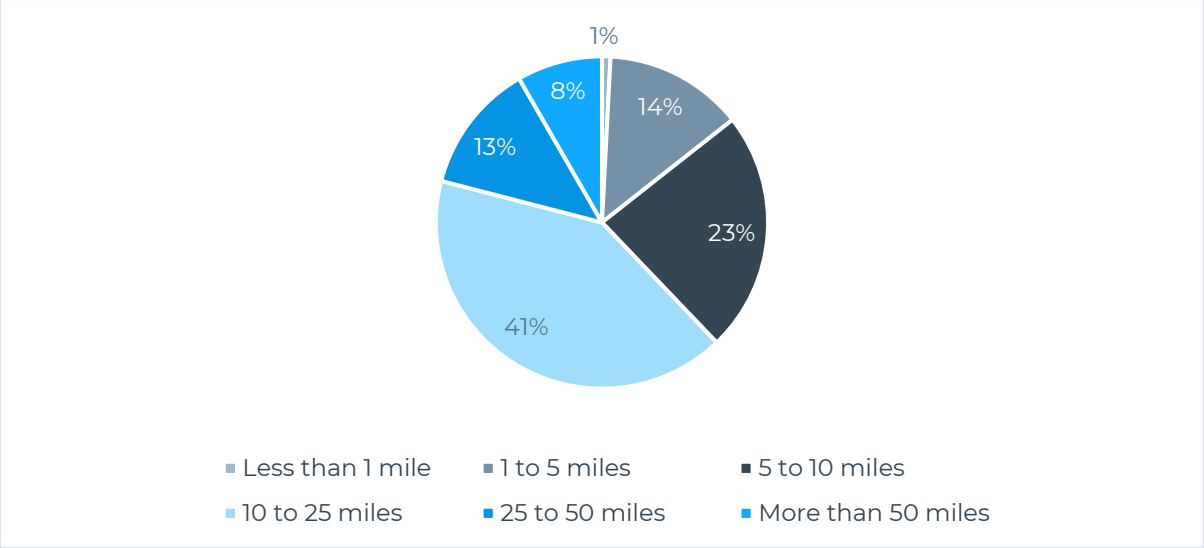

Figure 4: Proportion of emissions in Buckinghamshire trip length (2019)

2.6 EMISSIONS BY PLACE TYPE

To help identify the most appropriate interventions in different areas, Buckinghamshire has been categorised into nine different place types based on a variant of categories used in the National Trip End Model (NTEM). These place types are consistent with those used in the Carbon Assessment Playbook when presenting the impact of interventions in different place type areas.

The proportion of trips in 2019 originating in each place type area in Buckinghamshire is as follows:

- 0.0% of trips originate in **Inner Urban A**
- 0.0% of trips originate in **Inner Urban B**
- 0.0% of trips originate in **City Suburban A**
- 0.0% of trips originate in **City Suburban B**
- 54.4% of trips originate in **Urban Large**
- 9.9% of trips originate in **Urban Medium**
- 5.3% of trips originate in **Urban Small**
- 13.9% of trips originate in **Rural Town & Fringe**
- 16.5% of trips originate in **Rural Village & Dispersed**.

The total emissions from trips originating in each place type is shown in Figure 5. This includes emissions beyond the boundary from trips originating in Buckinghamshire that travel into other local transport authority areas. The prevalence of trips from different place types in Buckinghamshire will influence the suitability and impact of interventions introduced.

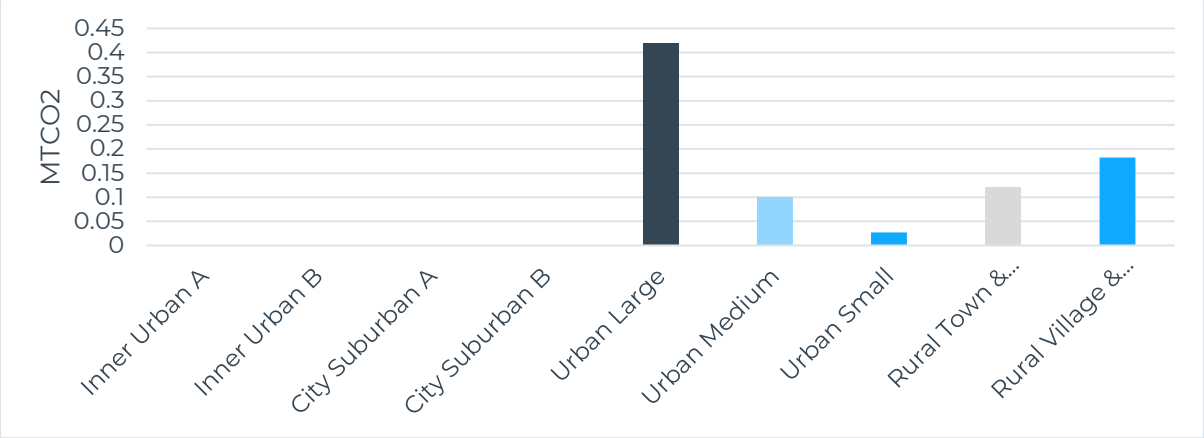

Figure 5: Proportion of emissions in Buckinghamshire by place type (2019)

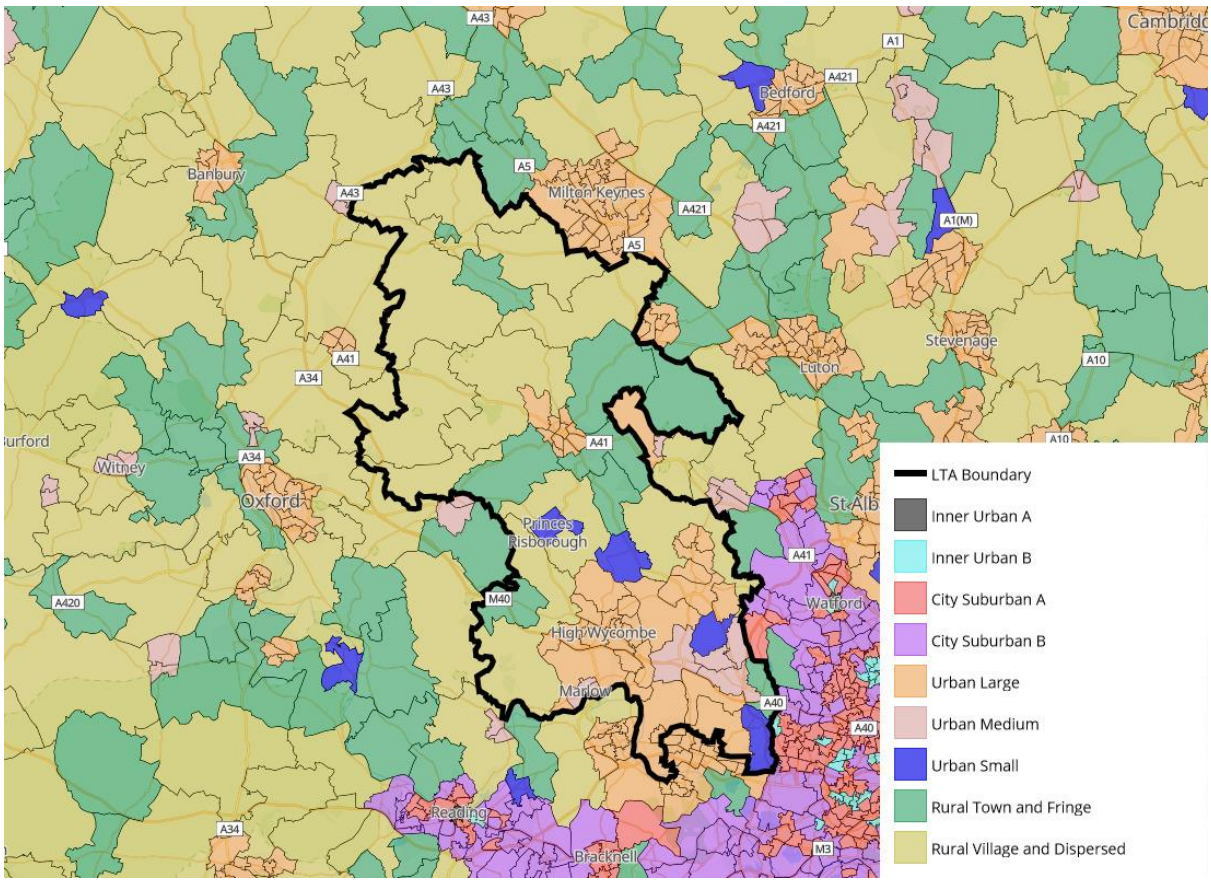

Figure 6: Choropleth map of place types in Buckinghamshire © OpenMapTiles

3. ESTIMATE OF FUTURE USER EMISSIONS

Transition to Zero Emission Vehicles (ZEVs) will provide a significant contribution towards decarbonising the transport network, although there remains uncertainty around the rate at which this transition will occur. Figure 7 shows the variation in future emissions in Buckinghamshire that result from different scenarios of ZEV uptake.

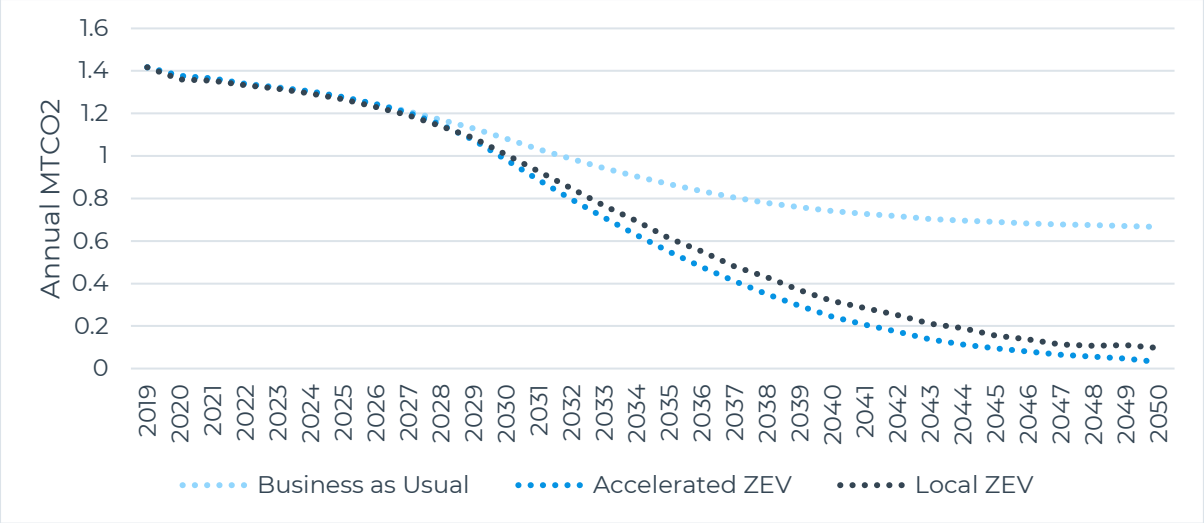

Figure 7: Total emissions in Buckinghamshire over time assuming different scenarios of ZEV uptake

Under a **'business as usual'** scenario, assuming growth in line with the national road traffic projections core scenario (2022) and fleet composition in line with TAG assumptions, the total user emissions for Buckinghamshire in 2050 are 0.666 $MtCO_2$ per annum. The source of emissions by vehicle type in 2050 is expected to change as shown in Figure 8 in response to changes in demand and different rates of decarbonisation across the vehicle fleet.

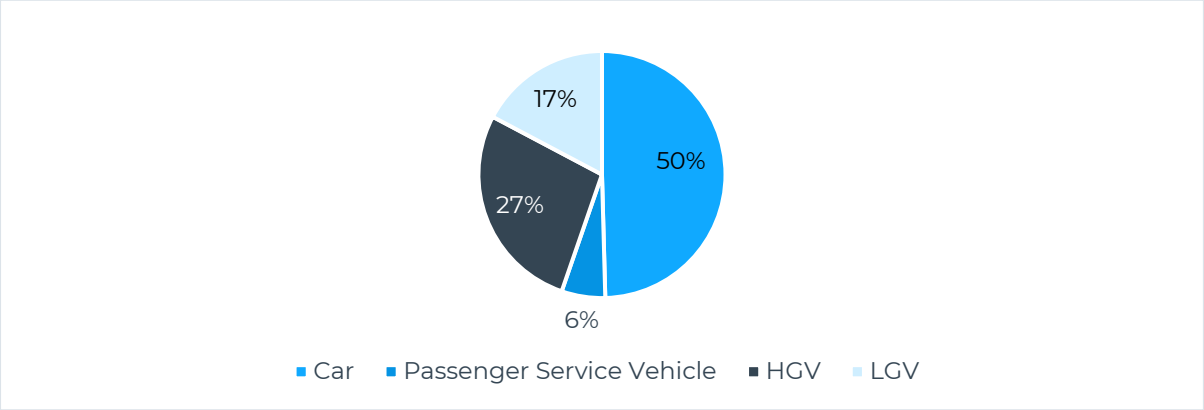

Figure 8: Proportion of emissions in Buckinghamshire by vehicle type (2050) under 'business as usual' scenario

'Business as usual' assumptions based on firm and funded policies potentially underestimate the proportion of the fleet that will comprise ZEVs in future years as they currently do not reflect the Government's planned ZEV mandate from 2024 or the phased commitment to ban the sale of new internal combustion engine (ICE) vehicles from 2035. As a result, this should be considered the lower limit of potential ZEV uptake.

Accelerated ZEV uptake based on mileage split data from the Department for Transport's common analytical scenarios would reduce total emissions in Buckinghamshire to 0.031 $MtCO_2$ per annum by 2050. However, this should be

considered the upper limit of potential ZEV uptake, and additional interventions would need to be identified both locally and nationally to realise this scenario.

Since the 'business as usual' scenario and the accelerated ZEV uptake scenario both reflect rates of uptake averaged at the national level, application to a local geography risks masking any variation in uptake that might be driven locally by place-based factors.

Taking into account local ZEV sales to date, propensity for ZEV uptake in Buckinghamshire, and current levels of local charging provision, it is reasonable to assume that total emissions in Buckinghamshire will reduce to 0.097 $MtCO_2$ per annum by 2050 under a **localised scenario of accelerated ZEV uptake**.

Despite recent changes to government policy, this localised scenario currently assumes the Government's original 2030 date for phased introduction of the ban on new ICE vehicles (now delayed until 2035). It also does not currently reflect the ZEV mandate, which will require 80% of new vehicles sold in 2030 to be ZEV. However, the locally specific nature of the scenario and its reflection of planned policies to influence the phase out of ICE vehicles (albeit assuming different dates for enactment) render it the most representative scenario from which the impact of other local interventions may be gauged.

For further information on the data and assumptions used in this localised scenario of accelerated ZEV uptake, please see the Baseline Scenarios & Pathways Guidance Note.

4. ESTABLISHING A LOCAL DECARBONISATION PATHWAY

4.1 PURPOSE OF PATHWAYS

Decarbonisation pathways reflect different interpretations of how to achieve net zero in line with carbon budgets. Carbon budgets quantify the amount of carbon that can be released over time in order to align with commitments in the Paris Agreement to keep global temperatures well below 2°C above pre-industrial levels.

Different pathways make different assumptions about the pace of change required and achievable within different sectors of the economy, balancing totals between sectors to ensure whole economy emissions fall at the rate prescribed in law through the national carbon budgeting process.

Local carbon budgets have not been set since different areas will decarbonise at different rates due to opportunities and constraints that are unique to each area. In the absence of a local budget, very few local transport authorities have developed a local decarbonisation pathway. The scaling of national pathways to a local level may instead provide an indicative proxy for the required pace of change, albeit some areas will be required to decarbonise quicker than the pathway implies to compensate for those areas that will decarbonise more slowly.

4.2 LOCAL CONTEXT

Buckinghamshire has not declared a climate emergency, although has a target for the council's own emissions to be net zero by 2030, and no later than 2050, and net zero emissions across the authority area by 2050. This is in line with national government, although a local pathway for realising this ambition has not been established.

4.3 SCALING NATIONAL PATHWAYS TO A LOCAL LEVEL

The Climate Change Committee (CCC) is an independent, statutory body established to advise the UK Government on emissions targets. The **CCC balanced transport pathway** from the Sixth Carbon Budget provides an indication of the pace of change required nationally across the surface transport sector in order to meet carbon budgets.

A scaled version of the CCC pathway for Buckinghamshire is shown in Figure 9, highlighting the gap in emissions that would need to be closed if the pace of decarbonisation was consistent across all areas. Assumptions behind the CCC's pathway can help provide a steer to local transport authorities on the blend of both national and local policy interventions needed in order to realise this pace of change.

A scaled version of the **Government's Net Zero Strategy domestic transport delivery pathway** for Buckinghamshire is also included in Figure 9. Presenting the impact of interventions against this pathway will enable a consistent comparison between different areas, helping contextualise the scale of impact from local interventions and associated levels of ambition relative to Government policy at the national level.

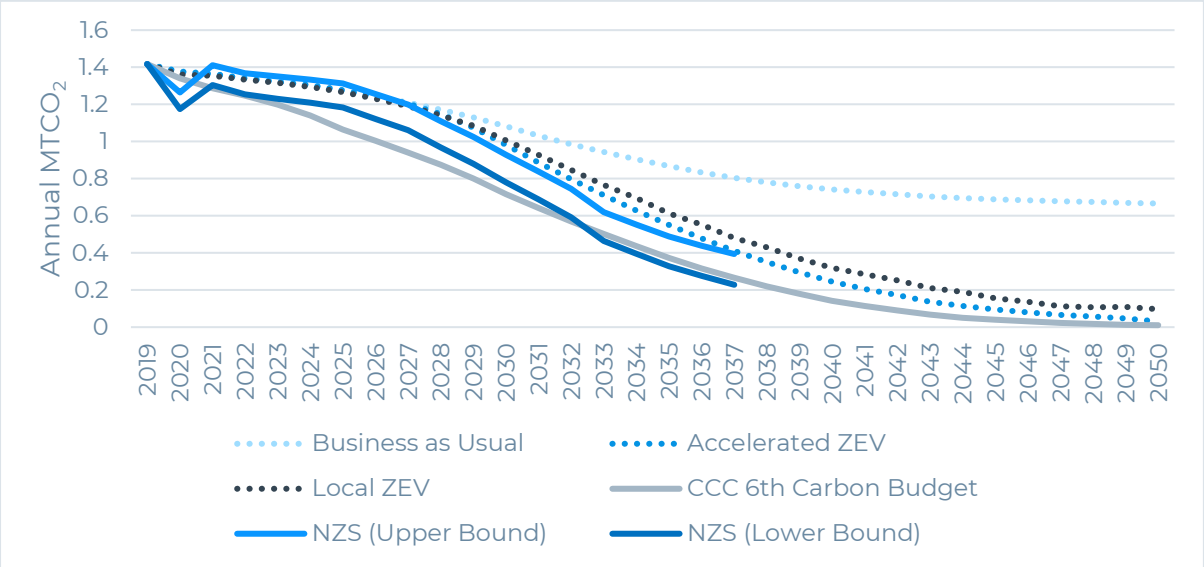

Figure 9: Total emissions in Buckinghamshire over time in context of local decarbonisation pathways

5. TRANSPORT OUTCOMES NEEDED TO ACHIEVE DECARBONISATION PATHWAYS

Typically, a significant 'emissions gap' will exist between scenarios based on current or expected policies, and pathways consistent with carbon budgets that achieve net zero by 2050. This implies the need to introduce new transport policy interventions at both a local and a national level to achieve decarbonisation at the scale and pace of change required.

Alongside measures to **improve** the efficiency of trips, the CCC predict this will require a reduction in vehicle kilometres travelled nationally by as much as 6% in 2030 and 14% in 2050, necessitating a combination of interventions that **avoid** or reduce travel demand and encourage a **shift** to more sustainable modes.

With background growth expected to increase vehicle kilometres due to population growth and increased car ownership, the CCC predicts the net effect of this reduction would temper growth in vehicle kilometres to 0% in 2030 and 3% by 2050 from 2020 levels.

A tailored approach will be necessary in different areas in order to achieve transport outcomes that recognise the unique characteristics of the local baseline and the opportunities that exist within the local geography to realise a change in travel behaviour.

In locations that are aspiring to achieve net zero earlier than 2050, more ambitious interventions will be required at greater intensities in order to achieve a more rapid rate of decarbonisation than that aligned with carbon budgets.

6. IMPACT OF INTERVENTIONS

The current version of the Carbon Assessment Playbook developed by England's Subnational Transport Bodies includes 30 in-built interventions that local transport authorities may wish to consider introducing in their area.

The scale and nature of impact associated with these interventions when introduced in different place type areas has been derived from an elasticity-based modelling approach that has been calibrated using empirical evidence from monitoring and evaluation of delivered schemes.

Interventions have been grouped by their main effects to provide easy identification of interventions that:

- **Avoid** or reduce travel demand
- Encourage a **shift** in modes
- **Improve** efficiency of trips

Table 1 below shows the top five interventions that are most likely to exert the greatest carbon reduction within Buckinghamshire, based on the makeup of the local baseline and the place types that are present within the local area.

The emissions reduction calculated serves to exemplify the maximum likely effect from delivery of these most impactful interventions if they were delivered across the full local transport authority area during 2024. As such they have been calculated using the Policy Builder, and applying each intervention individually with the intensity slider set to 100%, all zone scopes set to 100% and a build profile increasing linearly from 0% in 2019 to 100% in 2050.

This assessment has been undertaken to provide an indication of relative impacts only. Users of the Carbon Assessment Playbook should refer to the user settings guidance included on the Intervention Cards when setting scope and intensity of individual interventions since it may be impractical for some interventions to be delivered across the full geography of the authority area. Build profiles should also be set according to the year in which an intervention is introduced where the phasing of interventions is less applicable or appropriate.

Table 1: Interventions that would deliver the greatest reduction in emissions in Buckinghamshire assuming delivery in 2024 across full local transport authority area

Intervention	Category	Reduction in Emissions ($MtCO_2$)		
		2030	2040	2050
PC6 • Cordon based charges & restrictions	Shift	0.021	0.013	0.003
LE2 • EV charging infrastructure	Improve	0.021	0.012	0.000
PC1 • Road user charging/tolls	Shift	0.012	0.006	0.003
BC2 • EV car clubs	Shift	0.012	0.007	0.000
BC4 • Campaigns for switch to LEV fleets	Improve	0.011	0.006	0.000

Their resulting contribution towards closing the local emissions gap is shown in Figure 10, assuming a baseline that reflects the localised scenario of accelerated ZEV uptake and a decarbonisation pathway based on a scaled version of the CCC.

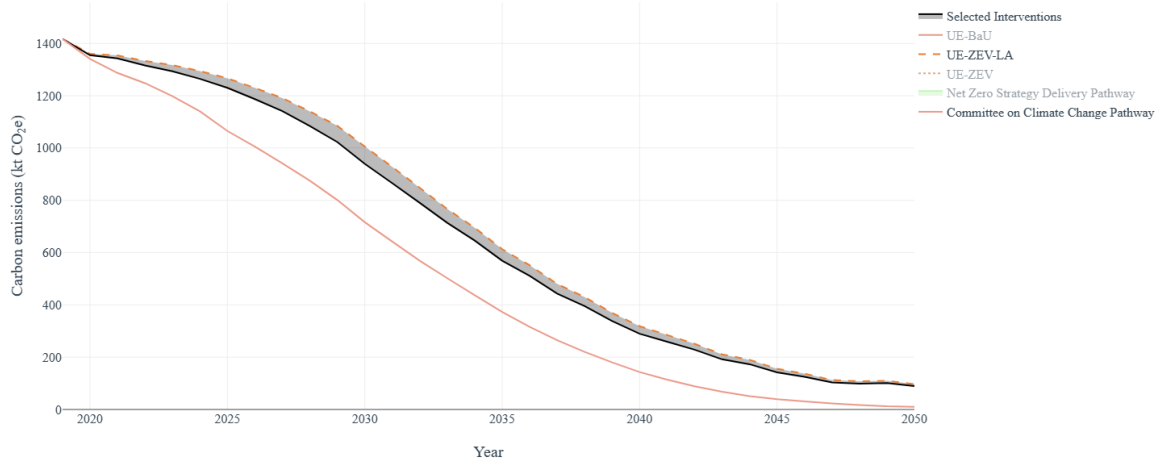

Figure 10: Change in total emissions in Buckinghamshire that would result assuming delivery of interventions in Table 1

The analysis presented within this report is intended to help inform development of a longlist of options for local intervention in order to achieve decarbonisation goals. The **Policy Builder** tab within the Carbon Assessment Tool may be used to inform the iterative development of these options by indicating their scale of impact, helping sift the longlist of options down to a shortlist and quantifying the cumulative effect of the resultant policy package against the local baseline.

7. HIGHWAY SCHEMES

Highway schemes include any intervention that improves capacity or journey times for general traffic. Highway schemes are not included in the Carbon Assessment Playbook since their carbon impact is influenced by a range of different factors that are unique to each scheme, preventing development of a consistent benchmark from which to inform any assessment.

A reduction in user emissions may result where highway schemes reduce congestion, reroute trips to a shorter distance route, lower average speeds or reduce the frequency of vehicle acceleration. Conversely, an increase in user emissions may be expected where highway schemes result in an increase in these factors.

Moreover, improved efficiency of the highway network can often induce new demand by making travel by private vehicle more attractive, resulting in more vehicle kilometres being travelled that runs counter to the headline requirement to avoid or reduce travel demand and encourage a shift to more sustainable modes.

Since many highway schemes result in a combination of increases and decreases across the various factors, quantification of overall impact requires a more detailed understanding of scheme performance. Traffic modelling of more significant highway schemes is therefore recommended to better understand their likely impact on network operation and user behaviour. Use of traffic models can further help scenario planning, such as the optimal distribution of new development to minimise carbon emissions where highway schemes are introduced to facilitate housing growth objectives.

Any change in user emissions predicted to result from highway schemes should be examined in the context of impacts predicted to result from the delivery of interventions included in the Carbon Assessment Playbook to ensure the impact of a chosen policy scenario is not outweighed or unreasonably diluted by associated highway impacts.

Where traffic modelling is not available, a ‘first principles’ assessment should be undertaken against each of the factors listed above to determine the likely risk that a given highway scheme runs counter to the scale of emissions reduction that is targeted.

8. INFRASTRUCTURE CARBON

Whilst the Carbon Assessment Playbook primarily considers the user emissions impact of different transport policy interventions, any capital carbon (from construction, maintenance and end-of-life replacement) or operational emissions

(associated with water or energy consumption) should also be considered at the early strategy stage to ensure alignment with PAS 2080 principles, the global standard for managing carbon in infrastructure delivery.

Since materials manufacture and energy use will contribute towards emissions in other sectors outside of transport, local transport authorities should strive to ensure any infrastructure carbon 'spent' in the construction and maintenance of new infrastructure is proportionate to the scale of user emissions savings that stand to be secured, ensuring a net reduction in whole economy emissions that avoids merely moving emissions between different sectors.

It is expected that a 'top-down' benchmarking method will be most appropriate when seeking to quantify infrastructure carbon at an early strategy stage to support option development and to assess the potential scale of programme impact.

Detailed, 'bottom-up' quantification derived from materials estimates will provide better information on the breakdown of emissions sources but is more likely to be appropriate at later stages of design.

The intervention fact sheets included in the Carbon Assessment Playbook signpost the relative impact of infrastructure carbon typically associated with each type of intervention.

The Department for Transport aims to work with local authorities and partners to develop benchmarks that may be applied to an intervention length or cost to derive an estimate of infrastructure carbon suitable for the context of transport strategy development.