7 November 2023

Hertfordshire County Council

70113157

Hemel Garden Communities

Potential Modal Shift

Source: Hemel Garden Communities Charter, Jan 2019

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Document Control

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Introduction & executive summary

Introduction & Executive summary

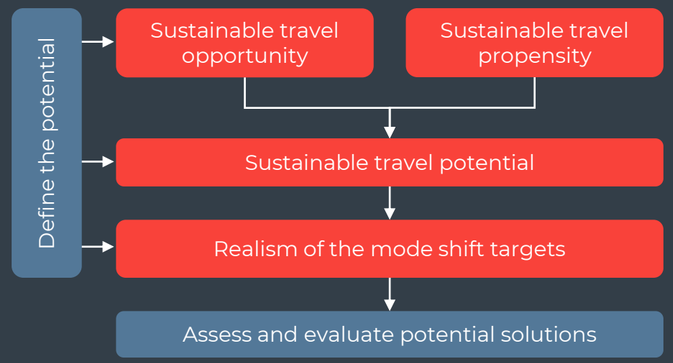
Overview

Hertfordshire County Council (HCC) engaged WSP to undertake a modal shift study for the Hemel Hempstead and Hemel Garden Communities (HGC) growth area.

The Hemel Garden Communities Spatial Vision aims to promote active and sustainable travel for all, linking local hubs with natural landscapes. The vision seeks to enhance lifestyles by fostering a deeper connection with nature, while also reducing energy consumption and playing a substantial role in reaching Net Zero carbon goals.

This report

This report summarises the key findings related to opportunity and propensity for sustainable travel, and the resulting potential for the HGC growth area, Hemel Hempstead and Dacorum, and a high-level assessment of potential interventions (solutions).



Project aims

The goal of the Hemel Garden Communities Spatial Vision is to achieve ambitious mode share targets by 2050:

- 40% of all trips starting and/or ending in the existing settlement area of Hemel Hempstead should be by active and sustainable travel modes, and
- 60% of all trips starting and/or ending in the new development of HGC growth area should be by active and sustainable travel modes.

This vision emphasises reducing reliance on private vehicles and promoting eco-friendly transportation options to create a more sustainable and liveable community.

The primary emphasis will be on data analysis to establish a fact-based method for estimating the sustainable travel potential outcomes of the project.

The next step is to ascertain the attainability and practicality of the specified mode shift targets for the HGC growth area.

This report aims to identify and assess specific interventions that will drive the desired mode shifts.

Report structure

The report is structured as follows:

- Part A – Sustainable travel opportunity – summarising the number of car trips that could be made by walking, cycling and public transport
- Part B – Sustainable travel propensity – calculating the propensity or likelihood of users to walk, cycle or use public transport
- Part C – Sustainable travel potential – estimates which car trips are likely to walk, cycle and use public transport
- Part D – Realism of mode share targets – assesses the achievability of the mode share targets, looking at existing travel patterns, mode share, and the sustainable opportunity and propensity findings.
- Part E – Assess and evaluate potential solutions – scores a long- and short-list of interventions based on their suitability or need to help achieve the mode share targets.
- Conclusion

The report should be read in conjunctions with the following appendices:

Appendix A – Policy review
Appendix B – Assess and evaluate potential solutions methodology
Appendix C – Avoid trips interventions and scoring
Appendix D – Shift modes interventions and scoring
Appendix E – Improve fuel efficiency interventions and scoring
Appendix F – Interventions scoring input data sources
Appendix G – Ideal value percentile values
Appendix H – Multi-criteria analysis scoring

Introduction & Executive summary

Project approach

The initial phase of this project focussed on sustainable travel potential – which was estimated by calculating and multiplying the opportunity trips by the propensity score.

Sustainable travel opportunity **x** Sustainable travel propensity **=** Sustainable travel potential

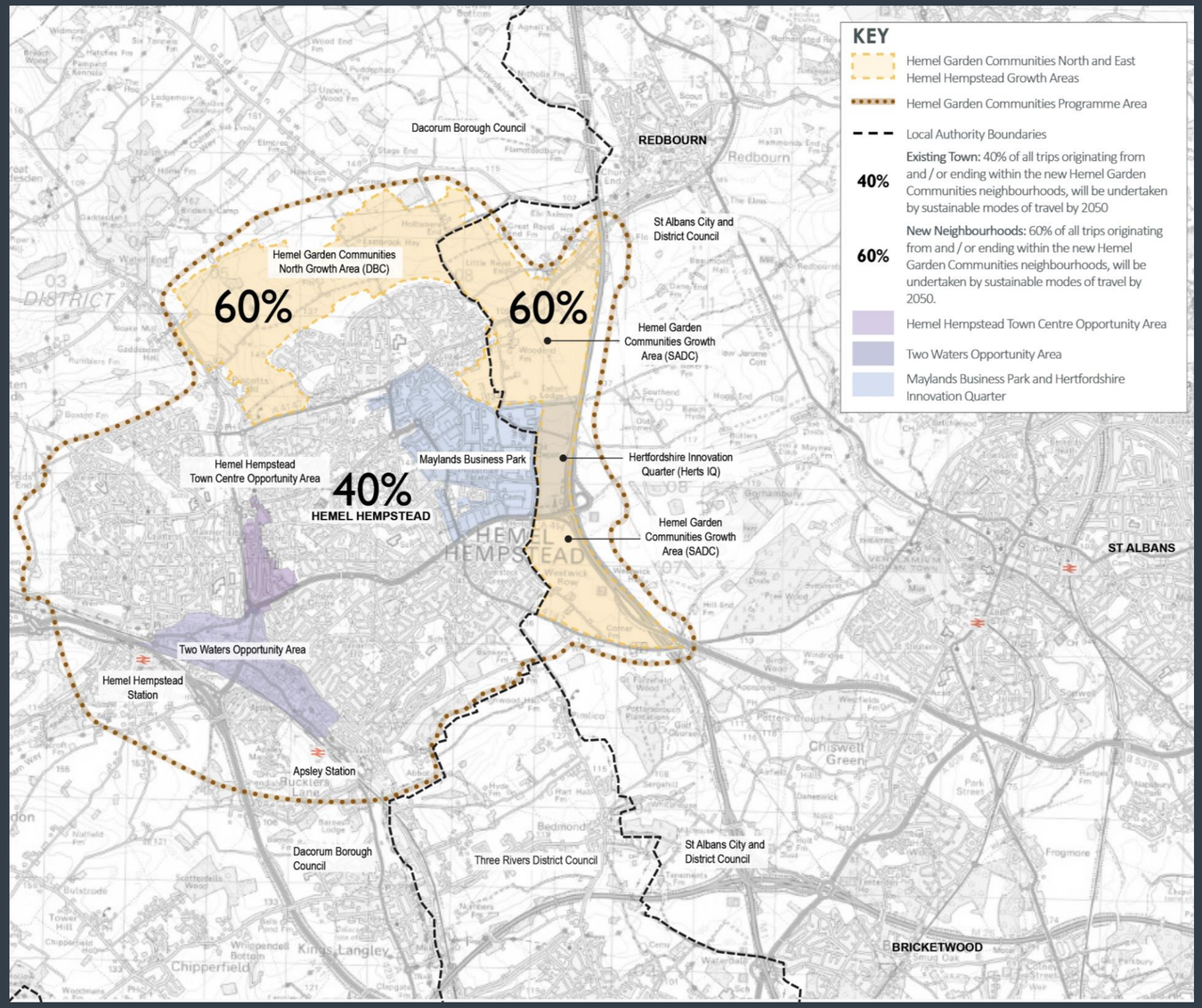
The second phase aimed to establish the realism of the mode shift targets – as set out in the Hemel Garden Communities Spatial Vision – by comparing the County Travel Survey data, WSP's Mobility Insights predictions and the sustainable travel potential to the targets.

Finally, the project assessed and evaluated a long list of interventions – drawing on WSP's Solutions Toolkit to understand which had the highest need (or potential to unlock the sustainable travel potential).

Based on the results and discussions with the client – a short list of interventions was developed – showing the prioritised interventions and where they should be considered across Hemel Hempstead.

The study area for this assessment is shown in Figure 1 focussed on the Hemel Garden Communities Programme Area (Hemel Hempstead) and the Hemel Garden Communities North and East & Hemel Hempstead Growth Areas (HGC growth area).

Figure 1 Hemel Hempstead and HGC growth area included in this study



Sustainable travel potential findings

Sustainable travel opportunity

What is it

Sustainable travel opportunity estimates the number of modelled car trips that can use sustainable modes (walking, cycling or public transport).

What did we do

Existing car journeys are extracted from the Hertfordshire Countrywide Model of Transport (COMET) and alternative route options are provided using the Google API.

Routes for walking, cycling and public transport are compared to the driving journey using lower and high sustainable travel opportunity scenarios:

- The high scenario aims to hit targets as set out in the Department for Transport's Gear Change – two miles for walking, five miles for cycling and a maximum public transport journey time of 2.4x the driving alternative.
- The lower scenario is more conservative and aims for a 15–20 minute neighbourhood – one mile for walking, three miles for cycling and a maximum public transport journey time of 1.5x the driving alternative.

Part A of this report summarises the approach and findings of the sustainable travel opportunity work.

Sustainable travel propensity

What is it

The sustainable travel propensity is the likelihood that a resident or household will use or switch to walking, cycling, bus or rail, and is benchmarked against the England average (which is set at 100).

What did we do

WSP's Mobility Insights survey response bank is used to derive propensities for walking, cycling, public transport (bus and rail), and driving by grouping survey results to the Dominant Experian Mosaic Group.

Responses are categorised into different variables (such as owning a car) and socio-demographic groups (derived from Experian Mosaic), then compared to the England average response.

A weighted average of relevant variables for each mode is calculated to determine propensity and is presented at a hex level (400m x 400m) based on the Dominant Mosaic Group in that hex.

Part B of this report summarises the approach and findings of the sustainable travel propensity work.

Sustainable travel potential

What is it

Sustainable travel potential estimates which car trips would use sustainable modes – considering the opportunity and propensity findings. It is intended to provide a better calculation for estimating the total number of switchable trips.

What did we do

Outputs from the sustainable travel opportunity analysis and the sustainable travel propensity analysis are combined to determine the sustainable travel potential.

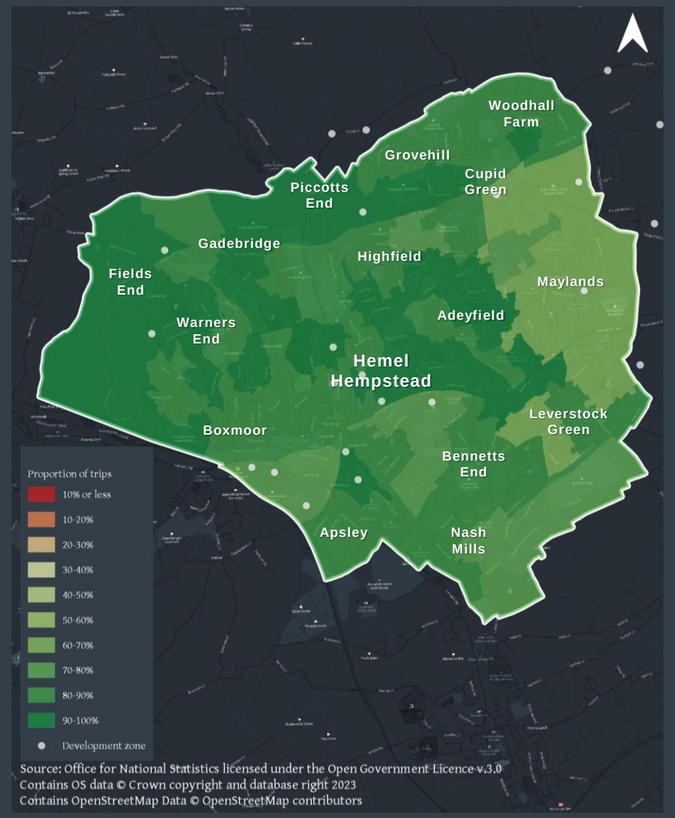
For active travel – the Gear Change target of 50% was used as the baseline mode share for walking and cycling trips for the England average. If propensity was 100 (England average) then 50% of the opportunity trips would shift – with a higher proportion switching if propensity was greater than 100, and the inverse for propensity scores below 100.

Public transport trips were adjusted by comparing the propensity to take public transport to that of driving.

Part C of this report summarises the approach and findings of the sustainable travel potential work.

Potential sustainable travel

Sustainable travel opportunity

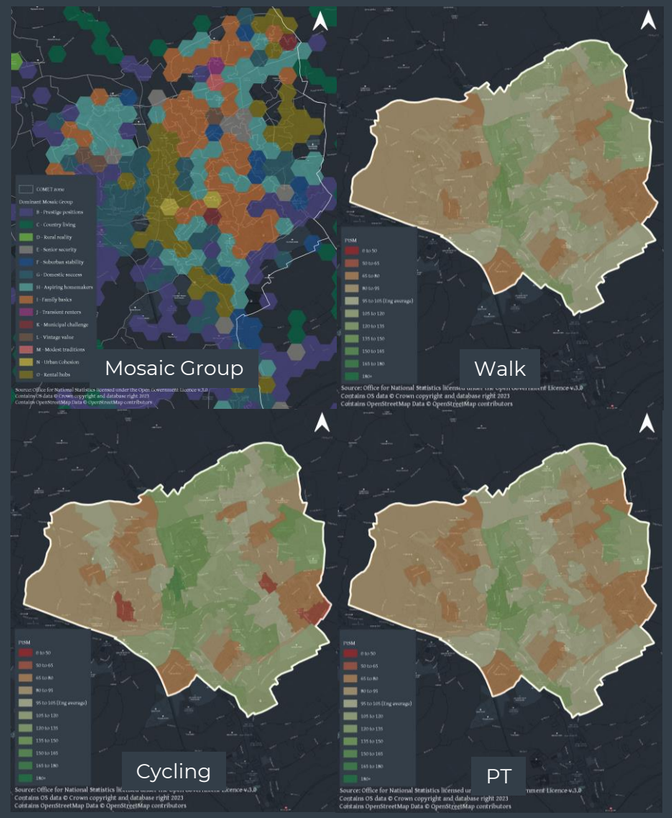


We calculated that up to:

- 54% of car trips in the HGC growth area,
- 66% of car trips in Hemel Hempstead have the opportunity to switch from cars.

The lower proportion for the HGC growth area (shown as development zones in the map) is explained as the zones are points and therefore mode shares for internal trips are not calculated – but would increase the opportunity.

Sustainable travel propensity

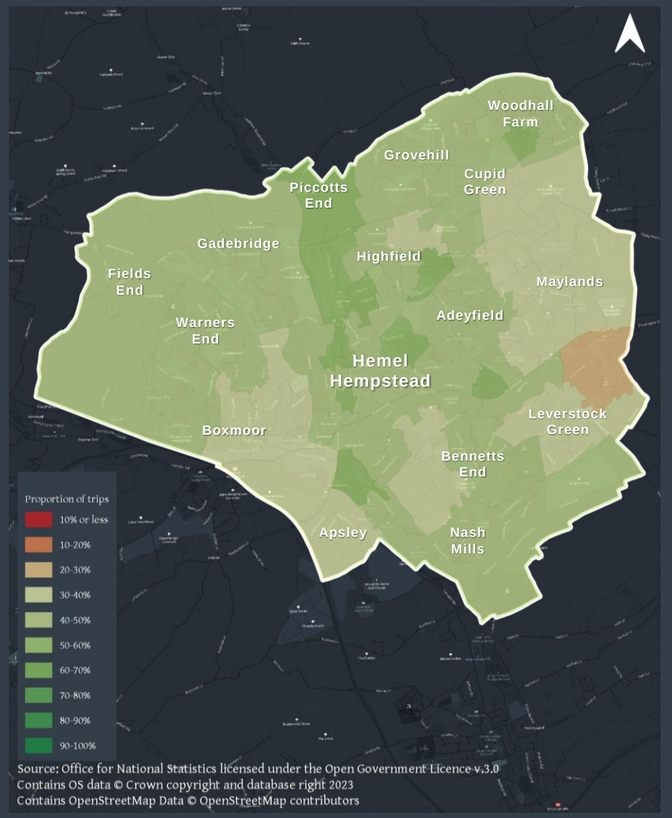


What did we find:

Based on the existing socio-demographics Hemel Hempstead has above average propensities for walking, cycling and public transport in the town centre, along the River Gade, Maylands, Woodhall Farm and Grovehill.

As the HGC growth area is developed, it is likely that the propensity to use sustainable modes will increase with new and incoming residents.

Sustainable travel potential



- 27% of car trips in the HGC growth area.
- 34% of car trips in Hemel Hempstead have the potential to be shifted from driving to sustainable modes – based on the current active and public transport networks, and current socio-demographics (propensities).

Sustainable travel potential findings

The table to the right summarises illustrative mode split calculations of this study (based on commuting trips), for both Hemel Hempstead and the HGC growth area.

- The existing mode split is based on the 2021 Census Journey to Work data for Dacorum – and has been used as the baseline mode share for both Hemel Hempstead and the HGC growth area. **It is noted that the Census only includes commuting trips, the realism of the mode share targets section looks at the sustainable travel mode shares for other trip types bringing in data from the County Travel Survey**.
- The sustainable travel potential sets out the car trips that could walk, cycle and public transport – based on current networks (sustainable travel opportunity), socio-demographics and travel habits (sustainable travel propensity).
- Finally, the illustrative mode split indicates the best-case scenario for mode share based on the current networks, socio-demographics and travel habits.

For the HGC growth area, sustainable travel mode share could increase from 18% to 41%. This is lower than Hemel Hempstead as a whole, as the development zones identified in the COMET model were point data – which meant that mode share calculations for internal trips were not undertaken. This is primarily due to the assumptions made in our calculations. These findings represent a worst-case scenario. In this analysis, we assumed that HGC growth area residents would exhibit similar travel habits to the existing Hemel residents, there would be no significant additional infrastructure developments, and that no internalisation of trips would occur due to the provision of facilities within the development. The results show:

- Walking increasing from 11% to 22%
- Cycling increasing from 1% to 13%
- Public transport remaining at 6%
- Car mode share decreasing from 80% to 40%.

Although the sustainable travel mode share for the HGC growth area is 41%, it should be noted that the analysed data is for 2036, based on existing transport networks and current socio-demographics. The HGC is planned to be built out by 2050 – suggesting that over time improved active and public transport networks will increase the opportunity (or number of trips) that can be made by sustainable modes, while new residents will shift socio-demographics to have a higher likelihood (or propensity) to use alternative travel methods – edging close to the 60% sustainable travel mode share target.

Illustrative commuting mode split calculations for **Hemel Hempstead**

Mode	Existing mode split		Mode shift		Illustrative mode split
Walk	11%	+	+14%	=	**25%**
Cycle	1%		+12%		**13%**
Public transport	6%		+2%		**8%**
Car	80%		-32%		**48%**
Other	2%		+4%		**6%**

46%

Illustrative commuting mode split calculations for **the HGC growth area**

Mode	Existing mode split		Mode shift		Illustrative mode split
Walk	11%	+	+11%	=	**22%**
Cycle	1%		+12%		**13%**
Public transport	6%		+0%		**6%**
Car	80%		-40%		**40%**
Other	2%		+17%		**19%**

41%

Sustainable travel potential findings

For Hemel Hempstead, sustainable travel commuting mode share could increase from 18% to 46%. The results show:

- Walking increasing from 11% to 25%
- Cycling increasing from 1% to 13%
- Public transport increasing from 6% to 8%
- Car mode share decreasing from 80% to 48%.

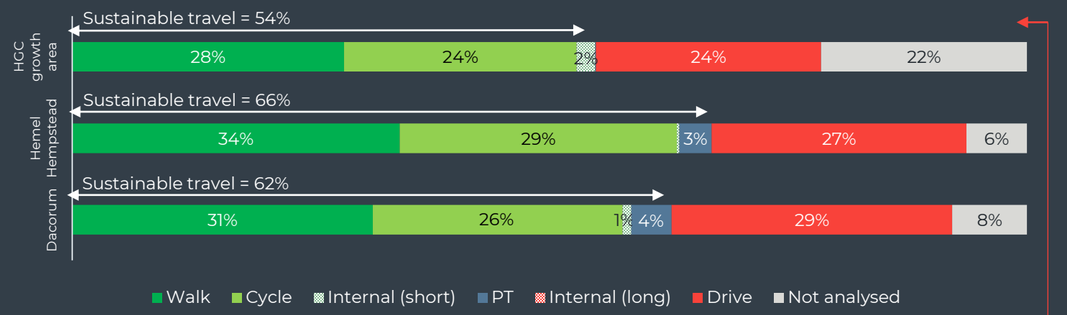
The data analysis suggests:

- A relatively high sustainable travel potential for walking and cycling – which could be unlocked and encouraged through continued investment in active travel infrastructure and shared mobility. Interventions considered in more detail in this study include connected walking and cycling infrastructure, logistics infrastructure, micro consolidation, mobility hubs, bike and scooter share.
- A lower mode shift opportunity to use bus and rail – suggesting that enhancements to the public transport network will be required. Focus should be on improving the bus and rail network to better meet the needs of existing and new residents – improving connectivity between activity centres and areas with a higher propensity to use public transport, while improving travel time competitiveness with driving. Interventions considered in more detail in this study include bus priority and demand responsive transport.

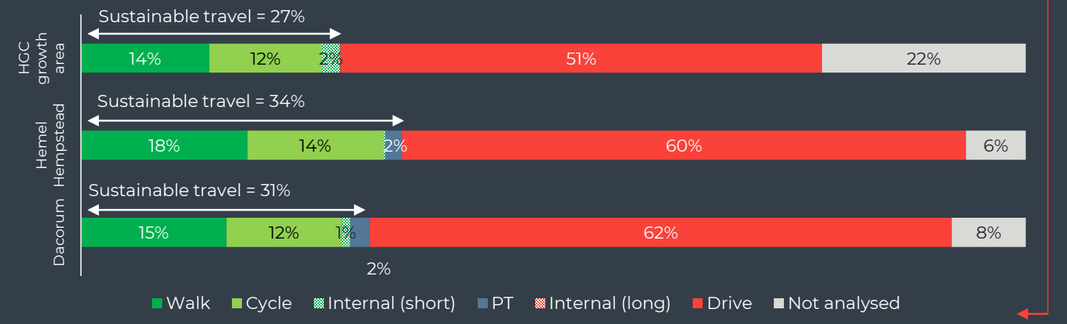
The graphs to the right show the mode share calculations that were used to calculate the illustrative mode split (high mode shift):

- Mode shift opportunity – or number of car trips that could be made by walking, cycling and public transport
- Sustainable travel potential – the number of car trips factoring for propensity of likelihood of residents to switch to walking, cycling and public transport
- Illustrative mode split – a recalculation of mode shares factoring mode shift from cars.

Commuting mode shift opportunity

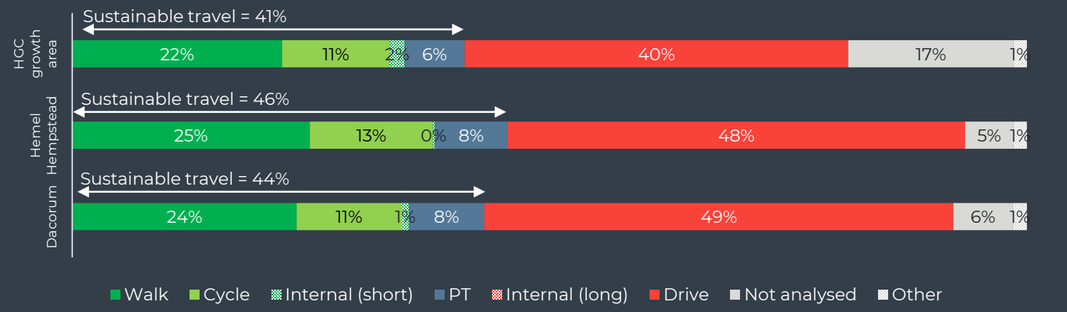


Commuting sustainable travel potential



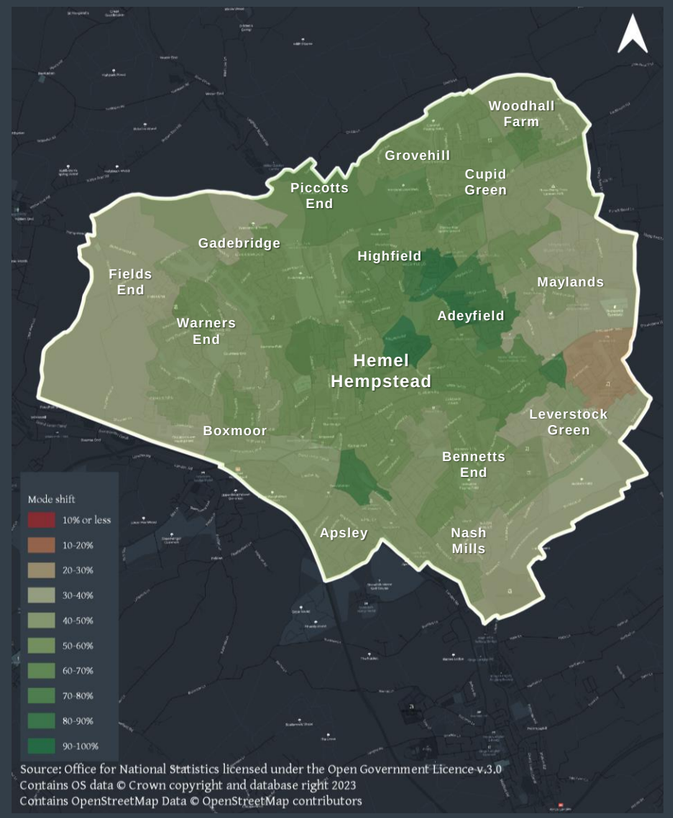
by number of trips

Commuting illustrative mode split



Potential sustainable travel (walking)

Opportunity to walk



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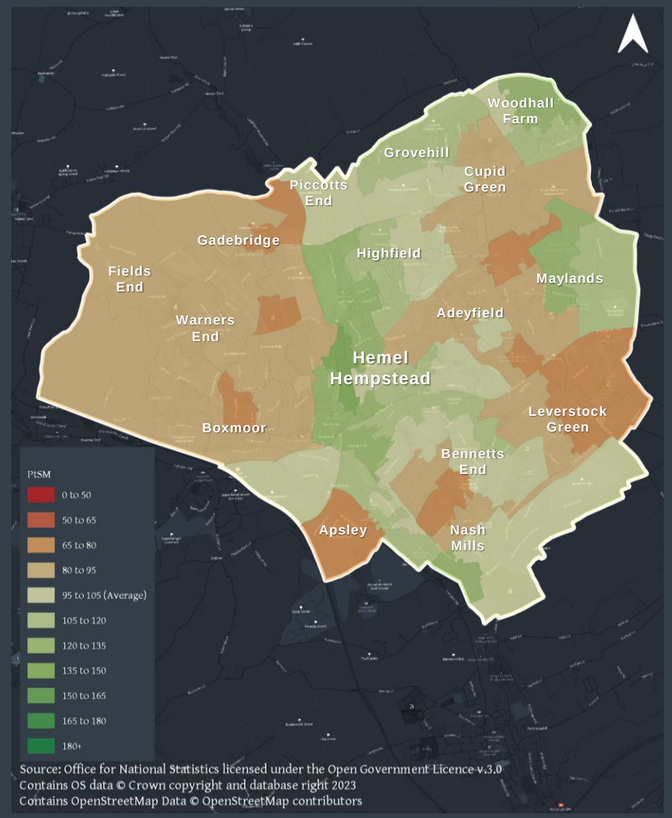
Propensity to walk



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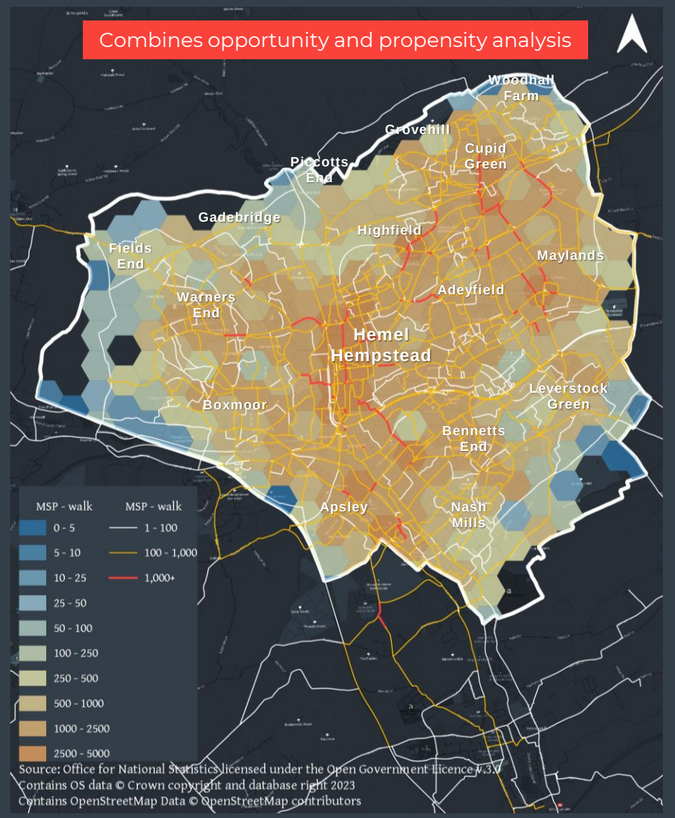
Walking potential



We calculated that up to:

- 28% of trips in the HGC growth area,
- 34% of trips in Hemel Hempstead have the opportunity to switch from cars to walking.

Areas where a high proportion of trips can be walked include the town centre, Adeyfield and Highfield.

What did we find:

Propensity to walk varies across Hemel Hempstead, including the characteristics of the residents and the local infrastructure. The town centre, along the River Gade, Maylands, Grovehill and Bennetts End have a higher-than-average propensity to walk. These areas may have a higher proportion of residents who prioritise active lifestyles and are more inclined to engage in walking activities for leisure or commuting purposes.

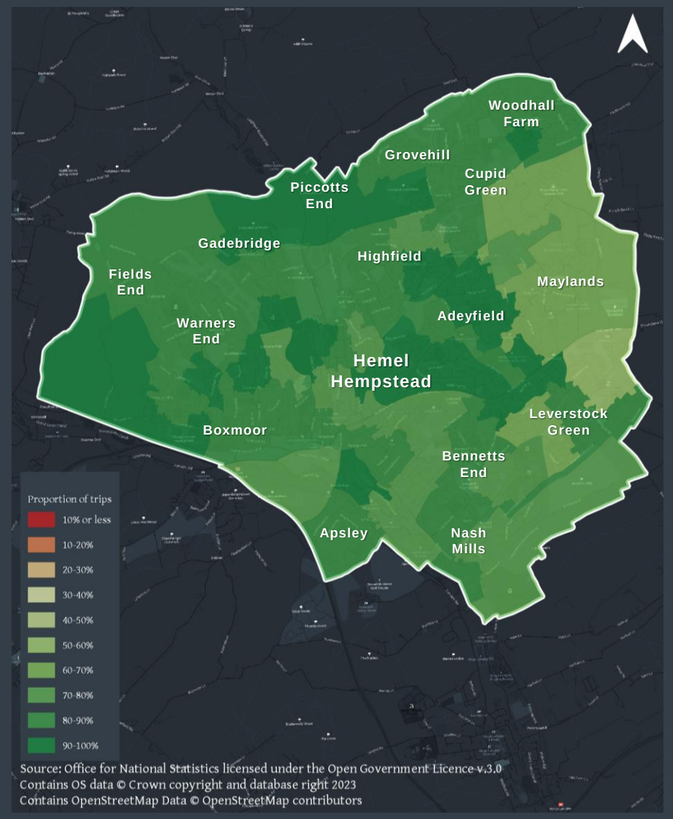
We calculated that up to:

- 14% of trips in the HGC growth area,
- 18% of trips in Hemel Hempstead have the potential to switch from cars to walking.

The map shows the number of trips at a hex and link level, red links have the highest potential for walking. The town centre, along Apsley, Maylands, Highfield and Cupid Green have a higher-than-average potential to walk.

Potential sustainable travel (cycling)

Opportunity to cycle



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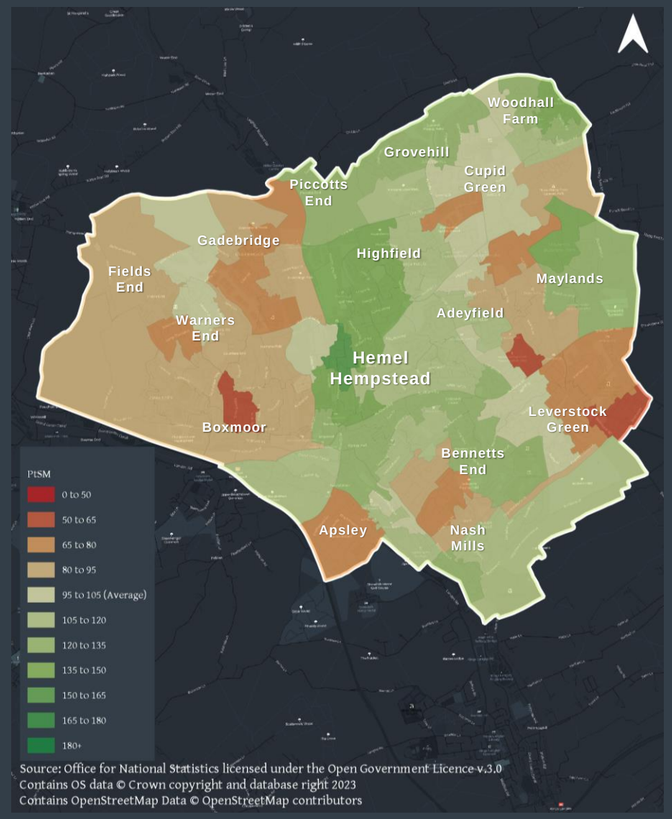
Propensity to cycle



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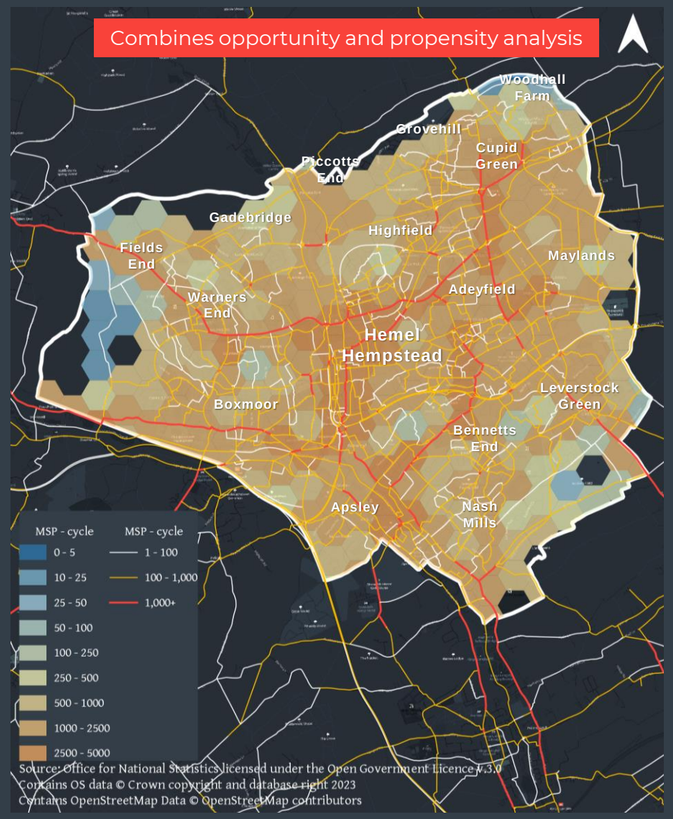
Cycling potential



We calculated that up to:

- 32% of trips in the HGC growth area,
- 37% of trips in Hemel Hempstead have the opportunity to switch from cars to cycling.

Areas where a high proportion of trips can be cycled include the town centre, Adeyfield, Highfield, Piccotts End and Warners End. This suggests that a high proportion of trips are within a comfortable five-mile cycle.

What did we find:

Propensity to cycle varies across Hemel Hempstead, including the characteristics of the residents and the local infrastructure. The town centre, Highfield, Piccotts End, Grovehill, Woodhill Farm, Maylands and Bennetts End have a higher-than-average propensity to cycle. These areas may have a higher proportion of residents who prioritise active lifestyles, prefer cycling, or find it a convenient means of getting around.

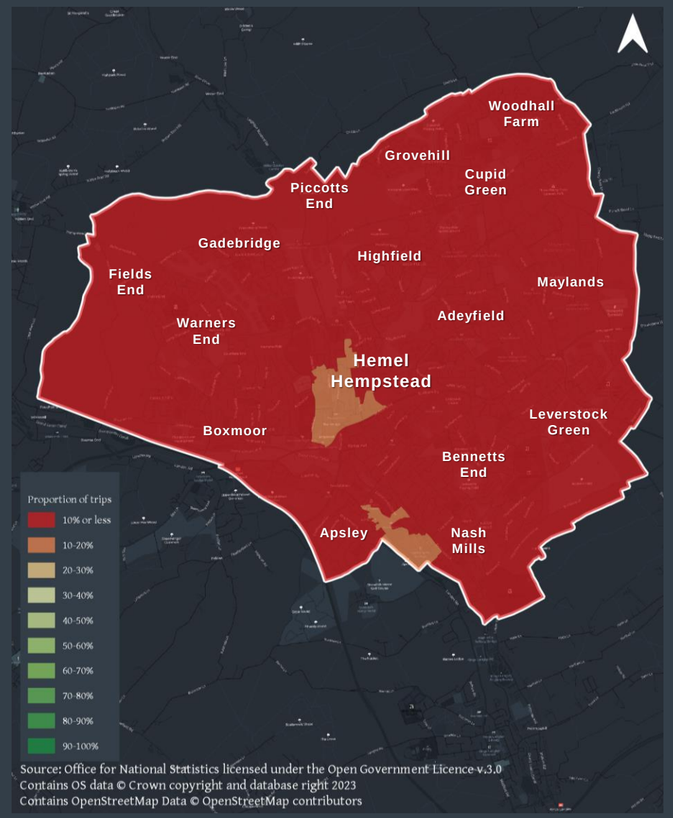
We calculated that up to:

- 15% of trips in the HGC growth area,
- 20% of trips in Hemel Hempstead have the potential to switch from cars to cycling.

The map shows the number of trips at a hex and link level – with the cycling trips distributed across Hemel Hempstead. Cycling infrastructure should focus on good links between areas and also with the town centre.

Potential sustainable travel(public transport)

Opportunity to use public transport



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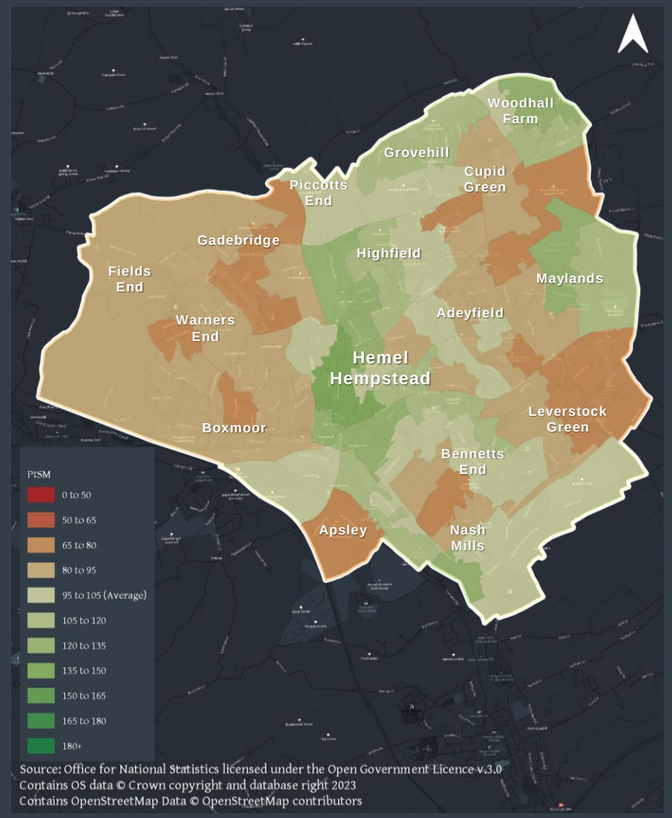
Propensity to use public transport



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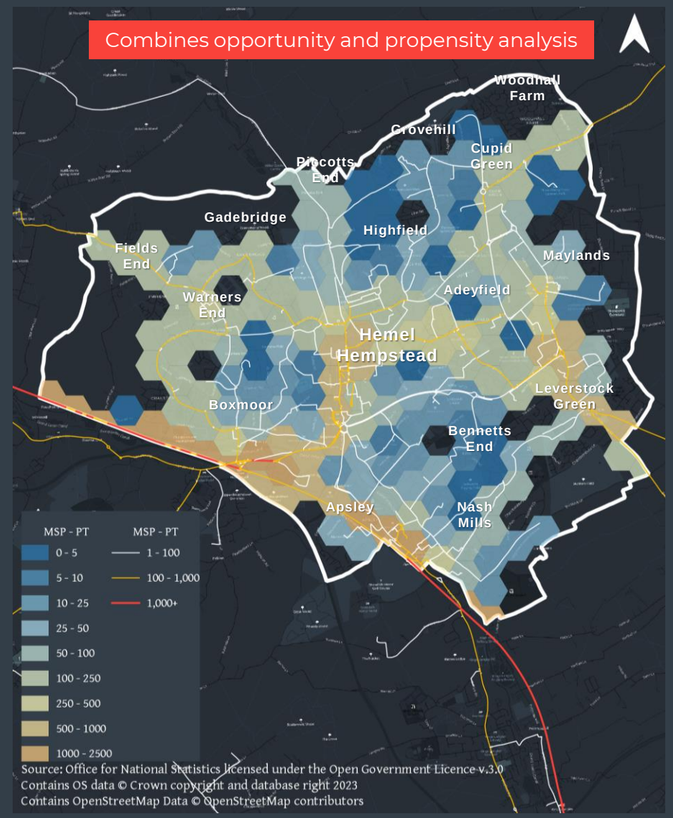
Public transport potential



We calculated that up to:

- 3% of trips in Hemel Hempstead have the opportunity to switch from cars to public transport – with very limited public transport options available.

The opportunity to use public transport is limited by the coverage and journey times of bus and rail when compared to car. For example, although a public transport trip could be made by bus or rail, it would take 2.4x longer than if driven.

What did we find:

Propensity to use public transport (which is an average of bus and rail) varies across Hemel Hempstead, including the characteristics of the residents and the local transport infrastructure. The town centre, Highfield, Grovehill, Woodhill Farm and Maylands have a higher-than-average propensity to use public transport. These areas may have a higher proportion of residents who prioritise sustainable transport methods, either due to personal preferences and environmental consciousness.

We calculated that up to:

- 2% of trips in Hemel Hempstead have the potential to switch from cars to public transport – and no trips for the HGC growth area.

The map shows the number of trips at a hex and link level based on the currently available public transport network. Red links have the highest potential for public transport. The focus for public transport improvements should be on key links between areas of higher propensity, but also new or improved services to improve public transport potential.

Realism of the mode shift target

Approach

The aim of this task was to assess the realism of the mode share target for Hemel Hempstead and the HGC growth area as set out in the Hemel Garden Communities Spatial Vision. The target is that by 2050:

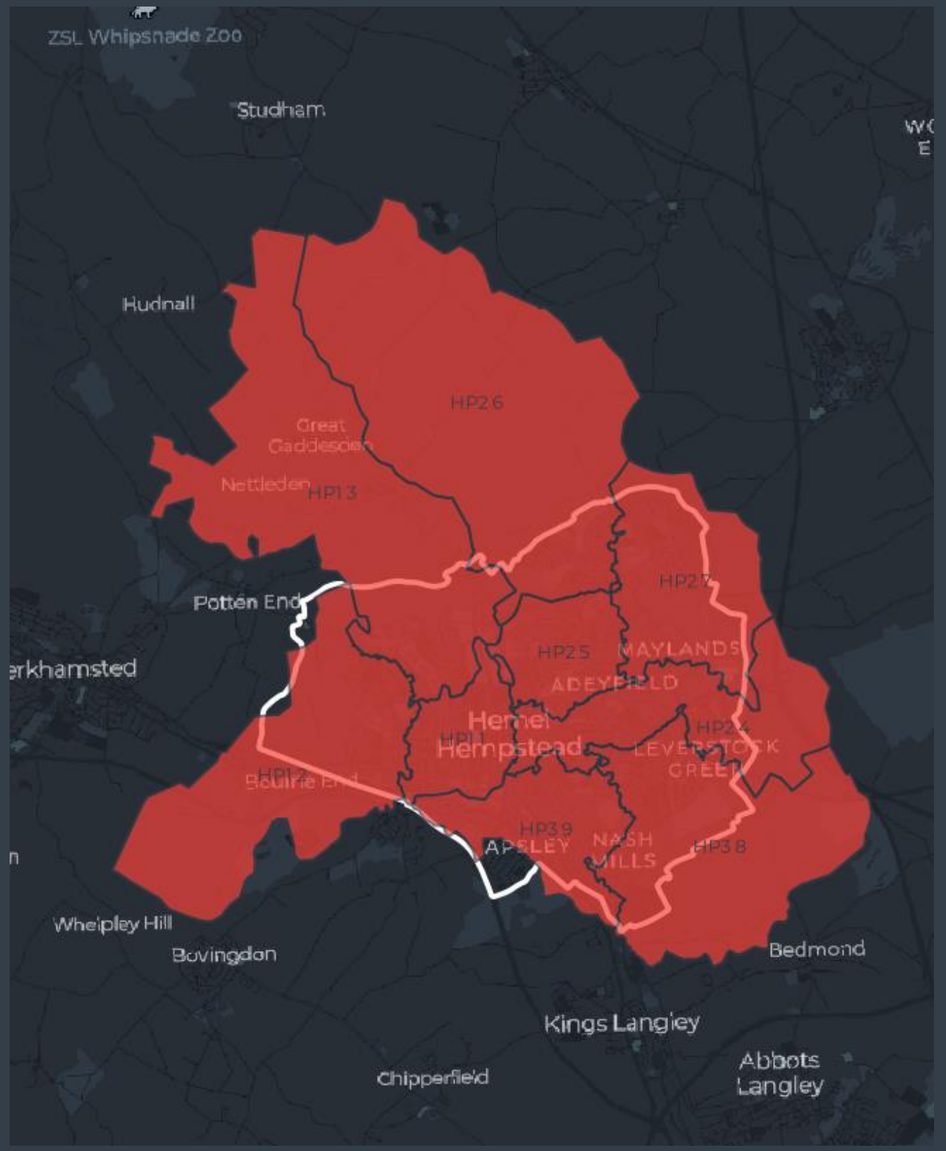
- **40% of all trips** starting and/or ending in the existing settlement area of Hemel Hempstead should be by active and sustainable travel modes, and
- **60% of all trips starting** and/or ending in the new development of the HGC growth area should be by active and sustainable travel modes.

This assessment is based on first comparing the results of the County Travel Survey to the Mobility Insights predictions from WSP's survey data bank to understand if the assumptions used to inform the sustainable travel opportunity, propensity and potential are representative of the area.

This was done as the data for the County Travel Survey was collected at a sub-district level (first four letters), while the sustainable travel opportunity, propensity and potential were analysed at a full postcode level (and linked to Experian Mosaic) and then combined into hexes. The figure to the right shows the postcode sub-district survey results that were included in the analysis.

The County Travel Survey included 320 household responses across the county, of which 171 were in postcode sub-districts relevant to Hemel Hempstead and included in the comparative analysis.

A matching exercise was undertaken to compare the results at the two different spatial resolutions to ensure that they were generally consistent.



Postcode sub-district survey results that were compared to the Mobility Insights

Realism of the mode shift target

Comparison of travel habits

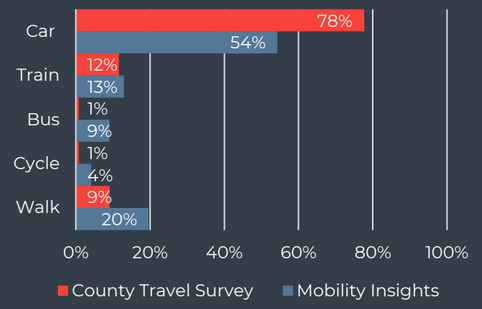
The graphs to the right show the current mode shares by trip type – comparing the County Travel Survey results with WSP's Mobility Insights survey bank predictions. The Mobility Insights prediction indicates likely travel behaviour that would be expected based on the socio-demographics in the area as evidenced in other parts of England:

- For commuting – car use based on the County Travel Survey is 78% - which is higher than would be expected. As a result, mode share for sustainable travel is lower than other parts of England. This suggests that there is an opportunity to improve active travel and public transport opportunities for commuting trips.
- For education – car use is 53% which is slightly higher than the Mobility Insights predictions (48%). Walking is 39% which is greater than other areas with similar socio-demographics. Cycling and use of bus and rail is lower than would be expected for the area.
- For shopping and personal business – car (79%) and walking (23%) trips are higher than predicted, with cycle, bus and train lower than expected.
- For leisure – walking trips are higher than predicted at 38% compared to 20% for Mobility Insights. As a result – car, cycle, bus and train trips are lower than predicted.
- For work-related trips – walking (29%) and train trips (21%) are higher than predicted when compared to Mobility Insights. Car and cycling are lower than predicted, while bus use is the same.

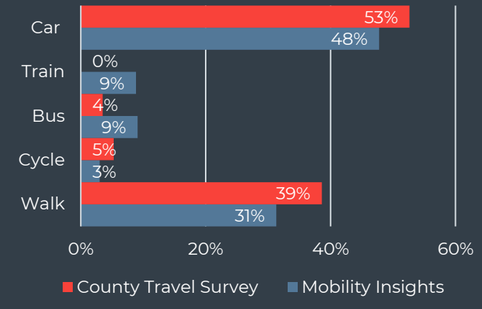
When looking at current sustainable travel (walk, cycle, bus and rail) from the County Travel Survey by trip purpose – those that fall below the 40% target include commuting (22%), shopping and personal business (30%). Trip purposes above the 40% target include education (47%), leisure (44%) and work-related (57%) – with leisure and work-related trips also exceeding the Mobility Insights predictions. This suggests that there is an opportunity to improve active travel and public transport networks particularly for commuting, education and shopping trips.

Comparison of main mode by trip type

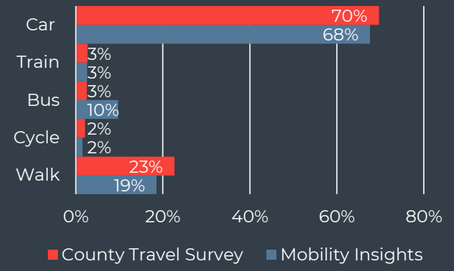
Commuting



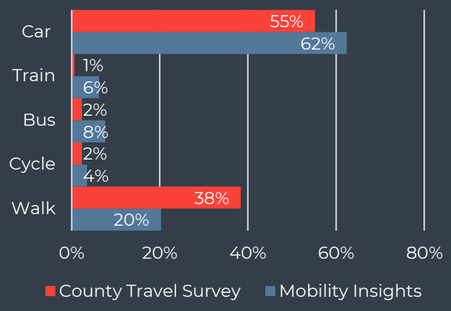
Education



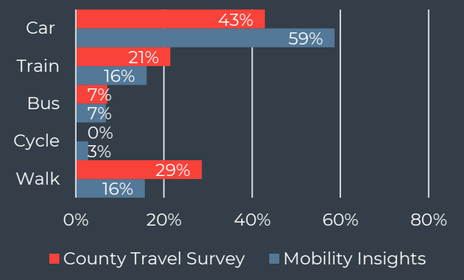
Shopping and personal business



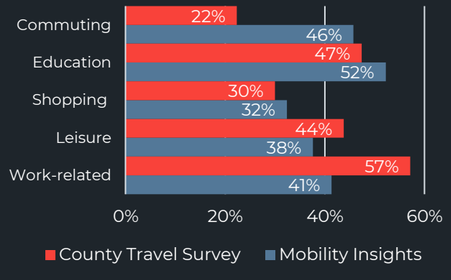
Leisure



Work-related (not commuting)



Sustainable travel by trip purpose



Realism of the mode shift target

Comparison of asset ownership

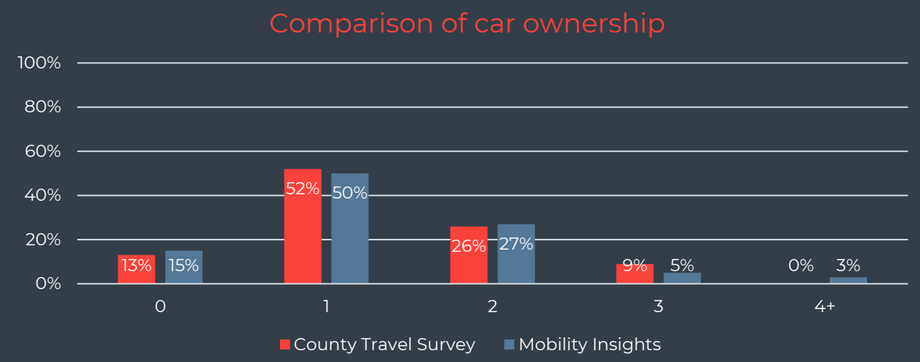
This analysis compares the asset ownership results between the County Travel Survey and Mobility Insights to understand residents' ownership.

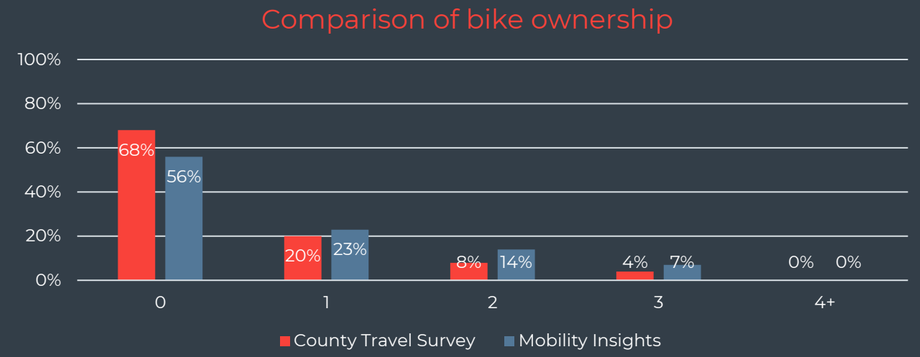
For the County Travel Survey – we included all the survey responses that fell within Hemel Hempstead. The results are shown in in the figure to the right and indicate:

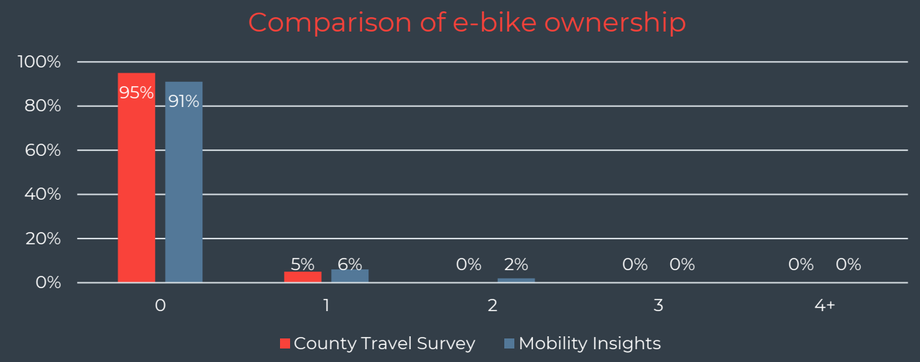
- Car – both data sources show relatively consistent results, with slightly higher ownership of more than 4+ cars in Mobility Insights compared to the County Travel Survey.
- Bike – Mobility Insights predicts slightly higher bike ownership compared to the County Travel Survey. The County Travel Survey indicates a higher proportion of households without bikes. This suggests that bike ownership is lower than would be expected – impacting on cycling mode share overall.
- E-bike – similar to bike ownership, Mobility Insights indicates a slightly higher than County Travel Survey.

In general, the results from the County Travel Survey and Mobility Insights are relatively consistent for asset ownership in Hemel Hempstead, and comparable.

Comparison of asset ownership







Realism of the mode shift target

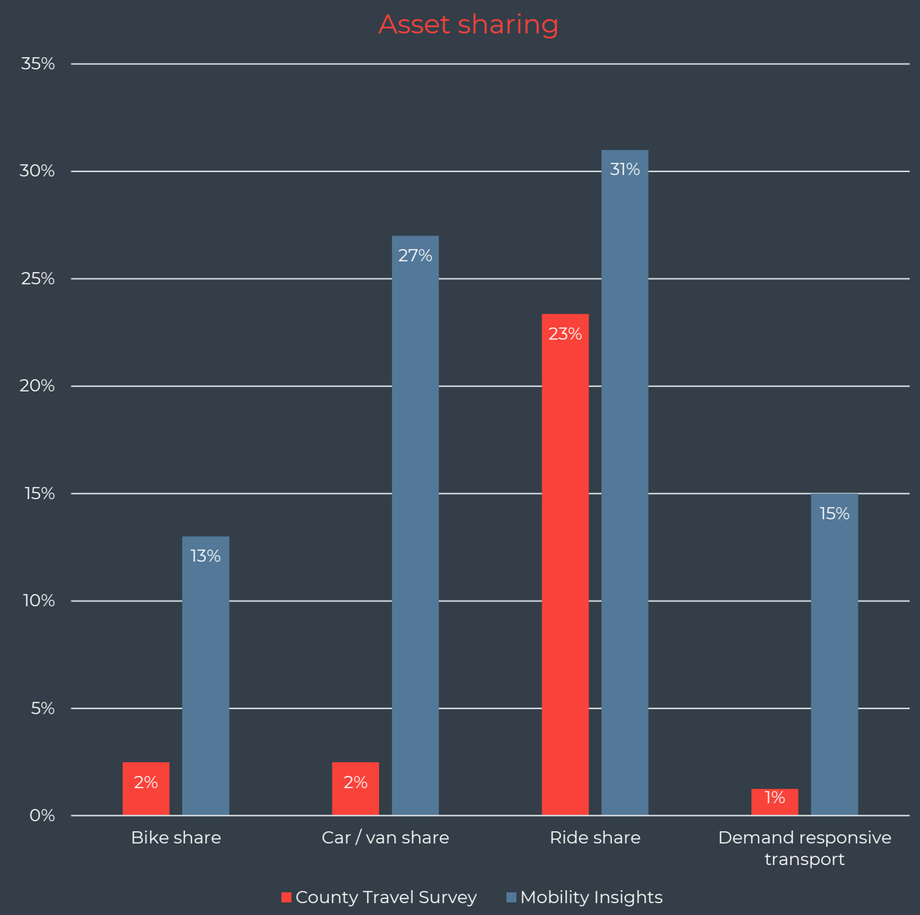
Comparison of asset sharing

The graph to the right compares asset sharing usage between the County Travel Survey and Mobility Insights predictions for bike share, car/van sharing, ride share and demand responsive transport.

- Bike share usage from the County Travel Survey is 2% with the question including bike hire, e-scooter hire, bike share and pool bike. This is lower than Mobility Insights predictions which would expect 13% of households to use bike share based on the Mosaic Groups.
- Car / van share from the County Travel Survey again is 2% and includes liftshare, car club, and car share (e.g. Zip car). This is lower than expected when compared to Mobility Insights which is 27%.
- Ride share from the County Travel Survey is 23% and includes app-based taxi hire and ride hailing (such as Uber). This is slightly lower than the Mobility Insights predictions which is 31%.
- Demand responsive transport from the County Travel Survey was 1% with initiatives in the survey including ArrivaClick and HertsLynx – both of which do not service Hemel Hempstead. As expected this is lower than the Mobility Insights prediction of 15%.

The analysis suggests that usage of asset sharing is lower than would be expected in the area based on the socio-demographic Experian Mosaic groupings, which is explained by limited asset sharing interventions in the area at present. This indicates that, based on survey results from other parts of England and the existing Experian Mosaic mix, there is an opportunity to implement bike share, car / van share and demand responsive transport. The findings of this analysis are included in the need or suitability of the interventions in Part E.

Comparison of asset sharing



Realism of the mode shift target

How realistic are the mode share targets for Hemel Hempstead and HGC growth area?

To answer this question, a few things need to be clarified:

- What is the current mode share – how do people currently travel and what is the baseline situation?
- What is the potential for change – how many trips could be made by sustainable travel both now and into the future?
- What are likely mode shares – what is the range of outcomes that could be expected?

What is the current mode share?

This report has used two potential sources for current mode share as shown in Table D1:

- The 2021 Census Journey to Work data for Dacorum was used as one source to understand current mode share. It is noted that this only includes commuting trips, which makes up a part but not all trips that are made. As shown in in the top table, the 2021 Census and County Travel Survey mode shares are generally consistent for commuting – however, mode shares for other trip types differ from the results of the Household Travel Survey.
- The County Household Travel Survey included a total of 320 households across Hertfordshire, of which 171 were in the postcode sub-districts covering Hemel Hempstead. While a small sample, this dataset provided useful insights related to mode share, as well as asset ownership and asset sharing.

The County Household Travel Survey sample dataset was compared to WSP's Mobility Insights survey bank which is an aggregated dataset linked to Experian Mosaic – which provided mode share predictions based on the Experian Mosaic groups present in Hemel Hempstead and is shown in bottom table to the right.

Current mode share (Census and Household Travel Survey)

Mode	**Dacorum 2021 Census (Journey to Work)**	**County Travel Survey data for Hemel Hempstead**				
	Commuting	Commuting	Education	Shopping	Leisure	Work-related
Walk	11%	9%	39%	23%	38%	29%
Cycle	1%	1%	5%	2%	2%	0%
Public transport	6%	12%	4%	5%	3%	29%
Car	82%	78%	53%	70%	55%	43%
Sustainable travel	18%	22%	48%	30%	43%	58%

Table D2 Mobility Insights mode share predictions based on the Mosaic Groups in Hemel Hempstead

Mode	Commuting	Education	Shopping	Leisure	Work-related
Walk	20%	31%	19%	20%	16%
Cycle	4%	3%	2%	4%	3%
Public transport	22%	18%	12%	14%	23%
Car	54%	48%	68%	62%	59%
Sustainable travel	46%	52%	33%	38%	42%

Realism of the mode shift target

What is the potential for change?

Comparison to Mobility Insights predictions

As noted in the previous pages, asset ownership (car, bike and e-bike) between the two datasets are generally consistent. However, the level of asset sharing (bikeshare, car/van share, ride share and demand responsive transport) is lower than predicted – explained through the limited availability of these measures at present – but indicating a likelihood to use these interventions if implemented.

The mode shares also vary between the two datasets, with the Household Travel Survey showing higher levels of car use and walking than predicted through Mobility Insights. This suggests that there is an opportunity to improve the cycling, bus and rail networks to better meet the needs of users – and achieve mode shares similar to that in other parts of England.

As a result, the Mobility Insights predictions could be used as a scenario when calculating the realism of the mode shift target (i.e. what has been achieved in other areas with comparable Mosaic Group socio-demographics).

Sustainable travel potential

Finally, previous sections of the report aimed to understand that proportion of car trips (as per the 2031 COMET model) could be made by walking, cycling and public transport. For existing areas this could be through mode switch.

- The top table shows the sustainable travel opportunity, or proportion of car trips that could be made by walking, cycling and public transport based on the current transport network in the lower and high scenario.
- The lower table meanwhile shows the sustainable travel potential, or proportion of car trips that are likely to be made by walking, cycling and public transport taking into account propensity to use those modes in the lower and high scenario.

The two scenarios for the sustainable travel opportunity and potential can also be used as methods to test the realism of the mode share target for Hemel Hempstead and HGC growth area. It is noted that for this realism test, only the findings for Hemel Hempstead has been used. The master plan, modelling O-D matrix and existing active and public transport networks for the HGC growth area are not yet fully developed and show a lower opportunity and potential than Hemel Hempstead.

Sustainable travel opportunity of car trips (Hemel Hempstead)

Mode	Lower	High
Walk	10%	34%
Cycle	37%	29%
Public transport	0%	3%
Sustainable travel	47%	66%

Sustainable travel potential of car trips (Hemel Hempstead)

Mode	Lower	High
Walk	5%	18%
Cycle	20%	14%
Public transport	0%	2%
Sustainable travel	25%	34%

Realism of the mode shift target

What could mode shares be for the area based on the current mode share and potential for change?

The final step is to calculate likely mode shares and compare the results to the targets. The top table shows the assumptions that have fed into the mode share calculations. To make it easier to understand, we have presented the data by trip type – split between sustainable travel (walk, cycle, bus and rail) and car trips.

- The top part of the table shows the sustainable travel mode share from the County Travel Survey by trip type. As the 2021 Census Journey to Work data was similar to the survey – it was excluded from this assessment.
- The second half of the table shows the proportion of car trips that could be made by sustainable travel based on the lower and high sustainable travel opportunity and potential results, as well as the proportion of trips by car.
- Finally the Mobility Insights predictions are included for reference.

Calculated mode share = Sustainable travel mode share + Proportion of car trips that could be made by sustainable travel X Proportion of car trips

The image graph to the bottom right shows the resulting mode share calculations across the six scenarios by trip type – and compared to the 40% and 60% mode share targets.

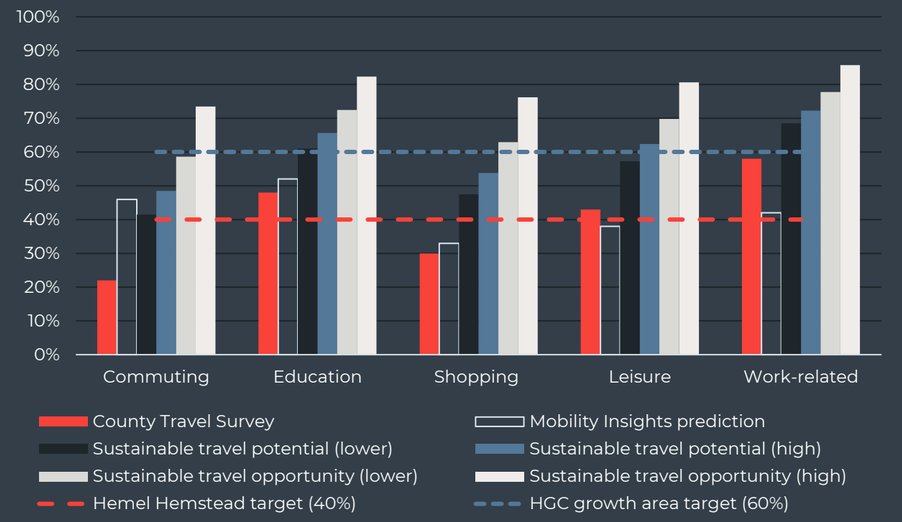
- Both the lower and high sustainable travel potential scenarios achieve the 40% mode share target across all trip types, but not the 60% target. This potential is based on existing transport networks and propensity to walk, cycle or use public transport of users.
- In comparison, both the lower and high sustainable travel opportunity scenarios achieve the 40% and 60% mode share targets across all trip types. This opportunity is based on existing transport networks, but does not include propensity or likelihood to use alternative modes to car.

The data suggests that while the 40% target is feasible, the 60% target will be more difficult to achieve unless the active travel and public transport networks are enhanced – particularly to support commuting, shopping and personal business and leisure trips – which is covered in Part E.

Table D5 Mode share calculations using County Travel Survey data

Sustainable travel mode share		Commuting	Education	Shopping	Leisure	Work-related
County Travel Survey		22%	48%	30%	43%	58%
Proportion of car trips that could be made by sustainable travel		Proportion of car trips				
Sustainable travel potential (lower)	25%	78%	52%	70%	57%	42%
Sustainable travel potential (high)	34%					
Sustainable travel opportunity (lower)	47%					
Sustainable travel opportunity (high)	66%					
Mobility Insights prediction		46%	52%	33%	38%	42%

Figure Mode share calculations by trip type and scenario



Interventions assessment and evaluation

This section looks at interventions that could help unlock the sustainable travel opportunity, propensity and potential and help achieve the mode share targets which were tested in Part D.

- The sustainable travel opportunity work showed that up to 66% of car trips could be walked, cycled or use public transport. This was based on existing active travel and public transport networks. So additional opportunity could be unlocked with transport network enhancements.
- The sustainable travel propensity work showed that there are parts of Hemel Hempstead with higher than England average propensity or likelihood to walk, cycle and use public transport.
- While the sustainable travel potential work showed that when taking into account propensity the proportion of car trips that would walk, cycle or use public transport reduces to 34%.
- Finally, the realism of the mode shift targets calculated that while the sustainable travel potential scenario could achieve the 40% mode share target for the existing settlement – more would need to be done to achieve the 60% mode share target which is closed to the sustainable travel opportunity scenarios.

For this interventions assessment we have used our WSP Solutions Toolkit which is a multi-criteria assessment tool that identifies a long-list of interventions. Working with the client we were then able to identify a short list most suited to increasing the number of trips that could be made by walking, cycling and public transport and unlocking the propensity of users to use sustainable travel.

The following sections of this part of the report sets out the approach of the multi-criteria assessment, the intervention included in the assessment and the final short-list of interventions considered in more detail.

The table to the right shows the short-list interventions that were considered as most suitable, with additional detail on all the interventions included in Appendix C, D and E.

Approach

The assessment toolkit has follows a four step process to calculate the intervention score, detailed through a worked example in the following pages:

- Step 1 – for each datapoint – calculate the **ideal value** accounting for place type
- Step 2 – for each datapoint – calculate the **actual value** by hex
- Step 3 - to calculate **datapoint score** – divide the actual value by ideal value by hex
- Step 4 – to calculate intervention score – weight and sum relevant datapoint scores.

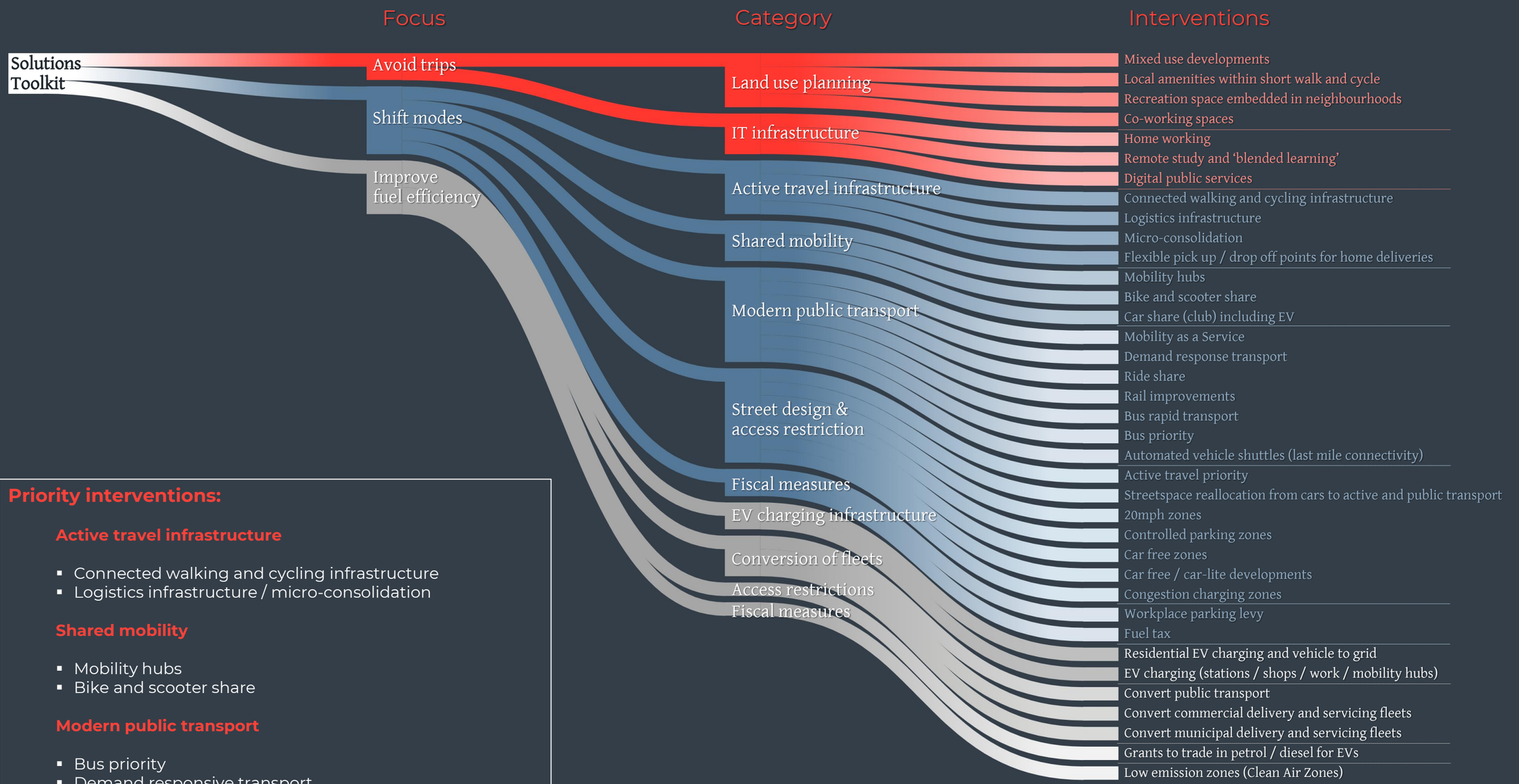
The appendices include more detail regarding the assumptions:

- Appendix B – outline the methodology and inputs
- Appendix F – sets out the data sources used in the assessment
- Appendix G – outlines the ideal values by place type
- Appendix H – sets out the weighting by criteria and intervention.

Prioritised interventions

Active travel infrastructure	Connected walking and cycling infrastructure
	Logistics infrastructure / micro-consolidation
Shared mobility	Mobility hubs
	Bike and scooter share
Modern public transport	Bus priority
	Demand responsive transport

The **Solutions Toolkit**



Priority interventions:

Active travel infrastructure

- Connected walking and cycling infrastructure
- Logistics infrastructure / micro-consolidation

Shared mobility

- Mobility hubs
- Bike and scooter share

Modern public transport

- Bus priority
- Demand responsive transport

Interventions assessment and evaluation

Intervention scores

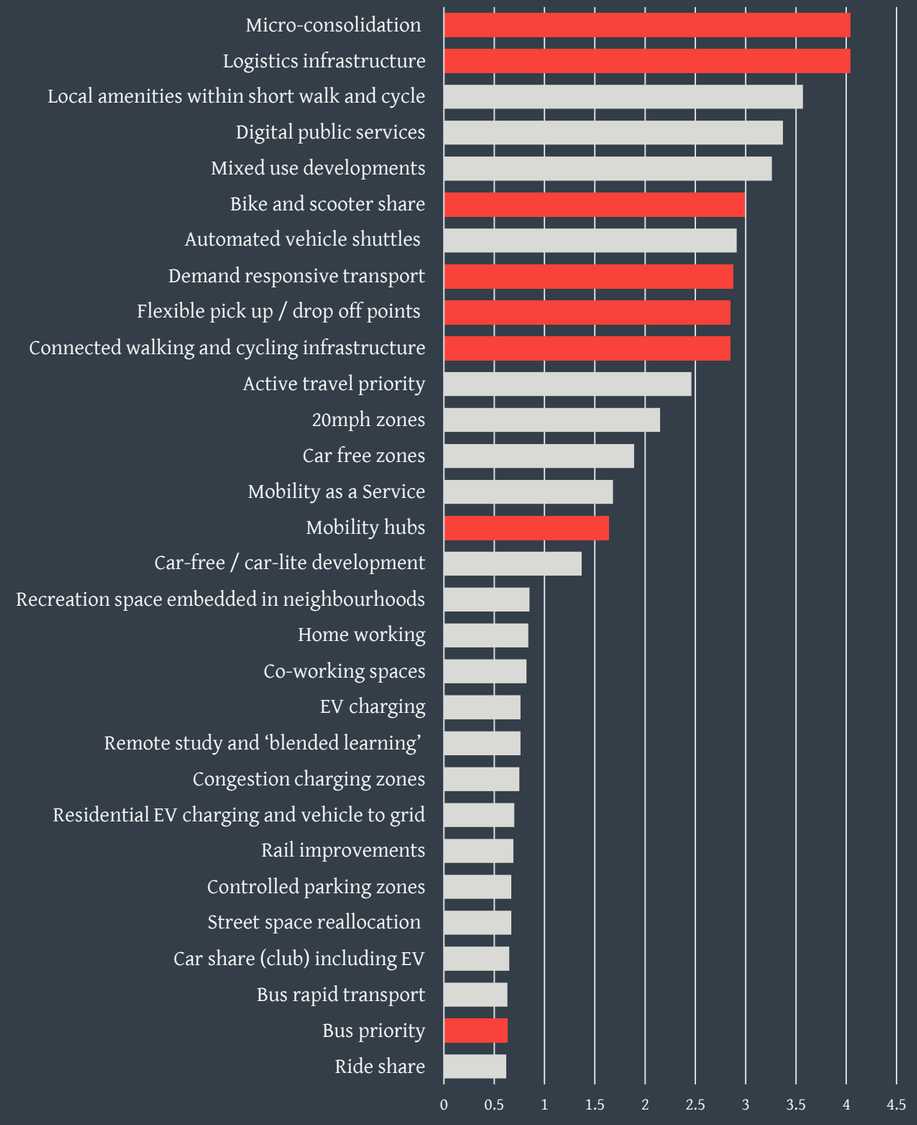
The graph to the right shows the average score by intervention (which can exceed 1.0 if the values are greater than the ideal value) – indicating a greater need or suitability for those interventions.

This is an average for Hemel Hempstead and only includes interventions considered within the Council's control to influence. This provides insight into the interventions that are most suitable or needed based on the criteria – which included the outputs of the sustainable travel opportunity, propensity and potential. In the graph, the interventions in red indicate those that have been included in the short-list for further consideration.

- For ***active travel infrastructure*** – logistics infrastructure and micro-consolidation, both rated at 4.04, stand out as high-potential interventions that could significantly enhance connectivity and efficiency. This could be supported by flexible pick up / drop off points for deliveries (score 2.85). Connected walking and cycling infrastructure (score 2.85) is relatively high, with the need reduced due to the presence of existing infrastructure in some areas.
- For ***shared mobility*** – bike and scooter share with a rating of 2.99 indicates a strong potential for shared mobility. Mobility hubs (rated at 1.64) has a slightly lower score compared to some other interventions.
- For ***modern public transport*** – demand-response transport (rated at 2.88) holds promise for addressing crucial connectivity gaps in the public transport network particularly to better connect the HGC growth area to the rail station, while bus priority scores 0.63.
- Other interventions, such as local amenities within a short walk and cycle (rated at 3.57) and mixed-use developments (rated at 3.26), Active travel priority measures (rated at 2.46), are highlighted as high-impact strategies for enhancing the liveability of regions and should be embedded as the HGC growth area is developed.

The following pages provide more detail on the short-list priority interventions.

Average intervention need scores for Hemel Hempstead



ACTIVE TRAVEL INFRASTRUCTURE

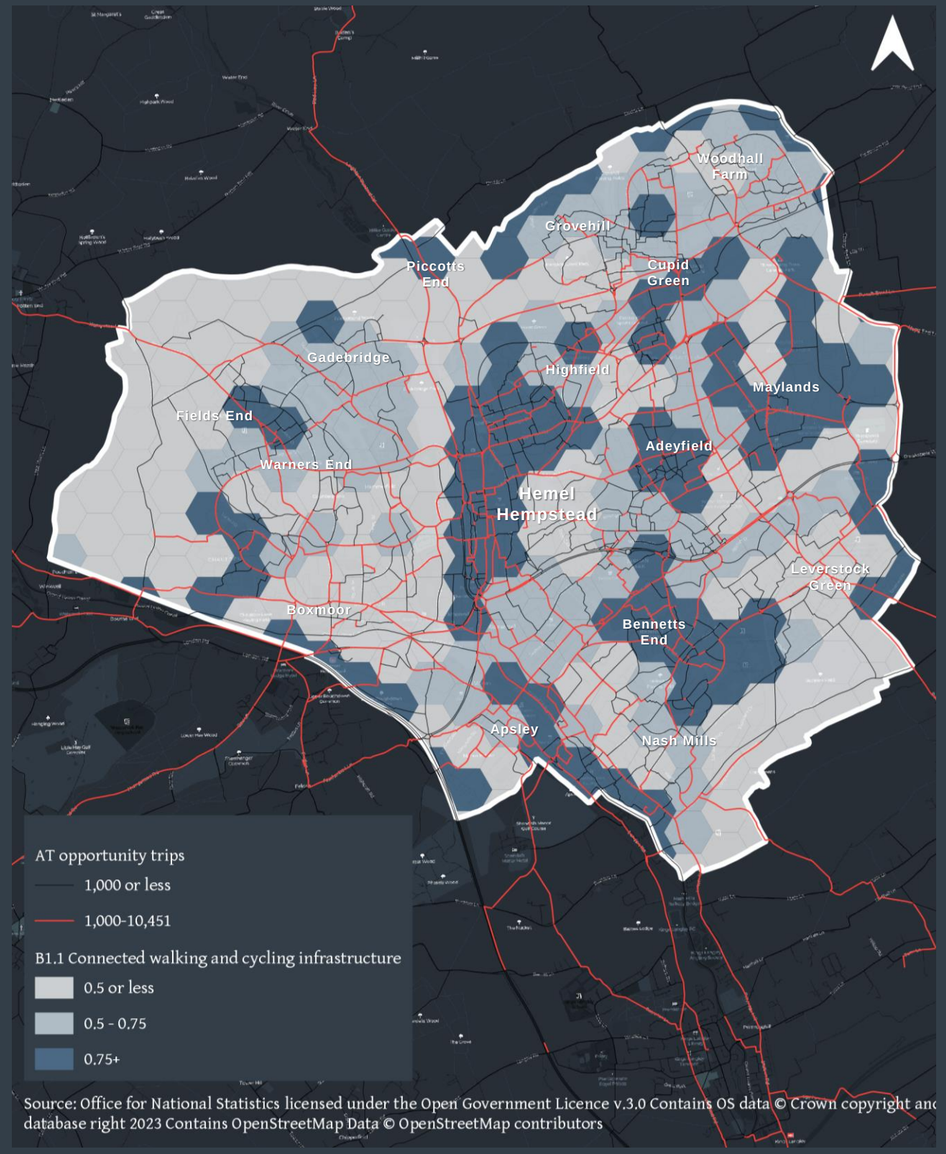
Connected walking and cycling infrastructure

Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use	Floorspace of non-residential land use (Valuations Office Agency)	
Infrastructure	Road safety (KSIs)	Length of national cycle network Length of cycle path Length of 20mph street
Behaviours / perceptions	Transport asset ownership (bike/scooter) Shared mobility usage / experience / perceptions Proportion of households reliant on on-street parking	Transport asset ownership (can/van, motorcycle)
Current travel patterns	Proportion of walking / cycling trips	
Modal shift potential	Opportunity to shift to walking / cycling Propensity to shift to walking / cycling	

The map to the right shows the need score for connected walking and cycling infrastructure overlayed with the opportunity to walk or cycle trips. Factors or criteria that are contributing to the need include the floorspace of commercial land uses, walking and cycling collisions (KSIs), bike/scooter ownership, positive shared mobility usage and perceptions, the proportion of active travel trips, as well as the opportunity and propensity outputs. Factors reducing the need include the presence of active travel infrastructure, as well as car/van and motorcycle ownership. The priority areas to target investment are shown in dark blue (with a score of 0.75/1.0 or more) and include:

- The town centre and areas adjacent to the River Gade (including Piccotts End and Apsley)
- Cupid Green, Maylands, Adeyfield and Bennetts Green
- Gadebridge, Fields End and Warners End, and
- The key corridor adjacent to the rail line.

Need for **connected walking and cycling infrastructure**



ACTIVE TRAVEL INFRASTRUCTURE

Logistics infrastructure / micro-consolidation

Criteria type	Factors contributing to the need	Factors reducing the need
Behaviours / perceptions	Proportion of households receiving parcel / takeaway / groceries deliveries Location of deliveries Proportion of households reliant on on-street parking	
Current travel patterns	Proportion of walking / cycling trips Proportion of car trips	

The map to the right shows the priority areas to target for logistics infrastructure / micro-consolidation, with the highest scores in dark blue (with a score of 0.75/1.0 or more), overlayed with the opportunity to walk or cycle trips.

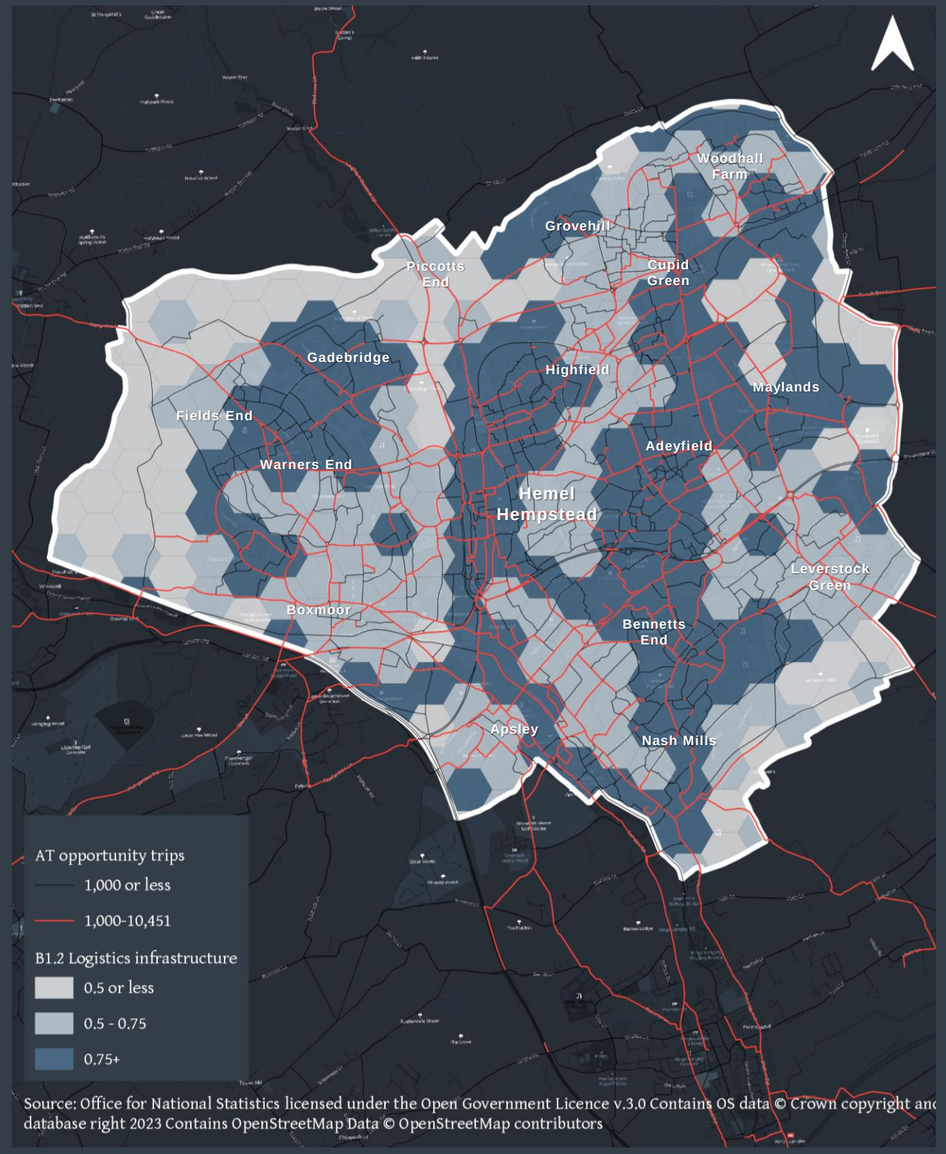
Factors contributing to the need or suitability include the proportion of households that receive deliveries, delivery location, as well as the proportion of active travel trips and car trips (which could be replaced through zero-emission deliveries).

and include:

- The town centre and areas adjacent to the River Gade
- A north-south arc extending from Cupid Green to Maylands, Adeyfield, Bennetts End and Nash Mills
- The area focussed on Gadebridge, Fields End and Warners End, and
- The key corridor adjacent to the rail line.

The data suggests a relatively high need across Hemel Hempstead for logistics infrastructure / micro-consolidation based on the estimated proportion of parcel / takeaway / grocery deliveries, as well as the location of deliveries.

Need for **logistics infrastructure / micro consolidation**



SHARED MOBILITY

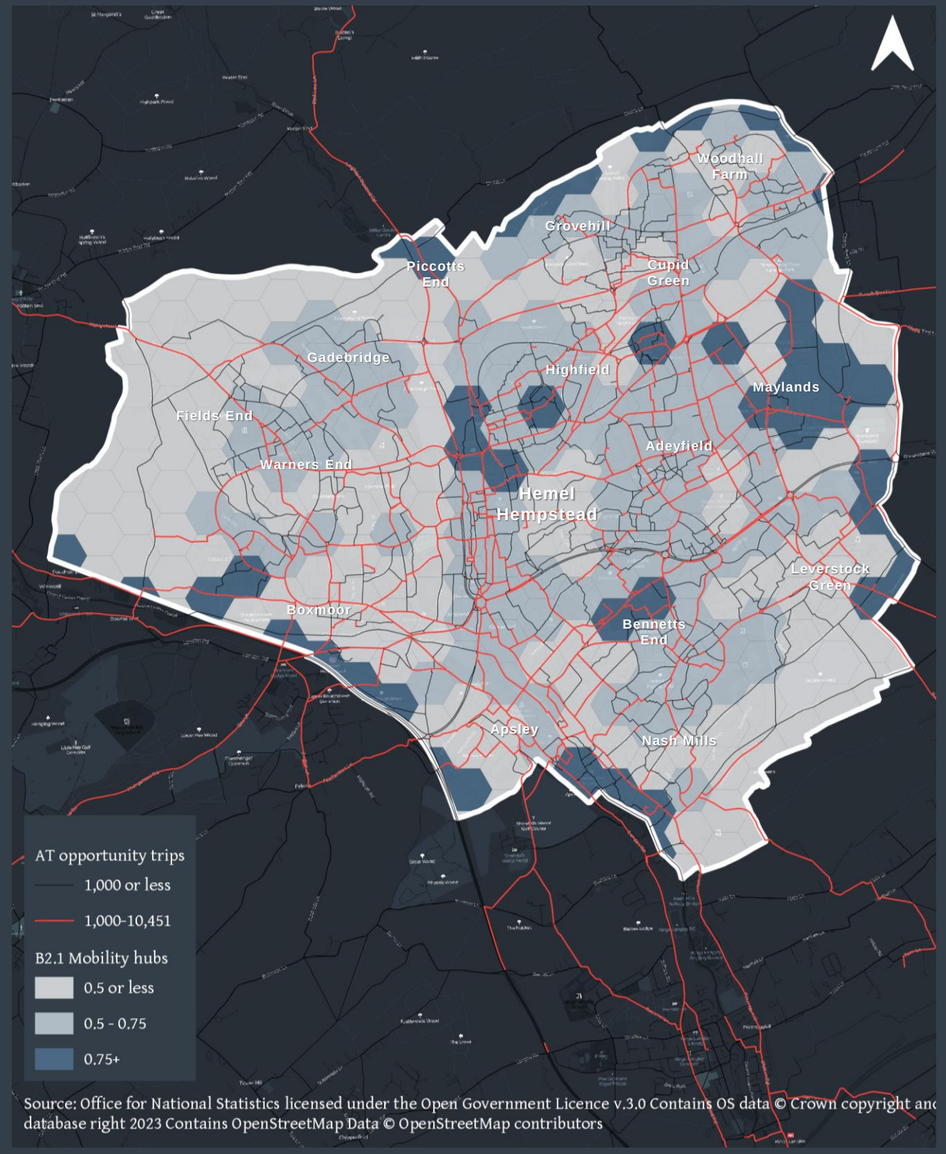
Mobility hubs

Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use	Number of amenities that can be reached within 30 minute PT journey	
Infrastructure	Length of national cycle network Length of cycle path Length of 20mph street Bus stop / rail station access	Number of EV charging points in area
Behaviours / perceptions	Transport asset ownership (bike/scooter) Shared mobility usage / experience / perceptions Bus stop / rail station access Proportion of households reliant on on-street parking	Transport asset ownership (car/van, motorcycle)
Current travel patterns	Proportion of walking / cycling trips Proportion of bus / rail trips	
Modal shift potential	Opportunity to shift to walking / cycling / PT Propensity to shift to walking / cycling / PT Estimated EV uptake (2030)	

The map to the right shows the priority areas to target for mobility hubs as they have the highest scores in dark blue (with a score of 0.75/1.0 or more), overlayed with the opportunity to walk or cycle trips. Key factors driving the need for mobility hubs include access to amenities, active travel infrastructure, public transport access, shared mobility usage / perceptions, current active travel patterns and sustainable travel potential.

Key mobility hub locations include the rail station, town centre, Maylands, Piccotts End, Highfield and Bennetts End.

Need for **mobility hubs**



SHARED MOBILITY

Bike and scooter share

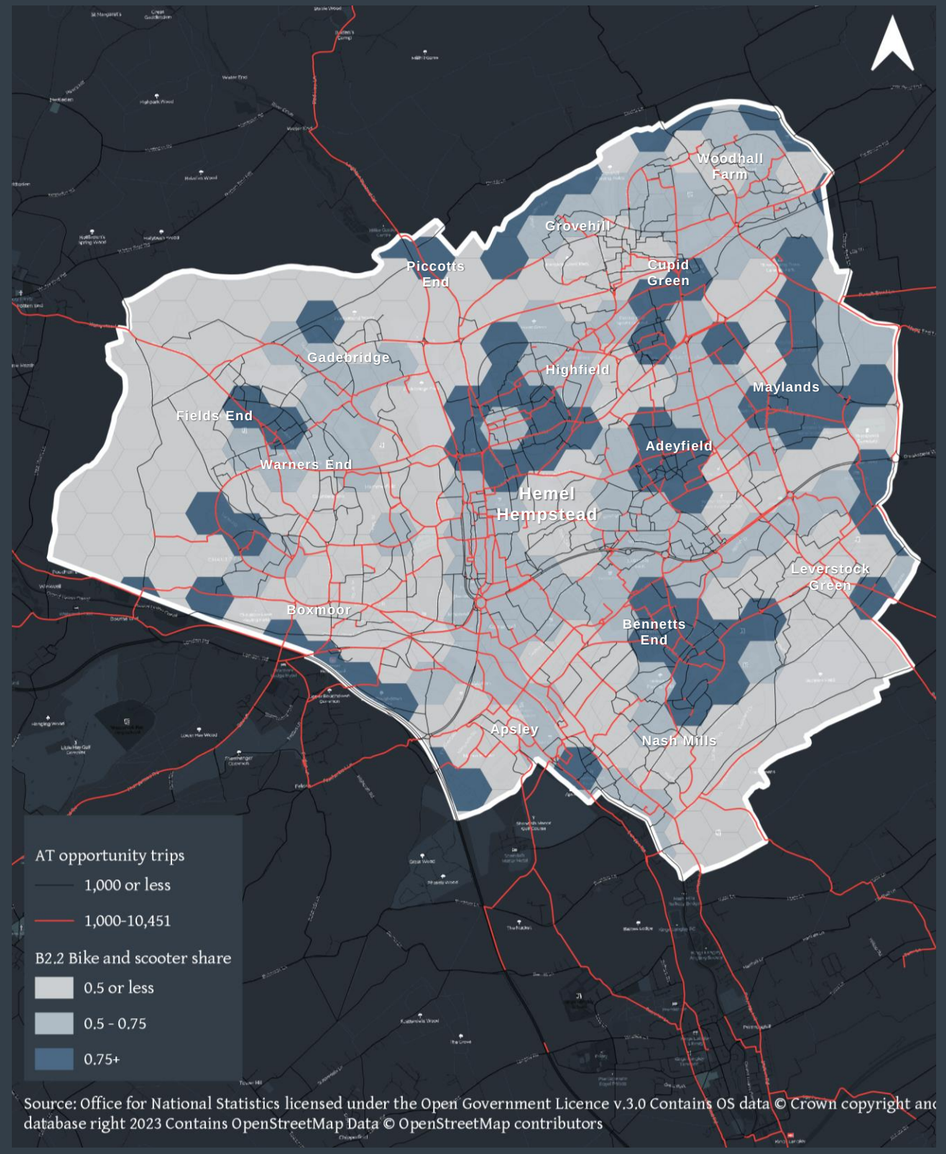
Criteria type	Factors contributing to the need	Factors reducing the need
Infrastructure	Length of national cycle network Length of cycle path Length of 20mph street Bus stop / rail station access	
Behaviours / perceptions	Transport asset ownership (bike/scooter) Shared mobility usage / experience / perceptions Proportion of households reliant on on-street parking	Transport asset ownership (car/van, motorcycle)
Current travel patterns	Proportion of cycling trips	
Modal shift potential	Opportunity to shift to walking / cycling Propensity to shift to walking / cycling	

The map to the right shows the priority areas to target for bike and scooter share as they have the highest scores in dark blue (with a score of 0.75/1.0 or more), overlayed with the opportunity to walk or cycle trips. Key factors driving the need include active travel infrastructure, public transport access, shared mobility usage / perceptions, the proportion of households reliant on on-street parking, the proportion of cycling trips and sustainable travel potential.

Key bike and scooter share areas include the rail station, town centre, Piccotts End, Cupid Green, Maylands, Adeyfield, Bennetts End and Field End which are mostly residential with high opportunity and propensity to use bike and scooter share.

As an example, the old town appears to have a higher score compared to the main town, driven due to being more residential. In reality, bike and scooter share would need to connect both residential and commercial areas.

Need for **bike and scooter share**



Modern public transport

Bus priority

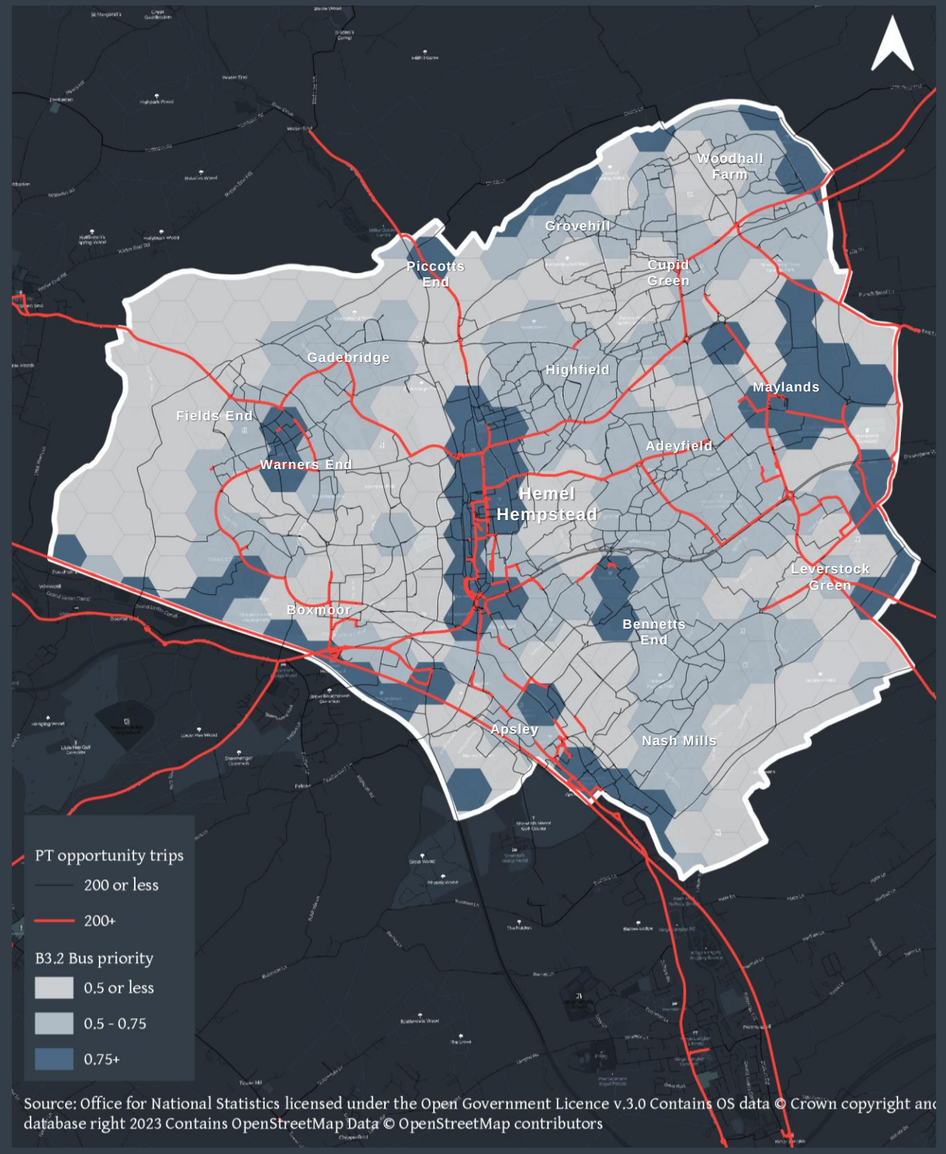
Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use	Number of amenities that can be reached within 30 minute PT journey	
Infrastructure	Bus stop / rail station access	
Behaviours / perceptions	Shared mobility usage / experience / perceptions Proportion of households reliant on on-street parking	
Current travel patterns	Proportion of bus trips	
Modal shift potential	Opportunity to shift to PT Propensity to shift to PT	

The map to the right shows the key areas to target for bus priority as they have the highest scores (with a score of 0.75/1.0 or more), overlayed with the opportunity to use public transport trips. Key factors contributing to the need for bus priority include bus stop / rail station access, reliance on on-street parking, the proportion of trips made by bus and public transport sustainable travel potential.

Key areas to be considered for bus priority include:

- The town centre and areas adjacent to the River Gade (including Piccotts End and Apsley)
- Maylands, Bennetts End, Warners End, and
- The key corridor adjacent to the rail line.

Need for **bus priority**



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MODERN PUBLIC TRANSPORT

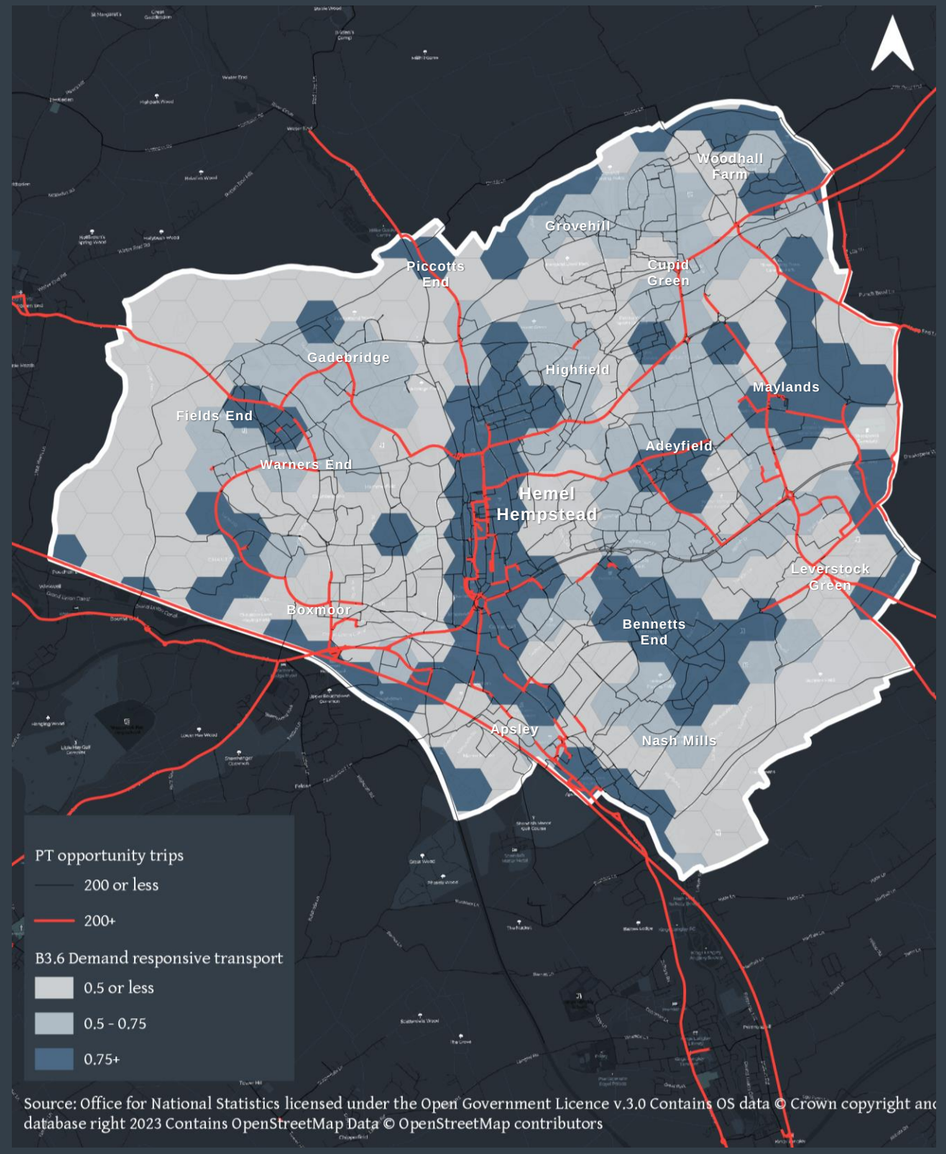
Demand responsive transport

Criteria type	Factors contributing to the need	Factors reducing the need
Behaviours / perceptions	Shared mobility usage / experience / perceptions Proportion of households reliant on on-street parking	Transport asset ownership (car/van, motorcycle)
Current travel patterns	Proportion of walking / cycling trips Proportion of bus / rail trips	
Modal shift potential	Opportunity to shift to PT Propensity to shift to PT	

The map to the right shows the key areas to target for demand responsive transport as they have the highest scores (with a score of 0.75/1.0 or more), overlayed with the opportunity to use public transport trips. Key factors contributing to the need include shared mobility usage / perceptions, reliance on on-street parking, the proportion of public transport trips and public transport sustainable travel potential.

- The town centre and areas adjacent to the River Gade (including Piccotts End and Apsley)
- Maylands, Bennetts End, Adeyfield, Fields End, and
- The key corridor adjacent to the rail line.

Need for **demand responsive transport**



Summary and next steps

Findings

This report focussed on understanding the sustainable travel opportunity, propensity and potential for Hemel Hempstead and the HGC growth area to test the realism of the ambitious mode shift targets set out in the Hemel Garden Communities Spatial Vision. It also scored the need or suitability of a long- and short-list of interventions that could help unlock the sustainable travel potential.

Sustainable travel opportunity

The assessment indicates that based on modelled origin-destination matrices for 2031, current active travel networks and available public transport services – up to 54% of modelled car trips in the HGC growth area and 66% in Hemel Hempstead could be made by sustainable methods - predominantly by active modes.

The walking and cycling opportunity data (hex and link) provides detail around where to focus active travel improvements to unlock additional trips and could be used to support the Local Cycling and Walking Infrastructure Plan being developed for Dacorum.

Only about 7% of car trips could reasonably use public transport based on existing services – which suggests an opportunity to improve the network to better match the origins-destinations of users (coverage and frequency) and be more time competitive with driving (speed) – focussed on commuting, education, shopping and personal business trips.

Sustainable travel propensity

This work which is benchmarked to the England average and based on current socio-demographics of the area, shows that while propensity is mixed across Hemel Hempstead – there are areas with a higher likelihood to walk, cycle and use pubic transport. These areas should be prioritised for active and public transport interventions to unlock the potential.

As the HGC growth area is developed, it is anticipated that incoming residents will shift the socio-demographics and propensities further to active and public modes.

Sustainable travel potential

Based on the findings on the opportunity and propensity work, it is estimated that up to 27% of car trips in the HGC growth area and 34% would use sustainable modes. It is noted that this is a worst-case scenario – based on the existing active and public transport options available, as well as the propensities of the current population.

Measures to increase sustainable travel opportunity such as enhanced walking, cycling, bus and rail networks could increase the number of trips that could be made.

Socio-demographic changes with the redevelopment and new development in the HGC growth area could increase the propensity to use active and public transport.

Realism of mode share targets

The County Travel Survey results for Hemel Hempstead were extracted, analysed and compared to the 2021 Census Journey to Work Data for Dacorum and the WSP's Mobility Insights predictions – to see if they were consistent, but also to understand if Mobility Insights could predict mode shares and use of shared mobility based on findings from other parts of England.

The County Travel Survey commuting results matched the 2021 Census Journey to Work data, while asset ownership was consistent with the Mobility Insights predictions.

The use of shared mobility was lower in the County Travel Survey compared to the Mobility Insights predictions – which is to be expected as there is limited bike share, car/van share, ride share and demand responsive options in the area at present.

The data suggests that the local population would be receptive to shared mobility interventions if implemented.

The mode shares differed between the County Travel Survey and the Mobility Insights predictions – with cycling, bus and rail being lower in the County Travel Survey.

This reinforces the need improve the cycle, bus and rail networks to unlock the sustainable travel potential.

Summary and next steps

The mode share results from the Household Travel Survey were used as a baseline to understand the realism of the mode share targets.

The baseline mode shares by trip type were then merged with the low and higher sustainable travel opportunity and potential to test several scenarios. The Mobility Insights predictions were included for reference and compared to the 40% and 60% mode share targets.

- The sustainable travel potential scenarios achieve the 40% mode share target across all trip types, but not the 60% target.
- Meanwhile, the sustainable travel opportunity scenarios achieve both the 40% and 60% mode share targets across all trip types.

The data suggests that while the 40% target is feasible, the 60% target will be more difficult to achieve unless the active travel and public transport networks are enhanced – particularly to support commuting, shopping and personal business and leisure trips.

Interventions assessment and evaluation

The interventions assessment identified and scored a long-list of interventions. Of that, six high-scoring interventions were considered as priority, including:

- Connected walking and cycling infrastructure
- Logistics infrastructure / micro-consolidation
- Mobility hubs
- Bike and scooter share
- Bus priority, and
- Demand responsive transport.

Next steps

- The HGC growth area is in the planning stages with the existing active travel and public transport networks not fully formed or in place. At the same time, the socio-demographic mix is not known. As a result, the sustainable travel opportunity, propensity and potential are a worst-case scenario and should be rerun for the HGC growth area as the master plan **is developed** – including housing, socio-demographics, active and public transport network and services.
- The data analysis for Hemel Hempstead shows a high opportunity, propensity and potential for active travel. The data from this study should be used to inform active travel investment and prioritisation – including the LCWIP that is being developed.
- The analysis showed that the current public transport network and services should be improved to better meet the needs of existing and future users. Further analysis into bus and rail networks improvements should be considered to increase the sustainable travel opportunity and unlock the propensity to use bus and rail of the local population.
- The sustainable travel potential and Mobility Insights predictions showed that there is propensity to use shared mobility. New and expanded bike share, car share, ride share and demand responsive transport should be considered to capitalise on the potential.

PART A

Sustainable travel opportunity

Sustainable travel opportunity

Methodology overview

Estimating sustainable travel potential (or the number of trips likely to be made by walking, cycling and public) is a product of calculating:

- Sustainable travel opportunity, or the number of trips that can be made by walking, cycling and public transport) based on realistic time and distance thresholds, and
- Sustainable travel propensity, or the likelihood for the local population to walk, cycle or use public transport based on understanding existing travel behaviours and opinions.

Sustainable travel opportunity **X** Sustainable travel propensity **=** Sustainable travel potential

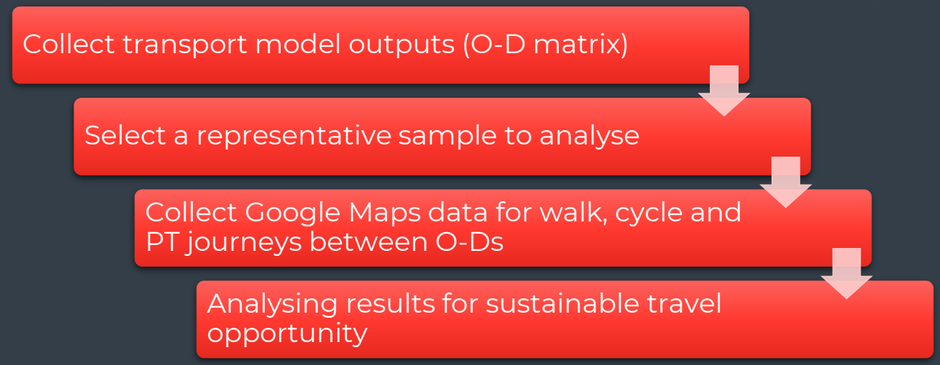
Part A of this report focusses on estimating and calculating the sustainable travel opportunity in Dacorum, Hemel Hempstead and HGC growth area, while the following sections of the report are set out as follows:

- Part B – Sustainable travel propensity
- Part C – Sustainable travel potential
- Part D – Realism of the modal share targets for Hemel Hempstead and HGC growth area, and
- Part E – Identifying interventions that could help unlock the sustainable travel potential and scoring the need or suitability across Hemel Hempstead.

To calculate the sustainable travel opportunity, data from a range of sources were used. These include:

- Modelling outputs – recording the origins / destinations (O-Ds) and daily trip numbers of car journeys across the study area
- Google Maps data – giving the distance, duration and route for a sample of these modelled trips by mode
- Government travel statistics and other research – which gives insight into how far people would be willing to travel by different modes.

The key steps are shown below, and explained in the subsequent pages:



Collecting model outputs

Origin-destination trip matrices from the Countywide Model of Transport (COMET) were used to identify journeys that start in Dacorum, Hemel Hempstead and the HGC growth area.

In total, 100,548,304 trips were extracted from COMET's trip matrices for the modelled year 2031.

Sustainable travel opportunity

Selecting a representative sample

The COMET model had a total of 9,165,084 unique O-D pairs containing 100,548,304 trips.

Table A1 shows the filtering approach to identify relevant trips within the model – focussing on car trips, less than 150km in distance, starting within Hertfordshire.

The following criteria were used in this filter:

- Remove non-car trips (-32% O-D pairs / -14% trips)
- Remove trips >150km and start outside Hertfordshire (-48% O-D pairs / -83% trips)
- Remove internal model zone trips (-1% O-D pairs / -2% trips) – these are calculated separately and added back into the analysis later.
- Remove O-D pairs containing less than 1 passenger car unit (-17% O-D pairs / 0% trips).

The result, is that a total of **279,091 O-D pairs** and **1,751,319 trips** were analysed - with the assessment based on whether they were a short trip (<8km) or long trip (>8km). The long trips (greater than 8km) were run through the Google Directions API (see overleaf) and analysed using travel time comparisons.

The short trips (less than 8km) were mapped using GIS software, finding the shortest route between the O-D pairs along roads, footpaths and cycle paths. The length of these routes could then be extracted and compared to the scenario thresholds.

Table A1 Sustainable travel opportunity sampling approach

Sustainable travel opportunity sampling approach	O-D pairs		Trips	
	Number	%	Number	%
COMET model trips in O-D matrix	9,165,084		100,548,304	
Remove non-car trips	-2,917,469	-32%	-14,544,997	-14%
Remove trips >150km and start outside Hertfordshire	-4,428,093	-48%	-83,751,103	-83%
Remove internal model zone trips (analysed separately)	-14,670	-1%	-265,578	-2%
Remove O-D pairs with less than 1pcu	-1,525,761	-17%	-235,307	0%
Analysed trips	**279,091**	**3%**	**1,751,319**	**2%**

Sustainable travel opportunity

Analysing results for opportunity to shift modes

Two scenarios have been developed to apply to this analysis, which are detailed in Table A2. They are:

- High sustainable travel – which has ambitious thresholds for trips to be made by sustainable modes as set out in the Department for Transport's Gear Change
- Lower sustainable travel – which has a more conservative set of journey time limits for trips to be made by sustainable modes, achieving a 15-20 minute neighbourhood.

Walking and cycling thresholds for the high sustainable travel scenario are based off the DfT's Gear Change which sets out ambitions to see a future where half of all journeys in towns and cities are cycled or walked under distances of five miles and two miles for cycling and walking, respectively.

Data from the National Travel Survey (NTS0303) indicates that the average journey time by public transport is around 2.4x longer than that of driving. The high sustainable travel scenario threshold was based off this, with the lower sustainable travel scenario (of 1.5x) considered a reasonable alternative.

Table A2 Sustainable travel opportunity scenario thresholds

Scenario	Car trips that could be walked	Car trips that could be cycled	Car trips that could be made by public transport
High sustainable travel opportunity	Under 2 miles / 3.2 km / **40 mins**	Under 5 miles / 8 km / **30 mins**	Less than **2.4x** slower
Lower sustainable travel opportunity	Under 1 mile / 1.6 km / **20 mins**	Under 3 miles / 4.8 km / **15 mins**	Less than **1.5x** slower

Sustainable travel opportunity

Using the Google API

The Google Maps API provides real-world transport route options for each journey and mode (walking, cycling, public transport and driving), including the fastest journey for each mode by time and distanced travelled.

This enables a comparison to be made between active travel, public transport and driving journey times.

Longer trips greater than 5 miles (public transport vs driving) and shorter (walking or cycling vs driving) trip analysis has been combined to determine the overall sustainable travel opportunity to walk, cycle or use public transport.

The analysis was further broken down focusing on the existing demand in Dacorum, Hemel Hempstead and predicted demand in the HGC growth area.

COMET model output
9,165,084 unique O-D pairs containing 100,548,304 trips

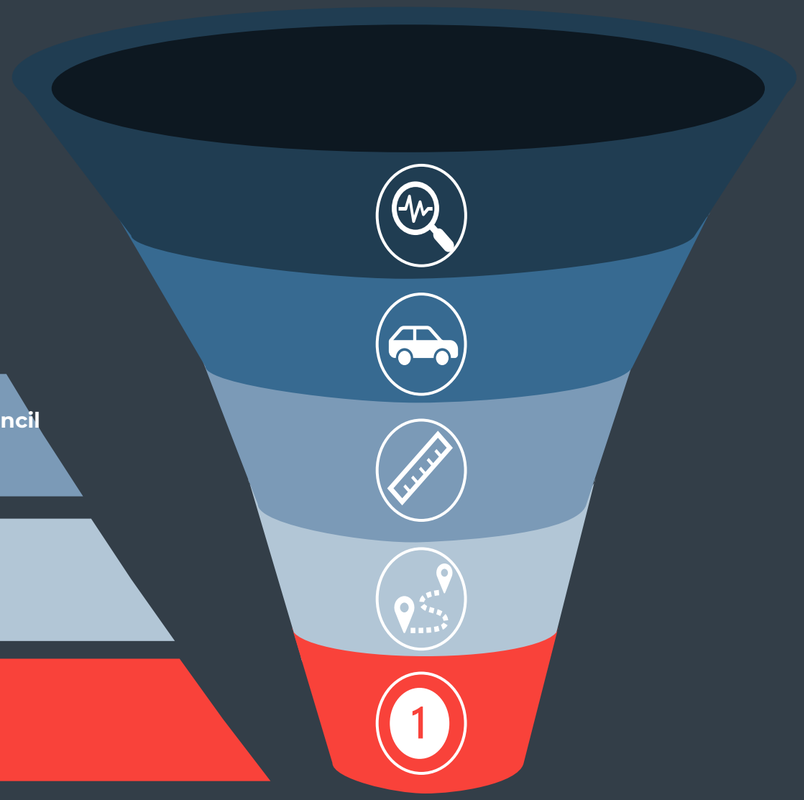
Sift 1: removing non-car trips
2,917,469 unique O-D pairs containing 14,544,997 trips

Sift 2: filtering for trips that are under 150km and start in Hertfordshire County Council
4,428,093 unique O-D pairs containing 83,751,103 trips

Sift 3: removing internal trips (analysed separately)
14,670 unique O-D pairs containing 265,578 trips

Final sift: Remove pairs with under 1 pcu
1,525,761 unique O-D pairs containing 235,307 trips

Leaving 279,091 unique O-D pairs and 1,751,318 trips



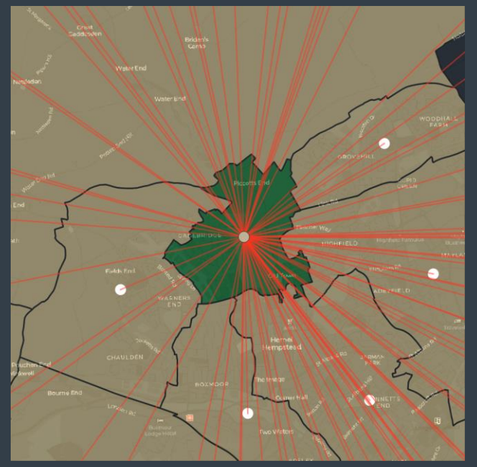
Sustainable travel opportunity

Process overview

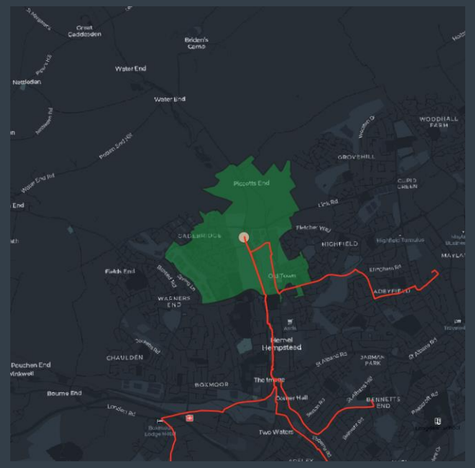
Start: zone / O-D pairs within the zone (100% car trips)

1. **Mode shift assignment** – Compare the Google Maps API outputs of the O-D pairs to the scenario thresholds. Allocate each O-D pair a mode - walking, cycling, public transport or driving – that it can be shifted to.
2. **Assign shifted trips to routes**
3. **Select for trips originating in each zone (i.e discard destination trips)**
4. **Account for internal trips**
    1. Given the area of each zone, an estimate for a 'worst case scenario' distance is derived using the diameter of a circle, where the circle's area matches that of the zone. This distance is compared to the scenario thresholds to assign a mode (walking, cycling or driving) for each zone containing internal trips.
    2. Add the internal trips to the sum of both the origin and destination trips for its assigned mode.
    3. Add the total number of internal trips to the running total of trips starting, and ending in the zone, respectively.
5. **Calculate opportunity as a proportion of all trips**
    1. Considering all trips that leave the zone separately to those coming in, calculate the proportion of shifted trips for each mode.
    2. For each mode, take a weighted average of the origin and destination proportions to calculate an overall opportunity for each zone.

End: zone with opportunity to shift modes

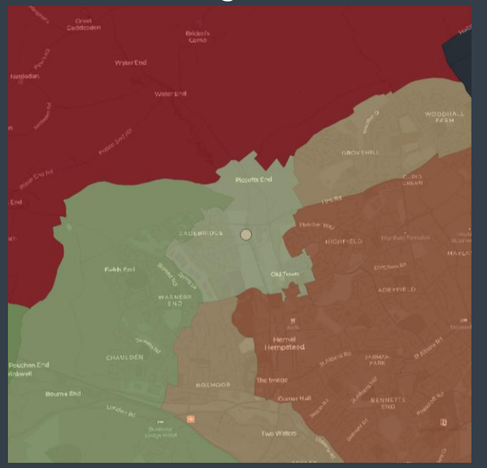


Zone with various journeys originating or ending in the zone



Route output example for cycling from Google API

Diameter method used for calculating length of internal trips



Resulting opportunity for sustainable travel to cycling for the given zone

Sustainable travel opportunity

What is the existing mode split?

Figure A3 represents an estimate of the existing mode share splits for Dacorum and Hemel Hempstead. Census journey to work data (2021)* has been used to estimate the existing mode share across the study area.

Of those travelling to work in Dacorum and Hemel Hempstead, only 17% travel by sustainable modes with walking making up the largest proportion of these with 11% of commuters. About 6% of commuters travel to work by public transport and 1% cycle to work.

When considering all of those in employment, Dacorum has a larger proportion of people currently working from home (39%) than Hemel Hempstead (33%). Hemel Hempstead has a larger proportion of those in employment travelling to work by car with 54% compared to 48% seen across the Dacorum area.

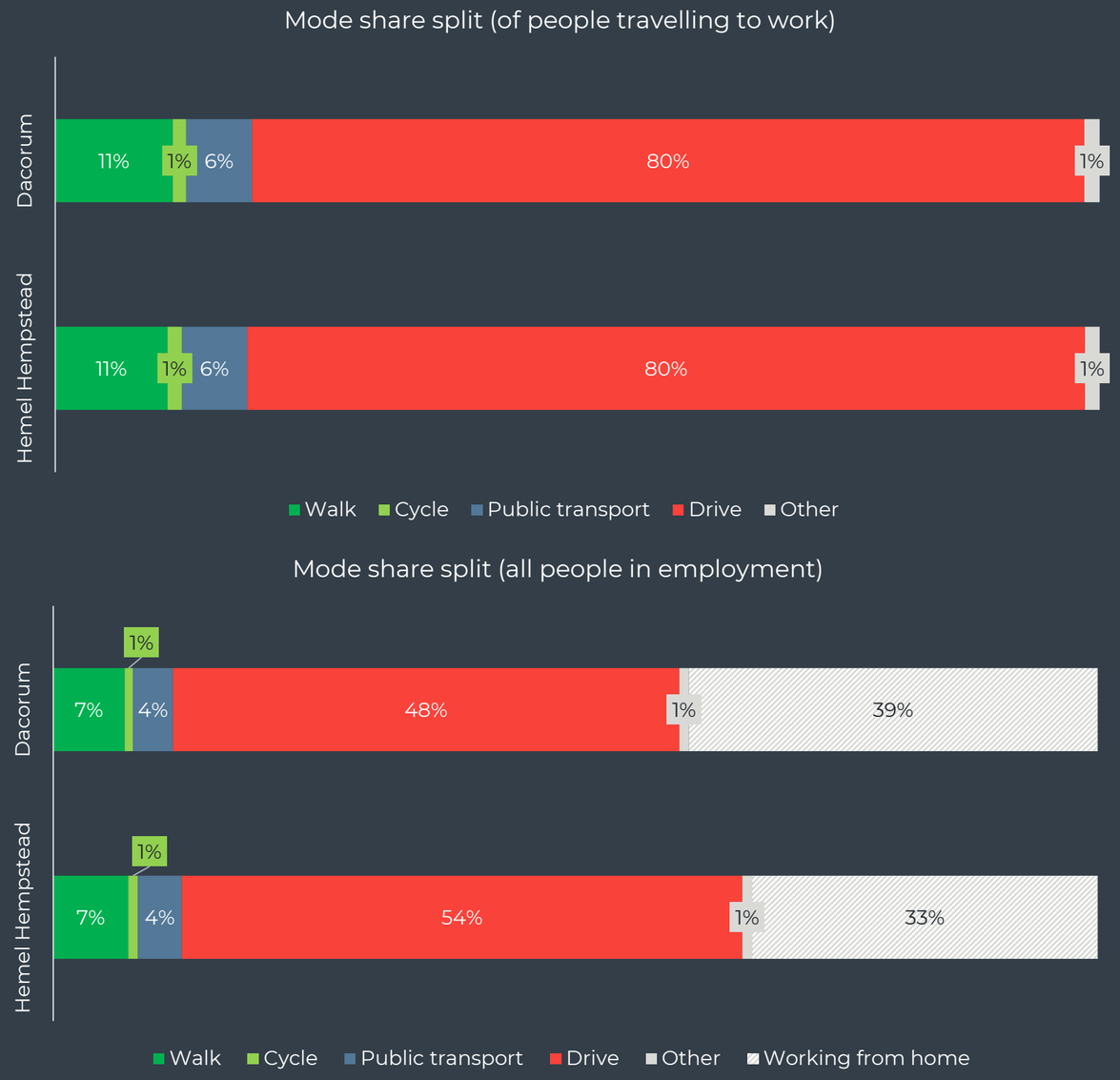
Only 12% of those in employment travel to work using sustainable modes with 7% walking, 4% using public transport and 1% cycling.

The analysis undertaken in this report relates to existing car journeys, so any opportunity for sustainable travel would have a reduction on the existing car travel which currently makes up 80% of journeys in Dacorum and Hemel Hempstead.

Census only includes work trips, but is a good proxy for existing mode split.

* Census journey to work data: Data taken from a Census carried out across England and Wales in 2021 by the Office for National Statistics

Figure A3 Existing mode share splits in Dacorum and Hemel Hempstead of people travelling to work (top) and of all people in employment (bottom)



Sustainable travel opportunity

Walking, cycling and public transport opportunity in the study area?

Figure A4 shows high and lower sustainable travel opportunity for trips – which is based on the 2031 COMET O-D matrix (accounting for future growth and development), but with the existing active travel and public transport networks. The intention is to provide a baseline on the number of future trips that could be made by walking, cycling and public transport – in the absence of transport network improvements.

- HGC growth area – opportunity is between **42-54%,** with walking being 8-28%, cycling 26-34% and public transport being less than 1%. This results in 46-58% of car trips that would need to be driven (including not analysed trips assumed to be driven).
- Hemel Hempstead – opportunity is between **47-66%**, with walking being 10-34%, cycling 29-37% and public transport being 0-3%. This results in 34-53% of car trips that would need to be driven (including not analysed trips assumed to be driven).
- Dacorum – opportunity is between **43-62%**, with walking being 10-31%, cycling 27-33% and public transport being 0-4%. About 38-57% of car trips will need to be driven (including not analysed trips assumed to be driven).

Figures A5 and A6 shows the proportion of car trips that could be made by sustainable methods for Dacorum at a model zone level, while Figures A7 and A8 shows the same for Hemel Hempstead and the HGC growth area.

Figure A4 Sustainable travel opportunity by number of trips for high (top) and lower (bottom) scenarios

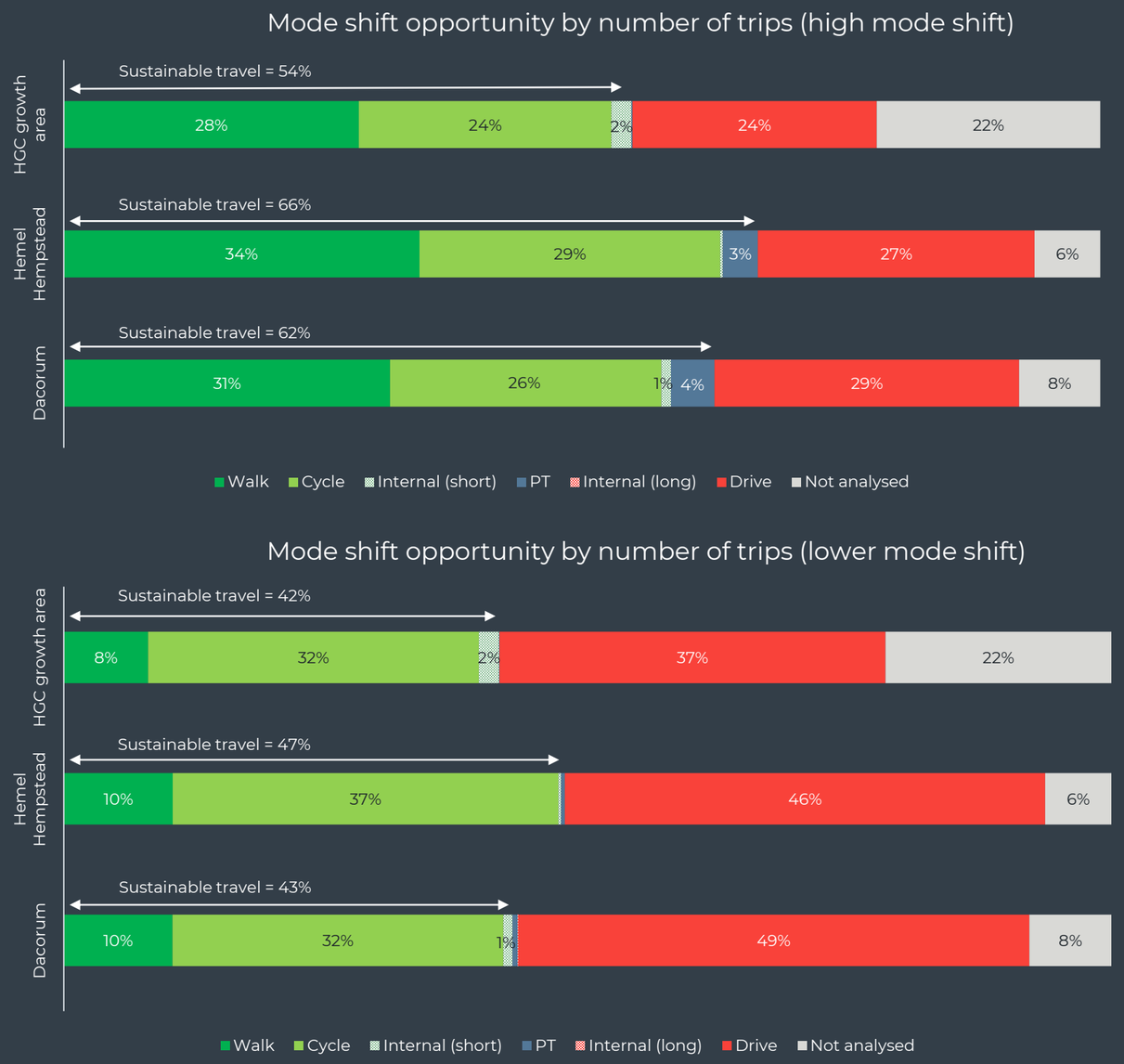


Figure A5 Dacorum trips could be made by sustainable transport modes – **low** scenario (analysed trips)

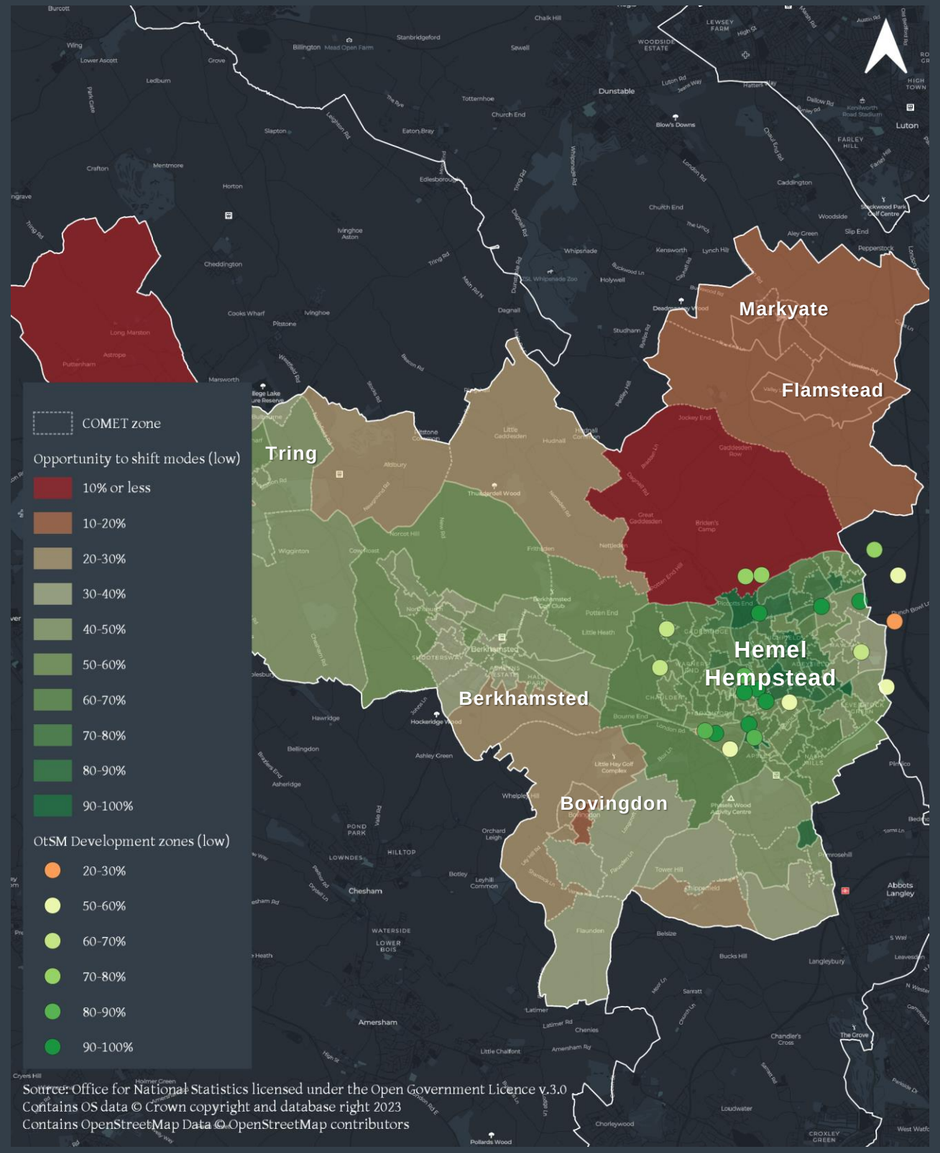


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Figure A6 Dacorum trips could be made by sustainable transport modes – **high** scenario (analysed trips)

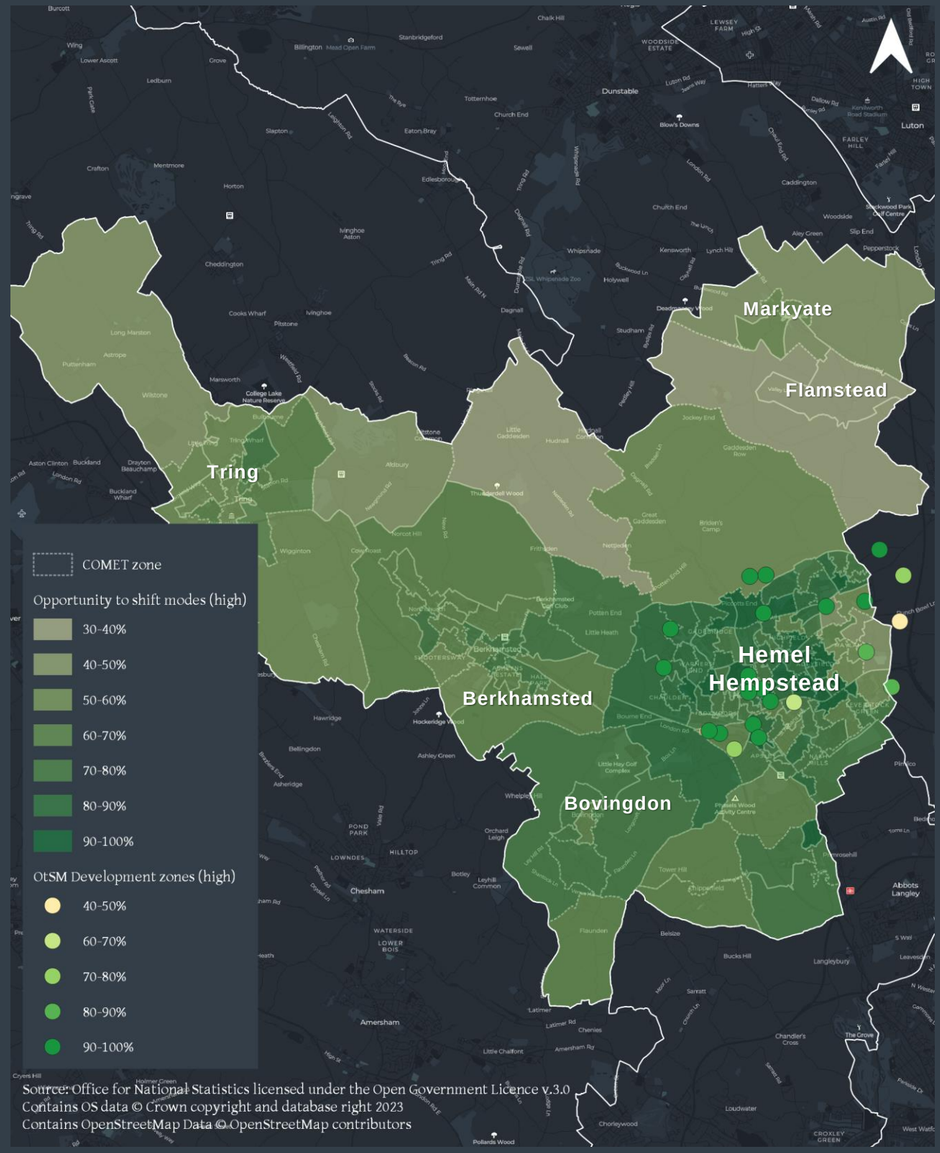

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Figure A7 Hemel Hempstead trips could be made by sustainable transport modes – **low** scenario (analysed trips)

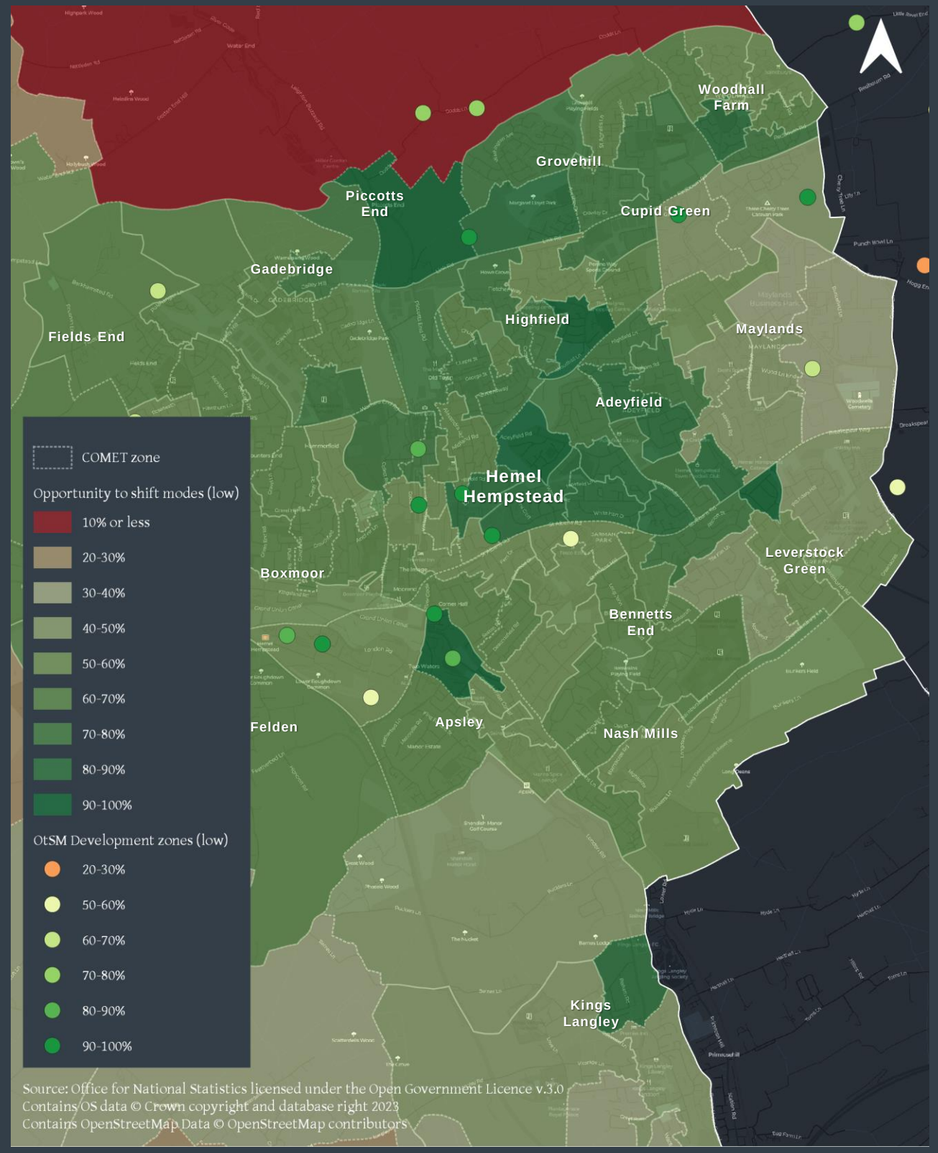

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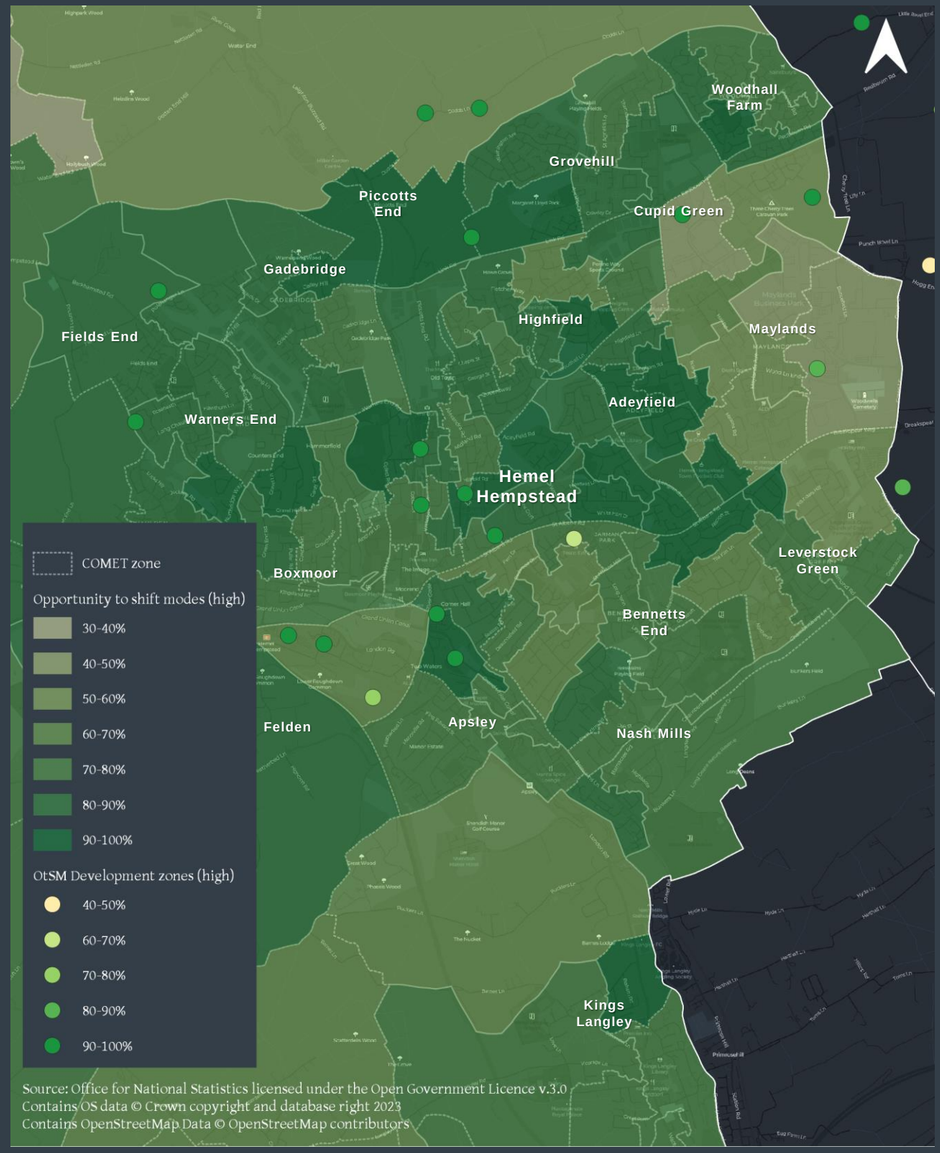
Figure A8 Hemel Hempstead trips could be made by sustainable transport modes – **high** scenario (analysed trips)



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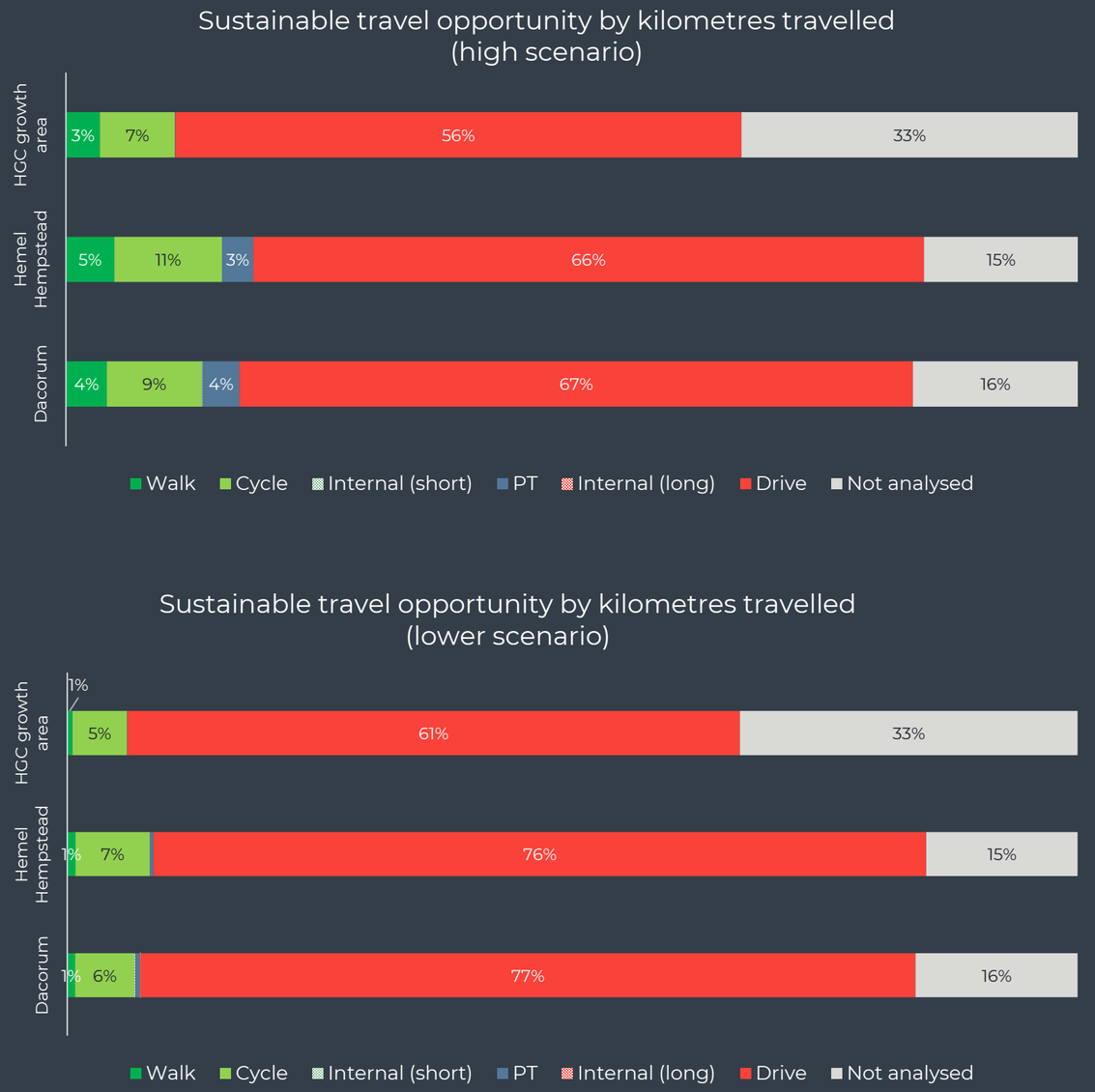
Sustainable travel opportunity

What is the sustainable travel opportunity by vehicle kilometres travelled (VKT)?

Figure A9 shows high and lower sustainable travel opportunity based on distance travelled:

- HGC growth area – opportunity is between **6-10%,** with walking being 1-3%, cycling 5-7% and public transport being less than 1%. This results in 56-61% of car trips that would need to be driven (including not analysed trips assumed to be driven).
- Hemel Hempstead – opportunity is between **8-19%**, with walking being 1-5%, cycling 7-11% and public transport being 0-3%. This results in 66-76% of car trips that would need to be driven (including not analysed trips assumed to be driven).
- Dacorum – opportunity is between **7-17%**, with walking being 1-4%, cycling 6-9% and public transport being 0-4%. About 67-77% of car trips will need to be driven (including not analysed trips assumed to be driven).

Figure A9 Sustainable travel opportunity by number of kilometres travelled for high (top) and lower (bottom) scenarios



Sustainable travel opportunity

Decarbonisation opportunities under the high scenario

Carbon emissions were calculated for each mode using the Government's carbon conversions factors and the vehicle kilometres travelled. Assuming the estimated sustainable travel opportunity will occur, average CO2e emissions were calculated for the relevant mode and compared to existing car emissions to determine what savings there could be. The factors used were 0.17 kg CO2e/km for car trips and distinct factors for bus and rail trips.

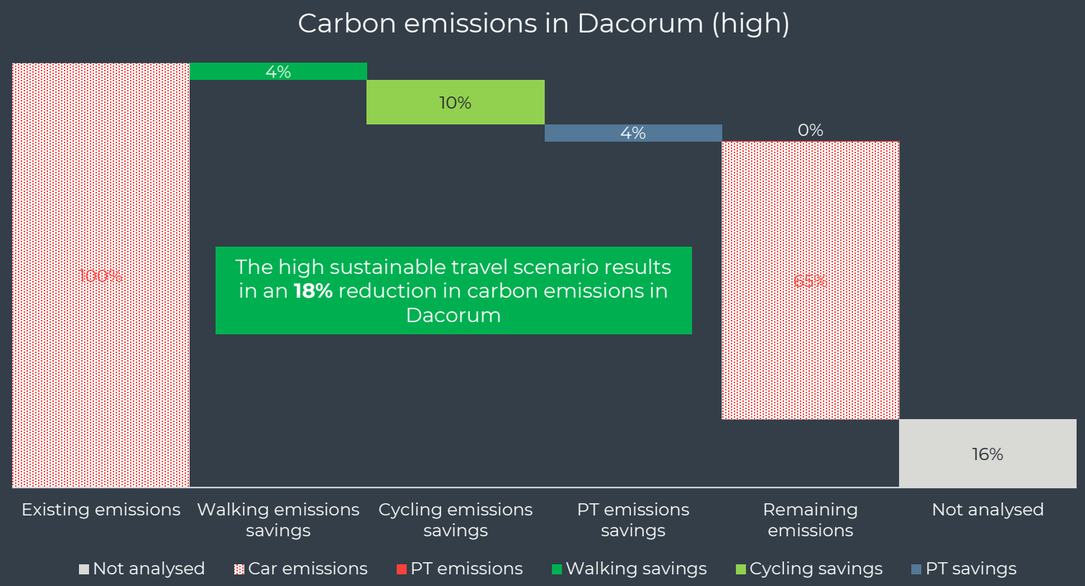
The model estimated 763 tonnes CO2e being produced across Dacorum each day from car trips, with over half of these emissions (484 tonnes CO2e) being produced in Hemel Hempstead alone. From the analysed sample, the existing daily trips produce 641 tonnes of CO2e across Dacorum, with 411 tonnes produced in Hemel Hempstead.

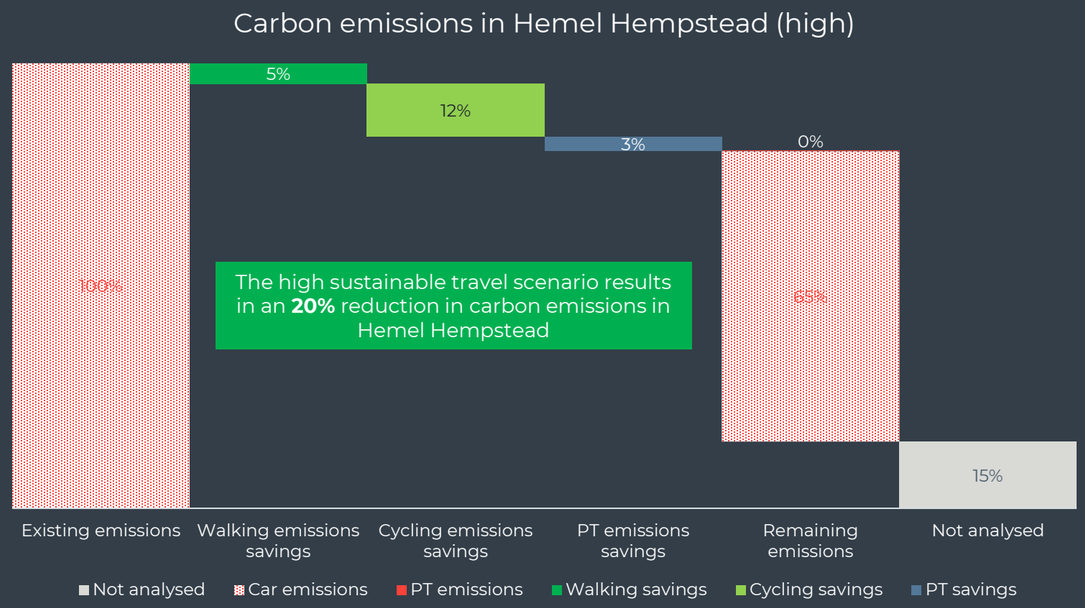
The carbon emissions for the high scenario is shown opposite in Figure A10 for Dacorum and Hemel Hempstead.

Under the high scenario, Dacorum shows the opportunity for roughly 141 tonnes CO2e to be saved, representing 18% of estimated total emissions (including emissions of trips not analysed). In Hemel Hempstead, there is an opportunity for a saving of roughly 95 tonnes CO2e, accounting for 20% of total emissions (including emissions of trips not analysed).

Carbon emissions are directly linked to vehicle kilometres travelled, which is why the CO2e with the opportunity to be saved by walking, cycling and public transport is very similar to the sustainable travel opportunity by kilometres travelled of these three modes.

Figure A10 Carbon emissions and savings under the high scenario for Dacorum (top) and Hemel Hempstead (bottom)





Sustainable travel opportunity

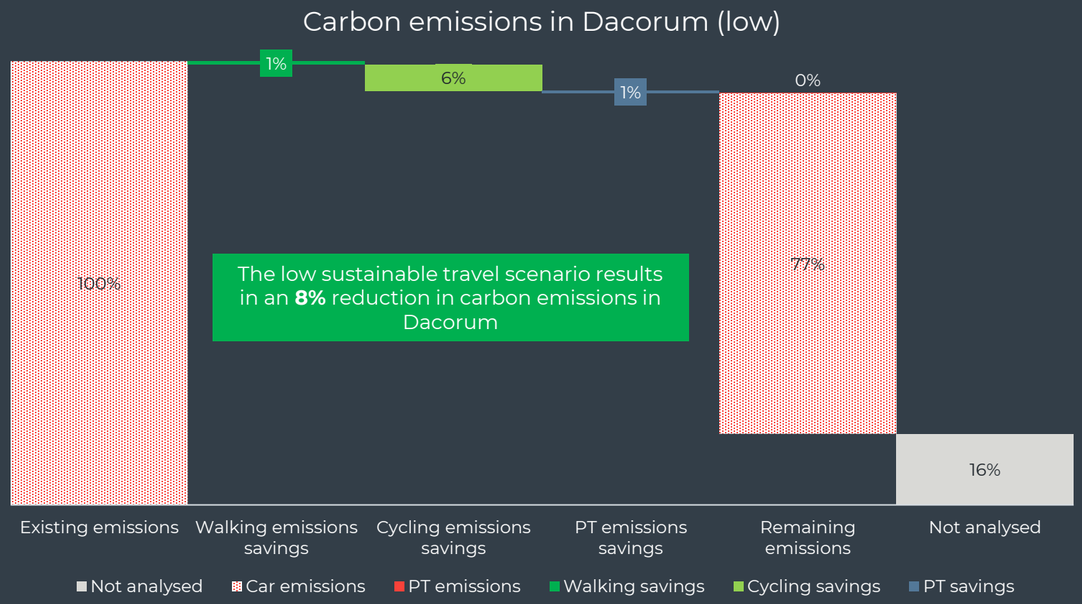
Decarbonisation opportunities under the lower scenario

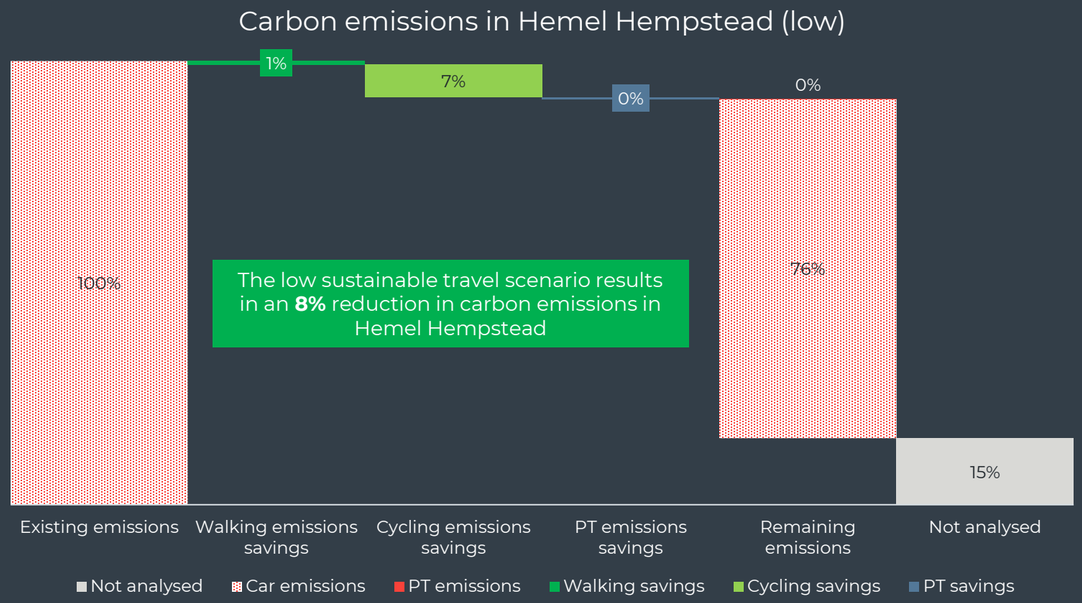
The carbon emissions for the lower sustainable travel scenario is shown opposite in Figure A11 for both Dacorum and Hemel Hempstead.

In the lower scenario, 56 tonnes out of 641 tonnes of analysed emissions in Dacorum could be saved (per day), accounting for 9% of analysed emissions (or 8% of the 763 tonnes of total existing emissions including not analysed data). Similarly, Hemel Hempstead presents the opportunity to save 41 tonnes out of 411 tonnes (10%) of analysed CO2 emissions (or 8% of the 484 tonnes of total existing emissions including not analysed data).

CO2e savings are proportional to the total vehicle kilometres shifted, which is why the output here is very similar to the sustainable travel opportunity by kilometres travelled outputs – that being that public transport does not provide significant savings, suggesting the need for public transport networks to be improved.

Figure A11 Carbon emissions and savings under the lower scenario for Dacorum (top) and Hemel Hempstead (bottom)





Walking opportunity

Up to **34%** of trips across Dacorum and **37%** in Hemel Hempstead could be made by walking as the main mode

Figure A12 shows the proportion of trips that could be walked by model zone, while the table below summarises the number of walkable trips:

- Dacorum – walking opportunity makes up to 34% of trips – resulting in 30,300-92,000 trips made as the main mode. This results in 34,700-177,700 people km. An additional 1,400-19,400 walking trips could be made as part of a public transport journey (first and last mile).

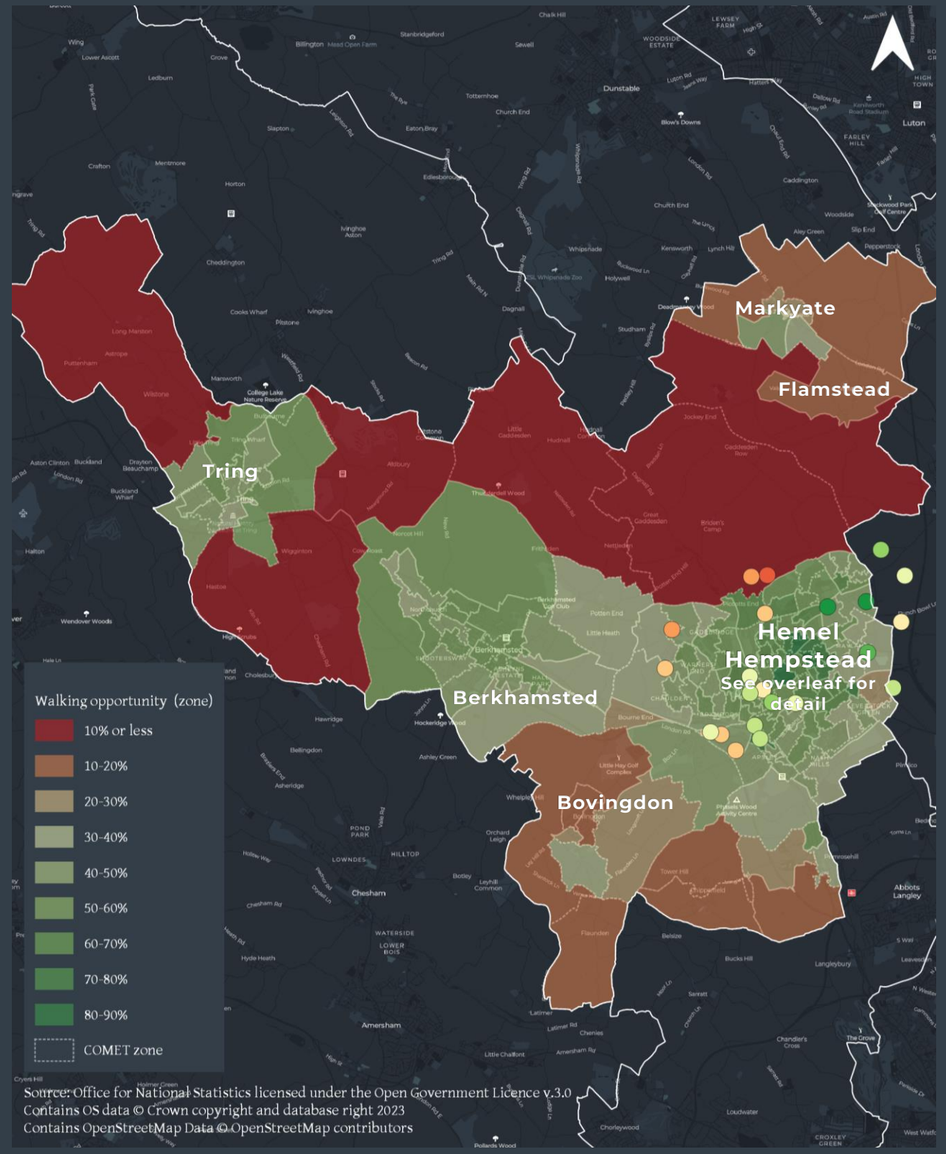
HGC growth area	Main mode	First and last mile*
Daily trips	1,200 – 4,400	6 – 100

Hemel Hempstead	Main mode	First and last mile*
Daily trips	20,300 – 66,900	700 – 11,600
Daily people km	23,100 – 133,000	900 – 12,800
Daily CO2e emissions saving (kg)	3,900 – 22,700	200 – 2,200

Dacorum	Main mode	First and last mile*
Daily trips	30,300 – 92,000	1,400 – 19,400
Daily people km	34,700 – 177,700	1,900 – 22,900
Daily CO2e emissions saving (kg)	5,900 – 30,300	300 – 3,900

* Linked to public transport trips

Figure A12 Walking opportunity in Dacorum (main mode)



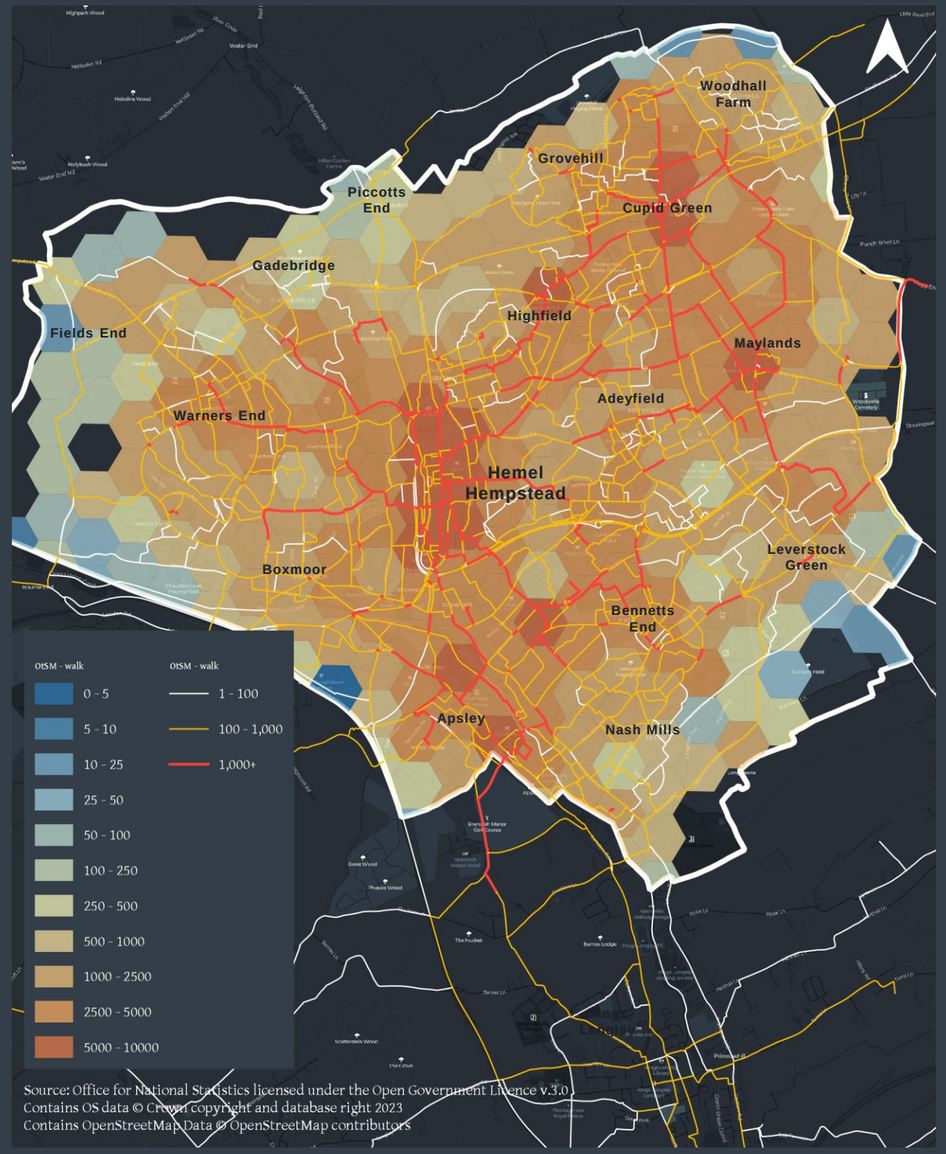
Walking opportunity

About **67,000** trips in Hemel Hempstead could be walked

Figure A13 shows the number of walking opportunity trips at a hex and link level:

- Hemel Hempstead – walking opportunity makes up to 37% of trips – resulting in 20,300-66,900 trips made as the main mode. This results in 23,100-133,000 people km. An additional 700-11,600 walking trips could be made as part of a public transport journey (first and last mile). Higher walking opportunity is in the town centre of Hemel Hempstead followed by Apsley through the main street in the south, Highfield then Cupid Green through the shopping centre in the north.
- HGC growth area – 600-2,100 trips could be walked as the main mode. Up to an additional 100 walking trips could be made as part of a public transport journey (first and last mile).

Figure A13 Walking opportunity in Hemel Hempstead (main mode)



Cycling opportunity

Up to **63%** of trips across Dacorum and **68%** in Hemel Hempstead could be made by cycling as the main mode

Figure A14 shows the proportion of trips that could be cycled at a model zone level, while the table below summarises the number of cycling trips:

- Dacorum – cycling opportunity makes up to 63% of trips – resulting in 122,600-168,500 trips made as the main mode. This results in 297,500-644,000 people km. An additional 1,400-19,400 cycling trips could be made as part of a public transport journey (first and last mile).

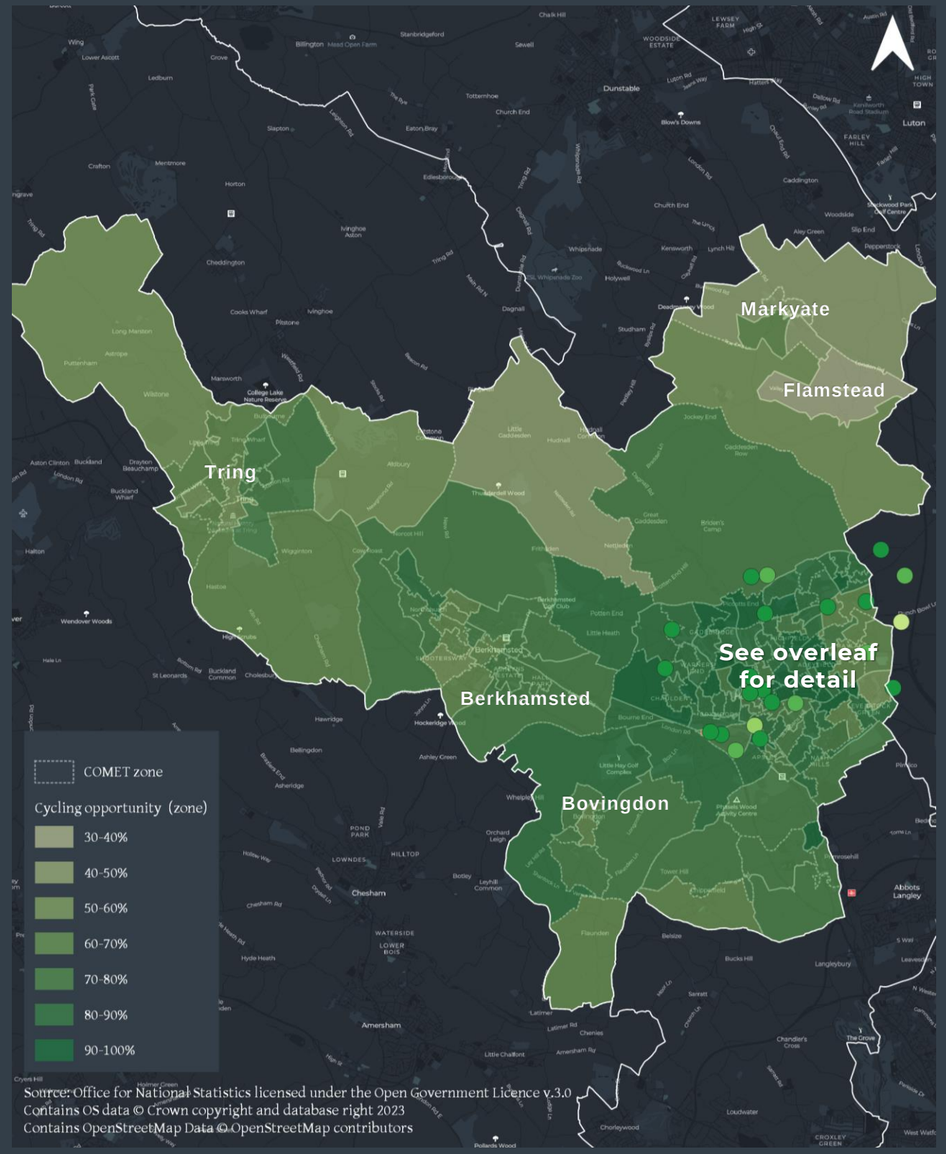
HGC growth area	Main mode	First and last mile*
Daily trips	6,100 – 8,100	6 – 100

Hemel Hempstead	Main mode	First and last mile*
Daily trips	92,000 – 123,500	700 – 11,600
Daily people km	231,400 – 468,100	900 – 12,800
Daily CO2e emissions saving (kg)	39,500 – 79,900	200 – 2,200

Dacorum	Main mode	First and last mile*
Daily trips	122,600 – 168,500	1,400 – 19,400
Daily people km	297,500 – 644,000	1,900 – 22,900
Daily CO2e emissions saving (kg)	50,800 – 109,900	300 – 3,900

* Linked to public transport trips

Figure A14 Cycling opportunity in Dacorum (main mode)



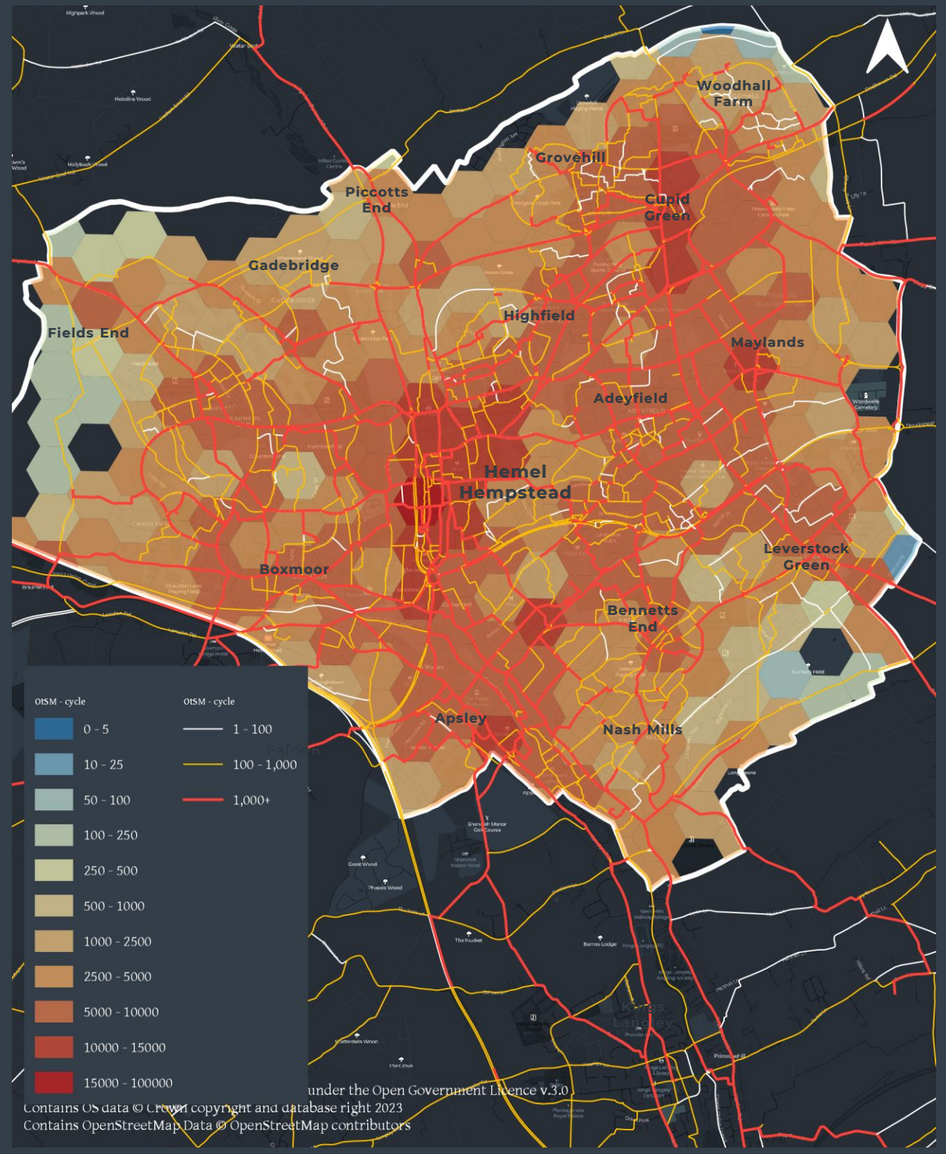
Cycling opportunity

About **123,500** trips in Hemel Hempstead could be cycled

Figure A15 focusses in on Hemel Hempstead and shows the number of daily trips that could be cycled at a link level.

- Hemel Hempstead – cycling opportunity makes up to 68% of trips – resulting in 92,000-123,500 trips made as the main mode. This results in 231,400-468,100 people km. An additional 700-11,600 cycling trips could be made as part of a public transport journey (first and last mile). Like walking, higher cycling opportunity is in the town centre of Hemel Hempstead followed by Apsley through the main street in the south, Highfield then Cupid Green through the shopping centre in the north, and Maylands.
- HGC growth area – 600-2,100 trips could be cycled as the main mode. Up to an additional 100 cycling trips could be made as part of a public transport journey (first and last mile).

Figure A15 Cycling opportunity in Hemel Hempstead (main mode)



Public transport opportunity

Up to **7%** of trips across Dacorum and **6%** in Hemel Hempstead could be made by public transport as the main mode

Figure A16 shows the proportion of trips that could be made by public transport at a model zone level, while the table below summarises the number of public transport trips:

- Dacorum – public transport opportunity makes up to 7% of trips – resulting in 1,400-19,400 trips made as the main mode. This results in 25,500-242,200 people km. Within Dacorum there is a limited opportunity to shift from private car to public transport, with the opportunity being the greatest in Hemel Hempstead.

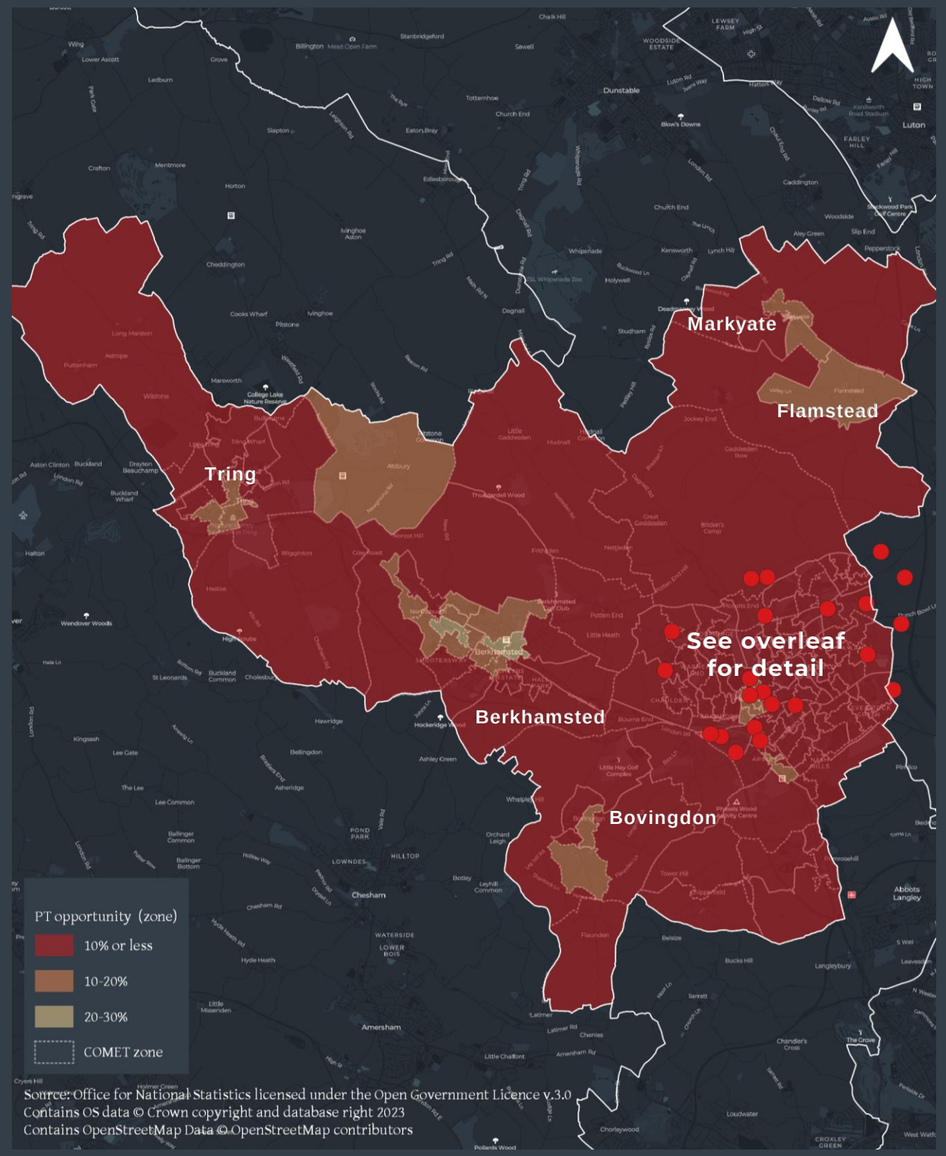
This is based on the current public transport network, which suggests that there is limited opportunity to shift to public transport. Enhancements to the bus and rail network could increase public transport potential. The propensity to shift modes work will identify population segments and locations where residents may be more open to using public transport.

HGC growth area	Main mode
Daily trips	6 – 100

Hemel Hempstead	Main mode
Daily trips	700 – 11,600
Daily people km	11,400 – 134,100
Daily CO2e emissions saving (kg)	1,900 – 21,400

Dacorum	Main mode
Daily trips	1,400 – 19,400
Daily people km	25,500 – 242,200
Daily CO2e emissions saving (kg)	4,300 – 39,300

Figure A16 Public transport opportunity in Dacorum (main mode)



Public transport opportunity

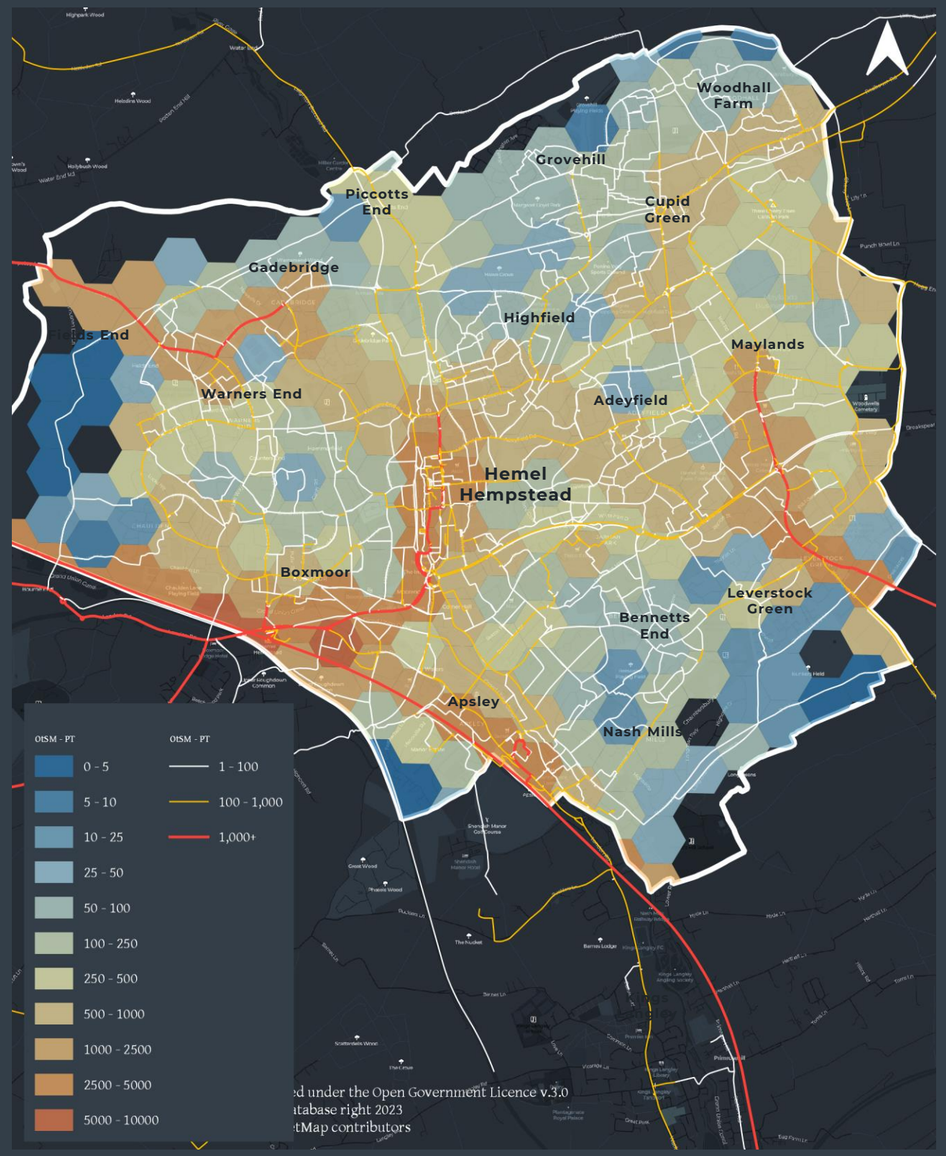
About **11,600** trips in Hemel Hempstead could be made by public transport

Figure A17 focusses in on Hemel Hempstead and shows the number of daily trips that could use public transport at a link level.

- Hemel Hempstead – public transport opportunity makes up about 700-11,600 trips as the main mode. This results in 11,400-134,100 people km. The greatest opportunity for public transport use can be seen in Hemel Hempstead centre through Boxmoor and Apsley. This can be explained by the Hemel Hempstead and Apsley railway stations. The corridor leading to Maylands also has higher public transport opportunity. It is noted that the area to the north-east of Hemel Hempstead has limited public transport opportunity.
- HGC growth area – up to 100 trips could be made by public transport as the main mode.

To improve the public transport opportunity, it is recommended that enhancements are considered between key origin-destination points, in areas with a higher propensity to use bus and rail, with improved first and last mile connectivity to improve the attractiveness of public transport as a viable mode compared to driving.

Figure A17 Public transport opportunity in Hemel Hempstead (main mode)



PART B
Sustainable travel propensity

Sustainable travel propensity

Introduction

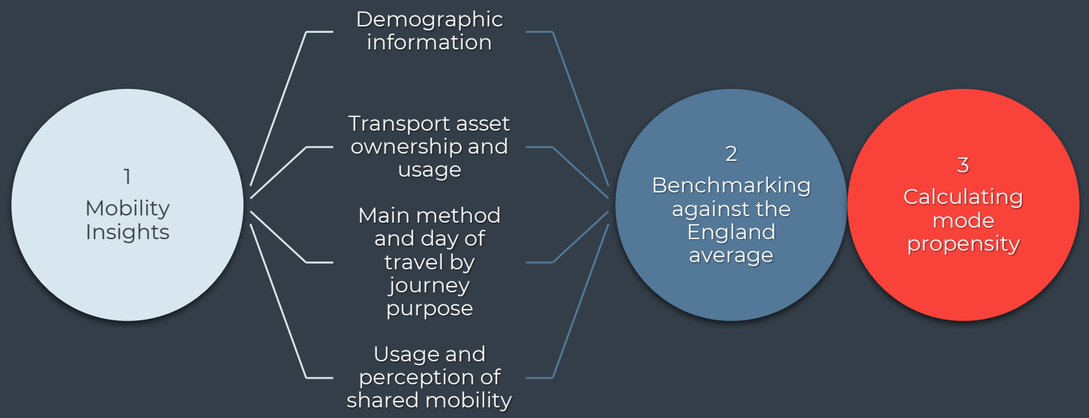
The sustainable travel opportunity presented a 'best-case' scenario of walking, cycling and public transport – based on the existing active travel and public transport networks.

To help determine a more realistic sustainable travel potential, individual travel behaviours and opinions must be considered (i.e. someone's propensity to travel by a given mode).

Propensities for walking, cycling, public transport (bus and rail), and driving have been derived using WSP's Mobility Insights survey responses, taking the following approach:

- Analysing Mobility Insights survey responses – The survey consists of questions relating to demographic information, transport asset ownership and usage, main method and day of travel for different journey purposes, and usage and perception of shared mobility. Survey responses were assigned to socio-demographic groups (using Experian Mosaic profiles) depending on the postcode of the respondent.
- Benchmarking against the England average – Mosaic group responses were compared to the England average to calculate a propensity factor for each variable and each Mosaic group, where 100 is the England average, so anything above 100 would be greater than average and less than 100 would be below average.
- Calculating mode propensity – For each mode, survey response variables (such as owning a car) were given weightings and a weighted average propensity was calculated.

Figure B1 Sustainable travel propensity process



Sustainable travel propensity

Proportion of household

Table B1 sets out the proportion of households for Dacorum, Hemel Hempstead and the HGC growth area compared to the England average.

This analysis highlights the differences in demographics and lifestyles between Dacorum, Hemel Hempstead and England across various categories. Dacorum and Hemel Hempstead seem to have distinct characteristics in terms of employment, family dynamics, and living preferences.

There are significant differences in the distribution of personas between Dacorum and Hemel Hempstead, and the England average. Prestige Positions have a much higher presence in Dacorum compared to the England average, while Aspiring Homemakers are more prevalent in Hemel Hempstead than the England average.

Dacorum maintains a larger percentage of Family Basics, with an even larger percentage in Hemel Hempstead, implying that it might offer more family-friendly facilities and services. A substantial proportion of individuals in Dacorum are Domestic Success, possibly indicating a preference for well-established residential areas with access to quality amenities.

The proportion of Rental Hubs in Hemel Hempstead is higher than that of Dacorum (and the England average) and is likely explained by the large volume of young people in the area.

For HGC growth area, the same Mosaic Group weightings were used as found in Hemel Hempstead. Figure B1 and B2 show the Dominant Mosaic Group across Dacorum and Hemel Hempstead, respectively.

Table B1 Mosaic Group by Dacorum & Hemel Hempstead (proportion of households)

	Mosaic Group	Dacorum	Hemel Hempstead	HGC growth area	England %
A	City Prosperity	1%	0%	0%	4%
B	Prestige Positions	18%	7%	7%	7%
C	Country Living	5%	0%	0%	7%
D	Rural Reality	2%	0%	0%	7%
E	Senior Security	4%	4%	4%	7%
F	Suburban Stability	6%	7%	7%	5%
G	Domestic Success	16%	13%	13%	9%
H	Aspiring Homemakers	16%	21%	21%	10%
I	Family Basics	12%	17%	17%	8%
J	Transient Renters	2%	4%	4%	6%
K	Municipal Challenge	1%	2%	2%	6%
L	Vintage Value	5%	6%	6%	5%
M	Modest Traditions	2%	3%	3%	5%
N	Urban Cohesion	2%	3%	3%	5%
O	Rental Hubs	10%	14%	14%	8%

Figure B2 Dominant Mosaic Group for Dacorum

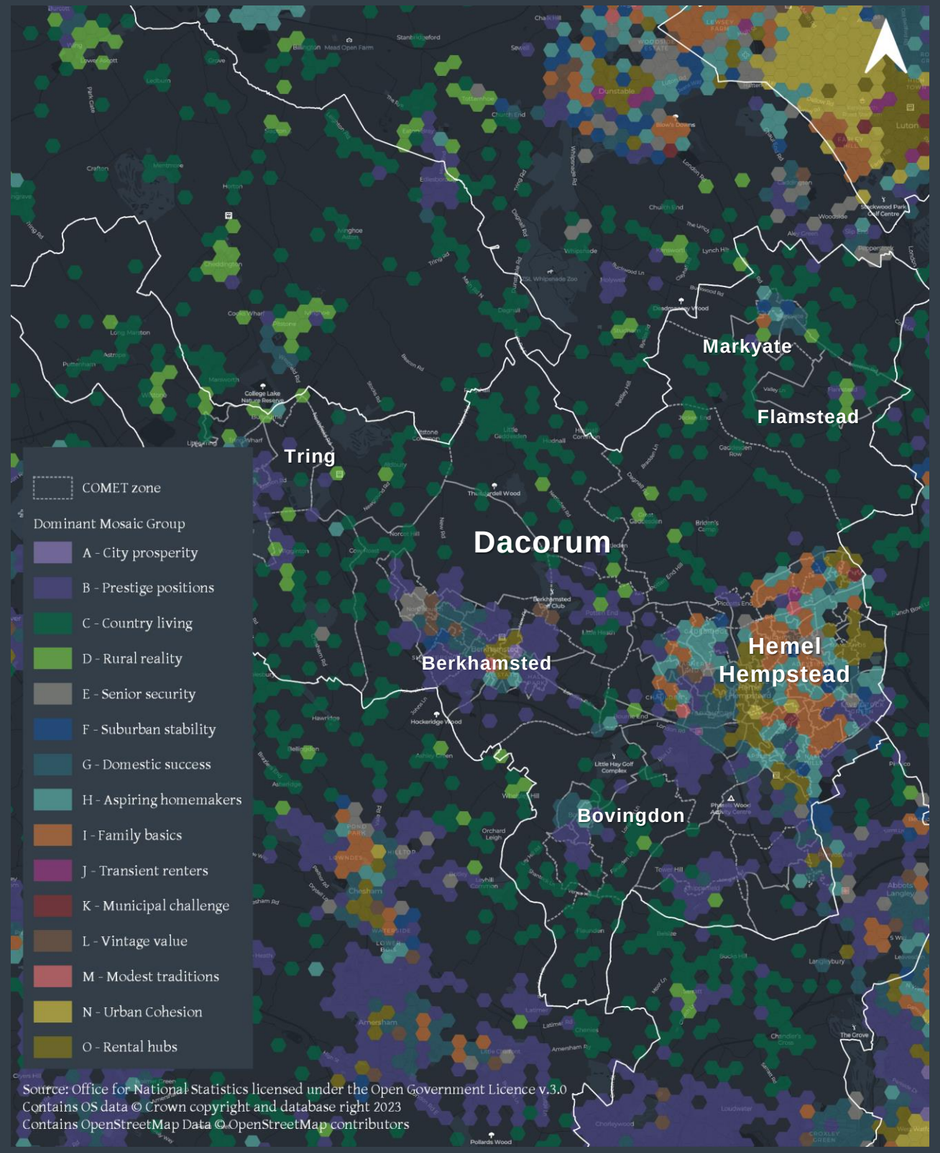


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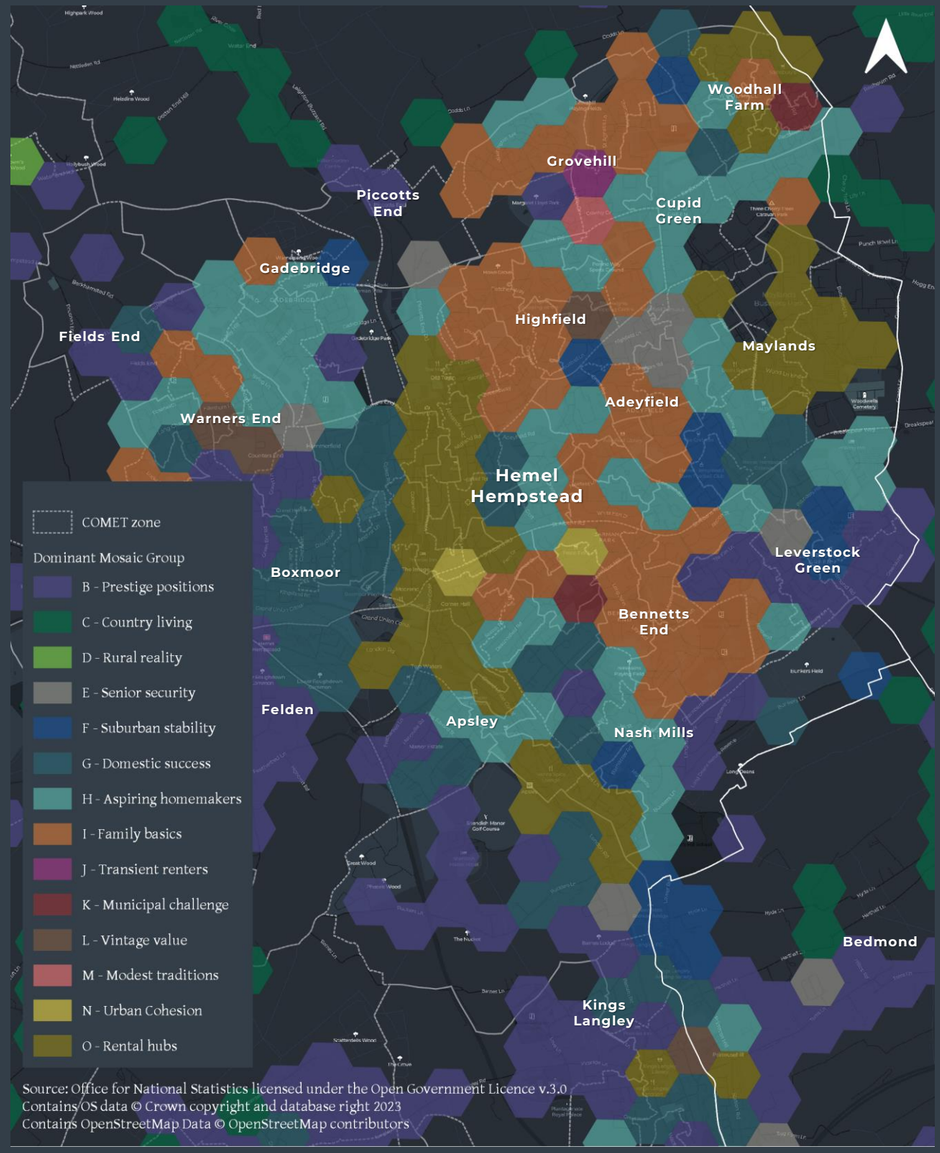
Figure B3 Dominant Mosaic Group for Hemel Hempstead



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Sustainable travel propensity

Average mode propensity

Table B2 sets out the average mode propensity (i.e. average of all trip types) for Dacorum and Hemel Hempstead compared to the England average (which is 100). A score greater than 100 suggests a higher than England average propensity to use that mode, while a value below 100 suggests the opposite.

Dacorum, Hemel Hempstead and HGC growth area are relatively car dependent, with a higher propensity to drive (105) compared to the England average (100).

Dacorum – propensity to use active travel and public transport is lower than the England average – being 89 for walking, 88 for cycling, 85 for bus and 88 for rail.

Hemel Hempstead and HGC growth area – while having a higher propensity to use sustainable modes than Dacorum, are still slightly below the England average. Walking is 95, cycling is 98, bus and rail are both 91.

It is noted that the propensity to use active travel and public transport is based on the current socio-demographics of the area, and wider survey results grouped by Experian Mosaic group. As Hemel Hempstead and HGC growth area are developed – the sustainable travel propensity will change – and potentially increase for active and public transport.

Table B2 Average propensity for walking, cycling, using bus, using rail and driving (all journey purposes)

Propensity compared to England average (100)	Dacorum	Hemel Hempstead	HGC growth area
Walk	89	95	95
Cycle	88	98	98
Bus	85	91	91
Rail	88	91	91
Drive	105	105	105

Sustainable travel propensity

Propensity to walk in Dacorum

Figure B4 sets out the propensity to walk for Dacorum compared to the England average at COMET model zone level.

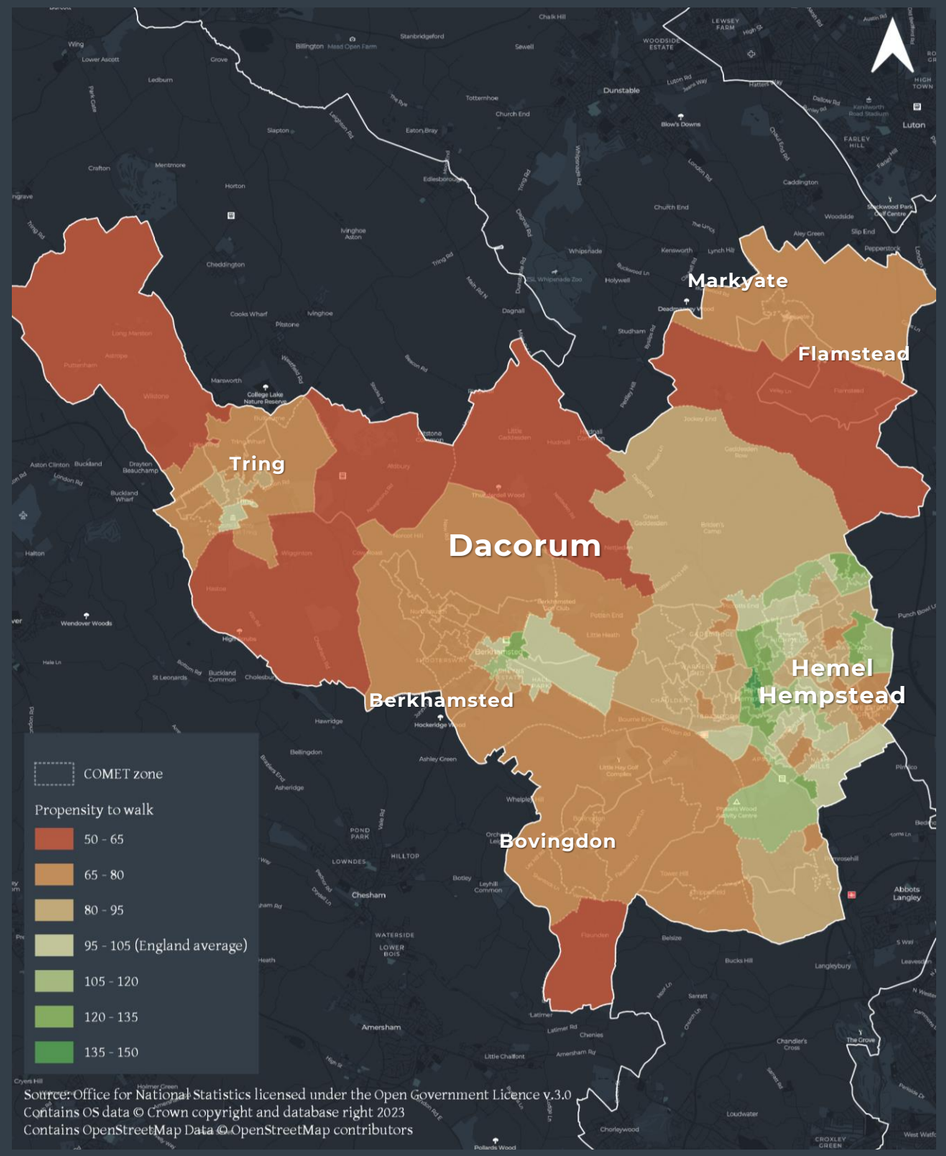
Areas of higher propensity to walk tend to be concentrated in towns such as Hemel Hempstead, Berkhamsted and Tring.

Generally, in Dacorum, propensity to walk is 89% of the England average. This indicates that other modes may be preferred within Dacorum as a whole. However, as noted in the map, the urban areas have a higher than England propensity to walk.

Comparing these regions to the opportunity map, almost all areas outside of Hemel Hempstead that show a high propensity to walk have limited opportunity.

The lack of opportunity can be explained due to the analysis covering trips starting/ending or passing through Dacorum, and therefore the longer distance of these trips would be unfeasible for walking as they exceed 3.2km (in urban areas) or 2.3km (in rural areas).

Figure B4 Propensity to walk in Dacorum



Sustainable travel propensity

Propensity to walk in Hemel Hempstead

Figure B5 sets out the propensity to walk for Hemel Hempstead compared to the England average.

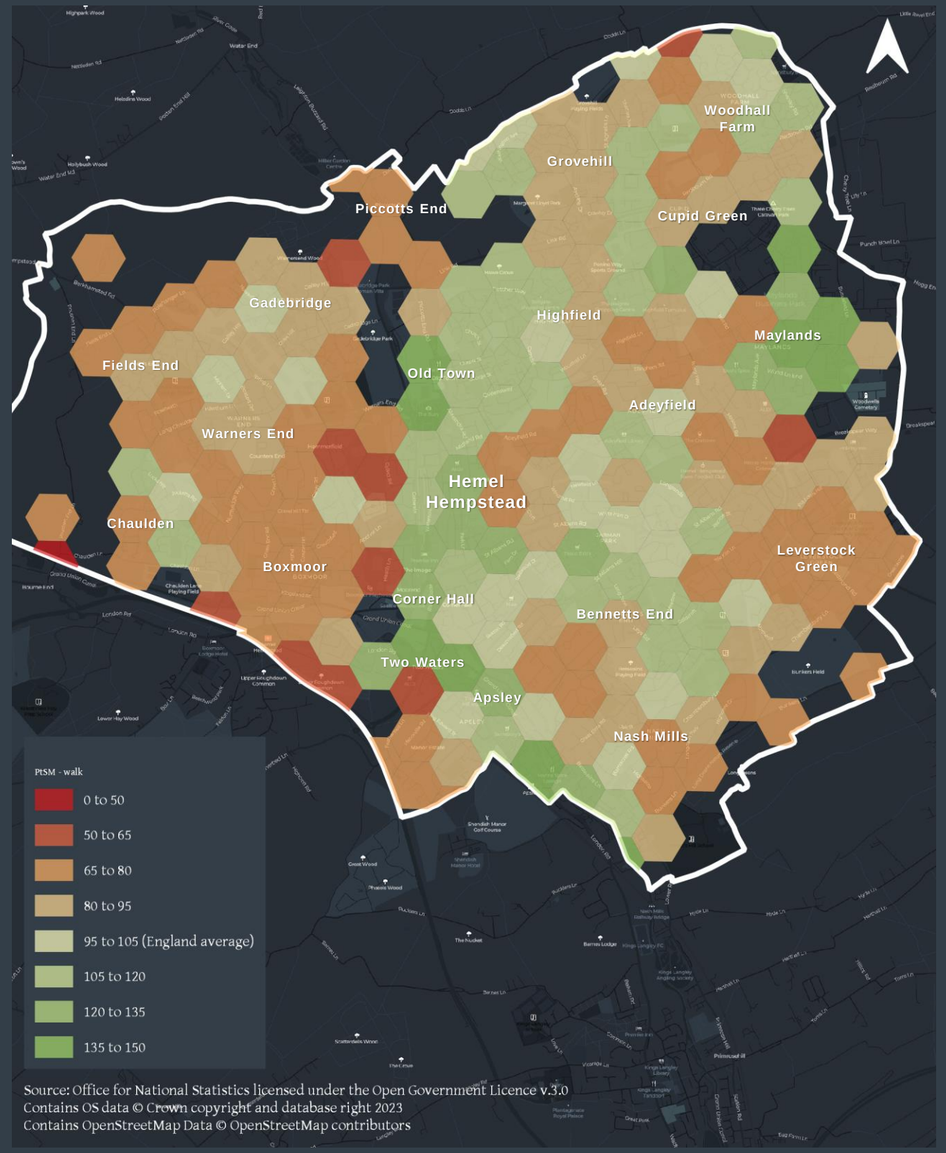
In Hemel Hempstead the propensity to walk is about 95% of the England average - with urban areas generally higher than Dacorum and the England average, while rural areas are lower.

Notably, areas such as Maylands, Apsley and central Hemel Hempstead show a walking propensity greater than the England average (between 105 to 150).

These areas are noted to have high opportunity and propensity, while also having essential facilities, such as shops and schools, reducing the necessity for longer trips to be made by car.

In line with this, the areas of Hemel Hempstead with lower propensity to walk tend to be lower-density residential areas with fewer local amenities available.

Figure B5 Propensity to walk in Hemel Hempstead



Sustainable travel propensity

Propensity to cycle in Dacorum

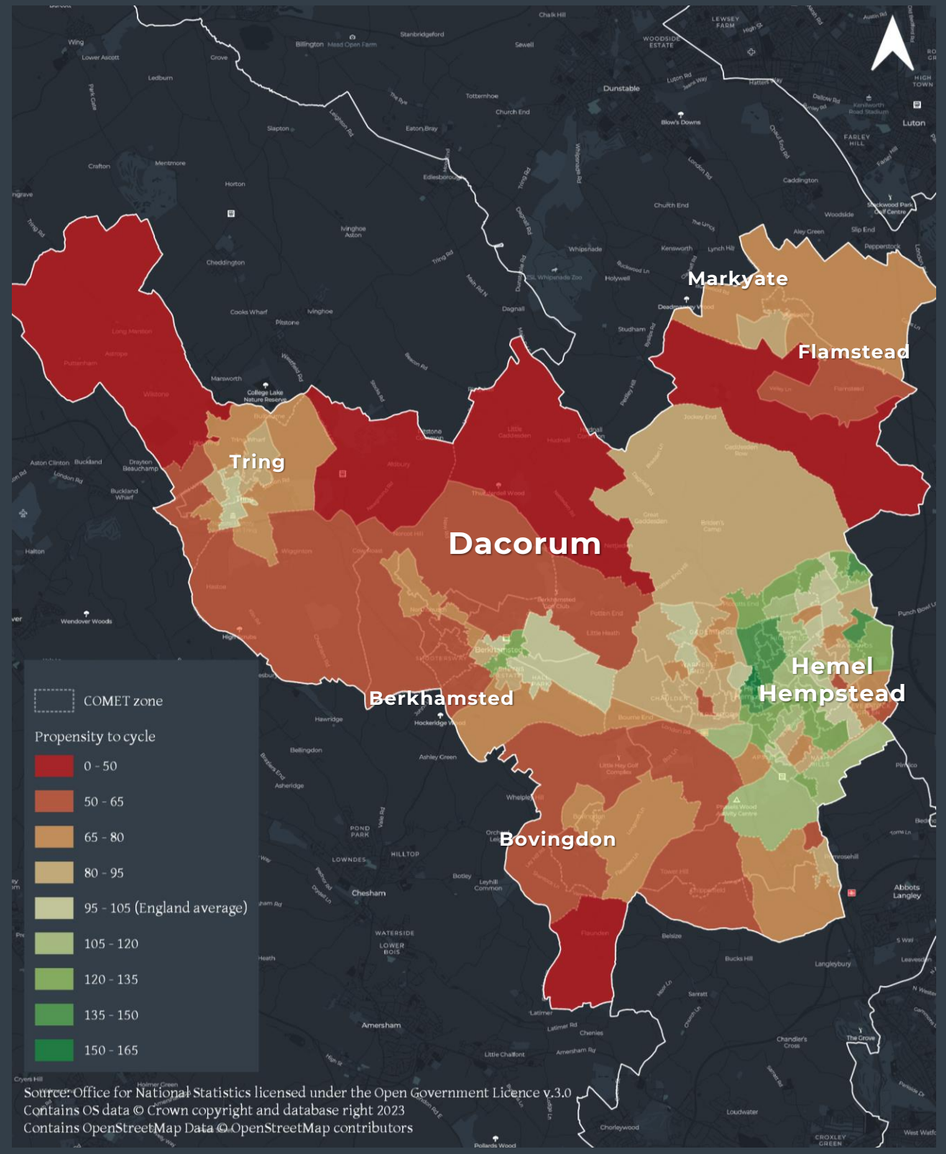
Figure B6 sets out the propensity to cycle for Dacorum compared to the England average – and averages about 88% across the local authority.

The propensity to cycle is significantly lower than the England average - with the exception of Hemel Hempstead. Given the highly rural typology of the region, it's anticipated that most areas would be less likely to favour cycling due to the longer distance trips and undulating terrain often experienced in these areas and therefore have more of a preference for driving.

In urban areas such as Hemel Hempstead and central Berkhamsted, the propensity to cycle is similar to or above the England average. It's likely that in these areas' destinations such as community facilities, shops and education establishments may be within a short distance (under 8km).

When compared with opportunity, areas in the north of Dacorum show almost no opportunity to cycle, meaning hotspots of high propensity in towns such as Tring would not feasibly be able to cycle.

Figure B6 Propensity to cycle in Dacorum



Sustainable travel propensity

Propensity to cycle in Hemel Hempstead

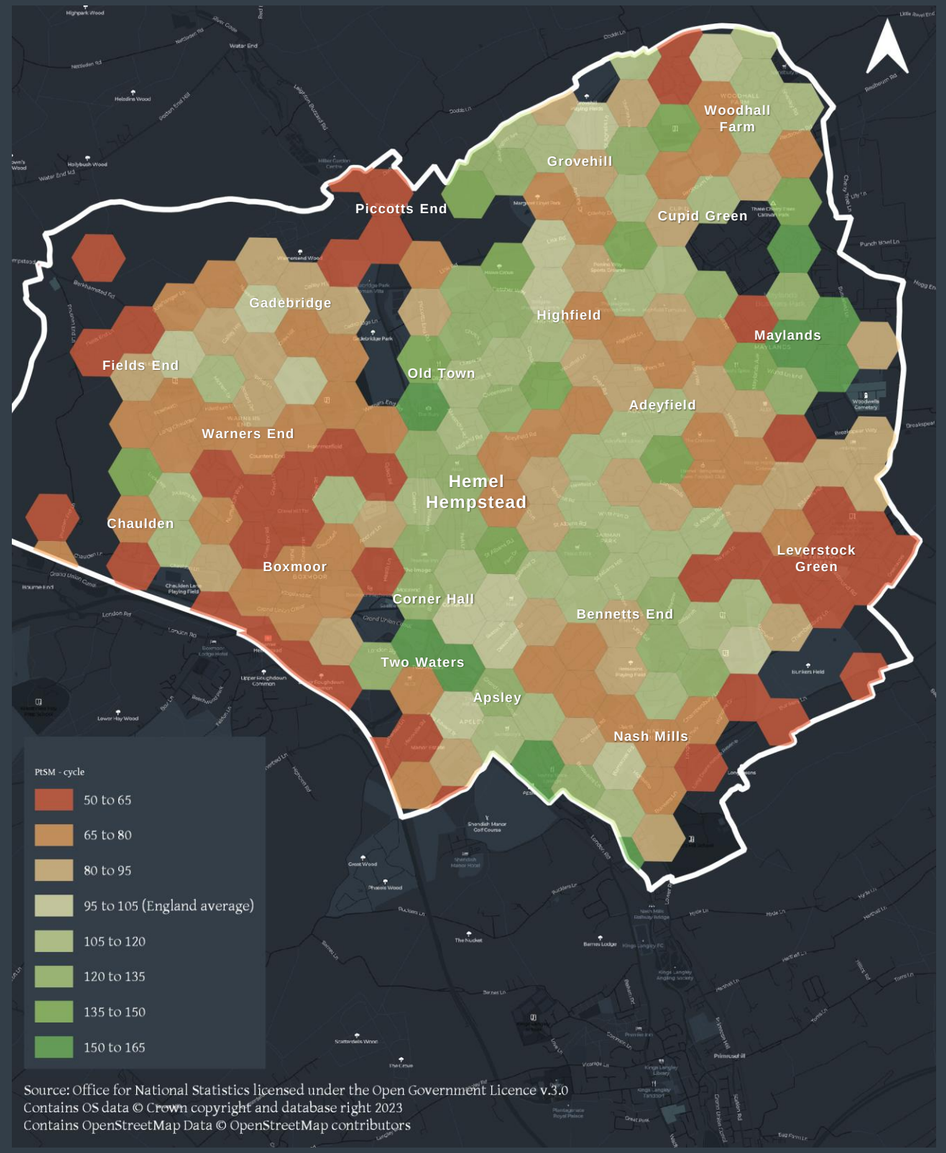
Figure B7 sets out the propensity to cycle for Hemel Hempstead – which is about 98% of the England average.

Propensity to cycle in Hemel Hempstead is variable throughout the area, with some areas showing higher propensity to cycle and others on the fringe with lower than England propensity to cycle – driven by a mix of socio-demographics across the town.

Similar to walking, cycling propensity is greatest in the highly urban areas of Maylands, Apsley and central Hemel Hempstead. These areas show propensities greater than the England average, some by more than 50%.

In contrast, areas on the outskirts of Hemel Hempstead generally have much lower propensity (in the range of 0 to 50). However, as the garden community is developed, it is expected that the socio-demographics may change with incoming residents potentially being more open to cycling.

Figure B7 Propensity to cycle in Hemel Hempstead



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Sustainable travel propensity

Propensity to use bus in Dacorum

Figure B8 sets out the propensity to use bus for Dacorum – which is about 85% of the England average.

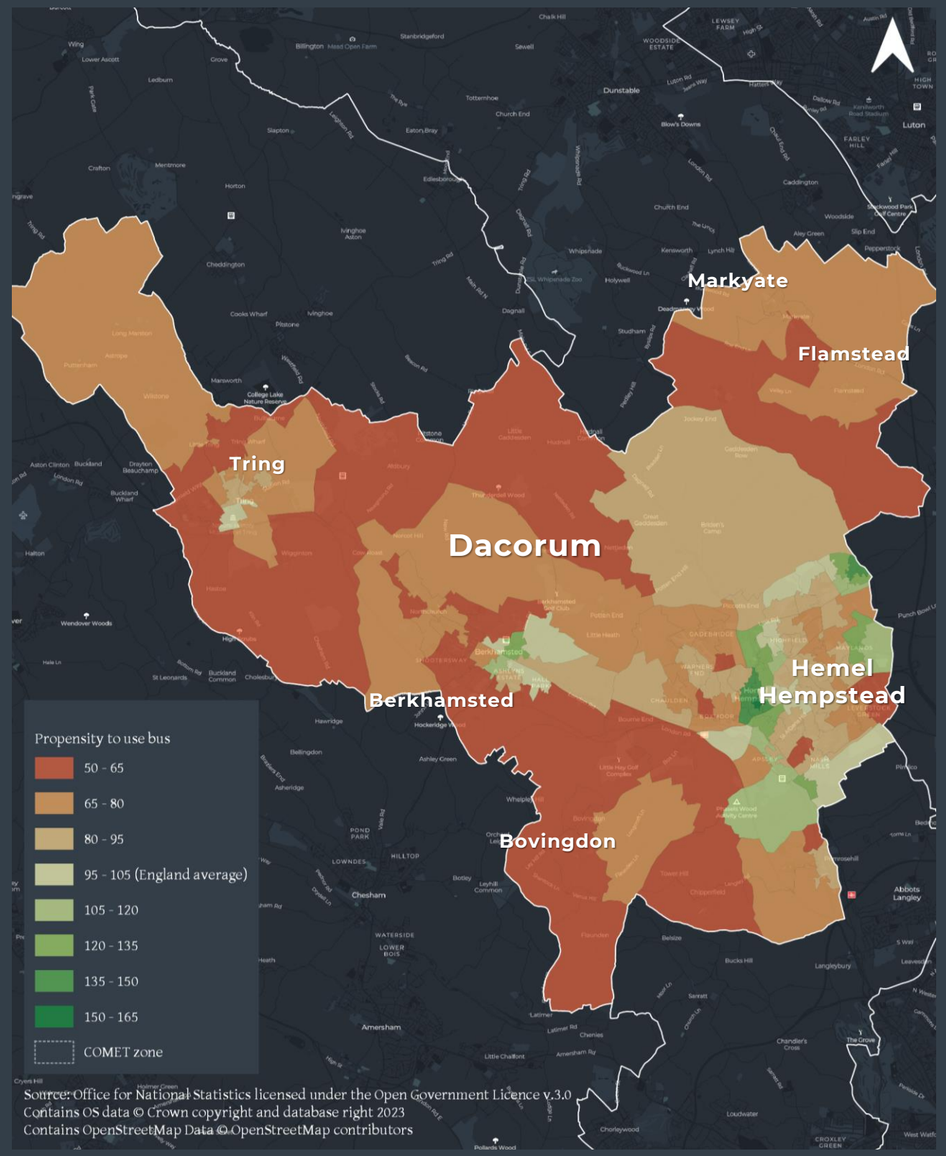
Within Dacorum, the overall propensity to travel by bus is significantly lower than the England average, with most areas having propensity in the range of 50 to 65.

These figures are supported by the limited opportunity to use public transport at present, highlighting an opportunity to increase bus services to better cater to the needs of users.

In a similar pattern to walking and cycling propensity, there is a greater willingness to travel by bus in the more urban areas within Dacorum (notably Hemel Hempstead and Berkhamsted), with the central zones in these areas displaying a greater inclination than the UK average.

Although bus propensity in Hemel Hempstead itself fares slightly better than the rest of Dacorum, with some areas of the town showing levels greater than the England average, many areas of the town still falls below this level.

Figure B8 Propensity to use bus in Dacorum



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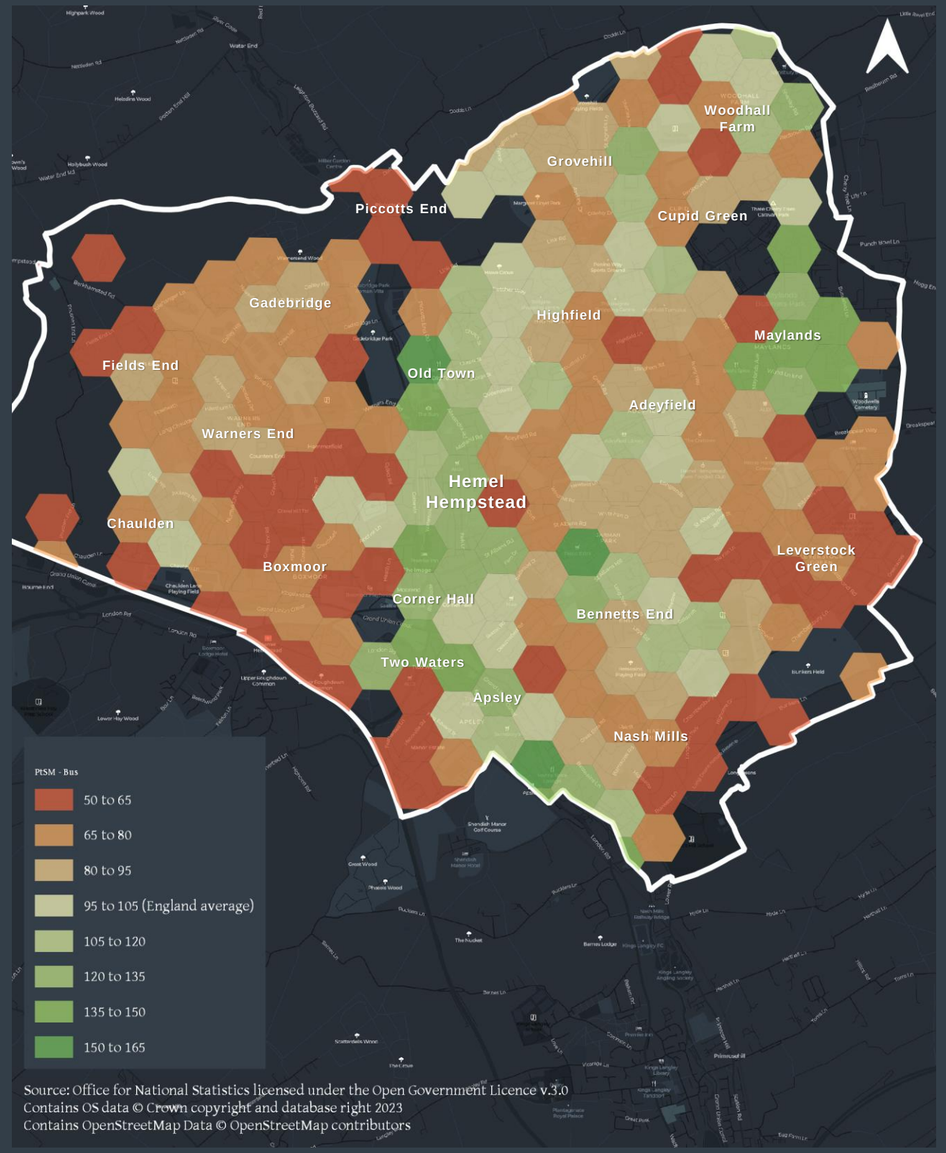
Sustainable travel propensity

Propensity to use bus in Hemel Hempstead

Figure B9 sets out the propensity to use bus for Hemel Hempstead – which is about 91% of the England average.

Propensity to travel by bus is uneven across Hemel Hempstead. Areas with higher bus propensity includes the town centre, Maylands, Apsley, Grovehill and Woodhall Farm.

Figure B9 Propensity to use bus in Hemel Hempstead



Sustainable travel propensity

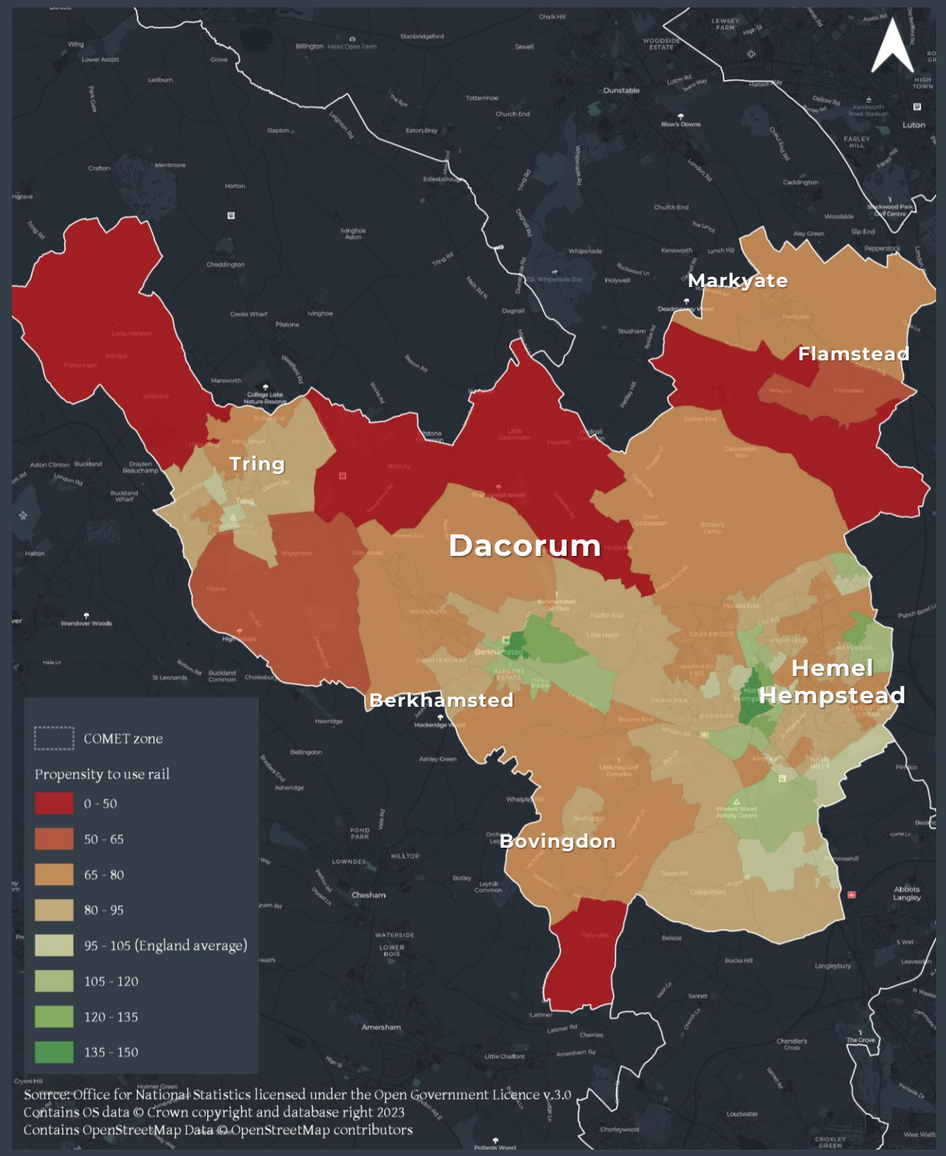
Propensity to use rail in Dacorum

Figure B10 sets out the propensity to use rail for Dacorum – which is about 88% of the England average.

Propensity to travel by rail in Dacorum is varied across the local authority, with large areas having lower than average propensity for rail travel compared with the England average. A lack of rail provision in these areas is likely to play a part in the lower propensity.

Where rail propensity is higher than average in Figure B10, this tends to align with the location of the rail stations in these settlements, suggesting that residents do not need to travel far to reach the rail stations.

Figure B10 Propensity to use rail in Dacorum



Sustainable travel propensity

Propensity to use rail in Hemel Hempstead

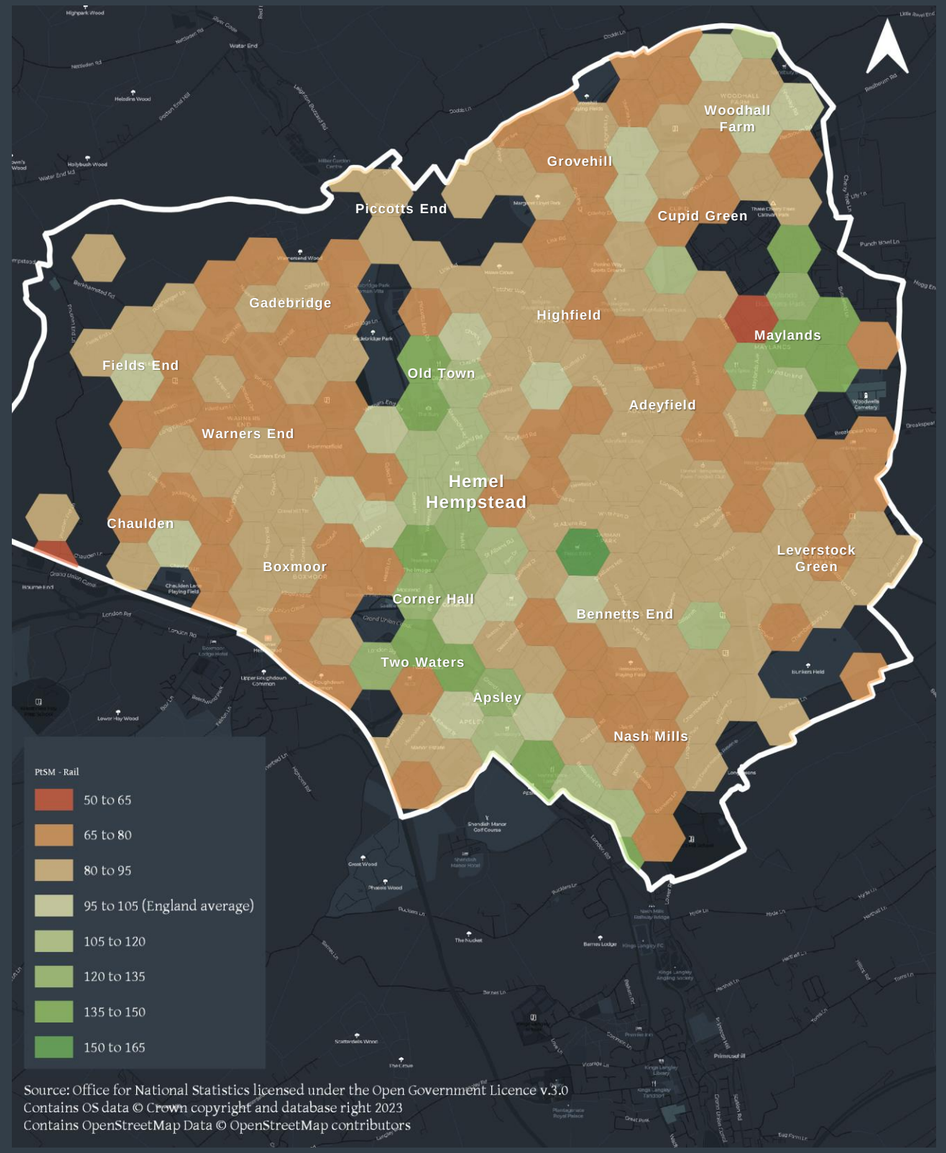
Figure B11 sets out the propensity to use rail for Hemel Hempstead – which is about 91% of the England average.

Following a similar pattern to bus propensity, the propensity to travel by rail is generally lower than the England average across much of Hemel Hempstead.

Similar to bus, propensity to travel by rail is uneven across Hemel Hempstead, with areas with higher rail propensity including the town centre, Maylands, Apsley, Grovehill and Woodhall Farm.

The propensity for rail and bus travel shows a similar pattern in Hemel Hempstead, suggesting there are areas with willingness to travel by public transport, and better provision of services could increase travel by rail.

Figure B11 Propensity to use rail in Hemel Hempstead



Sustainable travel propensity

Propensity to use car in Dacorum

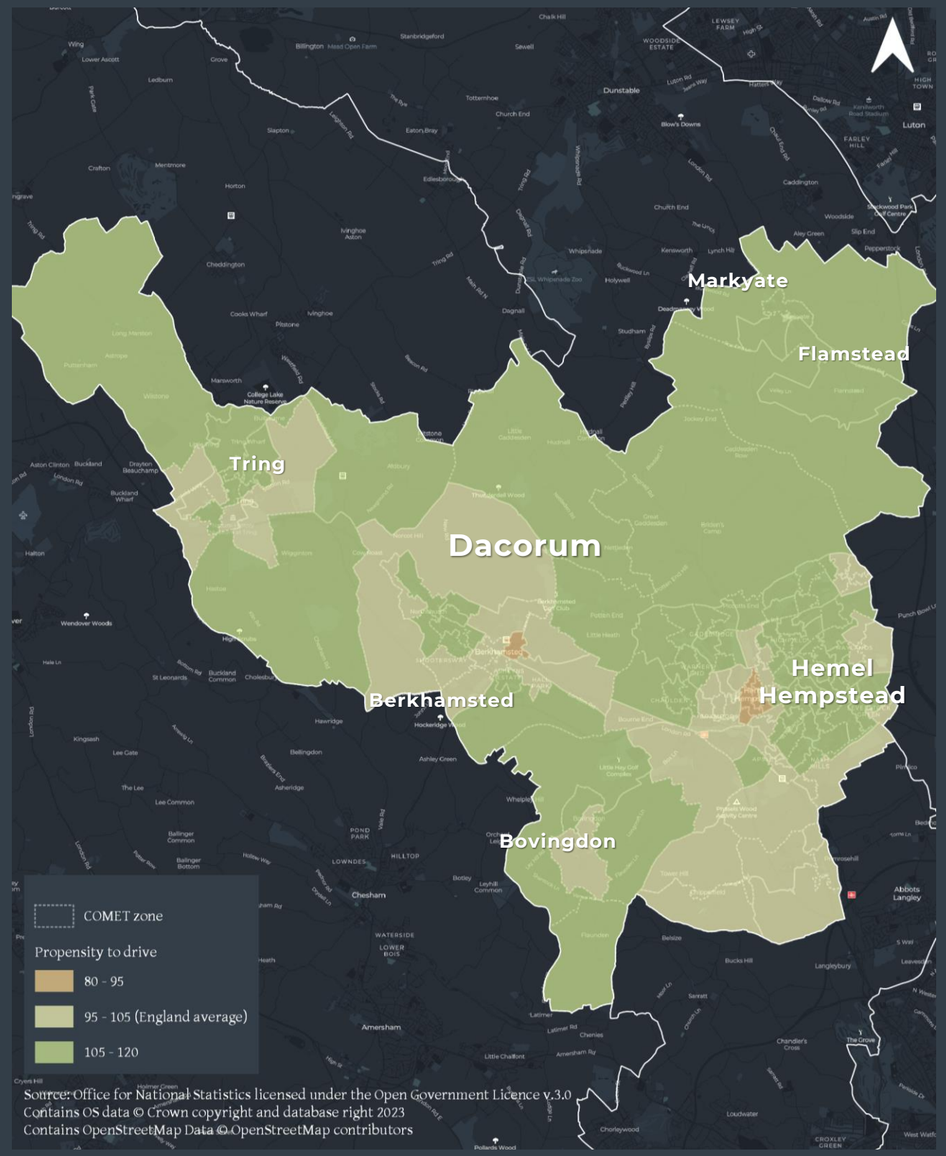
Figure B12 sets out the propensity for car use for Dacorum compared to the England average.

Across most of the region the propensity for driving is equal to or above the England average, highlighting car-dependency at present. This could be due to the lack of public transport connectivity amongst these areas discouraging people to take the bus or train instead of driving.

There are pockets of lower-than-average driving propensity in the region, namely in Hemel Hempstead and Berkhamsted, where alternative modes may be encouraged through suitable infrastructure.

The strategic placement of Berkhamsted rail station within the region enhances its appeal for encouraging the use of sustainable modes over private cars. Conversely, Tring station is located at a distance of one mile from the nearest residential areas of Tring, which could discourage many people from taking sustainable transport without adequate first and last mile interventions.

Figure B12 Propensity to use car in Dacorum



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SUSTAINABLE TRAVEL PROPENSITY

Propensity to use car in Hemel Hempstead

Figure B13 sets out the propensity to travel by car for Hemel Hempstead compared to the England average.

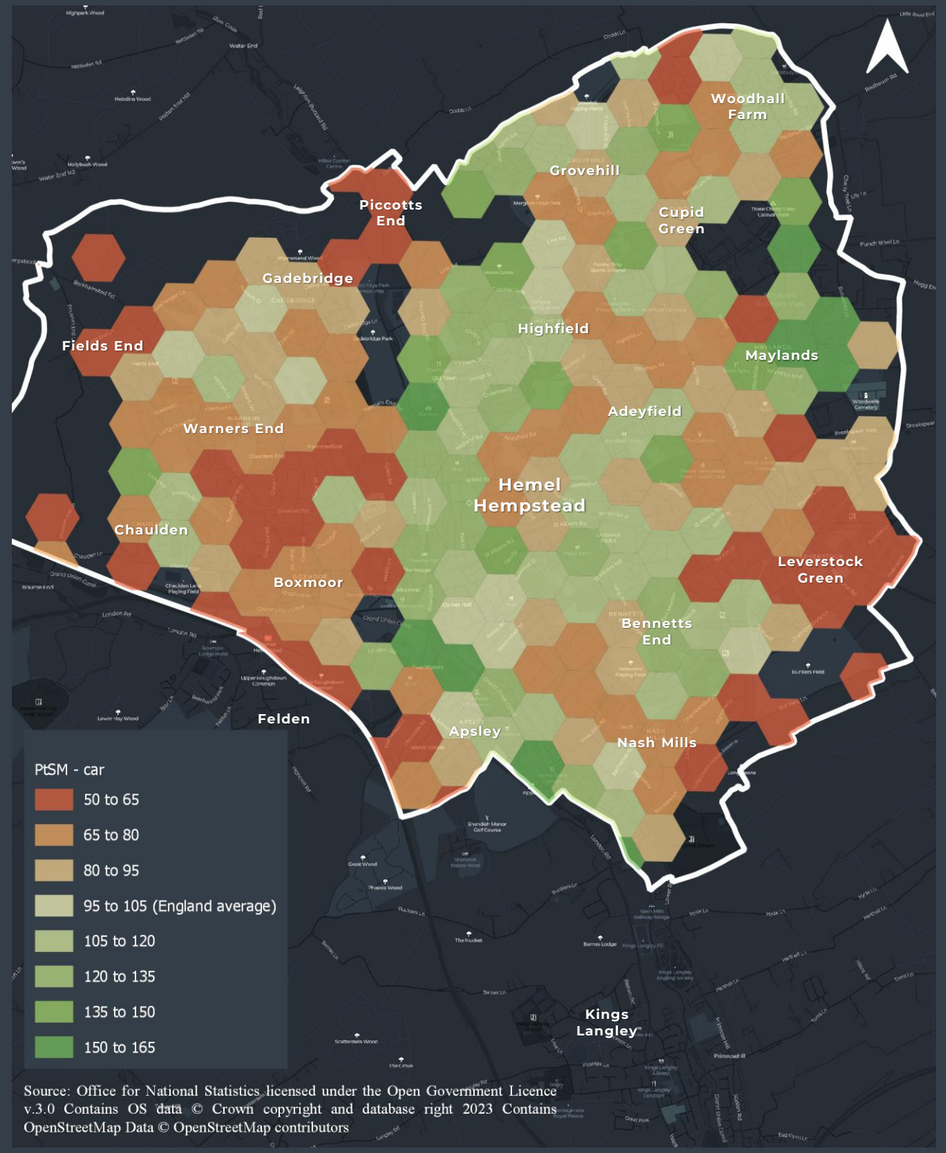
Across most of Hemel Hempstead the propensity for driving is equal to or above the England average, highlighting car-dependent lifestyles. This could be due to the lack of public transport connectivity amongst these areas discouraging people to take the bus or train instead of driving.

There are pockets of lower-than-average driving propensity in the region, namely in the town centre of Hemel Hempstead, where alternative modes could be viable through suitable infrastructure, including improved active travel infrastructure and public transport.

Maylands and Woodhall Farm also have a pockets of below-average car use, which could be due to the nature of the site as a largely commercial area.

The areas showing lower driving propensity align inversely with bus and rail use, showing a direct relationship that where there are viable public transport options, propensity for car use is lower.

Figure B13 Propensity to use car in Hemel Hempstead



PART C
Sustainable travel potential

Sustainable travel potential

Approach

Building on the opportunity and propensity analysis, the sustainable travel potential has been estimated.

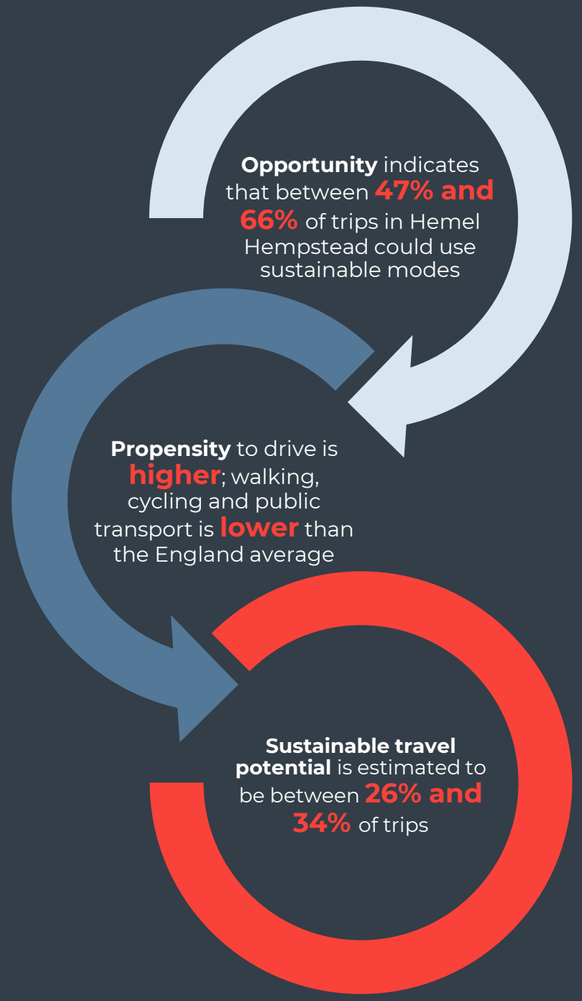
The opportunity analysis indicated the total number of trips that could be made by walking, cycling and public transport, and the propensity analysis provided an indication of the likelihood of the local population to use that mode. As noted previously, the propensity scores were derived using WSP's User Centric Survey Bank and grouped by Experian Mosaic Group.

The sustainable travel potential can be estimated by multiplying the opportunity trips by the propensity score (i.e. factoring the trips that could be made by walking, cycling and public transport by the likelihood).

Sustainable travel opportunity **X** Sustainable travel propensity **=** Sustainable travel potential

- For walking and cycling trips – the 50% Gear Change mode share target was used as the baseline, with the average England propensity (100) shifting by this amount. However, if the propensity was greater than 100 – then proportional increase would switch – up to a propensity score of 200 (when all opportunity trips would switch). Conversely, if the propensity was less than 100 – then the proportional decrease would switch – down to a propensity score of 0) – when no opportunity trips would switch.
- For public transport – the mode split was based on comparison of the propensity to use public transport and to drive.

Figure C1 Opportunity, propensity and potential for sustainable travel for Dacorum, Hemel Hempstead and the HGC growth area



Sustainable travel potential

What is the likely sustainable travel potential?

Figure C2 shows high and lower sustainable travel potential for trips:

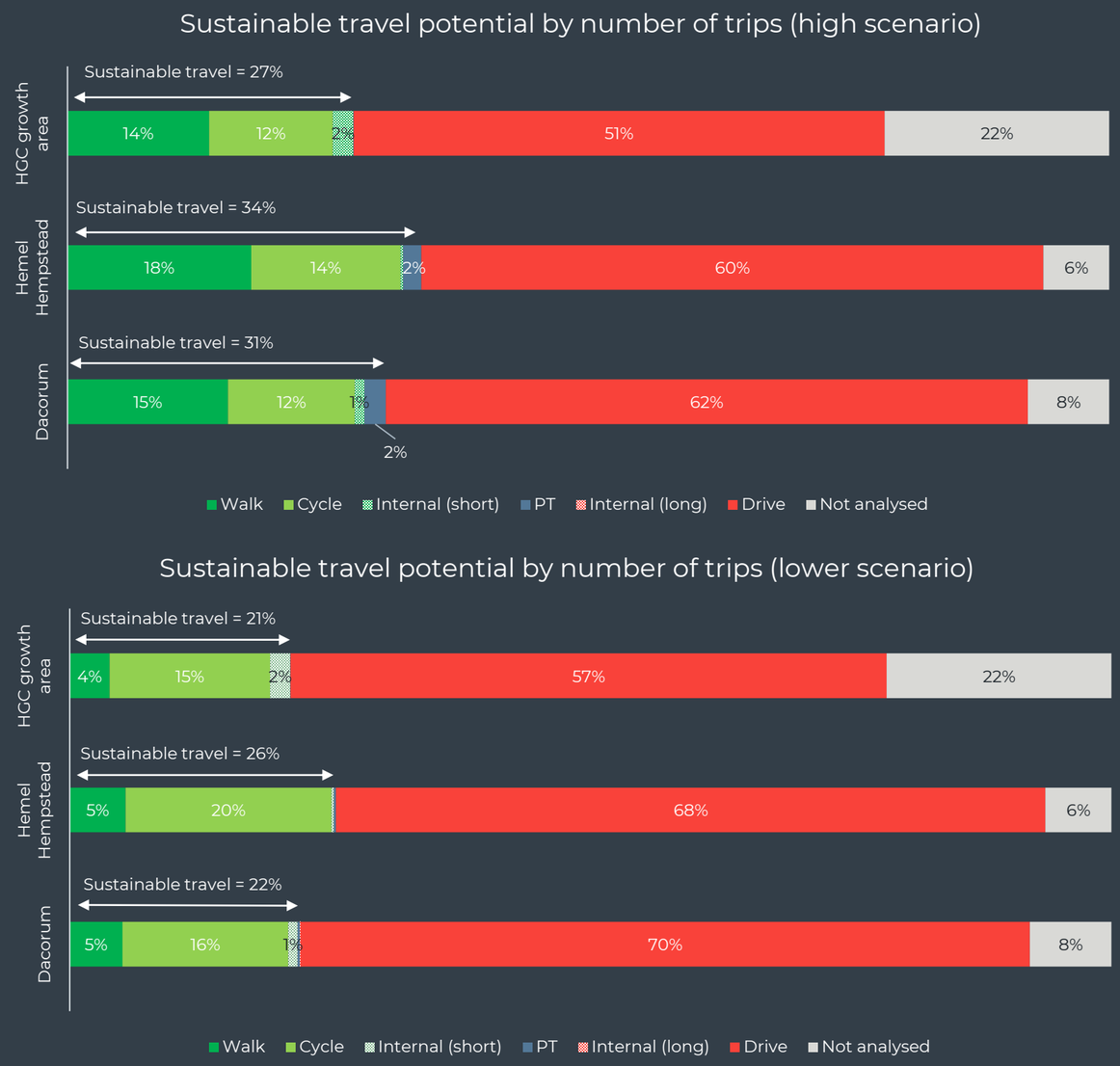
- HGC growth area – potential is between 21-27%, with walking being 4-14%, cycling 12-15% (including short internal trips) and public transport being less than 1%. About 73-79% of trips will be driven (including not analysed trips assumed to be driven).

- Hemel Hempstead – potential is between 26-34%, with walking being 5-18%, cycling 14-20% (including short internal trips) and public transport being less than 2%. About 66-74% of trips will be driven (including not analysed trips assumed to be driven).

- Dacorum – potential is between 22-31%, with walking being 5-15%, cycling 12-16% (including short internal trips) and public transport being less than 2%. About 70-78% of trips will be driven (including not analysed trips assumed to be driven).

This data indicates limited potential to use public transport, suggesting that the current public transport network could be improved to better compete with driving.

Figure C2 Sustainable travel potential by number trips for high (top) and lower (bottom) scenarios



Illustrative mode split

How does sustainable travel potential contribute to existing mode shares?

By combining the existing mode shares (from Census) with the sustainable travel potential of car trips, illustrative mode splits can be calculated.

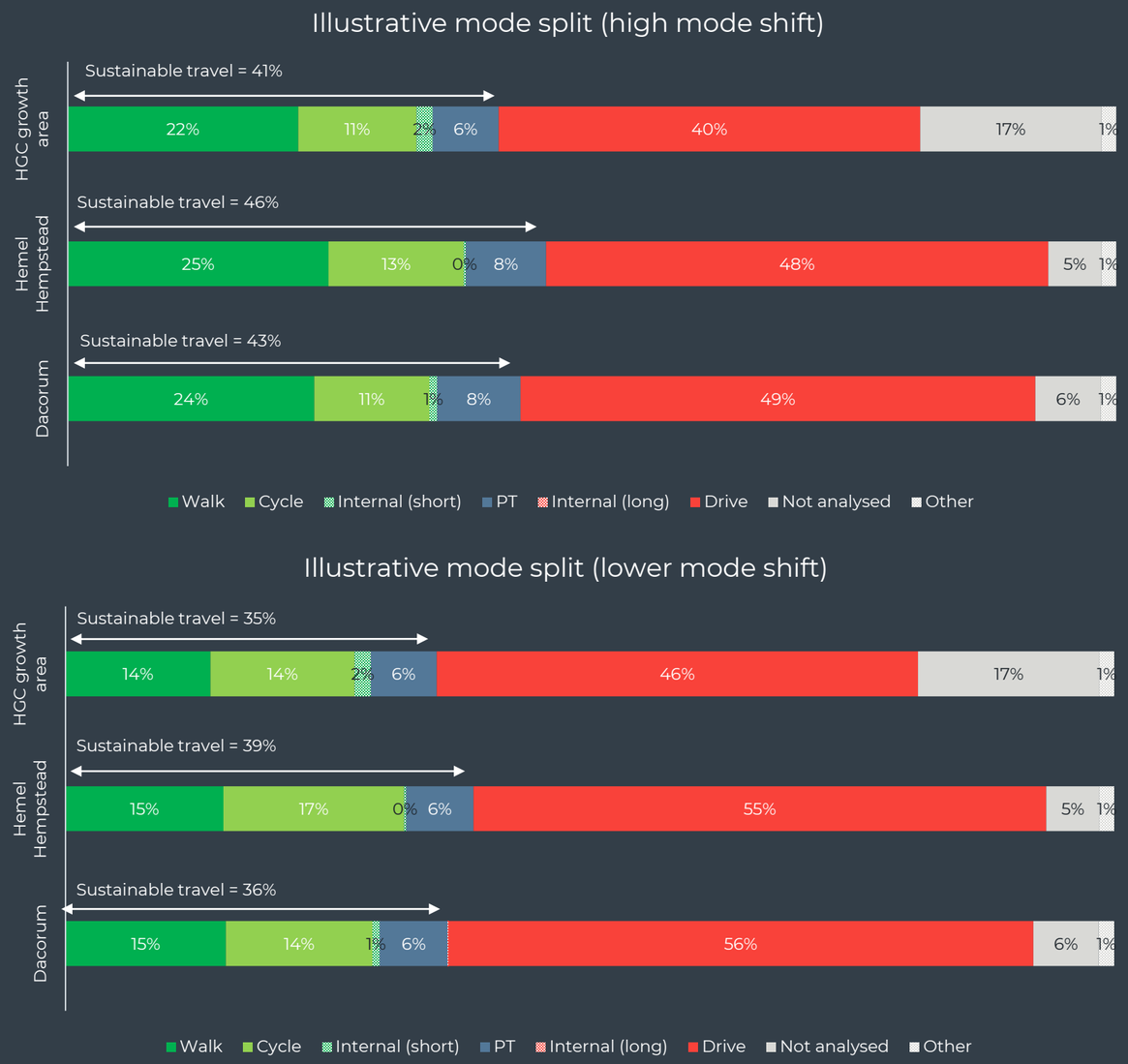
Figure C3 shows potential mode share splits for the high and lower sustainable travel scenarios:

- HGC growth area – the illustrative sustainable travel mode split is 35-41%, with walking being 14-22%, cycling 13-16% (including short internal trips) and public transport about 6% of trips. About 58-64% of trips will be driven (includes not analysed and other trips).

- Hemel Hempstead – the illustrative sustainable travel mode split is 39-46%, with walking being 15-25%, cycling being 13-17% (including short internal trips) and public transport 6-8% of trips. About 54-61% of trips will continue to be driven (includes not analysed and other trips).

- Dacorum – the illustrative sustainable travel mode split is 36-43%, with walking being 15-24%, cycling being 11-14% (including short internal trips) and public transport 6-8% of trips. About 56-63% of trips will continue to be driven (includes not analysed and other trips).

Figure C3 Potential mode share split for high (top) and lower (bottom) sustainable travel scenarios



Walking potential

Up to **17%** of trips across Dacorum and **19%** in Hemel Hempstead could be made by walking as the main mode

Figure C4 shows the proportion of trips that could reasonably be walked at a model zone level, while the table below summarises the number of walking trips:

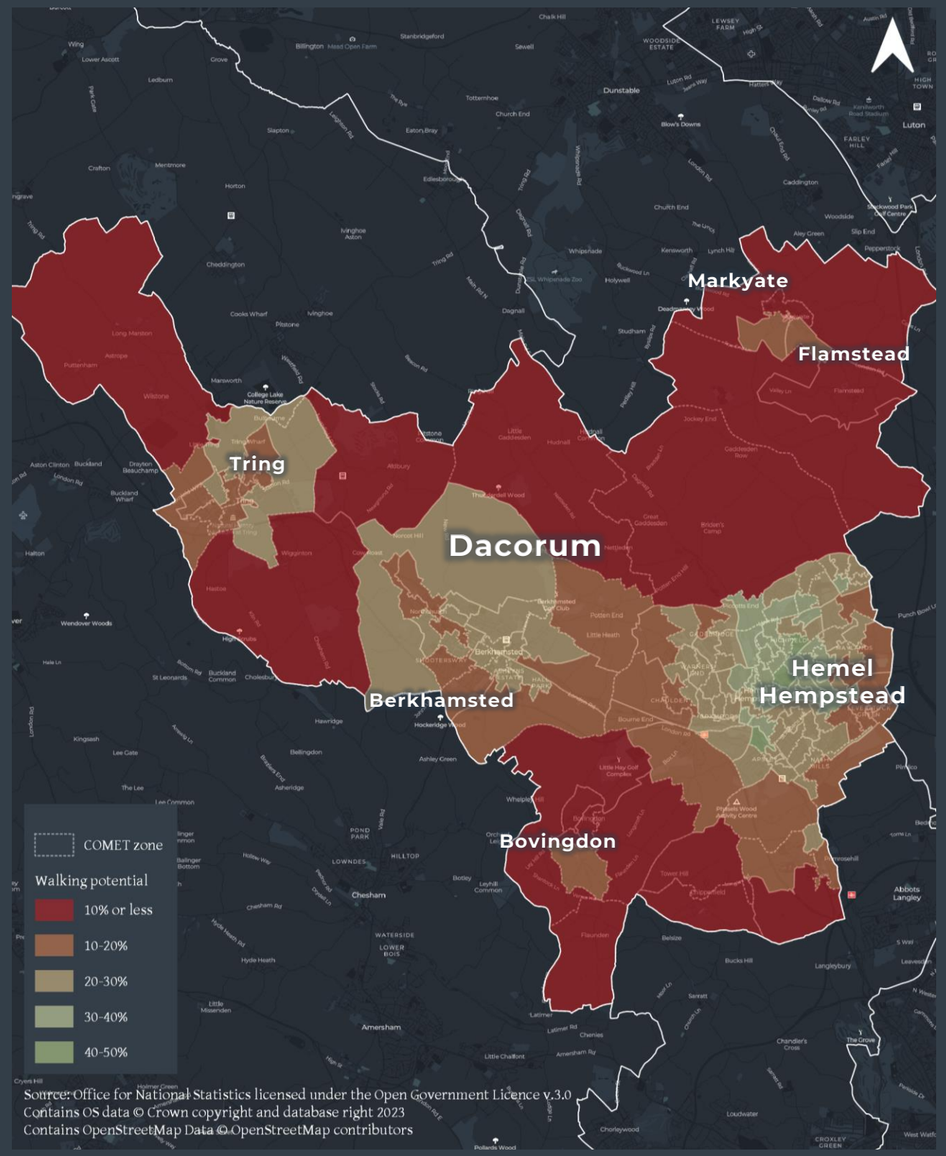
- Dacorum – walking potential makes up to 17% of trips – resulting in 14,800-45,000 trips made as the main mode. This results in 16,800-87,000 people km. An additional 700-9,400 walking trips could be made as part of a public transport journey (first and last mile).

HGC growth area	Main mode	First and last mile*
Daily trips	600 – 2,100	3 - 50

Hemel Hempstead	Main mode	First and last mile*
Daily trips	10,500 – 34,400	400 – 5,800
Daily people km	11,800 – 68,200	500 – 6,400
Daily CO2e emissions saving (kg)	2,000 – 11,600	100 – 1,100

Dacorum	Main mode	First and last mile*
Daily trips	14,800 – 45,000	700 – 9,400
Daily people km	16,800 – 87,000	900 – 11,000
Daily CO2e emissions saving (kg)	2,900 – 14,900	200 – 1,900

Figure C4 Walking potential in Dacorum



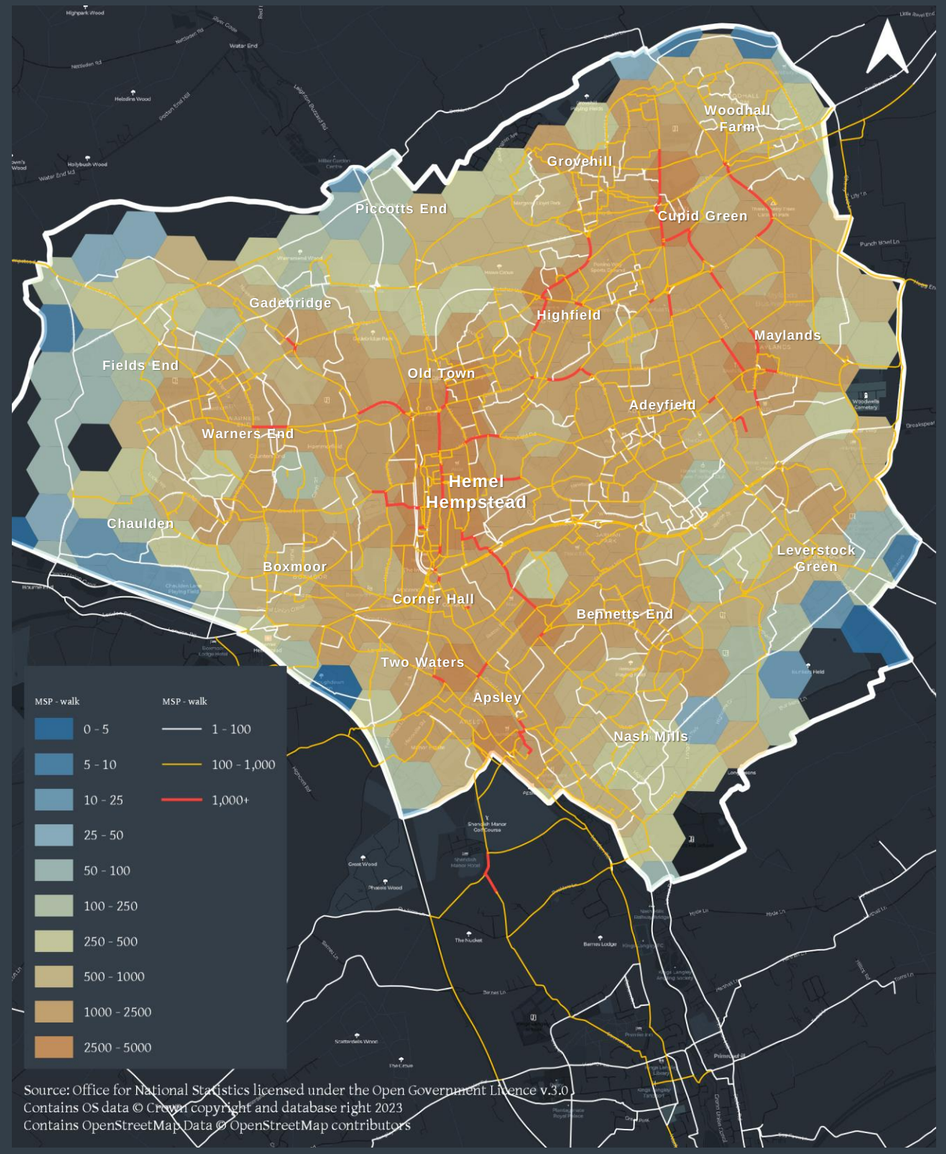
Walking potential

Almost **34,400** trips could be walked in Hemel Hempstead

Figure C5 shows the number of walking potential trips at a hex and link level. The hexes are coloured from low (blue) to high (red) based on the number of trips. Red links indicate 1,000 or more trips, while orange links indicate 100 to 1,000 trips. White links indicates 100 trips or less:

- Hemel Hempstead – 10,500-34,400 trips could be walked as the main mode. This results in 11,800-68,200 people km. An additional 400-5,800 walking trips could be made as part of a public transport journey (first and last mile). Areas such as the town centre, Maylands, Apsley, Highfield and Cupid Green show a walking potential (with up to 5,000 trips per hex). These areas are noted to have high opportunity and propensity, while also having essential facilities, such as shops and schools, reducing the necessity for longer trips to be made by car.
- HGC growth area – 600-2,100 trips could be walked as the main mode. An additional up to 50 walking trips could be made as part of a public transport journey (first and last mile).

Figure C5 Walking potential in Hemel Hempstead



Cycling potential

Up to **31%** of trips across Dacorum and **35%** in Hemel Hempstead could be made by cycling as the main mode

Figure C6 shows the proportion of trips that could reasonably be cycled at a model zone level, while the table below summarises the number of cycling trips:

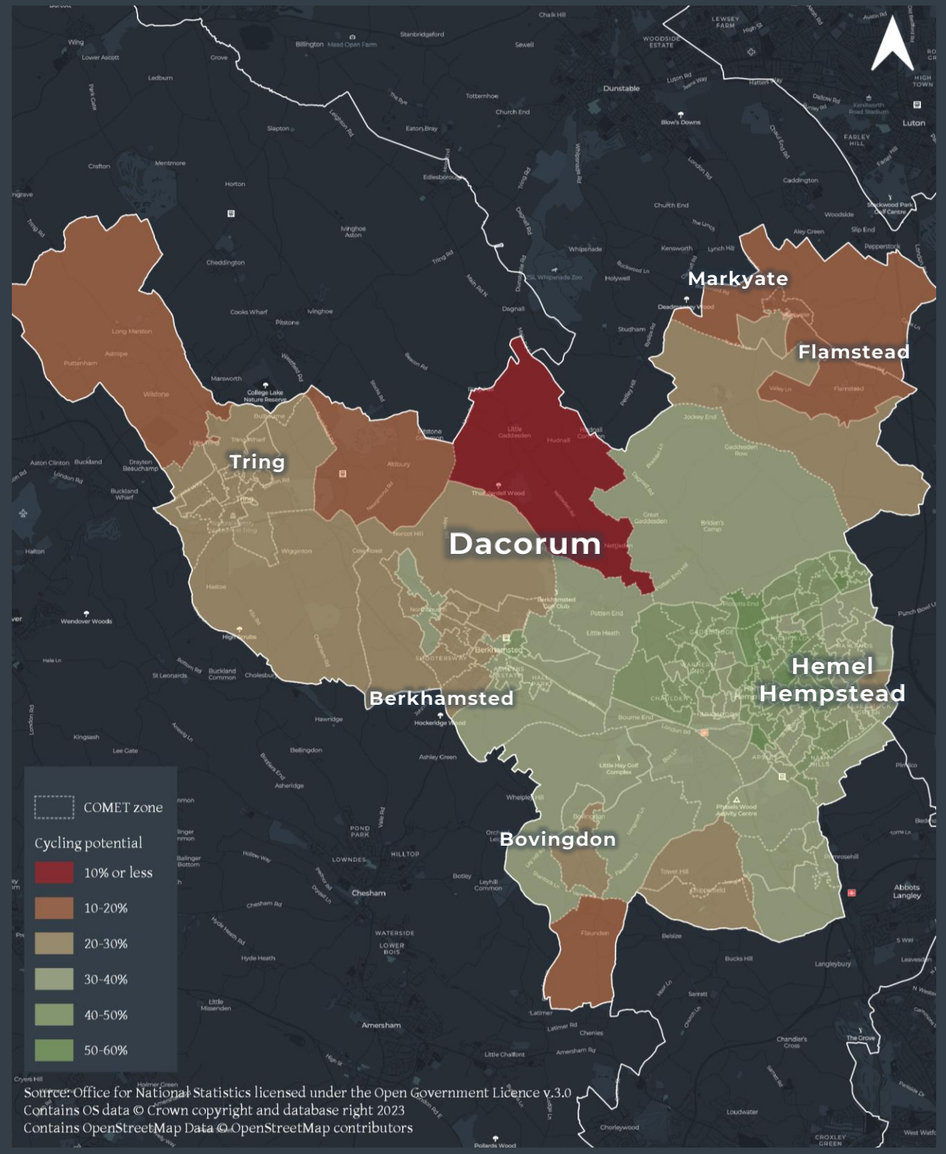
- Dacorum – cycling potential makes up to 31% of trips – with 62,000-82,400 trips made as the main mode. This results in 149,500-304,700 people km. An additional 700-9,400 cycling trips could be made as part of a public transport journey (first and last mile).

HGC growth area	Main mode	First and last mile*
Daily trips	3,000 – 3,900	3 - 50

Hemel Hempstead	Main mode	First and last mile*
Daily trips	49,700 – 64,600	400 – 5,800
Daily people km	123,700 – 235,800	500 – 6,400
Daily CO2e emissions saving (kg)	21,100 – 40,200	100 – 1,100

Dacorum	Main mode	First and last mile*
Daily trips	61,900 – 82,400	700 – 9,400
Daily people km	149,500 – 304,700	900 – 11,000
Daily CO2e emissions saving (kg)	25,500 – 52,000	200 – 1,900

Figure C6 Cycling potential in Dacorum



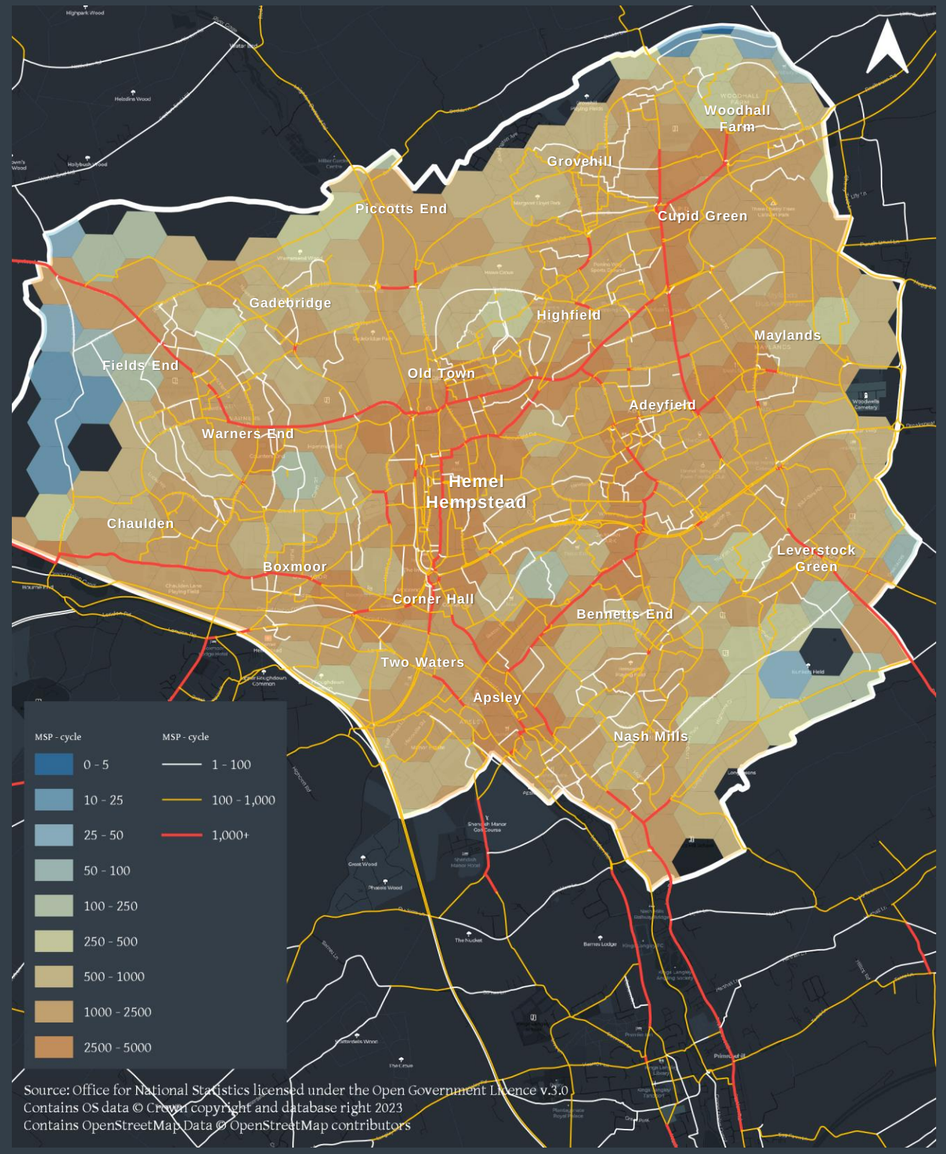
Cycling potential

Almost **64,600** trips could be cycled in Hemel Hempstead

Figure C7 shows the number of cycling potential trips at a hex and link level. The hexes are coloured from low (blue) to high (red) based on the number of trips. Red links indicate 1,000 or more trips, while orange links indicate 100 to 1,000 trips. White links indicates 100 trips or less:

- Hemel Hempstead – 49,700-64,600 trips could be made as the main mode. This results in 123,700-235,800 people km. An additional 400-5,800 cycling trips could be made as part of a public transport journey (first and last mile). Like walking, cycling potential is greatest in the town centre, Maylands, Apsley, Highfield and Cupid Green. Key links include north-south connections through the town centre, and between Adeyfield and Leverstock Green, while east-west connections are shown between Fields End and Woodhill Farm, through Boxmoor to Adeyfield.
- HGC growth area – 3,000-3,900 trips could be cycled as the main mode. An additional up to 50 cycling trips could be made as part of a public transport journey (first and last mile). In contrast, areas on the outskirts of Hemel Hempstead generally have lower potential (in the range of 100 to 500). However, as the garden community is developed, it is expected that the socio-demographics may change with incoming residents potentially being more open to cycling.

Figure C7 Cycling potential in Hemel Hempstead



Public transport potential

Up to **4%** of trips across Dacorum and **3%** in Hemel Hempstead could be made by public transport as the main mode

Figure C8 shows the proportion of trips that could reasonably be made by public transport at a model zone level, while the table below summarises the number of public transport trips:

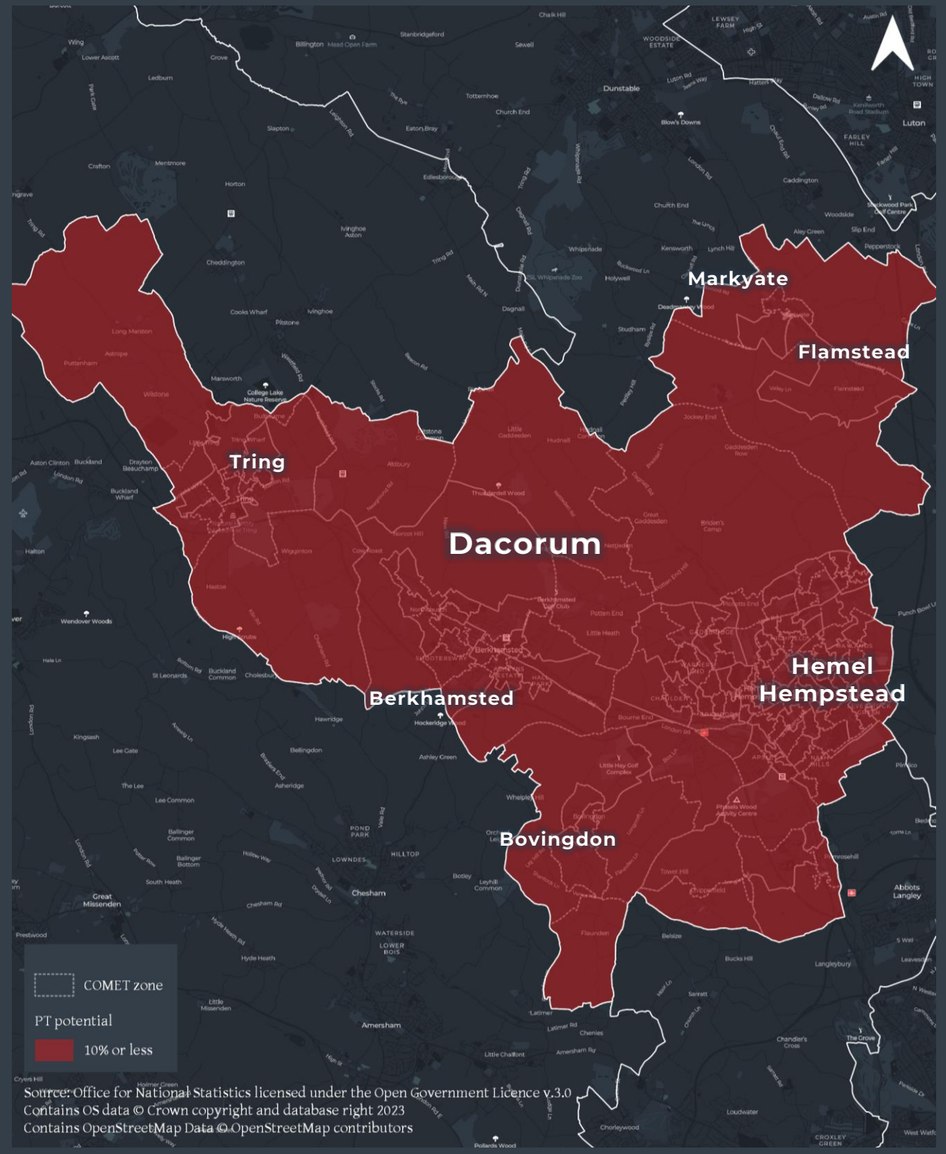
- Dacorum – public transport potential makes up to 4% of trips – resulting in 700-9,400 trips made as the main mode. This results in 12,300-117,300 people km.

HGC growth area	Main mode
Daily trips	3 - 50

Hemel Hempstead	Main mode
Daily trips	400 – 5,800
Daily people km	5,700 – 68,300
Daily CO2e emissions saving (kg)	800 – 9,700

Dacorum	Main mode
Daily trips	700 – 9,400
Daily people km	12,300 – 117,300
Daily CO2e emissions saving (kg)	1,600 – 15,900

Figure C8 Public transport potential in Dacorum



Public transport potential

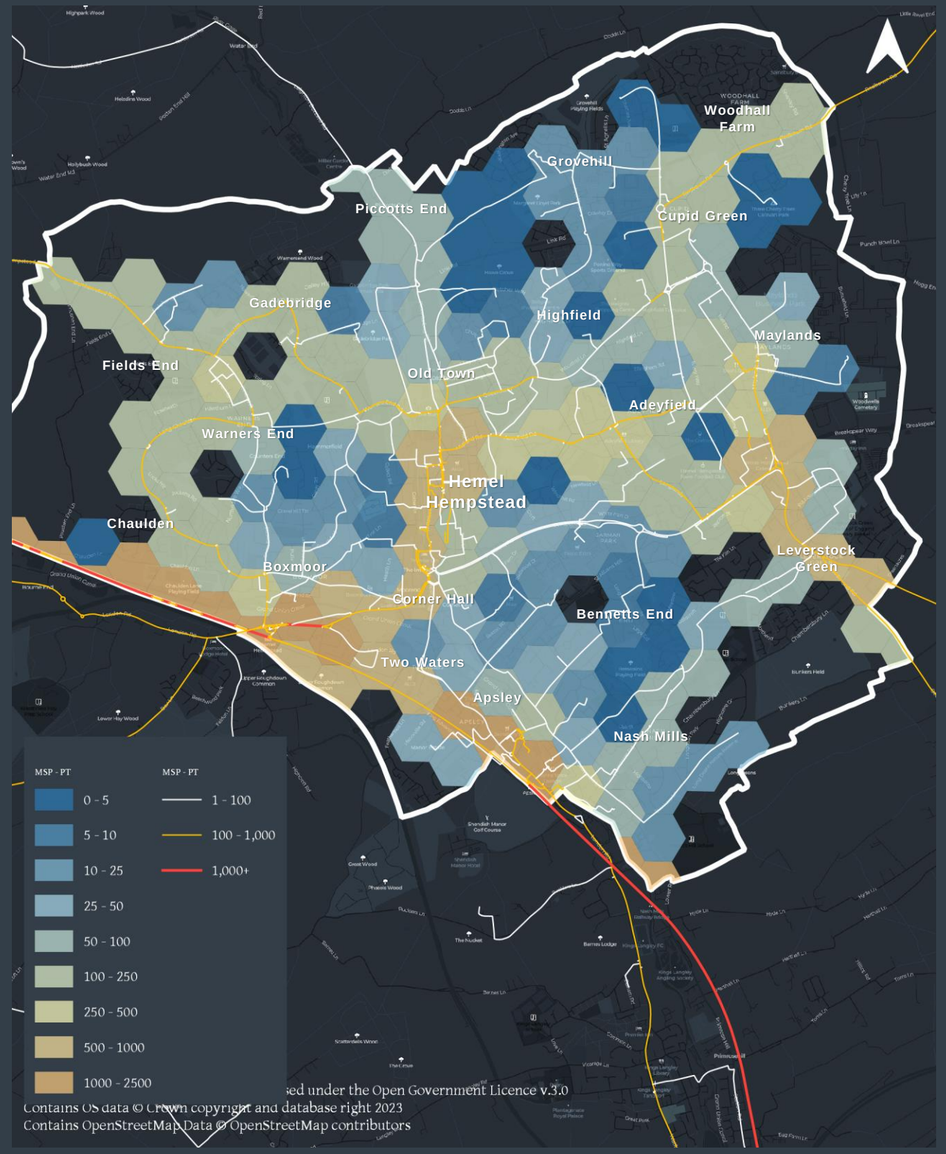
62% of public transport trips are focussed in Hemel Hempstead – totalling **5,800** trips

Figure C9 shows the number of public transport potential trips at a hex and link level. The hexes are coloured from low (blue) to high (red) based on the number of trips. Red links indicate 1,000 or more trips, while orange links indicate 100 to 1,000 trips. White links indicates 100 trips or less:

- Hemel Hempstead – 400-5,800 trips made as the main mode. This results in 5,700-68,300 people km. Key corridors include the rail line, as well as bus connections to and from the town centre to Warners End, Boxmoor, Adeyfield and Maylands. Other bus corridors include to and from Woodhill Farm, Maylands and Leverstock Green.
- HGC growth area – up to 50 trips could have public transport as the main mode.

The public transport map indicates low potential at present based on the existing services and timetable – suggesting an opportunity to improve bus and rail services to meet the needs of current and future users.

Figure C9 Public transport potential in Hemel Hempstead



PART D

Realism of the mode shift target

Realism of the mode shift target

Approach

The aim of this task is to assess the realism of the mode share target for Hemel Hempstead and the HGC growth area as set out in the Hemel Garden Communities Spatial Vision. The target is that by 2050:

- **40% of all trips** starting and/or ending in the existing settlement area of Hemel Hempstead should be by active and sustainable travel modes, and
- **60% of all trips starting** and/or ending in the new development of the HGC growth area should be by active and sustainable travel modes.

This assessment is based on first comparing the results of the County Travel Survey to the Mobility Insights predictions from WSP's survey data bank to understand if the assumptions used to inform the sustainable travel opportunity, propensity and potential are representative of the area.

This was done as the data for the County Travel Survey was collected at a sub-district level (first four letters), while the sustainable travel opportunity, propensity and potential were analysed at a full postcode level (and linked to Experian Mosaic) and then combined into hexes. Figure D1 shows the postcode sub-district survey results that were included in the analysis.

The County Travel Survey included 320 household responses across the county, of which 171 were in postcode sub-districts relevant to Hemel Hempstead and included in the comparative analysis.

A matching exercise was undertaken to compare the results at the two different spatial resolutions to ensure that they were generally consistent.

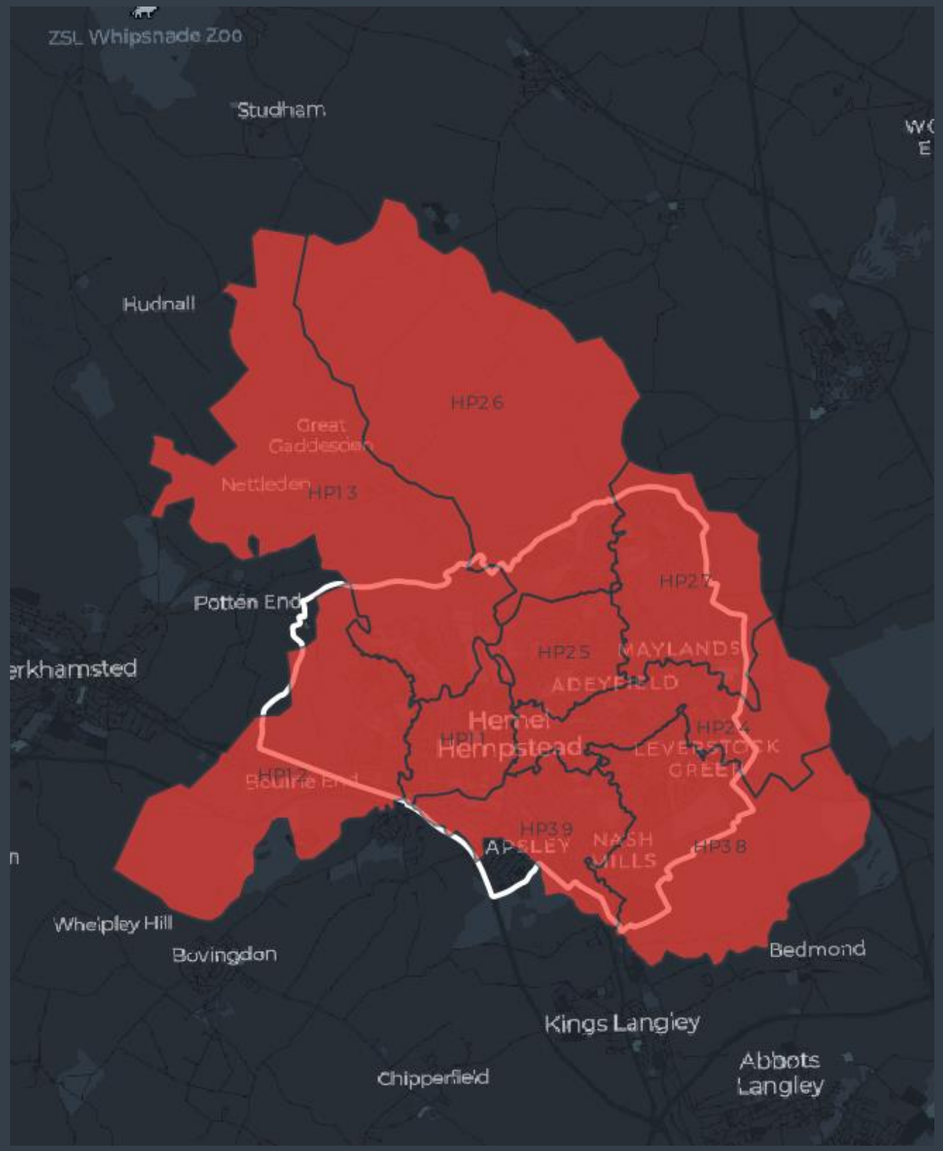


Figure D1 Postcode sub-district survey results that were compared to the Mobility Insights

Realism of the mode shift target

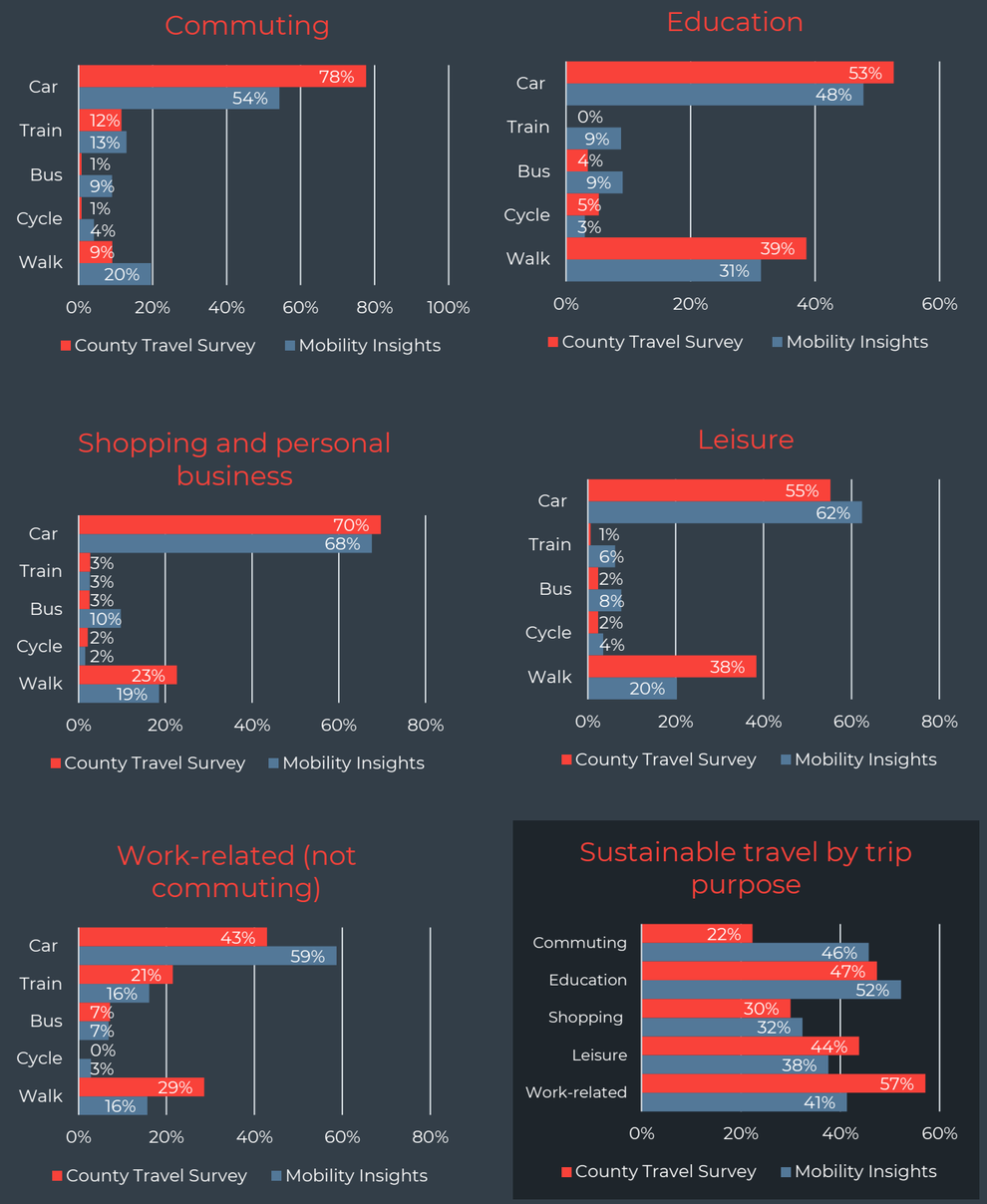
Comparison of travel habits

Figure D2 shows the current mode shares by trip type – comparing the County Travel Survey results with WSP's Mobility Insights survey bank predictions. The Mobility Insights prediction indicates likely travel behaviour that would be expected based on the socio-demographics in the area as evidenced in other parts of England:

- For commuting – car use based on the County Travel Survey is 78% - which is higher than would be expected. As a result, mode share for sustainable travel is lower than other parts of England. This suggests that there is an opportunity to improve active travel and public transport opportunities for commuting trips.
- For education – car use is 53% which is slightly higher than the Mobility Insights predictions (48%). Walking is 39% which is greater than other areas with similar socio-demographics. Cycling and use of bus and rail is lower than would be expected for the area.
- For shopping and personal business – car (79%) and walking (23%) trips are higher than predicted, with cycle, bus and train lower than expected.
- For leisure – walking trips are higher than predicted at 38% compared to 20% for Mobility Insights. As a result – car, cycle, bus and train trips are lower than predicted.
- For work-related trips – walking (29%) and train trips (21%) are higher than predicted when compared to Mobility Insights. Car and cycling are lower than predicted, while bus use is the same.

When looking at current sustainable travel (walk, cycle, bus and rail) by trip purpose – those that fall below the 40% target include commuting (22%), shopping and personal business (30%). Trip purposes above the 40% target include education (47%), leisure (44%) and work-related (57%) – with leisure and work-related trips also exceeding the Mobility Insights predictions. This suggests that there is an opportunity to improve active travel and public transport networks particularly for commuting, education and shopping trips.

Figure D2 Comparison of main mode by trip type



Realism of the mode shift target

Comparison of asset ownership

This analysis compares the asset ownership results between the County Travel Survey and Mobility Insights to understand residents' ownership.

For the County Travel Survey – we included all the survey responses that fell within Hemel Hempstead. The results are shown in Figure D3 and indicate:

- Car – both data sources show relatively consistent results, with slightly higher ownership of more than 4+ cars in Mobility Insights compared to the County Travel Survey.
- Bike – Mobility Insights predicts slightly higher bike ownership compared to the County Travel Survey. The County Travel Survey indicates a higher proportion of households without bikes. This suggests that bike ownership is lower than would be expected – impacting on cycling mode share overall.
- E-bike – similar to bike ownership, Mobility Insights indicates a slightly higher than County Travel Survey.

In general, the results from the County Travel Survey and Mobility Insights are relatively consistent for asset ownership in Hemel Hempstead, and comparable.

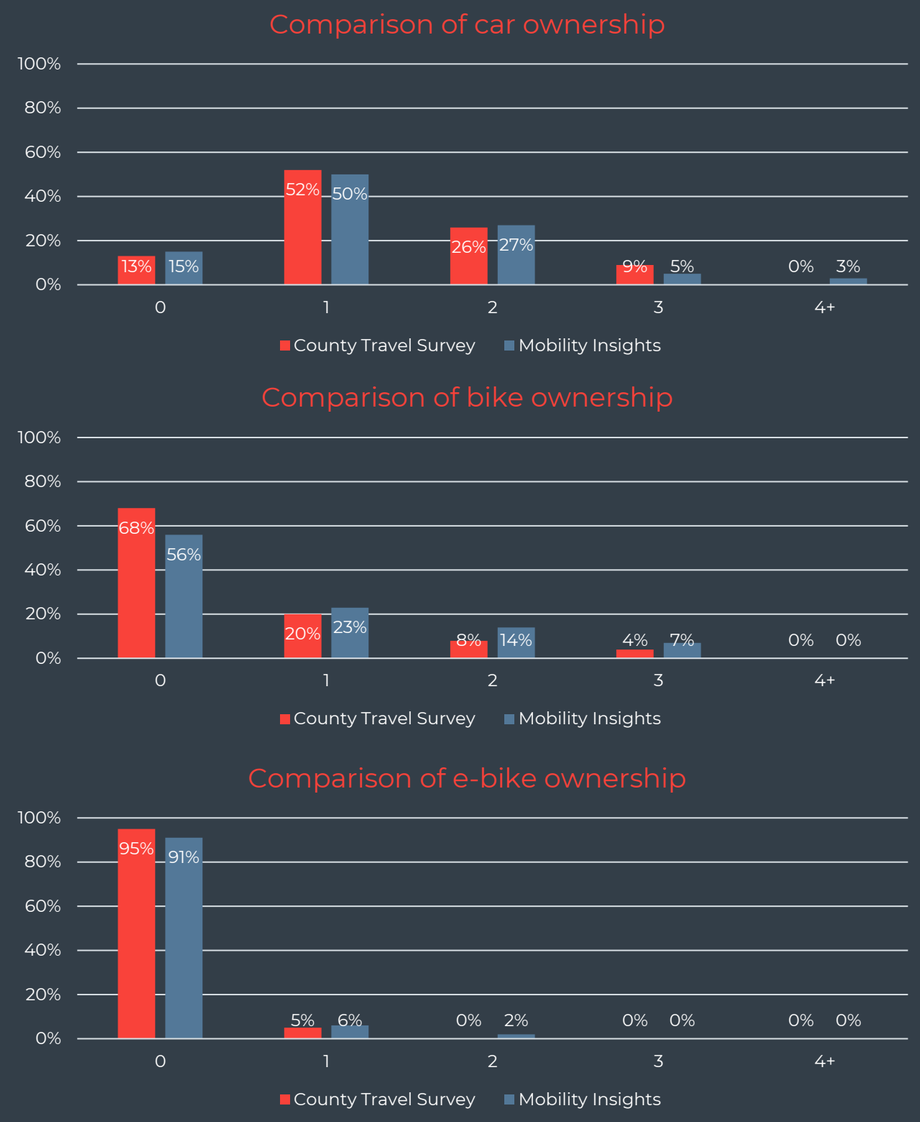


Figure D3 Comparison of asset ownership

Realism of the mode shift target

Comparison of asset sharing

Figure D4 compares asset sharing usage between the County Travel Survey and Mobility Insights predictions for bike share, car/van sharing, ride share and demand responsive transport.

- Bike share usage from the County Travel Survey is 2% with the question including bike hire, e-scooter hire, bike share and pool bike. This is lower than Mobility Insights predictions which would expect 13% of households to use bike share based on the Mosaic Groups.
- Car / van share from the County Travel Survey again is 2% and includes liftshare, car club, and car share (e.g. Zip car). This is lower than expected when compared to Mobility Insights which is 27%.
- Ride share from the County Travel Survey is 23% and includes app-based taxi hire and ride hailing (such as Uber). This is slightly lower than the Mobility Insights predictions which is 31%.
- Demand responsive transport from the County Travel Survey was 1% with initiatives in the survey including ArrivaClick and HertsLynx – both of which do not service Hemel Hempstead. As expected this is lower than the Mobility Insights prediction of 15%.

The analysis suggests that usage of asset sharing is lower than would be expected in the area based on the socio-demographic Experian Mosaic groupings, which is explained by limited asset sharing interventions in the area at present. This indicates that, based on survey results from other parts of England and based on the existing Experian Mosaic mix, there is an opportunity to implement bike share, car / van share and demand responsive transport. The findings of this analysis are included in the need or suitability of the interventions in Part E.

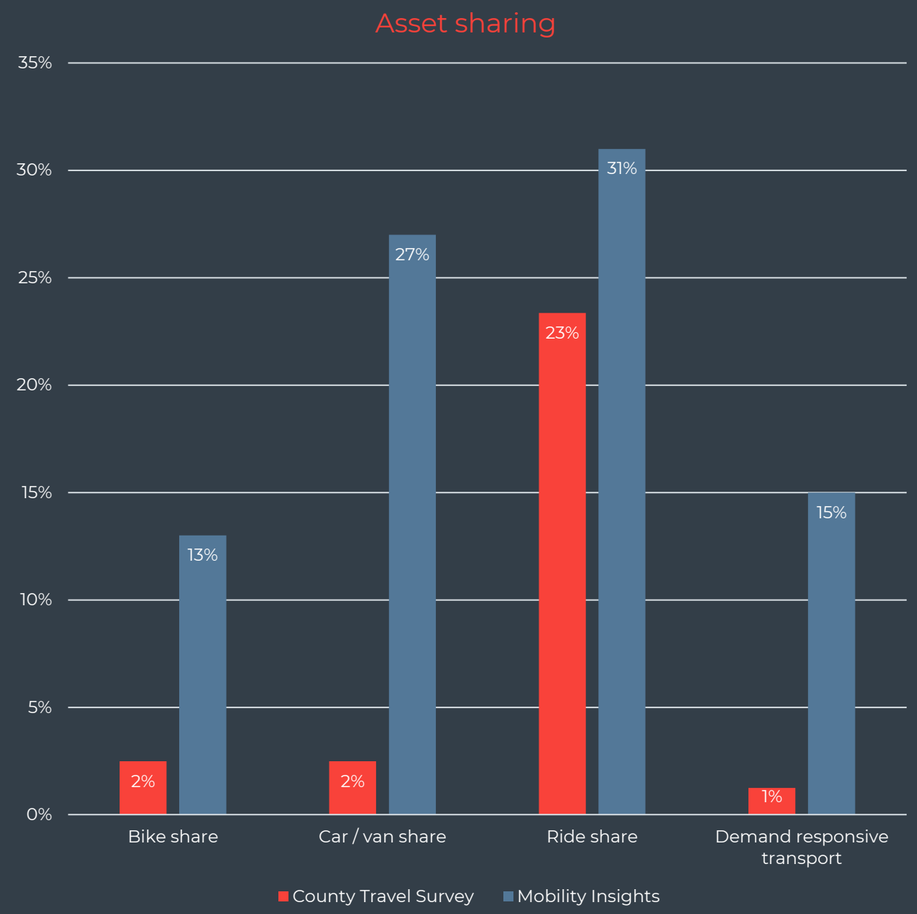


Figure D4 Comparison of asset sharing

Realism of the mode shift target

How realistic are the mode share targets for Hemel Hempstead and HGC growth area?

To answer this question, a few things need to be clarified:

- What is the current mode share – how do people currently travel and what is the baseline situation?
- What is the potential for change – how many trips could be made by sustainable travel both now and into the future?
- What are likely mode shares – what is the range of outcomes that could be expected?

What is the current mode share?

This report has used two potential sources for current mode share as shown in Table D1:

- The 2021 Census Journey to Work data for Dacorum was used as one source to understand current mode share. It is noted that this only includes commuting trips, which makes up a part but not all trips that are made. As shown in Table D1, the 2021 Census and County Travel Survey mode shares are generally consistent for commuting – however, mode shares for other trip types differ from the results of the Household Travel Survey.
- The County Household Travel Survey included a total of 320 households across Hertfordshire, of which 171 were in the postcode sub-districts covering Hemel Hempstead. While a small sample, this dataset provided useful insights related to mode share, as well as asset ownership and asset sharing.

The County Household Travel Survey sample dataset was compared to WSP's Mobility Insights survey bank which is an aggregated dataset linked to Experian Mosaic – which provided mode share predictions based on the Experian Mosaic groups present in Hemel Hempstead and is shown in Table D2.

Table D1 Current mode share (Census and Household Travel Survey)

Mode	Dacorum 2021 Census (Journey to Work)	County Travel Survey data for Hemel Hempstead				
	Commuting	Commuting	Education	Shopping	Leisure	Work-related
Walk	11%	9%	39%	23%	38%	29%
Cycle	1%	1%	5%	2%	2%	0%
Public transport	6%	12%	4%	5%	3%	29%
Car	82%	78%	53%	70%	55%	43%
Sustainable travel	18%	22%	48%	30%	43%	58%

Table D2 Mobility Insights mode share predictions based on the Mosaic Groups in Hemel Hempstead

Mode	Commuting	Education	Shopping	Leisure	Work-related
Walk	20%	31%	19%	20%	16%
Cycle	4%	3%	2%	4%	3%
Public transport	22%	18%	12%	14%	23%
Car	54%	48%	68%	62%	59%
Sustainable travel	46%	52%	33%	38%	42%

Realism of the mode shift target

What is the potential for change?

Comparison to Mobility Insights predictions

As noted in the previous pages, asset ownership (car, bike and e-bike) between the two datasets are generally consistent. However, the level of asset sharing (bikeshare, car/van share, ride share and demand responsive transport) is lower than would be predicted – explained through the limited availability of these measures at present – but indicating a likelihood to use these interventions if implemented.

The mode shares also vary between the two datasets, with the Household Travel Survey showing higher levels of car use and walking than predicted through Mobility Insights. This suggests that there is an opportunity to improve the cycling, bus and rail networks to better meet the needs of users – and achieve mode shares like that in other parts of England.

As a result, the Mobility Insights predictions could be used as a scenario when calculating the realism of the mode shift target (i.e. what has been achieved in other areas with comparable Mosaic Group socio-demographics).

Sustainable travel potential

Finally, previous sections of the report aimed to understand that proportion of car trips (as per the 2031 COMET model) could be made by walking, cycling and public transport. For existing areas this could be through mode switch.

- Table D3 shows the sustainable travel opportunity, or proportion of car trips that could be made by walking, cycling and public transport based on the current transport network in the lower and high scenario.
- Table D4 meanwhile shows the sustainable travel potential, or proportion of car trips that are likely to be made by walking, cycling and public transport taking into account propensity to use those modes in the lower and high scenario.

The two scenarios for the sustainable travel opportunity and potential can also be used as methods to test the realism of the mode share target for Hemel Hempstead and HGC growth area. It is noted that for this realism test, only the findings for Hemel Hempstead has been used. The master plan, modelling O-D matrix and existing active and public transport networks for the HGC growth area are not yet fully developed and show a lower opportunity and potential than Hemel Hempstead.

Table D3 Sustainable travel opportunity of car trips (Hemel Hempstead)

Mode	Lower	High
Walk	10%	34%
Cycle	37%	29%
Public transport	0%	3%
Sustainable travel	47%	66%

Table D4 Sustainable travel potential of car trips (Hemel Hempstead)

Mode	Lower	High
Walk	5%	18%
Cycle	20%	14%
Public transport	0%	2%
Sustainable travel	25%	34%

Realism of the mode shift target

What could mode shares be for the area based on the current mode share and potential for change?

The final step is to calculate likely mode shares and compare the results to the targets. Table D5 shows the assumptions that have fed into the mode share calculations. To make it easier to understand, we have presented the data by trip type – split between sustainable travel (walk, cycle, bus and rail) and car trips.

- The top part of the table shows the sustainable travel mode share from the County Travel Survey by trip type. As the 2021 Census Journey to Work data was similar to the survey – it was excluded from this assessment.
- The second half of the table shows the proportion of car trips that could be made by sustainable travel based on the lower and high sustainable travel opportunity and potential results, as well as the proportion of trips by car.
- Finally the Mobility Insights predictions are included for reference.

Calculated mode share	=	Sustainable travel mode share	+	Proportion of car trips that could be made by sustainable travel X Proportion of car trips

Figure D5 shows the resulting mode share calculations across the six scenarios by trip type – and compared to the 40% and 60% mode share targets.

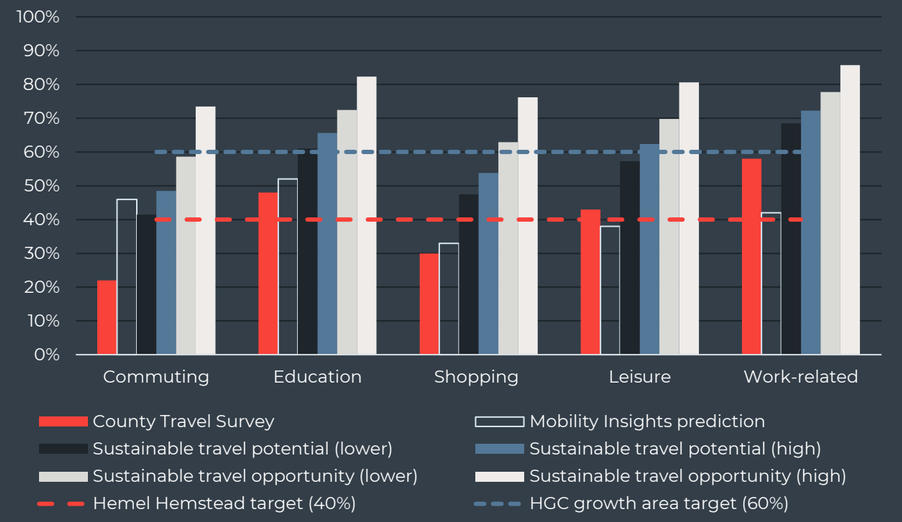
- Both the lower and high sustainable travel potential scenarios achieve the 40% mode share target across all trip types, but not the 60% target. This potential is based on existing transport networks and propensity to walk, cycle or use public transport of users.
- In comparison, both the lower and high sustainable travel opportunity scenarios achieve the 40% and 60% mode share targets across all trip types. This opportunity is based on existing transport networks, but does not include propensity or likelihood to use alternative modes to car.

The data suggests that while the 40% target is feasible, the 60% target will be more difficult to achieve unless the active travel and public transport networks are enhanced – particularly to support commuting, shopping and personal business and leisure trips – which is covered in Part E.

Table D5 Mode share calculations using County Travel Survey data

Sustainable travel mode share		Commuting	Education	Shopping	Leisure	Work-related
County Travel Survey		22%	48%	30%	43%	58%
Proportion of car trips that could be made by sustainable travel		Proportion of car trips				
Sustainable travel potential (lower)	25%	78%	52%	70%	57%	42%
Sustainable travel potential (high)	34%					
Sustainable travel opportunity (lower)	47%					
Sustainable travel opportunity (high)	66%					
Mobility Insights prediction		46%	52%	33%	38%	42%

Figure D5 Mode share calculations by trip type and scenario



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PART E
Assess and evaluate potential solutions

Interventions assessment and evaluation

This section looks at interventions that could help unlock the sustainable travel opportunity, propensity and potential and help achieve the mode share targets which were tested in Part D.

- The sustainable travel opportunity (Part A) work showed that up to 66% of car trips could be walked, cycled or use public transport. This was based on existing active travel and public transport networks. So additional opportunity could be unlocked with transport network enhancements.
- The sustainable travel propensity (Part B) work showed that there are parts of Hemel Hempstead with higher than England average propensity or likelihood to walk, cycle and use public transport.
- While the sustainable travel potential (Part C) work showed that when taking into account propensity the proportion of car trips that would walk, cycle or use public transport reduces to 34%.
- Finally, the realism of the mode shift targets (Part D) calculated that while the sustainable travel potential scenario could achieve the 40% mode share target for the existing settlement – more would need to be done to achieve the 60% mode share target which is closed to the sustainable travel opportunity scenarios.

For this interventions assessment we have used our WSP Solutions Toolkit which is a multi-criteria assessment tool that identifies a long-list of interventions. Working with the client we were then able to identify a short list most suited to increasing the number of trips that could be made by walking, cycling and public transport and unlocking the propensity of users to use sustainable travel.

The following sections of this part of the report sets out the approach of the multi-criteria assessment, the intervention included in the assessment and the final short-list of interventions considered in more detail.

Table E1 shows the short-list interventions that were considered as most suitable, with additional detail on all the interventions included in Appendix C, D and E.

Approach

The assessment toolkit has follows a four step process to calculate the intervention score, detailed through a worked example in the following pages:

- Step 1 – for each datapoint – calculate the **ideal value** accounting for place type
- Step 2 – for each datapoint – calculate the **actual value** by hex
- Step 3 - to calculate **datapoint score** – divide the actual value by ideal value by hex
- Step 4 – to calculate intervention score – weight and sum relevant datapoint scores.

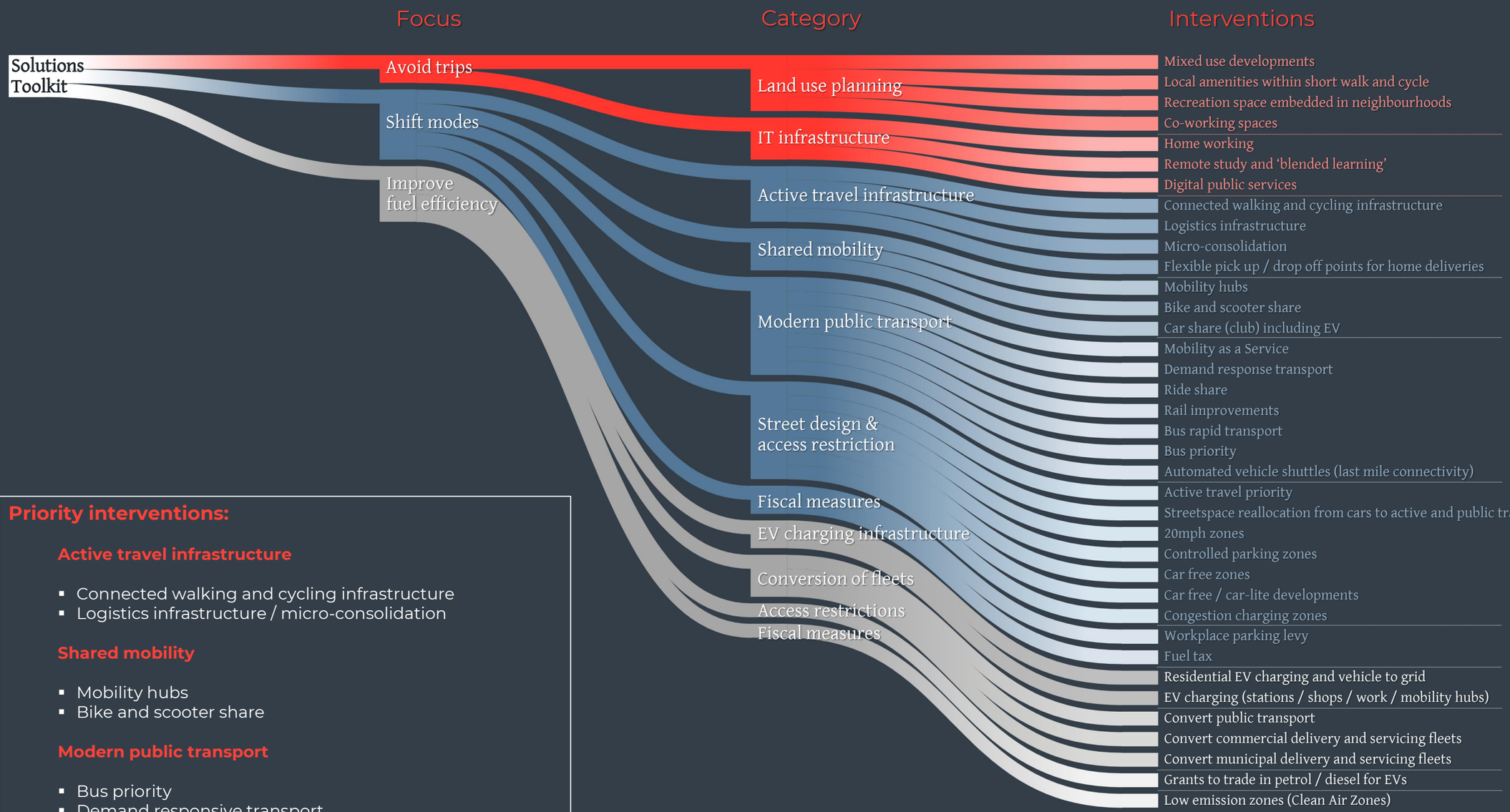
The appendices include more detail regarding the assumptions:

- Appendix B – outline the methodology and inputs
- Appendix F – sets out the data sources used in the assessment
- Appendix G – outlines the ideal values by place type
- Appendix H – sets out the weighting by criteria and intervention.

Table E1 Prioritised interventions

Active travel infrastructure	Connected walking and cycling infrastructure
	Logistics infrastructure / micro-consolidation
Shared mobility	Mobility hubs
	Bike and scooter share
Modern public transport	Bus priority
	Demand responsive transport

The **Solutions Toolkit** longlist



Priority interventions:

Active travel infrastructure

- Connected walking and cycling infrastructure
- Logistics infrastructure / micro-consolidation

Shared mobility

- Mobility hubs
- Bike and scooter share

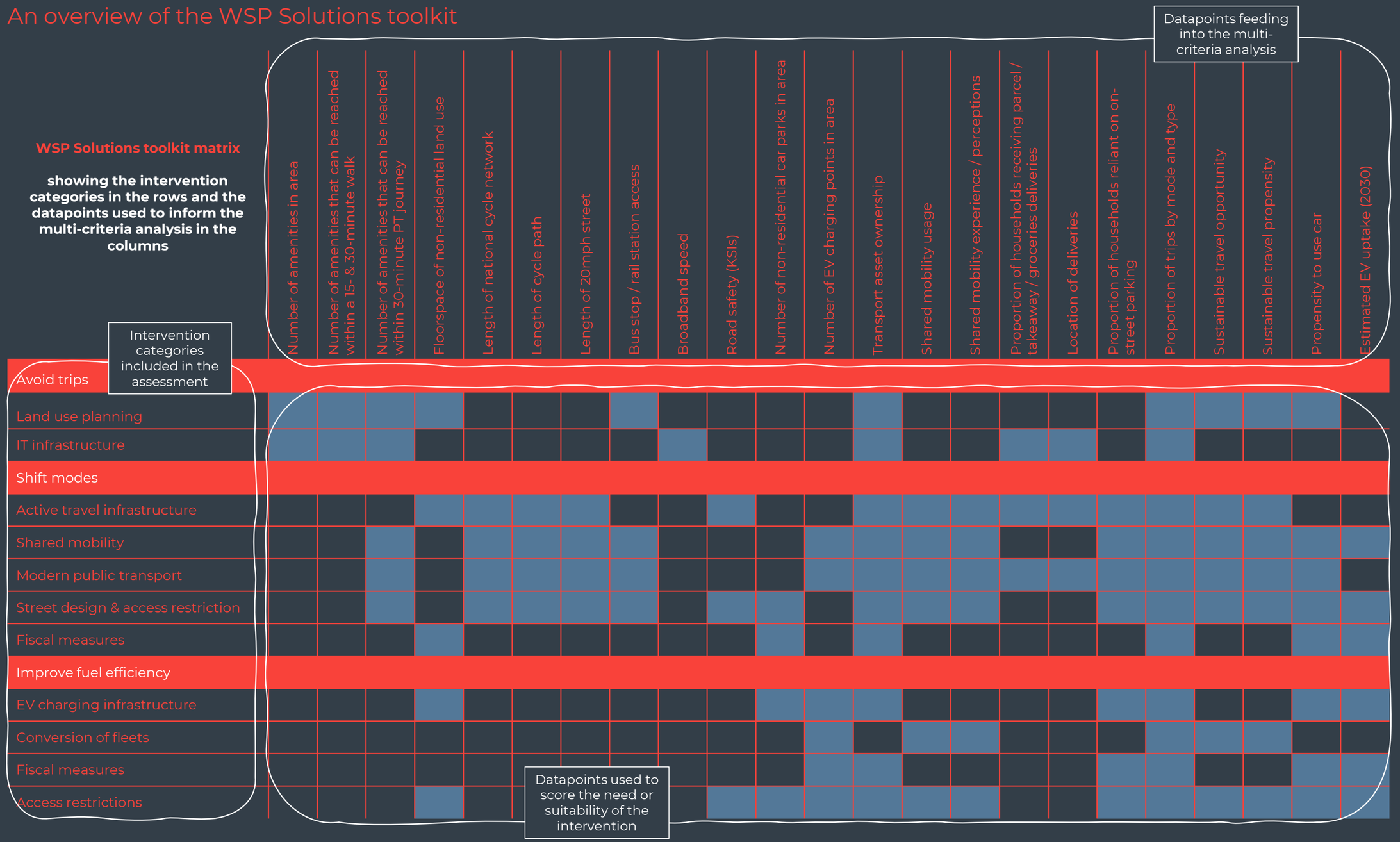
Modern public transport

- Bus priority
- Demand responsive transport

An overview of the WSP Solutions toolkit

WSP Solutions toolkit matrix

showing the intervention categories in the rows and the datapoints used to inform the multi-criteria analysis in the columns



Step 1 – for each datapoint – calculate the **ideal value** accounting for place type

For each datapoint – calculate the ideal value accounting for place type

WSP Solutions toolkit matrix

Example hex in Hemel Hempstead town centre (Hex BSX-2943)

Place type: City suburban A

	Number of amenities in area	Number of amenities that can be reached within a 15- & 30-minute walk	Number of amenities that can be reached within 30-minute PT journey	Floorspace of non-residential land use	Length of national cycle network	Length of cycle path	Length of 20mph street	Bus stop / rail station access	Broadband speed	Road safety (KSIs)	Number of non-residential car parks in area	Number of EV charging points in area	Transport asset ownership	Shared mobility usage	Shared mobility experience / perceptions	Proportion of households receiving parcel / takeaway / groceries deliveries	Location of deliveries	Proportion of households reliant on on-street parking	Proportion of trips by mode and type	Sustainable travel opportunity	Sustainable travel propensity	Propensity to use car	Estimated EV uptake (2030)
Avoid trips																							
Land use planning	17	928	79,227	9,753				6.12					9						44.62	14,133	585.5	110.9	
IT infrastructure	17	928	79,227						144				9			3.51	6.1		44.62				
Shift modes																							
Active travel infrastructure				9,753	0.76	725	372			19			9	10.1	7.05	3.51	6.1	0.55	44.62	14,133	585.5		
Shared mobility			79,227		0.76	725	372	6.12				1	9	10.1	7.05			0.55	44.62	14,133	585.5	110.9	0.58
Modern public transport			79,227		0.76	725	372	6.12				1	9	10.1	7.05	3.51	6.1	0.55	44.62	14,133	585.5	110.9	
Street design & access restriction			79,227		0.76	725	372	6.12		19	55		9	10.1	7.05			0.55	44.62	14,133	585.5	110.9	0.58
Fiscal measures				9,753							55		9						44.62			110.9	0.58
Improve fuel efficiency																							
EV charging infrastructure				9,753							55	1	9					0.55	44.62			110.9	0.58
Conversion of fleets												1		10.1	7.05				44.62	14,133	585.5		
Fiscal measures												1	9					0.55	44.62			110.9	0.58
Access restrictions				9,753						19	55	1	9	10.1	7.05			0.55	44.62	14,133	585.5	110.9	0.58

Step 2 – for each datapoint – calculate the **actual value** by hex

For each datapoint – calculate the actual value by hex

WSP Solutions toolkit matrix

Example hex in Hemel Hempstead town centre (Hex BSX-2943)

Place type: City suburban A

	Number of amenities in area	Number of amenities that can be reached within a 15- & 30-minute walk	Number of amenities that can be reached within 30-minute PT journey	Floorspace of non-residential land use	Length of national cycle network	Length of cycle path	Length of 20mph street	Bus stop / rail station access	Broadband speed	Road safety (KSIs)	Number of non-residential car parks in area	Number of EV charging points in area	Transport asset ownership	Shared mobility usage	Shared mobility experience / perceptions	Proportion of households receiving parcel / takeaway / groceries deliveries	Location of deliveries	Proportion of households reliant on on-street parking	Proportion of trips by mode and type	Sustainable travel opportunity	Sustainable travel propensity	Propensity to use car	Estimated EV uptake (2030)
Avoid trips																							
Land use planning	10	469	73120	9669				3.86					7						32.46	21075	611.25	97.47	
IT infrastructure	10	469	73120						134				7			3.14	3.85		32.46				
Shift modes																							
Active travel infrastructure				9669	0	0	0			0			7	7.95	5.37	3.14	3.85	0.3	32.46	21075	611.25		
Shared mobility			73120		0	0	0	3.86				0	7	7.95	5.37			0.3	32.46	21075	611.25	97.47	0.5
Modern public transport			73120		0	0	0	3.86				0	7	7.95	5.37	3.14	3.85	0.3	32.46	21075	611.25	97.47	
Street design & access restriction			73120		0	0	0	3.86		0	422		7	7.95	5.37			0.3	32.46	21075	611.25	97.47	0.5
Fiscal measures				9669							422		7						32.46			97.47	0.5
Improve fuel efficiency																							
EV charging infrastructure				9669							422	0	7					0.3	32.46			97.47	0.5
Conversion of fleets												0		7.95	5.37				32.46	21075	611.25		
Fiscal measures												0	7					0.3	32.46			97.47	0.5
Access restrictions				9669						0	422	0	7	7.95	5.37			0.3	32.46	21075	611.25	97.47	0.5

Step 3 - to calculate datapoint score – divide the actual value by ideal value by hex

WSP Solutions toolkit matrix

Example hex in Hemel Hempstead town centre (Hex BSX-2943)

Place type: City suburban A

	Number of amenities in area	Number of amenities that can be reached within a 15- & 30-minute walk	Number of amenities that can be reached within 30-minute PT journey	Floorspace of non-residential land use	Length of national cycle network	Length of cycle path	Length of 20mph street	Bus stop / rail station access	Broadband speed	Road safety (KSIs)	Number of non-residential car parks in area	Number of EV charging points in area	Transport asset ownership	Shared mobility usage	Shared mobility experience / perceptions	Proportion of households receiving parcel / takeaway / groceries deliveries	Location of deliveries	Proportion of households reliant on on-street parking	Proportion of trips by mode and type	Sustainable travel opportunity	Sustainable travel propensity	Propensity to use car	Estimated EV uptake (2030)
Avoid trips																							
Land use planning	0.59	0.51	0.92	0.99				0.63					0.78						0.73	1.49	1.04	0.88	
IT infrastructure	0.59	0.51	0.92						0.93				0.78			0.89	0.63		0.73				
Shift modes																							
Active travel infrastructure				0.99	0	0	0			0			0.78	0.79	0.76	0.89	0.63	0.55	0.73	1.49	1.04		
Shared mobility			0.92		0	0	0	0.63				0	0.78	0.79	0.76			0.55	0.73	1.49	1.04	0.88	0.86
Modern public transport			0.92		0	0	0	0.63				0	0.78	0.79	0.76	0.89	0.63	0.55	0.73	1.49	1.04	0.88	
Street design & access restriction			0.92		0	0	0	0.63		0	7.67		0.78	0.79	0.76			0.55	0.73	1.49	1.04	0.88	0.86
Fiscal measures				0.99							7.67		0.78						0.73			0.88	0.86
Improve fuel efficiency																							
EV charging infrastructure				0.99							7.67	0	0.78					0.55	0.73			0.88	0.86
Conversion of fleets												0		0.79	0.76				0.73	1.49	1.04		
Fiscal measures												0	0.78					0.55	0.73			0.88	0.86
Access restrictions				0.99						0	7.67	0	0.78	0.79	0.76			0.55	0.73	1.49	1.04	0.88	0.86

Datapoints used to score the need or suitability of the intervention

Step 4 – to calculate **intervention score** – weight and sum relevant datapoint scores

WSP Solutions toolkit matrix

Example hex in Hemel Hempstead town centre (Hex BSX-2943)
Place type: City suburban A

Datapoints feeding into the multi-criteria analysis

	Number of amenities in area	Number of amenities that can be reached within a 15- & 30-minute walk	Number of amenities that can be reached within 30-minute PT journey	Floorspace of non-residential land use	Length of national cycle network	Length of cycle path	Length of 20mph street	Bus stop / rail station access	Broadband speed	Road safety (KSIs)	Number of non-residential car parks in area	Number of EV charging points in area	Transport asset ownership	Shared mobility usage	Shared mobility experience / perceptions	Proportion of households receiving parcel / takeaway / groceries deliveries	Location of deliveries	Proportion of households reliant on on-street parking	Proportion of trips by mode and type	Sustainable travel opportunity	Sustainable travel propensity	Propensity to use car	Estimated EV uptake (2030)
Avoid trips																							
Land use planning	0.044	0.038	0.068	0.985				0.004					0.205						0.660	1.425	0.993	0.006	
IT infrastructure	0.010	0.009	0.059						0.006				0.021			0.798	0.577		0.718				
Shift modes																							
Active travel infrastructure				0.985	0.027	0.007	0.007			0.988			0.339	0.771	0.741	0.839	0.592	0.542	0.690	1.473	1.031		
Shared mobility			0.811		0.973	0.993	0.993	0.626				0.500	0.315	0.736	0.712			0.542	0.661	1.379	0.963	0.873	0.856
Modern public transport			0.330		0.973	0.993	0.993	0.212				0.973	0.144	0.745	0.724	0.870	0.614	0.542	0.661	1.406	1.016	0.873	
Street design & access restriction			0.078		0.500	0.500	0.336	0.004		0.957	7.621		0.611	0.722	0.699			0.542	0.612	1.179	0.850	0.815	0.856
Fiscal measures				0.985							7.621		0.757						0.661			0.873	0.006
Improve fuel efficiency																							
EV charging infrastructure				0.985							7.621	0.027	0.757					0.542	0.661			0.873	0.856
Conversion of fleets												0.973		0.782	0.757				0.659	1.481	1.016		
Fiscal measures												0.973	0.757					0.542	0.661			0.873	0.006
Access restrictions				0.985						0.952	7.621	0.973	0.711	0.715	0.692			0.542	0.661	1.331	0.926	0.873	0.006

Intervention categories included in the assessment

Datapoints used to score the need or suitability of the intervention

Interventions assessment and evaluation

Intervention scores

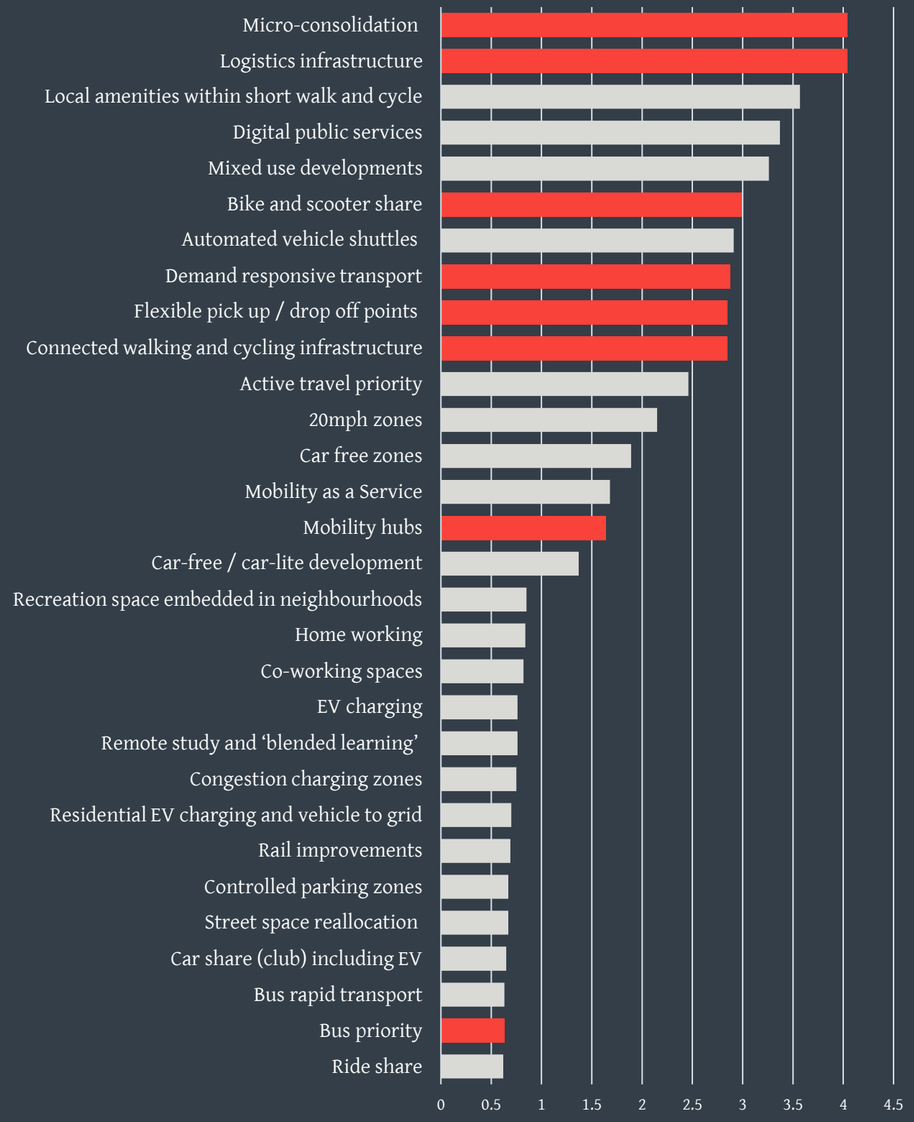
Figure E1 shows the average score by intervention which can exceed 1.0 if the values are greater than the ideal value – indicating a greater need or suitability for those interventions.

This is an average for Hemel Hempstead and only includes interventions considered within the Council's control to influence. This provides insight into the interventions that are most suitable or needed based on the criteria – which included the outputs of the sustainable travel opportunity, propensity and potential. In the figure, the interventions in red indicate those that have been included in the short-list for further consideration.

- For ***active travel infrastructure*** – logistics infrastructure and micro-consolidation, both rated at 4.04, stand out as high-potential interventions that could significantly enhance connectivity and efficiency. This could be supported by flexible pick up / drop off points for deliveries (score 2.85). Connected walking and cycling infrastructure (score 2.85) is relatively high, with the need probably decreased due to the presence of existing infrastructure in some areas.
- For ***shared mobility*** – bike and scooter share with a rating of 2.99 indicates a strong potential for shared mobility. Mobility hubs (rated at 1.64) has a slightly lower score compared to some other interventions, but promises high potential that can be built mobility hubs, mobility as a service and sharing systems.
- For ***modern public transport*** – demand-response transport (rated at 2.88) holds promise for addressing crucial connectivity gaps in the public transport network, while bus priority scores 0.63.
- Other interventions, such as local amenities within a short walk and cycle (rated at 3.57) and mixed-use developments (rated at 3.26), Active travel priority measures (rated at 2.46), are highlighted as high-impact strategies for enhancing the liveability of regions and should be embedded as the HGC growth area is developed.

The following pages provide more detail on the long-list of interventions considered, including a description, whether it was included in the study, and the average need score.

Figure E1 Average intervention need scores for Hemel Hempstead



SHIFT modes interventions

Intervention	Description	Included in study	Average need score
Active travel infrastructure			
Connected walking and cycling infrastructure	A safe separate cycle infrastructure linking to public transport network	Yes	2.85
Logistics infrastructure	Greening mobility by linking walking/cycling with logistics network	Yes	4.04
Micro-consolidation	Cuts carbon emissions in last-mile deliveries, improving trips and vehicle miles	Yes	4.04
Flexible pick up / drop off points for home deliveries	Flexible pick up / drop off points for receiving and sending packages, reducing the need for individual trips to distribution centres	Yes	2.85
Shared mobility			
Mobility hubs	Integrated transport centres where you can easily switch between different types of transportation like buses, trains, and bikes, making it simpler to get around.	Yes	1.64
Bike and scooter share	Provides easy access to bikes and scooters for short-distance travel, reducing the need for personal vehicles	Yes	2.99
Car share (club) including EV	Shared vehicle programs offering access to cars, including electric vehicles, promoting carpooling and reducing the overall number of vehicles on the road	Yes	0.65
Modern public transport			
Mobility as a Service	A digital platform integrating various transport services for seamless planning, booking, and payment of journeys	Yes	1.68
Bus priority	Bus priority refers to a set of measures and strategies implemented to give buses preferential treatment on the road, allowing them to move more efficiently and reliably through traffic	Yes	0.63
Bus rapid transport	Bus rapid transport is a high-capacity, rapid, and efficient mode of public transport	Yes	0.63
Ride share	Ride share is a transport service where individuals who are heading in the same direction share a single vehicle to reach their destinations	Yes	0.62
Rail improvements	Rail improvements refer to enhancements and upgrades made to existing railway infrastructure and services, which can include the construction of new railway lines to expand capacity and improve connectivity	Yes	0.69
Demand response transport	Demand response transport is a flexible and on-demand transport service that operates based on specific passenger requests	Yes	2.88
Automated vehicle shuttles (last mile connectivity)	Automated vehicle shuttles for last mile connectivity refer to small, self-driving vehicles that operate on fixed routes, providing transport over short distances to bridge the gap between major transport hubs and final destinations like homes or offices	Yes	2.91

SHIFT modes interventions (continued)

Intervention	Description	Included in study	Average need score
Street design & access restrictions			
Active travel priority	Active travel priority refers to giving higher importance or preference to walking and cycling as modes of transport in urban planning and infrastructure development	Yes	2.46
Street space reallocation from cars to active and public transport	Street space reallocation from cars to active and public transport refers to the process of redistributing the physical space on roads and streets to prioritise pedestrians, cyclists, and public transport over private vehicles	Yes	0.67
20mph zones	20mph zones refer to areas where the speed limit for vehicles is set at 20 miles per hour (about 32 kilometres per hour) instead of the standard speed limit	Yes	2.15
Controlled parking zones	Controlled parking zones are specific areas within a city or town where parking is regulated by local authorities	Yes	0.67
Car free zones	Car free zones are areas within a city or town where private vehicles are not allowed	Yes	1.89
Car-free / car-lite development	Car-free or car-lite development refers to urban planning and design strategies that prioritise reducing the reliance on private cars within a specific area or community	Yes	1.37
Congestion charging zones	Congestion charging zones are specific areas within a city where drivers are required to pay a fee in order to enter or drive within that area	Yes	0.75
Fiscal measures			
Workplace parking levy	Workplace parking levy is a policy where employers are charged a fee for providing parking spaces to their employees	No	-
Fuel tax	Fuel tax is a government-imposed levy on the sale of fuels such as gasoline and diesel	No	-

AVOID trips interventions

Intervention	Description	Included in study	Average need score
Land use planning			
Local amenities within short walk and cycle	Providing all essential services within walking or cycling distance	Yes	3.57
Recreation space embedded in neighbourhoods	Recreational spaces reduce car travel for leisure	Yes	0.85
Mixed use developments	Land planning, TOD, and restricted cars key for net-zero design	Yes	3.26
Co-working spaces	Co-working reduces commuting, promotes local work	Yes	0.82
IT Infrastructure			
Home working	Remote work cuts emissions, address land use and energy efficiency	Yes	0.84
Remote study and ‘blended learning’	Cuts carbon emission, offer flexibility & accessibility for education	Yes	0.76
Digital public services	Boost efficiency, cut emissions, offers sustainable land use	Yes	3.37

IMPROVE fuel efficiency interventions

Intervention	Description	Included in study	Average need score
EV charging infrastructure			
Residential EV charging and vehicle to grid	It enables electric vehicle owners to conveniently charge their cars at home and use them as mobile batteries to supply power back to the grid when needed	Yes	0.70
EV charging (stations / shops / work / mobility hubs)	EV charging infrastructure refers to the network of charging stations and facilities where electric vehicles (EVs) can be recharged	Yes	0.76
Conversion of fleets			
Convert public transport	Convert public transport refers to the process of transitioning traditional, fossil-fuel-powered public transport systems to more environmentally-friendly and sustainable alternatives	No	-
Convert commercial delivery and servicing fleets	Convert commercial delivery and servicing fleets refers to the process of transitioning the vehicles used for delivery and service operations in businesses to more environmentally-friendly and sustainable alternatives	No	-
Convert municipal delivery and servicing fleets	Convert municipal delivery and servicing fleets refers to the process of transitioning the vehicles used for various services and deliveries by local government entities (municipalities) to more environmentally-friendly and sustainable alternatives	No	-
Fiscal measures			
Grants to trade in petrol / diesel for EVs	Grants to trade in petrol/diesel for EVs refer to financial incentives provided by governments or organizations to encourage individuals or businesses to replace their traditional internal combustion engine (petrol or diesel) vehicles with electric vehicles (EVs)	No	-
Access restrictions			
Low emission zones (Clean Air Zones)	Low emission zones, also known as Clean Air Zones, are designated areas within cities or urban areas where certain restrictions or charges are imposed on vehicles that do not meet specific emission standards	No	-

CONCLUSION

Summary and next steps

Findings

This report focussed on understanding the sustainable travel opportunity, propensity and potential for Hemel Hempstead and the HGC growth area to test the realism of the ambitious mode shift targets set out in the Hemel Garden Communities Spatial Vision. It also scored the need or suitability of a long- and short-list of interventions that could help unlock the sustainable travel potential.

Sustainable travel opportunity

The assessment indicates that based on modelled origin-destination matrices for 2031, current active travel networks and available public transport services – up to 54% of modelled car trips in the HGC growth area and 66% in Hemel Hempstead could be made by sustainable methods - predominantly by active modes.

The walking and cycling opportunity data (hex and link) provides detail around where to focus active travel improvements to unlock additional trips and could be used to support the Local Cycling and Walking Infrastructure Plan being developed for Dacorum.

Only about 7% of car trips could reasonably use public transport based on existing services – which suggests an opportunity to improve the network to better match the origins-destinations of users (coverage and frequency) and be more time competitive with driving (speed) – focussed on commuting, education, shopping and personal business trips.

Sustainable travel propensity

This work which is benchmarked to the England average and based on current socio-demographics of the area, shows that while propensity is mixed across Hemel Hempstead – there are areas with a higher likelihood to walk, cycle and use pubic transport. These areas should be prioritised for active and public transport interventions to unlock the potential.

As the HGC growth area is developed, it is anticipated that incoming residents will shift the socio-demographics and propensities further to active and public modes.

Sustainable travel potential

Based on the findings on the opportunity and propensity work, it is estimated that up to 27% of car trips in the HGC growth area and 34% would use sustainable modes. It is noted that this is a worst-case scenario – based on the existing active and public transport options available, as well as the propensities of the current population.

Measures to increase sustainable travel opportunity such as enhanced walking, cycling, bus and rail networks could increase the number of trips that could be made.

Socio-demographic changes with the redevelopment and new development in the HGC growth area could increase the propensity to use active and public transport.

Realism of mode share targets

The County Travel Survey results for Hemel Hempstead were extracted, analysed and compared to the 2021 Census Journey to Work Data for Dacorum and the WSP's Mobility Insights predictions – to see if they were consistent, but also to understand if Mobility Insights could predict mode shares and use of shared mobility based on findings from other parts of England.

The County Travel Survey commuting results matched the 2021 Census Journey to Work data, while asset ownership was consistent with the Mobility Insights predictions.

The use of shared mobility was lower in the County Travel Survey compared to the Mobility Insights predictions – which is to be expected as there is limited bike share, car/van share, ride share and demand responsive options in the area at present.

The data suggests that the local population would be receptive to shared mobility interventions if implemented.

The mode shares differed between the County Travel Survey and the Mobility Insights predictions – with cycling, bus and rail being lower in the County Travel Survey.

This reinforces the need improve the cycle, bus and rail networks to unlock the sustainable travel potential.

Summary and next steps

The mode share results from the Household Travel Survey were used as a baseline to understand the realism of the mode share targets.

The baseline mode shares by trip type were then merged with the low and higher sustainable travel opportunity and potential to test several scenarios. The Mobility Insights predictions were included for reference and compared to the 40% and 60% mode share targets.

- The sustainable travel potential scenarios achieve the 40% mode share target across all trip types, but not the 60% target.
- Meanwhile, the sustainable travel opportunity scenarios achieve both the 40% and 60% mode share targets across all trip types.

The data suggests that while the 40% target is feasible, the 60% target will be more difficult to achieve unless the active travel and public transport networks are enhanced – particularly to support commuting, shopping and personal business and leisure trips.

Interventions assessment and evaluation

The interventions assessment identified and scored a long-list of interventions. Of that, six high-scoring interventions were considered as priority, including:

- Connected walking and cycling infrastructure
- Logistics infrastructure / micro-consolidation
- Mobility hubs
- Bike and scooter share
- Bus priority, and
- Demand responsive transport.

Next steps

- The HGC growth area is in the planning stages with the existing active travel and public transport networks not fully formed or in place. At the same time, the socio-demographic mix is not known. As a result, the sustainable travel opportunity, propensity and potential are a worst-case scenario and should be rerun for the HGC growth area as the master plan **is developed** – including housing, socio-demographics, active and public transport network and services.
- The data analysis for Hemel Hempstead shows a high opportunity, propensity and potential for active travel. The data from this study should be used to inform active travel investment and prioritisation – including the LCWIP that is being developed.
- The analysis showed that the current public transport network and services should be improved to better meet the needs of existing and future users. Further analysis into bus and rail networks improvements should be considered to increase the sustainable travel opportunity and unlock the propensity to use bus and rail of the local population.
- The sustainable travel potential and Mobility Insights predictions showed that there is propensity to use shared mobility. New and expanded bike share, car share, ride share and demand responsive transport should be considered to capitalise on the potential.

APPENDIX A
Policy review

Policy review

Hemel Garden Communities Spatial Vision

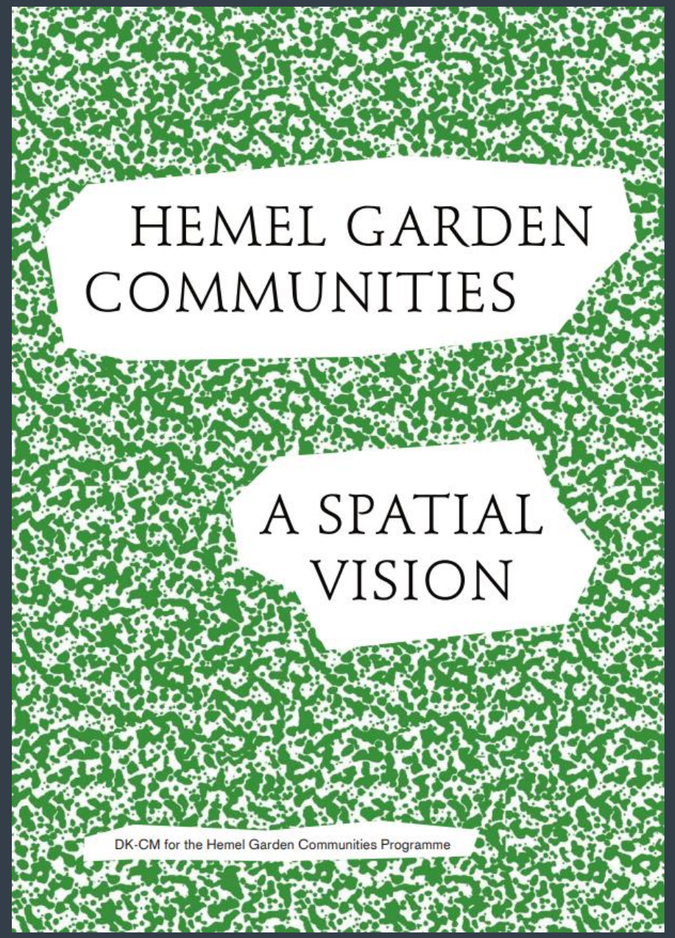
Hemel Garden Communities (HGC), supported by Garden City principles, covers the whole town of Hemel Hempstead, within the borough of Dacorum, as well as proposed growth areas straddling both Dacorum and St. Albans district to the north and east of the town and wider movement routes beyond.

HGC aims to deliver this ambitious development programme which will transform and grow Hemel Hempstead and create attractive, sustainable new neighbourhoods to its north and east by 2050.

The Spatial Vision builds on Hemel Hempstead's strengths and explains how HGC will look and feel once the development and transformation is complete.

The vision is organised into four thematic pillars as a green network, a self-sustaining economy, integrated neighbourhoods, engaged communities, all of which reinforce the aspirations to promote healthy lifestyles and respond to the climate crisis.

The Spatial Vision approach seeks to make active and sustainable travel accessible to everyone and connect local centres and key places to the countryside, the Chiltern Hills and wider destinations across Hertfordshire, transforming lifestyles through greater engagement with nature, reducing energy demand and making a significant contribution to achieving net zero carbon.



Policy review

This section sets out a review of relevant design guidance as well as national and regional policy to identify policy direction and opportunities relevant to the HGC growth area.

Best practice design guidance

The HGC growth area will need to consider best practice guidance to plan and deliver an exemplar scheme. The Transport for New Homes Garden Villages and Garden Towns: Visions and Reality document reviewed 20 garden village proposals and highlights the stark differences between the plan for and realisation of many garden community schemes.

The document outlines the need for developments to *"Change transport modelling and 'value for money ' calculations so that sustainable transport solutions do well on the basis that we achieve government aims for active lifestyles and a shift away from car use"* - supporting the mode shift.

The Town and Country Planning Association (TPCA) has produced several guides to provide steps for successfully making garden communities a reality. *Garden Cities Guide 13* outlines three core aims (promote active travel/ establish excellent public transport from the outset/ reduce the use of private cars) and 10 garden city principles to follow (below). The guide sets the standard for garden city design to enable 'at least 50% of trips originating in the Garden City to be made by non-car means, with a goal to increase this over time to at least 60%'.

TCPA 10 Garden Cities Principles:

- Location and connectivity should be the starting point.
- Set an overarching vision, focused on delivering sustainable transport.
- Collaboration is crucial.
- Sustainable transport systems must be inclusive.
- Transport must be future-proofed.
- Local Plans should establish mode share targets and networks.
- Build to the right density.
- Apply a user hierarchy.
- Consider key design features.
- Integrate green infrastructure and climate resilience within transport design.

The RTPI's Net Zero Transport (2021) emphasises the need for a 'do everything' scenario in planning. This means that no single intervention, or even combination of interventions, will be enough to reduce transport emissions, and that all possible ways to reduce carbon must be included in future planning. The document outlines a four-step approach to reducing surface transport emissions by 80% (see below) and the carbon reduction impact of approximately 40 different interventions to achieving this goal.

- Negative carbon developments
- Substitute trips
- Shift modes
- Switch fuels

Policy review

CoMoUK is a charity dedicated to promoting shared transport in the UK. The New Developments and Shared Transport design document focuses on implementing shared transport, such as car clubs and mobility hubs, with shared assets in new developments. In particular, it emphasises re-framing planning policy around place rather than cars by avoiding a one-to-one conversion to EVs, limiting parking provision and rethinking the driveway.

CoMoUK – Success factors of low-car developments:

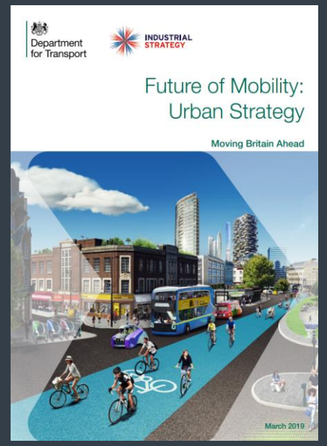
- Access to reliable, frequent public transport and cycle infrastructure.
- Access to key amenities such as retail, healthcare and education.
- Developer contributions for capital costs and private parking charges.
- Sufficient scale to support sustainable transport modes.

The Campaign for Better Transport's Renewing the Transport System (2020) document proposes using the Covid-19 pandemic as an opportunity for a fundamental shift in the transport system through improved public transport, zero emission road and rail vehicles manufactured in the UK, improvements in walking and cycling infrastructure, and changed revenue models with a refocusing on government funding rather than private franchising, particularly in the bus network.

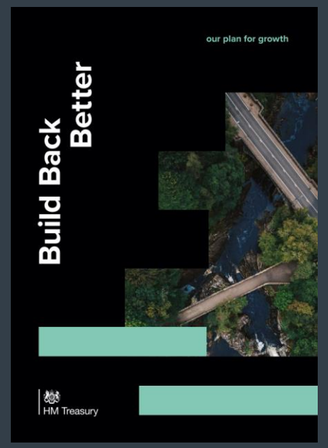
National policy

Key national policy documents such as DfT's Decarbonising Transport: A Better, Green Britain highlight the need to use national e-scooter trials to understand their environmental impact, safety, and mode shift potential to evaluate whether they should be legalised. The document also emphasises the mode shift to active transport is one of the most cost-effective ways of reducing transport emissions.

The Government's 2019 Future of Mobility: Urban Strategy focuses on increasing active travel and public transport: New technology offers opportunities to shift people towards more space-efficient modes, through widening access to active travel and making public transport more integrated, reliable and attractive. Increased use of car clubs could also help to alleviate congestion; having access to a shared vehicle has been shown to lead to reductions in personal car ownership and miles driven, as well as increased use of other modes of transport.



Policy review

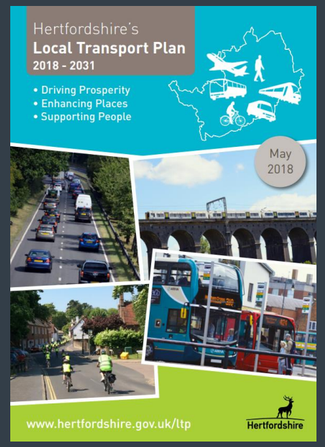


The DfT's 2022 policy paper on the Strategic road network and delivery of sustainable development sets out the principles of sustainable development which should give priority to walking, wheeling and cycle movements and facilitate access to high-quality public transport where possible. The paper also highlight to need to be subject to sustained monitoring and management of targets for achieving a modal shift to sustainable transport.

Meanwhile, the Government's 2021 Build Back Better: Our Plan for Growth highlights the need to improve transport connectivity while achieving net zero targets by making transport more sustainable and harnessing the benefits of digital connectivity.

Regional policy

Hertfordshire's Local Transport Plan (LTP) 4 sets a vision for the future of transport in the county with a focus on transitioning away from a car-centric focus and towards a more sustainable network, seeking to benefit both the environment and population.



Summary

There is a strong policy direction that advocates for a significant modal shift in the way communities plan their transportation systems. The traditional model is being replaced by a more people and place-centred model. This shift is clearly emphasized in numerous best practice guidance documents and is supported by national and regional policies.

Some of the key themes repeated across several best practice design documents centre around the need to integrate genuinely feasible alternative travel modes to the private car into the design of the community from the start and to focus on place rather than cars.

At all levels of policy, planning documents are calling for the need to improve connectivity and access to services and opportunities, boost economic growth, and ensure all activity is undertaken sustainably and with respect for the natural environment.

More specifically, policy documents call for improved walking and cycle infrastructure to encourage active travel, investment in the public transport network, and using shared mobility to shift away from private car usage, while digital connectivity should be harnessed to reduce the need to travel.

APPENDIX B

Assess and evaluate potential solutions methodology

WSP Solutions Toolkit

What is the Solutions Toolkit

A multi-criteria assessment tool that scores a long-list of interventions using the **Avoid-Shift-Improve** framework – to identify which best meet the needs of the area and unlock the potential to inform the development of a short-list (or basket of measures).

Builds on the data analysis and insights from **Discover** the problem and **Define** the potential.

Why use it

Assesses and evaluates the long-list of interventions to inform decision making and prioritisation.

Output

Hex level (400m x 400m) scores for **Avoid-Shift-Improve**, category and intervention – to allow for benchmarking and comparison between hexes.

Interventions overview

Explaining interventions

WSP have built on the Avoid-Shift-Improve approach and used RTPI Net Zero Transport research to develop a Solutions Toolkit which is a long-list of interventions that encompasses avoiding unnecessary trips, shifting to more efficient modes of transport, and improving fuel efficiency for unavoidable car trips.

The interventions undergo a detailed assessment process to identify a short list most suited to addressing the problems and unlocking the full potential of the region's modal shift.

Delivered through customisable multi-criteria assessment based on problems, needs, suitability and sustainable travel potential.

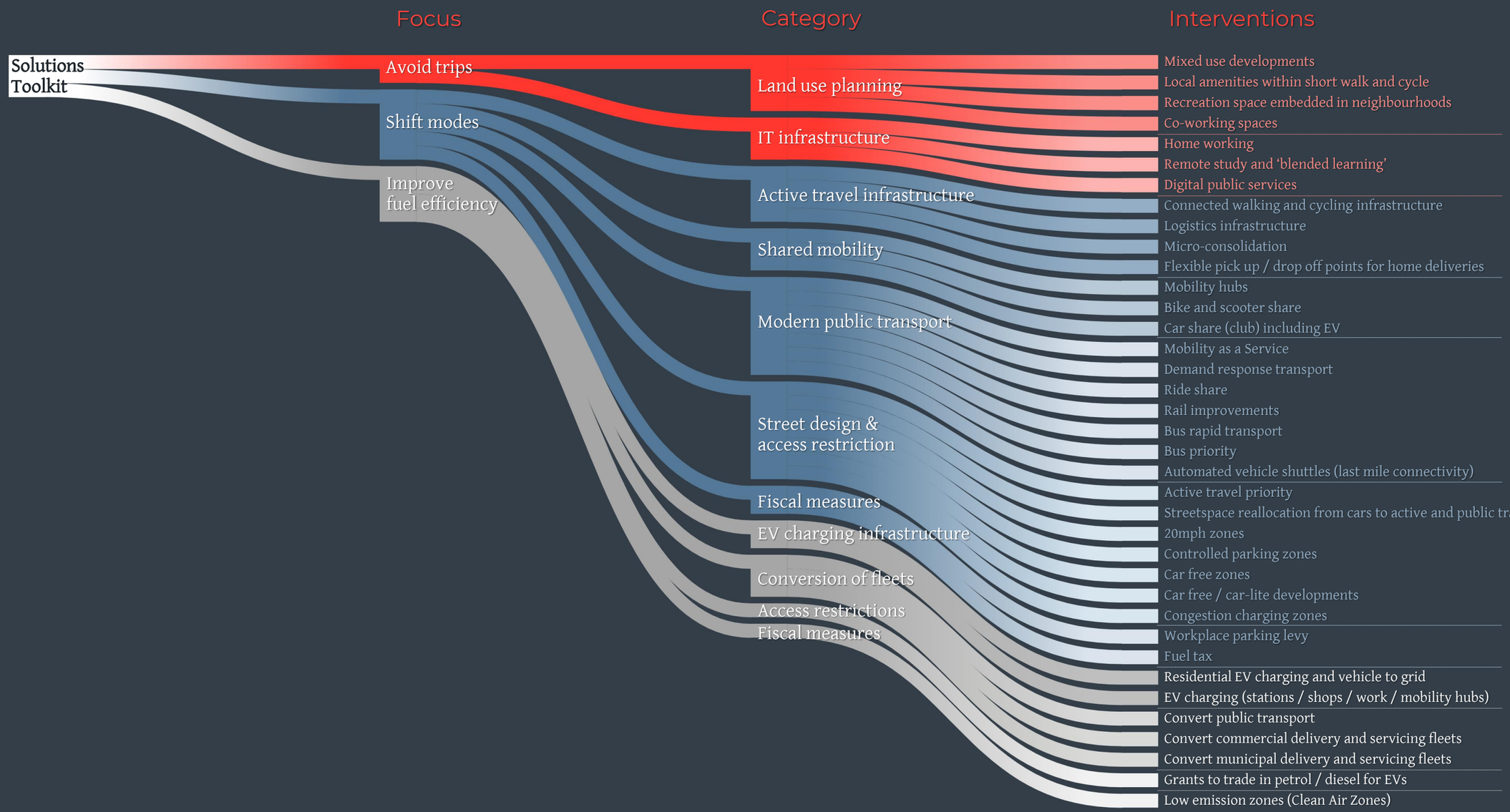
The assessment process yields a short list of interventions that demonstrate the highest suitability and potential impact. These outcomes are instrumental in informing various aspects:

- Local Plans – Providing valuable input for the development and refinement of local transport plans.
- Local Transport Strategies – Contributing data-driven insights to enhance local transport strategies.
- Modal Strategies and Further Studies – Guiding decisions on which modal strategies to prioritise for further in-depth studies and development.
- Stakeholder Engagement – Equipping stakeholders with evidence-backed insights to address their inquiries and concerns.

Table B1 Avoid-Shift-Switch approach and interventions

	Category	Interventions
Avoid trips	Land use planning	▪ Mixed use developments ▪ Local amenities within short walk and cycle ▪ Recreation space embedded in neighbourhoods ▪ Co-working spaces
	IT infrastructure	▪ Home working (superfast broadband and house design to allow for workspace) ▪ Remote study and 'blended learning' ▪ Digital public services
Shift modes	Active travel infrastructure	▪ Connected walking and cycling infrastructure ▪ Logistics infrastructure ▪ Micro-consolidation ▪ Flexible pick up / drop off points for home deliveries
	Shared mobility	▪ Mobility hubs ▪ Bike and scooter share ▪ Car share (club) including EV
	Modern public transport	▪ Mobility as a Service ▪ Demand response transport ▪ Ride share ▪ Rail improvements ▪ Bus rapid transport ▪ Bus priority ▪ Automated vehicle shuttles (last mile connectivity)
	Street design & access restriction	▪ Active travel priority ▪ Streetspace reallocation from cars to active and public transport ▪ 20mph zones ▪ Controlled parking zones ▪ Car free zones ▪ Car-free / car-lite development ▪ Congestion charging zones
	Fiscal measures	▪ Workplace parking levy ▪ Fuel tax
Improve fuel efficiency	EV charging infrastructure	▪ Residential EV charging and vehicle to grid ▪ EV charging (stations / shops / work / mobility hubs)
	Conversion of fleets	▪ Convert public transport ▪ Convert commercial delivery and servicing fleets ▪ Convert municipal delivery and servicing fleets
	Fiscal measures	▪ Grants to trade in petrol / diesel for EVs
	Access restrictions	▪ Low emission zones (Clean Air Zones)

The **Solutions Toolkit**



Interventions overview

Methodology

STEP **01**

For each datapoint – calculate the **ideal value** accounting for place type

STEP **02**

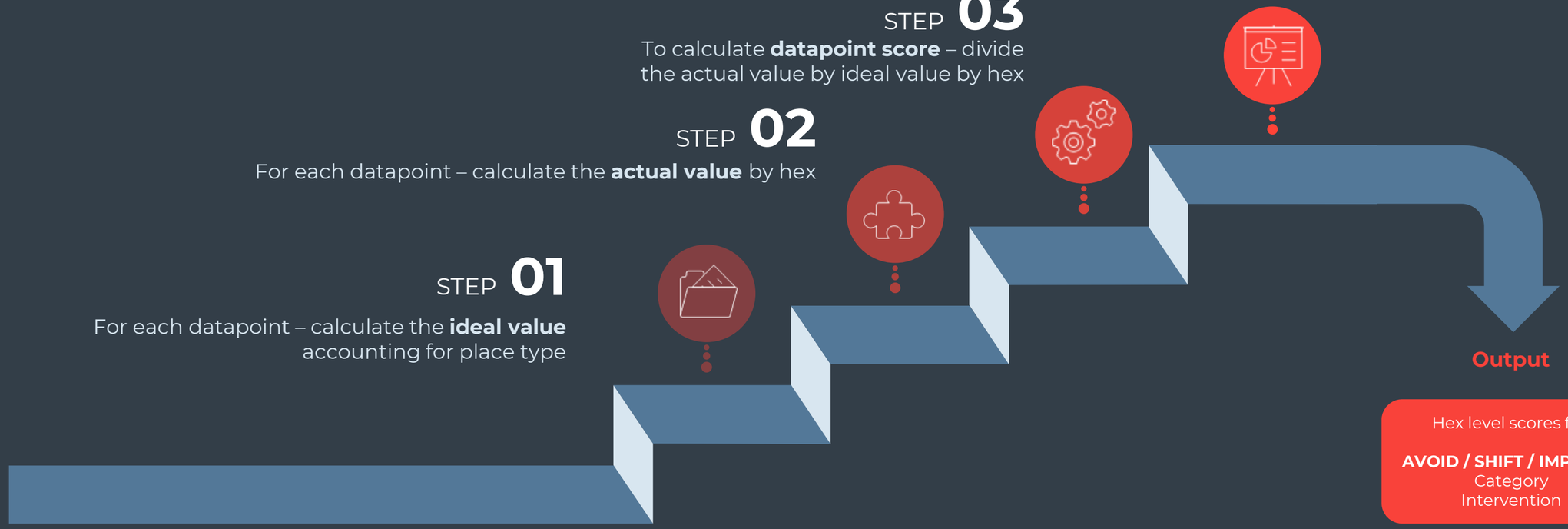
For each datapoint – calculate the **actual value** by hex

STEP **03**

To calculate **datapoint score** – divide the actual value by ideal value by hex

STEP **04**

To calculate **intervention score** – weight and sum relevant datapoint scores



Output

Hex level scores for:

AVOID / SHIFT / IMPROVE
Category
Intervention

Figure B1 Methodology overview

Interventions overview

Step 01 – Input data sources and calculate **criteria value** (at a hex level)

Data forms the backbone of our assessment process, enabling us to make informed and data-driven decisions.

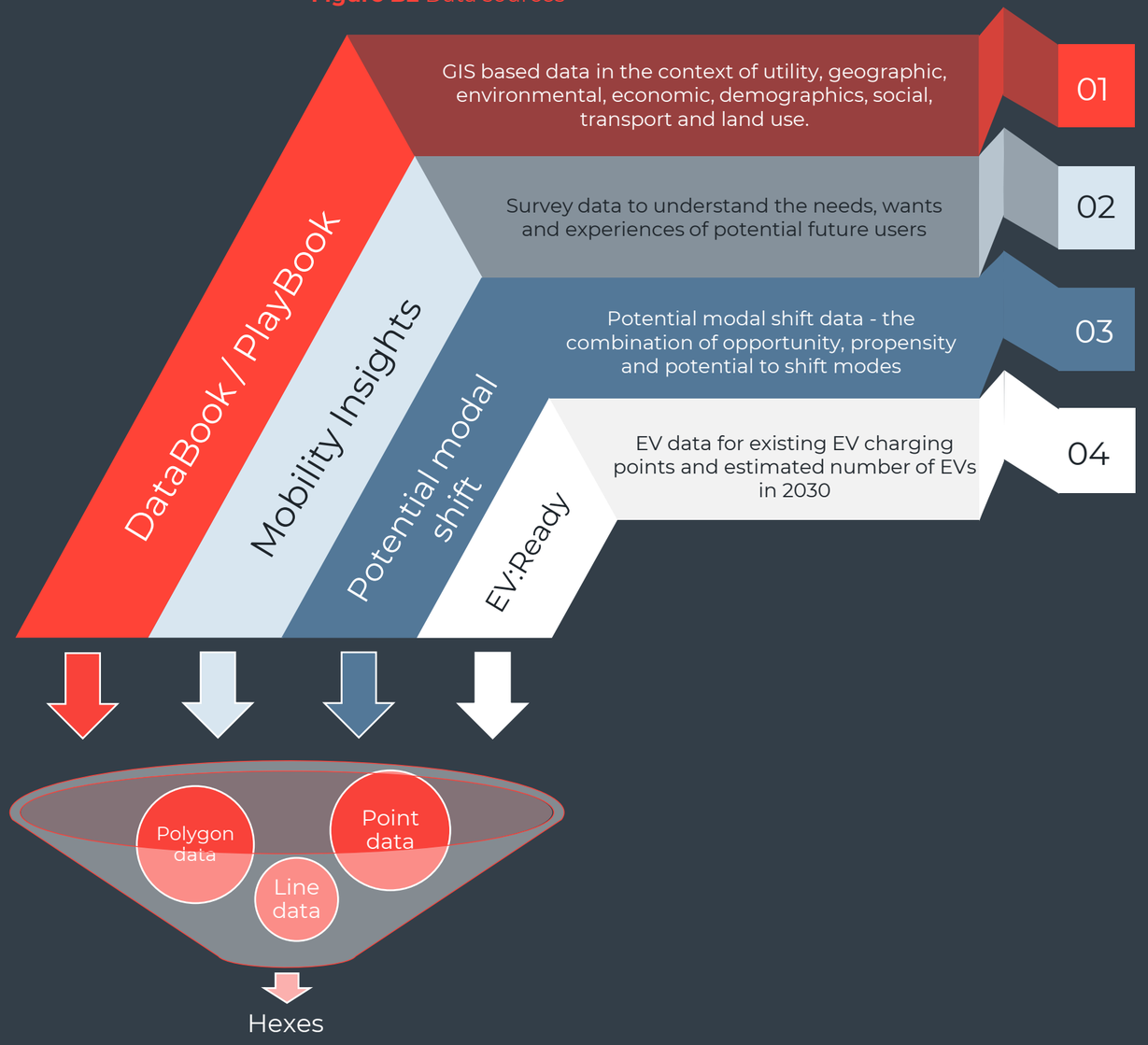
Below are the key data sources:

- DataBook / PlayBook – data from various sources such as geoportal, NOMIS, ONS, Open street map, DfT and national reports
- Mobility Insights – data from WSP user-centric survey bank – categorised by Experian Mosaic Group
- Potential modal shift – data from regional or countywide models, Google API, Experian Mosaic
- EV:Ready – data from WSP's EV:Ready tool

All data was processed at a hex level which ensures that interventions are assessed with a high degree of precision, allowing for more accurate and targeted decision-making.

Appendix F sets out a more detailed list of the criteria used, the data processing, data sources and output categories.

Figure B2 Data sources



Interventions overview

Step 02 – Calculate **ideal value** (85th percentile values) for each criteria (by place type)

The aim is to score each criteria against an ideal (85th percentile score) to benchmark the data point against a well performing area – related to that criteria.

To account for variation across the country the 85th percentile values were calculated for each criteria by place type.

The defined place types are as follows:

- Inner Urban A
- Inner Urban B
- City Suburban A
- City Suburban B
- Urban Large (within urban areas with a ppl. of 100-250k)
- Urban Medium (within urban areas with a ppl. of 25-100k)
- Urban Small (within urban areas with a ppl. of less than 25k)
- Rural town and fringe

85th percentile values have been used rather than maximum (highest) values to account for data outliers. 85% is a value chosen based on professional judgement and acts as a threshold indicating a higher level of performance for each criteria.

Appendix G sets out the ideal value (85th percentile values) that have been used to score the criteria based on the place type.

Inner Urban A	Inner Urban B
City Suburban A	City Suburban B
Urban Large	Urban Medium
Urban Small	Rural town and fringe

Interventions overview

Step 03 – Calculate **criteria score** (by hex and factoring place type)

This step calculates a score per criteria benchmarked against the 85th percentile values that were calculated in the previous step.

The criteria score is calculated at a hex level, factoring in place type as defined in the previous step.

The process involves evaluating the performance against defined criteria within each hex, with consideration given to the characteristics of the respective place type.

Step 04 – Run MCA to calculate **intervention score** (at a hex level)

Finally, the multi-criteria assessment tool is run to calculate an intervention score at hex level, involving several key stages to ensure a comprehensive evaluation:

Inputs – merging criteria scores with their respective weightings to form the basis of the analysis.

Running – weighted criteria scores are calculated by using sigmoid function to translate the weightings into a standardised scale between 0 and 1.

Aggregating – combining standardised scores to form a comprehensive assessment for each intervention.

Iterating – systematically exploring potential solutions through iterations to strive to identify the most optimal intervention strategy for maximum impact.

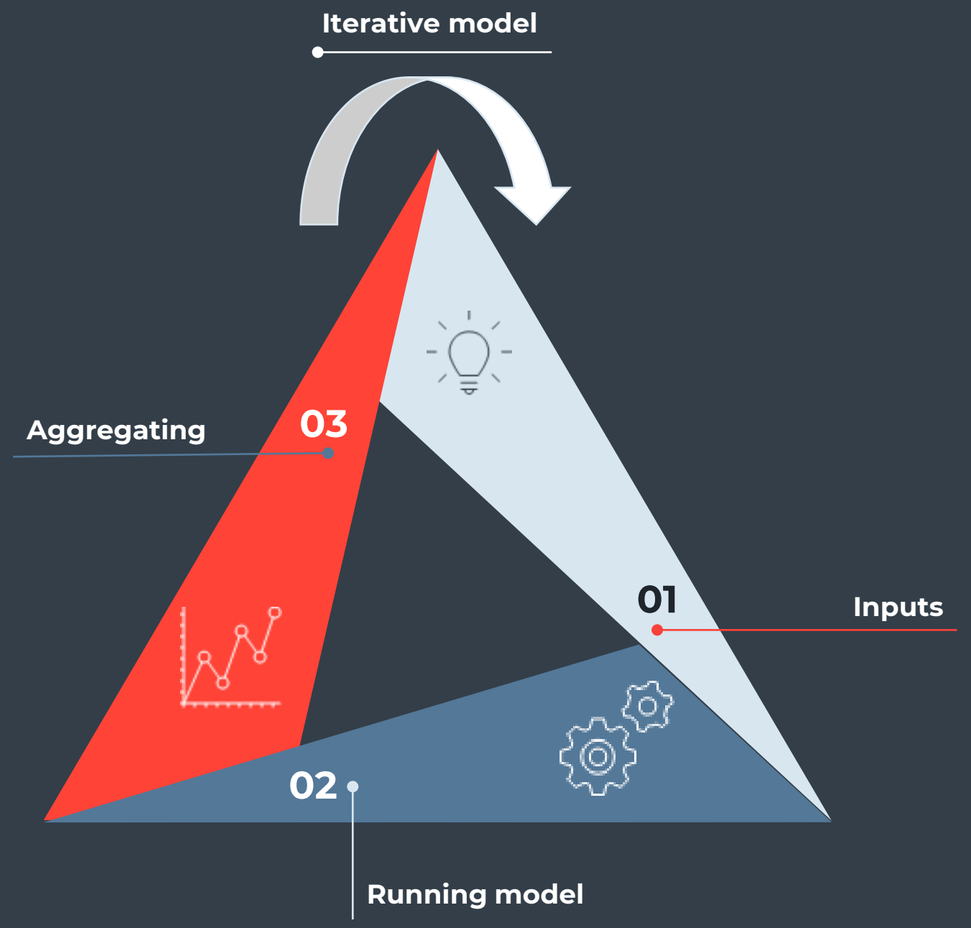


Figure B3 Running MCA process

Interventions overview

Step 04 (continued) - MCA weightings explained

In this step, data was assessed to determine their potential impact for each intervention. This evaluation process is crucial for making informed decisions regarding intervention selection and prioritisation.

For each data point, we determined its effect on the intervention, categorising it as either positive or negative. Subsequently, each data point was assigned a prioritisation score ranging from -5 to +5.

Positive impact - to identify the positive contributions of each data point to each intervention.

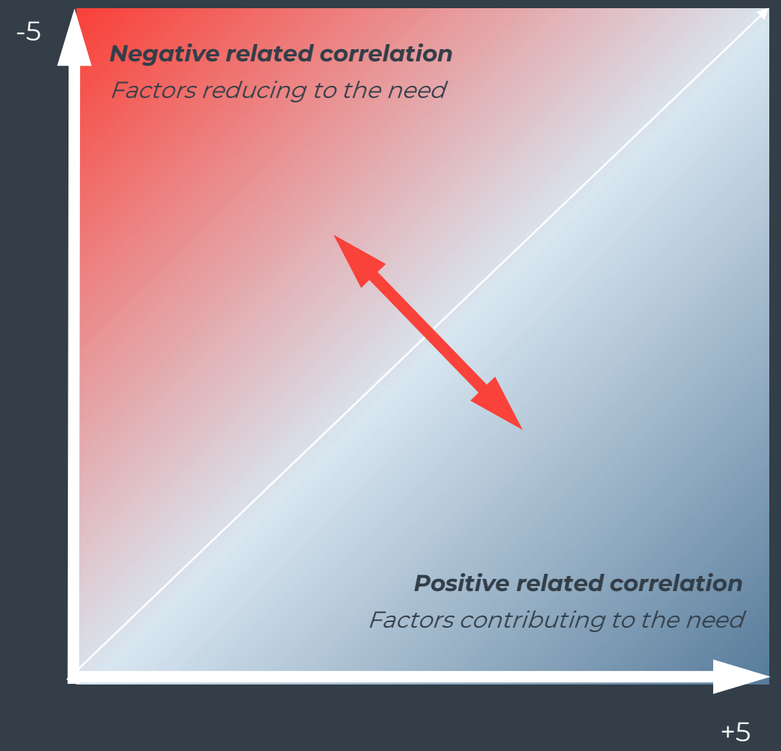
For example, if the data on shared mobility experiences and shared mobility usage indicate a high potential for mobility hubs or car-share interventions, these insights are considered positively impactful for this intervention. They signify a promising opportunity for intervention due to the evident potential for effective implementation.

Negative impact - to identify the negative contributions of each data point to each intervention.

For example, if the cycle path network is sufficient compared to other similar areas for a connected walking and cycling infrastructure intervention, these data will have a negative impact for this intervention because there is no intervention needed.

Go to Appendix H part for detailed MCA weightings.

Figure B4 Impact analysis



Worked Example

Step 01 – Input data sources and calculate **criteria value** (at a hex level)

The criteria value is calculated for each criteria at a hex level.

For example, considering the criteria 'Connected walking and cycling infrastructure', count the number of asset ownership within each hex. This value is the **criteria value**.

Hex 1: Relies on traditional vehicles.

Hex 2: Prioritizes sustainable transport.

Hex ID	Asset Ownership			
	Car/Van	Motor Cycle	Bicycle	Scooter
Hex 1	5	3	2	1
Hex 2	1	2	5	3

Step 02 – Calculate **ideal value** (85th percentile values) for each criteria (by place type)

The hex data is aggregated based on place type and the 85th percentile values are calculated.

The below shows the **ideal value** for the 'Asset ownership' criteria for the place type 'City suburban A':

Place type	Asset Ownership			
	Car/Van	Motor Cycle	Bicycle	Scooter
City suburban A	3	2	3	2

Step 03 – Calculate **criteria score** (by hex and factoring place type)

Divide the criteria value for each hex by the relevant ideal value for that place type. This normalises the value ensuring consistent evaluation across data points. This value is the **criteria score**.

Hex ID	Asset Ownership			
	Car/Van	Motor Cycle	Bicycle	Scooter
Hex 1	1.67	1.5	0.67	0.5
Hex 2	0.33	1	1.67	1.5

Step 04 – Run MCA to calculate **intervention score** (at a hex level)

MCA weightings are pre-calculated prioritisation scores that vary depending on the intervention type.

In the case of 'Connected walking and cycling infrastructure', ownership is weighted;

- Down to -5 for car/motorcycle reliance
- Up to +5 for bike/scooter reliance

Which means, if a hex relies more on cars, it will receive a lower score, whereas if it relies more on bikes, it will receive a higher score.

	Asset Ownership			
	Car/Van	Motor Cycle	Bicycle	Scooter
Weightings	-5	-3	5	3

These values are then standardised between 0 and 1 to allow for meaningful comparison. To do that, sigmoid function is used.

	Asset Ownership			
	Car/Van	Motor Cycle	Bicycle	Scooter
Weightings	-5	-3	5	3
Sigmoid Function values	0.00669	0.04743	0.99331	0.95257

To calculate the **intervention scores**, the multi-criteria assessment tool (MCA) multiplies the criteria scores from step 3 by the standardised MCA score input values above.

Hex ID	Asset Ownership			
	Car/Van	Motor Cycle	Bicycle	Scooter
Hex 1	0.011172	0.071145	0.665518	0.476285
Hex 2	0.002208	0.04743	1.658828	1.428855

To compare, the average score is taken and evaluated. Based on this result, Hex 1 has lower intervention score rather than hex 2 for 'connected walking and cycling infrastructure' intervention – which means a need to focus on Hex 2 to unlock the potential.

Hex ID	Avg. Score
Hex 1	0.30603
Hex 2	0.78433

APPENDIX C

AVOID trips interventions score

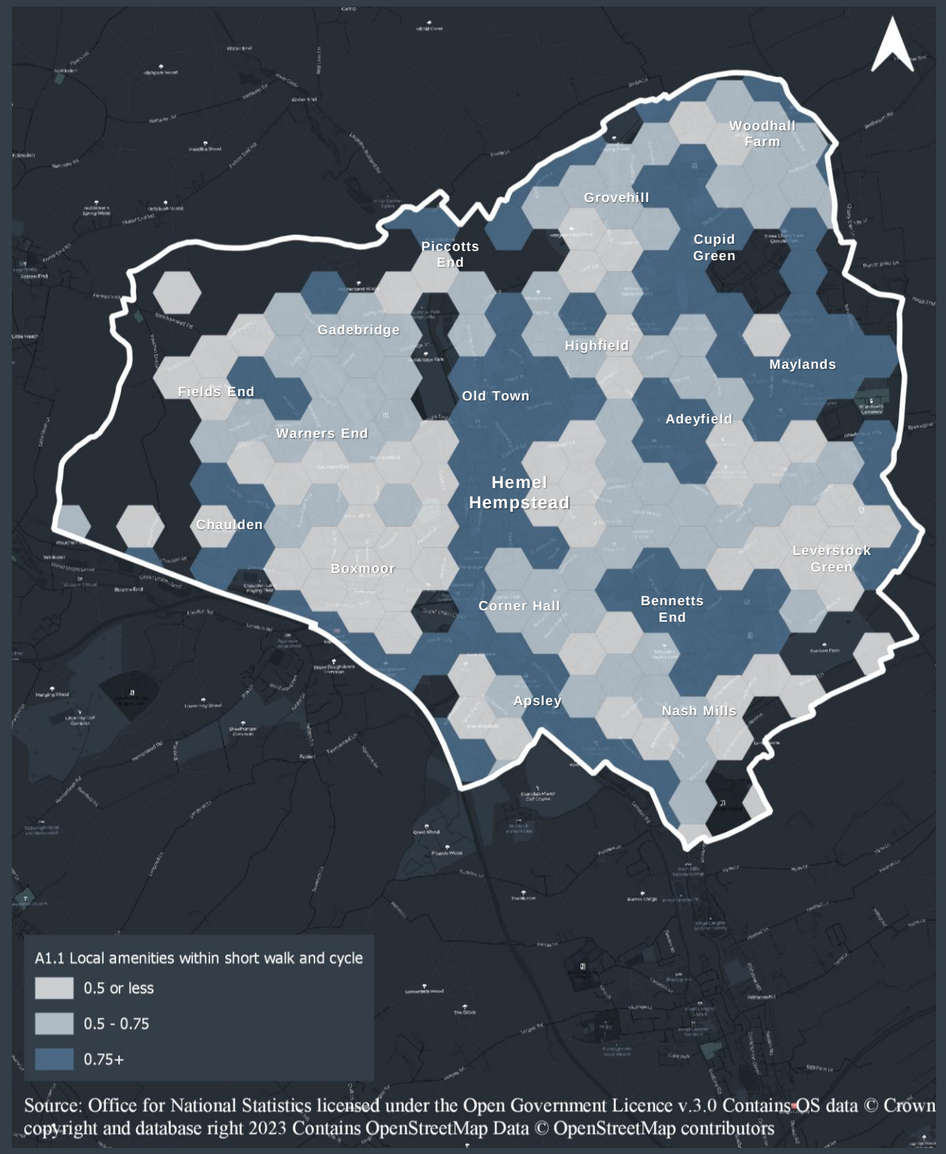
Avoid trips

Land use planning
Local amenities within short walk and cycle

The 15-minute neighbourhood aims to minimize the need to travel by ensuring that all services and activities are provided within walking or cycling distance. This concept seeks to achieve a mixed land use by adapting existing communities.

Key findings – Blue coloured hexes show where new local amenities need to be added to unlock the potential. So, Maylands, Cupid Green, Adeyfield and Bennetts End have the highest score for this intervention followed by the corridor between Old Town, the centre, Corner Hall, and Apsley.

Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use	Floorspace of non-residential land use (Valuations Office Agency)	Number of amenities in area Number of amenities that can be reached within a 15 & 30 minute walk
Behaviours / perceptions	Transport asset ownership (bike/scooter)	Transport asset ownership (car/van, motorcycle)
Current travel patterns	Proportion of walking / cycling trips	
Modal shift potential	Opportunity to shift to walking / cycling Propensity to shift to walking / cycling	Propensity to use car



Appendix C1 Land use planning – Local amenities within short walk and cycle

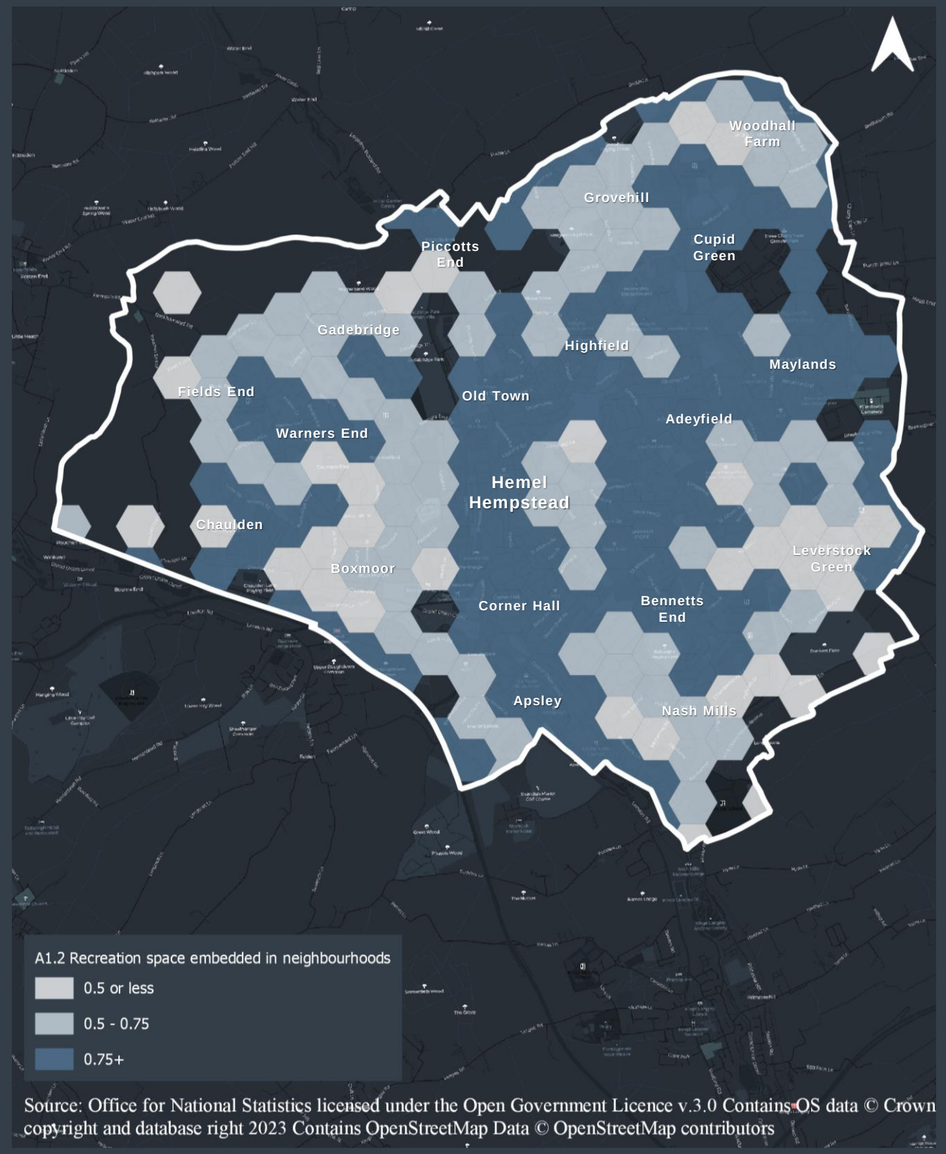
Avoid trips

Land use planning
Recreation space embedded in neighbourhoods

The presence of recreational spaces is anticipated to shift away from car-centric design, boost natural carbon absorption within urban areas, and moderately decrease the need for travel in pursuit of leisure activities.

Key Findings – Blue coloured hexes show where new recreation spaces need to be added to unlock the potential. So, Maylands, Cupid Green, Adeyfield, and Bennetts End have the highest score for this intervention followed by the corridor between Old Town, the centre, Corner Hall, and Apsley.

Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use		Number of amenities in area Number of amenities that can be reached within a 15 & 30 minute walk
Behaviours / perceptions	Transport asset ownership	
Current travel patterns	Proportion of walking / cycling trips	
Modal shift potential	Opportunity to shift to walking / cycling Propensity to shift to walking / cycling	Propensity to use car



Appendix C2 Land use planning – Recreation space embedded in neighbourhoods

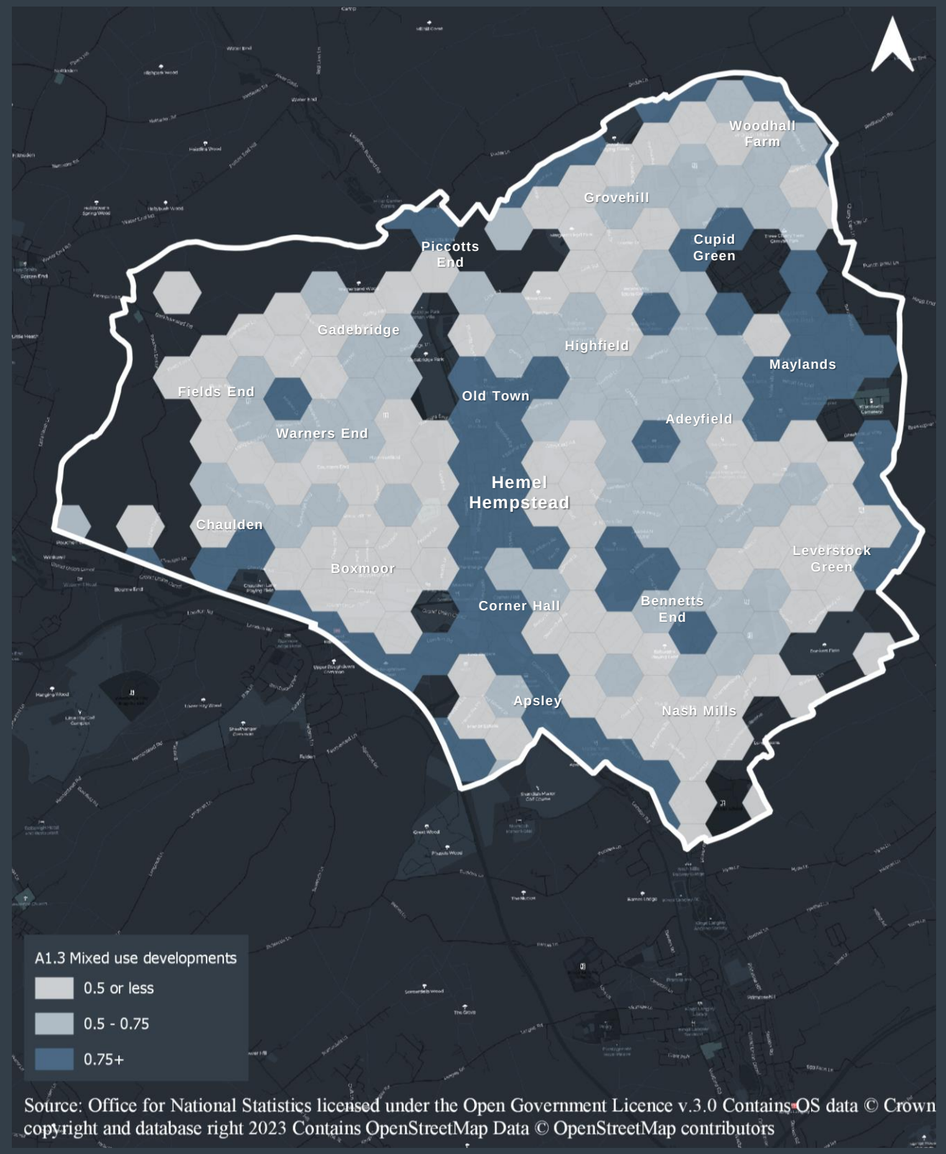
Avoid trips

Land use planning
Mixed use developments

Mixed use planning with a combination of land use planning, transit-oriented development (TOD) and restricting access to private vehicles are likely to be the key to achieve net zero by design.

Key Findings – Blue coloured hexes show where mixed use developments need to be adopted to unlock the potential. So, Maylands, Cupid Green, and Bennetts End have the highest score for this intervention followed by the corridor between Old Town, the centre, Corner Hall, and Apsley.

Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use	Floorspace of non-residential land use (Valuations Office Agency)	Number of amenities in area Number of amenities that can be reached within a 15 & 30 minute walk Number of amenities that can be reached within 30-minute PT journey
Infrastructure		Bus stop / rail station access
Behaviours / perceptions		Transport asset ownership
Current travel patterns	Proportion of walking / cycling trips Proportion of bus / rail trips	
Modal shift potential	Opportunity to shift to walking / cycling / PT Propensity to shift to walking / cycling / PT	Propensity to use car



Appendix C3 Land use planning – Mixed use developments

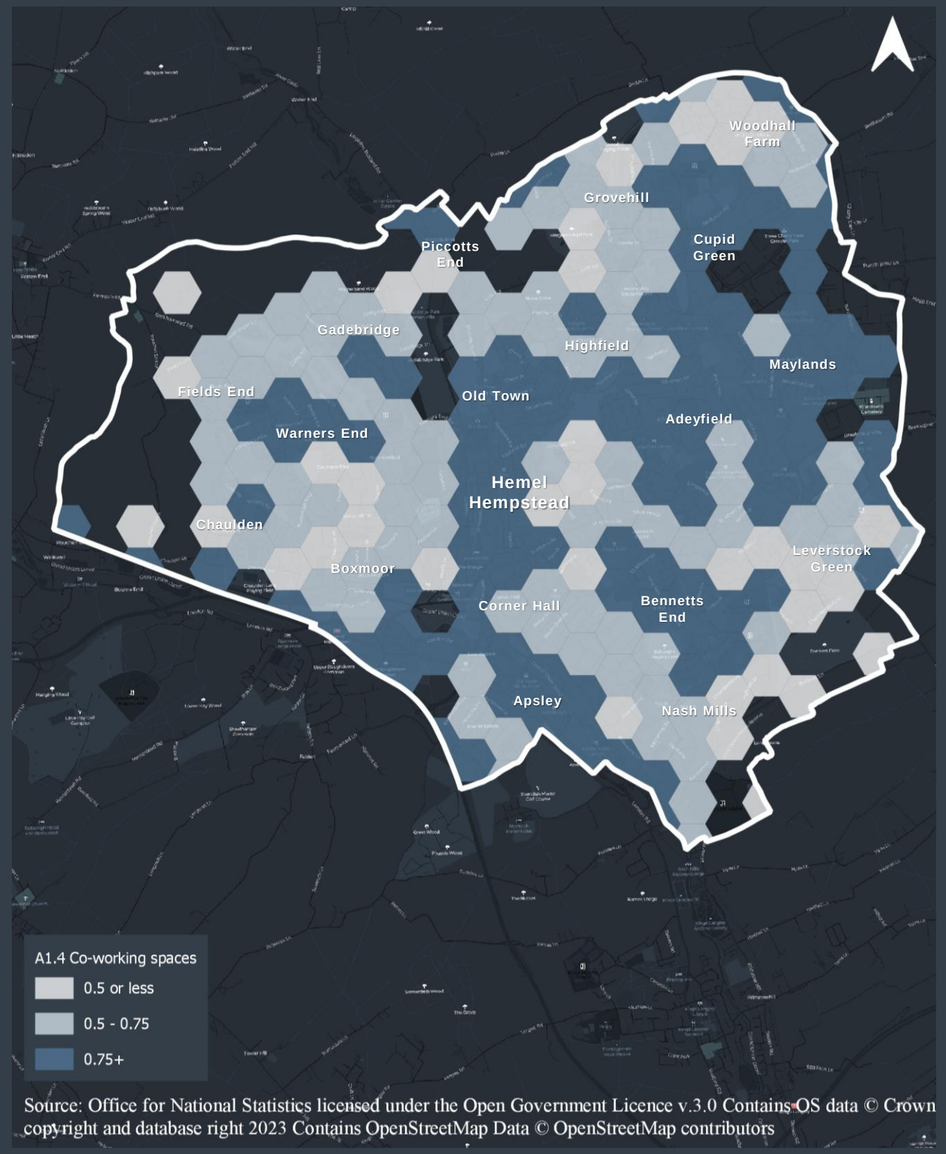
Avoid trips

Land use planning
Co-working spaces

Co-working spaces are instrumental in promoting a permanent shift towards working in local area. They have the potential to decrease the necessity for commuting, thereby inducing local trips.

Key Findings – Blue coloured hexes show where co-working spaces need to be added to unlock the potential. So, Maylands, Cupid Green, Adeyfield and Bennetts End have the highest score for this intervention followed by the corridor between Old Town, the centre, Corner Hall, and Apsley.

Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use		Number of amenities in area Number of amenities that can be reached within a 15 & 30 minute walk Number of amenities that can be reached within 30 minute PT journey
Modal shift potential	Opportunity to shift to walking / cycling / PT Propensity to shift to walking / cycling / PT	Propensity to use car



Appendix C4 Land use planning – Co-working spaces

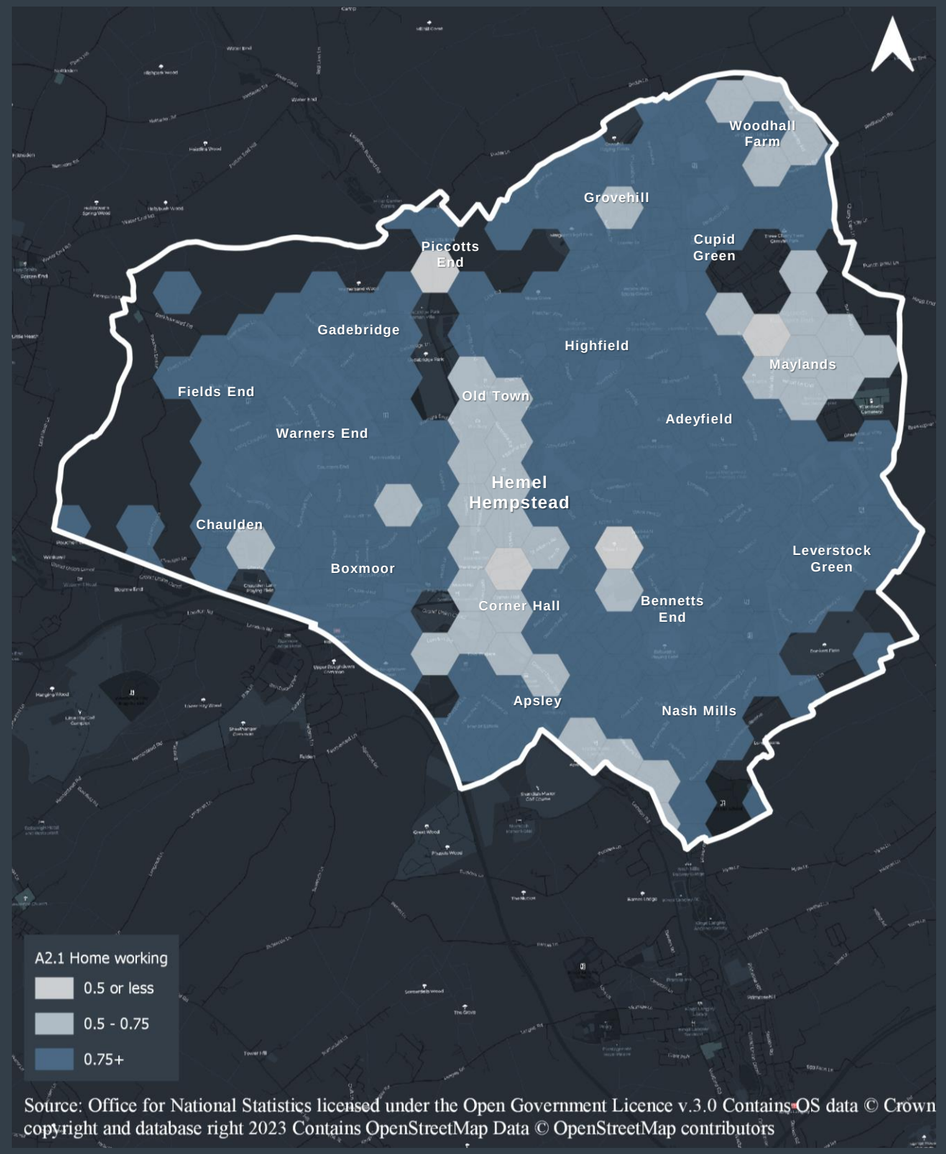
Avoid trips

IT infrastructure
Home working

Home working offers a significant opportunity to reduce carbon emissions from commuting. To fully capitalise on these environmental benefits, initiatives should be integrated with strategies addressing land use and energy efficiency.

Key findings – Blue coloured hexes show where working home approach is crucial to unlock the potential. So, most regions have received the highest scores, except for the centre of Hemel Hempstead and Maylands, due to their higher concentration of commercial/business activities.

Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use		Number of amenities in area Number of amenities that can be reached within a 15 & 30 minute walk Number of amenities that can be reached within 30 minute PT journey
Infrastructure		Broadband speed
Current travel patterns	Proportion of car trips	



Appendix C5 IT infrastructure – Home working

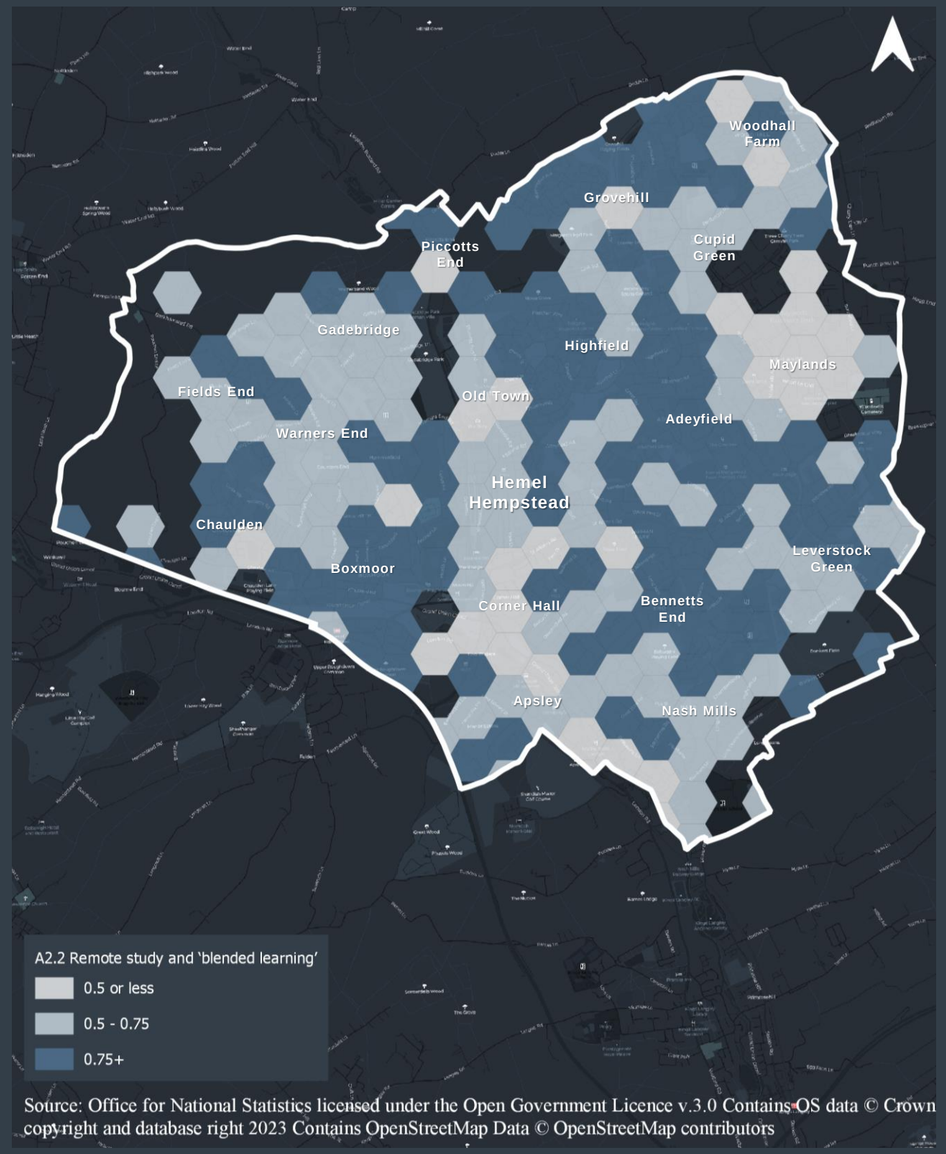
Avoid trips

IT infrastructure
Remote study and 'blended learning'

Remote study and 'blended learning' models have emerged as transformative approaches in education. These methods not only offer flexibility and accessibility but also hold the potential to reduce carbon emissions associated with traditional commuting.

Key findings – Blue coloured hexes show where remore study and blended learning approach is crucial to unlock the potential. So, Highfield, Adeyfield, Leverstock Green, and Bennetts End have the highest score for this intervention followed by Boxmoor.

Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use		Number of amenities in area Number of amenities that can be reached within a 15 & 30 minute walk Number of amenities that can be reached within 30 minute PT journey
Infrastructure		Broadband speed
Current travel patterns	Proportion of car trips	



Appendix C6 IT infrastructure – Remote study and 'blended learning'

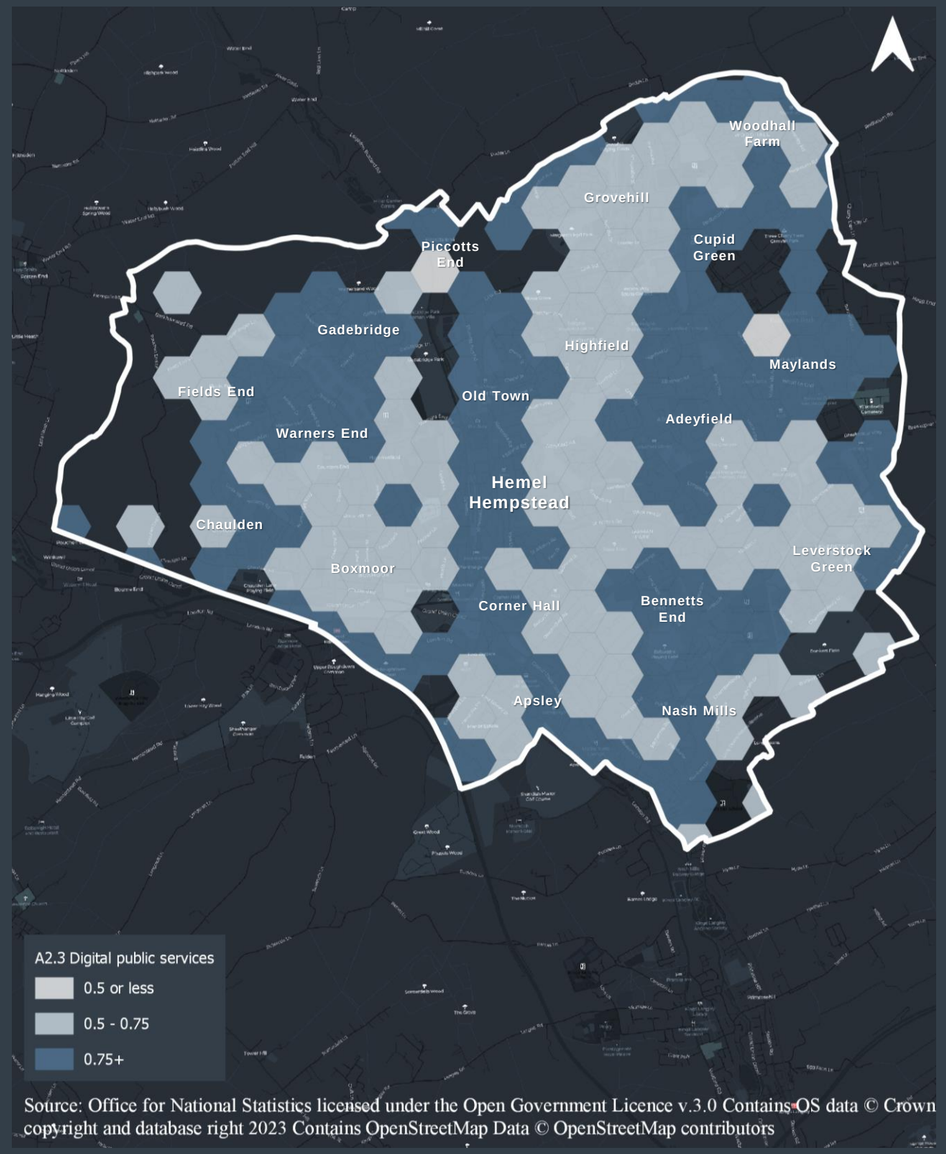
Avoid trips

IT infrastructure
Digital public services

The digitalisation of public services represents a transformative shift with the potential to greatly improve efficiency and reduce carbon emissions. To fully realise these environmental benefits, it is imperative to integrate digital public services with initiatives focused on sustainable land use and energy efficiency.

Key findings – Blue coloured hexes show where digital public services need to be adopted to unlock the potential. So, Maylands, Cupid Green, Adeyfield, and Bennetts End in the east, Gadebridge and Warners End in the west have the highest score for this intervention followed by the corridor between Old Town, the centre, Corner Hall, and Apsley.

Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use		Number of amenities in area Number of amenities that can be reached within a 15 & 30 minute walk Number of amenities that can be reached within 30 minute PT journey
Infrastructure		Broadband speed]
Behaviours / perceptions	Proportion of households receiving parcel / takeaway / groceries deliveries Location of deliveries	Transport asset ownership
Current travel patterns	Proportion of walking / cycling trips Proportion of car trips	



Appendix C7 IT infrastructure – digital public services

APPENDIX D
SHIFT modes interventions score

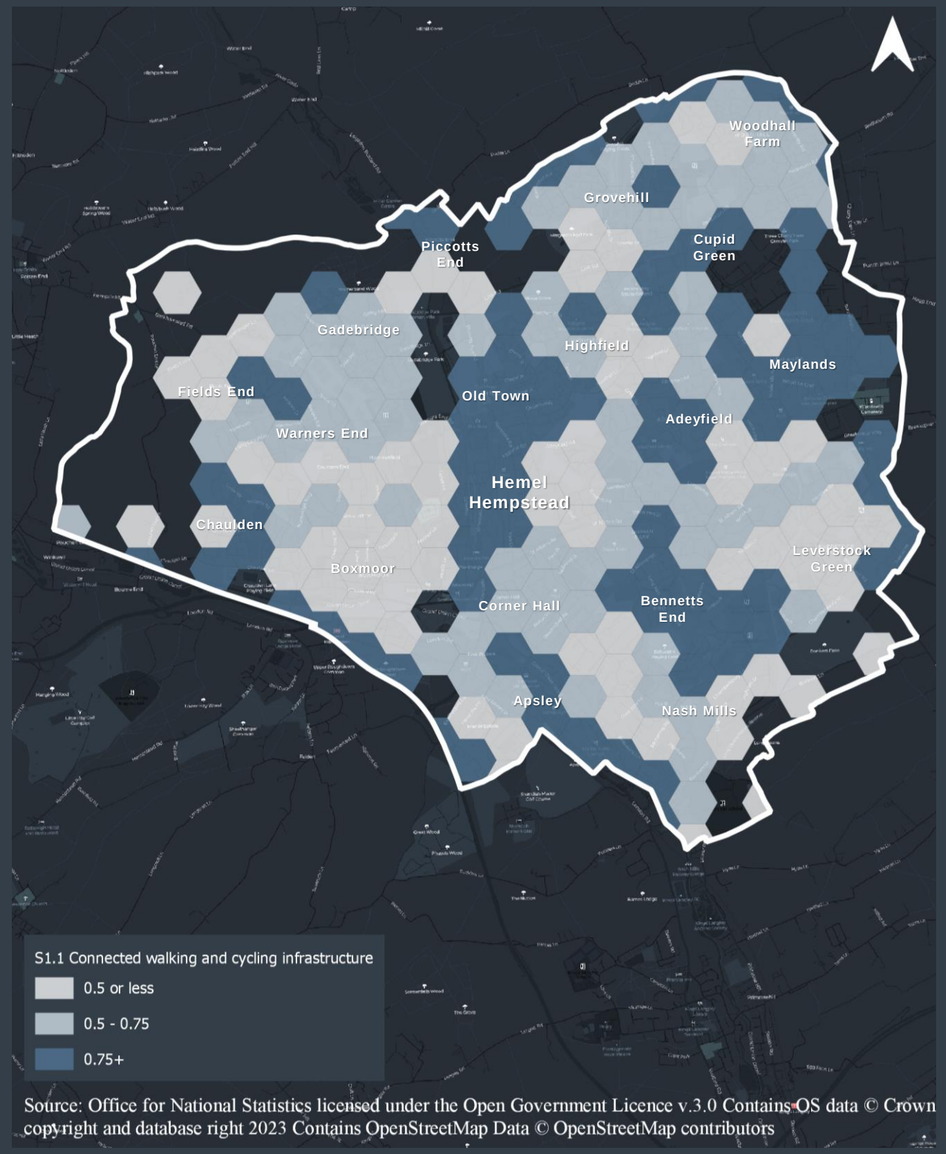
Shift modes

Active travel infrastructure
Connected walking and cycling infrastructure

A safe, separated cycling infrastructure, linking to public transport networks are the key influencing factors of cycling propensity. A walkable environment plays a vital role in promoting active transportation.

Key findings – The blue-coloured hexes highlight the areas where developing connected walking and cycling infrastructure is key to unlocking their potential. So, Maylands, Cupid Green, Adeyfield, and Bennetts End have the highest score for this intervention, closely followed by the corridor between Old Town, the centre, Corner Hall, and Apsley.

Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use	Floorspace of non-residential land use (Valuations Office Agency)	
Infrastructure	Road safety (KSIs)	Length of national cycle network Length of cycle path Length of 20mph street
Behaviours / perceptions	Transport asset ownership (bike/scooter) Shared mobility usage / experience / perceptions Proportion of households reliant on on-street parking	Transport asset ownership (can/van, motorcycle)
Current travel patterns	Proportion of walking / cycling trips	
Modal shift potential	Opportunity to shift to walking / cycling Propensity to shift to walking / cycling	



Appendix D1 Active travel infrastructure – connected walking and cycling infrastructure

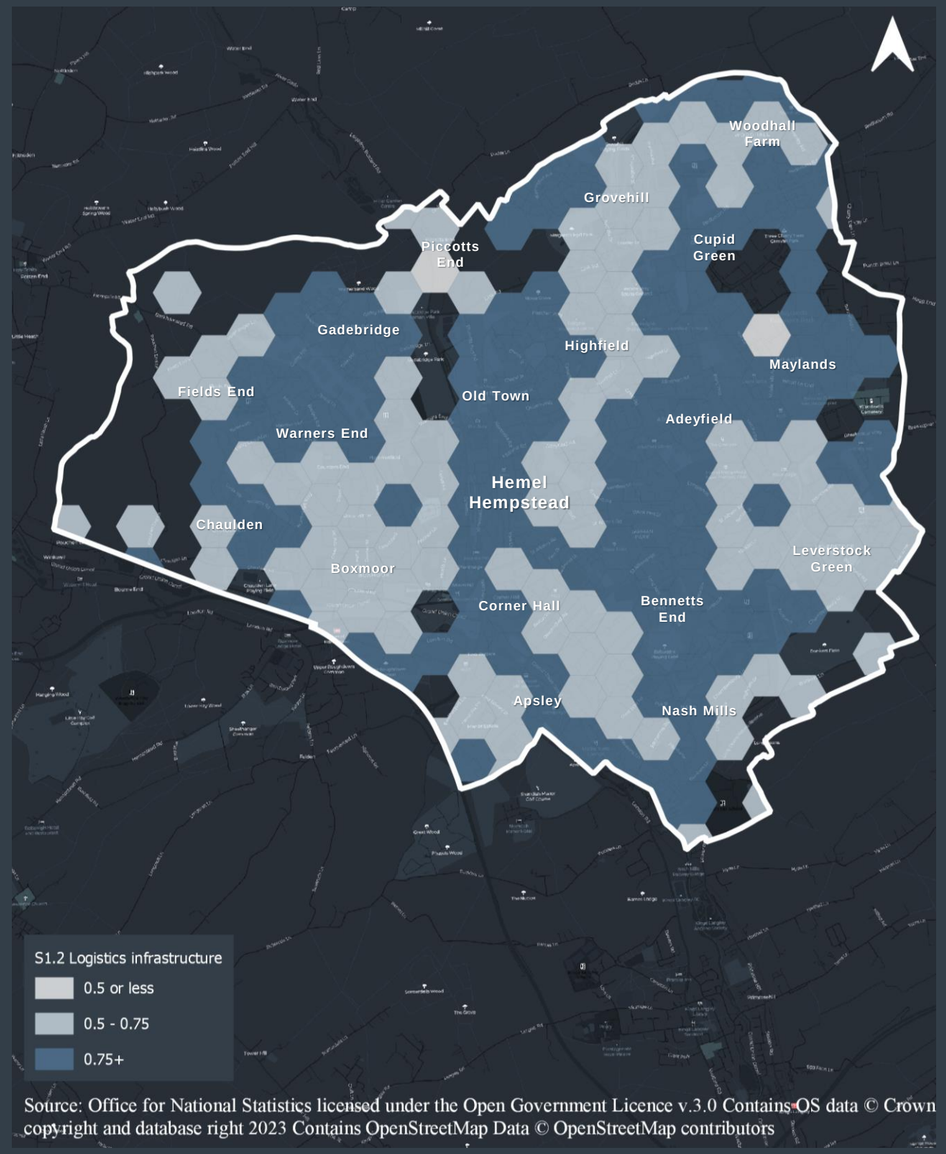
Shift modes

Active travel infrastructure
Logistics infrastructure

Integrating active travel infrastructure with logistics networks presents a promising avenue for advancing sustainable mobility. By seamlessly connecting pedestrian and cycling pathways with efficient logistics systems, we can create a more environmentally-friendly and streamlined transport ecosystem. This synergy has the potential to not only reduce carbon emissions but also enhance overall urban accessibility and efficiency.

Key findings – The blue-coloured hexes highlight the areas where developing logistics infrastructure is key to unlocking their potential. So, the corridor between Maylands, Cupid Green, Adeyfield, Bennetts End and Nash Mills have the highest score for this intervention, closely followed by the corridor between Old Town, the centre, Corner Hall, and Apsley.

Criteria type	Factors contributing to the need	Factors reducing the need
Behaviours / perceptions	Proportion of households receiving parcel / takeaway / groceries deliveries Location of deliveries Proportion of households reliant on on-street parking	
Current travel patterns	Proportion of walking / cycling trips Proportion of car trips	



Appendix D2 Active travel infrastructure – Logistics infrastructure

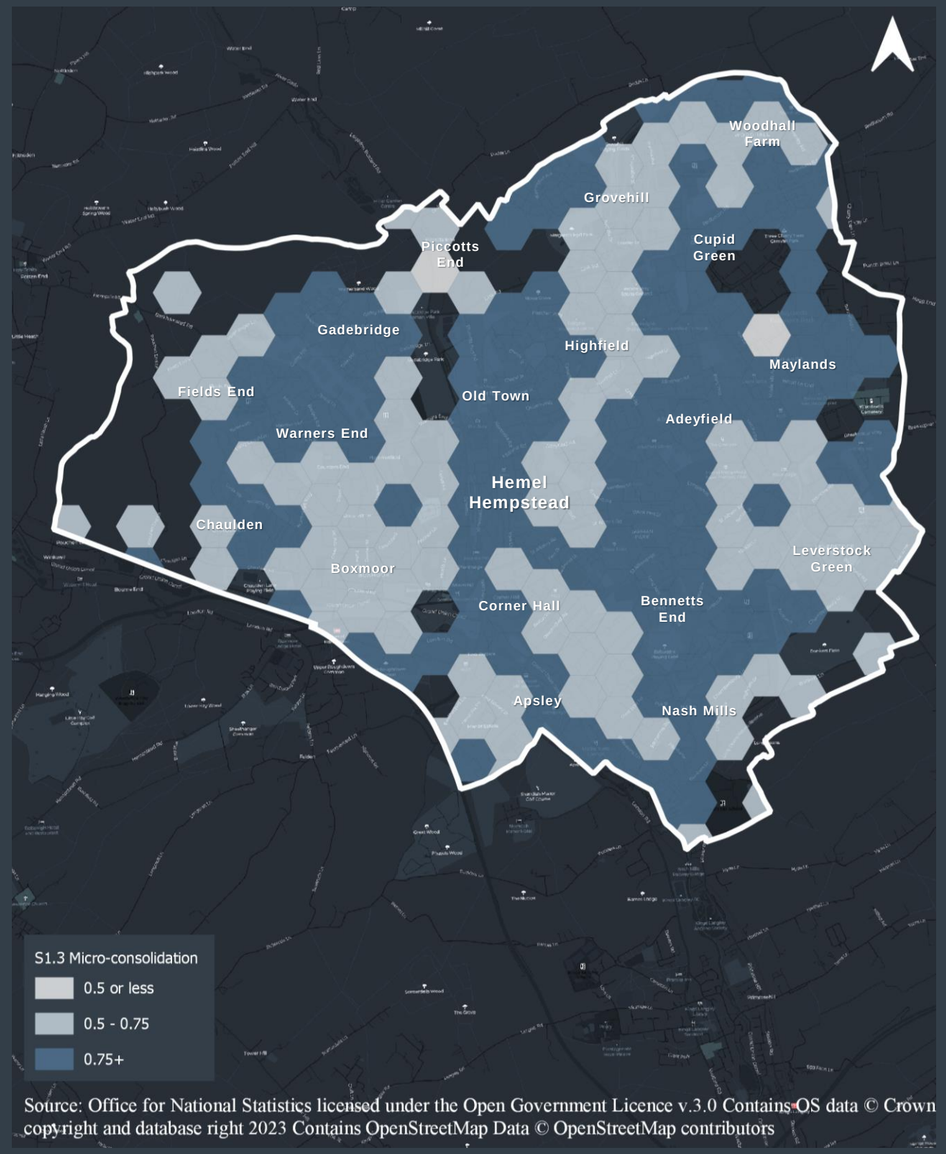
Shift modes

Active travel infrastructure
Micro-consolidation

Micro-consolidations use low carbon options for last mile deliveries and have the higher potential to reduce carbon emissions associated with the use of LGV's/motorised trips. They also have positive impact on trips and vehicle miles.

Key findings – The blue-coloured hexes highlight the areas where developing micro-consolidation is key to unlocking their potential. So, the corridor between Maylands, Cupid Green, Adeyfield, Bennetts End and Nash Mills have the highest score for this intervention, closely followed by the corridor between Old Town, the centre, Corner Hall, and Apsley.

Criteria type	Factors contributing to the need	Factors reducing the need
Behaviours / perceptions	Proportion of households receiving parcel / takeaway / groceries deliveries Location of deliveries Proportion of households reliant on on-street parking	
Current travel patterns	Proportion of walking / cycling trips Proportion of car trips	



Appendix D3 Active travel infrastructure – Micro-consolidation

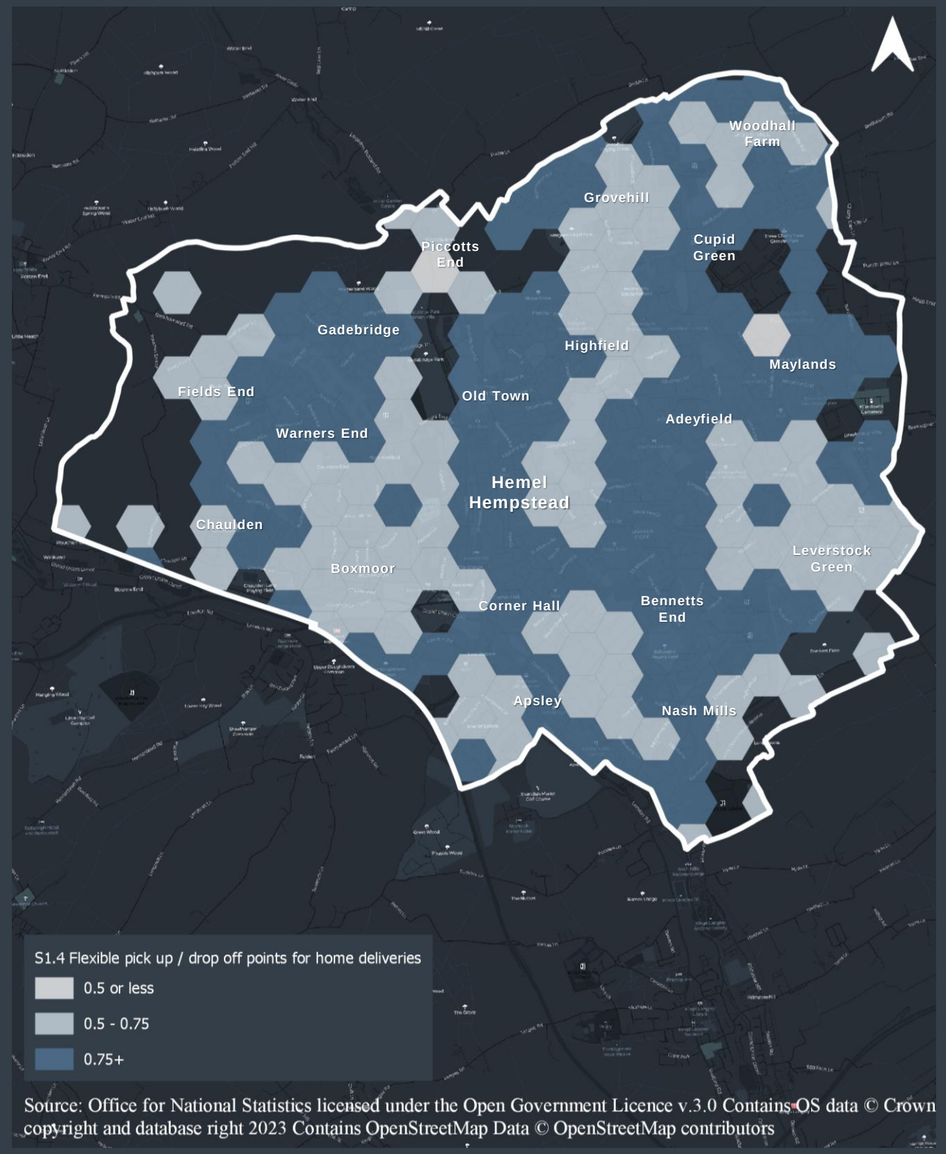
Shift modes

Active travel infrastructure
Flexible pick up / drop off points for home deliveries

Parcel pickup points would transform the last legs of a journey into a walking trip instead of delivering items directly to the customer's doorstep. This approach could potentially save multiple short travel legs, as a single drop-off can suffice instead of several.

Key Findings – The blue-coloured hexes highlight the areas where developing logistics infrastructure is key to unlocking their potential. So, the corridor between Maylands, Cupid Green, Adeyfield, Bennetts End and Nash Mills have the highest score for this intervention, closely followed by the corridor between Old Town, the centre, Corner Hall, and Apsley.

Criteria type	Factors contributing to the need	Factors reducing the need
Behaviours / perceptions	Transport asset ownership Shared mobility usage / experience / perceptions Bus stop / rail station access Proportion of households receiving parcel / takeaway / groceries deliveries Location of deliveries Proportion of households reliant on on-street parking	
Current travel patterns	Proportion of walking / cycling trips Proportion of bus / rail trips Proportion of car trips	
Modal shift potential	Opportunity to shift to walking / cycling / PT Propensity to shift to walking / cycling / PT Estimated EV uptake (2030)	



Appendix D4 Active travel infrastructure – Flexible pick up / drop off points for home deliveries

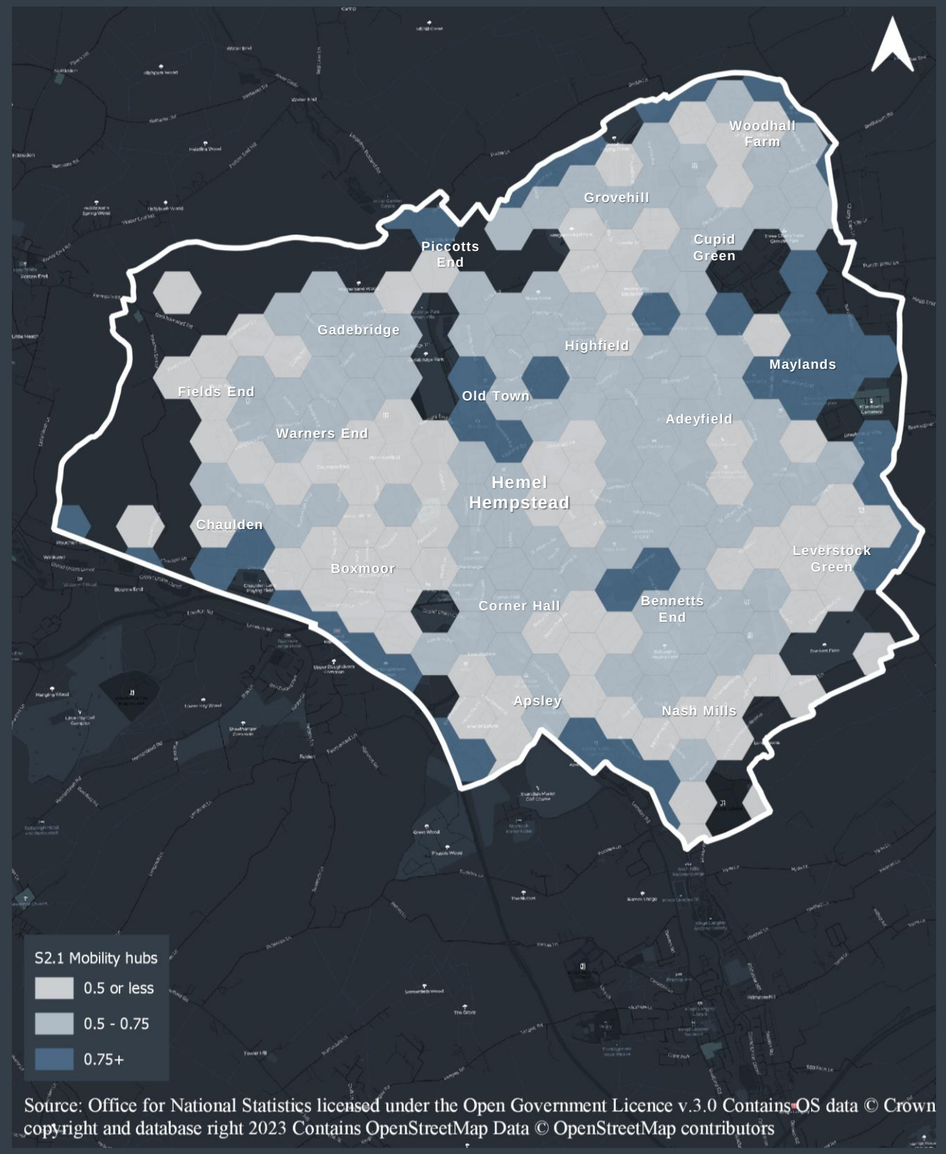
Shift modes

Shared mobility
Mobility hubs

Shared mobility and mobility hubs represent a promising approach to fostering sustainable transport. By encouraging the use of shared modes of transport and providing centralized access points, we can significantly reduce individual vehicle emissions.

Key Findings – The blue-coloured hexes highlight the areas where developing mobility hubs is key to unlocking their potential. So, Maylands, Old Town, and Bennetts End have the highest score for this intervention.

Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use	Number of amenities that can be reached within 30 minute PT journey	
Infrastructure	Length of national cycle network Length of cycle path Length of 20mph street Bus stop / rail station access	Number of EV charging points in area
Behaviours / perceptions	Transport asset ownership (bike/scooter) Shared mobility usage / experience / perceptions Bus stop / rail station access Proportion of households reliant on on-street parking	Transport asset ownership (car/van, motorcycle)
Current travel patterns	Proportion of walking / cycling trips Proportion of bus / rail trips	
Modal shift potential	Opportunity to shift to walking / cycling / PT Propensity to shift to walking / cycling / PT Estimated EV uptake (2030)	



Appendix D5 Shared mobility – Mobility hubs

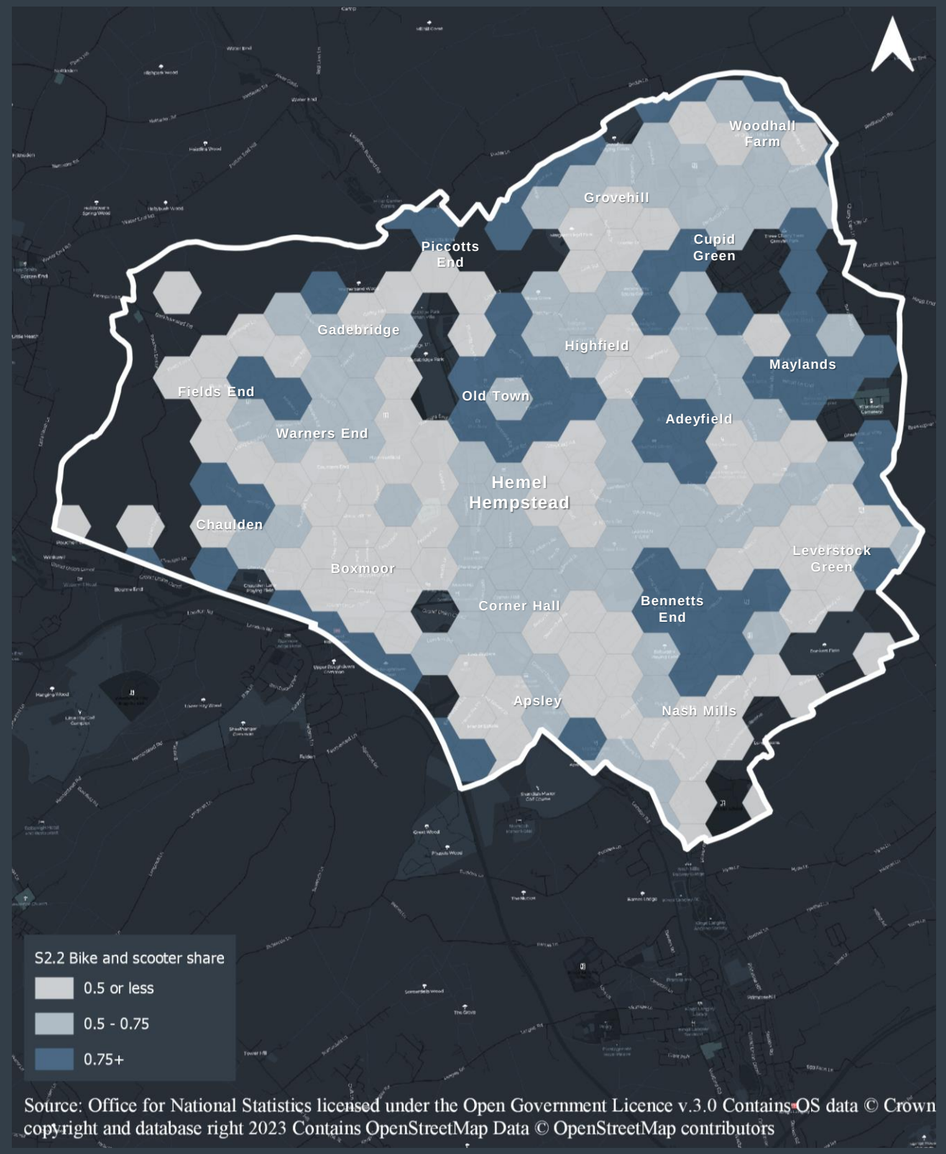
Shift modes

Shared mobility
Bike and scooter share

Bike and scooter sharing plays a vital role in reducing personal driving and taxi use by providing users access to a bike from multiple locations. It is also more likely to act as a substitute for public transport trips in larger and dense cities.

Key Findings – The blue-coloured hexes highlight the areas where implementing bike and scooter share systems is key to unlocking their potential. So, Maylands, Cupid Green, Adeyfield, and Bennetts End have the highest score for this intervention, closely followed by Old Town, Fields End and Warners End.

Criteria type	Factors contributing to the need	Factors reducing the need
Infrastructure	Length of national cycle network Length of cycle path Length of 20mph street Bus stop / rail station access	
Behaviours / perceptions	Transport asset ownership (bike/scooter) Shared mobility usage / experience / perceptions Proportion of households reliant on on-street parking	Transport asset ownership (car/van, motorcycle)
Current travel patterns	Proportion of cycling trips	
Modal shift potential	Opportunity to shift to walking / cycling Propensity to shift to walking / cycling	



Appendix D6 Shared mobility – Bike and scooter share

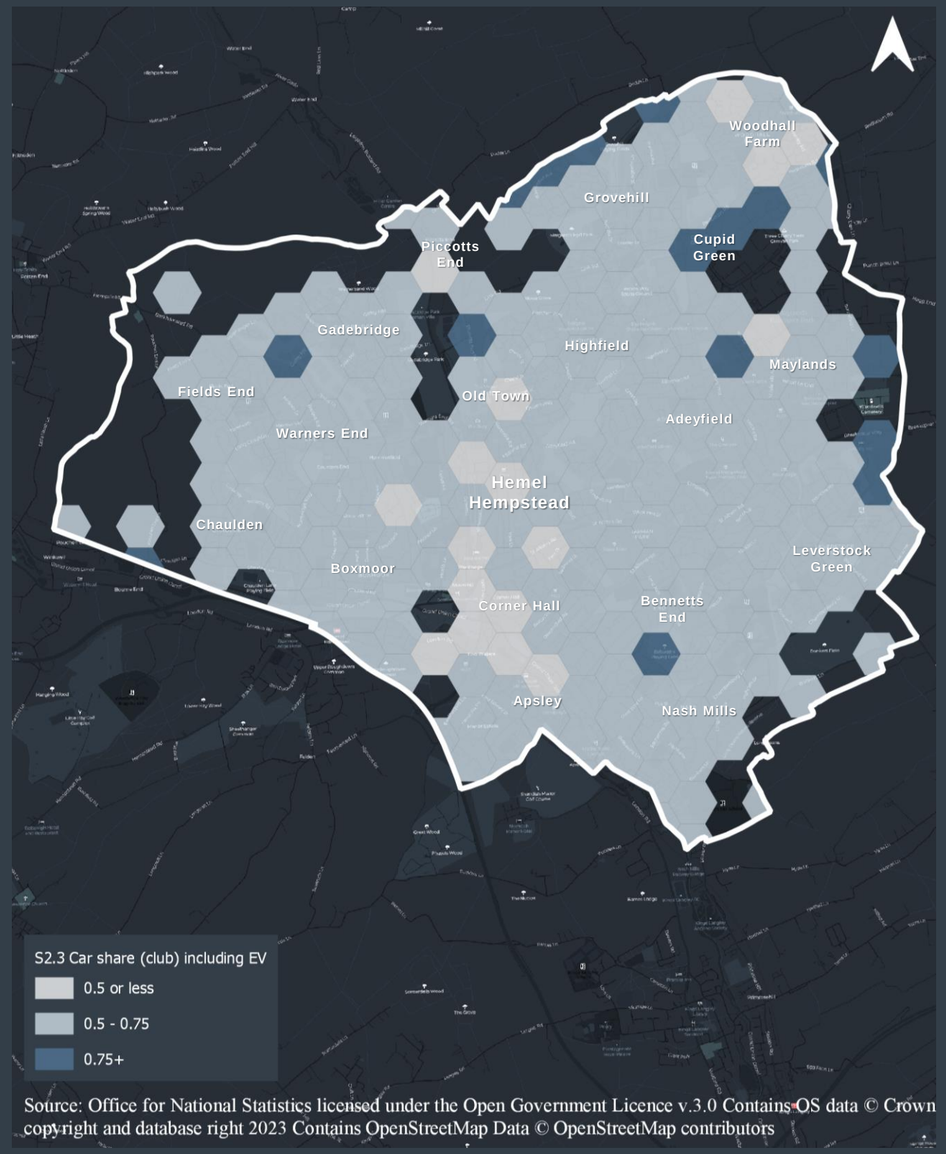
Shift modes

Shared mobility
Car share (club) including EV

Car clubs provide individuals, who are considering giving up car ownership, occasional access to a vehicle. These clubs also offer electric cars, which not only emit zero tailpipe emissions but contribute to promoting the adoption of low-carbon vehicles.

Key Findings – The blue-coloured hexes highlight the areas where implementing car clubs is key to unlocking their potential. Some spots in Maylands, Cupid Green, Old Town, and Gadebridge have the highest score for this intervention, closely followed by Bennetts End.

Criteria type	Factors contributing to the need	Factors reducing the need
Infrastructure	Number of EV charging points in area	
Behaviours / perceptions	Shared mobility usage / experience / perceptions Proportion of households reliant on on-street parking	Transport asset ownership (car/van, motorcycle)
Current travel patterns	Proportion of car trips	
Modal shift potential	Propensity to use car	



Appendix D7 Shared mobility – Car share (club) including EV

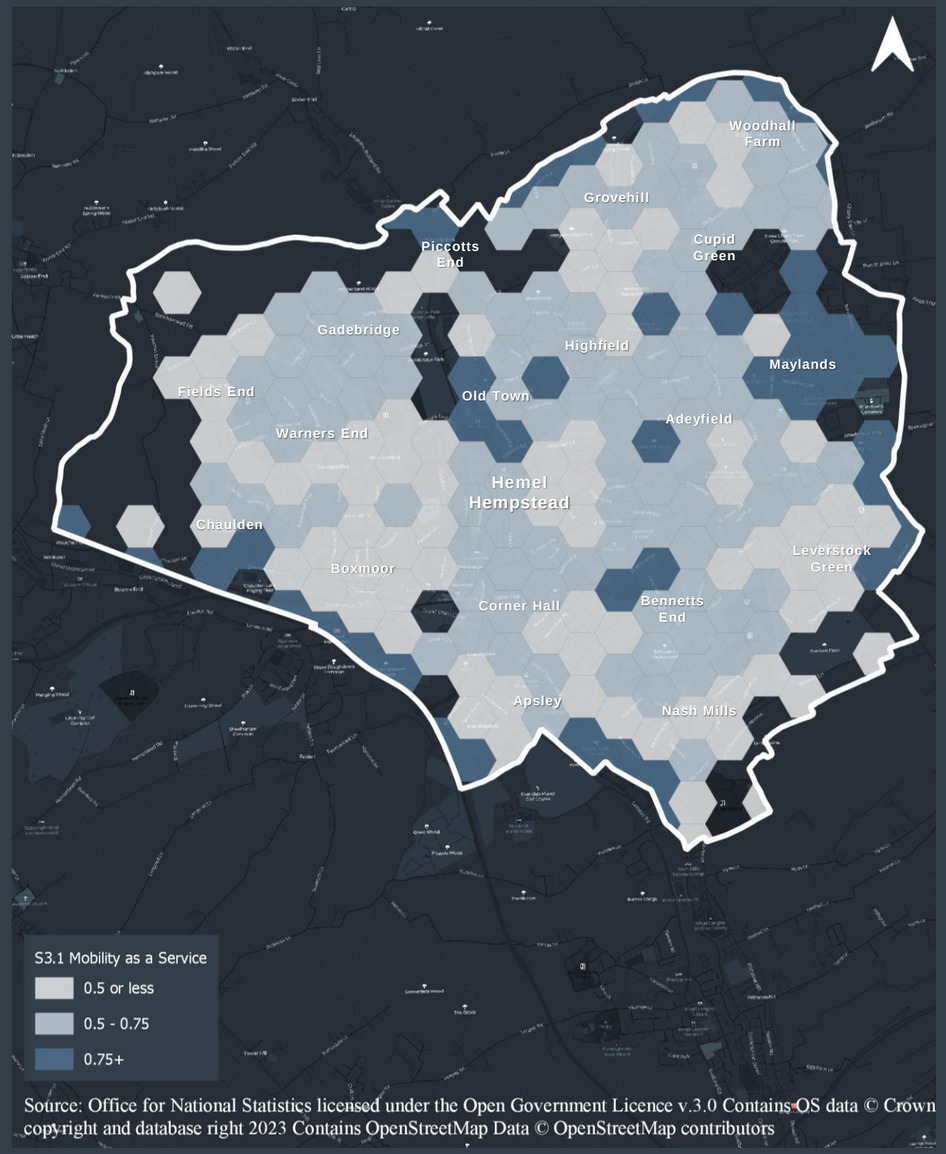
Shift modes

Modern public transport
Mobility as a Service

MaaS has the potential to revolutionize urban mobility. It not only enhances accessibility but also contributes significantly to reducing individual car ownership and reliance on fossil-fuel-driven vehicles.

Key findings – The blue-coloured hexes highlight the areas where implementing mobility as a service is key to unlocking their potential. Some spots in Maylands, Adeyfield, Highfield, and Old Town have the highest score for this intervention, closely followed by Bennetts End.

Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use	Number of amenities that can be reached within 30 minute PT journey	
Infrastructure	Length of national cycle network Length of cycle path Length of 20mph street Bus stop / rail station access	
Behaviours / perceptions	Transport asset ownership (bike/scooter) Shared mobility usage / experience / perceptions Bus stop / rail station access	Transport asset ownership (car/van, motorcycle)
Current travel patterns	Proportion of walking / cycling trips Proportion of bus / rail trips	
Modal shift potential	Opportunity to shift to walking / cycling / PT Propensity to shift to walking / cycling / PT	



Appendix D8 Modern public transport – Mobility as a Service

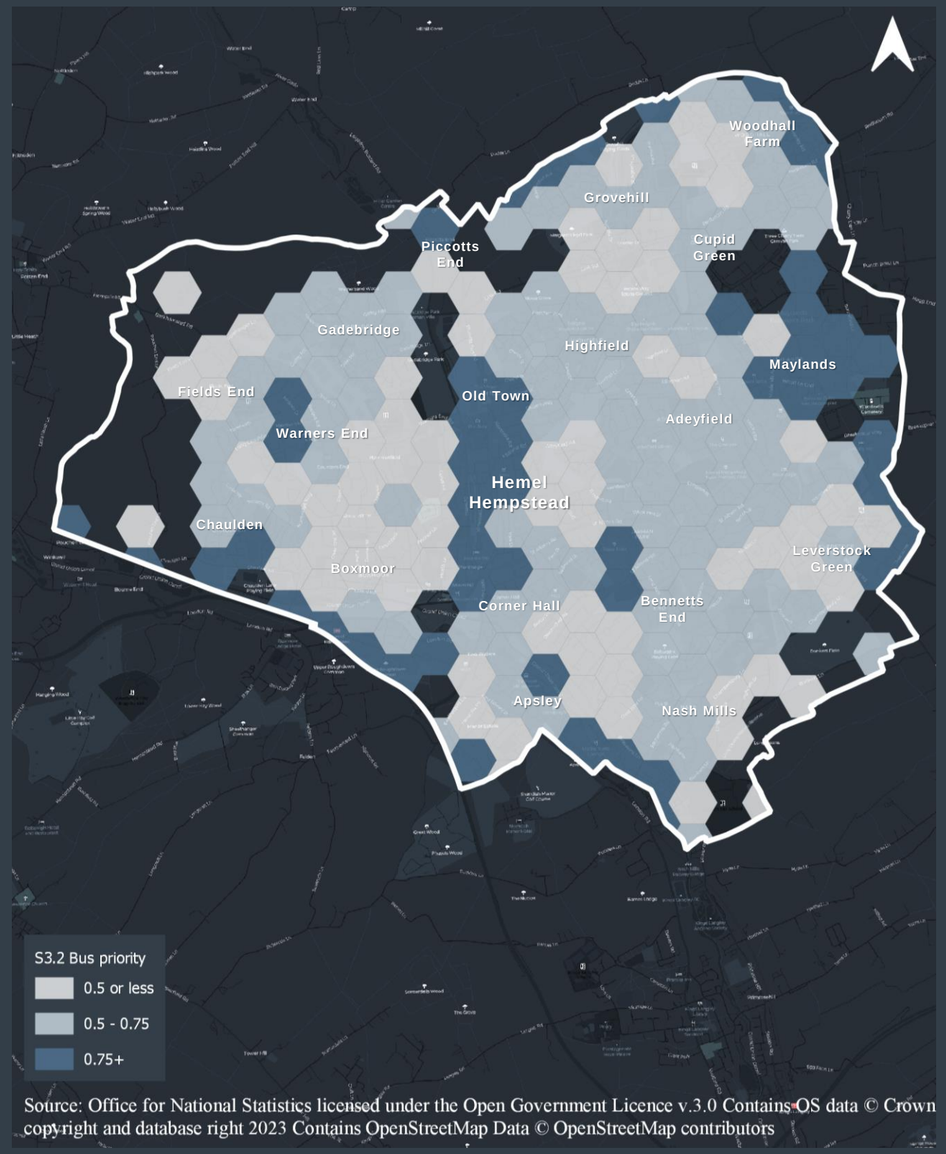
Shift modes

Modern public transport
Bus priority

By prioritising bus networks, cities can significantly improve the efficiency and attractiveness of public transport options. This not only reduces congestion but also encourages more individuals to choose eco-friendly modes of travel, thereby further contributing to a reduction in overall carbon emissions.

Key findings – The blue-coloured hexes highlight the areas where implementing bus priority is key to unlocking their potential. So, the corridor between Old Town, the centre and Corner Hall have the highest score for this intervention, closely followed by Maylands and Bennetts End.

Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use		Number of amenities that can be reached within 30 minute PT journey
Infrastructure		Bus stop / rail station access
Behaviours / perceptions	Shared mobility usage / experience / perceptions Bus stop / rail station access Proportion of households reliant on on-street parking	
Current travel patterns	Proportion of bus trips	
Modal shift potential	Opportunity to shift to PT Propensity to shift to PT	



Appendix D9 Modern public transport – Bus priority

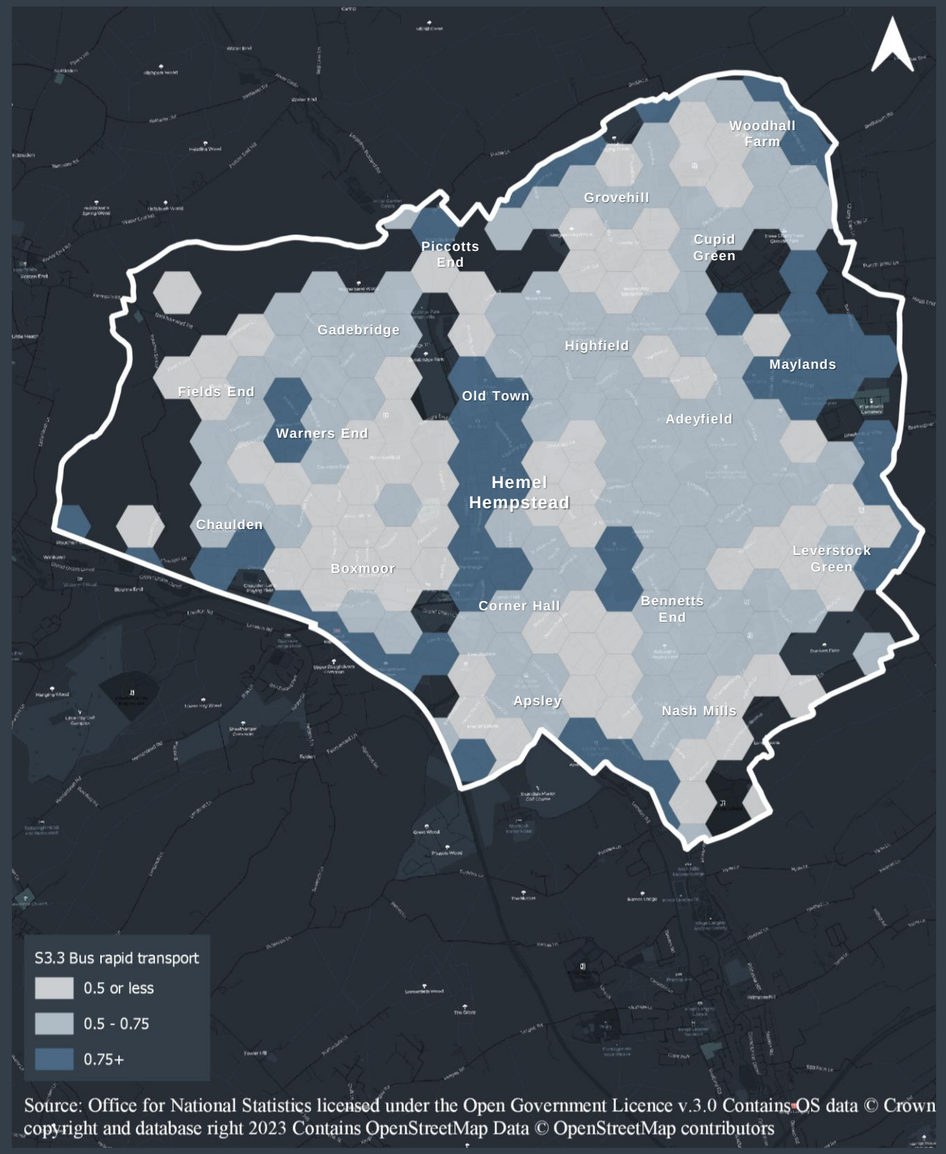
Shift modes

Modern public transport
Bus rapid transport

BRT has the potential to entice a significant number of private vehicle users to change mode choice and can attract many passengers if travel time reductions are sufficiently high.

Key findings – The blue-coloured hexes highlight the areas where implementing bus priority is key to unlocking their potential. So, the corridor between Old Town, the centre and Corner Hall have the highest score for this intervention, closely followed by Maylands and Bennetts End.

Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use	Number of amenities that can be reached within 30 minute PT journey	
Infrastructure	Bus stop / rail station access	
Behaviours / perceptions	Shared mobility usage / experience / perceptions Proportion of households reliant on on-street parking	
Current travel patterns	Proportion of bus trips	
Modal shift potential	Opportunity to shift to PT Propensity to shift to PT	



Appendix D10 Modern public transport – Bus rapid transport

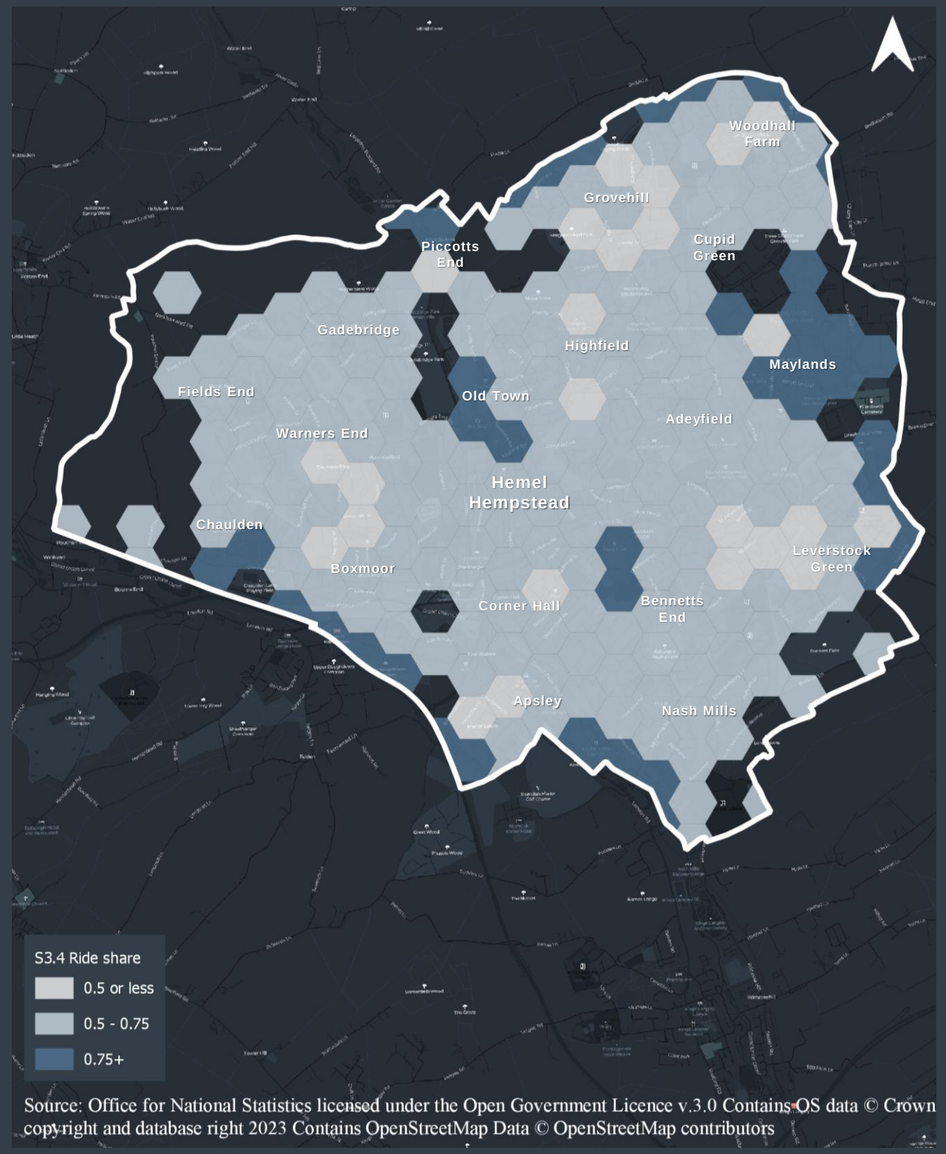
Shift modes

Modern public transport
Ride share

By promoting shared transportation solutions and investing in efficient, eco-friendly modes of public transit, we can further advance our collective efforts to mitigate environmental impact.

Key Findings – The blue-coloured hexes highlight the areas where implementing ride share systems is key to unlocking their potential. Some spots in Old Town, Maylands and Bennetts End have the highest score for this intervention.

Criteria type	Factors contributing to the need	Factors reducing the need
Infrastructure	Number of EV charging points in area	
Behaviours / perceptions	Shared mobility usage / experience / perceptions Proportion of households reliant on on-street parking	Transport asset ownership (car/van, motorcycle)
Current travel patterns	Proportion of bus / rail trips Proportion of car trips	
Modal shift potential	Propensity to use car	



Appendix D11 Modern public transport – Ride share

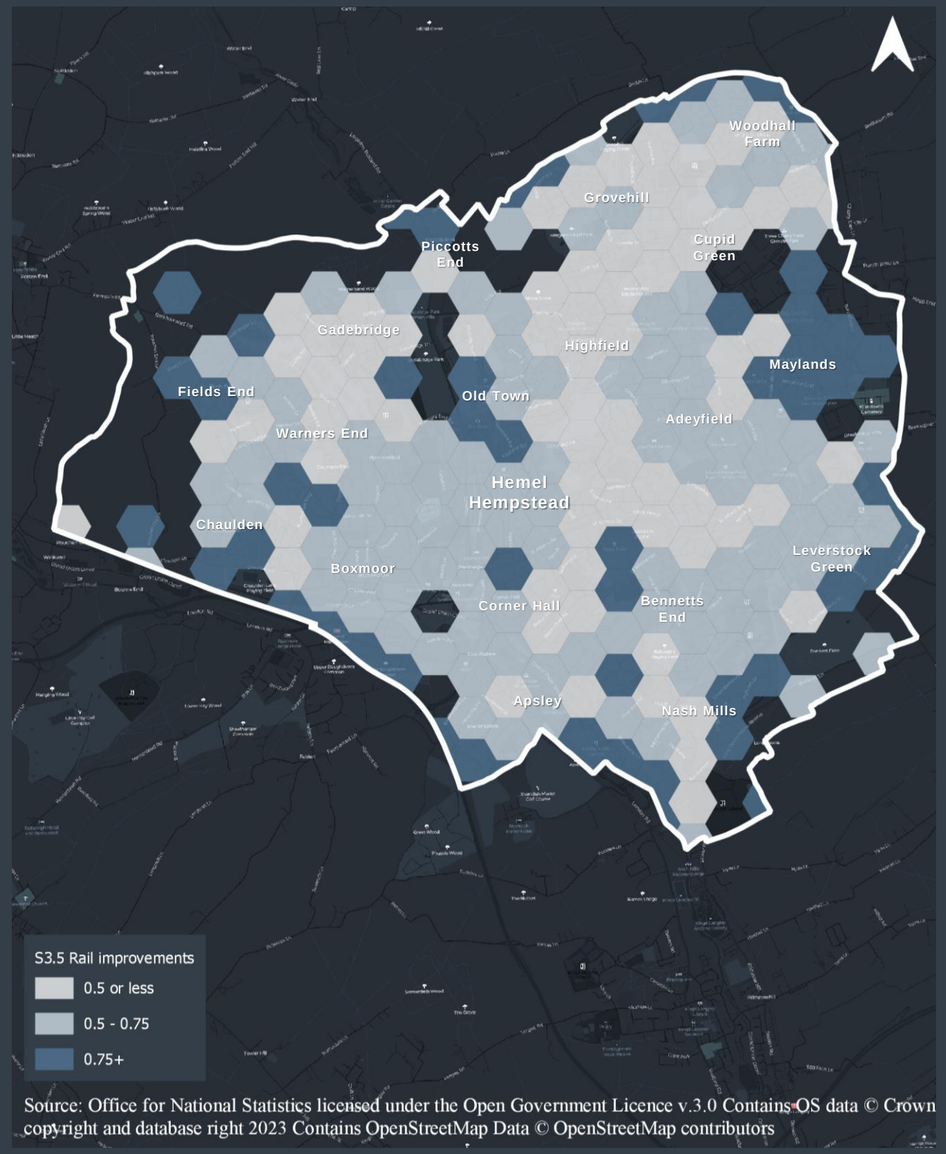
Shift modes

Modern public transport
Rail improvements

By upgrading rail networks, we can not only improve connectivity but also significantly reduce the environmental impact of commuting. These improvements in rail systems play a pivotal role in curbing carbon emissions, making public transport a more sustainable and efficient option for urban mobility.

Key Findings – The blue-coloured hexes highlight the areas where improving rail systems is key to unlocking their potential. Some spots in Old Town, Corner Hall, Nash Mills, and Bennetts End have the highest score for this intervention, closely followed by Maylands.

Criteria type	Factors contributing to the need	Factors reducing the need
Behaviours / perceptions	Shared mobility experience / perceptions	Transport asset ownership (car/van, motorcycle)
Current travel patterns	Proportion of rail trips	
Modal shift potential	Opportunity to shift to PT Propensity to shift to PT	



Appendix D12 Modern public transport – Rail improvements

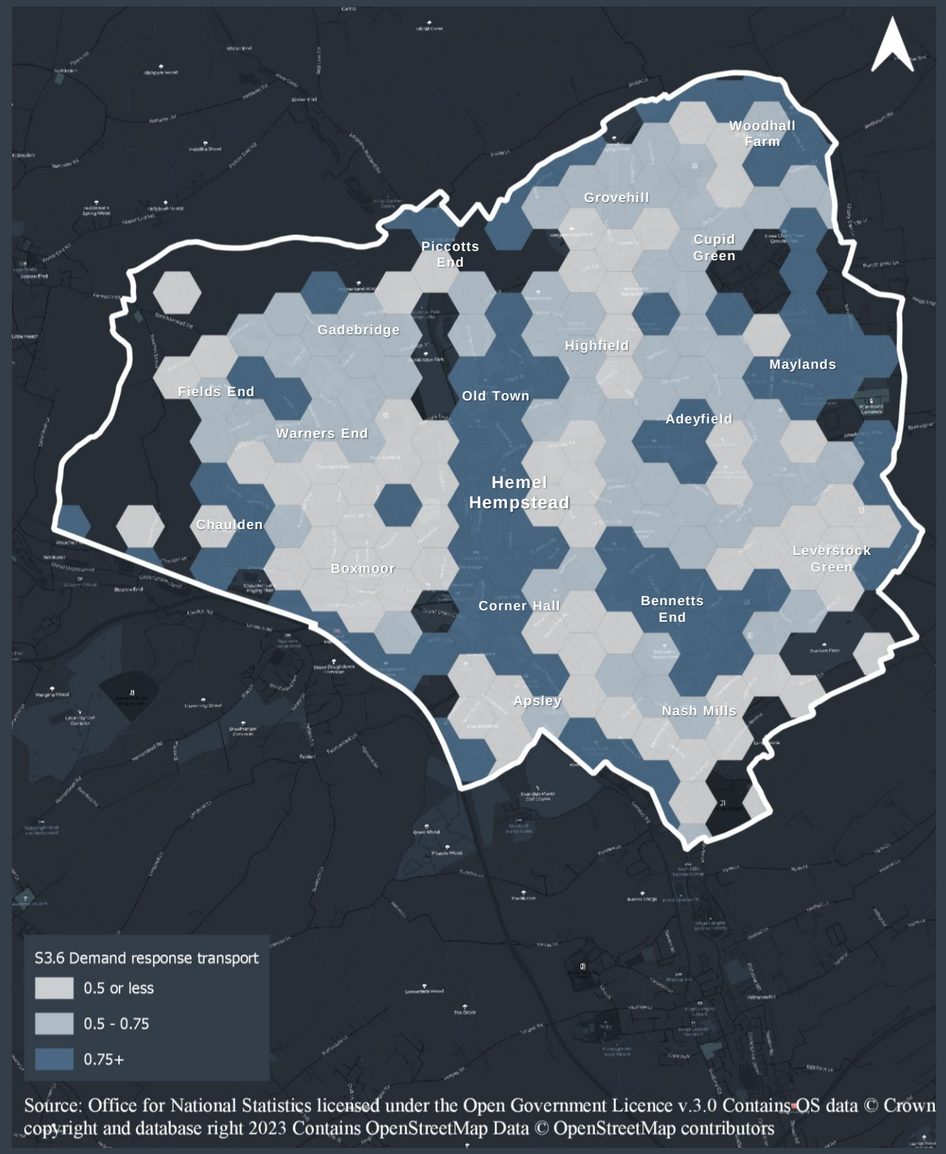
Shift modes

Modern public transport
Demand response transport

This integrated system has the potential to revolutionize urban transportation, offering flexible, efficient, and eco-friendly options for commuters. By combining the strengths of established public transit with on-demand services, we can address the diverse needs of urban populations while reducing individual carbon footprints.

Key findings – The blue-coloured hexes highlight the areas where developing demand response transport is key to unlocking their potential. So, the corridor between Old Town, the centre and Corner Hall have the highest score for this intervention, closely followed by Maylands, Adeyfield, and Bennetts End.

Criteria type	Factors contributing to the need	Factors reducing the need
Behaviours / perceptions	Shared mobility usage / experience / perceptions Proportion of households reliant on on-street parking	Transport asset ownership (car/van, motorcycle)
Current travel patterns	Proportion of walking / cycling trips Proportion of bus / rail trips	
Modal shift potential	Opportunity to shift to PT Propensity to shift to PT	



Appendix D13 Modern public transport – Demand response transport

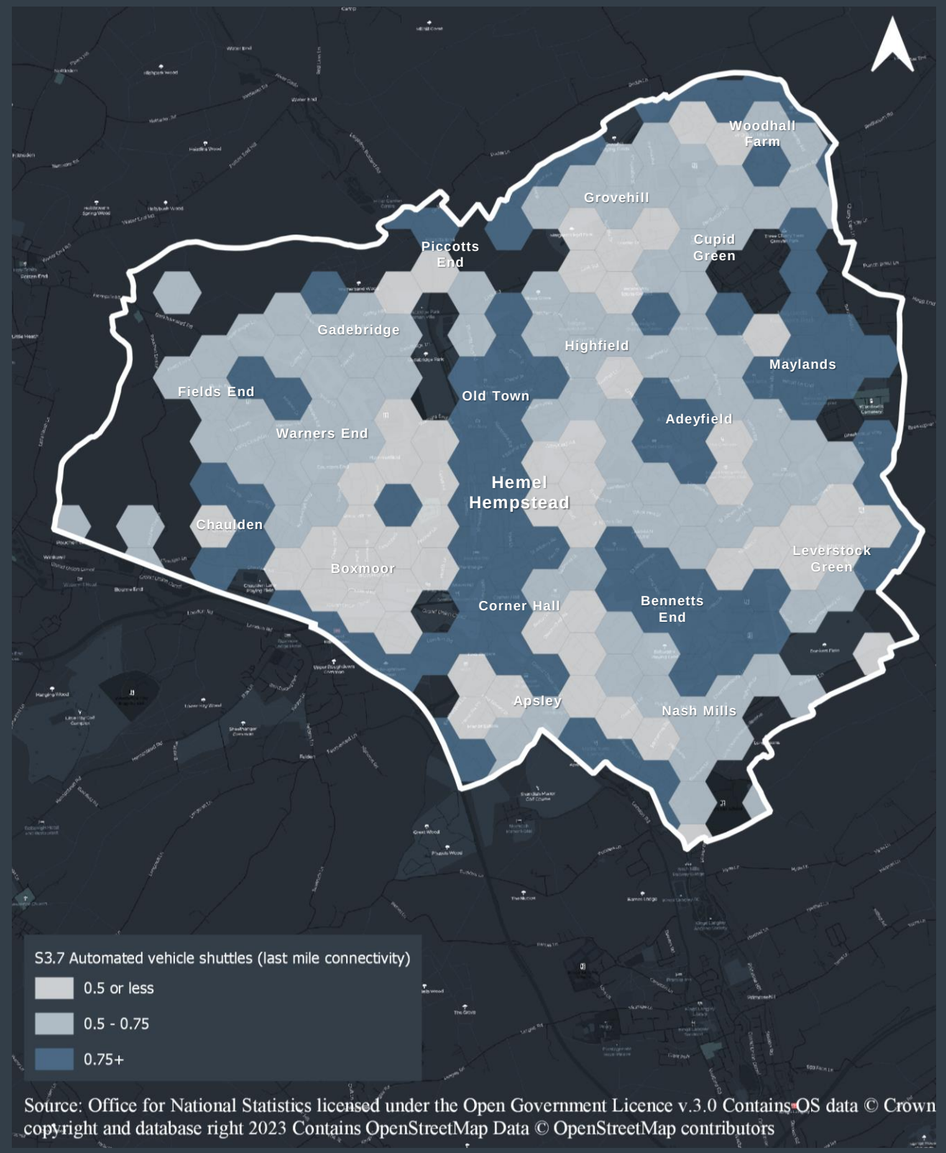
Shift modes

Modern public transport
Automated vehicle shuttles (last mile connectivity)

This innovative approach not only improves the accessibility and efficiency of urban mobility but also holds the potential to significantly reduce greenhouse gas emissions associated with individual car usage. By bridging the gap between conventional transport systems and final destinations, automated shuttles contribute to a more sustainable and convenient urban transport ecosystem.

Key findings – The blue-coloured hexes highlight the areas where implementing automated vehicle shuttles is key to unlocking their potential. So, the corridor between Old Town, the centre and Corner Hall have the highest score for this intervention, closely followed by Maylands, Adeyfield, and Bennetts End.

Criteria type	Factors contributing to the need	Factors reducing the need
Behaviours / perceptions	Proportion of households receiving parcel / takeaway / groceries deliveries Location of deliveries Proportion of households reliant on on-street parking	Transport asset ownership (car/van, motorcycle)
Current travel patterns	Proportion of walking / cycling trips Proportion of bus / rail trips	



Appendix D14 Modern public transport – Automated vehicle shuttles (last mile connectivity)

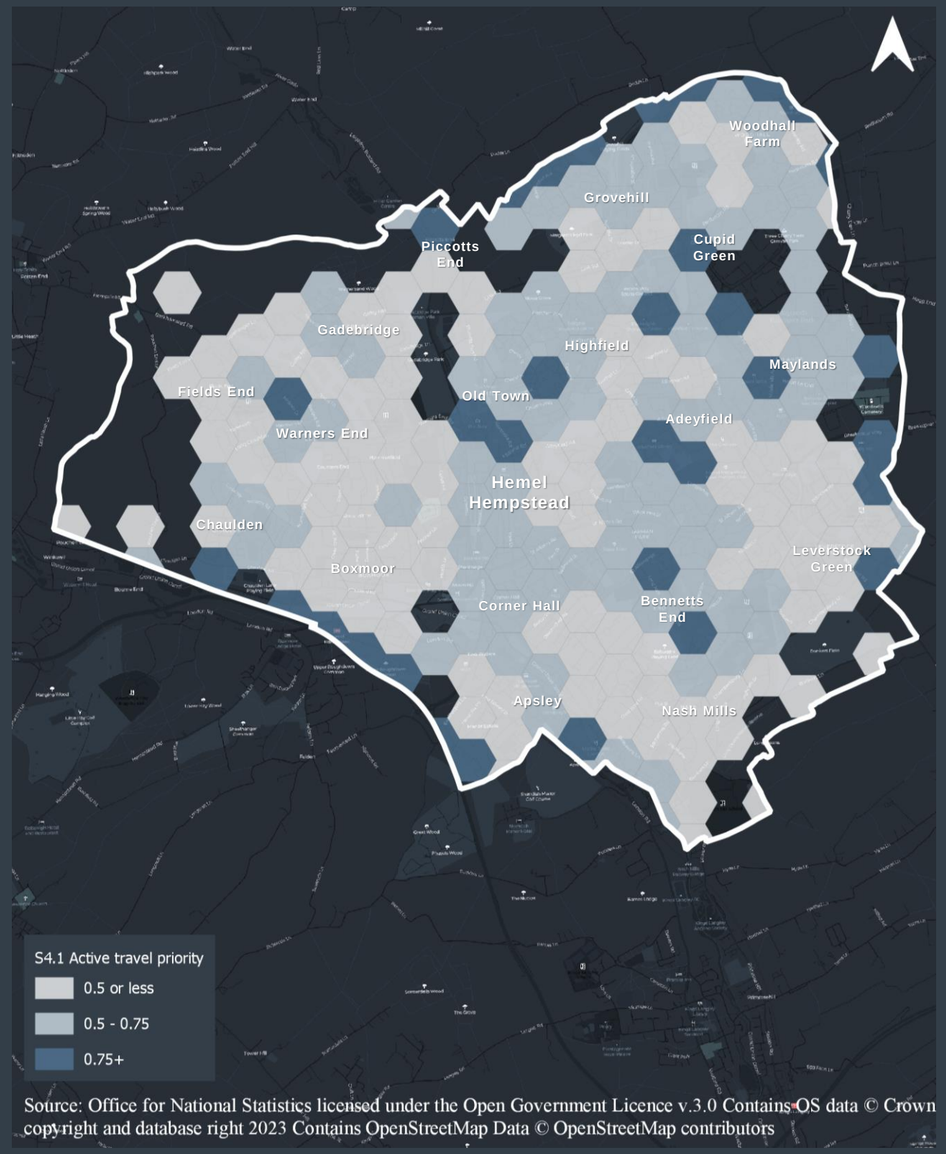
Shift modes

Street design & access restriction
Active travel priority

Low traffic neighbourhoods consist of residential streets surrounded by roads where the passage of through motor vehicle traffic is either discouraged or restricted. This intervention proves effective in decreasing car traffic and promoting a shift towards active travel.

Key Findings – The blue-coloured hexes highlight the areas where implementing active travel priority is key to unlocking their potential. Some spots in Maylands, Adeyfield, Cupid Green, and Old Town have the highest score for this intervention, closely followed by Bennetts End.

Criteria type	Factors contributing to the need	Factors reducing the need
Infrastructure	Length of national cycle network Length of cycle path Length of 20mph street Road safety (KSIs)	
Behaviours / perceptions	Transport asset ownership (bike/scooter) Shared mobility usage / experience / perceptions Proportion of households reliant on on-street parking	Transport asset ownership (car/van, motorcycle)
Current travel patterns	Proportion of walking / cycling trips	
Modal shift potential	Opportunity to shift to walking / cycling Propensity to shift to walking / cycling	



Appendix D15 Street design & access restriction – Active travel priority

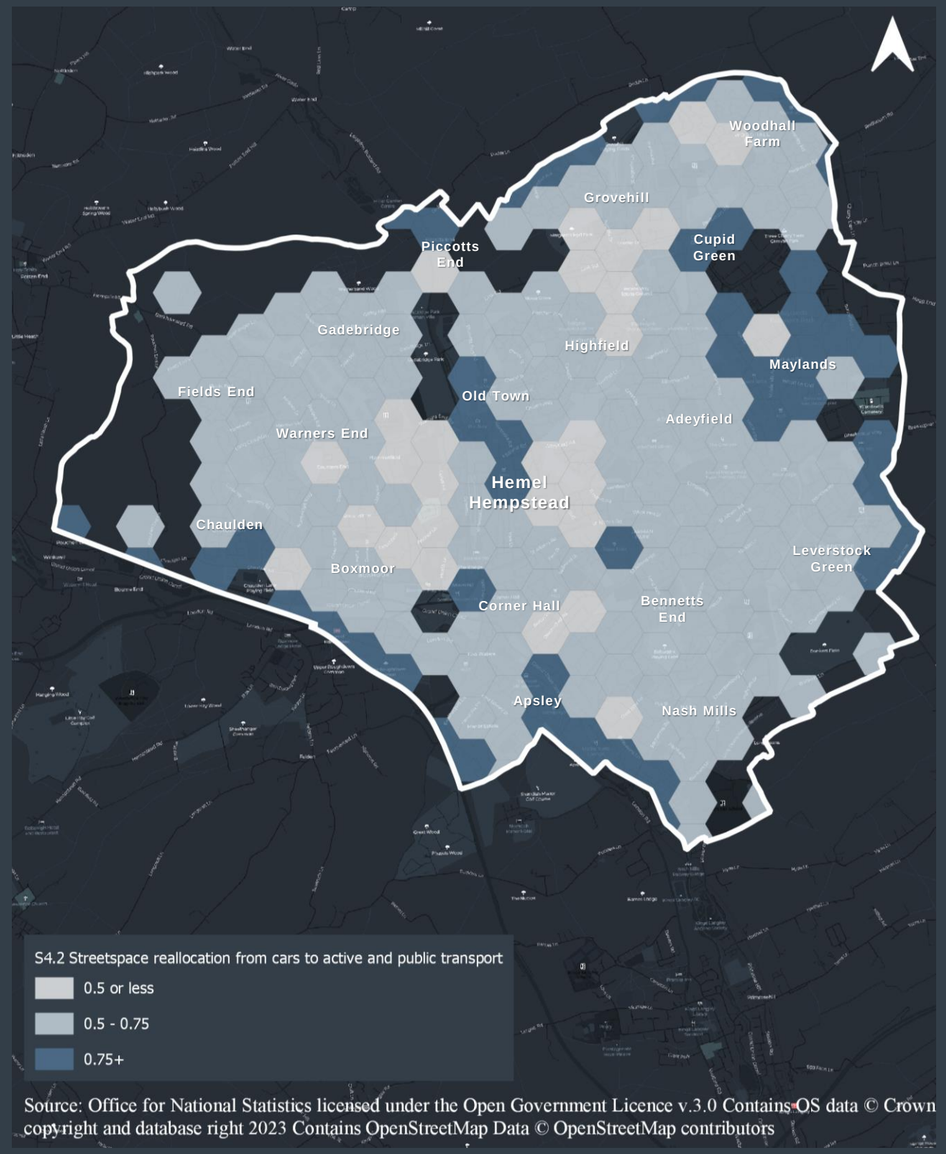
Shift modes

Street design & access restriction
Streetspace reallocation from cars to active and public transport

Reallocation of road space is an alternative to the private car and significant reduction in traffic has been observed.

Key Findings – The blue-coloured hexes highlight the areas where developing streetspace reallocation is key to unlocking their potential. So, Old Town, the centre Maylands have the highest score for this intervention, closely followed by Corner Hall and Apsley.

Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use		Number of amenities that can be reached within 30 minute PT journey
Infrastructure	Road safety (KSIs) Number of non-residential car parks in area	Bus stop / rail station access
Behaviours / perceptions	Transport asset ownership (bike/scooter) Shared mobility usage / experience / perceptions Bus stop / rail station access Proportion of households reliant on on-street parking	Transport asset ownership (car/van, motorcycle)
Current travel patterns	Proportion of bus / rail trips Proportion of car trips	
Modal shift potential	Opportunity to shift to PT Propensity to shift to PT	



Appendix D16 Street design & access restriction – Streetspace reallocation from cars to active and public transport

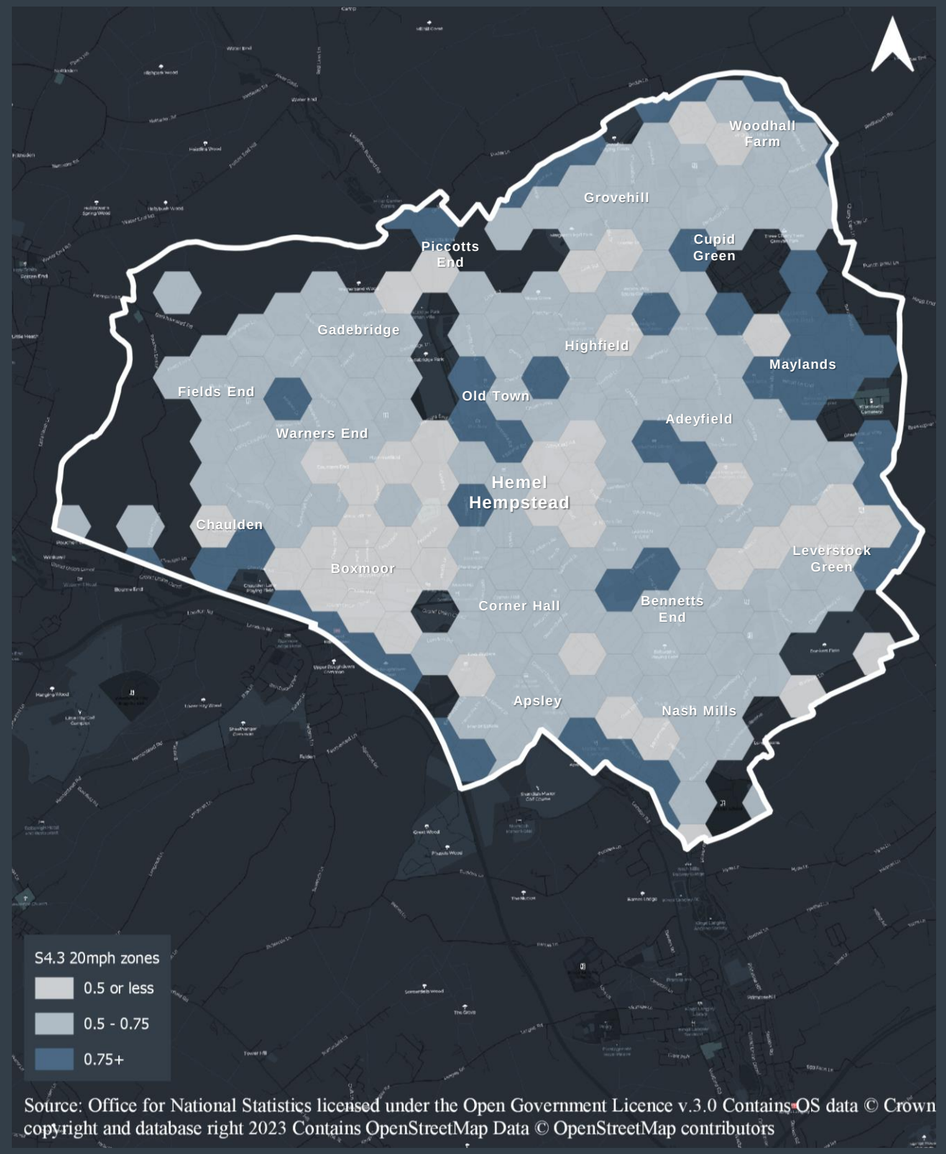
Shift modes

Street design & access restriction
20mph zones

20mph zones are pivotal in reducing the risk of road accidents and making it more attractive to walk and cycle. Also, it is estimated to increase journey times and a reducing car-based journeys.

Key Findings – The blue-coloured hexes highlight the areas where implementing 20mph zones is key to unlocking their potential. So, Old Town, the centre, and Maylands have the highest score for this intervention, closely followed by Bennetts End.

Criteria type	Factors contributing to the need	Factors reducing the need
Infrastructure	Road safety (KSIs)	Length of 20mph street
Behaviours / perceptions	Transport asset ownership	
Current travel patterns	Proportion of walking / cycling trips Proportion of bus / rail trips Proportion of car trips	
Modal shift potential	Opportunity to shift to walking / cycling Propensity to shift to walking / cycling Propensity to use car	



Appendix D17 Street design & access restriction – 20mph zones

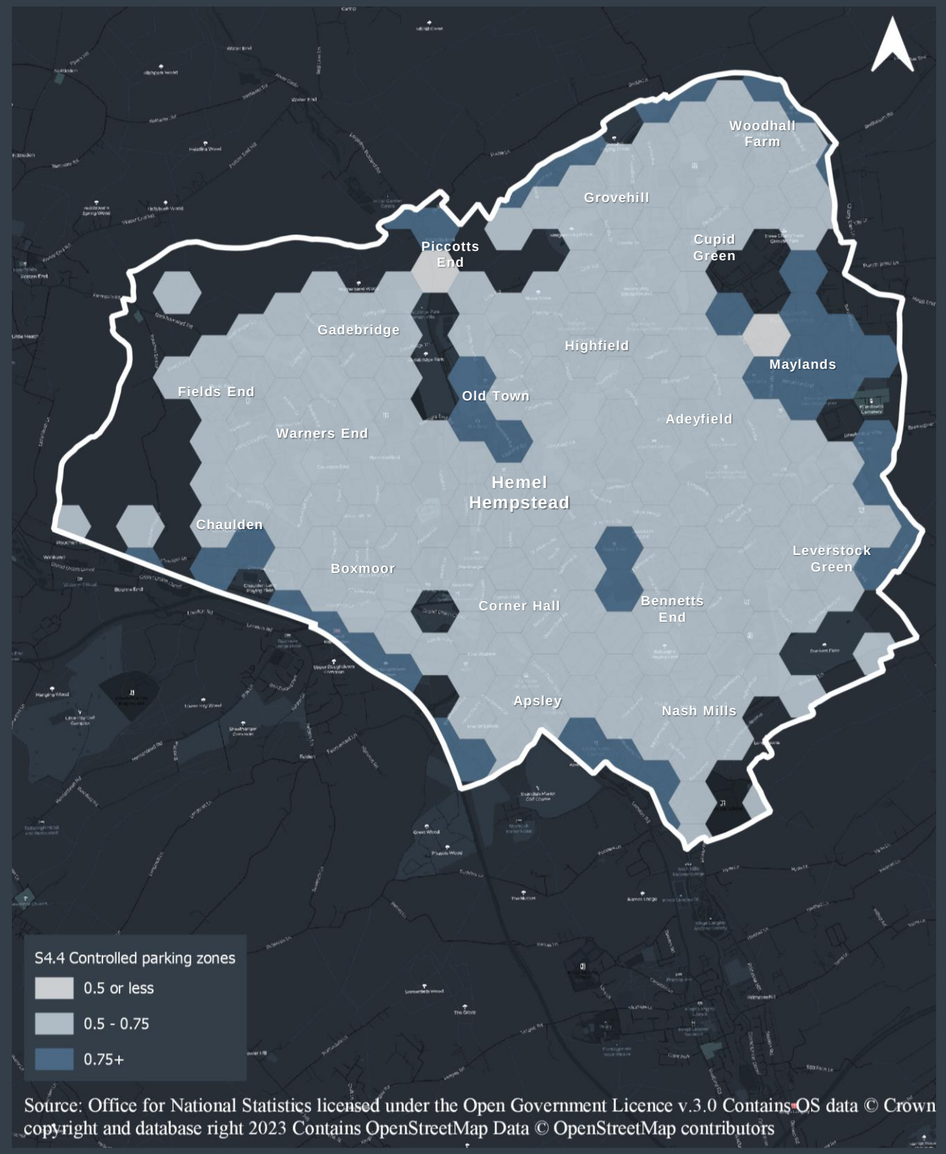
Shift modes

Street design & access restriction
Controlled parking zones

By providing efficient and eco-friendly transport alternatives, coupled with regulated parking areas, cities can significantly reduce traffic congestion and emissions. This approach not only fosters a more liveable urban landscape but also aligns with global efforts to combat climate change and improve air quality.

Key findings – The blue-coloured hexes highlight the areas where implementing controlled parking zones is key to unlocking their potential. So, Old Town and Maylands have the highest score for this intervention, closely followed by Bennetts End.

Criteria type	Factors contributing to the need	Factors reducing the need
Behaviours / perceptions	Transport asset ownership Proportion of households reliant on on-street parking	
Current travel patterns	Proportion of bus / rail trips Proportion of car trips	
Modal shift potential	Propensity to use car Estimated EV uptake (2030)	



Appendix D18 Street design & access restriction – Controlled parking zones

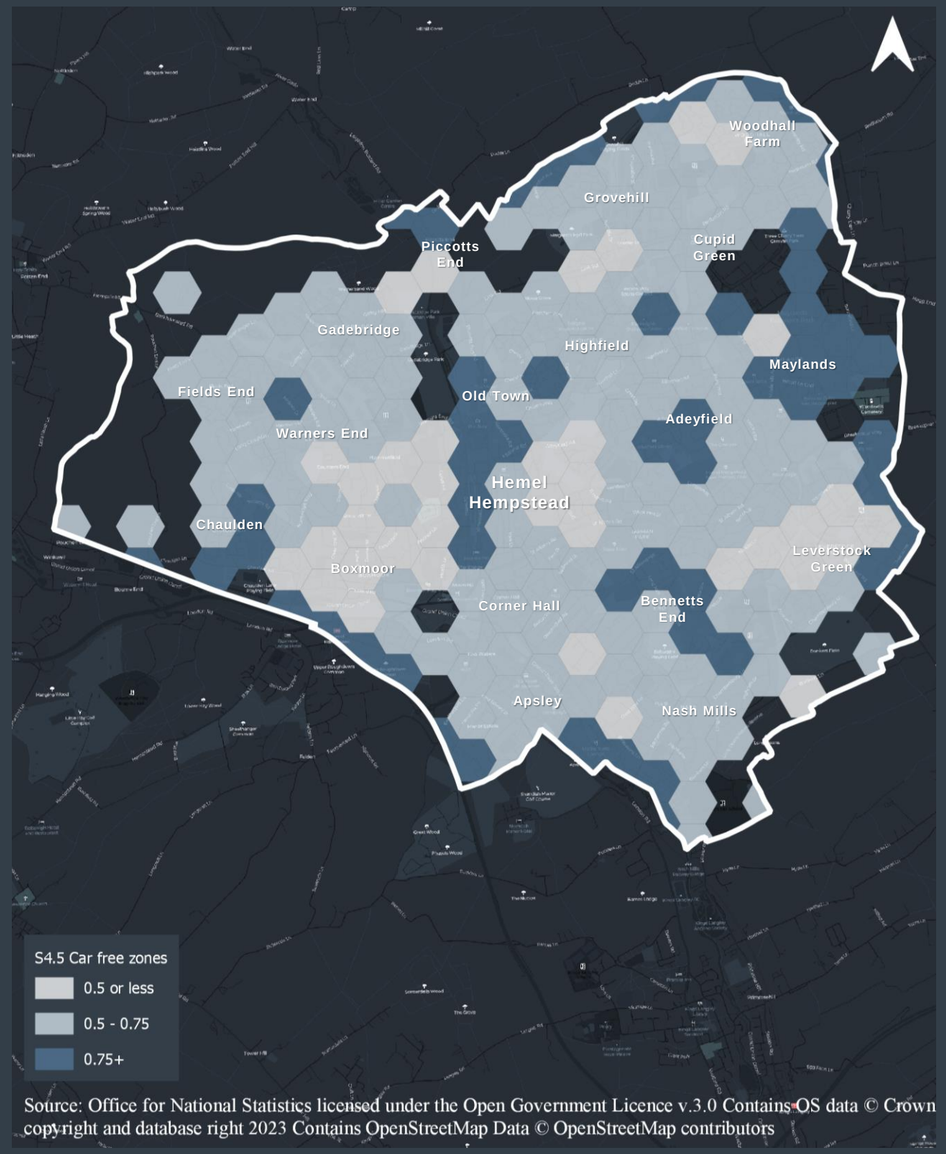
Shift modes

Street design & access restriction
Car free zones

Car free zones can be implemented through pedestrianisation schemes or car free development. It is observed as an important traffic demand management measures.

Key findings – The blue-coloured hexes highlight the areas where developing car free zones is key to unlocking their potential. So, Old Town, the centre, Adeyfield, Maylands have the highest score for this intervention, closely followed by Bennetts End.

Criteria type	Factors contributing to the need	Factors reducing the need
Infrastructure	Road safety (KSIs)	
Behaviours / perceptions	Transport asset ownership Shared mobility usage / experience / perceptions Proportion of households reliant on on-street parking	
Current travel patterns	Proportion of walking / cycling trips Proportion of bus / rail trips Proportion of car trips	
Modal shift potential	Opportunity to shift to walking / cycling / PT Propensity to shift to walking / cycling / PT	



Appendix D19 Street design & access restriction – Car free zones

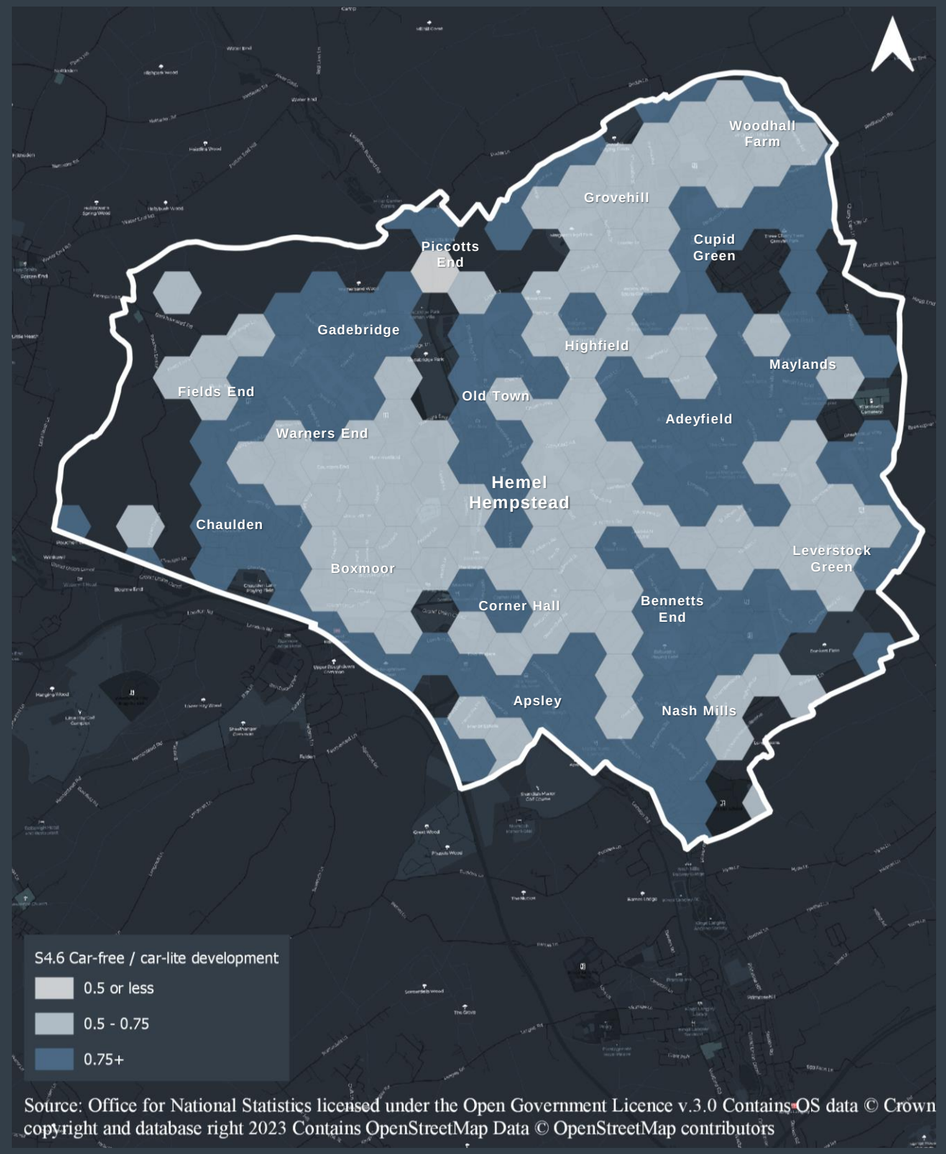
Shift modes

Street design & access restriction
Car-free / car-lite development

Embracing a car-free or car-lite development approach is a crucial step towards sustainable urban planning. By prioritizing pedestrian-friendly spaces and promoting alternative transportation modes such as cycling, walking, and public transit, we can substantially decrease reliance on private vehicles. This shift not only alleviates traffic congestion and improves air quality but also significantly reduces carbon emissions associated with traditional transportation methods.

Key Findings – The blue-coloured hexes highlight the areas where developing car-free / car-lite areas is key to unlocking their potential. So, Maylands, Adeyfield, Cupid Green in the east, Gadebridge and Chaulden in the west, Bennetts End and Nash Mills in the south have the highest score for this intervention, closely followed by Old Town and the centre.

Criteria type	Factors contributing to the need	Factors reducing the need
Infrastructure	Number of non-residential car parks in area	Length of national cycle network Length of cycle path
Behaviours / perceptions	Transport asset ownership Shared mobility usage / experience / perceptions Proportion of households reliant on on-street parking	
Current travel patterns	Proportion of car trips	Proportion of walking / cycling trips
Modal shift potential	Propensity to use car	Opportunity to shift to walking / cycling Propensity to shift to walking / cycling



Appendix D20 Street design & access restriction – Car-free / car-lite development

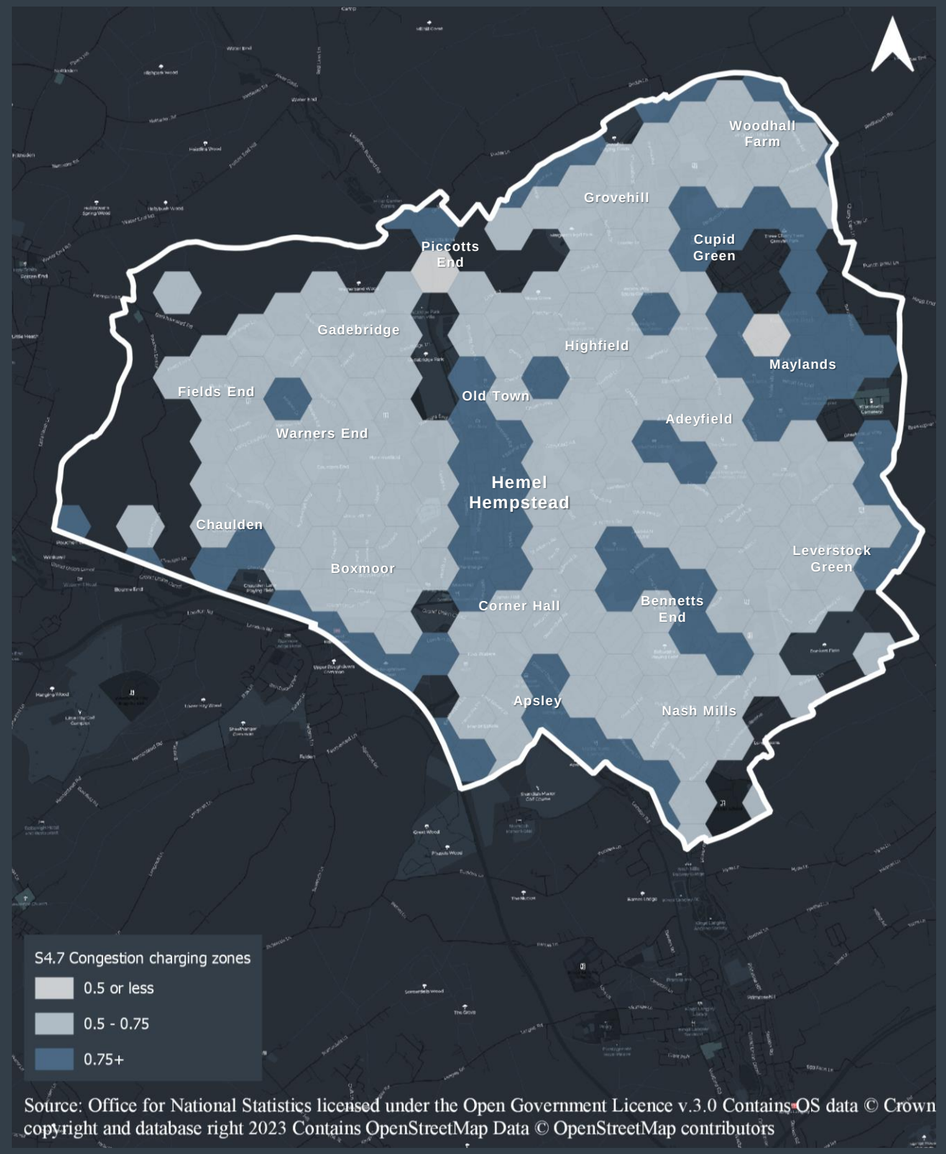
Shift modes

Street design & access restriction
Congestion charging zones

Congestion charging zones have a positive impact in terms of price elasticity and public support especially in case of availability of good public transport.

Key Findings – The blue-coloured hexes highlight the areas where implementing congestion charging zones is key to unlocking their potential. So, Old Town, the centre, Maylands, and Adeyfield have the highest score for this intervention, closely followed by Bennetts End and Apsley.

Criteria type	Factors contributing to the need	Factors reducing the need
Infrastructure	Number of non-residential car parks in area	
Behaviours / perceptions	Transport asset ownership Shared mobility usage / experience / perceptions Proportion of households reliant on on-street parking	
Current travel patterns	Proportion of bus / rail trips Proportion of car trips	
Modal shift potential	Opportunity to shift to walking / cycling / PT Propensity to shift to walking / cycling / PT Propensity to use car	



Appendix D21 Street design & access restriction – Congestion charging zones

APPENDIX E

IMPROVE fuel efficiency interventions score

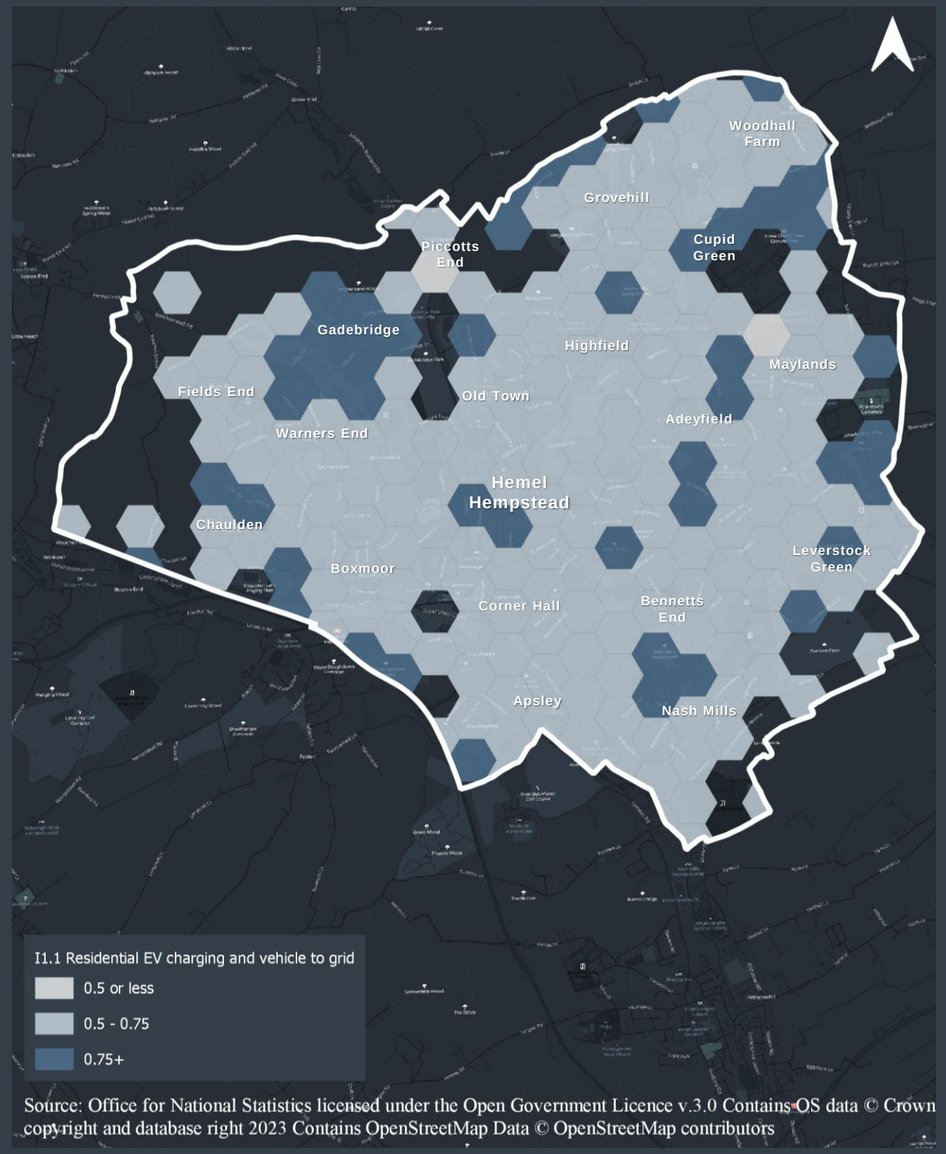
Improve fuel efficiency

EV charging infrastructure
Residential EV charging and vehicle to grid

This symbiotic relationship between EVs and the grid holds immense potential for grid stabilisation and load management, further enhancing the green credentials of electric mobility. Embracing this technology offers a promising avenue to reduce carbon emissions and forge a more sustainable future for transport.

Key findings – The blue-coloured hexes highlight the areas where implementing vehicle to grid systems is key to unlocking their potential. Some spots in Gadebridge, the centre, Maylands, Cupid Greens, and Adeyfield have the highest score for this intervention, closely followed by Nash Mills.

Criteria type	Factors contributing to the need	Factors reducing the need
Behaviours / perceptions	Transport asset ownership Proportion of households reliant on on-street parking	
Modal shift potential	Propensity to use car Estimated EV uptake (2030)	



Appendix E1 EV charging infrastructure – Residential EV charging and vehicle to grid

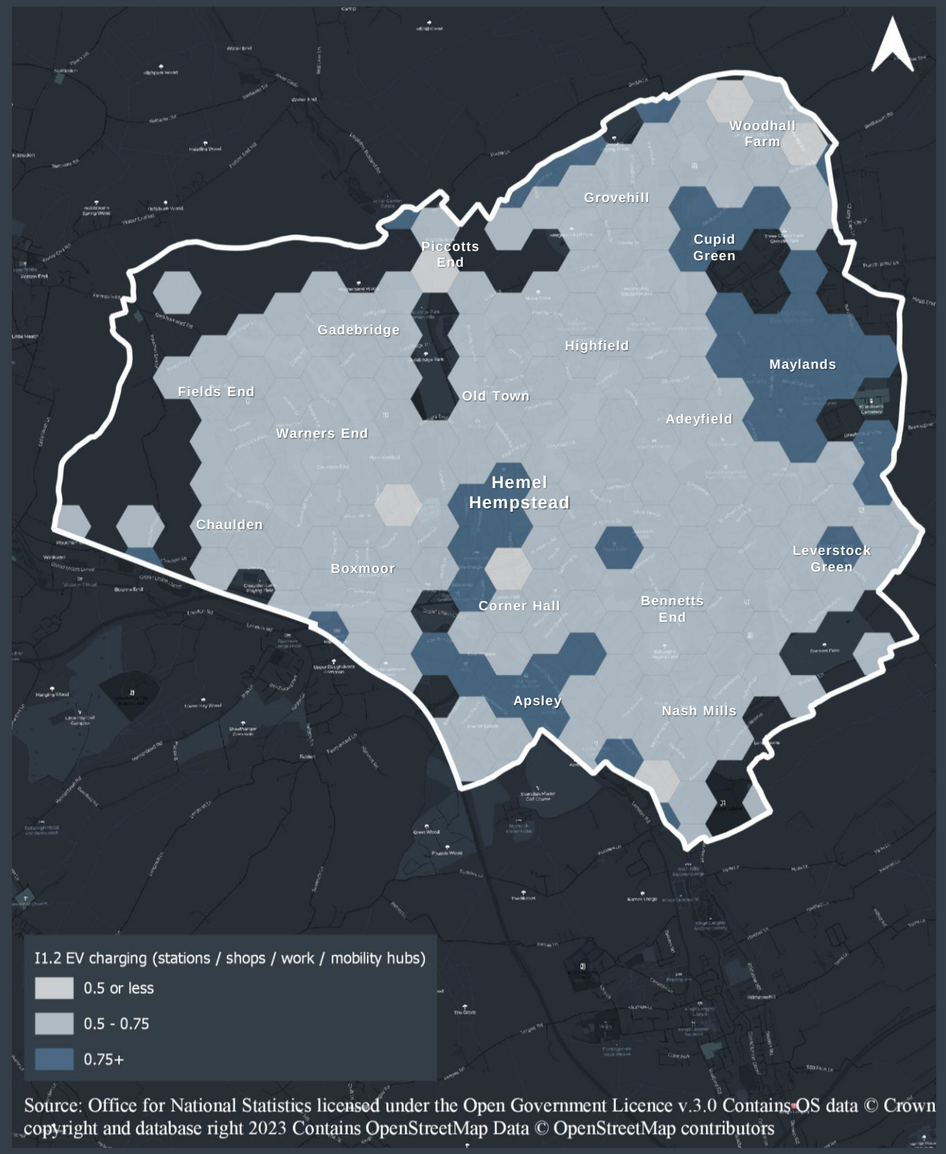
Improve fuel efficiency

EV charging infrastructure
EV charging (stations / shops / work / mobility hubs)

These strategically positioned charging stations not only facilitate convenient charging for EV owners but also encourage the broader adoption of electric vehicles, ultimately contributing to a greener future. This comprehensive approach to EV charging infrastructure integration across diverse settings is vital for creating an accessible and reliable network for electric vehicle users.

Key findings – The blue-coloured hexes highlight the areas where implementing EV charging stations is key to unlocking their potential. Some spots in Maylands, Cupid Green, and the centre have the highest score for this intervention, closely followed by Corner Hall and Apsley.

Criteria type	Factors contributing to the need	Factors reducing the need
Amenities / land use	Floorspace of non-residential land use (Valuations Office Agency)	
Infrastructure	Number of non-residential car parks in area	Number of EV charging points in area
Behaviours / perceptions	Transport asset ownership Proportion of households reliant on on-street parking	
Current travel patterns	Proportion of car trips	
Modal shift potential	Propensity to use car Estimated EV uptake (2030)	



Appendix E2 EV charging infrastructure – EV charging (stations / shops / work / mobility hubs)

APPENDIX F
Interventions scoring input data sources

Appendix F1 – Input data sources

Criteria type	Criteria	Data processing / analysis	Data source	Output categories
Amenities / land use	Number of amenities in area	Count of amenities within hex	OpenStreetMap	Community facilities, education establishments, parks & open space, local shops, local employment opportunities
	Number of amenities that can be reached within a 15- & 30-minute walk	Count of amenities within adjacent two and five hexes		
	Number of amenities that can be reached within 30-minute PT journey	Count of amenities that can be reached within 30 minute PT journey	Accessibility Indicators for Great Britain (Zenodo)	Employment facilities, supermarkets, primary schools, secondary schools, GPs, hospitals
	Floorspace of non-residential land use	Sum of floorspace of commercial land uses within hex	Non-domestic rating (Valuation Office Agency)	Total in sq.m
Infrastructure	Length of national cycle network	Length of national cycle network within hex	National Cycle Network (Sustrans)	Total in metres
	Length of cycle path	Length of cycle path within hex	OpenStreetMap	Total in metres
	Length of 20mph street	Length of 20mph street within hex		
	Bus stop / rail station access	Flag if bus stop within hex, flag if hex or adjacent hex has rail station		400m from a bus stop, 800m from a rail station
	Broadband speed	Broadband speed data at a constituent level output at hex	Constituency data: broadband coverage and speeds (House of Commons Library)	Broadband speed
	Road safety (KSIs)	Sum of crashes by mode within hex	STATS19 road accidents (Department for Transport)	Walking, cycling, motorcycle, motor vehicle
	Number of non-residential car parks in area	Sum of non-domestic car parks within hex	Non-domestic rating (Valuation Office Agency)	Total number of car parks
	Number of EV charging points in area	Sum of EV charge points by speed in hex	Open Charge Map & National Chargepoint Registry	Standard EVCPs, Rapid EVCPs

Appendix F1 – Input data sources (continued)

Criteria type	Criteria	Data processing / analysis	Data source	Output categories
Behaviours / perceptions	Transport asset ownership	Calculate the proportion of households owning each asset class grouped by Experian Mosaic Group	WSP Mobility Insights survey bank	Bicycle, scooter, motorcycle, car/van
	Shared mobility usage	Calculate the proportion of households using shared mobility grouped by Experian Mosaic Group		Car/van share (club), ride share, demand responsive transport, bike share, scooter share
	Shared mobility experience / perceptions	Calculate the proportion of households with positive experience / perceptions around shared mobility grouped by Experian Mosaic Group		
	Proportion of households receiving parcel / takeaway / groceries deliveries	Calculate the proportion of households receiving deliveries grouped by Experian Mosaic Group		Parcel, takeaway, groceries
	Location of deliveries	Calculate the proportion of households receiving deliveries by location grouped by Experian Mosaic Group		Direct to door, pick-up locker, click and collect, post office
	Proportion of households reliant on on-street parking	Calculate the proportion of households reliant on on-street parking grouped by Experian Mosaic Group	WSP EV:Ready	Proportion of households
Current travel patterns	Proportion of trips by mode and type	Calculate the proportion of households making journeys by mode and type (purpose) grouped by Experian Mosaic Group	WSP Mobility Insights survey bank	Mode – walk, cycle, bus, rail, car Trip type – commuting, education, shopping & personal business, leisure, work-related
Modal shift potential	Sustainable travel opportunity	Calculate the number of trips that could be made by sustainable modes	WSP Modal shift potential analysis (derived from Transport Model O-D inputs)	Walk, cycle, bus, rail
	Sustainable travel propensity	Calculate the propensity (likelihood) of the local population to switch to sustainable modes benchmarked against the England average grouped by Experian Mosaic Group	WSP Modal shift potential analysis & Mobility Insights survey bank	
	Propensity to use car	Calculate the propensity (likelihood) of the local population to drive benchmarked against the England average grouped by Experian Mosaic Group		Car
	Estimated EV uptake (2030)	Calculate the proportion of vehicles estimated to be EVs in 2030	WSP EV:Ready	Proportion of vehicles

APPENDIX G

Ideal value – 85th percentile values

Appendix G1 – Ideal value (85th percentile values) – Amenities / land use

Place type	Number of amenities in area					Floorspace of non-residential land use (sq.m)
	Community facility	Education establishment	Parks & open space	Local shops	Local employment opportunities	
City suburban A	3	2	2	6	4	9,752
City suburban B	3	2	2	5	3	9,543
Inner Urban A	6	4	3	18	37	100,066
Inner Urban B	4	2	3	11	11	17,867
Rural	2	1	2	3	2	1,560
Urban Large (within urban area with pop 100-250k)	3	2	2	5	4	10,788
Urban Medium (within urban area with pop 25-100k)	3	2	2	5	4	7,490
Urban Small (within urban area with pop <25k)	3	2	2	5	4	4,332

Appendix G2 – Ideal value (85th percentile values) – Amenities / land use

Place type	Number of amenities that can be reached within a 15-minute walk					Number of amenities that can be reached within a 30-minute walk				
	Community facility	Education establishment	Parks & open space	Local shops	Local employment opportunities	Community facility	Education establishment	Parks & open space	Local shops	Local employment opportunities
City suburban A	38	16	21	69	59	130	58	72	236	229
City suburban B	22	10	16	34	30	73	34	52	120	104
Inner Urban A	135	56	52	363	1,003	449	232	190	1296	3,311
Inner Urban B	79	36	35	191	215	283	123	126	638	743
Rural	5	2	7	4	6	16	7	16	15	20
Urban Large (within urban area with pop 100-250k)	27	11	18	41	45	72	30	49	117	129
Urban Medium (within urban area with pop 25-100k)	21	7	15	32	35	38	14	31	56	65
Urban Small (within urban area with pop <25k)	15	5	11	19	21	26	11	23	32	41

Appendix G3 – Ideal value (85th percentile values) – Amenities / land use

Place type	Number of amenities that can be reached within 30-minute PT journey						
	Employment opportunities	Supermarkets	Primary schools	Secondary schools	GPs	Hospitals	PT accessibility
City suburban A	79,144	13	33	8	24	3	6.12
City suburban B	38,535	8	19	4	12	2	3.29
Inner Urban A	220,4136	56	148	36	124	30	56.03
Inner Urban B	48,2706	28	79	19	58	8	18.82
Rural	3,950	1	3	1	1	1	0.51
Urban Large (within urban area with pop 100-250k)	31,100	7	13	3	7	2	2.42
Urban Medium (within urban area with pop 25-100k)	10,675	4	7	2	3	1	1.29
Urban Small (within urban area with pop <25k)	6,638	3	5	1	2	1	0.97

Appendix G4 – Ideal value (85th percentile values) – Infrastructure

Place type	Active travel				Public transport		Broadband speed
	Length of national cycle network (on-road)	Length of national cycle network (off-road)	Length of cycle path	Length of 20mph street	Bus stop access within 400m (proportion of households)	Rail station access within 800m (proportion of households)	
City suburban A	0.37	0.39	725	372	1.0	1.0	144
City suburban B	0.37	0.39	670	955	1.0	1.0	140
Inner Urban A	0.44	0.39	1,591	1	1.0	1.0	150
Inner Urban B	0.38	0.41	940	275	1.0	1.0	150
Rural	0.39	0.37	638	347	1.0	1.0	118
Urban Large (within urban area with pop 100-250k)	0.38	0.4	700	296	1.0	1.0	131
Urban Medium (within urban area with pop 25-100k)	0.39	0.38	654	121	1.0	1.0	119
Urban Small (within urban area with pop <25k)	0.4	0.36	660	1,206	1.0	1.0	125

Appendix G5 – Ideal value (85th percentile values) – Infrastructure

Place type	Road safety				Number of EV charging points in area		Number of non-residential car parks in area
	Cycle collisions	Pedestrian collisions	Motor vehicle collisions	Motorcycle collisions	Standard EVCPs	Rapid EVCPs	
City suburban A	3	4	9	3	1	1	55
City suburban B	2	3	6	2	1	1	56
Inner Urban A	13	12	14	9	9	1	110
Inner Urban B	7	7	13	7	6	1	66
Rural	2	2	4	2	1	1	10
Urban Large (within urban area with pop 100-250k)	2	3	6	2	1	1	71
Urban Medium (within urban area with pop 25-100k)	2	2	4	2	1	1	51
Urban Small (within urban area with pop <25k)	2	2	4	1	1	1	34

Appendix G6 – Ideal value (85th percentile values) – Behaviours / perceptions

Place type	Transport asset ownership				Shared mobility usage (benchmarked to England average = 100)					Proportion of households reliant on on-street parking
	Car	Motorcycle	Bike	Scooter	Car / van share (club)	Ride share	Demand Responsive Transport	Bike share	Scooter share	
City suburban A	1.16	1.42	3.25	2	2.64	2.16	1.56	1.65	2.08	0.55
City suburban B	1.16	1.74	3	1.33	1.21	1.32	1.56	1.44	1.15	0.47
Inner Urban A	0.82	0.98	1.29	1.09	1.4	2.79	1.61	0.93	4.33	0.38
Inner Urban B	0.87	1.42	3.25	1.09	2.64	2.79	1.61	1.35	4.33	0.55
Rural	1.17	1.33	0.99	0.81	0.99	0.59	0.69	0.95	0.55	0.19
Urban Large (within urban area with pop 100-250k)	1.16	1.62	2.12	1.33	1.21	1.32	1.56	1.44	1.15	0.48
Urban Medium (within urban area with pop 25-100k)	1.16	1.62	2.12	1.33	1.21	1.18	1.56	1.15	1.15	0.40
Urban Small (within urban area with pop <25k)	1.16	1.74	3	1.14	1.19	1.18	1	1.15	1.07	0.34

Appendix G7 – Ideal value (85th percentile values) – Behaviours / perceptions

Place type	Proportion of households receiving parcel / takeaway / groceries deliveries (benchmarked to England average = 100)			Location of deliveries				Shared mobility perceptions (benchmarked to England average = 100)				
	Parcel	Take away	Groceries	Direct to door	Parcel locker	Click & collect	Post office	Car / van share (club)	Ride share	Demand Responsive Transport	Bike share	Scooter share
City suburban A	1.09	1.21	1.21	1.03	2.43	1.23	1.42	1.82	1.33	1.2	1.37	1.33
City suburban B	1.05	1.12	1.17	1.09	1.18	1.23	1.42	1.31	1.18	1.17	1.37	1.54
Inner Urban A	1.01	1.08	1.08	1.03	1.26	1.23	0.99	1.12	1.48	1.11	1.25	1.54
Inner Urban B	1.01	1.2	1.08	1.16	2.43	1.23	1.21	1.82	1.48	1.79	1.35	1.54
Rural	1.05	0.79	0.96	0.98	1.13	1.48	0.97	1.14	1.06	1.18	0.87	0.93
Urban Large (within urban area with pop 100-250k)	1.05	1.12	1.17	1.09	1.18	1.16	1.42	1.31	1.18	1.17	1.37	1.45
Urban Medium (within urban area with pop 25-100k)	1.05	1.08	1.08	1.09	1.18	1.25	1.42	1.31	1.18	1.17	1.37	1.45
Urban Small (within urban area with pop <25k)	1.05	1.07	0.99	1.09	1.14	1.25	1.42	1.31	1.07	1.18	1.25	1.54

Appendix G8 – Ideal value (85th percentile values) – Current travel patterns

Place type	Main method of travel - walk					Main method of travel - cycle				
	Commuting	Education	Shopping & personal business	Leisure	Work-related (excluding commuting)	Commuting	Education	Shopping & personal business	Leisure	Work-related (excluding commuting)
City suburban A	1.15	1.32	1.92	1.44	1.56	1.67	1.94	2.13	1.87	1.15
City suburban B	1.13	1.44	1.38	1.31	1.56	1.32	1.94	1.34	1.53	1.13
Inner Urban A	1.13	1.02	1.98	1.47	1.34	1.86	2.42	2.36	1.43	1.13
Inner Urban B	1.23	1.13	1.98	1.47	1.34	1.86	2.42	2.36	1.59	1.23
Rural	1.5	0.83	0.51	0.77	0.38	1.04	0	0	0.4	1.5
Urban Large (within urban area with pop 100-250k)	1.15	1.44	1.45	1.38	1.56	1.32	1.94	1.34	1.53	1.15
Urban Medium (within urban area with pop 25-100k)	1.23	1.44	0.78	1.31	1.39	1.32	1.1	1.31	1.19	1.23
Urban Small (within urban area with pop <25k)	1.5	1.32	0.75	0.88	0.89	1.11	1.1	0.96	1.04	1.5

Appendix G9 – Ideal value (85th percentile values) – Current travel patterns

Place type	Main method of travel - bus					Main method of travel - rail				
	Commuting	Education	Shopping & personal business	Leisure	Work-related (excluding commuting)	Commuting	Education	Shopping & personal business	Leisure	Work-related (excluding commuting)
City suburban A	2.78	2.26	1.77	1.91	1.84	1.8	1.95	2.64	2.01	1.67
City suburban B	1.41	1.51	1.39	1.35	1.46	1.33	2.16	1.11	1.02	1.51
Inner Urban A	1.45	1.54	1.78	1.49	1.86	2.42	2.64	3.17	2.63	2.01
Inner Urban B	1.45	2.26	1.78	1.97	1.87	2.42	2.64	3.17	2.63	2.01
Rural	2.17	0.62	1.87	1.02	0.85	0.66	0.59	0.31	1.19	0.9
Urban Large (within urban area with pop 100-250k)	1.41	1.51	1.78	1.35	1.46	1.3	1.95	1.19	1.02	1.51
Urban Medium (within urban area with pop 25-100k)	1.41	1.38	1.87	1.31	1.15	1.17	1.62	1.11	1.02	1.18
Urban Small (within urban area with pop <25k)	2.17	0.63	2.32	1.02	0.85	1.17	2.16	1.03	1.19	1.51

Appendix B10 – Ideal value (85th percentile values) – Current travel patterns

Place type	Main method of travel - car				
	Commuting	Education	Shopping & personal business	Leisure	Work-related (excluding commuting)
City suburban A	1.3	1.38	1.29	1.32	1.26
City suburban B	1.3	1.4	1.29	1.32	1.26
Inner Urban A	0.74	0.67	0.57	0.67	0.87
Inner Urban B	0.74	0.78	0.68	0.68	0.87
Rural	1.37	1.4	1.42	1.37	1.44
Urban Large (within urban area with pop 100-250k)	1.3	1.43	1.29	1.32	1.26
Urban Medium (within urban area with pop 25-100k)	1.37	1.43	1.31	1.32	1.44
Urban Small (within urban area with pop <25k)	1.62	1.4	1.31	1.33	1.55

Appendix B11 – Ideal value (85th percentile values) – Modal shift potential

Place type	Sustainable travel opportunity			Sustainable travel propensity					Estimated EV uptake (2030)	
	Walk	Cycle	Public transport	Walk	Cycle	Bus	Rail	Car	Low	High
City suburban A	3,702	8,633	1,797	135	139	157	152	110	202	144
City suburban B	1,896	5,636	1,694	112	122	113	102	112	149	104
Inner Urban A	7,383	18,513	5,931	153	163	168	203	93	279	210
Inner Urban B	7,779	22,019	2,858	150	159	167	191	93	286	214
Rural	195	1,487	510	67	70	72	72	113	52	36
Urban Large (within urban area with pop 100-250k)	3,184	6,988	2,205	116	124	117	106	112	162	112
Urban Medium (within urban area with pop 25-100k)	2,376	4,185	2,360	102	101	98	94	113	159	110
Urban Small (within urban area with pop <25k)	439	2,971	971	83	81	81	94	114	138	95

APPENDIX H
Multi-criteria analysis scoring

Appendix H1: Weightings
Land use planning - Local amenities within short walk and cycle

Datapoints related to **local amenities within short walk and cycle**	Weightings (-5 to 5)
Count of amenities in hexes	
Community facilities in hexes	-3
Education establishments in hexes	-2
Parks and open spaces in hexes	-4
Local shops and services in hexes	-5
Local employment opportunities in hexes	-1
Count of amenities that can be walked	
Count of community facilities that can be reached by 15 min walk	-3
Count of education establishments that can be reached by 15 min walk	-2
Count of parks and open spaces that can be reached within by 15 min walk	-4
Count of local shops and services that can be reached by 15 min walk	-5
Count of local employment opportunities that can be reached by 15 min walk	-1
Count of community facilities that can be reached by 30 min walk	-3
Count of education establishments that can be reached by 30 min walk	-2
Count of parks and open spaces that can be reached by 30 min walk	-4
Count of local shops and services that can be reached by 30 min walk	-5
Count of local employment opportunities that can be reached by 30 min walk	-1
Asset ownership	
Car/van ownership	-5
Motorcycle ownership	-3
Bicycle ownership	5
Scooter ownership	3
Walk - main method of travel	
Commuting - Walk	1
Education - Walk	2
Shopping&personel business - Walk	5
Leisure - Walk	3
Work-related (not commuting) - Walk	4
Cycle - main method of travel	
Commuting - Cycle	1
Education - Cycle	2
Shopping&personel business - Cycle	5
Leisure - Cycle	3
Work-related (not commuting) - Cycle	4
Sustainable travel opportunity	
Sustainable travel opportunity - Walk	5
Sustainable travel opportunity - Bike	4
Sustainable travel propensity	
Sustainable travel propensity - Walk	5
Sustainable travel propensity - Bike	4
Sustainable travel propensity -Car	-5
Land use	
VOA land use	5

Appendix H2: Weightings
Land use planning - Recreation space embedded in neighbourhoods

Datapoints related to **recreation space embedded in neighbourhoods**	Weightings (-5 to 5)
Count of amenities in hexes	
Community facilities in hexes	-3
Parks and open spaces in hexes	-5
Count of amenities that can be walked	
Count of community facilities that can be reached by 15 min walk	-3
Count of parks and open spaces that can be reached within by 15 min walk	-5
Count of community facilities that can be reached by 30 min walk	-3
Count of parks and open spaces that can be reached by 30 min walk	-5
Asset ownership	
Car/van ownership	-5
Motorcycle ownership	-3
Walk - main method of travel	
Leisure - Walk	5
Cycle - main method of travel	
Leisure - Cycle	5
Sustainable travel opportunity	
Sustainable travel opportunity - Walk	5
Sustainable travel opportunity - Bike	4
Sustainable travel propensity	
Sustainable travel propensity - Walk	5
Sustainable travel propensity - Bike	4
Sustainable travel propensity -Car	-5

Appendix H3: Weightings
Land use planning - Mixed use developments

Datapoints related to **mixed use developments**	Weightings (-5 to 5)
Count of amenities in hexes	
Community facilities in hexes	-3
Education establishments in hexes	-2
Parks and open spaces in hexes	-4
Local shops and services in hexes	-5
Local employment opportunities in hexes	-1
Count of amenities that can be walked	
Count of community facilities that can be reached by 15 min walk	-3
Count of education establishments that can be reached by 15 min walk	-2
Count of parks and open spaces that can be reached within by 15 min walk	-4
Count of local shops and services that can be reached by 15 min walk	-5
Count of local employment opportunities that can be reached by 15 min walk	-1
Count of community facilities that can be reached by 30 min walk	-3
Count of education establishments that can be reached by 30 min walk	-2
Count of parks and open spaces that can be reached by 30 min walk	-4
Count of local shops and services that can be reached by 30 min walk	-5
Count of local employment opportunities that can be reached by 30 min walk	-1
Asset ownership	
Car/van ownership	-5
Motorcycle ownership	-3
Count of amenities from PT stops	
Count of employment facilities that can be reached by 30 min walk from PT stops	-4
Count of supermarkets that can be reached by 30 min walk from PT stops	-5
Count of primary schools that can be reached by 30 min walk PT stops	-3
Count of secondary schools that can be reached by 30 min walk from PT stops	-2
Count of GPs that can be reached by 30 min walk from PT stops	-3
Count of hospitals that can be reached by 30 min walk from PT stops	-1
Average public transport accessibility (benchmarked to the UK)	-5
Walk - main method of travel	
Education - Walk	1
Shopping&personel business - Walk	5
Leisure - Walk	3
Cycle - main method of travel	
Education - Cycle	1
Shopping&personel business - Cycle	5
Leisure - Cycle	3
Bus - main method of travel	
Education - Bus	3
Shopping&personel business - Bus	5
Leisure - Bus	1
Rail - main method of travel	
Education - Rail	3
Shopping&personel business - Rail	5
Leisure - Rail	1
Sustainable travel opportunity	
Sustainable travel opportunity - Walk	5
Sustainable travel opportunity - Bike	4
Sustainable travel propensity	
Sustainable travel propensity - Walk	5
Sustainable travel propensity - Bike	4
Sustainable travel propensity –Car	-5
Land use	
VOA land use	5

Appendix H4: Weightings
Land use planning - Co-working spaces

Datapoints related to **co-working spaces**	Weightings (-5 to 5)
Count of amenities in hexes	
Local employment opportunities in hexes	-5
Count of amenities that can be walked	
Count of local employment opportunities that can be reached by 15 min walk	-5
Count of local employment opportunities that can be reached by 30 min walk	-5
Count of amenities from PT stops	
Count of employment facilities that can be reached by 30 min walk from PT stops	-5
Sustainable travel opportunity	
Sustainable travel opportunity - Walk	5
Sustainable travel opportunity - Bike	3
Sustainable travel opportunity -PT	1
Sustainable travel propensity	
Sustainable travel propensity - Walk	5
Sustainable travel propensity - Bike	4
Sustainable travel propensity - Bus	2
Sustainable travel propensity -Train	1
Sustainable travel propensity -Car	-5

Appendix H5: Weightings
IT Infrastructure – Home working

Datapoints related to **home working**	Weightings (-5 to 5)
Count of amenities in hexes	
Local employment opportunities in hexes	-5
Count of amenities that can be walked	
Count of local employment opportunities that can be reached by 15 min walk	-5
Count of local employment opportunities that can be reached by 30 min walk	-5
Broadband Data	
Broadband Data	-5
Count of amenities from PT stops	
Count of employment facilities that can be reached by 30 min walk from PT stops	-5
Car - main method of travel	
Commuting - Car	3
Work-related (not commuting) - Car	5

Appendix H6: Weightings
IT Infrastructure – Remote study and 'blended learning'

Datapoints related to **remote study and 'blended learning'**	Weightings (-5 to 5)
Count of amenities in hexes	
Education establishments in hexes	-5
Count of amenities that can be walked	
Count of education establishments that can be reached by 15 min walk	-5
Count of education establishments that can be reached by 30 min walk	-5
Broadband Data	
Broadband Data	-5
Count of amenities from PT stops	
Count of primary schools that can be reached by 30 min walk PT stops	-3
Count of secondary schools that can be reached by 30 min walk from PT stops	-5
Car - main method of travel	
Education - Car	5

Appendix H7: Weightings
IT Infrastructure – Digital public services

Datapoints related to **digital public services**	Weightings (-5 to 5)
Count of amenities in hexes	
Community facilities in hexes	-5
Local shops and services in hexes	-3
Count of amenities that can be walked	
Count of community facilities that can be reached by 15 min walk	-5
Count of local shops and services that can be reached by 15 min walk	-3
Count of community facilities that can be reached by 30 min walk	-5
Count of local shops and services that can be reached by 30 min walk	-3
Broadband Data	
Broadband Data	-5
Delivery types to house	
Delivery type: Parcels	3
Delivery type: Takeaways	1
Delivery type: Groceries	5
Delivery methods	
Delivery methods: Direct to door	5
Delivery methods: Pick-up locker	4
Delivery methods: Click and collect	3
Delivery methods: Post Office	1
Asset ownership	
Car/van ownership	-5
Motorcycle ownership	-3
Count of amenities from PT stops	
Count of supermarkets that can be reached by 30 min walk from PT stops	-5
Count of GPs that can be reached by 30 min walk from PT stops	-3
Count of hospitals that can be reached by 30 min walk from PT stops	-1
Walk - main method of travel	
Shopping & personel business – Walk	5
Cycle - main method of travel	
Shopping & personel business – Cycle	5
Car - main method of travel	
Leisure - Car	5

Appendix H8: Weightings
Active travel infrastructure – Connected walking and cycling infrastructure

Datapoints related to **connected walking and cycling infrastructure**	Weightings (-5 to 5)
Cycle network	
Sustrans network on road	-5
Sustrans network off road	-3
Cycle path length	-5
20mph road length	0
20mph road length	-5
Shared mobility usage	
Bike share usage	5
E-scooter share usage	3
Experience and/or perception around shared mobility	
Bike experience of share usage	5
E-scooter experience of share usage	3
Asset ownership	
Car/van ownership	-5
Motorcycle ownership	-3
Bicycle ownership	5
Scooter ownership	3
Casualty count	
Casuality count - Cycle	4
Casuality count - Walking	5
Walk - main method of travel	
Commuting - Walk	1
Education - Walk	2
Shopping&personel business - Walk	5
Leisure - Walk	3
Work-related (not commuting) - Walk	4
Cycle - main method of travel	
Commuting - Cycle	1
Education - Cycle	2
Shopping&personel business - Cycle	5
Leisure - Cycle	3
Work-related (not commuting) - Cycle	4
Sustainable travel opportunity	
Sustainable travel opportunity - Walk	5
Sustainable travel opportunity - Bike	4
Sustainable travel propensity	0
Sustainable travel propensity – Walk	5
Sustainable travel propensity – Bike	4
Land use	
VOA land use	5
Car parking	
Proportion of households reliant on on-street parking	5

Appendix H9: Weightings
Active travel infrastructure – Logistics infrastructure

Datapoints related to **logistics infrastructure**	Weightings (-5 to 5)
Delivery types to house	
Delivery type: Parcels	5
Delivery type: Groceries	3
Delivery methods	
Delivery methods: Direct to door	3
Delivery methods: Pick-up locker	5
Walk - main method of travel	
Shopping&personel business - Walk	5
Cycle - main method of travel	
Shopping&personel business - Cycle	5
Car - main method of travel	
Shopping&personel business - Car	5
Car parking	
Proportion of households reliant on on-street parking	5

Appendix H10: Weightings
Active travel infrastructure – Micro-consolidation

Datapoints related to **micro-consolidation**	Weightings (-5 to 5)
Delivery types to house	
Delivery type: Parcels	3
Delivery type: Groceries	5
Delivery methods	
Delivery methods: Direct to door	3
Delivery methods: Pick-up locker	5
Walk - main method of travel	
Shopping&personel business - Walk	5
Cycle - main method of travel	
Shopping&personel business - Cycle	5
Car - main method of travel	
Shopping&personel business - Car	5
Car parking	
Proportion of households reliant on on-street parking	5

Appendix H11: Weightings
Active travel infrastructure – Flexible pick up / drop off points for home deliveries

Datapoints related to **flexible pick up / drop off points for home deliveries**	Weightings (-5 to 5)
Delivery types to house	
Delivery type: Parcels	3
Delivery type: Takeaways	1
Delivery type: Groceries	5
Delivery methods	
Delivery methods: Direct to door	1
Delivery methods: Pick-up locker	5
Delivery methods: Post Office	3
Shared mobility usage	
Car/van share usage	5
Experience and/or perception around shared mobility	
Car/van experience of share usage	5
Asset ownership	
Car/van ownership	-5
Motorcycle ownership	-3
Household parking location	5
Walk - main method of travel	
Shopping&personel business - Walk	5
Cycle - main method of travel	
Shopping&personel business - Cycle	5
Car - main method of travel	
Shopping&personel business - Car	5
Car parking	
Proportion of households reliant on on-street parking	5

Appendix H12: Weightings
Shared mobility – Mobility hubs

Datapoints related to **mobility hubs**	Weightings (-5 to 5)
Cycle network	
Sustrans network on road	5
Sustrans network off road	3
Cycle path length	5
20mph road length	
20mph road length	5
Shared mobility usage	
Car/van share usage	2
Ride share usage	4
Demand responsive transport usage	3
Bike share usage	5
E-scooter share usage	1
Experience and/or perception around shared mobility	
Car/van experience of share usage	2
Ride experience of share usage	4
DRT experience of share usage	3
Bike experience of share usage	5
E-scooter experience of share usage	1
Asset ownership	
Car/van ownership	-5
Motorcycle ownership	-3
Bicycle ownership	5
Scooter ownership	3
Count of amenities from PT stops	
Count of employment facilities that can be reached by 30 min walk from PT stops	4
Count of supermarkets that can be reached by 30 min walk from PT stops	5
Count of primary schools that can be reached by 30 min walk PT stops	1
Count of secondary schools that can be reached by 30 min walk from PT stops	1
Count of GPs that can be reached by 30 min walk from PT stops	2
Count of hospitals that can be reached by 30 min walk from PT stops	3
Average public transport accessibility (benchmarked to the UK)	5
Population access	
Population which can access bus/coach stop points within a distance of 800m	3
Population which can access railway station access points within a distance of 800m	5
Walk - main method of travel	
Commuting - Walk	1
Education - Walk	2
Shopping&personel business - Walk	5
Leisure - Walk	3
Work-related (not commuting) - Walk	4
Cycle - main method of travel	
Commuting - Cycle	1
Education - Cycle	2
Shopping&personel business - Cycle	5
Leisure - Cycle	3
Work-related (not commuting) - Cycle	4
Bus - main method of travel	
Commuting - Bus	3
Education - Bus	1
Shopping&personel business - Bus	5
Leisure - Bus	2
Work-related (not commuting) - Bus	4
Rail - main method of travel	
Commuting - Rail	3
Education - Rail	1
Shopping&personel business - Rail	5
Leisure - Rail	2
Work-related (not commuting) - Rail	4
Sustainable travel opportunity	
Sustainable travel opportunity - Walk	5
Sustainable travel opportunity - Bike	3
Sustainable travel opportunity -PT	1
Sustainable travel propensity	
Sustainable travel propensity - Walk	5
Sustainable travel propensity - Bike	4
Sustainable travel propensity - Bus	2
Sustainable travel propensity -Train	1
Car parking	
Proportion of households reliant on on-street parking	5
Number of Evs	
Number of EVs (2030)	5
Number of rapid EVCPs	-5
Number of standard EVCPs	-3

Appendix H13: Weightings
Shared mobility – Bike and scooter share

Datapoints related to **bike and scooter share**	Weightings (-5 to 5)
Cycle network	
Sustrans network on road	5
Sustrans network off road	3
Cycle path length	5
20mph road length	
20mph road length	5
Shared mobility usage	
Bike share usage	5
E-scooter share usage	3
Experience and/or perception around shared mobility	
Bike experience of share usage	5
E-scooter experience of share usage	3
Asset ownership	
Car/van ownership	-5
Motorcycle ownership	-3
Bicycle ownership	5
Scooter ownership	3
Cycle - main method of travel	
Commuting - Cycle	4
Education - Cycle	5
Shopping&personel business - Cycle	1
Leisure - Cycle	2
Work-related (not commuting) - Cycle	3
Sustainable travel opportunity	
Sustainable travel opportunity - Walk	3
Sustainable travel opportunity - Bike	5
Sustainable travel propensity	
Sustainable travel propensity - Walk	3
Sustainable travel propensity - Bike	5
Car parking	
Proportion of households reliant on on-street parking	5

Appendix H14: Weightings
Shared mobility – Car share (club) including EV

Datapoints related to **car share (club) including EV**	Weightings (-5 to 5)
Shared mobility usage	
Car/van share usage	5
Experience and/or perception around shared mobility	
Car/van experience of share usage	5
Asset ownership	
Car/van ownership	-5
Motorcycle ownership	-3
Car - main method of travel	
Commuting - Car	4
Education - Car	1
Shopping&personel business - Car	2
Leisure - Car	3
Work-related (not commuting) - Car	5
Sustainable travel propensity	
Sustainable travel propensity -Car	5
Car parking	
Proportion of households reliant on on-street parking	5
Number of Evs	
Number of rapid EVCPs	5
Number of standard EVCPs	3

Appendix H15: Weightings
Modern public transport – Mobility as a Service

Datapoints related to **mobility as a Service**	Weightings (-5 to 5)
Cycle network	
Sustrans network on road	5
Sustrans network off road	3
Cycle path length	5
20mph road length	
20mph road length	5
Shared mobility usage	
Car/van share usage	2
Ride share usage	4
Demand responsive transport usage	3
Bike share usage	5
E-scooter share usage	1
Experience and/or perception around shared mobility	
Car/van experience of share usage	2
Ride experience of share usage	4
DRT experience of share usage	3
Bike experience of share usage	5
E-scooter experience of share usage	1
Asset ownership	
Car/van ownership	-5
Motorcycle ownership	-3
Bicycle ownership	5
Scooter ownership	3
Count of amenities from PT stops	
Count of employment facilities that can be reached by 30 min walk from PT stops	4
Count of supermarkets that can be reached by 30 min walk from PT stops	5
Count of primary schools that can be reached by 30 min walk PT stops	1
Count of secondary schools that can be reached by 30 min walk from PT stops	2
Count of GPs that can be reached by 30 min walk from PT stops	2
Count of hospitals that can be reached by 30 min walk from PT stops	3
Average public transport accessibility (benchmarked to the UK)	5
Population access	
Population which can access bus/coach stop points within a distance of 800m	3
Population which can access railway station access points within a distance of 800m	5
Walk - main method of travel	
Commuting - Walk	1
Education - Walk	2
Shopping&personel business - Walk	5
Leisure - Walk	3
Work-related (not commuting) - Walk	4
Cycle - main method of travel	
Commuting - Cycle	1
Education - Cycle	2
Shopping&personel business - Cycle	5
Leisure - Cycle	3
Work-related (not commuting) - Cycle	4
Bus - main method of travel	
Commuting - Bus	3
Education - Bus	1
Shopping&personel business - Bus	5
Leisure - Bus	2
Work-related (not commuting) - Bus	4
Rail - main method of travel	
Commuting - Rail	3
Education - Rail	1
Shopping&personel business - Rail	5
Leisure - Rail	2
Work-related (not commuting) - Rail	4
Sustainable travel opportunity	
Sustainable travel opportunity - Walk	1
Sustainable travel opportunity - Bike	3
Sustainable travel opportunity -PT	5
Sustainable travel propensity	
Sustainable travel propensity - Walk	2
Sustainable travel propensity - Bike	3
Sustainable travel propensity - Bus	5
Sustainable travel propensity -Train	4

Appendix H16: Weightings
Modern public transport – Bus priority

Datapoints related to **bus priority**	Weightings (-5 to 5)
Shared mobility usage	
Demand responsive transport usage	5
Experience and/or perception around shared mobility	
DRT experience of share usage	5
Count of amenities from PT stops	
Count of employment facilities that can be reached by 30 min walk from PT stops	-3
Count of supermarkets that can be reached by 30 min walk from PT stops	-5
Count of primary schools that can be reached by 30 min walk PT stops	-4
Count of secondary schools that can be reached by 30 min walk from PT stops	-3
Count of GPs that can be reached by 30 min walk from PT stops	-1
Count of hospitals that can be reached by 30 min walk from PT stops	-2
Average public transport accessibility (benchmarked to the UK)	-5
Population access	
Population which can access bus/coach stop points within a distance of 800m	5
Bus - main method of travel	
Commuting - Bus	3
Education - Bus	1
Shopping&personel business - Bus	5
Leisure - Bus	2
Work-related (not commuting) - Bus	4
Sustainable travel opportunity	
Sustainable travel opportunity -PT	5
Sustainable travel propensity	
Sustainable travel propensity - Bus	5
Car parking	
Proportion of households reliant on on-street parking	5

Appendix H17: Weightings
Modern public transport – Bus rapid transport

Datapoints related to **bus rapid transport**	Weightings (-5 to 5)
Shared mobility usage	
Demand responsive transport usage	5
Experience and/or perception around shared mobility	
DRT experience of share usage	5
Count of amenities from PT stops	
Count of employment facilities that can be reached by 30 min walk from PT stops	-3
Count of supermarkets that can be reached by 30 min walk from PT stops	-5
Count of primary schools that can be reached by 30 min walk PT stops	-4
Count of secondary schools that can be reached by 30 min walk from PT stops	-3
Count of GPs that can be reached by 30 min walk from PT stops	-1
Count of hospitals that can be reached by 30 min walk from PT stops	-2
Average public transport accessibility (benchmarked to the UK)	-5
Population access	
Population which can access bus/coach stop points within a distance of 800m	5
Bus - main method of travel	
Commuting - Bus	4
Education - Bus	1
Shopping&personel business - Bus	3
Leisure - Bus	2
Work-related (not commuting) - Bus	5
Sustainable travel opportunity	
Sustainable travel opportunity -PT	5
Sustainable travel propensity	
Sustainable travel propensity - Bus	5
Car parking	
Proportion of households reliant on on-street parking	5

Appendix H18: Weightings
Modern public transport – Ride share

Datapoints related to **ride share**	Weightings (-5 to 5)
Shared mobility usage	
Ride share usage	5
Experience and/or perception around shared mobility	
Ride experience of share usage	5
Asset ownership	
Car/van ownership	-5
Motorcycle ownership	-3
Bus - main method of travel	
Commuting - Bus	3
Education - Bus	1
Shopping&personel business - Bus	5
Leisure - Bus	2
Work-related (not commuting) - Bus	4
Rail - main method of travel	
Commuting - Rail	3
Education - Rail	1
Shopping&personel business - Rail	5
Leisure - Rail	2
Work-related (not commuting) - Rail	4
Car - main method of travel	
Commuting - Car	4
Education - Car	1
Shopping&personel business - Car	2
Leisure - Car	3
Work-related (not commuting) - Car	5
Sustainable travel propensity	
Sustainable travel propensity -Car	5
Car parking	
Proportion of households reliant on on-street parking	5
Number of Evs	
Number of rapid EVCPs	5
Number of standard EVCPs	3

Appendix H19: Weightings
Modern public transport – Rail improvements

Datapoints related to **rail improvements**	Weightings (-5 to 5)
Experience and/or perception around shared mobility	
DRT experience of share usage	5
Asset ownership	
Car/van ownership	-5
Motorcycle ownership	-3
Rail - main method of travel	
Commuting - Rail	4
Education - Rail	1
Shopping&personel business - Rail	3
Leisure - Rail	2
Work-related (not commuting) - Rail	5
Sustainable travel propensity	
Sustainable travel propensity -Train	5

Appendix H20: Weightings
Modern public transport – Demand response transport

Datapoints related to **demand response transport**	Weightings (-5 to 5)
Shared mobility usage	
Demand responsive transport usage	5
Experience and/or perception around shared mobility	
DRT experience of share usage	5
Asset ownership	
Car/van ownership	-5
Motorcycle ownership	-3
Walk - main method of travel	
Commuting - Walk	1
Education - Walk	3
Shopping&personel business - Walk	5
Leisure - Walk	2
Work-related (not commuting) - Walk	4
Cycle - main method of travel	
Commuting - Cycle	1
Education - Cycle	3
Shopping&personel business - Cycle	5
Leisure - Cycle	2
Work-related (not commuting) - Cycle	4
Bus - main method of travel	
Commuting - Bus	4
Education - Bus	1
Shopping&personel business - Bus	3
Leisure - Bus	2
Work-related (not commuting) - Bus	5
Rail - main method of travel	
Commuting - Rail	4
Education - Rail	1
Shopping&personel business - Rail	3
Leisure - Rail	2
Work-related (not commuting) - Rail	5
Sustainable travel opportunity	
Sustainable travel opportunity -PT	5
Sustainable travel propensity	
Sustainable travel propensity - Bus	5
Car parking	
Proportion of households reliant on on-street parking	5

Appendix H21: Weightings
Modern public transport – Automated vehicle shuttles (last mile connectivity)

Datapoints related to **automated vehicle shuttles (last mile connectivity)**	Weightings (-5 to 5)
Delivery types to house	
Delivery type: Parcels	5
Delivery type: Groceries	3
Delivery methods	
Delivery methods: Direct to door	3
Delivery methods: Post Office	5
Asset ownership	
Car/van ownership	-5
Motorcycle ownership	-3
Walk - main method of travel	
Commuting - Walk	1
Education - Walk	3
Shopping&personel business - Walk	5
Leisure - Walk	4
Work-related (not commuting) - Walk	2
Cycle - main method of travel	
Commuting - Cycle	1
Education - Cycle	3
Shopping&personel business - Cycle	5
Leisure - Cycle	4
Work-related (not commuting) - Cycle	2
Bus - main method of travel	
Commuting - Bus	3
Education - Bus	1
Shopping&personel business - Bus	5
Leisure - Bus	2
Work-related (not commuting) - Bus	4
Rail - main method of travel	
Commuting - Rail	3
Education - Rail	1
Shopping&personel business - Rail	5
Leisure - Rail	2
Work-related (not commuting) - Rail	4
Car parking	
Proportion of households reliant on on-street parking	5

Appendix H22: Weightings
Street design & access restriction – Active travel priority

Datapoints related to **active travel priority**	Weightings (-5 to 5)
Cycle network	
Sustrans network on road	5
Sustrans network off road	3
Cycle path length	5
20mph road length	
20mph road length	5
Shared mobility usage	
Bike share usage	5
E-scooter share usage	3
Experience and/or perception around shared mobility	
Bike experience of share usage	5
E-scooter experience of share usage	3
Asset ownership	
Car/van ownership	-5
Motorcycle ownership	-3
Bicycle ownership	5
Scooter ownership	3
Casuality count	
Casuality count - Cycle	4
Casuality count - Walking	5
Casuality count - Motor vehicle	3
Casuality count - Motorcycle	2
Walk - main method of travel	
Commuting - Walk	1
Education - Walk	4
Shopping&personel business - Walk	5
Leisure - Walk	3
Work-related (not commuting) - Walk	2
Cycle - main method of travel	
Commuting - Cycle	1
Education - Cycle	4
Shopping&personel business - Cycle	5
Leisure - Cycle	3
Work-related (not commuting) - Cycle	2
Sustainable travel opportunity	
Sustainable travel opportunity - Walk	5
Sustainable travel opportunity - Bike	3
Sustainable travel propensity	
Sustainable travel propensity - Walk	5
Sustainable travel propensity - Bike	3
Car parking	
Proportion of households reliant on on-street parking	5

Appendix H23: Weightings
Street design & access restriction – Streetspace reallocation from cars to active and public transport

Datapoints related to **streetspace reallocation from cars to active and public transport**	Weightings (-5 to 5)
Shared mobility usage	
Demand responsive transport usage	3
Bike share usage	5
E-scooter share usage	1
Experience and/or perception around shared mobility	
DRT experience of share usage	3
Bike experience of share usage	5
E-scooter experience of share usage	1
Asset ownership	
Car/van ownership	-5
Motorcycle ownership	-3
Bicycle ownership	5
Scooter ownership	3
Household parking location	1
Count of amenities from PT stops	
Count of employment facilities that can be reached by 30 min walk from PT stops	-3
Count of supermarkets that can be reached by 30 min walk from PT stops	-5
Count of primary schools that can be reached by 30 min walk PT stops	-4
Count of secondary schools that can be reached by 30 min walk from PT stops	-3
Count of GPs that can be reached by 30 min walk from PT stops	-1
Count of hospitals that can be reached by 30 min walk from PT stops	-2
Average public transport accessibility (benchmarked to the UK)	-5
Population access	
Population which can access bus/coach stop points within a distance of 800m	5
Casuality count	
Casuality count - Motor vehicle	4
Casuality count - Motorcycle	5
Bus - main method of travel	
Commuting - Bus	3
Education - Bus	4
Shopping&personel business - Bus	3
Leisure - Bus	5
Work-related (not commuting) - Bus	1
Rail - main method of travel	
Commuting - Rail	3
Education - Rail	4
Shopping&personel business - Rail	3
Leisure - Rail	5
Work-related (not commuting) - Rail	1
Car - main method of travel	
Commuting - Car	3
Education - Car	4
Shopping&personel business - Car	3
Leisure - Car	5
Work-related (not commuting) - Car	1
Sustainable travel opportunity	
Sustainable travel opportunity -PT	5
Sustainable travel propensity	
Sustainable travel propensity - Bus	5
Sustainable travel propensity -Train	3
Car parking	
Car parks count	5
Proportion of households reliant on on-street parking	5

Appendix H24: Weightings
Street design & access restriction – 20mph zones

Datapoints related to **20mph zones**	Weightings (-5 to 5)
20mph road length	
20mph road length	-5
Asset ownership	
Car/van ownership	4
Motorcycle ownership	3
Bicycle ownership	5
Scooter ownership	1
Casuality count	
Casuality count - Cycle	2
Casuality count - Walking	3
Casuality count - Motor vehicle	4
Casuality count - Motorcycle	5
Walk - main method of travel	
Commuting - Walk	2
Education - Walk	5
Shopping&personel business - Walk	4
Leisure - Walk	3
Work-related (not commuting) - Walk	1
Cycle - main method of travel	
Commuting - Cycle	2
Education - Cycle	5
Shopping&personel business - Cycle	4
Leisure - Cycle	3
Work-related (not commuting) - Cycle	1
Bus - main method of travel	
Commuting - Bus	3
Education - Bus	1
Shopping&personel business - Bus	4
Leisure - Bus	2
Work-related (not commuting) - Bus	5
Rail - main method of travel	
Commuting - Rail	3
Education - Rail	1
Shopping&personel business - Rail	4
Leisure - Rail	2
Work-related (not commuting) - Rail	5
Car - main method of travel	
Commuting - Car	4
Education - Car	3
Shopping&personel business - Car	1
Leisure - Car	2
Work-related (not commuting) - Car	5
Sustainable travel opportunity	
Sustainable travel opportunity - Walk	5
Sustainable travel opportunity - Bike	3
Sustainable travel propensity	
Sustainable travel propensity - Walk	5
Sustainable travel propensity - Bike	3
Sustainable travel propensity -Car	1

Appendix H25: Weightings
Street design & access restriction – Controlled parking zones

Datapoints related to **controlled parking zones**	Weightings (-5 to 5)
Asset ownership	
Car/van ownership	5
Motorcycle ownership	3
Bicycle ownership	2
Scooter ownership	1
Household parking location	4
Bus - main method of travel	
Commuting - Bus	3
Education - Bus	1
Shopping&personel business - Bus	4
Leisure - Bus	2
Work-related (not commuting) - Bus	5
Rail - main method of travel	
Commuting - Rail	3
Education - Rail	1
Shopping&personel business - Rail	4
Leisure - Rail	2
Work-related (not commuting) - Rail	5
Car - main method of travel	
Commuting - Car	4
Education - Car	1
Shopping&personel business - Car	2
Leisure - Car	3
Work-related (not commuting) - Car	5
Sustainable travel propensity	
Sustainable travel propensity -Car	5
Car parking	
Proportion of households reliant on on-street parking	5
Number of Evs	
Number of EVs (2030)	5

Appendix H26: Weightings
Street design & access restriction – Car free zones

Datapoints related to **car free zones**	Weightings (-5 to 5)
Shared mobility usage	
Demand responsive transport usage	5
Bike share usage	3
E-scooter share usage	1
Experience and/or perception around shared mobility	
DRT experience of share usage	5
Bike experience of share usage	3
E-scooter experience of share usage	1
Asset ownership	
Car/van ownership	5
Motorcycle ownership	4
Bicycle ownership	2
Scooter ownership	1
Casuality count	
Casuality count - Cycle	2
Casuality count - Walking	3
Casuality count - Motor vehicle	4
Casuality count - Motorcycle	5
Walk - main method of travel	
Commuting - Walk	2
Education - Walk	5
Shopping&personel business - Walk	4
Leisure - Walk	3
Work-related (not commuting) - Walk	1
Cycle - main method of travel	
Commuting - Cycle	2
Education - Cycle	5
Shopping&personel business - Cycle	4
Leisure - Cycle	3
Work-related (not commuting) - Cycle	1
Bus - main method of travel	
Commuting - Bus	3
Education - Bus	1
Shopping&personel business - Bus	4
Leisure - Bus	2
Work-related (not commuting) - Bus	5
Rail - main method of travel	
Commuting - Rail	3
Education - Rail	1
Shopping&personel business - Rail	4
Leisure - Rail	2
Work-related (not commuting) - Rail	5
Car - main method of travel	
Commuting - Car	4
Education - Car	1
Shopping&personel business - Car	2
Leisure - Car	3
Work-related (not commuting) - Car	5
Sustainable travel opportunity	
Sustainable travel opportunity - Walk	5
Sustainable travel opportunity - Bike	3
Sustainable travel opportunity -PT	1
Sustainable travel propensity	
Sustainable travel propensity - Walk	5
Sustainable travel propensity - Bike	4
Sustainable travel propensity - Bus	2
Sustainable travel propensity -Train	1
Car parking	
Proportion of households reliant on on-street parking	5

Appendix H27: Weightings
Street design & access restriction – Car free / car-lite development

Datapoints related to **car free / car-lite development**	Weightings (-5 to 5)
Cycle network	
Sustrans network on road	-5
Sustrans network off road	-3
Cycle path length	-5
20mph road length	
20mph road length	-5
Shared mobility usage	
Car/van share usage	5
Ride share usage	3
Experience and/or perception around shared mobility	
Car/van experience of share usage	5
Ride experience of share usage	3
Asset ownership	
Car/van ownership	5
Motorcycle ownership	3
Household parking location	1
Walk - main method of travel	
Commuting - Walk	-4
Education - Walk	-1
Shopping&personel business - Walk	-3
Leisure - Walk	-2
Work-related (not commuting) - Walk	-5
Cycle - main method of travel	
Commuting - Cycle	-4
Education - Cycle	-1
Shopping&personel business - Cycle	-3
Leisure - Cycle	-2
Work-related (not commuting) - Cycle	-5
Car - main method of travel	
Commuting - Car	4
Education - Car	1
Shopping&personel business - Car	2
Leisure - Car	3
Work-related (not commuting) - Car	5
Sustainable travel opportunity	
Sustainable travel opportunity - Walk	-5
Sustainable travel opportunity - Bike	-3
Sustainable travel propensity	
Sustainable travel propensity - Walk	-5
Sustainable travel propensity - Bike	-3
Sustainable travel propensity -Car	5
Car parking	
Car parks count	5
Proportion of households reliant on on-street parking	5

Appendix H28: Weightings
Street design & access restriction – Congestion charging zones

Datapoints related to **congestion charging zones**	Weightings (-5 to 5)
Shared mobility usage	
Demand responsive transport usage	5
Bike share usage	3
E-scooter share usage	1
Experience and/or perception around shared mobility	
DRT experience of share usage	5
Bike experience of share usage	3
E-scooter experience of share usage	1
Asset ownership	
Car/van ownership	5
Motorcycle ownership	4
Bicycle ownership	2
Scooter ownership	1
Bus - main method of travel	
Commuting - Bus	3
Education - Bus	1
Shopping&personel business - Bus	4
Leisure - Bus	2
Work-related (not commuting) - Bus	5
Rail - main method of travel	
Commuting - Rail	3
Education - Rail	1
Shopping&personel business - Rail	4
Leisure - Rail	2
Work-related (not commuting) - Rail	5
Car - main method of travel	
Commuting - Car	4
Education - Car	1
Shopping&personel business - Car	2
Leisure - Car	3
Work-related (not commuting) - Car	5
Sustainable travel opportunity	
Sustainable travel opportunity - Walk	4
Sustainable travel opportunity - Bike	3
Sustainable travel opportunity -PT	1
Sustainable travel propensity	
Sustainable travel propensity - Walk	4
Sustainable travel propensity - Bike	3
Sustainable travel propensity - Bus	2
Sustainable travel propensity -Train	1
Sustainable travel propensity -Car	5
Car parking	
Car parks count	5
Proportion of households reliant on on-street parking	5

Appendix H29: Weightings
EV charging infrastructure – Residential EV charging and vehicle to grid

Datapoints related to **residential EV charging and vehicle to grid**	Weightings (-5 to 5)
Asset ownership	
Car/van ownership	5
Household parking location	3
Sustainable travel propensity	
Sustainable travel propensity -Car	5
Car parking	
Proportion of households reliant on on-street parking	5
Number of Evs	
Number of EVs (2030)	5

Appendix H30: Weightings
EV charging infrastructure – EV charging (stations / shops / work / mobility hubs)

Datapoints related to **EV charging (stations / shops / work / mobility hubs)**	Weightings (-5 to 5)
Asset ownership	
Car/van ownership	5
Household parking location	3
Car - main method of travel	
Commuting - Car	4
Education - Car	1
Shopping&personel business - Car	2
Leisure - Car	3
Work-related (not commuting) - Car	5
Sustainable travel propensity	
Sustainable travel propensity -Car	5
Land use	
VOA land use	5
Car parking	
Car parks count	5
Proportion of households reliant on on-street parking	5
Number of Evs	
Number of EVs (2030)	5
Number of rapid EVCPs	-5
Number of standard EVCPs	-3

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