Greater Cambridge Partnership

Making Connections

Appendix E: Social and Distributional Impact Assessment

RPT-SDIA
AUGUST 2023

PUBLIC

Greater Cambridge Partnership

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Project: Making Connections

OUR REF. NO. Rpt-SDIA

Date: August 2023

Quality Control

Issue/Revision	Issue 1	Issue 2	Issue 3	Issue 4
Remarks	High Level Assessment for OAR	Revised Assessment for OBC	Revised Assessment for OBC including addressing comments	
Date	28/04/23	11/08/2023	21/08/2023	
Prepared by	SS, FMS	SS, EO, AE, FMS	SS, EO, AE, FMS	
Checked by	AMP	PB	PB, AMP	
Authorised by	PG	PG	PG/LC	
Report number				

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1 Introduction

1.1 Project Context

1.1.1. The Greater Cambridge area is facing several pressures over the coming years, with continued growth of traffic congestion, limited public transport choice, poor air quality, high levels of carbon emissions, car-dominated environments and poor accessibility including the daily needs for students, workers and residents who rely on public transport.

1.1.2. Housing and employment growth of the past decade is expected to continue, bringing more opportunity and prosperity to Greater Cambridge and beyond. This exacerbates the need to transform the transport network so it can meet the needs of the area now and for future generations.

1.1.3. For those without a car, the combination of high cost and poor-quality public transport can limit access to opportunities, leaving people isolated and communities less integrated and more unequal.

1.2 Overview of the Proposal

1.2.1. The Making Connections programme seeks to reduce the number of cars within the city centre thereby tackling existing congestion and provide alternative modes of transport to car by increasing public transport options, lowering fares and providing for active travel.

1.2.2. The project seeks to introduce transformational bus services across Cambridge, funded through a charging scheme on vehicles travelling into the city centre. The overall strategy is to reduce the number of cars in the city centre to tackle the severe congestion that is currently limiting Cambridge's potential. New bus services will offer fast, affordable and convenient connections that drive mode shift from car to bus through offering attractive alternatives to car.

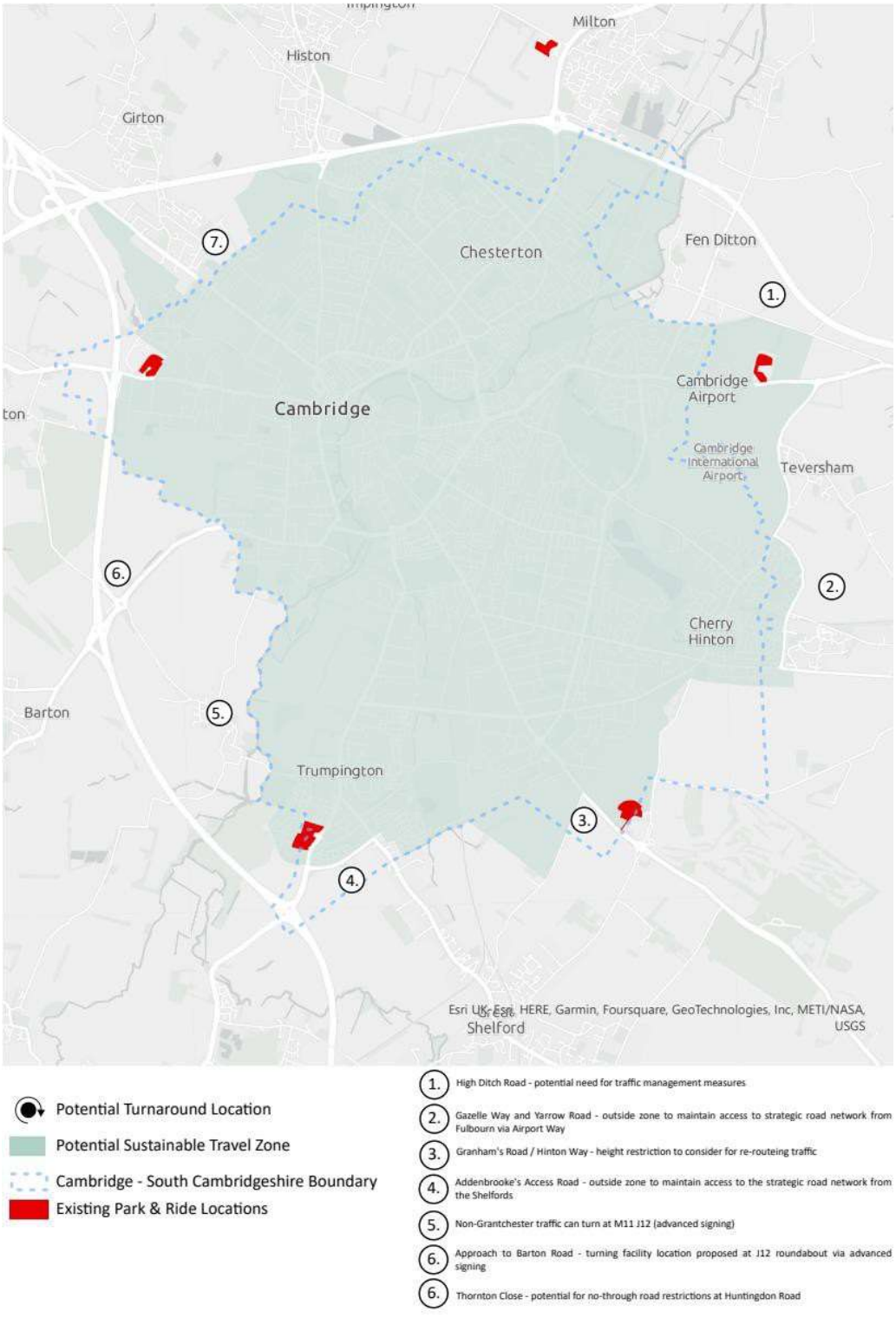
1.2.3. The Greater Cambridge area is growing fast, between 2011 and 2021 the population increased by 17% to 307,000. By 2031 it is expected to be 28% higher than in 2011. This will increase travel demand and congestion on an already struggling transport system. Unless action is taken, congestion and car dependency will continue to threaten the area's social, economic, and environmental wellbeing.

1.2.4. Making Connections comprises a complete repositioning of the bus network to provide new routes, longer operating hours, more affordable fares and new destinations, all funded by a charge for driving that will reduce congestion and free up space for public transport, walking and cycling. Investment in the bus network is intended to result in one of the biggest changes outside London since deregulation of the bus industry in the 1980s.

1.2.5. Making Connections will rebalance the use of highway space to enable more people to travel sustainably whether by bus or active travel. It will boost walking and cycle use for short journeys within the city. It will underpin sustainable growth and support a safer, healthier, economically stronger Cambridge.

1.2.6. **Figure 1-1** shows the initial proposals for the area over which the STZ is proposed to cover. The existing park and ride locations are not included in the SZT and would be accessible without crossing into the STZ from the surrounding areas.

Figure 1-1 – Potential proposed charge zone



1.2.7. This report provides a high-level qualitative assessment of three different scenarios (Scenario 1, Scenario 2 and Scenario 3) for the charging scheme, making a comparison between the programme that was taken to public consultation in October 2022. **Table 1-1** outlines the different scenarios being considered as a part of this assessment. Scenario 1A was not included for full assessment within this SDIA, however more detail of potential impacts of this scenario is set out in Chapter 7.

Table 1-1 – Overview of Proposed Scenarios

	Charge	Time	Implementation	Additional Exemptions (to those consulted on)
Consultation Scheme	£5 for cars £10 LGV £50 HGV	7am-7pm weekdays	AM only 2026	
Scenario 1	£5 for cars £10 LGV £50 HGV	AM/ PM weekdays	starts 2027	Hospitals (patients and visitors) Small vans as cars
Scenario 2	£5 for cars £10 LGV £50 HGV	7am-7pm weekdays	AM only 2026	180 Free days 2026, 2027 100 Free days 2028 50 Free days 2029
Scenario 3	£3 for cars £10 LGV £50 HGV	AM / PM weekdays	starts in 2027	Hospitals (patients and visitors) 100 Free days 2027 100 free days 2028
Do minimum	Ref Case			

1.2.8. In accordance with DfT Transport Appraisal Guidance (TAG) a separate assessment of the Do Minimum scenario was not undertaken as part of this SDIA. This is primarily because of the comparative nature of the assessment, which focuses on assessing the alternative interventions against the baseline using a 7-point scale. This comparative assessment would be against a Do Nothing/Do Minimum counterfactual scenario, hence any assessment on a “Do Minimum” scenario would lead to a neutral outcome.

1.2.9. As part of the Making Connections programme, there are certain vehicles and/or drivers who may be entitled to a discount, exemption or reimbursement (DER) from the STZ charge. Certain vehicles would be exempt from the STZ charge. An exemption means that you do not have to pay for the charge. It applies to particular DVLA categories of vehicle and therefore exemptions are applied automatically without the need to register an individual’s details. A discount of up to 100% would also apply to vehicles if they or the driver meet certain criteria. Further details on the DER will be added to further iterations of this assessment once the specific criteria have been finalised.

1.2.10. Feedback from the Autumn 2021 consultation and engagement with key stakeholders, was used to develop reimbursement schemes which were included in the 2022 consultation for the following groups:

- NHS patients clinically assessed as too ill, weak, or disabled to travel to an appointment on public transport, including those who:
  - Have a compromised immune system.
  - Require regular therapy or assessments.
  - Need regular surgical intervention.
- NHS staff using a vehicle to carry certain items (such as equipment, controlled drugs, patient notes or clinical specimens), or responding to an emergency when on call.
- NHS and other emergency services staff responding to an emergency when on call.
- Other essential emergency service trips made in business vehicles that are not specifically listed above for exemptions, e.g. fire safety inspections.
- Social care, peripatetic health workers and CQC-registered care home workers.
- Minibuses and LGVs used by charities and not-for-profit groups.

Table 1-2 Additional proposed discounts, exemptions and reimbursements (DERs) post-consultation

DERs
• Goods vehicles • Healthcare visits (beyond what's already proposed) • Small businesses • Unpaid carers • Traveller sites • Charity volunteers • Groups that can't use public transport for specific reasons • Community transport groups • Residents living near to the boundary travelling outbound • Free travel for all patients and visitors to hospitals

1.2.11. **Table 1-2** outlines the proposed discounts and exemptions that are being considered as part of the Making Connections programme as of August 2023. As there is no existing database for vehicles which meet these criteria, an application process will be introduced to apply the discount.

1.3 Purpose of the report

1.3.1. The Social and Distributional Assessment (SDIA) has been updated following the submission of the proposed scheme and Strategic Outline Business Case (SOBC) for public consultation. Following on from the consultation, an Outline Business Case (OBC) for the

scheme is now being developed. As a part of the OBC three scenarios of Making Connections programme are being considered alongside the consultation option. Details of possible scenarios being considered are outlined in Section 1. The Do Nothing scenario has not been assessed as a scenario in its own right as the SDIA is a comparative assessment, therefore assessment of each scenario would be against a Do Nothing/Do Minimum counterfactual scenario, hence any assessment on a "Do Minimum" scenario would lead to a neutral outcome.

1.3.2. Traffic modelling data was available for Scenario 1 and therefore a more detailed quantitative assessment was undertaken for this scenario. This scenario performs most favourably against the scheme objectives and undertaking a quantitative assessment gives greater detail to inform potential impacts within the SIA and DIA.

1.3.3. The report has been structured as follows:

- Chapter 1: Introduction
- Chapter 2: Assessment Methodology
- Chapter 3: Baseline Assessment
- Chapter 4: Social Impact Assessment
- Chapter 5: Distributional Impact Assessment
- Chapter 6: Place-based Analysis
- Chapter 7: Summary.

2 ASSESSMENT METHODOLOGY

2.1 Overview of Assumptions

2.1.1. A series of assumptions have been made regarding data and information used to inform the Social and Distributional Impact (SDI) Appraisal. The following assumptions have been made when completing the assessment:

- The assessment of effects has been based on the programme in Section 1 of this report and in Section 2.1.2. This information has been provided by the Business Case and wider project team and reflects the level of detail and information that was available at the time of writing.
- Information on the type, scale and location of improvements to the active travel network and bus network including location of bus stops, bus routes was not available at this stage in the business case process.
- Assumptions around the proposed discounts and exemptions have been based on a list of discount and exemptions as set out in the discounts and exemptions technical note published as part of the consultation[1] as well as additional measures which have been developed and are being considered as part of the wider Business Case
- Final qualitative outputs from the Noise and Air Quality assessments were not available at the time of writing this assessment and so a high-level assessment has been made when considering these factors within the appraisal.
- Due to availability of modelling data, the qualitative assessments undertaken as part of the SDIA have used results from the DS6 scenario.

2.1.2. The following assumptions have been assumed in relation to the proposed public transport improvements, the scale of improvements will be dependent on the level of funding available.

- Improved access to Addenbrooke's including improved frequency of services within Cambridge, increased frequency and capacity at the Park and Ride and improve access to services within Cambridge City to provide connection to Addenbrooke's.
- Improved access to services within Cambridge City to improve the level of public transport available within the area.
- Improved frequency of bus services within Cambridge.

[1] GCP Making Connections Sustainable Travel Zone Discounts, Exemptions and Reimbursements Technical Note Date Accessed: April 2023.

- Additional direct services to improve bus service speeds.
- Improved access and capacity at the Park and Ride facility to improve access to the city centre.

2.1.3. In addition to the above, the following assumptions have been made about wider improvements to the active travel network and public realm. These are high level assumptions and the detail and specificity will be developed further once the scheme progresses.

- Improvements to some active travel routes to and from bus stops including improvements to wayfinding.
- Improvements to formal surveillance, public realm, lighting etc. on public transport routes including on buses, in and around bus stops and along key walking and cycling routes.

2.1.4. As detailed information is not available a worst-case scenario has been assumed and reflected within the assessment accordingly.

2.2 Social Impact Appraisal

Purpose

2.2.1. The Social Impact Appraisal (SIA) is undertaken to understand the impacts which cover human experience of a transport system and its impact on social factors which are not considered as part of wider economic or environmental impacts. The SIA forms part of the options appraisal process and will feed into the Appraisal Summary Table. The SIA has been undertaken in accordance with TAG Unit A4.1 (November 2022).

Assessment of Effects

2.2.2. For the SIA, the following topics have been included within the assessment. In line with TAG Unit A4.1, all eight topic areas are required to be assessed as part of the appraisal.

- Accidents
- Physical Activity
- Security
- Severance
- Journey Quality
- Option and Non-Use Values
- Accessibility
- Personal Affordability.

2.2.3. The assessment for the SIA is structured around each of the impacts outlined above. The assessment is presented using a 7-point scale, which is in **Table 2-1** overleaf.

Table 2-1 – Assessment Categories

Impact	Assessment
Beneficial and the population impacted is significantly greater than the proportion of the group in the total population	Large Beneficial
Beneficial and the population impacted is broadly in line with the proportion of the group in the total population	Moderate Beneficial
Beneficial and the population impacted is smaller than the proportion of the group in the total population	Slight Beneficial
There are no significant benefits or disbenefits experienced by the group for the specified impact	Neutral
Adverse and the population impacted is smaller than the proportion of the population of the group in the total population	Slight Adverse
Adverse and the population impacted is broadly in line with the proportion of the population of the group in the total population	Moderate Adverse
Adverse and the population impacted is significantly greater than the proportion of the group in the total population	Large Adverse

2.2.4. The following sections outline our approach to appraising impacts for each of the topic areas.

Accidents

2.2.5. The proposed illustrative scenarios could result in changes to the volume of traffic across the road network and could therefore impact on the number and type of accidents. The assessment has been based on a comparison of accidents 'with-scheme' and 'without-scheme' forecasts. An assessment has been made based on the 7-point scale above.

Physical Activity

2.2.6. The illustrative scenarios that are being assessed may cause an impact to the amount of daily physical activity that people undertake. This could result from any complementary walking and cycling measures being delivered as well as from a modal shift to public transport as more people would likely be walking or cycling to bus stops. To assess the changes in physical activity we have assessed the estimated net change in car, active travel, and public transport trips.

Security

2.2.7. As a part of the illustrative scenarios being put forward, there are several complementary measures being proposed including bus network improvements. The assessment of security has largely related to any changes in public transport waiting or interchange facilities, changes to pedestrian access, changes to visibility or natural surveillance etc. The assessment of security impacts has been based on a series of security indicators set out in TAG Unit A4.1 including site perimeters, entrances and exits, formal surveillance, informal surveillance, landscaping, lighting and visibility and emergency calls. Each of these indicators was assigned a relative importance (low, medium, or high) and a qualitative assessment (using the 7-point scale) has been made on the impact of the proposals both with and without scheme.

Severance

2.2.8. TAG Unit A4.1 requires the assessment of individuals whose access to community facilities could be impacted by the programme. The assessment is largely concerned with non-road users i.e., pedestrians. It takes into consideration any physical and perceived barriers (e.g., route diversions resulting in increased journey times) for people to access facilities. The assessment has focused on any physical barriers created by the proposed illustrative scenarios or if traffic changes resulting from the programme remove or create barriers for local people.

2.2.9. The assessment has focused on areas where there is an increase or decrease in traffic flow of 10% and identification of key routes where journeys would be impacted. A map of key routes **(Figure 5-8)** has been created to aid in the assessment of severance impacts. Severance would have an impact if local residents were unable to access community facilities. As such, we have identified any facilities located within an 800m buffer boundary of areas where there are changes in traffic flow. This has been undertaken in line with Design Manual for Roads and Bridges (DMRB) guidance as outlined within TAG Unit A4.1.

2.2.10. The impact of severance has been assessed with and without scheme and may be classified according to the following four broad levels: None, Slight, Moderate and Severe. An overall assessment will then be made in line with Table 5.1 within TAG Unit A4.1.

Journey Quality

2.2.11. As outlined within TAG Unit A4.1, journey quality refers to a measure of the real and perceived physical and social environment experienced while travelling. Factors affecting journey quality include public information provision, perceptions of safety, provisions for accessibility, physical crowding on public transport services etc.

2.2.12. Journey quality has been identified across three main categories as follows:

- Traveller care
- Travellers' views
- Traveller stress.

2.2.13. An initial qualitative assessment has been undertaken to assess the difference in journey quality in a 'with scheme' and 'without scheme' scenario, using a 7-point scale.

Option and Non-Use Values

2.2.14. The requirement to assess option and non-use values arises when there is a substantial change in the availability of transport services and includes the introduction of local bus services. The assessment has considered the number of households impacted by any proposals and has been assigned a qualitative score as follows:

- >1,000 households: Large impact
- 250-999 households: Moderate impact
- 1-249 households: Slight impact
- 0 households: Neutral impact.

2.2.15. The values are assessed as beneficial when a service is introduced and as adverse when a service is removed.

Accessibility

2.2.16. TAG Unit A4.1 identifies five key barriers that impact upon accessibility, as follows:

- The availability and physical accessibility of transport: For some people in isolated urban and rural areas there are limited or no public transport services or the services are unreliable, or do not go to the right places or at the right times.
- Cost of transport: Some people find the costs of personal or public transport very high or unaffordable.
- Services and activities located in inaccessible places: Developments including housing, hospitals, business and retail are often located in areas not easily accessible to people without a car.
- Safety and security: Some people will not use public transport or walk to key services because of the fear of crime or anti-social behaviour.
- Travel horizons: Some people are unwilling to travel long journey times or distances or may not know about or trust transport services.

2.2.17. A qualitative assessment will be undertaken for each of the barriers listed above and will inform a more detailed analysis of accessibility within the SDI.

Personal Affordability

2.2.18. The introduction of road user charging will have a direct and tangible impact on the affordability of travel by car for some users. Measures to reduce bus fares will also impact on personal affordability of public transport. A full assessment of personal affordability is undertaken within the DIA.

2.3 Distributional Impact Assessment

Purpose

2.3.1. A Distributional Impact Appraisal (DIA) considers the variance of impacts from transport interventions across different social groups. A DIA is required within the options appraisal process and feeds into the Appraisal Summary Table produced for the Making Connections Programme. Both beneficial and/or adverse distributional impacts of the proposed interventions have been considered along with the identification of the different social groups that are likely to be affected. The assessment has been carried out in line with TAG Unit A4.2 (May 2023) using the same seven-point grading scale used for the social impact assessment (see Table 2-2).

Screening the Assessment

2.3.2. A key step in the DIA is undertaking a screening exercise (**Table 2-2).** The impacts that are included within this stage are those that are outlined within TAG Unit A4.2. The screening exercise has established what topics will be scoped into the assessment. The scoping is based on the relevance of these topics to the illustrative scenarios being considered and the data available to undertake the analysis.

Table 2-2 – Screening

Indicator	Appraisal Output Criteria	Potential Impact (Yes/ No/ Positive/ Negative) if known	Inclusion within DIA (Yes/No)
User benefits	The Transport User Benefit Analysis (TUBA) user benefit analysis software or an equivalent process has been used in the appraisal; and/or the value of user benefits Transport Economic Efficiency (TEE) table is non-zero.	Yes	Yes – split between Charge and Non-Charge impacts
Noise*	Any change in alignment of transport corridor or any links with significant changes (>25% or <-20%) in vehicle flow, speed or %Heavy Duty Vehicle (HDV) content.	Yes – likely positive, however quantitative analysis to be undertaken when data is available	Yes

	Also note comment in TAG Unit A3.		
Air quality*	Any change in alignment of transport corridor or any links with significant changes in vehicle flow, speed or %HDV (Heavy-Duty Vehicles) content: • Change in 24-hour AADT of 1,000 vehicles or more • Change in 24-hour Annual Average Daily Traffic (AADT) of HDV of 200 HDV vehicles or more • Change in daily average speed of 10kph or more • Change in peak hour speed of 20kph or more • Change in road alignment of 5m or more	Yes – likely positive, however quantitative analysis to be undertaken when data is available	Yes
Accidents	Any change in alignment of transport corridor (or road layout) that may have positive or negative safety impacts, or any links with significant changes in vehicle flow, speed, %HGV content or any significant change (>10%) in the number of pedestrians, cyclists or motorcyclists using road network.	Yes	Yes
Security	Any change in public transport waiting/interchange facilities including pedestrian access expected to affect user perceptions of personal security.	Yes	Yes

Severance	Introduction or removal of barriers to pedestrian movement, either through changes to road crossing provision, or through introduction of new public transport or road corridors. Any areas with significant changes (>10%) in vehicle flow, speed, %HGV content.	Yes – Positive	Yes
Accessibility	Changes in routings or timings of current public transport services, any changes to public transport provision, including routing, frequencies, waiting facilities (bus stops / rail stations) and rolling stock, or any indirect impacts on accessibility to services (e.g., demolition & re-location of a school).	Yes – Positive	No
Affordability	In cases where the following charges would occur; Parking charges; Car fuel and non-fuel operating costs; Road user charges; Public transport fare changes; or Public transport concession availability.	Yes – Negative	Yes

*Full quantitative Air Quality and Noise data is unavailable at this stage, therefore these assessments have been carried out based off of qualitative Air Quality and Noise assessments and will be revisited in further detail once quantitative data is available.

Carrying out the Assessment

2.3.3. A DIA has been carried out for impacts that have been scoped into the assessment. The DIA will also include a summary of the socio-demographic assessment, presented as text as well as maps which show the distribution of social groups in the study area. Details of how the study area was established are outlined in Section 2.4.

2.3.4. The DIA has highlighted the different social groups which are known or presumed to be more sensitive to changes within certain indicators. This is informed by work being done on the Equality Impact Assessment.

2.3.5. The assessment for the DIA is structured around each of the potential DIs identified. Each DI describes its impact area and the analysis of the impacts. We identify: the spatial scope of each topic which may vary between impacts and will depend on the topic being assessed; the mode of transport being assessed; the user groups or whether the impacts are being assessed on the public or residents in the area.

2.3.6. Where sufficient data is available, assessment of impacts has been quantitative, however, in some cases the assessment has been carried out qualitatively. Where limited information is available or initial assessment outcomes are required, it is likely that a high-level indication of assessment outcomes will be provided on a 3-point scale (adverse, neutral, or beneficial).

2.3.7. The following sections outline our approach to appraising impacts for each of the impacts.

User Benefits

2.3.8. The assessment of user benefits within the DIA focuses on analysing the spatial distribution of user benefits against the distribution of income. To understand these benefits, usually, the outcomes from the Department for Transport's software, Transport Users Benefit Appraisal (TUBA), are used to ascertain user benefits.

2.3.9. For this assessment user benefits have been split into **non-charge impacts** (travel time savings and operating costs) and **charge impacts** (which includes toll, fares, and parking fees).

2.3.10. The user benefits for each zone which fall within the defined study area will be analysed, with our assessment of user benefits only considering non-business journeys. It is deemed inappropriate to conduct a DIA for business journeys as any benefits or disbenefits are experienced by businesses rather than individuals. The assessment of user benefits within the DIA will be calculated for the AM peak, inter peak and PM peak periods. User benefits are reported at discounted present values in 2010 prices.

2.3.11. The distribution of these user benefits will then be mapped against the Index of Multiple Deprivation, specifically the Income Domain, grouped into quintiles, across the Lower Super Output Areas (LSOAs) within the defined study area.

Noise

2.3.12. The DIA assesses noise impacts resulting from the proposals against the distribution of income as well as vulnerable groups, particularly children aged 0-15 years and older people aged 65 and over.

2.3.13. In the absence of quantitative noise assessment outcomes for each option being considered within the assessment, a high-level qualitative assessment has been undertaken.

2.3.14. Further iterations of the assessment will draw on the predicted changes to noise levels resulting from changes to traffic levels because of the programme. The assessment will consist of mapping affected locations including residential and non-residential locations (non-residential locations will focus on places where people may gather) to LSOAs particularly looking at income and vulnerable groups. This will enable us to ascertain where people in each group experience adverse changes (forecasted increases in noise), beneficial changes (forecast decrease in noise) or no-change in noise levels.

Air Quality

2.3.15. The DIA assesses air quality impacts resulting from the proposals against the distribution of income as well as vulnerable groups, particularly children aged 0-15 years. The quantitative air quality modelling outputs are unavailable for this issue of the report and will be assessed in further stages of the programme. This assessment considers preliminary qualitative Air Quality assessment outputs.

2.3.16. The assessment (once modelling is available) will draw on the predicted changes to air quality resulting from changes to traffic levels because of the programme. The assessment has consisted of mapping affected locations including residential and non-residential locations (where non-residential locations are places where people may gather) to LSOAs, particularly looking at income and vulnerable groups. This has enabled us to ascertain the proportion of the population in each group that could experience adverse changes (forecasted increases in air pollutants), beneficial changes (forecast decrease in air pollutants), and no-change in air pollutants.

Accidents

2.3.17. Should the illustrative scenarios presented result in a change of more than 10% on the various routes being considered for the following variables: vehicle flow, speed, heavy duty vehicles or pedestrians for road user charging then accident analysis will be required.

2.3.18. An analysis of STATS19 data has been undertaken to identify casualties by vulnerable group for the study area. The casualty data is then analysed against the following vulnerable groups:

- Children
- Older people
- Young males (as drivers)
- Pedestrians
- Cyclists
- Motorcyclists.

2.3.19. The accidents by vulnerable groups have then been mapped to identify the cluster of hotspots. In line with TAG, with and without scheme accident analysis has been used to ascertain the total number of accidents and casualties by severity of injury (fatal, serious and slight) within the impact appraisal. The forecast change in accident rates has been

analysed against vulnerable user groups to assess whether there are any distributional impacts.

Security

2.3.20. The DIA builds on the assessment outcomes of the SIA. Using the assessment outcomes, the vulnerable groups who have concerns about their personal security especially regarding journeys completed on public transport were mapped. Vulnerable groups include older people, children, women, people with disabilities and ethnic minority groups.

2.3.21. It is hard to quantitatively assess security benefits or disbenefits, therefore a qualitative analysis has been undertaken for a 'with programme and 'without programme scenario. The assessment has been undertaken in line with the framework provided within TAG Unit A4.2.

Severance

2.3.22. Assessment of severance within the DIA is largely related to traffic related severance to understand how changes in traffic may impact journeys of vulnerable groups. It has built on outcomes from the SIA. As defined within TAG Unit A4.2, community severance is related to separation of residents from community facilities and services caused by changes in infrastructure or traffic flow. Severance will be assessed across vulnerable groups, which will include the following:

- Children (under 16)
- Older people (aged 70 and over)
- People with a disability
- People without access to a car.

Accessibility

2.3.23. As outlined in Section 2.1 a series of wider public and active travel improvements are proposed as part of the Making Connections programme. The accessibility assessment has taken into consideration any changes in routing, frequency or timing of public transport services as well as key destinations that local residents would be travelling to. The exact details of these interventions are currently unavailable, leading to a qualitative assessment conducted at a high-level. Changes to public transport journeys will then be considered for vulnerable groups. These groups include:

- Young people
- Older people
- Women
- Individuals with disabilities
- Low-income households.

2.3.24. This is largely a qualitative assessment and is informed by on-going work from the Bus Strategy team.

Personal Affordability

2.3.25. The assessment of affordability focuses on personal affordability impacts of the proposed illustrative scenarios and is assessed against the distribution of income groups. To understand the impact on personal affordability, the TUBA outputs for impacting the costs of travel are used. These costs include car operating costs, public transport fares, parking charges as well as user charges. The methodology for personal affordability mirrors the methodology used for user benefits.

2.4 Place-based analysis

Purpose

2.4.1. In addition to the SIA and DIA, place-based analysis was undertaken in accordance with TAG A4.3. This analysis aimed to evaluate the spatial distribution of scheme impacts across the study area.

Screening the Assessment

2.4.2. For this analysis the following topics were included which were found to have relevant spatial implications as identified through mapping which was carried out as part of the DIA:

- User Benefits
- Severance
- Personal Affordability.

Carrying out the Assessment

2.4.3. This analysis is closely linked with the DIA and uses the same traffic modelling inputs as that assessment. However, the place-based analysis examines the ways in which impacts are distributed spatially, whereas the DIA primarily examines the ways in which impacts are distributed across different groups.

2.4.4. Place-based analysis was undertaken by assessing the GIS (Geographic Information System) maps which were produced as part of the DIA to assess spatial distribution of expected impacts.

Study Area

2.4.5. The study area for the Social and Distributional Impact assessment (SDIA) is outlined in **Figure 2-1**. Four inputs were used to inform the definition of the study area, these include:

- Middle Super Output Area – MSOAs are the statistical boundaries to which census and other authoritative data is available. MSOAs broadly represent populations of a minimum of 5,000 people, with a mean of 7,200. This allows a granular level of analysis to enable an accurate analysis of the distribution of protected characteristic groups.
- Modelling outputs – A Strategic Transport Model was developed by AECOM to model the transport impacts of the proposed scheme. The nodes from the transport model

were used to determine the model coverage to understand the spatial extent of the data that would be available for assessment.

- Journey to work data – Journey to work data using the 2011 Census was mapped to understand existing travel patterns of residents, travelling to and from Cambridge.
- Prior studies – Several studies have been undertaken to assess the impact of the proposed programme, the study areas from these studies have been taken into consideration when developing the study area for this assessment.

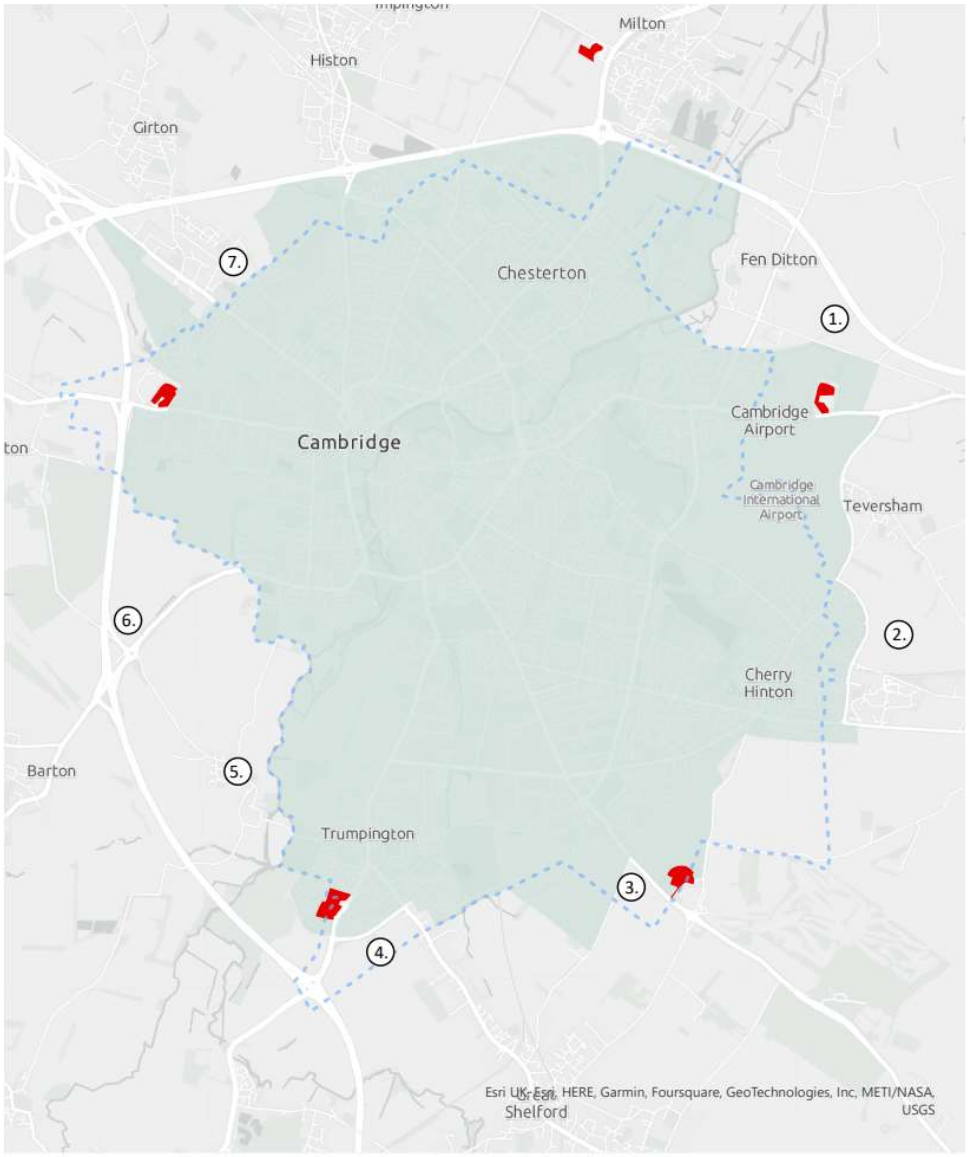
2.4.6. Taking the above four factors into consideration, the final study area was determined using the travel to work areas as the basis to capture the broader area including communities likely to be impacted by the proposed sustainable transport improvements and road pricing scheme. Alignment of the study area with MSOAs enables the assessment to rely on publicly accessible data, including the Index of Multiple Deprivation (IMD) and other demographic information.

2.4.7. As shown in **Figure 2-1** the study area encompasses Cambridge City, South Cambridgeshire, and the Greater Cambridge area. The area is predominantly rural and consists of smaller towns and villages, while also including the broader commuter zones. The study area also includes towns outside of the Greater Cambridgeshire area including Newmarket, Haverhill, St Ives and Chatteris. It is considered that those who live in these areas regularly require access to Cambridge City for employment opportunities and access to some services. The study area also includes parts of Hertfordshire, Essex, Suffolk and Bedfordshire. The study area has been extended beyond the Cambridge City area, as the proposed programme will likely have a significant impact on residents living in these areas.

Figure 2-1 – Study Area

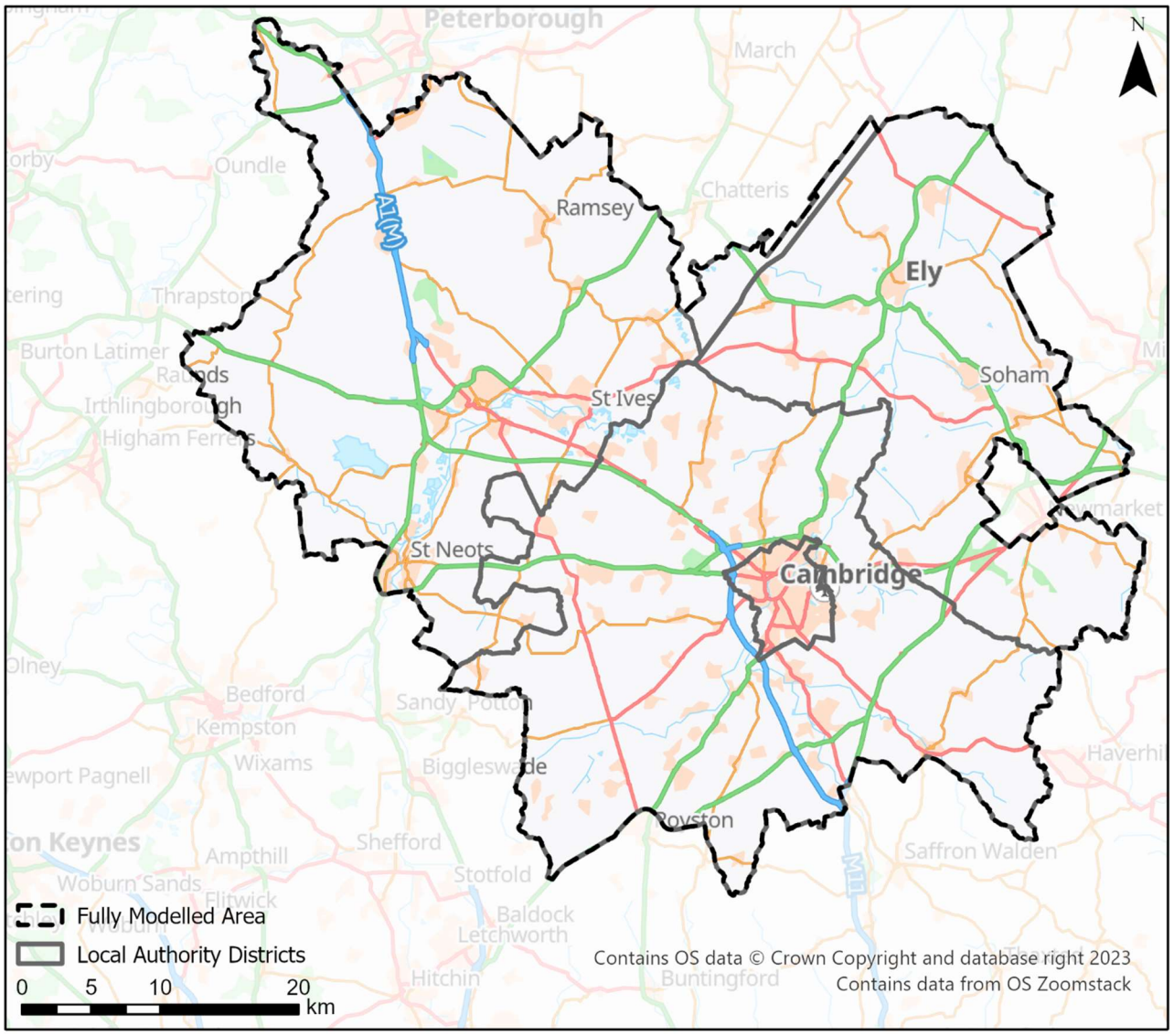
2.4.8. The STZ for the scheme broadly covers the Cambridge urban area as this is where congestion is greatest. In many locations the area therefore mirrors the boundary between Cambridge City and South Cambridgeshire so as, where possible, to treat communities in those areas equitably. The area covered by the STZ is outlined in **Figure 2-2** below.

Figure 2-2 – Map of the Sustainable Transport Zone



2.4.9. **Figure 2-3** shows the area which was used for the purposes of transport modelling. This area and the impacts which were found to occur within it, form the basis of the Distributional Impact Assessment due to that assessment's use of traffic modelling outputs and so differs from the study area outlined previously.

Figure 2-3 – Traffic Modelling Area



3 Baseline Assessment

3.1 Introduction

3.1.1. The following section provides an overview of the baseline socio-demographic indicators for the study area, Cambridgeshire and England. The full baseline assessment can be found in the Equality Impact Assessment (EqIA).

3.2 Sex

Profile of the Population by Sex

3.2.1. **Table 3-1** shows the split between male and female residents within the study area is 49.5% male to 50.5% female. The averages for South Cambridgeshire are like those of the study area with Cambridge City having a marginally higher proportion of male residents. The national and regional averages show a higher proportion of female residents compared to the study area and therefore the study area has a slightly higher proportion of male residents compared to the national and regional averages.

Table 3-1 – Proportion of the population by Sex (%)[2]

	Cambridge	South Cambridgeshire	Cambridgeshire	Study Area	East of England	England
Female	49.9	50.9	50.6	50.5	51.0	51.0
Male	50.1	49.1	49.4	49.5	49.0	49.0

Travel Patterns by Sex

3.2.2. According to the National Travel Survey, in 2021 women made 9% more trips per year compared to men. Survey results showed that men travelled 14% further than women as a large proportion of trips made by men were for commuting and business purposes (as

[2] ONS Census 2021- Sex – TS008 (Retrieved by Atkins 2023)

shown in **Table 3-2**). Women made more trips for shopping and as such travelled shorter distances[3].

3.2.3. The National Travel Survey also outlined that men tend to make more trips by car compared to women. Survey results highlighted that woman made more trips by walking compared to men, although a larger proportion of men cycled compared to women. Additionally, both men and women had similar levels of bus usage.

3.2.4. The National Travel Survey also highlights that most households in England own a car (approximately 78%) with 80% of males holding a driving license compared to 74% of females[4]. Within households a higher proportion of men are the primary driver (65%) compared to 55% of women. Additionally, a higher proportion of women are non-drivers (13%) compared to men (9%). However, the proportion of men and women who do not have access to a car are similar with 15% of men not having access to a car compared to 18% of women.[5]

Table 3-2 – Number of Trips per person per year by journey purpose[6]

	Male	Female
Commuting and Business	129	98.0
Education (inc. Escort Education)	82	114
Shopping, Leisure and Other	508	581
All Trips	719	793

[3] National Travel Survey - Average trips made, and miles travelled per person per year by sex: England, 2021 (NTS0601) (Link) (Date retrieved: April 2023)

[4] National Travel Survey - Percentage of households by car access: Great Britain (1971 to 1988) and England (1989 to 2021) (NTS0205) (Link) (Date retrieved: April 2023)

[5] National Travel Survey - Adult personal car access by sex: England, 1975/76 onwards (NTS0206) (Link) (Date retrieved: April 2023)

[6] National Travel Survey - Average number of trips (trip rates) by age, sex and purpose: England 2021- NTS0611 (Link) (Date retrieved: April 2023)

3.3 Age

Profile of the Population by Age

3.3.1. **Table 3-3** outlines the age structure of the population in the study area. In 2021, the study area had a slightly lower proportion of children (aged 0-15), with 16.1% of the population aged between 0-15, compared to the regional average of 17.1% but higher than the national average of 13.6%. The data suggests that Cambridge City has the lowest proportion of children (11.8%) compared to other comparator areas.

3.3.2. The proportion of young people (aged 16-24) in the study area is 9.6% which lower than the regional average (8.8%) and the national average (7.0%). The highest concentration of young people (16.7%) is seen within Cambridge City, most likely due to the large university presence.

The proportion of older people aged 65 and over in the study area (16.9%) is far below the national average of 32.5% but above the regional average (17.9%). Overall, the study area has a slightly older population. Both Cambridge City (10.8%) and South Cambridgeshire (12.6%) have lower levels of those aged over 65 compared to the study area and regional and national averages.

Table 3-3 – Age Structure (%)[7,8]

	Cambridge	South Cambridgeshire	Cambridgeshire	Study Area	East of England	England
0-15	14.4	19.6	17.6	17.8	18.7	18.6
16-24	21.0	8.0	11.1	10.7	9.7	10.6
25-64	53.2	52.8	52.7	42.8	52.0	52.4
65+	11.4	19.6	18.6	18.7	19.6	18.4

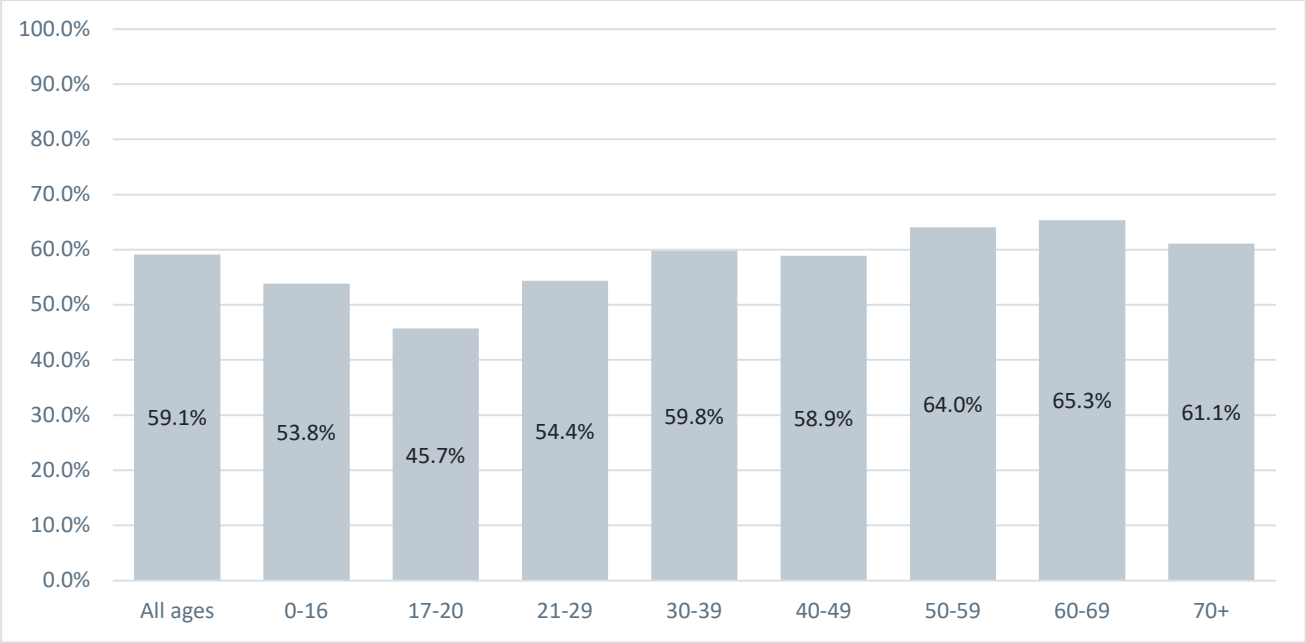
[7] ONS Census 2021 – Age by single year – TS007 (Retrieved by Atkins April 2023)

[8] ONS Population estimates mid-2021 (Link) (Retrieved by Arup April 2023)

Travel Patterns by Age

3.3.3. **Figure 3-1** below shows the percentage of journeys made by car by different age groups across the UK. The 60-69 age group took the largest amount of their journeys by car, either as the passenger or driver, which comprised 65.3% of all their journeys. Whereas the 17-20 age group took the least with only 45.7% of their trips being taken in cars. Trends in the data show generally, the older the age group, the higher the percentage of their trips were taken in cars. The age groups 30-39, 40-49, 50-59 and 60-69 all scored above the 'all ages' average of 59.1% of journeys taken by car. The National Travel Survey also outlined that a large proportion of trips for those aged 17-20 was by bus and a large proportion of those aged 0-16 completed trips by walking.

Figure 3-1 – Percentage of Journeys made by car by age group[9]



3.3.4. According to the National Travel Survey 2021, all age groups make most of their car trips (either as a driver or passenger) for shopping. The age group 21 to 29 took the most trips for commuting and for those aged 0 to 16, the highest proportion of trips was for education.

[9] National Travel Survey - Average number of trips (trip rates) by age, gender and main mode: England, from 2021 – NTS0601a (Link) (Date retrieved: April 2023)

For those aged 17-20, 18% of their trips were for education. In contrast, shopping and leisure trips are typically more flexible and discretionary in nature.

3.4 Disability

3.4.1. Data relating to long-term health conditions and disability from the 2021 Census is summarised within the study area, 15.5% of the population recorded consider themselves disabled under the Equality Act, with the averages for Cambridge City (14.7%) and South Cambridgeshire (14.7%) slightly below the study area average. These averages are below the average for the East of England (16.6%) and the average for England (16.9%).

3.4.2. From this, 5.6% of the population in the study area stated that their day-to-day actives are limited a lot, with the averages for Cambridge City (4.9%) and South Cambridgeshire (5.2%) being lower than the study area average. The study areas average is also lower than the average in England (7.0%) and the East of England (6.6%).

3.4.3. Furthermore, 9.9% of the population within the study area claimed their day-to-day activities were hindered a little, in line with the national and regional averages (9.9% and 10%, respectively).

3.4.4. In total, 84.5% of the population in the study area are not considered disabled under the Equality Act. However, 8.1% of the population within the study area are not disabled under the Equality Act but still have a long-term physical or mental health condition. This is comparatively higher than the regional and national averages at 7.2% and 6.9%, respectively. South Cambridgeshire has a slightly higher proportion of people (8.5%) with a long term physical or mental health condition but who are not disabled under the Equality Act, compared to the study area.

Table 3-4 – Proportion of the population with a limited long-term illness or disability (%)[10]

	Cambridge	South Cambridgeshire	Cambridgeshire	Study Area	East of England	England
Not disabled under the Equality Act	85.3	85.3	83.8	84.5	83.4	82.7
Disabled under the Equality Act: Day to day activities limited a lot	4.9	5.2	6.0	5.6	6.6	7.3
Disabled under the Equality Act: Day to day activities limited a little	9.8	9.6	10.2	9.9	10.0	10.0
Not disabled under the Equality Act, but has long term physical or	7.7	8.5	8.0	8.1	7.2	6.8

[10] ONS Census 2021 - Disability – TS038 – (Retrieved by Atkins 2023)

Table 3-5 – Number of disabled people per household

	Cambridge	South Cambridgeshire	Cambridgeshire	Study Area	East of England	England
Total: All households	52,472	66,996	277,634	342,138	2,628,782	23,436,085
Number with no disabled persons	37,666	48,056	194,134	243,695	1,816,840	15,928,198
No disabled persons (%)	71.8	71.7	69.9	71.2	69.1	68
Number with one disabled person	11,893	15,367	66,561	79,087	644,288	5,950,081
One disabled person (%)	22.7	22.9	24	23.1	24.5	25.4
Number with two or more disabled persons	2,913	3,573	16,939	19,356	167,654	1,557,806
Two or more disabled persons (%)	5.6	5.3	6.1	5.7	6.4	6.6

3.4.5. Office for Health Improvements and Disparities (formerly Public Health England)[11] produces annual health profiles which aim to provide local government and health and social services with a better understanding of local community needs. The most recent profile for Cambridge City and South Cambridgeshire highlights that there are inequalities present across the region. Overall, for other relevant health indicators Cambridge City and South Cambridgeshire performing "better" than England including the following:

- Prevalence of child obesity
- Children under 16 in low-income families
- Under 75 mortality due to cardiovascular disease
- Under 75 mortality from all causes.

[11] Public Health England - Local Health Profiles (Link) (Date retrieved: April 2023)

3.4.6. Whilst the data suggests that on the whole health indicators are better than the national average, it is important to note that there are significant health inequalities within Cambridge. Data provided by Cambridge City Council[12] suggests that residents living within the most deprived wards in 2019 in Cambridge City lived 11.6 years less on average compared to residents in the least deprived wards.

Travel Patterns for those with Mobility Difficulties

3.4.7. Data regarding blue badge ownership is only available for Cambridgeshire County Council in the public domain. As this is an initial assessment further engagement will be carried out to get more localised information as the programme progresses. As shown in **Table 3-6,** the number of people who have a blue badge as a percentage of the population is 4.4% of a total population of 679,000 within Cambridgeshire. This proportion of the population is marginally higher the average for the East of England (4.3%) and England has a whole (4.3%).

Table 3-6 – Blue Badge ownership[13]

	Cambridgeshire	East of England	England
Badge holders as a percentage of the population (%)	4.4	4.3	4.3
Number of people with blue badge ownership	12,553	112,928	1,028,813

[12] Cambridge City Anti-Poverty Strategy 2020-23 (Link) (Date retrieved: April 2023)
[13] Department for Transport - Valid Blue Badges held and population measures: England by region and local authority, 2022 – Table DIS0105 (Link) (Date retrieved: April 2023)

3.4.8. According to the National Travel Survey 2021[14], for those with a mobility difficulty the most common mode of travel was by car with 177 of trips made by car, the highest trip rate by those in this user group. Disabled adults tend to be slightly more reliant on buses with 28 tips completed per person compared to 27 for those without a mobility difficulty.

3.4.9. The National Travel Survey also outlined that shopping was the trip purpose with the greatest number of average trips completed for those with a mobility difficulty. This was followed by personal business, for which there was a higher rate of average trips completed for those with mobility difficulties compared to those without any mobility difficulties.

3.5 Ethnicity

Profile of the Population by Ethnicity

3.5.1. **Table 3-7** summarises the proportion of the population by ethnicity within the study area. Based on the 2021 Census, 88.9% of the population in the study area is of a white ethnicity. This is considerably higher than the average for England (81.1%) and higher than the average for the East of England (86.7%). However, a considerably lower proportion of the population in Cambridge City (75.4%) is of a white ethnicity. The second largest ethnic group is Asian/Asian British, 5.5% of the study area's population, however this is lower than both the regional (6.4%) and national (9.6%) averages. The average number of Asian/Asian British residents in Cambridge City is 14.8%, higher than both regional and national averages.

3.5.2. There is also a sizeable Gypsy and Traveller Community within the study area, and there are several local authority traveller sites in Cambridgeshire including two sites in East Cambridgeshire, five sites in Fenland, one site in Huntingdonshire and two sites in South Cambridgeshire[15].

[14] Average trips per adult (aged 16+) per year by mobility status and main mode: England, 2021 (NTS0709) (Link) (Date retrieved: April 2023)
[15] Cambridgeshire County Council, Advice for Gypsy, Roma and Traveller People (Link) (Date accessed: April 2023)

Table 3-7 – Proportion of the population by ethnicity[16]

	Cambridge	South Cambridgeshire	Cambridgeshire	Study Area	East of England	England
White: Total	74.5	89.0	88.6	88.9	86.7	81.1
Mixed/multiple ethnic groups: Total	5.1	2.8	2.9	2.9	2.8	3.0
Asian/Asian British: Total	14.8	5.8	5.8	5.5	6.4	9.6
Black/African/ Caribbean/ Black British: Total	2.4	1.2	1.4	1.5	2.9	4.2
Other ethnic group: Total	3.1	1.1	1.3	1.3	1.4	2.2

Travel Patterns by Ethnicity

3.5.3. According to data from the Department for Transport from 2020, people of all ethnicities across the country took 40% of their journeys via car. However, this differed by ethnicity group, the only ethnic group which took a larger than average proportion of their journeys by car was white with 42% of all journeys by car. Those who are mixed race appeared to make journeys via car the least, making up only 19% of their journeys; instead, a larger proportion of their journeys were made by walking. The lowest proportion of journeys made by walking were by individuals from a white ethnic background, comprising only 25% of their total journeys. Individuals who are from a black ethnic group, had the highest proportion of travel by bus followed by those who are mixed race. A breakdown of journeys made by the most popular modes and ethnicity is outlined in **Table 3-8** below.

[16] ONS Census 2021 - Ethnic Group – TS021 (Retrieved by Atkins 2023)

Table 3-8 – Percentage of journeys by mode and ethnicity (%)[17][18]

Transport Mode	All	Asian	Black	Mixed	White	Other
Driving	40	31	25	19	42	28
Car/van Passenger	21	21	15	28	21	18
Walking	26	31	29	35	25	33
Bus (not incl. London Bus)	4	3	7	6	4	5
Other (bicycle, bus in London and surface rail)	9	14	39	12	8	16

3.6 Deprivation

3.6.1. The Index of Multiple Deprivation (IMD)[19] (2019) acts as a suitable indicator in identifying concentration of vulnerable groups including those which may belong to protected characteristic groups. The IMD was last updated in 2019 and provides an overall measure of deprivation, combining seven separate domains, comprising the following:

- **Income deprivation**: The proportion of the population experiencing deprivation relating to low income, including those individuals that are out-of-work and those that are in work but who have low earnings (satisfying the respective means tests).
- **Employment deprivation**: The proportion of the working-age population within an area, involuntarily excluded from the labour market, including those individuals who would like to work but are unable to do so due to unemployment, sickness or disability, or caring responsibilities.
- **Education, skills, and training deprivation**: The lack of attainment and skills in the local population.
- **Health deprivation and disability**: The risk of premature death and the impairment of quality of life through poor physical or mental health. Morbidity, disability, and premature mortality are also considered, excluding the aspects of behaviour or environment that may be predictive of future health deprivation.
- **Crime**: The risk of personal and material victimisation at local level.

[17] Gov.co.uk – Ethnicity Facts and Figures 2020 - Travel by distance, trips, type of transport and purpose (Link) (Date retrieved: April 2023)
[18] The figures in table 3 -7 do not sum to 100% because some of the other modes have been omitted as they aren't relevant to the study. These modes include bus in London, Car Passenger and surface rail.
[19] DLUHC – The English Indices of Deprivation 2019 (Link) (Date retrieved: April 2023)

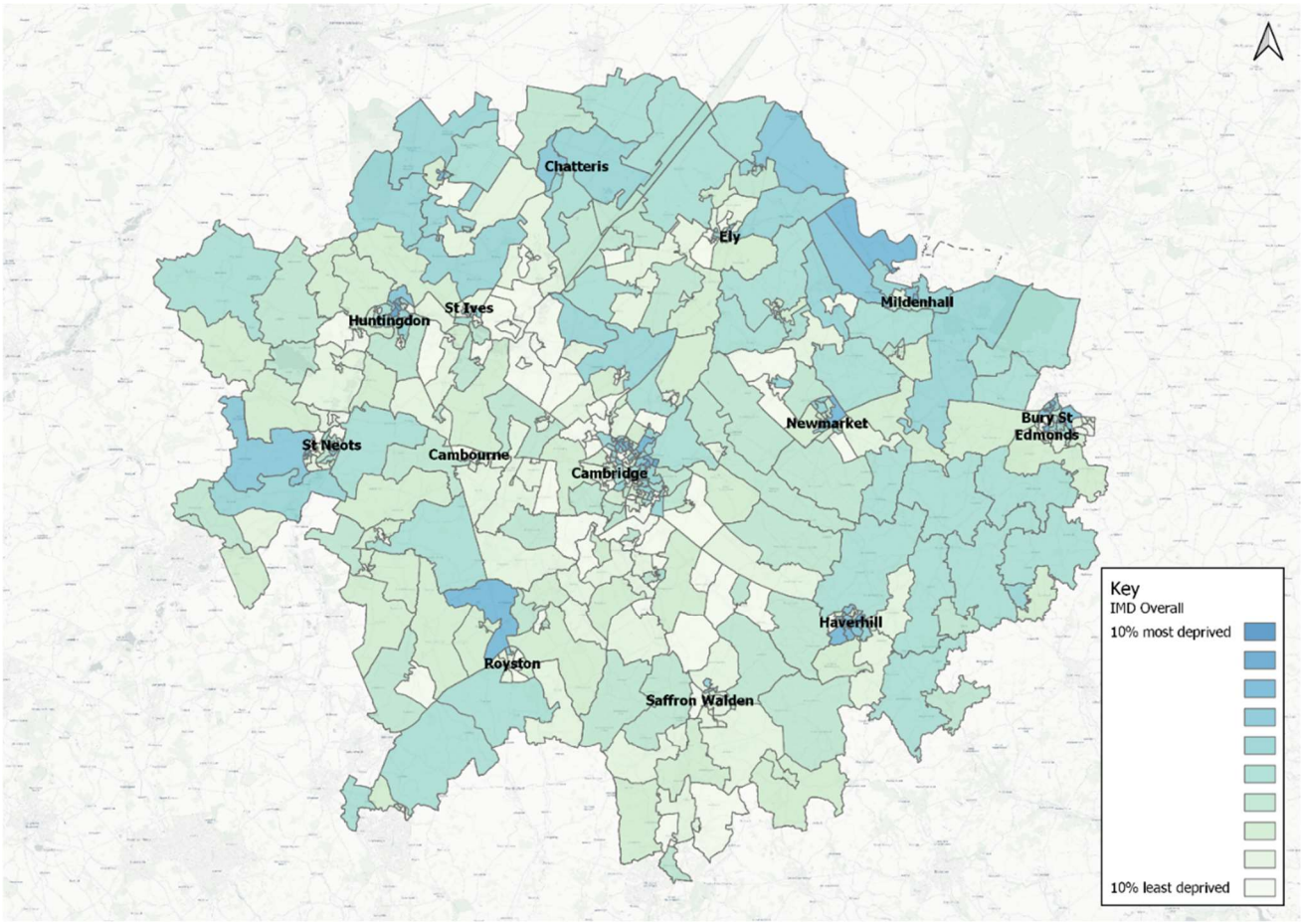
- **Barriers to housing and services**: The physical and financial accessibility of housing and local services, with indicators categorised into sub-domains:
  - 'Geographical Barriers': relating to the physical proximity of local services.
  - 'Wider Barriers': relating to access to housing, such as affordability.
- **Living environment deprivation**: The quality of the local environment, with indicators falling categorised in two sub-domains:
  - 'Indoors Living Environment' measures the quality of housing.
  - 'Outdoors Living Environment' measures air quality and road traffic accidents.

3.6.2. Using the overall IMD measure in 2019, Cambridge was ranked 210 out of a total 317 local authorities in 2019 and South Cambridgeshire is ranked as 300 out 317 local authorities. With the 317th local authority being the least deprived and the 1st local authority being the most deprived. This demonstrates very low levels of deprivation at a general population level in Cambridge as a whole and South Cambridgeshire. Only three of Cambridge's 69 LSOAs ranked in 20% of most deprived LSOAs and no LSOAs in South Cambridgeshire were ranked in the 20% most deprived LSOAs. **Figure 3-2** shows the overall IMD 2019 rankings by LSOA for the study area However, **Figure 3-2** does indicate that there are pockets of deprivation in certain areas. A report developed by Centre for Cities in 2018 outlined that Cambridge was the least equal city in England and Wales for the 2nd year in a row[20]. This was pasted based on a Gini coefficient developed by the Centre for Cities.

3.6.3. Within Cambridge City, areas of deprivation can be seen in the north and northeast of the city, specifically within the areas of Barnwell and the wider Abbey ward, King Hedges and Chesterton. More widely within the study area, in the areas surrounding the city, there are pockets of deprivation observed especially in Orchard Park as well as within smaller towns and villages including, Haverhill, Newmarket, Royston and Huntingdon.

[20] Centre for Cities – Cities Outlook 2018 (link) (date retrieved: April 2023)

Figure 3-2 – Overall IMD Rankings by LSOA (2019)

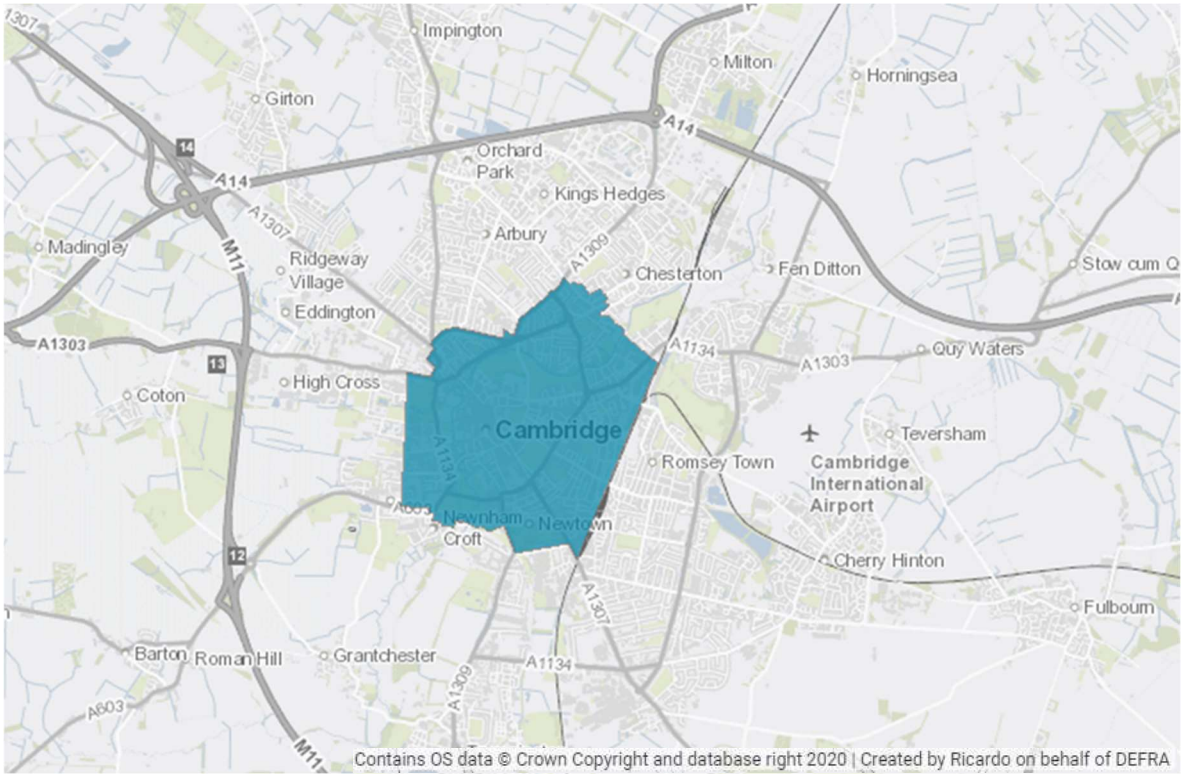


Living Environment

3.6.4. Living environment can be categorised by two sub-domains, outdoor living environment and indoor living environment. Poor air quality can impact on the outdoor living environment. **Figure 3-3** shows the Air Quality Management Area (AQMA) that was declared in Cambridge in 2004 by Cambridge City Council, encompassing the inner ring road, all the land within it and a buffer zone around the ring road and its junctions with main feeder roads[21]. This AQMA was declared because of the high concentration of nitrogen dioxide in the atmosphere. Other AQMAs in the area include the Huntingdon AQMA and the Hemingford to Fenstanton AQMA.

[21] DEFRA – UK Air Information Resource for Cambridge City Council – (Link) (Date retrieved: April 2023)

Figure 3-3 – Cambridge Air Quality Management Area



3.6.5. The outdoor living environment is also influenced by the number of road traffic accidents. According to the DfT road traffic statistics[22] for 2021, there were a total of 334 casualties who were killed or seriously injured within the Cambridgeshire area. Of these casualties, 74 included pedal cyclists and 39 were pedestrians.

3.6.6. The Indoor Living Environment measures quality of housing. In the East of England 86.6% of homes are of 'decent' housing quality (2020) according to the English Housing Survey. This is slightly greater than the 85.0% of homes across England that are of 'decent' housing quality. Housing quality in the East of England was better than the national average. The presence of any Category 1 hazard[23] is the most common reason for a dwelling to fail the Decent Homes Standard, in the east 7.5% of homes contained a Category 1 hazard and 2.1% contained damp. This is lower than the national averages of the 9.2% of homes with a category 1 hazard and 4% of homes with damp.

[22] UK Government, Reported road casualties, Great Britain, Annual Results: 2021 (Link) (Date retrieved: April 2023)
[23] Category 1 hazards are those where the most serious harm outcome is identified, for example, death, permanent paralysis, permanent loss of consciousness, loss of a limb or serious fractures.

Income Deprivation

3.6.7. Wider domains included within the IMD were also analysed, particularly the income domain, to understand the proportion of the population in the study area.

3.6.8. **Figure 3-4** shows the 2019 IMD income domain rankings by LSOA within the study area. Overall, similar patterns of deprivation can be seen within the income domain compared to the overall IMD score. Relatively low levels of income deprivation are seen within Cambridge City Centre with high concentrations seen in the north and east of the city including in the wards of King Hedges, East Chesterton, Abbey and Cherry Hinton. More broadly, within the study area there are again similar trends in income deprivation, with towns in the surrounds of Cambridge City experiencing higher levels of income deprivation including Huntingdon, Haverhill and Newmarket. Additionally, LSOAs outside of towns and cities in more rural areas are also showing higher levels of income deprivation particularly to the north of Cambridge in rural areas and villages around the new town of Northstowe, areas around St Neots and areas to the north of Newmarket.

Figure 3-4 – IMD Income Domain Rankings by LSOA (2019)

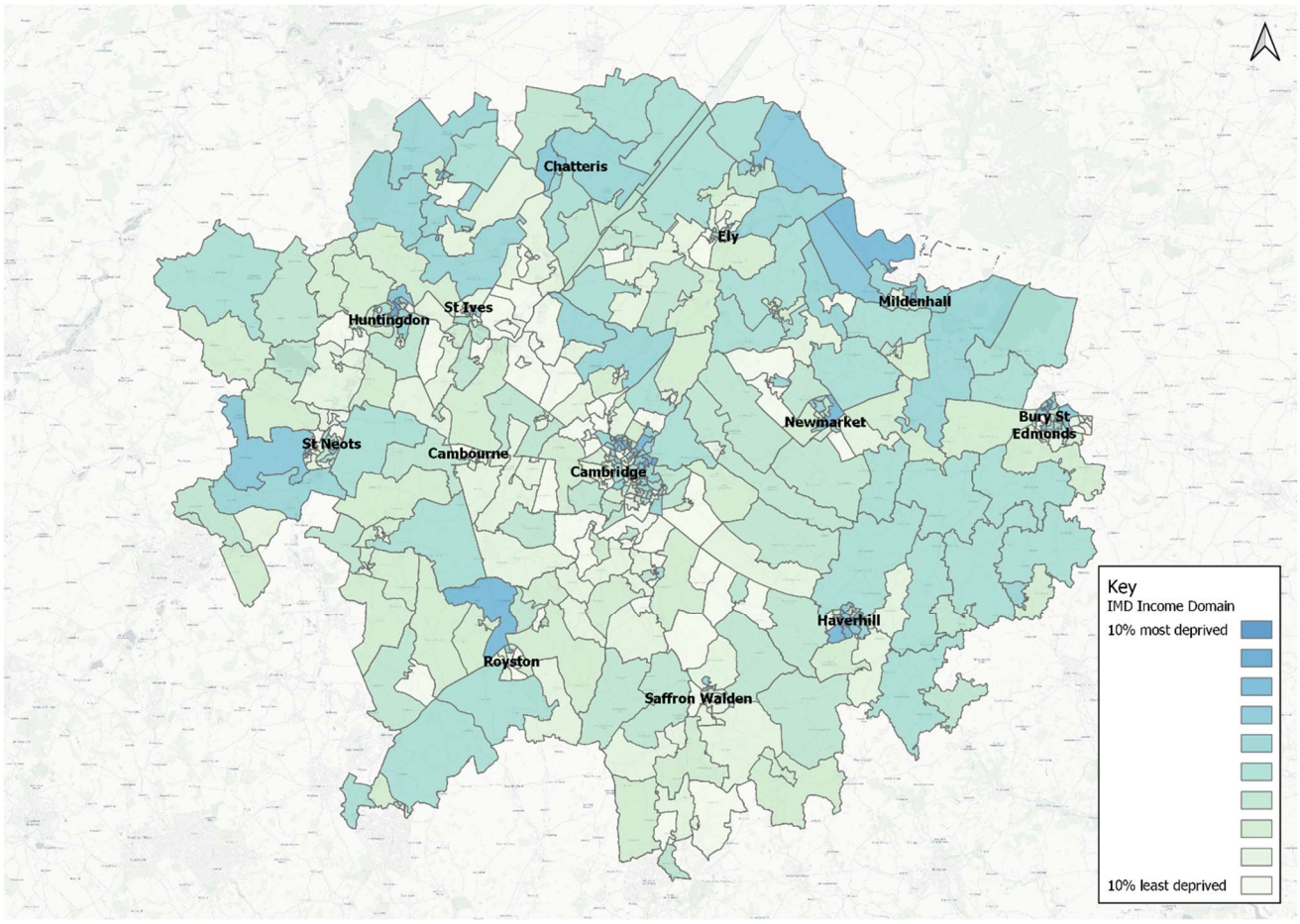


Table 3-9 shows the gross weekly income in Cambridge City (£728.50) and South Cambridgeshire (£782.90) for full time workers, higher than both the regional and national averages. For men who work full time in both Cambridge City and South Cambridgeshire, gross weekly pay is significantly higher than the national average. Overall, women get a much lower gross weekly pay compared to men, although the average weekly pay for women who are full time workers is higher in Cambridge City and only slightly higher in South Cambridgeshire compared to the national average.

Table 3-9 – Gross Weekly income (£)[24]

	Cambridge	South Cambridgeshire	Cambridgeshire	East	Great Britain
Full-Time Workers	728.50	782.90	666.00	628.60	613.10
Male Full-Time Workers	779.90	873.90	715.80	684.20	655.50
Female Full-Time Workers	667.00	577.70	568.10	568.30	558.10

3.6.9. Although the data presented above shows that income within Cambridge is broadly in in line with median incomes across the country, information provided by Cambridge City Council from the Housing Benefit and Council Tax Support data suggest that more than 1 in 10 residents within Cambridge lived in households claiming benefits in 2017 and according to the ONS Annual Survey of Household Earnings in 2018 the lowest 10% of earners earning 3.5 times less than the average for all Cambridge employees.

3.6.10. Furthermore, an article written for the Municipal Journal in 2021[25], based on research undertaken by Centre for Cities, suggests that before the Covid-19 pandemic around 6% of the highest earners in Cambridge City took home one fifth of their total income compared to the lowest earners in Cambridge who took home 2% of their total income showing the levels of income inequality within the Cambridge City.

3.6.11. The latest information provided by Cambridge City Council from the Housing Benefit and Council Tax Support data suggest that more than 1 in 10 residents within Cambridge lived in households claiming benefits in 2017. In addition to this, the cost of living in Cambridge remains high, according to data provided by Cambridge City Council[26], in 2018, the average lower quartile monthly rent was £950, while lower quartile average house prices were 16.3 times the average lower quartile earnings. Furthermore, the housing affordability ratio for Cambridge in 2022 was 13.27. This is the ratio between the median house price and the median earnings for a Cambridge resident. This is far higher than the national affordability ratio of 8.28, demonstrating how relatively unaffordable housing in Cambridge is compared

[24] ONS Annual Survey of Hours and Earnings 2021, (Link) (Date retrieved: April 2023 by Arup)
[25] The Municipal Journal- Levelling up the UK's most unequal city 2021- (Link) (Date retrieved: April 2023)
[26] Cambridge City Anti-Poverty Strategy 2020-23 (Link) (Date retrieved: April 2023)

to the rest of the country[27]. Housing affordability in South Cambridgeshire also follows similar patterns with median house prices 9.3 times the median income of those working in the area, this ratio is close to 11 for low quartile house prices to lower quartile earnings in South Cambridgeshire[28].

3.6.12. In the UK there is a positive correlation between cars per household and income. The top three income deciles had the highest vehicle ownership rate with 94% of them owning at least one vehicle. Only 35% of households in the lowest decile income group in 2018 had at least one car per household. Most of these households only have one car as only around 2% of households in the lowest income decile have more than one car. Conversely 93% of households in the top income decile have at least one car, with 43% of these highest income households having two cars and 26% of them having three or more cars[29]. The top decile of income had the highest ownership rate of three cars or more, further reinforcing the positive correlation between income and car ownership.

3.6.13. Data from the ONS[30] outlines household expenditure on motoring for those who own a car between 2019 and 2020. Data shows that the lowest two income deciles spend £53.80 (lowest decile) and £52.20 (second lowest decile) each week on motoring costs, which represents a significant part of their weekly income. It is considered that the provision of better public transport links through the programme will create a modal shift and enable people to spend less of their weekly income as public transport costs would be much lower than motor costs and offer a suitable alternative mode of transport.

[27] ONS – House price to residence-based earnings ratio – (Link) (Date retrieved: April 2023)
[28] Savills Greater Cambridgeshire Report June 2017- (Link) (Date retrieved: April 2023)
[29] ONS – Percentage of households with cars by income group, tenure and household composition: Table A47 – (Link) (Date retrieved: April 2023)
[30] ONS Household expenditure on motoring for households owning a car FY 19-20, (Link) (Date retrieved: April 2023)

4 Social Impact Assessment

4.1 Accidents

4.1.1. TAG Unit A4.1 outlines that a transport intervention can alter the risk of individuals being killed or injured because of an accident. The guidance reiterates that accidents can occur across modes and can impact on those who are not using the intervention. This programme aims to introduce interventions that will lead to a mode shift to more sustainable transport and remove some traffic from the road. The programme may also result in the redistribution of traffic. For example, changing the volume of traffic on different roads leading to a change in the type and number of accidents. Reduction in the volume of traffic on the road network and improvements to active travel infrastructure should impact on casualty rates recorded within the study area.

4.1.2. The Economic Case considers the number of accidents and their severity, both with the scheme in place and without the scheme in place (**Table 4-1**). The full reporting of the accident analysis can be found within Economic Case.

Table 4-1 – COBALT Accident Analysis

Casualty summary	Do Minimum (no scheme)	Do Something (Scenario 1)	Benefits of the Scheme
Fatal	714	704	10
Serious	9,031	8,846	185
Slight	91,614	89,881	1733

4.1.3. **Table 4-1** above shows a reduction in the number of accidents in all categories as a result of the scheme. The biggest reduction was in slight accidents, with a 1.89% reduction in the in Scenario 1. There was a similar reduction in serious accidents and a smaller reduction in fatal accidents. This assessment provides evidence that the scheme is effective in reducing the number of accidents in the study area and results in a **moderate beneficial effect**.

4.2 Physical Activity

4.2.1. Exercise and physical activity have been proven to have a huge number of health benefits. According to the NHS, “it can reduce your risk of major illnesses, such as coronary heart disease, stroke, type 2 diabetes and cancer and lower your risk of early death by up to 30%.” The UK Chief Medical Officers' Physical Activity Guidelines state that adults should aim to do at least 150 minutes of physical activity over a week, through a variety of

activities[31]. Walking or cycling are some of the easiest ways to build exercise a daily routine, making active transport an important way of improving health and wellbeing in a community.

4.2.2. TAG 4.1 stresses the importance of assessing physical activity due to the interrelation between transport, the environment and health, as transport can have major effects on levels of physical activity. A car-centric transportation pattern can lead to a more sedentary lifestyle, whereas promoting active travel such as walking or cycling can encourage people to incorporate more physical activity into their daily routines.

4.2.3. There are several plans in place as part of this programme that aim to encourage active travel by methods such as improving active travel networks and infrastructure. Additionally, wider measures to improve the walking and cycling facilities in the area will help to improve confidence of individuals in using active modes of transport and encourage more people to take up active travel. An improved bus network should also make people engage in physical activity as they are more likely to walk or cycle to a bus stop compared to using a car for their journey. Furthermore, the subsequent mode shift to more buses and active travel will remove cars off the network creating a safer environment for walking and cycling and will encourage a larger uptake in active modes due to a more welcoming environment.

4.2.4. The measures of the programme will have a beneficial impact on physical activity within the study area. Greater rates of active travel and use of public transport will likely lead to more physical activity and subsequently better health and environmental outcomes.

4.2.5. The Making Connections programme will result in **moderate beneficial** effects in terms of physical activity as it is expected to generate a modest level of revenue to invest into public and active travel infrastructure.

4.3 Security

4.3.1. TAG Unit 4.1 states that transport interventions may affect the level of security in place for users of transport services. It is therefore important to assess the impacts of both changes in security and the likely numbers of users affected. The security of individuals will differ at different points in the journey depending on the method of transport. For example, bus users may be at greater security risk at points where they are required to wait for long periods of time at bus stops or when they are travelling to and from bus stops.

4.3.2. Security benefits have not been monetised, but a qualitative assessment has been undertaken against key security indicators. An assessment for walkers and cyclists and public transport users has been summarised in the tables below (**Table 4-2** and **Table 4-3).**

[31] NHS – Benefits of Exercise - (Link) – Date Retrieved: April 2023

Walking and Cycling

Table 4-2 – Walking and Cycling Security Impacts

Security Indicator	Relative importance (High/ Medium/ Low)	Without scheme (Poor/Moderate/High)	With Scheme (Poor/Moderate/High)	Impact
Site perimeters, entrances and exits.	Medium	**Not applicable** - an active transport network is proposed so no site perimeters/ entrances and exits are required.	**Not applicable** - an active transport network is proposed so no site perimeters, entrances and exits are required.	**Negligible**
Formal surveillance	High	**Moderate** - Some CCTV along active travel routes exist.	**High -** Wider measures to surveillance to improve CCTV and lighting along active travel routes are being considered as part of the scheme.	**Slight Beneficial**
Informal surveillance	Medium	**Moderate -** Some informal surveillance from other walkers and cyclists using routes, some maintenance on walking routes to retain visibility etc.	**High -** A higher number of people walking/ cycling as well as improvements to infrastructure to encourage visibility etc will help to improve informal surveillance.	**Slight Beneficial**
Landscaping	High	**Moderate –** some landscaping on existing active travel routes.	**High -** as part of improvements to the active travel network there will be opportunities to introduce additional planting along routes to improve the amenity.	**Slight Beneficial**

Security Indicator	Relative importance (High/ Medium/ Low)	Without scheme (Poor/Moderate/High)	With Scheme (Poor/Moderate/High)	Impact
Lighting and visibility	High	**Moderate** - some lighting and visibility across existing walking and cycling routes.	**High -** the scheme will improve lighting and visibility across the active travel network and will ensure that all routes are well lit and maintain vegetation to ensure that overgrown vegetation doesn't impede on visibility.	**Slight Beneficial**
Emergency call	Low	**Not applicable –** the current provision of emergency call facilities is unknown.	**Not applicable** - scheme details are not refined and so provisions for emergency calls and reporting have not been established.	**Negligible**

Public Transport

Table 4-3 – Public Transport Security Impacts

Security Indicator	Relative importance (High/ Medium/ Low)	Without scheme (Poor/Moderate/High)	With scheme (Poor/Moderate/High)	Impact
Site perimeters, entrances and exits.	Medium	**Not applicable** - the assessment considers a public transport network, so no site perimeters / entrances and exits are required.	**Not applicable**- a public transport improvement is proposed so no site perimeters, entrances and exits are required.	**Negligible**
Formal surveillance	High	**Moderate** - Some CCTV at bus stops and buses is currently in place.	**High-** Wider measures to improve formal surveillance at bus stops and on buses will be implemented as part of the scheme	**Slight Beneficial**

Security Indicator	Relative importance (High/ Medium/ Low)	Without scheme (Poor/Moderate/High)	With scheme (Poor/Moderate/High)	Impact
Informal surveillance	Medium	**Moderate -** Some informal surveillance from other public transport users at bus stops, some bus stops are currently not well kept and may impact on visibility.	**High-** wider measures will help to improve informal surveillance including a higher number of people using the bus as well as improvements to bus top infrastructure to help visibility etc.	**Moderate Beneficial**
Landscaping	Low	**Moderate –** some landscaping around bus stops.	**High-** as part of improvements to the public transport network there will be opportunities to introduce additional planting at bus stops.	**Slight Beneficial**
Lighting and visibility	High	**Moderate** - some lighting and visibility across existing bus stops.	**High-** the scheme will improve lighting and visibility across the public transport network and will ensure that all bus stops and routes to/from bus stops are well lit.	**Slight Beneficial**
Emergency call	Low	**Not applicable –** the current provision of emergency call facilities is unknown.	**Not applicable-** scheme details are not refined and as a result provisions for emergency calls and reporting have not been established.	**Neutral**

Due to the large number of people likely to be impacted because of the proposed improvements the Making Connections programme will lead to a **beneficial** effect as some level of revenue will be generated which can be used to fund some wider measures to enable people to shift to sustainable modes.

4.4 Severance

4.4.1. TAG Unit 4.1 defines community severance as "the separation of residents from facilities and services they use within their community caused by substantial changes in transport infrastructure or by changes in traffic flows. Severance will only be an issue where either vehicle flows are significant enough to significantly impede pedestrian movement or where infrastructure presents a physical barrier to movement." Research suggests that transport infrastructure like roads can create physical barriers that reduce opportunities to cross the road. These barriers can create detours, reduce opportunities for social contact, reduce access to workplaces and services, and can make active modes less attractive[32].

4.4.2. Assessment of the programme's severance will be completed in two parts. The first part of the assessment has looked at whether the proposed programme creates or removes any physical barriers. The second has looked at changes in traffic flows from the Charging Scheme and whether it removes or causes barriers to access for residents/communities.

4.4.3. The Making Connections programme is aiming to make several important improvements. Firstly, Making Connections will result in a reduction in the volume of traffic on the road network. Additionally, improvements will also be made to cycling and walking in the study area. Improvements to walking and cycling routes by extending the existing active travel network and wider measures will help to improve confidence of individuals in using active modes of transport and encourage more people to take up active travel.

4.4.4. These plans are designed to increase residents' access to cycling and active travel options, reducing the effects of severance created by existing transport infrastructure. The programme will improve footways and cycleways as well as formal crossings further improving severance. These improvements will be made bearing in mind access to key services and employment sites.

4.4.5. The Making Connections Programme is expected to generate **slight beneficial** effects due to improvements to footways and cycles and reductions in car traffic which would decrease the impact of severance.

4.4.6. Detailed analysis of traffic flows for the DS6 scenario has been conducted. The DS6 scenario involves a £5 charge for cars all day on weekdays starting in 2027 with exemptions for those visiting hospital and small vans as cars. This intervention leads to a reduction in traffic in Cambridge, with traffic to and from Cambridge reducing by approximately 18%. Further details on the impact by road and its effect is presented in **Section 5.8**

[32] Open Transport Research Review - Disentangling barrier effects of transport infrastructure: synthesising research for the practice of impact assessment – (Link) – Date Retrieved: April 2023

4.5 Journey Quality

4.5.1. Journey quality is an important factor to assess when considering the impact of the Making Connections programme. Travel is a derived demand that arises from people's desire to engage in activities. Therefore, a high-quality journey, when experienced, is often taken for granted. However, a poor journey quality, when experienced, can be easily recognised. DfT's TAG Unit A4.1 defines journey quality as "a measure of the real and perceived physical and social environment experienced while travelling". This requires a qualitative assessment that considers factors such as public information provision, perceptions of safety, provisions for accessibility and crowding on public transport services.

4.5.2. The table of assessment **(Table 4-4)** is based on the framework and categories set out within TAG Unit A4.1. The analysis indicates that programme aims to improve journey quality across all factors.

Table 4-4 – Changes to Journey Quality factors

Factor	Sub-factor	Outcome	Comments
Traveller Care	Cleanliness	Better	Improvements to bus stops and a better maintenance strategy across the public transport and active travel network will help to ensure that the level of cleanliness on these networks is maintained to a good standard.
	Facilities	Better	Improvements to travel infrastructure such as more bus stops, and a better bus fleet will improve the overall quality of the facilities for those traveling using public transport. Improvements to active travel infrastructure will also improve the physical facilities for those choosing to travel using active modes.
	Information	Better	Information available to those travelling by public transport will improve because of the programme. The programme improves bus routes and the available information, providing real time information about bus routes, arrival times and journey times.

Factor	Sub-factor	Outcome	Comments
	Environment	Better	The improved bus fleet that will lead to improved conditions on buses and improve the quality of services. Increased frequencies of bus services will lead to less crowding where services are currently infrequent and certain times are more popular due to a lack of alternative times to travel. Additionally, improved active travel infrastructure will lead to better amenity when completing walking and cycling journeys.
Travellers' Views	-	Better	Reduced congestion on roads should improve traveller's views from buses and other public or active transport options.
Traveller Stress	Frustration	Better	Improvements to active travel provision will improve conditions when cycling and will make journeys efficient and easy to complete therefore reducing traveller stress. Improvements to public transport including more frequent services and longer operating hours, coupled with a mode shift resulting in less traffic and congestion will lead to improved journey times for all modes therefore leading to reduction in traveller stress from reduced journey delays.
	Fear of potential accidents	Better	Fear of potential accidents will be reduced through improved active travel network especially on routes with segregated cycle ways where cyclists can complete journeys separate from car traffic reducing their fear of accidents. In general, the programme will reduce the volume of traffic on the road network due to a modal shift, creating a safer and more amenable environment for walkers and cyclists to undertake journeys.

Factor	Sub-factor	Outcome	Comments
	Route uncertainty	Better	As part of the programme, improved wayfinding is proposed to ensure that users can make their journeys efficiently without getting lost or being uncertain of their route choice. Information on public transport including route information, travel times and bus arrival times will be made more available i.e., though an online platform. Wayfinding will be made accessible for all groups.

4.5.3. None of the outcomes are expected to be neutral or worse because of the programme and therefore no entries have been made for these categories. As outlined within TAG Unit A4.1 should more than 10,000 travellers experience benefits of improved journey quality then the programme will result in beneficial effects. It is considered that the programme will lead to benefits for over 10,000 people across the study area. However, as the details of public transport interventions are yet to be finalised a conservative assessment has been made, therefore the programme is expected to result in **moderate beneficial** effects as some level of revenue is expected to be generated which could be available to invest in interventions that improve journey quality both on public and active travel.

4.6 Accessibility

4.6.1. TAG Unit A4.1 defines accessibility as “a term that has a multitude of meanings within the transport profession ranging from the physical access onto a public transport vehicle, the ability to get to a given place, to the accessibility of information about a particular public transport service.” Impacts on accessibility are important to assess, as a key objective of the programme is to improve accessibility to public transport services and active travel across all socio-demographic groups.

4.6.2. There are five key barriers impacting on accessibility, according to TAG Unit A4.1. These are:

- The availability and physical accessibility of transport – limited or no access to public transport in isolated areas.
- Cost of transport – cost can be very high and unaffordable.
- Services and activities located in inaccessible places – some places are in areas that are not easily accessed without a car.
- Safety and security – People will not use public or active transport because of fear of their personal safety.
- Travel horizons – People may be unwilling to travel long journey times due to distrust of transport services.

4.6.3. The programme is attempting to improve accessibility through several measures. Improving and increasing the provision and quality of bus services (including an expanded bus network, increased frequency of buses, longer operating hours, improved cycle parking and lower fares) will help improve accessibility for those within the Cambridge urban area as well as in smaller isolated villages for shift workers, those who work more than one job, work at night as well as for the night-time economy. New bus services will improve connection to key services and employment opportunities and improve access to social networks. Better bus stops with improved street lighting, CCTV etc. is being considered as part of the Making Connections programme and would improve the safety and security of transport users. Furthermore, a reduction in congestion will improve journeys on public transport and improve travel horizons through better journey time reliability.

4.6.4. Further qualitative analysis on the programme's impacts on accessibility barriers was undertaken in line with guidance outlined in TAG Unit A4.1 and is summarised in the assessment table below in **Table 4-5**.

Table 4-5 – Accessibility Assessment

Accessibility Barriers	Score	Summary of outcomes
Availability and physical accessibility of transport	Beneficial	Improvements to the public transport network including an expanded network, increased frequency, longer operating hours and demand responsive services means that the Cambridge urban area and wider rural areas that are currently poorly served by public transport will have great access to bus services and improve accessibility to a range of modes. Improvements to the active travel network will improve the quality and access to this mode of transport. Improvements to walking and cycling routes will also improve access to bus stops via active modes.
Cost of transport	Neutral	Whilst a road user charge is being proposed, revenue from this element of the Charging Scheme will be reinvested into the public and active transport network. The proposed interventions to the public transport network, will improve these services and enable the use of public transport to be a suitable alternative to travel by car.

Accessibility Barriers	Score	Summary of outcomes
Services and activities located in inaccessible places	Beneficial	Improvements to the public transport network including an expanded network improving connectivity to more rural areas and villages, increased frequency, demand responsive services will improve access to key services and facilities including employment areas, hospitals (including Addenbrooke's Hospital) and services within Cambridge City. It will make these areas more accessible for people where there is currently poor active travel and public transport provision.
Safety and security	-	To prevent potential double-counting with other benefits, the analysis of safety and security benefits has been included only in the accident (Section 4.3) and security (Section 4.1) assessment
Travel horizons	Beneficial	Improved public transport and active travel infrastructure will help to reduce journey times on these modes, coupled with the reduced congestion resulting from a mode shift making journey times on public transport more reliable. Improved information on public transport services including real time journey information will improve knowledge around route choice and help support travel planning.

4.6.5. Overall, the programme is considered to have a **moderate to large beneficial effect** in terms of accessibility due to the significant improvements coming forward to the public transport and active travel network. The scale of the effect is likely to vary depending upon the amount of revenue which is available to fund improvements to public transport and active travel. Care should be taken when interpreting these scores as this is the result of a high-level assessment which needs to be revisited at a later stage.

4.7 Option and Non-Use Values

4.7.1. An option value is the willingness-to-pay to preserve the option of using a transport service for trips not yet anticipated or currently undertaken by other modes, over and above the expected value of any such future use. Non-use values are the values that are placed on the continued existence of a service, regardless of any possibility of future use by the individual in question. Option and non-use values should be assessed if the programme being appraised includes measures that will substantially change the availability of transport services within the study area.

4.7.2. A qualitative analysis was conducted to assess the impacts of the programme on the scenarios and non-use values. Networks improvement will be made across the Cambridge

travel-to-work area extending to Newmarket, Bury St Edmunds and Haverhill in Suffolk, Royston in Hertfordshire, and St Neots, Huntingdon, Alconbury, Ramsey Chatteris, March and Littleport in Cambridgeshire

4.7.3. These areas are currently under served by public transport. Where there is already public transport, the provision of it will be greatly improved, including increased frequencies and reduced fares. This will create a step change in the services that are provided, and more households will have access to the bus network. Improvements to the active travel network and wider measures are being considered to aide behaviour changes to create more opportunities for travel on these routes. Overall, it is considered that the Making Connections programme will result in **moderate beneficial** effects as some level of revenue is expected to be generated, there will be some funding available to invest in interventions that improve the availability of public transport.

4.8 Personal Affordability

4.8.1. TAG Unit A4.1 outlines the need to assess personal affordability as the cost of travel can act as a major barrier for certain groups and their ability access key services and destinations. The guidance outlines that those on low incomes may spend less money on travel, however this amount would account for a larger proportion of their overall income and therefore it is important to consider the overall impact of the proposed interventions on personal affordability.

4.8.2. The programme is made up of revenue-funded improvements to the bus services and walking and cycling infrastructure. To raise revenue, a charging scheme has been proposed to generate the funding needed for the investment into public transport and active travel to encourage a modal shift. Improvements to the bus network within the Cambridge urban area as well as rural areas and villages, improvements include implementation of new routes, more affordable fares and new destinations. As a result, access to employment areas and key services will also be improved as well as bus frequency and operating hours will be increased. Extensions to the active travel network will also be made. These improvements will enable a mode shift and offer a suitable alternative and provide a more affordable travel option compared to car. These modes are a lower cost option compared to driving due to the wider costs associated with car ownership including vehicle tax, insurance, fuel costs and other parking charges.

4.8.3. Overall, the assessment of personal affordability is considered to the be **slight beneficial** across all scenarios although this is subject to further work. Whilst a road user charge is being proposed that could potentially increase the cost of personal travel, revenues from this element of the scheme will be reinvested into the public and active transport network. The improved availability and connectivity of public and active transport will improve access to services and employment opportunities and offer a low-cost travel option. For those individuals who are reliant on a car to access key services and employment opportunities including those with limited mobility or those from a low-income household, a series of

discounts and exemptions are being put in place which would mitigate any increases to journey costs and still make car journeys affordable.

4.8.4. Those making a mode shift will experience lower fares on buses and making the service more affordable and acting as an alternative modal choice.

5 Distributional Impact Assessment

5.1 Introduction

5.1.1. The results of the DIA are provided for each affected category pertinent to each impact. The following eight impacts have been assessed:

- User Benefits
- Noise
- Air Quality
- Accidents
- Security
- Severance
- Accessibility
- Affordability.

5.1.2. Quantitative assessments of user benefits, accidents, severance and affordability were undertaken using traffic modelling data available for Scenario 1. Qualitative assessments were undertaken for security and accessibility, giving high level comparisons between all three scenarios being considered.

5.1.3. Modelling data for noise and air quality were unavailable at the time of writing and will be included in the assessments once available.

5.2 Income Deprivation

5.2.1. To determine distributional impacts, the income domain deciles from the English Indices of Multiple Deprivation (2019) have been extracted for the LSOAs within the study area. Income deprivation refers to the proportion of the population experiencing deprivation relating to low income, including those individuals that are out-of-work and those that are in work but who have low earnings (satisfying the respective means tests). The deciles have been grouped into quintiles and their associated populations within the study area have been summarised in **Table 5-1**. The percentages refer to the proportion of the population who live in areas ranked highest in terms of income deprivation rather than numbers of low-income households or population.

5.2.2. As outlined in TAG Unit A4.2, there is no alternative disaggregate income data available for the study area. As such the Index of Multiple Deprivation (IMD) is used as a proxy measure for the most vulnerable groups.

5.2.3. The distribution of population across the income categories in the study area is detailed in **Table 5-1**. This table is based on the study area as it will inform the assessment of impacts in the DIA that covers the area beyond Cambridge City and South Cambridgeshire. Most of the population (65%) live in the least deprived income quintiles (from 60%-100%), with 11% of the population living in areas that are most deprived in the income domain (0-40%).

Relatively low levels of income deprivation are seen within the city centre with high concentrations seen in the north and east of the city centre (**Table 5-1**).

5.3 User Benefits

5.3.1. User benefits are experienced in specific areas by specific groups of people. The proposed scheme is projected to deliver benefits to public transport users across the study area. The assessed and quantified impacts have been spatially characterised in terms of journey time benefits. The benefits have been mapped and compared to the spatial distribution of deprivation categories.

Assessment

5.3.2. TAG Unit A4.2 defines the impact as the area in which the transport intervention will result in changes to the cost of travel for users of the transport network. Therefore, the impact area is the fully modelled area and is shown in

5.3.3. **Table 5-1** shows the distribution of income quintiles in the LSOAs within the traffic modelling area as well as the comparison against averages across the local authority districts within the study area and the average for England. Compared to the England average, it shows a low proportion of people in income quintiles one and two, and a high proportion of people in income quintiles four and five.

5.3.4. Identification of amenities for the user benefits DI appraisal is not required according to the TAG Unit A4.2.

Figure 5-1 – User benefits impact area

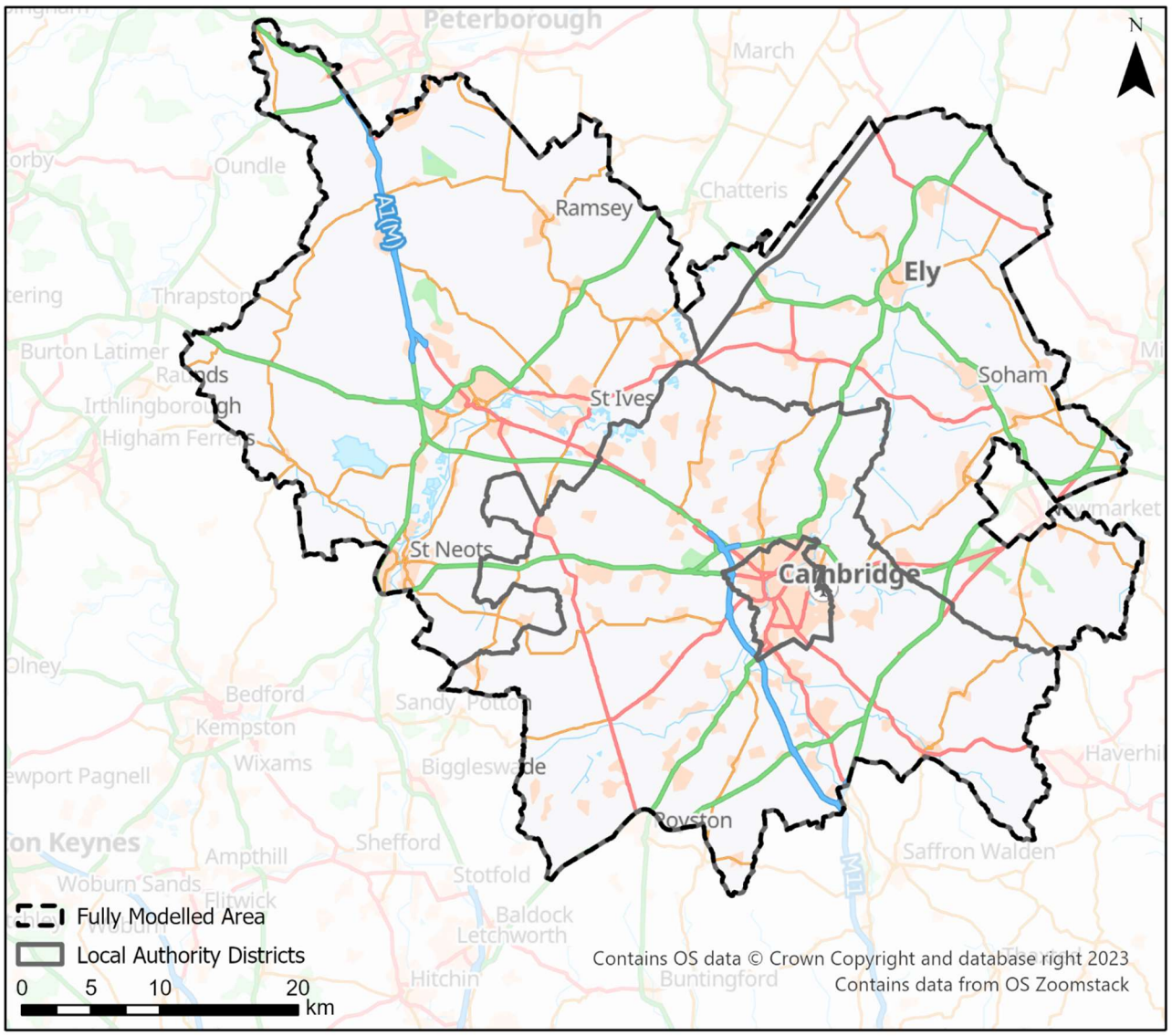


Table 5-1 – Social groups in user benefit impact area

Social Group	Impact Area	Local Authorities	England Average
Income Quintile 1 (most deprived)	1%	1%	20%
Income Quintile 2	9%	8%	20%
Income Quintile 3	23%	23%	20%
Income Quintile 4	25%	16%	20%
Income Quintile 5 (least deprived)	42%	52%	20%

Appraisal of impacts

5.3.5. For the DIA, travel time benefits and the impact to vehicle operating costs for the proposed scheme have been assessed using TUBA outputs from the main economic appraisal. In accordance with the requirements set out in TAG Unit A4.2, the user benefits assessment considers the following:

- Home-based trips calculated using commuting and other trips (excluding business trips).
- Home based trips using origins as home location for morning, destinations as home in afternoon and inter-peak uses average of origin and destination.
- The two modelled years, 2026 and 2041.

5.3.6. The study area as shown in

5.3.7. The user benefits have been distributed to Lower Super Output Areas (LSOA) using a combination of post codes and population by LSOA and model zone using the following methodology:

- Firstly, using population estimate, the number of people in each LSOA is calculated.
- Using location of post code centroids, the average number of people per postcode in each LSOA is calculated.
- For each model zone, the number of people per postcode and LSOA can be aggregated and used to split benefits from model zone to LSOA.

5.3.8. **Table 5-2** and **Table 5-3** show the user benefits for the two modelled years, 2026 and 2041. The benefits have also been split between ***non-charge impacts*** (travel time savings and vehicle operating costs) and ***charge impacts*** (which includes toll, fares, and parking fees).

5.3.9. Looking at the ***non-charging impacts*****,** these show **beneficial impacts** across all income quintiles due to improved journey times due to reduced congestion. These benefits are are disporportionately large for income quintile five. All other income groups experince benefits in line with the proportion of population for both modelled year.

5.3.10. ***Charging impacts*** have been found to deliver disbenefits across each income quintile ranging from **slight to moderate adverse** due to the intorduction of the road user charge which will introduce increased costs for some road users. These impacts affect income quintie four disproportionately less while all other income groups experince disbenefits in line with the proportion of population for both modelled years. It should be noted however, that detailed modelling does not make allowances for the proposed discounts and exemptions, which will mitigate against some of the adverse effects identified as part of the quantitative assessment.

5.3.11. The introduction of discounts and exemptions as detailed in **Table 1-2** would mitigate the impact of the road user charge upon some road users with the effect of lessening disporportionate cost burdens upon certain categories of road users.

Table 5-2 – User benefits assessment 2026

	Income Quintile					
	0-20% (Most deprived)	20-40%	40-60%	60-80%	80-100% (Least deprived)	Total
Total benefits (£m)	-	-	-	-	-	-
Total disbenefits (£m)	-0.04	-0.74	-1.66	-0.39	-2.11	-4.93
Non-charge benefits (£m)	0.09	1.20	3.38	3.37	7.32	15.36
Non-charge disbenefits (£m)	-	-	-	-	-	-
Charge benefits (£m)	-	-	-	-	-	-
Charge disbenefits (£m)	-0.12	-1.94	-5.04	-3.76	-9.43	-20.30
Share of total user benefits	-	-	-	-	-	-
Share of total user disbenefits	1%	15%	34%	8%	43%	100%
Share of non-charge benefits	1%	8%	22%	22%	48%	100%
Share of non-charge disbenefits	-	-	-	-	-	-
Share of charge benefits	-	-	-	-	-	-
Share of charge disbenefits	1%	10%	25%	19%	46%	100%
Share of population in the impact area	1%	9%	23%	25%	42%	100%
Non-charge assessment	Moderate beneficial	Moderate beneficial	Moderate beneficial	Moderate beneficial	Large beneficial	

	Income Quintile					
	0-20% (Most deprived)	20-40%	40-60%	60-80%	80-100% (Least deprived)	Total
Charge assessment	Moderate adverse	Moderate adverse	Moderate adverse	Slight adverse	Moderate adverse	

Table 5-3 – User benefits assessment 2041

	Income Quintile					
	0-20% (Most deprived)	20-40%	40-60%	60-80%	80-100% (Least deprived)	Total
Total benefits (£m)	-	-	-	0.11	-	0.11
Total disbenefits (£m)	-0.01	-0.34	-0.62	-	-0.10	-1.08
Non-charge benefits (£m)	0.06	0.86	2.62	2.46	5.69	11.69
Non-charge disbenefits (£m)	-	-	-	-	-	-
Charge benefits (£m)	-	-	-	-	-	-
Charge disbenefits (£m)	-0.08	-1.20	-3.25	-2.35	-5.79	-12.66
Share of total user benefits	-	-	-	100%	-	100%
Share of total user disbenefits	1%	32%	58%	-	9%	100%
Share of non-charge benefits	1%	7%	22%	21%	49%	100%
Share of non-charge disbenefits	-	-	-	-	-	-

	Income Quintile					
	0-20% (Most deprived)	20-40%	40-60%	60-80%	80-100% (Least deprived)	Total
Share of charge benefits	-	-	-	-	-	-
Share of charge disbenefits	1%	9%	26%	19%	46%	100%
Share of population in the impact area	1%	9%	23%	25%	42%	100%
Non-charge assessment	Moderate beneficial	Moderate beneficial	Moderate beneficial	Moderate beneficial	Large beneficial	
Charge assessment	Moderate adverse	Moderate adverse	Moderate adverse	Slight adverse	Moderate adverse	

5.3.12. **Figure 5-2 to Figure** 5-5 show the non-charge and charge benefit quintiles by LSOA for the two modelled years. For both modelled years, the ***Non-charge impacts*** are focused around Cambridge and South Cambridgeshire as this area has the largest impact due time savings due to the reduction in traffic and improvements in public transport. Conversly, for the ***Charge impacts***, the largest dis-benefits are also in Cambridge and South Cambridgeshire as the population there is more likely to travel to and from Cambridge and therefore are more likely to be impacted by the cost associated with the charging scheme.

Figure 5-2 – Non-charge impact 2026 by LSOA

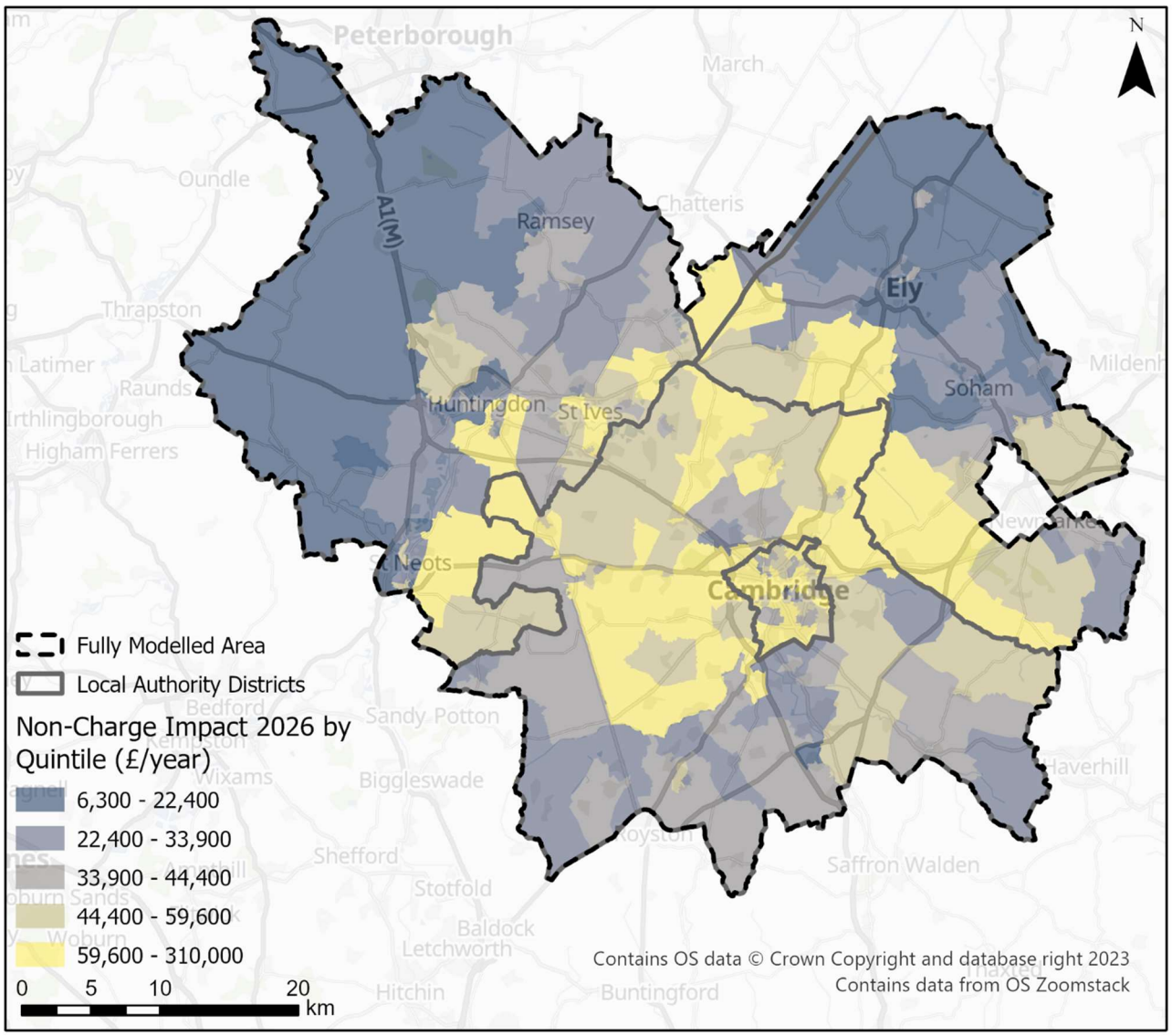


Figure 5-3 – Charge impact 2026 by LSOA

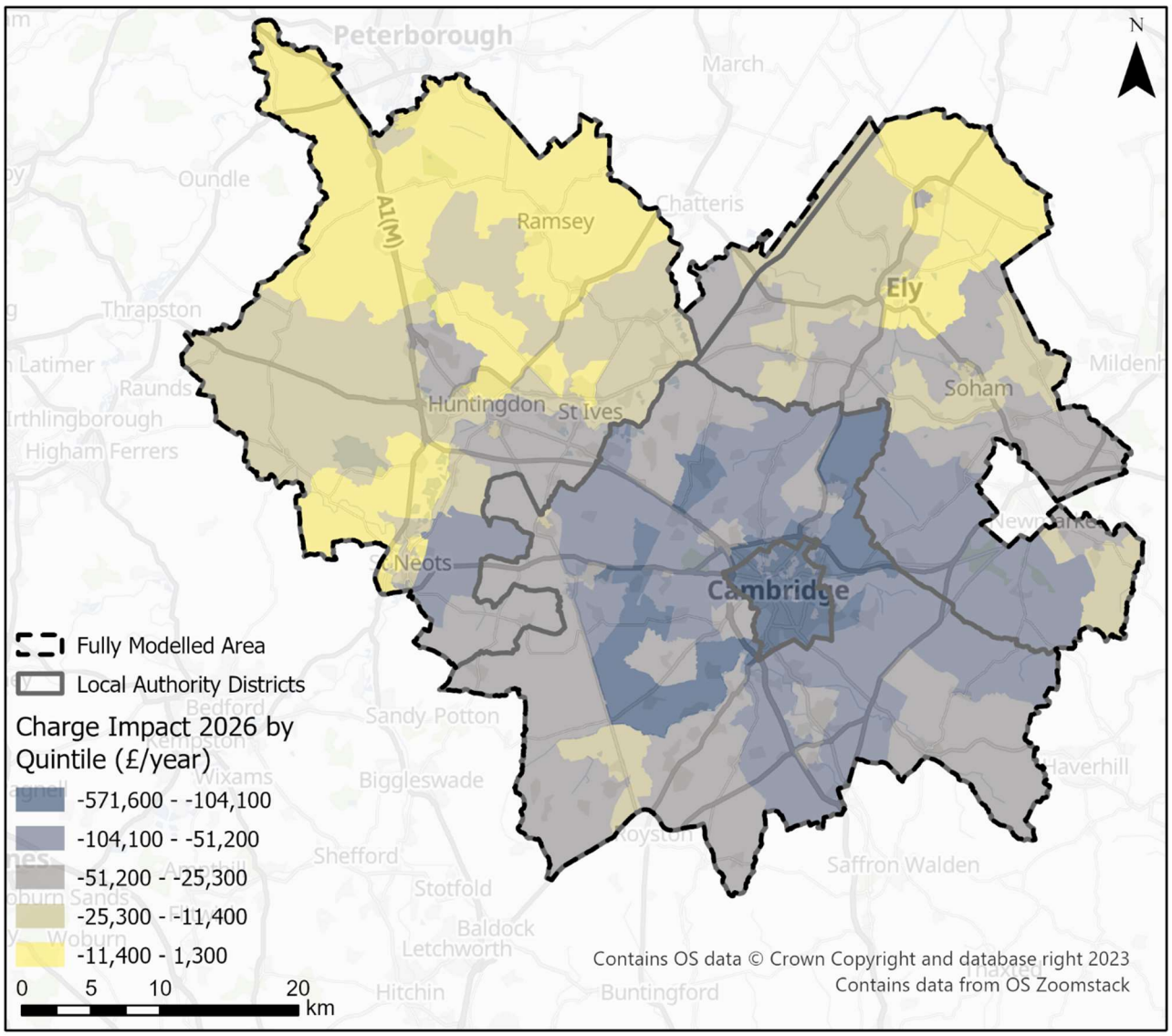


Figure 5-4 – Non-charge impact 2041 by LSOA

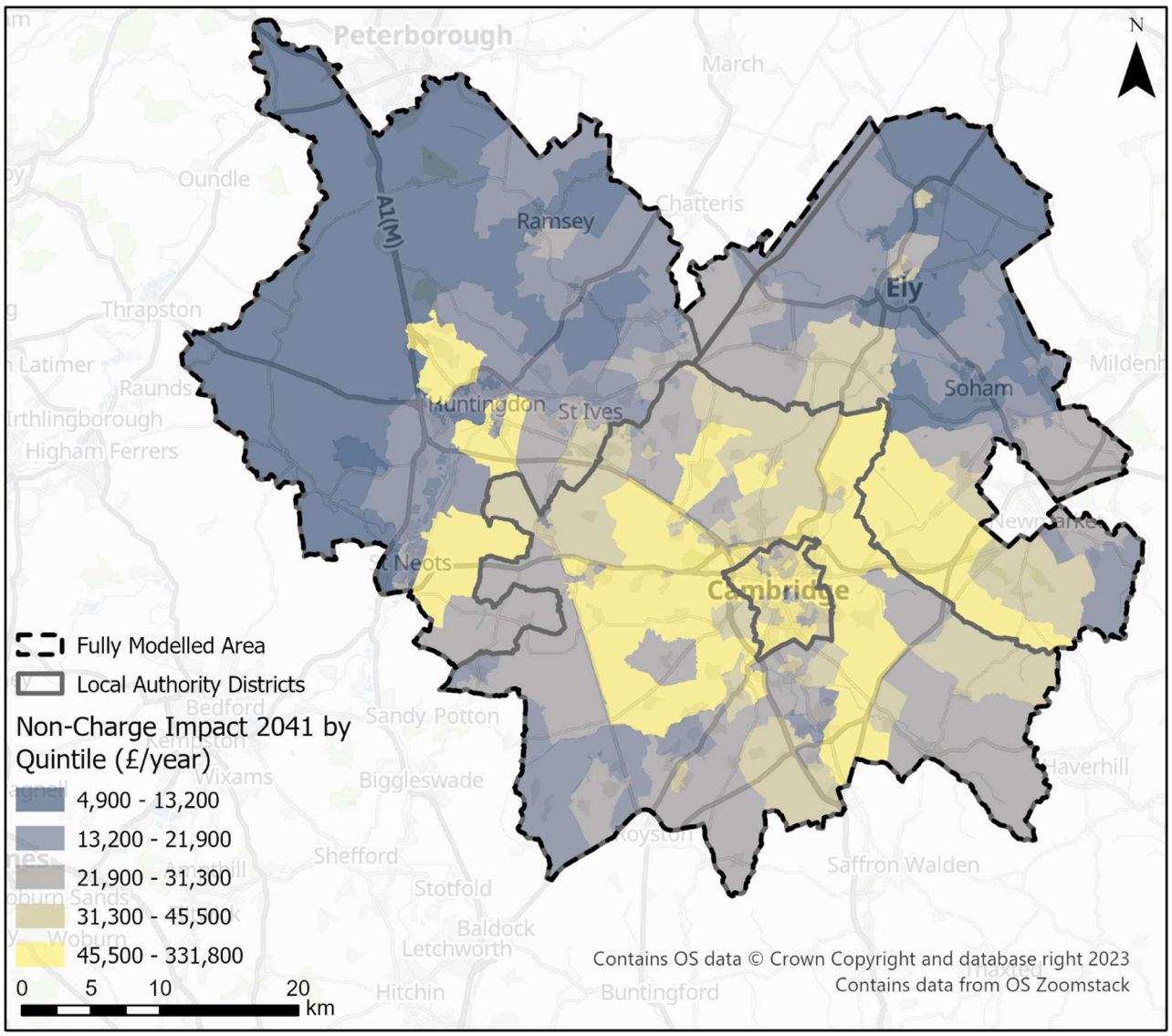
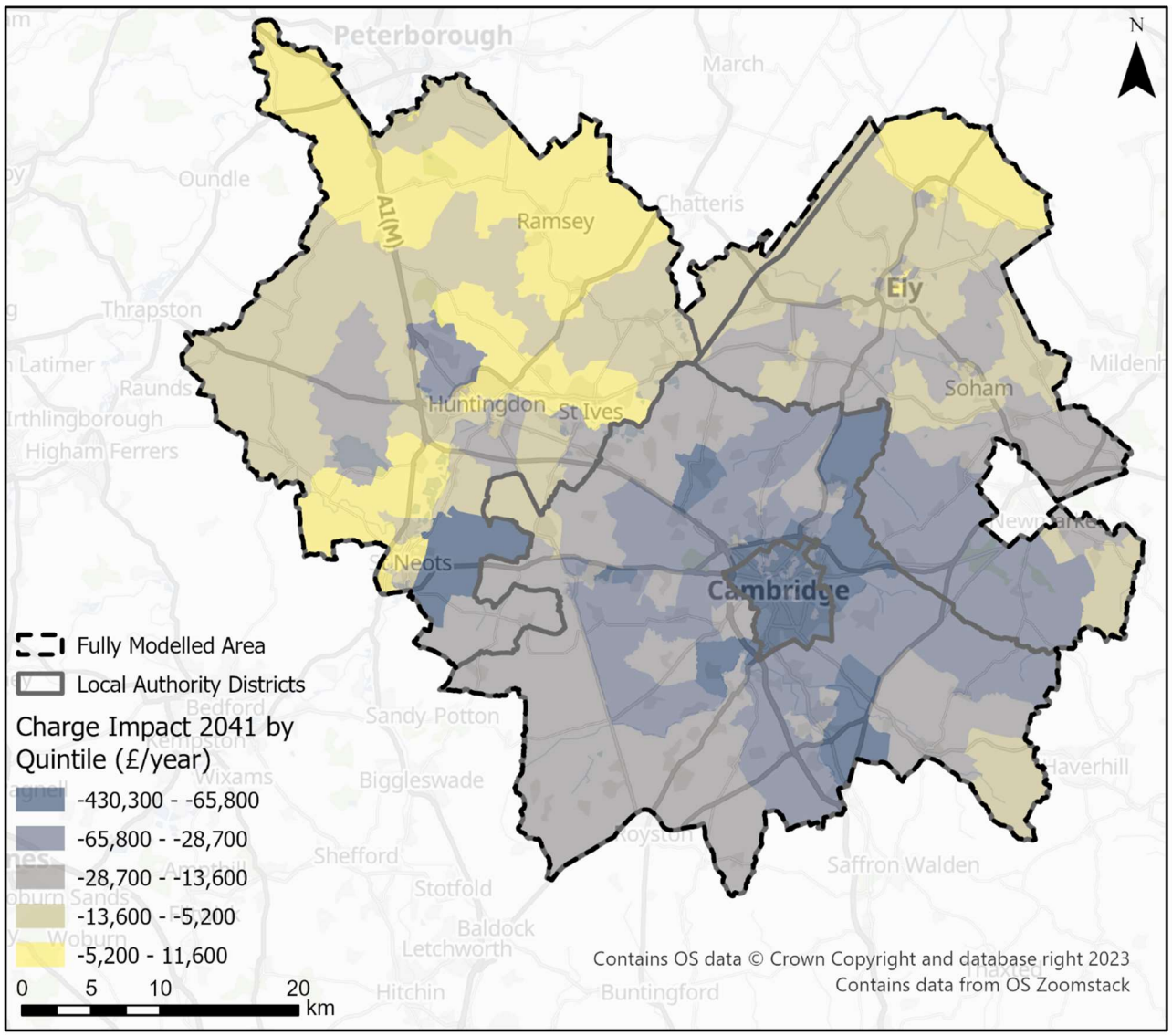


Figure 5-5 – Charge impact 2041 by LSOA



5.3.13. A summary of the results is presented in **Table 5-4**.

Table 5-4 – Outcome of user benefits assessment by social group

Social Group	Charge Assessment	Non-Charge Assessment
Income Quintile 1 (most deprived)	Moderate Beneficial	Moderate Adverse
Income Quintile 2	Moderate Beneficial	Moderate Adverse
Income Quintile 3	Moderate Beneficial	Moderate Adverse

Social Group	Charge Assessment	Non-Charge Assessment
Income Quintile 4	Moderate Beneficial	Slight Adverse
Income Quintile 5 (least deprived)	Large Beneficial	Moderate Adverse

5.4 Noise

5.4.1. Detailed noise modelling data was not available at the time of writing. This information will be included in this assessment when it is available. The current noise analysis is indicative and is based on the change in road traffic noise level on each individual road link from the transport model. It shows that as traffic is expected to reduce overall, there will be reductions in noise.

5.4.2. Tag Unit A4.2 describes noise impacts as a nuisance and a cause for negative health outcomes describing the following pathways for impacts:

- Annoyance / amenity
- Sleep disturbance
- Acute Myocardial Infarction (AMI)
- Stress
- Dementia (through increased hypertension)

5.4.3. The guidance indicates the assessment consider income quintiles in addition to older people and children, who are more vulnerable to changes in noise levels. In the absence of noise assessments, a high-level assessment of noise based on overall judgement on the likelihood of changes to traffic levels has been made. It is likely that across all scenarios there will be a reduction in traffic, this will result in an **overall beneficial outcome** especially for children and the older population.

5.4.4. Further analysis is required to assess potential fluctuations (decrease or increase) in noise levels across the study area. Locations where noise level changes occur need to take into account their proximity to sensitive receptors, such as schools and hospitals. This consideration is essential to understand the potential distributional impacts among vulnerable groups.

5.5 Air Quality

5.5.1. Poor air quality can lead to adverse health conditions, with the three main conditions associated with air pollution being respiratory conditions (such as asthma), cardiovascular

disease (CVD) and lung cancer[33]. Air quality impacts are likely to occur where an intervention results in changes to traffic flows, with sensitive human receptors including schools with students, and housing for example.

5.5.2. An air quality assessment has not yet been finalised for the proposed programme and, as a result, outputs from this assessment have not been used to inform the DIA. Instead, a high-level assessment had been made on the potential impacts of the programme across all scenarios. It is expected that there will be **beneficial impacts** in terms of air quality, particularly for vulnerable users including children and older people, as air quality levels should improve because of the reduction of traffic flows within the city centre.

5.6 Accidents

Assessment

5.6.1. The assessment uses the results from Cost and Benefit to Accidents – Light Touch (COBALT) modelling and the impact area includes the links used in this assessment and are shown in **Figure 5-6**.

5.6.2. There are several potential vulnerable groups in terms of accidents including social groups such as children and older people. As indicated in TAG Unit A4.2, vulnerable road users are also included in the analysis, including pedestrians, cyclists, motorcyclists, as well as young male drivers (aged between 16 and 25).

5.6.3. **Table 5-5** profiles the STATS19 casualties by type of road user to identify the baseline conditions in terms of typology. Casualties between 2015 and 2019[34] by vulnerable group are included for comparison at the national level. It shows a lower proportion of pedestrian than the England average but significantly higher proportion of cyclist casualties.

[33] UK Government, Health matters: air pollution, 2018
[34] Due to the impacts of Covid-19, it is considered inappropriate to incorporate accident data from 2020 or 2021 as traffic movements post mid-March 2020 are considered to be untypical."

Figure 5-6 – Accident impact area

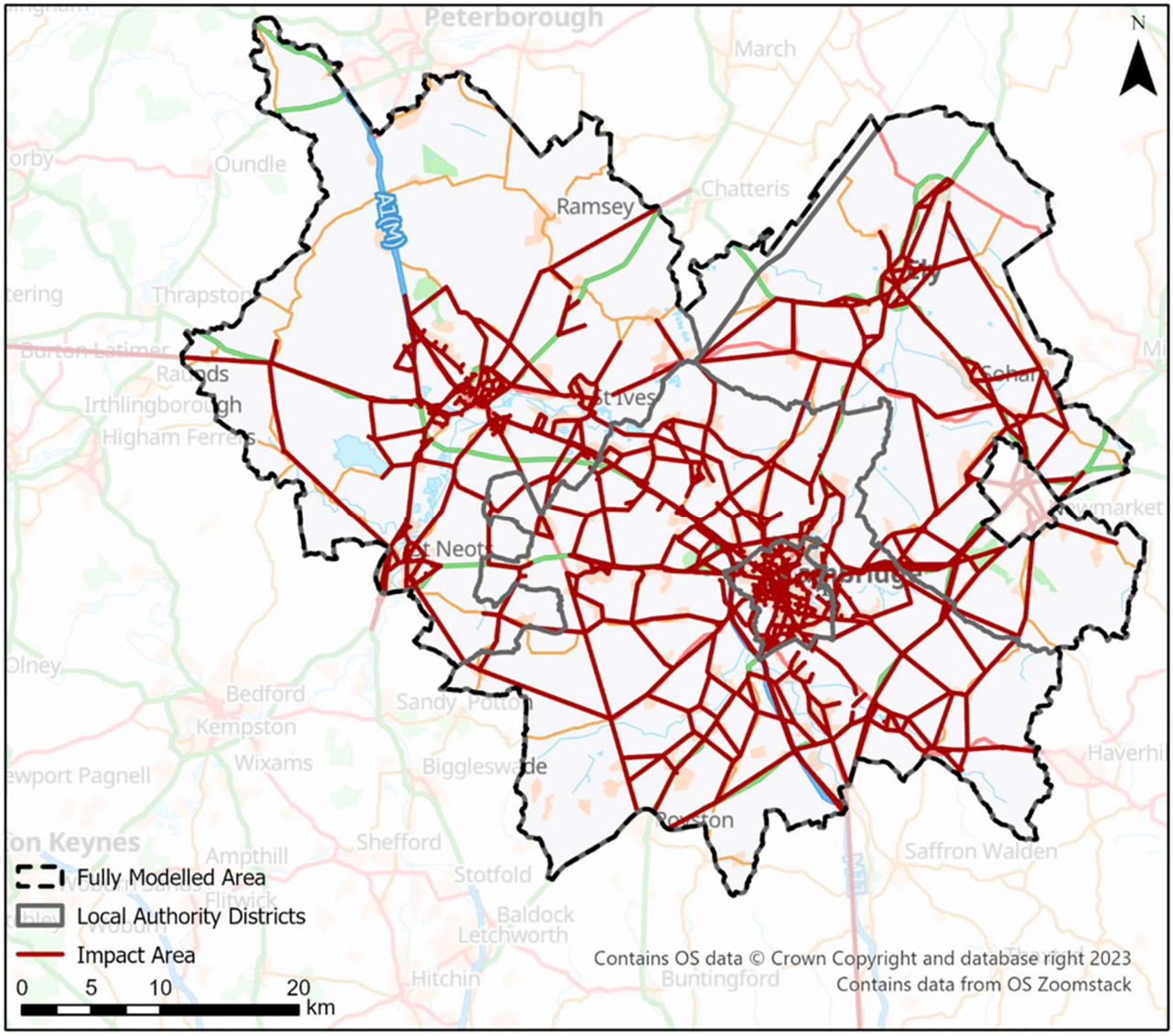
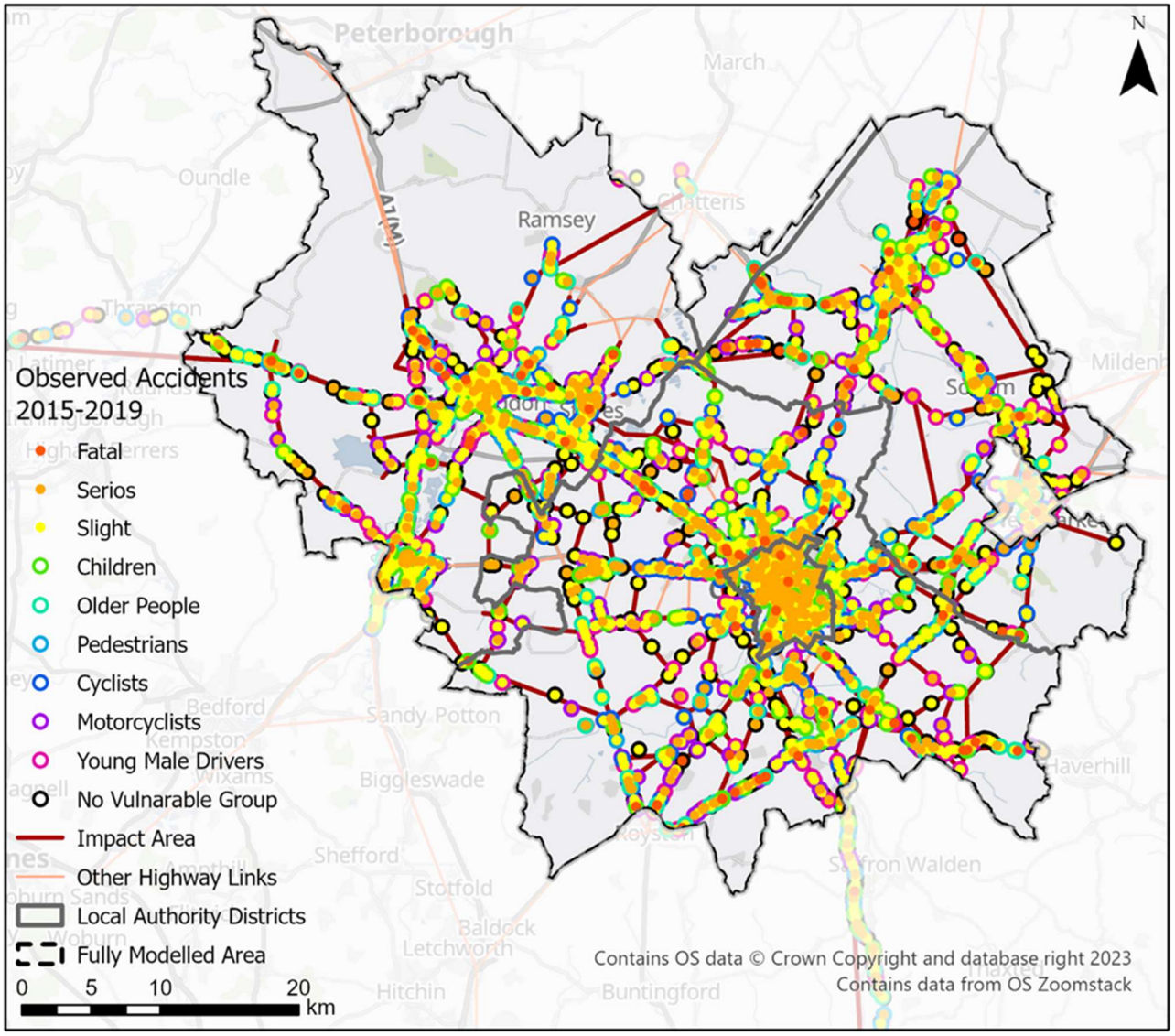


Table 5-5 – Accidents by vulnerable group 2015 to 2019

Vulnerable Group	Impact Area		England	
	Number of Casualties	Percent	Number of Casualties	Percent
Children (<16)	415	6%	89,837	11%
Older people (≥70)	459	7%	57,940	7%
Pedestrians	248	4%	115,618	14%
Cyclists	1,357	20%	90,076	11%
Motorcyclists	539	8%	90,299	11%
Young male drivers (16-25)	1,146	17%	92,917	11%
Total accidents 2015-2019	6,811	-	850,132	-

5.6.4. **Figure 5-7** shows the location of the accidents along with their severity.

Figure 5-7 – Observed accidents between 2015 and 2019



Appraisal of impacts

5.6.5. COBALT has been used to assess the impact on accidents over the 60-year appraisal period. **Table 5-6** categorises the casualties that have been involved in accidents between 2015 and 2019 by the forecast change in accident rates (that is split by highway links forecast to experience benefits or disbenefits in accidents) using outputs from COBALT. The proportions have then been compared to the proportion of accidents between 2015 and 2019 to derive a final assessment.

Table 5-6 – Estimated change in casualties between with and without scheme

Social Group	Links with >10% Increase in Accidents (Disbenefits)		Links with >10% Decrease in Accidents (Benefits)		Proportion of accidents 2015-2019	Assessment
	Number of Casualties	Percent	Number of Casualties	Percent		
Children	12	13%	55	6%	6%	Moderate beneficial
Older People	5	5%	52	6%	7%	Moderate beneficial
Pedestrians	2	2%	17	2%	4%	Moderate beneficial
Cyclists	49	53%	435	50%	20%	Large beneficial
Motorcyclists	4	4%	79	9%	8%	Moderate beneficial
Young Male Drivers	18	19%	176	20%	17%	Moderate beneficial
Vulnerable Groups	90	97%	814	93%	61%	-
Total	93	-	878	-	-	-

5.6.6. The analysis shows that the majority of links are expected to experience a decrease in accident rates (benefit). Accidents involving all vulnerable groups are more likely to occur on links forecast to experience a decrease in accident levels. In addition, for all vulnerable groups (apart from cyclists), the proportion that experience benefits and disbenefits is in line to the number of accidents across the impact area. For cyclists, the expected change is larger than their proportion of accidents. **Table 5-7** presents a summary of the accident impact by vulnerable group, which is **moderate beneficial** overall.

Table 5-7 – Outcome of accident assessment by social group

Social Group	Assessment
Children	Moderate beneficial
Older people	Moderate beneficial
Pedestrians	Moderate beneficial
Cyclists	Large beneficial
Motorcyclists	Moderate beneficial
Young male drivers	Moderate beneficial

5.7 Security

5.7.1. The proposed Making Connections programme has the public transport network being improved across a large area spanning from Cambridge city centre to areas like Haverhill, Newmarket and West Cambridge. The security of individuals will differ at different points in the journey depending on the method of transport. For example, bus users may be at greater security risk at points where they are required to wait for long periods of time at bus stops or when they are travelling to and from bus stops. The programme will also have implications for the personal security for users, particularly women, younger people (primarily teenagers), and older people.

5.7.2. In general, the Making Connections programme is expected to result in a **moderate beneficial** outcome as some level of revenue will be generated which can be used to fund some wider measures to enable people to shift to sustainable modes.

5.7.3. There will be improved levels of personal security for transport users including women, younger and older people due to complementary measures proposed such as improvements to lighting and CCTV which will increase the amount of formal surveillance as well as lighting/visibility in the study area (**Table 5-8**).

Table 5-8 – Assessment of Personal Security

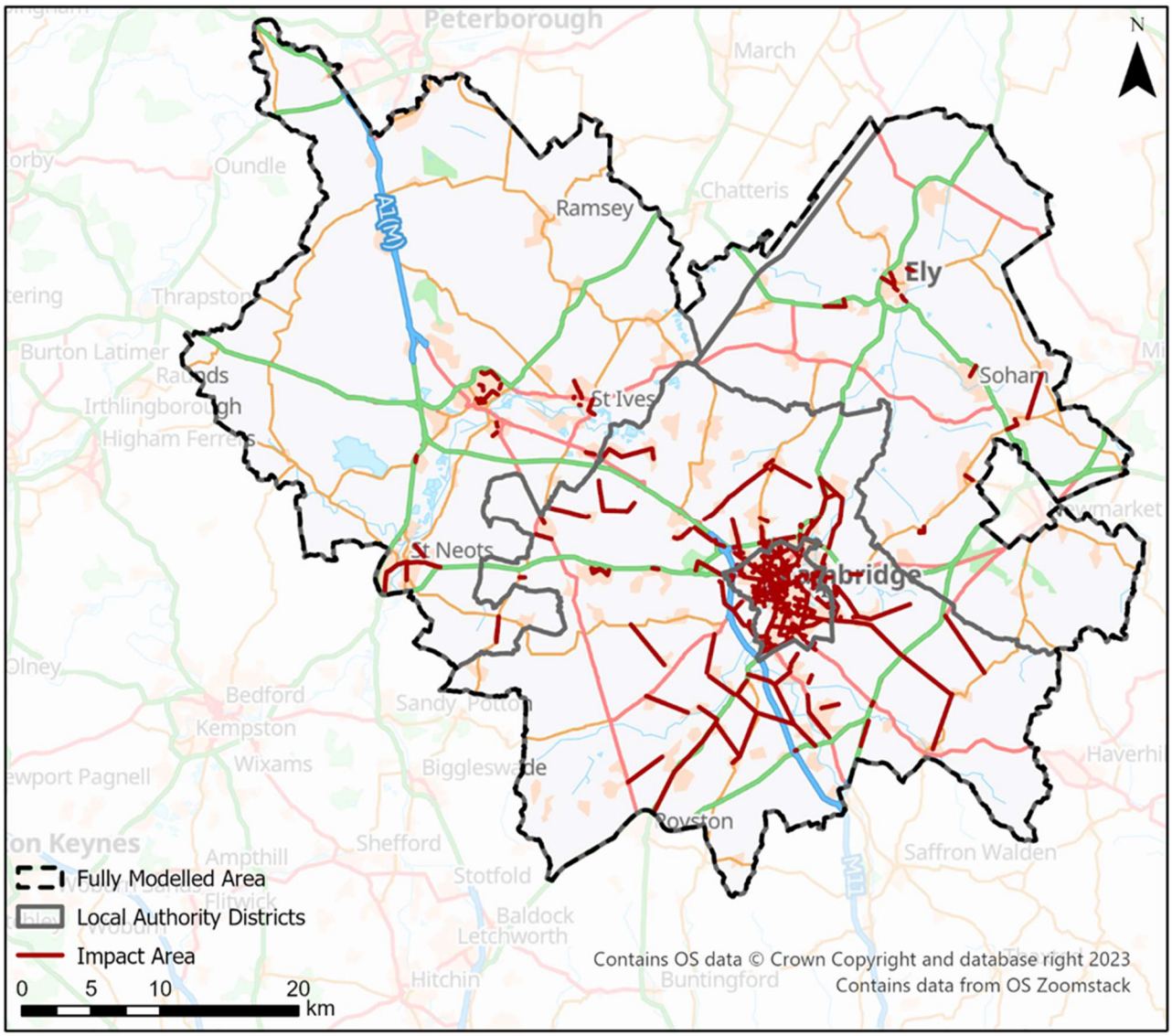
Security Indicator and element of entire journey	Performance for each security indicator			Relative importance of each indicator (High/Medium/Low) [B]				Weighted score for each indicator [C] = [A * B]			
	Without scheme	With scheme	Change (0/+1/+2) [A]	All users	Older People	Women	Young People	All users	Older People	Women	Young People
Site perimeter, entrances and exits	N/A	N/A	0	Medium	Medium	Medium	Medium	0	0	0	0
Formal surveillance	Moderate	High	+1	Medium	Medium	High	Medium	2	2	3	2
Informal surveillance	Moderate	High	+1	Medium	Medium	Medium	Medium	2	2	2	2
Landscaping	Moderate	Moderate	0	Medium	Medium	Medium	Medium	0	0	0	0
Lighting and visibility	Moderate	High	+1	Medium	Medium	High	Medium	2	2	3	2
Emergency call	Moderate	Moderate	0	Medium	Medium	High	Medium	0	0	0	0
Total security improvement score [D] = [C]n								6	6	8	6
Overall assessment of security impacts (all users and vulnerable groups)								Moderate to Slight Beneficial	Slight Beneficial	Moderate Beneficial	Slight Beneficial

5.8 Severance

Assessment

5.8.1. The assessment area for severance, as shown in **Figure 5-8**, includes any location with physical changes in road alignment or where links on the road network experience significant changes (>10%) in traffic flows, speed, or proportion of heavy goods vehicles in the do-something scenario compared to the do-minimum scenario for the opening year. From these links, a 500 metre buffer has been applied to estimate the number of people impacted by the change in traffic flows.

Figure 5-8 – Severance impact area



5.8.2. **Table 5-9** shows the social groups in the severance impact area as well as for the local authorities and the England average. It shows that the proportion of each social group is close the national and local average with the proportion of households without cars in the impact area being higher than the average across the local authorities and the national average.

Table 5-9 – Social groups in severance impact area

Social group	Impact area	Local authorities	England average
Children (<16)	16%	18%	18%
Older people (≥70)	12%	13%	14%
People with a disability	15%	15%	18%
No car households	25%	20%	23%

Appraisal of impacts

5.8.3. The appraisal has been undertaken based on the classification in DMRB 11.3.8. It states that existing or new roads with an annual average daily traffic (AADT) flow exceeding 8,000 vehicles should be considered. The impact is then classified as:

- Slight: change in AADT above 10% but below 30% in urban areas.
- Moderate: change in AADT between 30% and 60% in urban areas.
- Large: change in AADT above 60% in urban areas.

5.8.4. In rural areas, higher percentage should be used, if they are not bisecting a village or small town. In this assessment, only the values for urban areas are used.

5.8.5. **Figure 5-9** shows the assessment of severance in the fully modelled area. It shows only small impacts outside of Cambridge.

5.8.6. **Figure 5-10** to **Figure** 5-13 show the severance impact in Cambridge against the concentrations of children, older people, people with a disability as well as households without car access. The figures show that there are only small benefits overall.

Figure 5-9 – Severance impact

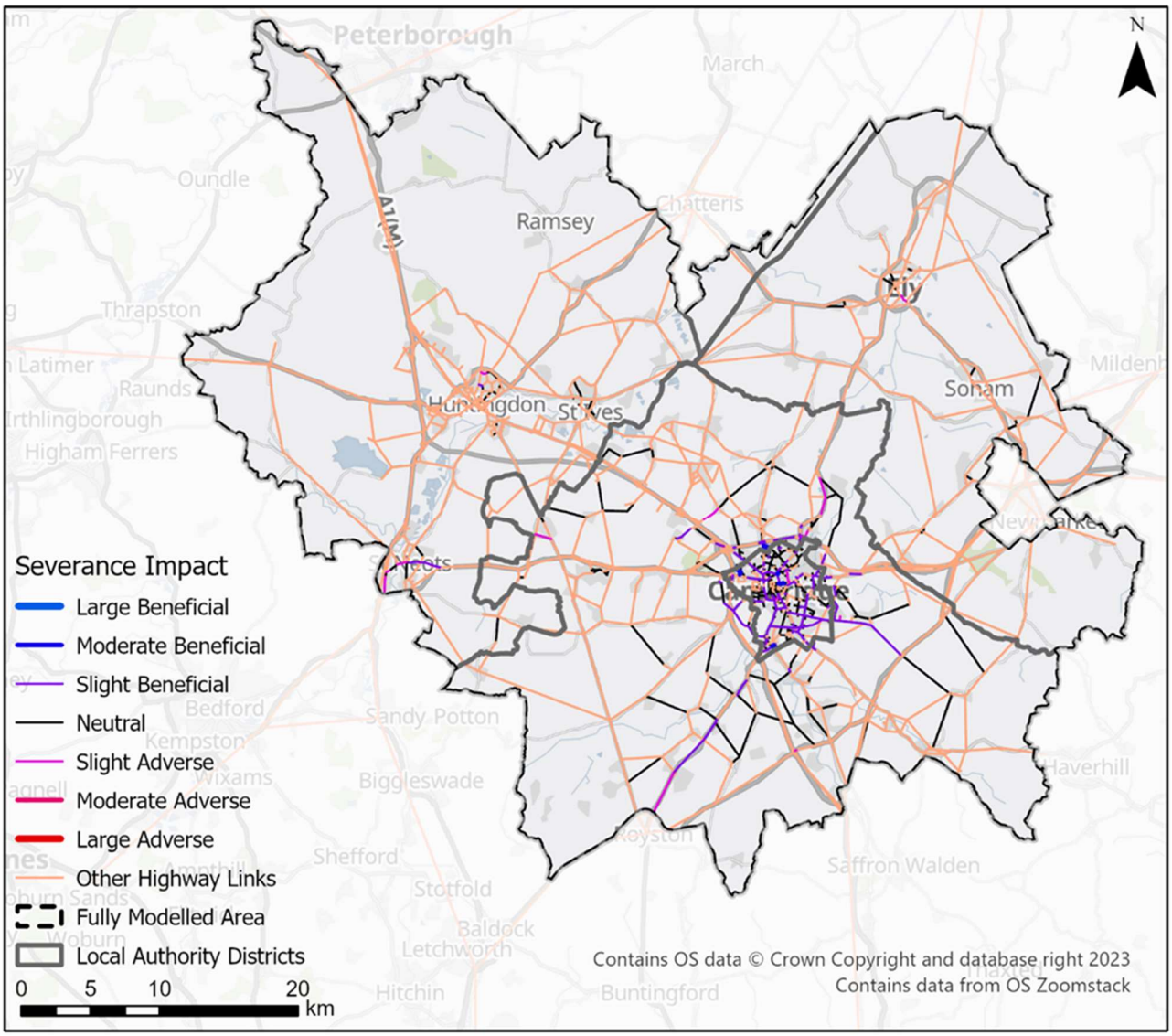


Figure 5-10 – Severance impact and concentration of children

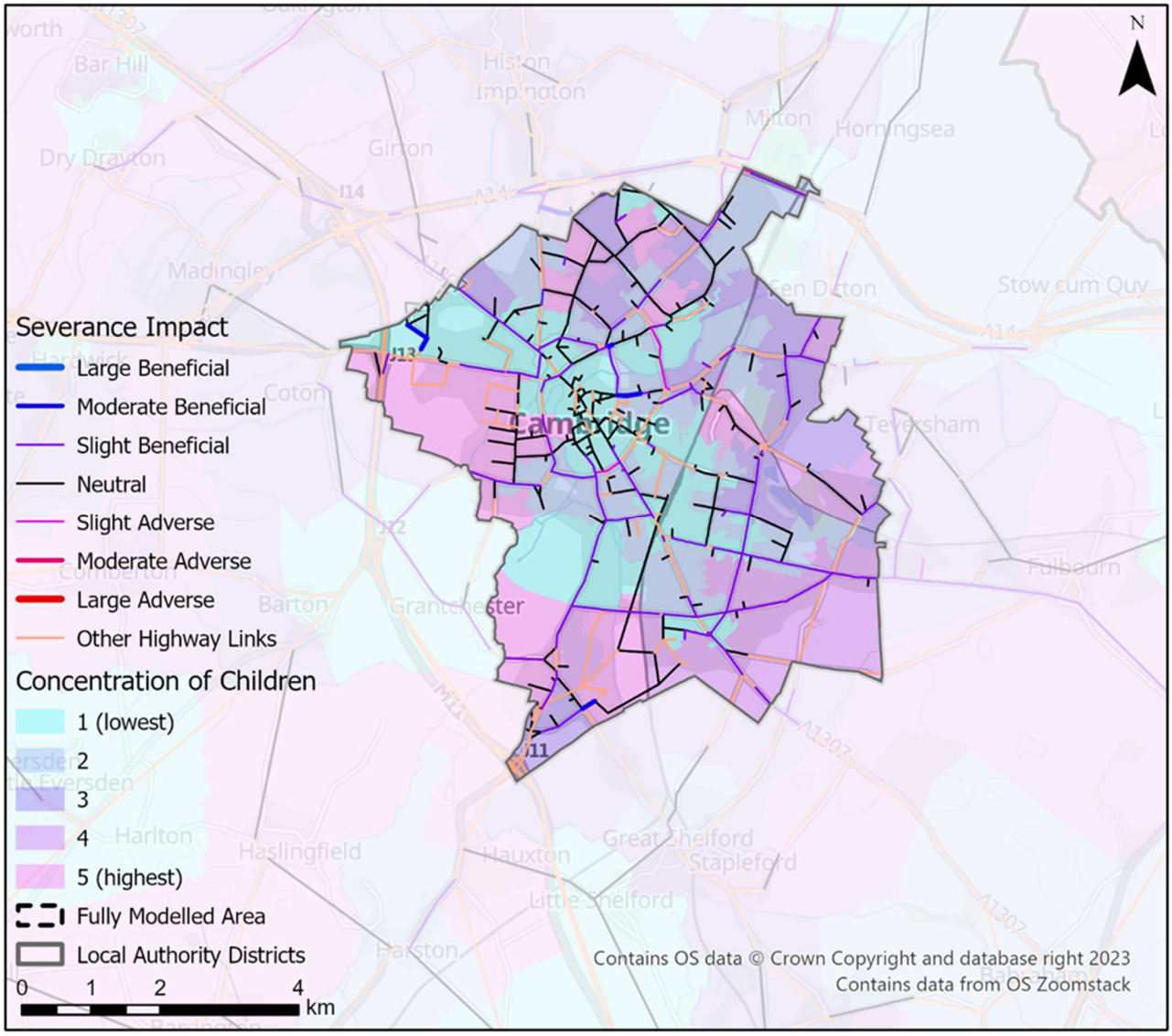


Figure 5-11 – Severance impact and concentration of older people

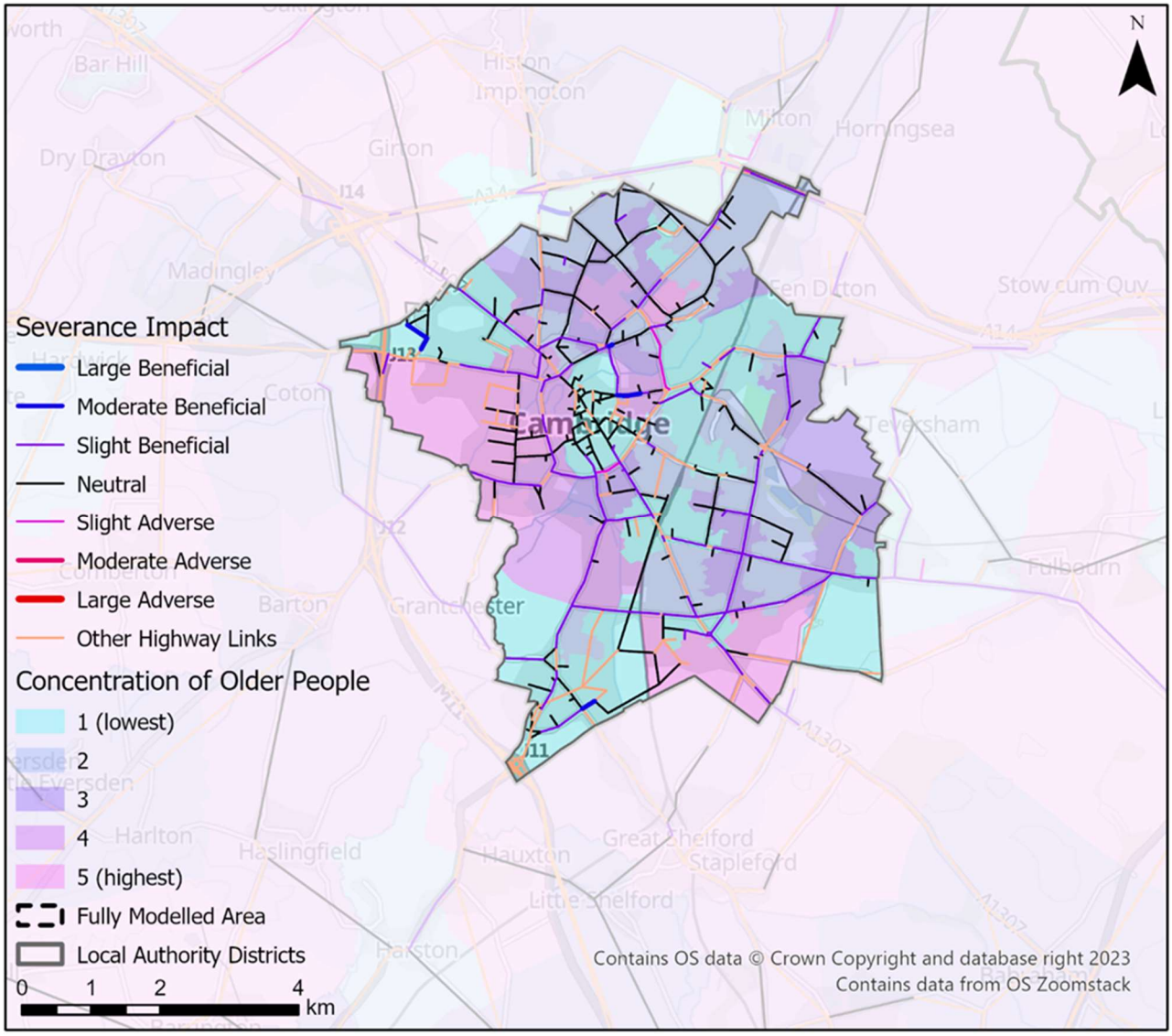


Figure 5-12 – Severance impact and concentration of people with a disability

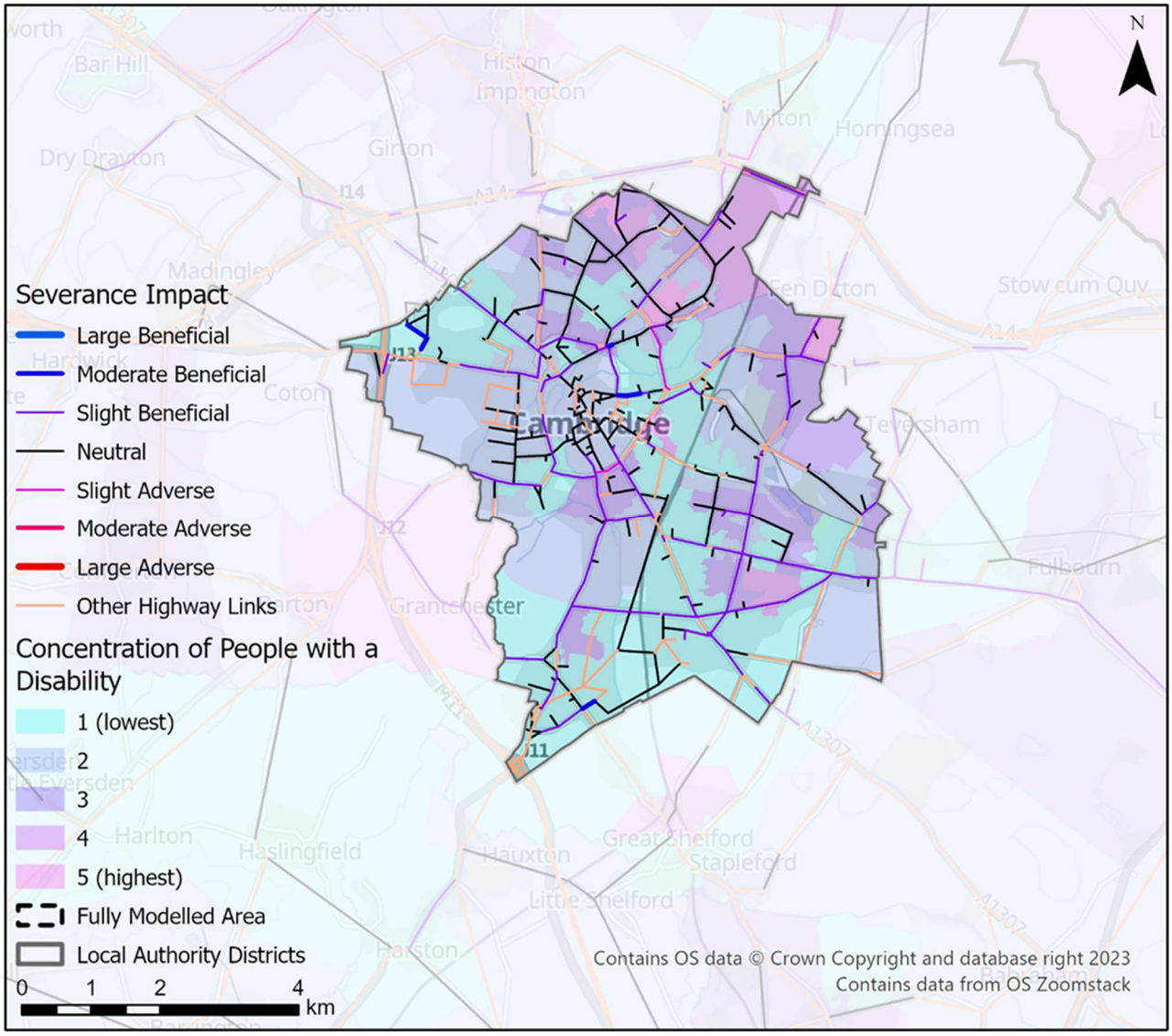
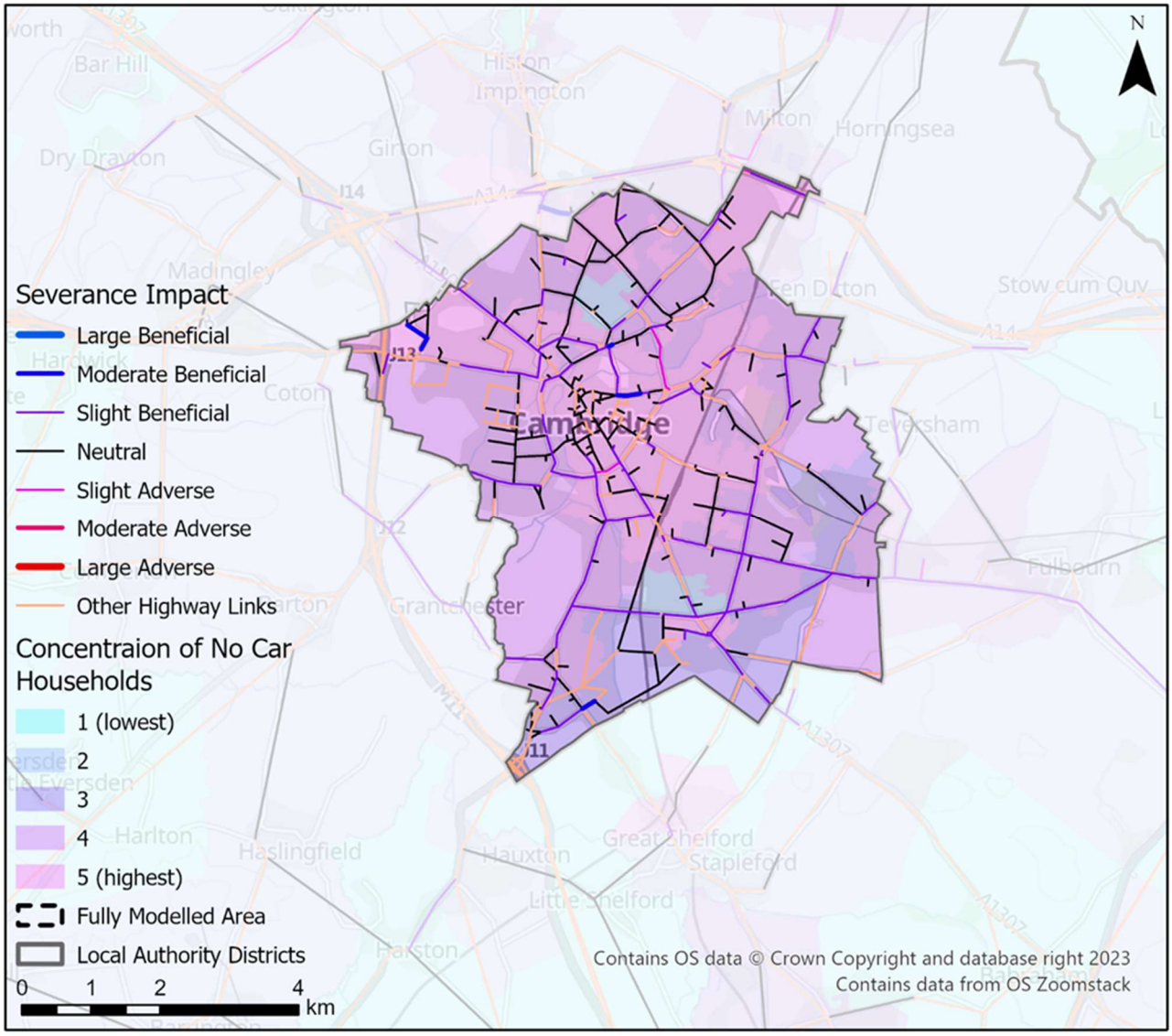


Figure 5-13 – Severance impact and concentration of no car households



5.8.7. **Table 5-10** below shows that the largest proportion is assessed as neutral, meaning that AADT flows are below 8,000 vehicles. There is significant proportion of all social groups in the category slight beneficial, mainly from traffic reduction in Cambridge.

Table 5-10 – Severance assessment

Link Assessment	Children	Older People	People with a Disability	No Car Households
Large Beneficial	0%	0%	0%	0%
Moderate Beneficial	2%	1%	1%	1%

Slight Beneficial	31%	32%	32%	31%
Neutral	63%	62%	61%	64%
Slight Adverse	4%	4%	5%	4%
Moderate Adverse	0%	0%	0%	0%
Large Adverse	0%	0%	0%	0%
Overall Assessment	Neutral	Neutral	Neutral	Neutral

5.8.8. **Table 5-11** shows a summary of the result and the overall assessment is considered **neutral.**

Table 5-11 – Outcome of severance assessment by social group

Social group	Assessment
Young people	Neutral
Older people	Neutral
People with a disability	Neutral
No car households	Neutral

5.9 Accessibility

5.9.1. Accessibility is of key importance in the operation of transport systems, and links closely with severance impacts, which appraises barriers to accessibility within a local community, focusing on walking to local facilities, including access to public transport stops. Different social groups have different transport needs and priorities. For example, those with disability, people with children and older people may place greater value on the availability of routes closer to home, and higher frequency than other groups. People on low incomes living in households with no access to a car are also particularly vulnerable to social exclusion in the event that public transport does not provide the accessibility needed to reach key destinations.

5.9.2. As part the scheme, there are a range of transport interventions including increased bus services in the Cambridge travel-to-work area extending to Newmarket, Bury St Edmunds

and Haverhill in Suffolk, Royston in Hertfordshire, and St Neots, Huntingdon, Alconbury, Ramsey Chatteris, March and Littleport in Cambridgeshire. Proposed bus upgrades include:

- Increased frequencies and service durations on existing routes;
- Some route extensions and re-routeing of existing services;
- New bus services, including orbital services in Cambridge, and rural connector and demand responsive transport services in rural areas;
- Reduced fares within Cambridge and some surrounding areas;
- The use of zero emissions vehicles for any new buses which are introduced to deliver the Making Connections network.

5.9.3. The Making Connections programme will need to ensure that the bus fleet and bus stops are made accessible for those using wheelchairs, pushchairs and for those with hearing and visual impairments. Bus stops and bus fleets will need to ensure that they are wheelchair accessible and can accommodate for pushchairs. Bus services will also need to ensure that announcements for the next bus stop and bus services are made as well as having the appropriate signage on buses and at bus stops. This will improve accessibility to the bus network for those who are disabled, those with hearing or visual impairments and those travelling with pushchairs.

5.9.4. These changes are both within the Cambridge urban area providing benefits to those in Cambridge City as well as those travelling to and from South Cambridgeshire particularly beneftting those in the Cambridge City area who do not have access to a car. The overall impact of the scheme on accessibility is therefore considered to be **moderate to large beneficial**, due to the improvements to the bus network including increased bus frequencies, an expanded bus network, extended operating hours, and improved access to bus stops which makes access to public transport significantly easier and more accessible as a result of the scheme, especially for young people, those with disabilities and older people within Cambridge City, South Camrbidgeshire and the wider study area.

5.9.5. To note, once the location of stops and route information is available, a more detailed assessment can be undertaken on the amenities present within the impact area. This is likely to include schools/nurseries, playgrounds, parks and open spaces, hospitals, care homes/day centres and community centres as the improvements are widespread.

5.10 Personal Affordability

5.10.1. Personal affordability is of key importance in the operation of a transport system, where the most significant impacts of the costs of travel are on low-income households, particularly when travelling to employment or education as stated in TAG Unit A4.2. Personal affordability is concerned with changes in the monetary cost of travel. Changes in transport costs could have disproportionate effects where there are few or no travel alternatives.

Assessment

5.10.2. The impact area and the identification of social groups for personal affordability is the same as for user benefit. For the assessment, see **Section 5.3**.

Appraisal of impacts

5.10.3. The methodology used mirrors the one used for user benefits (for its description see Chapter 5.3). **Table 5-12** and **Table 5-13** show the user benefits for the two modelled years, 2026 and 2041.

5.10.4. In both modelled years, there are increase in car costs due to road pricing and reduction in public transport costs due to the introduction of a bus fare cap. For all but income quintle four, the affordability disbenefits are proportional to the distribution of people. Income quintle four has a lower proportion of disbenefits from personal affordability than their proportion of population.

Table 5-12 – Personal affordability assessment 2026

	Income Quintile					
	0-20% (Most deprived)	20-40%	40-60%	60-80%	80-100% (Least deprived)	Total
Total benefits (£m)	-	-	-	-	-	-
Total disbenefits (£m)	-0.11	-1.65	-4.41	-3.29	-8.27	-17.73
Share of benefits	-	-	-	-	-	-
Share of disbenefits	1%	9%	25%	19%	47%	100%
Share of population	1%	9%	23%	25%	42%	100%
Assessment	Moderate adverse	Moderate adverse	Moderate adverse	Slight adverse	Moderate adverse	

Table 5-13 – Personal affordability assessment 2041

	Income Quintile					
	0-20% (Most deprived)	20-40%	40-60%	60-80%	80-100% (Least deprived)	Total
Total benefits (£m)	-	-	-	-	-	-

	Income Quintile					
	0-20% (Most deprived)	20-40%	40-60%	60-80%	80-100% (Least deprived)	Total
Total disbenefits (£m)	-0.07	-1.10	-3.03	-2.18	-5.40	-11.78
Share of benefits	-	-	-	-	-	-
Share of disbenefits	1%	9%	26%	19%	46%	100%
Share of population	1%	9%	23%	25%	42%	100%
Assessment	Moderate adverse	Moderate adverse	Moderate adverse	Slight adverse	Moderate adverse	

5.10.5. **Figure 5-14** and **Figure 5-15** show the personal affordability impact quintiles by LSOA for the two modelled years. They both show that most disbenefits are located in Cambridge and South Cambridgeshire, driven by the increase in car disbenefits. The least impact is experienced in Huntingdonshire and East Cambridgeshire.

Figure 5-14 – Personal affordability 2026 by LSOA

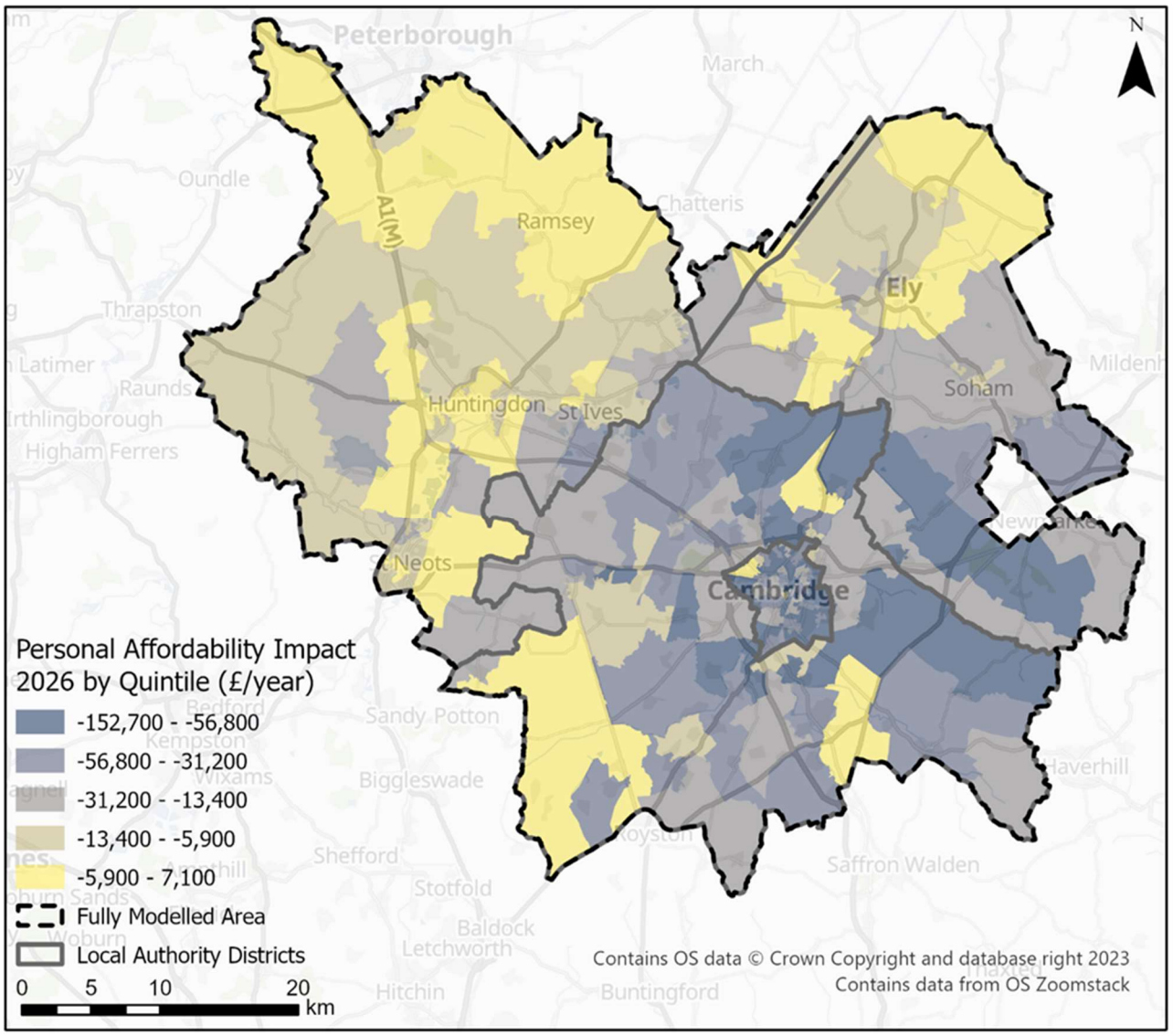
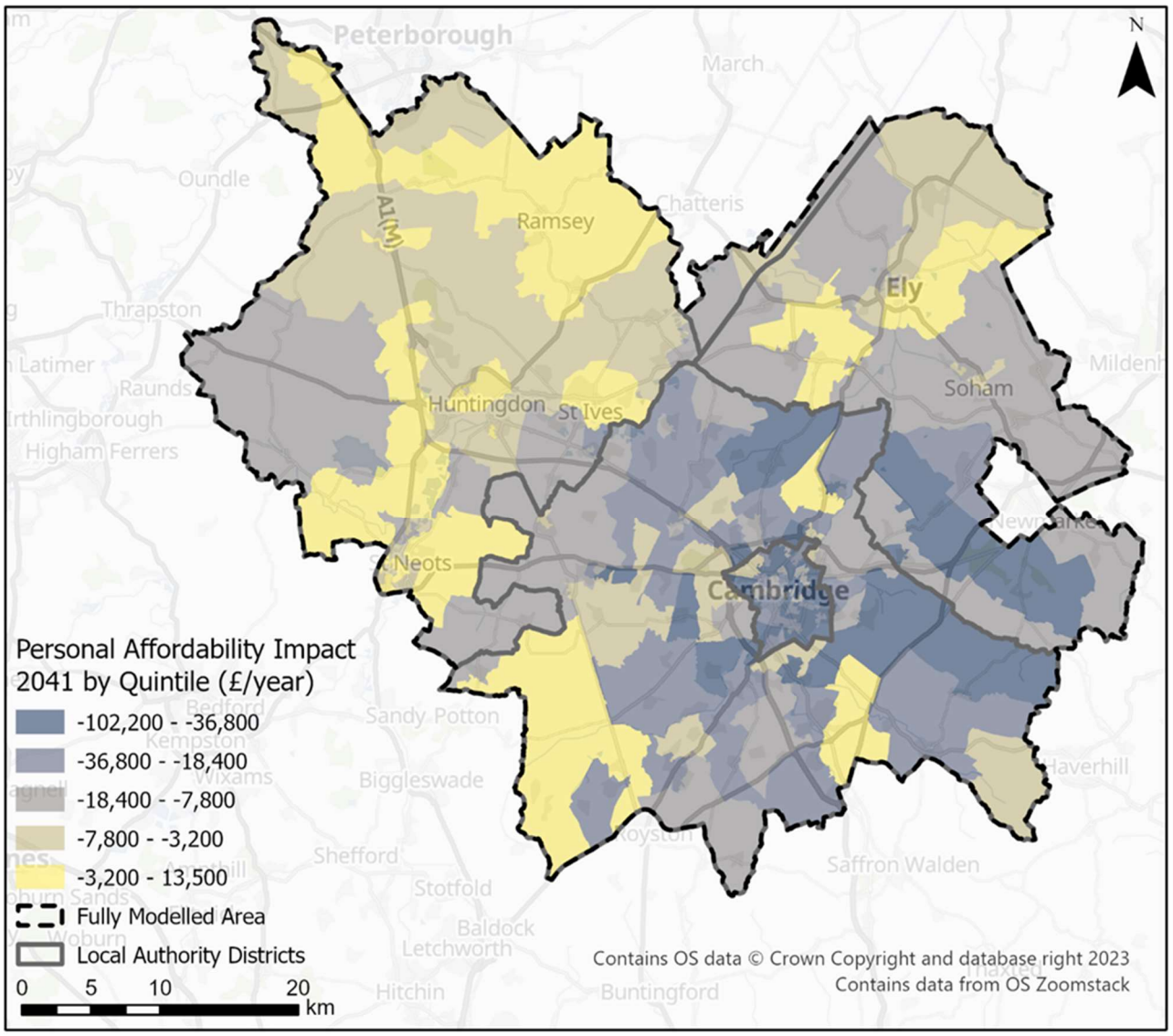


Figure 5-15 – Personal affordability 2041 by LSOA



5.10.6. A summary of the results is presented in **Table 5-14**.

Table 5-14 – Outcome of personal affordability assessment by social group

Social group	Assessment
Income Quintile 1 (most deprived)	Moderate adverse
Income Quintile 2	Moderate adverse
Income Quintile 3	Moderate adverse
Income Quintile 4	Slight adverse
Income Quintile 5 (least deprived)	Moderate adverse

5.10.7. The proposed charge zone would potentially lead to disbenefits across all income quintiles as the programme includes road user charging. The most deprived quintiles are expected to receive some disbenefits. Data from the ONS[35] highlights that most households in the two lowest income deciles show lower rates of car ownership (either only owning one car or no cars at all), which indicates that people who are in more deprived deciles are less likely to be negatively impacted by increased costs associated with car use.

5.10.8. When comparing areas of deprivation and levels of car ownership within Cambridge there are relatively low levels of car ownership in the northeast of Cambridge which correlates with areas of higher levels of deprivation. Other areas which are more deprived and have lower levels of car ownership include Bury St Edmunds, Haverhill, Newmarket, St Neots and Huntingdon. People on low incomes are less likely to drive and own cars, with only 35% of the lowest income households in the UK owning at least one car compared to 94% in higher income groups[36]. This indicates that these groups are less likely to be impacted by increased costs associated with car use and would benefit from improved access to public transport, which offers a lower-cost travel option.

5.10.9. Considering low car ownership levels within deprived communities outlined above, the Making Connections programme is set to significantly improve public transport and active travel provision including to rural areas, increased bus frequencies and operating hours as well as lower fares to make these modes more accessible for vulnerable groups. Reducing fares on public transport will benefit those who are from lower income households and do not have access to a car for example those in the northeast of Cambridge City as well as to wider areas within the study area. With the scale of improvements set to come forward, public transport and active travel will offer a lower cost option compared to driving due to the wider costs associated with car ownership including vehicle tax, insurance, fuel costs and other parking charges. Travel costs for these groups represent a large proportion of their income in comparison to higher income groups.

5.10.10. However, some low-income households, older people, those with disabilities or those travelling for medical appointments may own a car and rely on the use of the car to access key services as well as employment. Some individuals may be travelling long distances to get to employment opportunities located in more remote areas that are only accessible via

[35] ONS- Percentage of households with cars by income group, tenure and household composition- 2018 (Link) (Date Retrieved: July 2022)
[36] ONS - Percentage of households with cars by income group, tenure and household composition: Table A47 (Link) (Date retrieved: August 2022)

car, or they may require use of a car due to trip chaining or for other reasons i.e. to access specialist medical care.

5.10.11. The Scenarios which are being considered offer a range of discounts and exemptions to help address these issues as detailed in **Table 1-2** in addition to the core exemptions set out in **Table 1-1**.

5.10.12. Discounts, exemptions, and reimbursements include disabled tax class vehicles (exempt), NHS tax-exempt vehicles (exempt), dial-a-ride services (exempt), blue badge holders (nominate up to two vehicles for 100% discount) and low-income households (potential for tapered discount 25%-100%). These discounts and exemptions are expected to mitigate against any increase in costs to travel for vulnerable groups including low-income households and will have a slight beneficial effect on personal affordability.

5.10.13. The application of the discounts and exemptions which are being considered as part of the Making Connections Programme would mitigate the adverse impacts in terms of personal affordability associated with the charging scheme and therefore the overall impact is likely to be slight adverse.

6 PLACE-BASED IMPACTS

6.1.1. This chapter considers the potential place-based impacts of the Making Connections project, in accordance with TAG Unit A4.3 which states that place-based analysis is defined by the HMT Green Book as follows:

6.1.2. *"Place Based Analysis concerns appraisal applied to geographically defined areas within the UK. This definition includes a wide range of obvious categories such as villages, towns, cities, counties and regions and the home countries that make up the UK, it also includes other geographically based definitions such as "rural areas" or "areas of urban deprivation."*

6.1.3. Place-based analysis is closely linked with Distributional Impact Analysis, with TAG noting that DIA considers how impacts are dispersed across population groups, whereas place-based analysis considers dispersion across spatial areas.

6.1.4. This chapter will therefore build upon the findings of the DIA and will examine how the impacts identified in that assessment are distributed spatially across the study area. Since the spatial analysis is largely based on available traffic modelling data, this chapter (like Chapter 5) focuses on the impact of Scenario 1 of the Making Connections project, due to the availability of traffic modelling.

6.1.5. Place-based impacts were assessed in accordance with TAG Unit A4.3 for the following impacts:

- User Benefits
- Severance
- Personal Affordability.

6.1.6. As additional information becomes available, it is possible that additional topics (for example, Noise and Air Quality) will be included for future place-based impact analysis.

6.2 User Benefits

6.2.1. As established in **Section 5.3**, as assessment of User Benefits was undertaken across the fully modelled area as illustrated in **Figure 2-3.**

6.2.2. The methodology for the assessment of user benefits is detailed in **Section 5.1**. In summary, this assessment examines ***non-charge impacts*** (travel time savings and vehicle operating costs) and ***charge impacts*** (which includes toll, fares, and parking fees) using TUBA outputs. This analysis was undertaken for the two modelled years of 2026 and 2041, with the spatial findings illustrated in **Figure 5-2** to **Figure 5-5**.

6.2.3. For both modelled years, the ***non-charge impacts*** are focused around Cambridge and South Cambridgeshire as this area has the largest impact due time savings due to the reduction in traffic and improvements in public transport.

6.2.4. The areas to the north west and north east of Cambridge show the lowest degree of benefit for non-charge impacts which is likley due to proportionatley more minor improvements in travel time when traveling from these areas which are further from the STZ.

6.2.5. Conversely, for the ***charge impacts***, the largest dis-benefits are also in Cambridge and South Cambridgeshire as the population there is more likely to travel to and from Cambridge and therefore is more likely to be impacted by the cost associated with the charging scheme.

6.2.6. Similarly to what is observed for the non-charge impacts, the adverse effects of the charge impacts are lower in the areas in Huntingdonshire and north east of Cambridge near Ely, potentially due to lower likelihood of driving from these areas into the STZ.

6.2.7. Overall, the place-based analysis of user benefits shows that the areas in closer proximity to the STZ are more likely to experience the non-charge benefits associated with reduced congestion and are more likely to experience the charge disbenefits associated with the introduction of a roach user charge. Areas which are further afield are likely to experience lesser degrees of both benefits and disbenefits.

6.2.8. However it should be noted that disbenefits associated with the charge could be mitigated against due to the range of discounts and exemptions being implemented as a part of the Making Connections programme.

6.3 Severance

6.3.1. The place-based analysis of severance builds upon the DIA assessment of severance impacts upon different groups. The methodology by which the assessment was undertaken is detailed in Section 5. In summary, severance assessments consider the ways in which changes in road alignment and traffic flows, speed and proportion of HGVs alter the impact of roads as barriers within communities.

6.3.2. **Figure 5-9** illustrates the anticipated severance impacts which are expected to be delivered by Scenario 1 of the Making Connections project.

6.3.3. This analysis indicates that the greatest concentration of severance benefits is expected to be experienced in Cambridge City, largely due to reduced traffic volumes within the city which are anticipated to be delivered by the scheme. There are also pockets of anticipated benefits concentrated in the centres of St Neots, Huntingdon and Ely.

6.4 Personal Affordability

6.4.1. As examined in **Section 5.10**, the assessment of personal affordability is closely linked to that of user benefits. This assessment considers the impact of car costs and public transport costs upon users.

6.4.2. The findings of the assessment of personal affordability, when considered spatially, as illustrated in **Figure 5-14** and **Figure 5-15** for model years 2026 and 2041.

6.4.3. In 2026 it is anticipated that the greatest concentration of disbenefits in terms of personal affordability will be located within Cambridge City and the areas shown in darker blue to the on the south-eastern edge of Cambridge and to the north east near Ely. This is likely due to the increased car costs of travel throughout the STZ.

6.4.4. It is notable that, for the most part, a similar spatial pattern of personal affordability impacts is observed in 2041. There are slight alterations in Huntingdonshire which are anticipated to experience relative reductions in disbenefits, however the general spatial pattern remains largely consistent between the 2026 and 2041 model years.

7 SUMMARY

7.1.1. The Social Impact Assessment and DIA (collectively the SDIA) was undertaken to understand the impacts on the human experience of a transport system of the proposed scheme. The SIA was undertaken in accordance with TAG Unit A4.1 and DIA with TAG Unit 4.2 with exception for air quality due to modelling results being unavailable. In the next phase of the scheme, an air quality assessment can be undertaken to complete the assessment.

7.1.2. Scenario 1 was fully assessed using quantitative traffic modelling to inform the SDIA, while Scenarios 2, 3 and the consultation option were assessed qualitatively to provide a high-level comparison. In addition to these scenarios, there is an additional Scenario 1A (as indicated in **Section 1.2**).

7.1.3. Scenario 1a is likely to deliver similar results as Scenario 1 across most of the assessment categories and therefore has not been assessed separately. The difference between Scenario 1 and Scenario 1A focuses on the types of exemptions which would apply under each scenario. Scenario 1 includes additional exemptions for hospital trips (visitors and patients) and charges vans as cars, whereas Scenario 1A includes an SME discount and includes 50 free days indefinitely.

7.1.4. The variation in discounts and exemptions would impact different people within society in different ways. For example, people who are more likely to make hospital trips due to age or illness would benefit from the discounts associated with Scenario 1, whereas employees and owners of small businesses who operate vehicles owned by the business would likely benefit more greatly under Scenario 1A.

7.1.5. Overall, the scheme was considered to have beneficial impacts across the core elements that formed the assessment, in terms of a reduction of accidents (due to reduced traffic flows), increased physical activity (with more accessibility to public transport stops), improved security through a range of complementary measures, noise reductions and user benefits. These benefits were largely experienced by vulnerable groups, including children, women, and the elderly population. The results are summarised in **Table 7-1** to **Table 7-3.**

Table 7-1 – Summary of Social Impact Assessment

Social Impact Appraisal Indicators	Assessment				
	Consultation Scheme	Scenario 1	Scenario 2	Scenario 3	
Accidents	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial	A reduction in accidents of all severity levels is forecast because of reduced car use and improvements to the walking and cycling environment. COBALT analysis shows a reduction in all types of accidents.
Physical Activity	Large Beneficial	Moderate Beneficial	Moderate Beneficial	Slight Beneficial	The transformative measures of the scheme will have a considerable beneficial impact on physical activity within the study area. Greater rates of active travel and use if public transport will likely lead to more physical activity and subsequently better health and environmental outcomes. The scale at which levels of physical activity increase are dependent on the investment to enable mode shift will vary across the illustrative scenarios. Where less revenue is available, there will be smaller scale investments into active travel.

Social Impact Appraisal Indicators	Assessment				
	Consultation Scheme	Scenario 1	Scenario 2	Scenario 3	
Security	Moderate Beneficial	Slight Beneficial	Slight Beneficial	Slight Beneficial	A wide range of impacts have been assessed across all modes, ranging from slight to moderate beneficial. No adverse impacts have been forecast for any user group. Wider measures being considered as part of the Making Connections programme will improve perceptions of safety for those using the public transport network. The variation of impact will depend on the revenue generate to fund different improvement based on the proposed package.
Severance	Slight Beneficial	Slight Beneficial	Slight Beneficial	Slight Beneficial	The scheme will reduce traffic while also allowing investment in improved sustainable transport measures which will consider delivering formal crossings improving severance. COBALT analysis suggests a small number of roads will see benefits so the total benefit from each scenario is only slight.
Journey Quality	Large Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial	The scheme aims to improve journey quality across public information provision, perceptions of safety, provisions for accessibility and crowding on public transport services. The scale of interventions to improve journey quality will depend on the revenue available for investment and will vary across scenarios.

Social Impact Appraisal Indicators	Assessment				
	Consultation Scheme	Scenario 1	Scenario 2	Scenario 3	
Option and Non-Use Values	Large Beneficial	Moderate Beneficial	Moderate Beneficial	Slight Beneficial	These areas are currently under served by public transport. Where there is already public transport, the provision of it will be greatly improved. This will create a step change in the services that are provided, and more households will have access to the bus network. Improvements to the active travel network and wider measures are being considered to aide behaviour changes to create more opportunities for travel on these routes.
Accessibility	Large Beneficial	Moderate Beneficial	Moderate Beneficial	Slight Beneficial	The scheme is attempting to improve accessibility through several measures. Improving and increasing the provision and quality of bus services. This includes improving accessibility for disabled users by enabling access to buses for more than one wheelchair, improved information provision for those with visual and hearing impairments including more announcement at bus stops and on buses. New bus services will improve connection to key services and employment opportunities and improve access to social networks. A reduction in congestion will improve journeys on public transport and improve travel horizons through better journey time reliability. The scale of the effect is likely to vary between illustrative scenarios as each option will generate

Social Impact Appraisal Indicators	Assessment				
	Consultation Scheme	Scenario 1	Scenario 2	Scenario 3	
					different levels of revenue that can be reinvested into the public transport and active travel network.
Personal Affordability	Slight beneficial (subject to further work)	Slight Beneficial (subject to further work)	Slight Beneficial (subject to further work)		Whilst a road user charge is being proposed, those from low-income households that can use public transport will have a more affordable mode of transport. Where trips cannot be made by public transport a series of discounts, exemptions and reimbursements are being considered and would mitigate against any increase in travel costs.

Table 7-2 – Summary of Distributional Impact Assessment

Distributional Impact Appraisal Indicators	Assessment				
	Consultation Scheme	Scenario 1	Scenario 2	Scenario 3	
User Benefits (Charge)	*User benefits were not disaggregated by charge and non-charge impacts. Impact was assessed as Slight beneficial.	Moderate Adverse	Moderate Adverse	Moderate Adverse	For charge elements of the programme, analysis shows that adverse effects will be experienced across all income quintiles. It should be noted however, that detailed modelling does not make allowances for the proposed discounts and exemptions, which will mitigate against some of the adverse effects identified as part of the quantitative assessment.
User Benefits (Non-Charge)		Moderate Beneficial	Moderate Beneficial	Moderate Beneficial	Assessment of user benefits as part of the non-charge elements has been undertaken separately and considers time and vehicle operating costs. Journey times have improved due to people shifting to public and/or active travel resulting in fewer vehicles and therefore less delays. Revenue raised from the STZ will be re-invested into improvements to public and active travel, which will improve accessibility, journey times and reliability and offer a lower cost travel option for those travelling by these modes.

Distributional Impact Appraisal Indicators	Assessment				
	Consultation Scheme	Scenario 1	Scenario 2	Scenario 3	
Noise*	Moderate Beneficial	Slight Beneficial	Slight Beneficial	Slight Beneficial	7.1.1. It is likely that across all scenarios there will be a reduction in traffic, this will result in an overall beneficial outcome especially for children and the older population. Further analysis is required to assess potential fluctuations (decrease or increase) in noise levels across the study area. *Noise Modelling data was not available at the time of writing. This information will be included in this assessment when it is available
Air Quality*	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial	It is expected that there will be beneficial impacts in terms of air quality, particularly for vulnerable users including children and older people, as air quality levels should improve because of the reduction of traffic flows within the city centre. *Air Quality Modelling data was not available at the time of writing. This information will be included in this assessment when it is available

Distributional Impact Appraisal Indicators	Assessment				
	Consultation Scheme	Scenario 1	Scenario 2	Scenario 3	
Accidents	Slight Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial	Overall, accidents will reduce within Cambridge City and surrounding areas due to a reduction of traffic on the road network. This will benefit both children and older people who are more vulnerable to the risks of accidents. While quantitative analysis was not undertaken for Scenarios 2 and 3, it is anticipated that similar moderate beneficial impacts would be generated.
Security	Moderate Beneficial	Slight Beneficial	Slight Beneficial	Slight Beneficial	Transport users including women, younger and older people, those with disabilities and from minority groups will experience improved levels of personal security due to sustainable transport measures being considered such as potential improvements to lighting and CCTV which will increase the amount of formal surveillance as well as lighting/visibility in the study area. The level of investment into interventions that improve personal security will depend on the revenue generated from each option.

Distributional Impact Appraisal Indicators	Assessment				
	Consultation Scheme	Scenario 1	Scenario 2	Scenario 3	
Severance	Slight Beneficial	Slight Beneficial	Slight Beneficial	Slight Beneficial	Reduced traffic flow should lead to a reduced impact of severance. COBALT analysis concluded that the impacts are slightly beneficial due to overall reduction in traffic volumes in Cambridge. While quantitative analysis was not undertaken for Scenarios 2 and 3, it is anticipated that similar slight beneficial impacts would be generated.
Accessibility	Large Beneficial	Moderate to Large Beneficial	Moderate to Large Beneficial	Moderate to Large Beneficial	The overall impact of the scheme on accessibility is considered to be moderate to large beneficial depending on the option, due to the improvements to the bus network including increased bus frequencies, an expanded bus network, extended operating hours, and improved access to bus stops which makes access to public transport significantly easier and more accessible as a result of the scheme, especially for young people, those with disabilities and older people within Cambridge City, South Cambridgeshire and the wider study area.

Distributional Impact Appraisal Indicators	Assessment				
	Consultation Scheme	Scenario 1	Scenario 2	Scenario 3	
Personal Affordability	Slight Beneficial	Slight Adverse	Slight Adverse	Slight Adverse	The proposed charge zone would potentially lead to disbenefits across all income quintiles as the programme includes road user charging. Reducing fares on public transport will benefit those who are from lower income households and do not have access to a car for example those in the northeast of Cambridge City as well as to wider areas within the study area. With the scale of improvements set to come forward, public transport and active travel will offer a lower cost option compared to driving due to the wider costs associated with car ownership including vehicle tax, insurance, fuel costs and other parking charges. However, the scale of disbenefits due to car costs outweighs the affordability benefit associated with reduced public transport costs. While quantitative analysis was not undertaken for Scenarios 2 and 3, it is anticipated that similar moderate adverse impacts would be generated.

*Detailed Noise and Air Quality Assessments were not available to do a full Distributional Assessment and conclusions have been based on initial qualitative assessments

Table 7-3 – Impact Assessment Summary Table

Topic	Scenario 1	Scenario 2	Scenario 3
Social Impact Appraisal			
Accidents	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
Physical Activity	Moderate Beneficial	Moderate Beneficial	Slight Beneficial
Security	Slight Beneficial	Slight Beneficial	Slight Beneficial
Severance	Slight Beneficial	Slight Beneficial	Slight Beneficial
Journey Quality	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
Accessibility	Moderate Beneficial	Moderate Beneficial	Slight Beneficial
Option and Non-Use Value	Moderate Beneficial	Moderate Beneficial	Slight Beneficial
Personal Affordability	Slight Beneficial (subject to further work)	Slight Beneficial (subject to further work)	Slight Beneficial (subject to further work)
Distributional Impact Assessment			
User Benefits (Charge)	Moderate Adverse	Moderate Adverse	Moderate Adverse
User Benefits (Non-Charge)	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
Noise*	Slight Beneficial (subject to further work)	Slight Beneficial (subject to further work)	Slight Beneficial (subject to further work)
Air Quality*	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
Accidents	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
Security	Slight Beneficial	Slight Beneficial	Slight Beneficial

Severance	Slight Beneficial	Slight Beneficial	Slight Beneficial
Accessibility	Moderate to Large Beneficial	Moderate to Large Beneficial	Moderate to Large Beneficial
Personal Affordability	Slight Adverse	Slight Adverse	Slight Adverse