SHEFFIELD AND ROTHERHAM CLEAN AIR ZONE FEASIBILITY STUDY

SUPPORTING DOCUMENT 12: DISTRIBUTIONAL IMPACT APPRAISAL

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DOCUMENT CONTROL

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1. INTRODUCTION

1.1 Appraisal Overview

SYSTRA has been commissioned by Sheffield City Council (SCC) and Rotherham Metropolitan Borough Council (RMBC) to support the development of the Outline Business Case (OBC) for the Sheffield and Rotherham Clean Air Zone (CAZ) Feasibility Study. This report aims to provide proportionate distributional impact input to inform the OBC; it will be included as an appendix to the OBC submission.

1.2 Overview of the Options

The proposed preferred option which has come out of the Feasibility Study is for a Sheffield charging CAZ which covers the area bounded by the inner ring road, including the inner ring road itself. The proposed CAZ is a category CAZ C+ which involves non-compliant buses, coaches, taxis (London-style hackneys and private hire), HGVs and LGVs being charged a daily rate for entering and moving within the zone along with additional measures in order to achieve legal air quality compliance by 2021.

The alternative options which have been proposed are all category CAZ D options, which as well as charging the above vehicles in CAZ C+, they also involve charging private cars a daily rate for entering and moving within the zone. These options also include the expansion of the proposed charging area with each charging area's extent shown in Figure 1.

Figure 1.   Potential charging areas considered
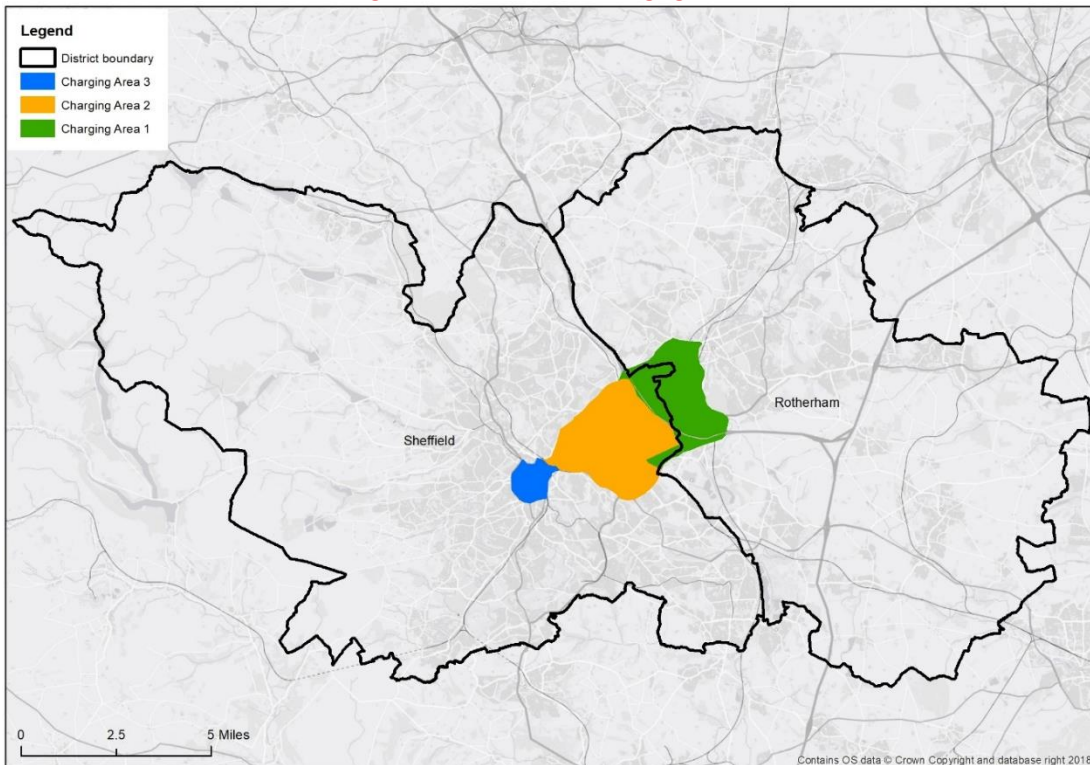
For the purposes of this assessment, the distributional impact appraisal has only considered the two options whose charging area is 'Charging Area 3' (the Preferred Option) as displayed in the above figure. 'Charging Area 1' and 'Charging Area 2' have been excluded from the analysis as they have already been determined to be less politically and publicly acceptable than 'Charging Area 3'.

Hereafter, the two options will be referred to as CAZ C+ and CAZ D.

1.3 Report Background and Purpose

Distributional impact appraisals consider the variance of a scheme's impact across different social groups, in this case the measures proposed to achieve compliance with air quality legal limits. Both beneficial and / or adverse distributional impacts of proposed options are considered, along with the identification of social groups likely to be affected.

The impacts considered are:

- User benefits;
- Noise;
- Air quality;
- Accidents;
- Security;
- Severance;
- Accessibility; and
- Personal affordability.

This distributional impact appraisal has been undertaken in line with guidance outlined in the Joint Air Quality Unit's (JAQU) Option Appraisal guidance and WebTAG Unit A4.2 by giving consideration to the social effects (both beneficial and adverse) of the preferred and alternative options, against the eight distributional impact indicators above. The effects of the options have been identified using a seven-point scale system, in accordance with the WebTAG criteria as shown below in Table 1.

Table 1. Distributional impact seven-point scale

IMPACT	ASSESSMENT SCORE
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 (✗✗✗)
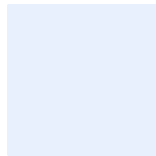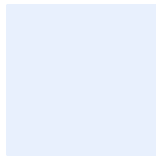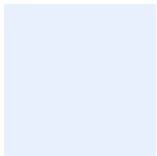
The distributional impact undertaken encompasses a number of stages/steps which are:

- Step 1 consists of an initial screening process which examines the eight impacts and determines whether they need to be appraised further;
- Step 2 confirms the impact area extent for when the impacts are mapped using GIS software, identifies the social groups and related amenities in the impact areas; and
- Step 3 appraises the results and provides an assessment of the impacts of the intervention.

Following this introduction and a local context section to set the scene, the report will provide and the results of the initial screening process before separately providing information on the methodology and results of each of the impacts which progresses beyond Step 1.

2.   LOCAL CONTEXT

Poor air quality is increasingly seen as one of the world's most significant public health challenges. In Sheffield, it is estimated that poor air quality contributes to 500 deaths a year but it also undermines the quality of life for a far greater number of people in the city. Poor air quality impacts on the day-to-day lives and life chances of communities, for example, 7-12% of annual childhood asthma cases were specifically attributable to traffic related air pollution and it increases the chances of hospital admissions, visits to A&E and respiratory and cardiovascular disease.

The UK has been in breach of the legal limit for nitrogen dioxide (NO_2) concentrations since January 2010 and along with other major urban areas in the UK, roads in Sheffield and Rotherham breach those legal limits. DEFRA's data indicates that Sheffield and Rotherham has roads where the average concentration of NO_2 in 2017 exceeds the legal limit of 40µg/m³, in some places by as much as 30%.

Evidence from local air quality monitoring and traffic data in Sheffield and Rotherham demonstrates that there are multiple places in the area where NO_2 emissions currently breach the legal limit and it is expected this will continue for the foreseeable future. Specifically, Sheffield NO_2 problem is:

- Road-based – 50% of Sheffield's NO_2 emissions come from the tailpipes of vehicles.
- Disproportionately caused by particular vehicle types – whilst private cars make up the majority of vehicles on Sheffield's roads, diesel and older petrol buses (1% of the vehicles but 5% of emissions), London-style Hackney taxis and Private Hire taxis (3% of vehicles but 4% of emissions and trips heavily focused on the city centre), HGVs (3% of vehicles but 15% of emissions) and LGV vans (13% of vehicles but 26% of emissions) are disproportionately responsible for the level of NO_2 emissions from road transport.
- Predominantly focused on the city centre – whilst there are multiple sites across the city where NO_2 emissions breach the legal limit, the problem is most acute in the city centre and Lower Don Valley. Evidence shows that natural fleet change (i.e. drivers replacing and upgrading their vehicles) does not bring emissions in these places within the legal limit by 2021 and therefore, targeted intervention is needed to improve air quality at these sites.

Sheffield and Rotherham have therefore been required by Government to tackle vehicle emissions from diesel vehicles, and older petrol vehicles, in order to become compliant with legal limits in the 'shortest possible time'.

Government propose the creation of 'Clean Air Zones' (CAZs) to geographically concentrate interventions to tackle the main sources of pollution in local areas. Interventions can be wide ranging and designed to suit specific local challenges and needs. CAZs can involve charging drivers for entering an specific area in a vehicle that does not meet a specific minimum standard – broadly this means diesel vehicles that are older than Euro 6 (around 2016) or petrol vehicles that are older than Euro 4 (around 2006).

Government's priority is speed of delivery/impact and their modelling suggests that CAZs with charging for non-compliant vehicles are most likely to reduce emissions in the shortest possible time (i.e. being charged to enter a specific area encourages behaviour change and vehicle change most quickly). Government have made clear that they will test any interventions proposed by Sheffield and Rotherham against the assumed speed of impact that charging would have.

3. STEP 1 – SCREENING PROCESS

The Step 1 screening process considers the variety of impacts that the options might have and undertakes a prioritisation exercise so that only the most relevant indicators for each of the options are further appraised and consider the impact on the following social and business groups:

- Children;
- Elderly;
- Sex;
- People on low incomes;
- People with disabilities;
- People of black and minority ethnic groups;
- Pedestrians, cyclists and motorists;
- Business count; and
- LGVs

Each of the 8 distributional impacts have been assessed individually using a screening proforma (in line with WebTAG A4.2) to determine the potential impact of the options on the indicators whether they need to be appraised further.

The full screening proforma and the reasons behind whether a distributional impact is to be appraised further or not can be found in Sub Appendix A. In summary, the impacts which have progressed to Step 2 are:

- User benefits;
- Air quality;
- Accidents;
- Accessibility; and
- Affordability.

4. STEP 2 – ASSESSMENT

4.1 Distribution of social and business groups

Step 2 of the distributional impact assessment involves collecting information on the geographical area that is likely to be affected by the scheme and how different social and business groups are distributed within that geographical area using Geographic Information Systems (GIS).

The impact area has been defined based on the model simulation area of the Sheffield and Rotherham Transport Model 3 (SRTM3B) which has been developed to economically appraise the two options. The extent of the impact area for the distributional impact appraisal is shown in Figure 2. Therefore, detail on the social and business groups in Sheffield and Rotherham has been gathered at the lowest geographical scale in which data was available, namely Lower Super Output Areas (LSOAs) and Middle Super Output Areas (MSOAs).

Figure 2.   Defined distributional impact area
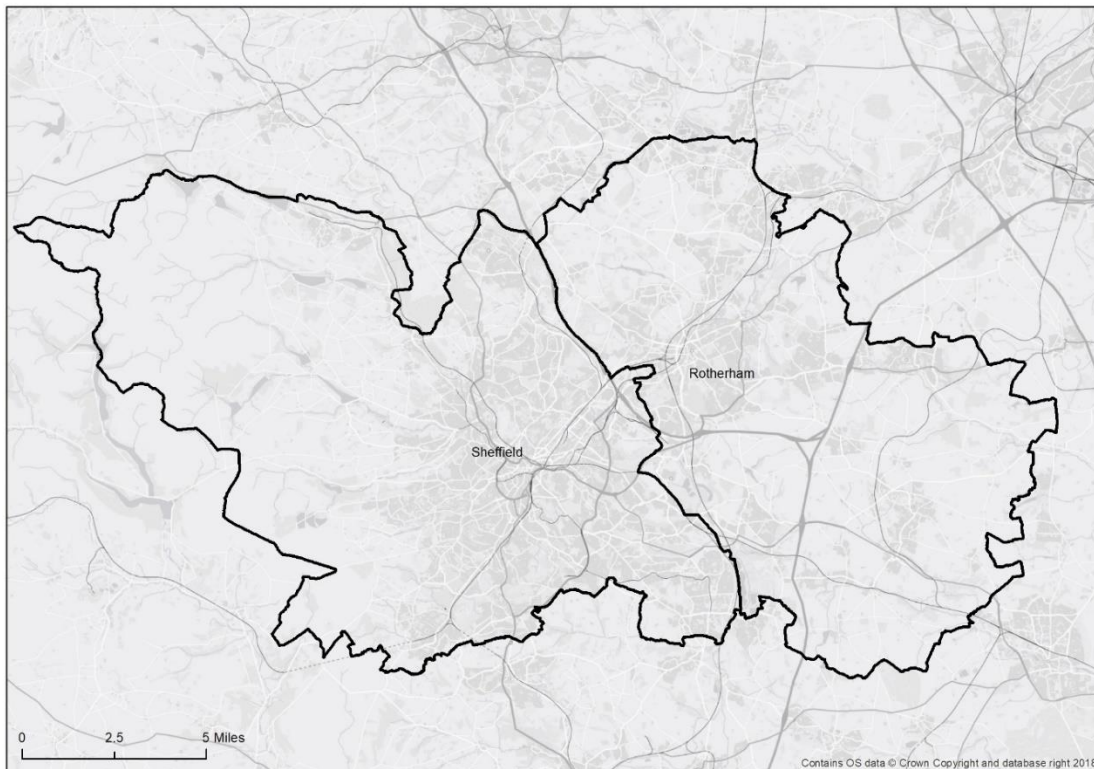
Step 2b requires the analysis of the socio-economic, social and demographic characteristics of:

- The transport users that will experience changes in travel generalised costs resulting from the options;
- The people living in areas who may experience impacts of the options even if they are not users; and
- The people travelling in areas identified as likely to be affected by the options.

Step 1 identified the distributional impacts to be further appraised. The analysis of the characteristics of people in the impact area likely to be affected by the scheme is summarised in Table 2 by the groups of people to be identified in the analysis for each impact.

Table 2. Impact categories in scope for each social or business group

SOCIAL OR BUSINESS GROUP	USER BENEFITS	AIR QUALITY	ACCIDENTS	ACCESSIBILITY	AFFORDABILITY
Income Distribution	✓	✓		✓	✓
Children		✓	✓	✓	
Elderly			✓	✓	
Disability				✓	
Sex				✓	
Ethnicity				✓	
Business Count	✓				✓
LGV	✓				✓
Pedestrians			✓		
Cyclists			✓		
Motorcyclists			✓		

To present the distribution of the above social and business groups across the scheme impact area, GIS has been used. The series of figures below display each of the social or business groups within Sheffield and Rotherham.

Figure 3 shows the distribution of income deprivation in the impact area using LSOA data, according to the 2015 English Indices for Deprivation. JAQU and WebTAG A4.2 guidance outlines that income distribution should be mapped based on ranking LSOAs within the study area and then also based on the overall distribution in England and Wales. However, with the least income deprived LSOA in England and Wales being located in the impact area, only one figure is required to display the income distribution rather than two figures as suggested in the JAQU guidance.

Figure 3. **Income deprivation by LSOA across impact area**
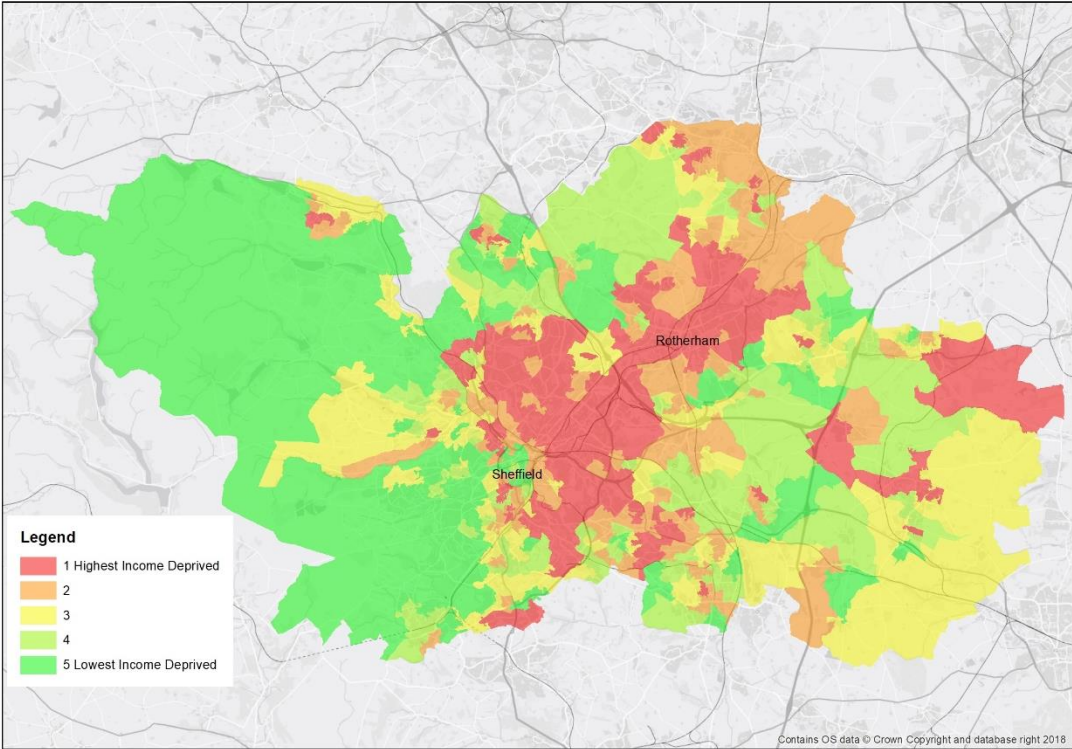
The distribution of children (under 16s) across the impact area's LSOAs (Figure 4) has been mapped based on ONS mid-year (2017) population estimates.

Figure 4. **Children proportion by LSOA across impact area**
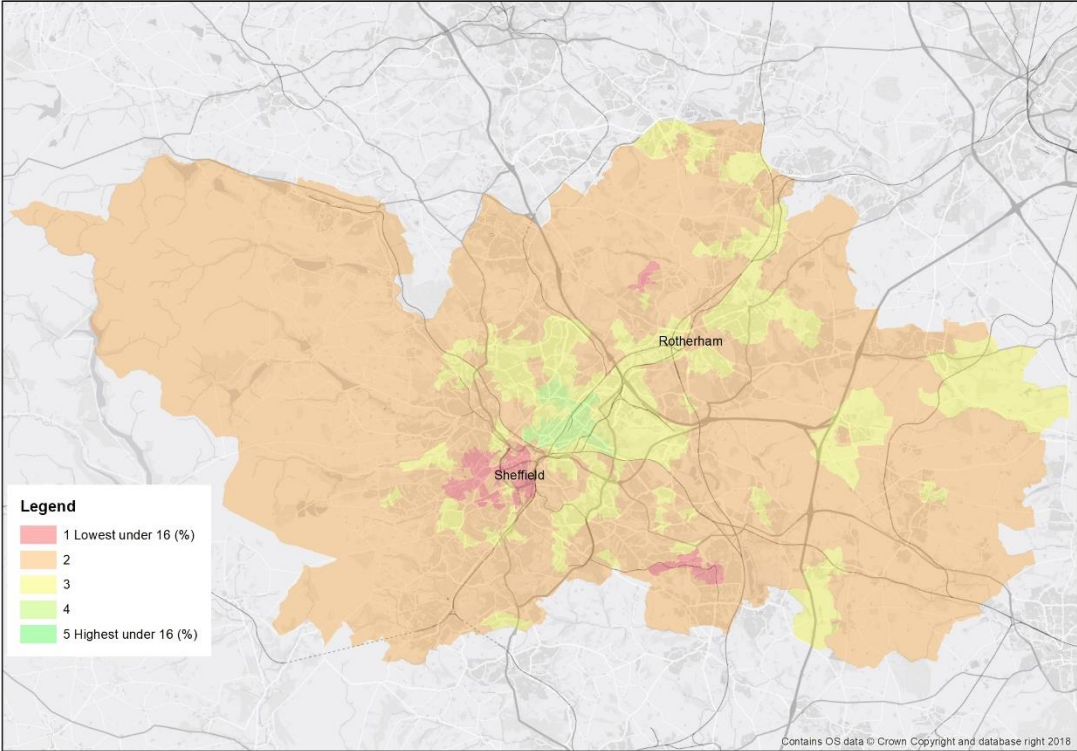
The distribution of elderly (over 65s) across the impact area's LSOAs has been mapped (Figure 5) based on ONS mid-year (2017) population estimates.

Figure 5.   **Elderly proportion by LSOA across impact area**
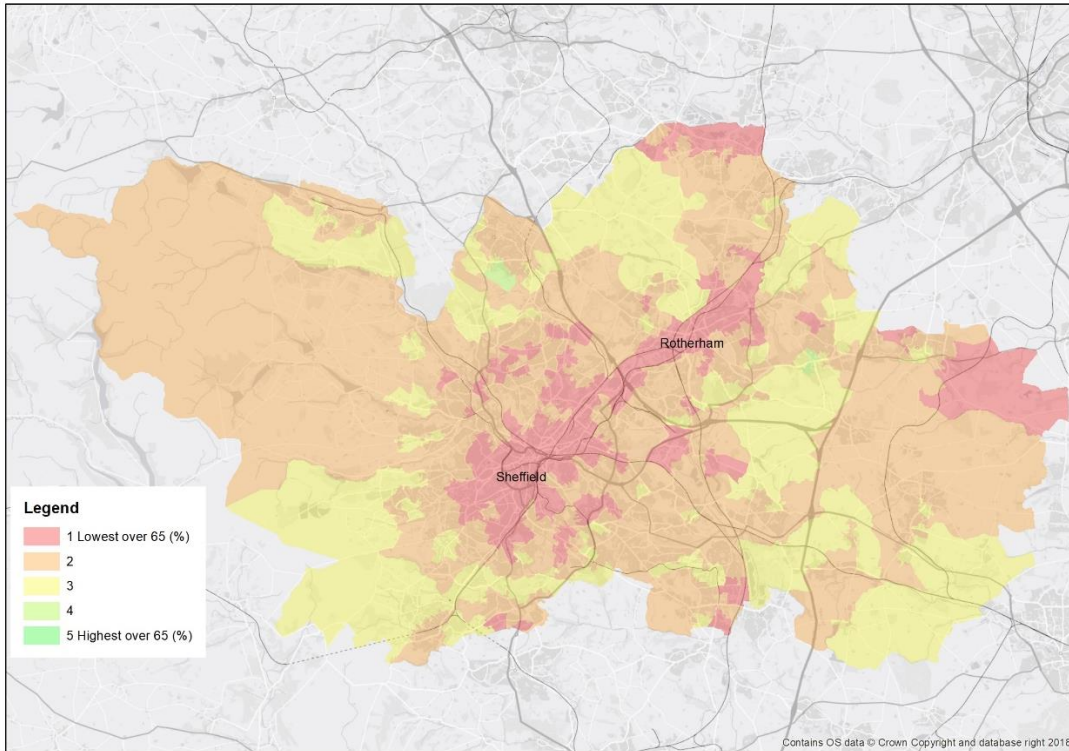
The distribution of disability across the impact area's LSOAs has been mapped (Figure 6) based on the comparative illness and disability ration indicator, an underlying indicator of the 2015 English Indices of Deprivation.

Figure 6. **Disability proportion by LSOA across impact area**
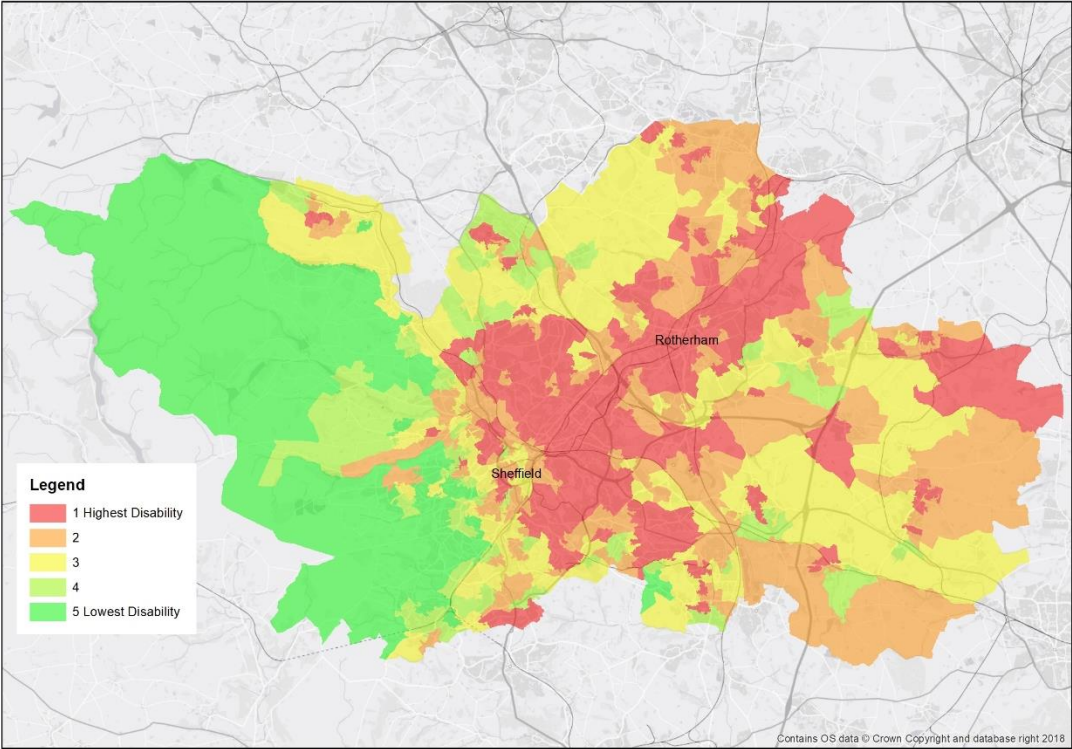
The distribution of sex (proportion of females) across the impact area's LSOAs (Figure 7) has been mapped based on ONS mid-year (2017) population estimates.

Figure 7. **Female proportion by LSOA across impact area**
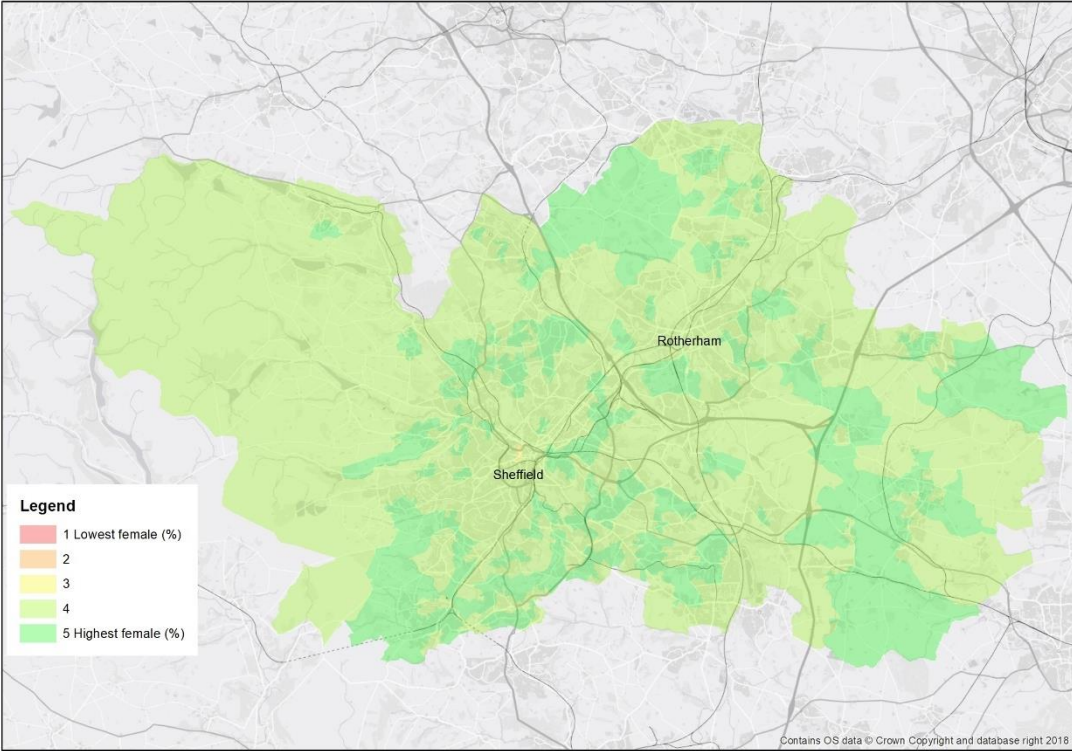
The distribution of ethnicity (non-white proportion) across the impact area's LSOAs has been mapped (Figure 8) based on outputs from the 2011 census.

Figure 8. **Ethnicity by LSOA across impact area**
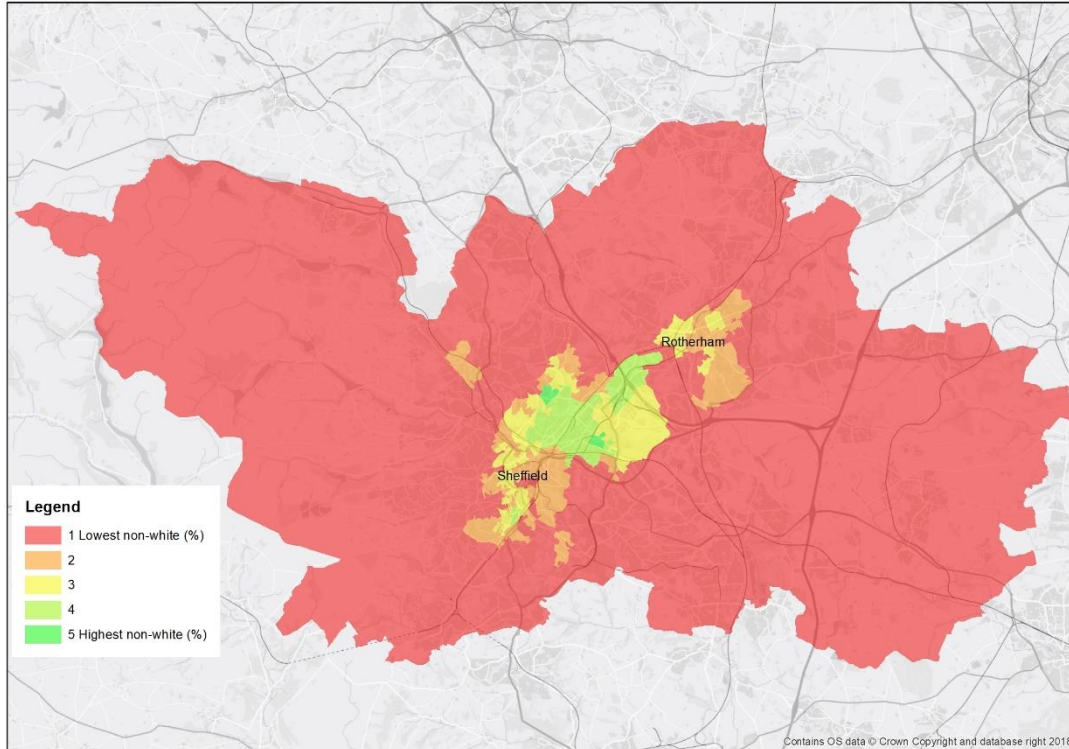
The distribution of businesses across the impact area's MSOAs has been mapped (Figure 9) based on information available from 2017 Nomis labour market statistics.

Figure 9. **Business count by MSOA across impact area**
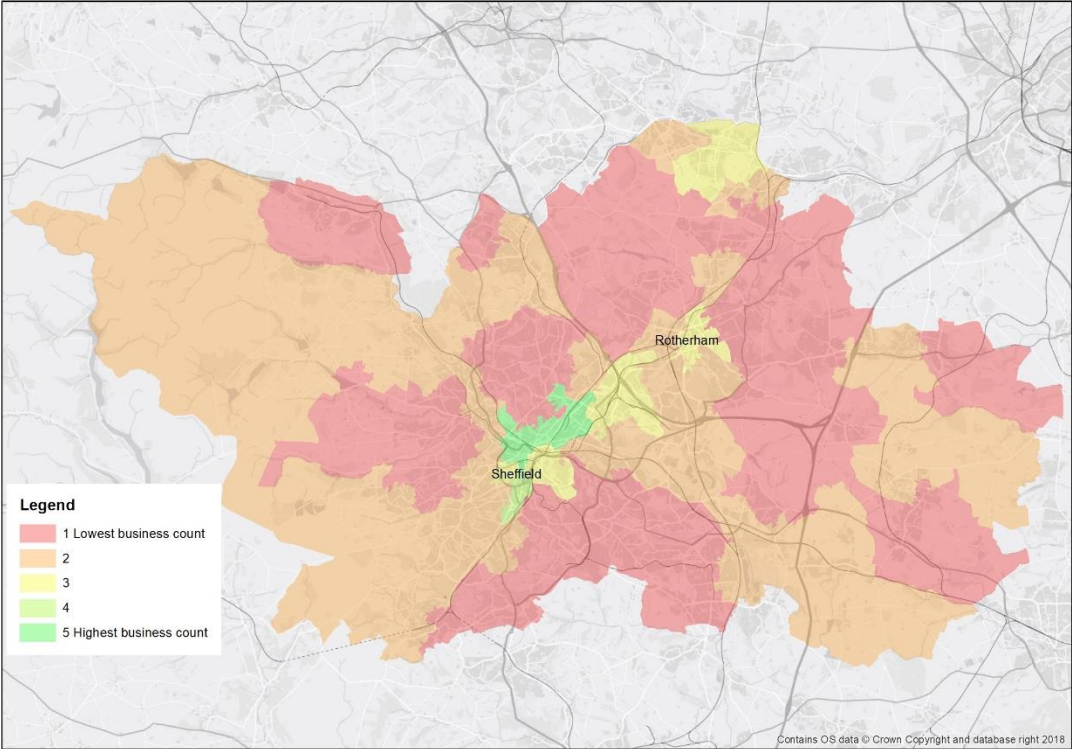
The distribution of LGVs across the impact area's LSOAs has been mapped on Figure 10 below based on information provided by JAQU.

Figure 10. **LGV number by LSOA across impact area**
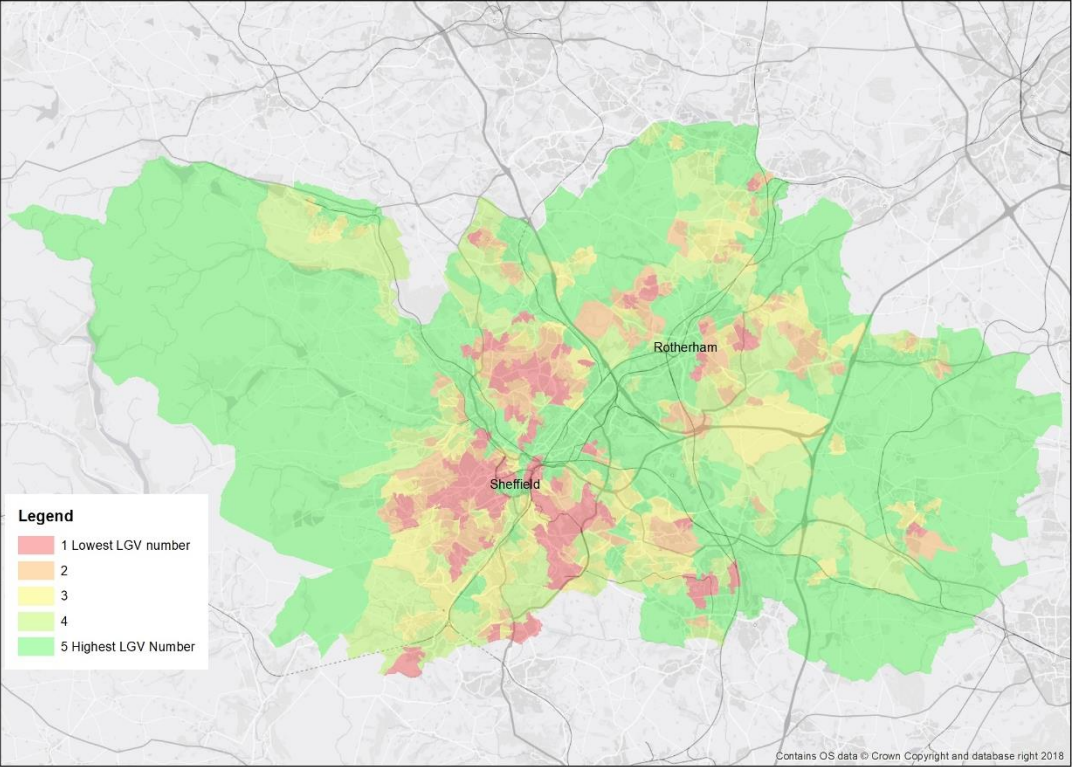
The figure above indicates that the LSOAs with the highest number of LGVs registered are not in the centre of Sheffield (where the CAZ cordon will be implemented). However, the MSOAs with most businesses which are serviced and/or utilise LGVs are in the area within the proposed CAZ cordon as seen on Figure 9.

Having captured the LGV journeys on the road network within Sheffield City council based on the transport model, this equates to 872,094 vkm on an average day which result in approximately 0.735T of NOx. This is approximately 22.6% of the total daily emissions and corresponds to 0.84g of NOx per vkm which is more than 3 times higher than any private car user class.

In order to mitigate the adverse impact of the CAZ charging scheme on these LGV drivers and businesses and support these trips to have a reduced emissions footprint, it is recommended that a fund is made available through the Clean Air Fund (CAF). Based on consideration of the other impacts and implications of the CAZ application in Sheffield, the amount calculated in the funding model is in the region of £1.8m.

The following sections consider each of the distributional impact indicators to be further assessed individually in terms of the forecast appraisal impact brought about by the scheme options.

4.2 Distributional Impacts of User Benefits

Step 2a: Confirmation of areas impacted by the scheme
The impact on user benefits has been considered for the Sheffield and Rotherham districts as shown in Figure 2. The areas of the SRTM3B model outside of Sheffield and Rotherham have been deemed as an external sector.

Step 2b: Identification of social and business groups in the impact area
The income deprivation distribution map, as shown in Figure 3, shows that there is a considerable spread of income deprivation across the user benefit impact area. The main areas of high income deprivation are to the east of Sheffield city centre, extending across to Rotherham town centre in the Lower Don Valley area.

The income distribution within the CAZ C+ cordon shows that this is predominantly an area which is not very deprived with some pockets of more deprived areas around the edges of the cordon.

The impact on user benefits also considers the distribution of businesses and LGVs. Each of these groups and their distribution within the impact area is displayed in Figure 9 and Figure 10. The highest concentration of businesses is shown to be in Sheffield City Centre with the high concentration also extending to the north east into the Lower Don Valley. The distribution of LGV numbers is more sporadic with areas in the highest LGV quintile tending to be in more rural locations such as to the north and east of Rotherham town centre and north west of Sheffield city centre. Conversely to the number of businesses, LGV numbers are shown to be low in and around Sheffield city centre which is to be expected given the limited land availability and associated costs.

Step 2c: Identification of amenities in the impact area
Guidance in WebTAG A4.2 states that the identification of amenities within the user benefits distributional impact appraisal is not required due to the appraisal focusing on the impact across

income deprivation quintiles and the impact area being too large to warrant identification of local attractors.

Step 3: Appraisal of impact

The transport benefits of the scheme have been calculated using the transport user benefit appraisal (TUBA) software which carries out the economic appraisal of schemes in accordance with DfT guidance. This is based on trip and cost matrices from the SRTM3B transport model and travel cost changes implied by the proposed scheme.

The TUBA assessment was undertaken for the expected duration of the CAZ charging scheme (2021 – 2024) for all vehicle types / user classes included in the SRTM3B model. The matrices for compliant and non-compliant vehicles were processed separately due to the additional cost incurred by the non-compliant groups. Detailed outputs were exported from TUBA showing the benefits for each origin, destination, time period, mode and purpose combination. For the purpose of the analysis, the following benefits were aggregated to determine the total user benefits:

- Time benefits
- Tolls
- Fuel vehicle operating costs
- Non-fuel vehicle operating costs

The benefits extracted from TUBA were provided for model zones. SCC and RMBC provided Local Land and Property Gazetteer (LLPG) GIS files which allowed the benefits allocated to each model zone to be allocated to LSOAs in order to distribute the benefits across the relevant data sources e.g. number of LGVs or income.

The benefits were distributed across the impact area in two groups (business trips and commute / other trips).

Table 3 to Table 5 summarises the distributional analysis of user benefits for CAZ C+. The benefits have been distributed in terms of income deprivation for 'commute and other' trips and number of businesses (micro to medium) / LGVs for business trips.

The table below presents the results for 'commute and other' trips extracted from the TUBA output file and distributed across the income deprivation quintiles for the impact area.

Table 3. User benefit distributional impact analysis for CAZ C+ (commute and other trips)

	INCOME DEPRIVATION (£M)					TOTAL
	1st quintile (most deprived)	2nd quintile	3rd quintile	4th quintile	5th quintile (least deprived)	
Total benefits	£6,256,987	£7,103,912	£4,373,613	£7,044,526	£8,136,711	£32,915,749
Total disbenefits	-£332,103	-£158,895	-£103,383	-£1,921	-£219,877	-£816,179
Number of people with improved user benefits	223,741	125,038	115,344	114,613	140,865	719,601
Number of people with reduced user benefits	36,732	20,995	13,351	4,666	13,163	88,907
Number of net winners	187,009	104,043	101,993	109,947	127,702	630,694
Net 'winners' in each area as % of total	30%	16%	16%	17%	20%	100%
Share of total population in impact area	32%	18%	16%	15%	19%	100%
Assessment	✓✓	✓✓	✓✓	✓✓	✓✓	

The results shown in the table above indicate that the majority of users undertaking a 'commute' or 'other' trip in the CAZ C+ scenario experience user benefits and therefore a large number of net 'winners' is shown. It should be noted that this is the only user benefit table where a benefit is shown. This is likely to be due to the fact that the 'commute and other' matrices are largely composed of private car trips which are not charged in the CAZ C+ scenario; these users therefore experience a time benefit and no disbenefit as a result of the charge.

The distribution of these benefits across income quintiles is broadly in line with the proportion of each group in the total population. The largest differences are shown for the first and second quintiles where the proportion of net winners is 2% lower than the share of the total population, but this is not significantly different from their proportion in the population.

The table below shows the distribution of user benefits across businesses in the impact area. The monetary values presented are for business trips only from the TUBA outputs. The number of net 'winners'/'losers' in this case represents the number of businesses within each area that experiences a benefit or disbenefit respectively.

Table 4.   User benefit distributional impact analysis for CAZ C+ (business trips)

	NUMBER OF BUSINESSES					TOTAL
	1st quintile (most businesses)	2nd quintile	3rd quintile	4th quintile	5th quintile (least businesses)	
Total benefits	£8,171	£6,571	£-	£42,835	£18,290	£75,868
Total disbenefits	-£47,232,797	-£13,448,086	-£4,808,772	-£6,674,470	-£7,941,351	-£80,105,475
Number of businesses with improved user benefits	52	239	-	129	34	455
Number of businesses with reduced user benefits	12,093	6,431	4,507	2,671	2,106	27,807
Number of net 'winners'	-12,040	-6,192	-4,507	-2,541	-2,071	-27,352
Net 'losers' in each area as % of total	44%	23%	16%	9%	8%	100%
Share of total businesses in impact area	43%	24%	16%	10%	8%	100%
Assessment	✗✗	✗✗	✗✗	✗✗	✗✗	

The results indicate that the majority of users undertaking business trips experience a disbenefit as a result of the CAZ C+ scheme. The spread of these disbenefits, in terms of the number of businesses located in an area experiencing a disbenefit, is broadly in line with the spread of businesses across the impact area.

Table 5 shows the distribution of user benefits based on the number of LGVs in an LSOA. The number of net 'winners'/'losers' in this case represents the number of LGVs within each LSOA that experiences a benefit or disbenefit respectively.

Table 5. User benefit distributional impact analysis for CAZ C+ (business trips)

	NUMBER OF LGVS					TOTAL
	1st quintile (most LGVs)	2nd quintile	3rd quintile	4th quintile	5th quintile (least LGVs)	
Total benefits	£36,538	£2,436	£32,825	£-	£4,068	£75,868
Total disbenefits	-£24,816,249	-£7,832,455	-£19,399,920	-£8,153,861	-£19,902,990	-£80,105,475
Number of LGVs with improved user benefits	617	123	132	-	29	901
Number of LGVs with reduced user benefits	15,090	5,682	4,588	3,583	2,329	31,272
Number of net 'winners'	-14,473	-5,559	-4,456	-3,583	-2,300	-30,371
Net 'losers' in each area as % of total	48%	18%	15%	12%	8%	100%
Share of total LGVs in impact area	49%	18%	15%	11%	7%	100%
Assessment	✕✕	✕✕	✕✕	✕✕	✕✕	

The results show that the majority of users undertaking business trips experience disbenefit as a result of the CAZ C+ scheme. The spread of disbenefits, in terms of the net number of 'losers' (LGVs located in impact areas that experience disbenefits), is broadly in line with the spread of LGVs across the impact area.

Table 6 to Table 8 presents the results of the distributional analysis of user benefits for the CAZ D scenario.

Table 6. User benefit distributional impact analysis for CAZ D (commute and other trips)

	INCOME DEPRIVATION (£M)					TOTAL
	1st quintile (most deprived)	2nd quintile	3rd quintile	4th quintile	5th quintile (least deprived)	
Total benefits	£1,496	£-	£-	£32,121	£44,368	£77,985
Total disbenefits	-£34,718,529	-£24,135,103	-£16,727,773	-£15,423,019	-£23,560,027	-£114,564,451
Number of people with improved user benefits	1,571	-	-	2,901	4,846	9,318
Number of people with reduced user benefits	258,902	146,033	128,695	116,378	149,182	799,190
Number of net 'winners'	-257,331	-146,033	-128,695	-113,477	-144,336	-789,872
Net 'losers' in each area as % of total	33%	18%	16%	14%	18%	100%
Share of total population in impact area	32%	18%	16%	15%	19%	100%
Assessment	××	××	××	××	××	

The results show that the majority of users undertaking 'commute' and 'other' trips experience disbenefits as a result of the scheme. The distribution of these benefits in terms of the number of net 'losers' is broadly in line with the proportion of each income group in the total population and do not disproportionately affect lower income groups.

The table below shows the distribution of user benefits across quintiles representing the number of businesses.

Table 7. User benefit distributional impact analysis for CAZ D (business trips)

	NUMBER OF BUSINESSES					TOTAL
	1st quintile (most businesses)	2nd quintile	3rd quintile	4th quintile	5th quintile (least businesses)	
Total benefits	£-	£-	£-	£7,671	£-	£7,671
Total disbenefits	-£62,676,772	-£21,460,633	-£8,978,463	-£11,508,605	-£12,525,879	-£117,150,352
Number of businesses with improved user benefits	-	-	-	71	-	71
Number of businesses with reduced user benefits	12,145	6,670	4,507	2,729	2,140	28,191
Number of net 'winners'	-12,145	-6,670	-4,507	-2,658	-2,140	-28,120
Net 'losers' in each area as % of total	43%	24%	16%	9%	8%	100%
Share of total businesses in impact area	43%	24%	16%	10%	8%	100%
Assessment	✗✗	✗✗	✗✗	✗✗	✗✗	

The results indicate that the majority of those undertaking a 'business' trip will experience a disbenefit as a result of the CAZ D scheme. The spread of these disbenefits, in terms of the number of businesses located in an area experiencing a disbenefit, is broadly in line with the spread of businesses across the impact area.

The table below shows the distribution of user benefits for CAZ D based on the number of LGVs in an LSOA.

Table 8. User benefit distributional impact analysis for CAZ D (business trips)

	NUMBER OF LGVS					TOTAL
	1st quintile (most LGVs)	2nd quintile	3rd quintile	4th quintile	5th quintile (least LGVs)	
Total benefits	£7,671	£-	£-	£-	£-	£7,671
Total disbenefits	-£34,894,197	-£11,881,153	-£26,554,443	-£12,746,403	-£31,074,156	-£117,150,352
Number of LGVs with improved user benefits	151	-	-	-	-	151
Number of LGVs with reduced user benefits	15,556	5,805	4,720	3,583	2,358	32,022
Number of net 'winners'	-15,405	-5,805	-4,720	-3,583	-2,358	-31,871
Net 'losers' in each area as % of total	48%	18%	15%	11%	7%	100%
Share of total LGVs in impact area	49%	18%	15%	11%	7%	100%
Assessment	××	××	××	××	××	

Similar to CAZ C+, the results show that the majority of those undertaking a 'business' trip will experience a disbenefit as a result of the CAZ D scheme. The spread of disbenefits, in terms of the net number of 'losers' (LGVs located in impact areas that experience disbenefits), is broadly in line with the spread of LGVs across the impact area.

User benefit summary assessment for CAZ C+: Moderate Adverse
User benefit summary assessment for CAZ D: Moderate Adverse

4.3 Distributional Impacts of Air Quality

The distributional impact analysis for the air quality indicator has focused on identifying the road links which experience an improvement, deterioration or no change in air pollution concentrations, namely NO_x and PM_{10}. This requires assigning each affected link to an LSOA to calculate the number of properties[1] affected by any air quality changes.

Step 2a: Confirmation of areas impacted by the scheme
The focus of the air quality appraisal is the impact area as shown in Figure 2.

---

[1] Information on property number and location within impact area provided by SCC and RMBC.

Step 2b: Identification of social groups in the impact area

The focus of the air quality assessment is on the distribution of income deprivation (Figure 3) and children (Figure 4). The analysis of income distribution in the impact area has been previously discussed in Section 4.1.

There are only a few areas where the proportion of children is within the highest quintile to the north east of Sheffield city centre with the proportion of children across the impact area predominantly being in the third and fourth highest quintile. The main exception to this is within the CAZ C+ cordon which is shown to mostly be in the lowest quintile in terms of the proportion of the population classed as children.

Step 2c: Identification of amenities in the impact area

For the purposes of identifying amenities, there has been a focus on the immediate area within and around the proposed CAZ boundary. The focus of identifying amenities is therefore in Sheffield city centre and inner city, itself an area which attracts large numbers of people from different income groups due to the shops and facilities present. In addition, the location of education amenities (nurseries, schools and other education facilities) used by children have been mapped and are displayed in Figure 11.

Figure 11. **Location of education amenities around and within CAZ boundary**

Legend
• School and Education Amenities

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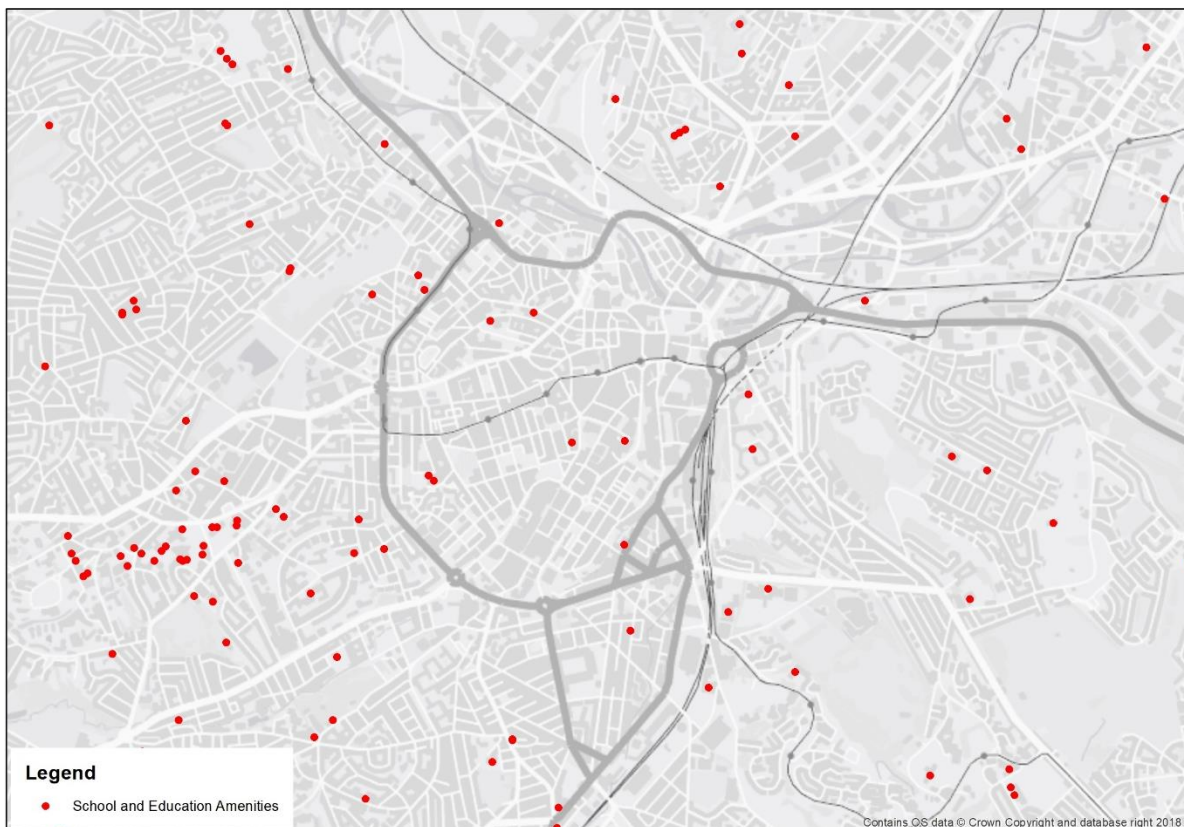
Step 3: Appraisal of impact

Figure 12 displays the forecasted change in NO_x on SRTM3B links as a result of the CAZ C+ scheme with Figure 13 showing the forecasted change in PM_{10}. The income distribution by LSOA across the impact area has been added to estimate in detail the changes in air quality experienced by households in different groups.

The figures show that the majority of model links are forecast to see an improvement in air quality in terms of reduced NO_x and PM_{10} levels with this more evident for NO_x. When considering the change in air quality in relation to the distribution of people on low incomes, a visual high level assessment appears to show a potential relationship between the locations of forecasted worsening air quality and areas where there are higher proportions of people on low incomes. This potential relationship is further assessed in more detail in Table 9 and Table 10 on page(s) 29 and 30.

Figure 12.   Impact of CAZ C+ on NO_x in impact area
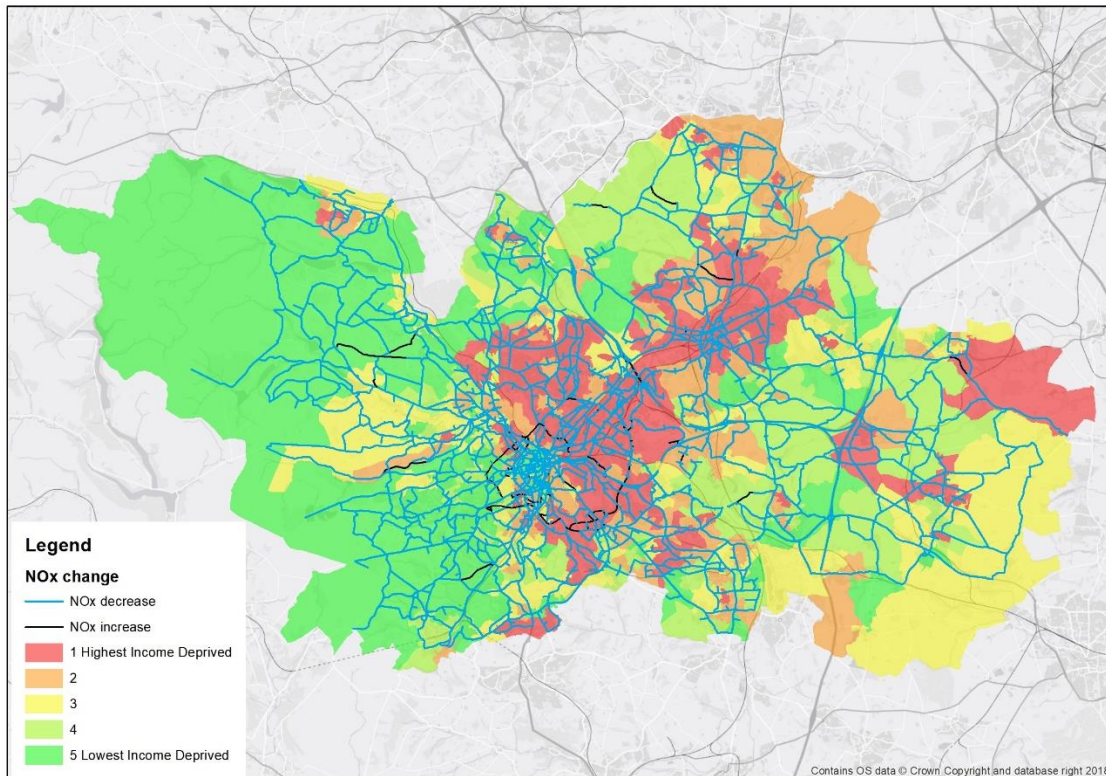
Figure 13. **Impact of CAZ C+ on PM$_{10}$ in impact area**
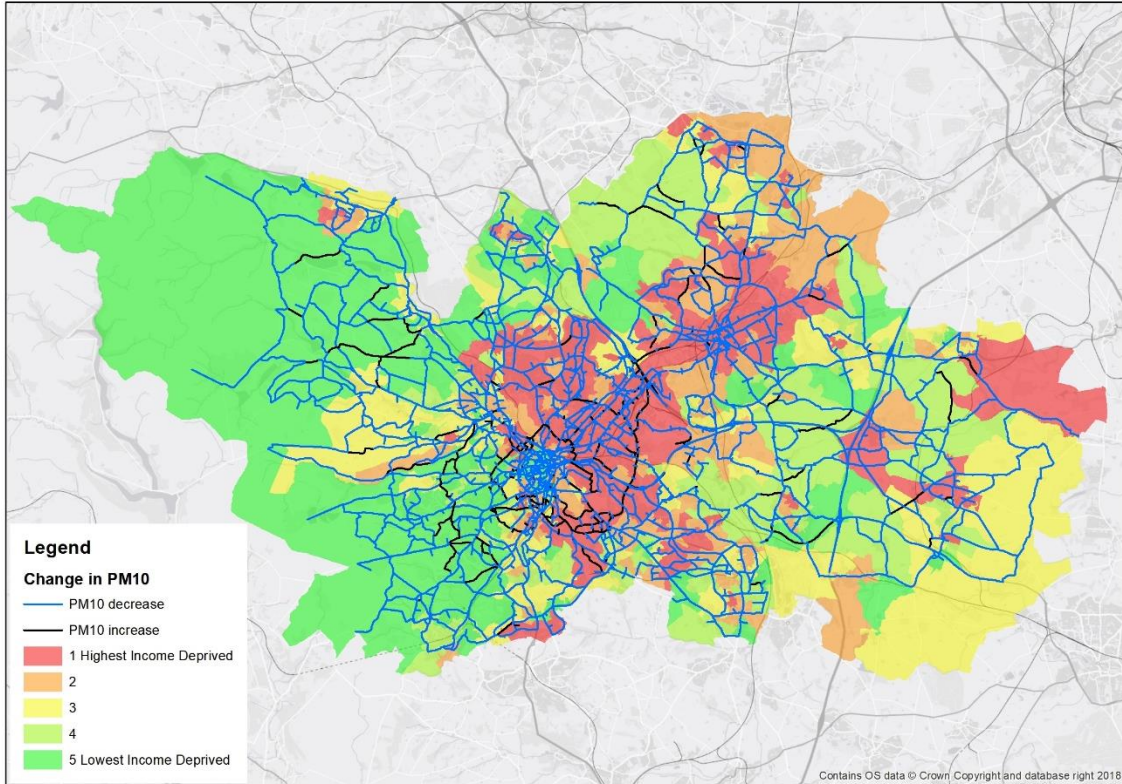
Figure 14 and Figure 15 show the change in NOx and PM10 forecast as a result of the CAZ D option on the SRTM3B model links. Visually, it would appear there are more links forecast to see air quality worsening in the CAZ D option compared to the CAZ C+ option especially for links to the north west and south west of Sheffield city centre in areas in the lowest income deprivation quintile. The quantitative assessment of the CAZ D option is shown below in Table 11 and Table 12 on page(s) 23 and 24 for both air quality measurements.

Figure 14.   Impact of CAZ D on NO$_x$ in impact area
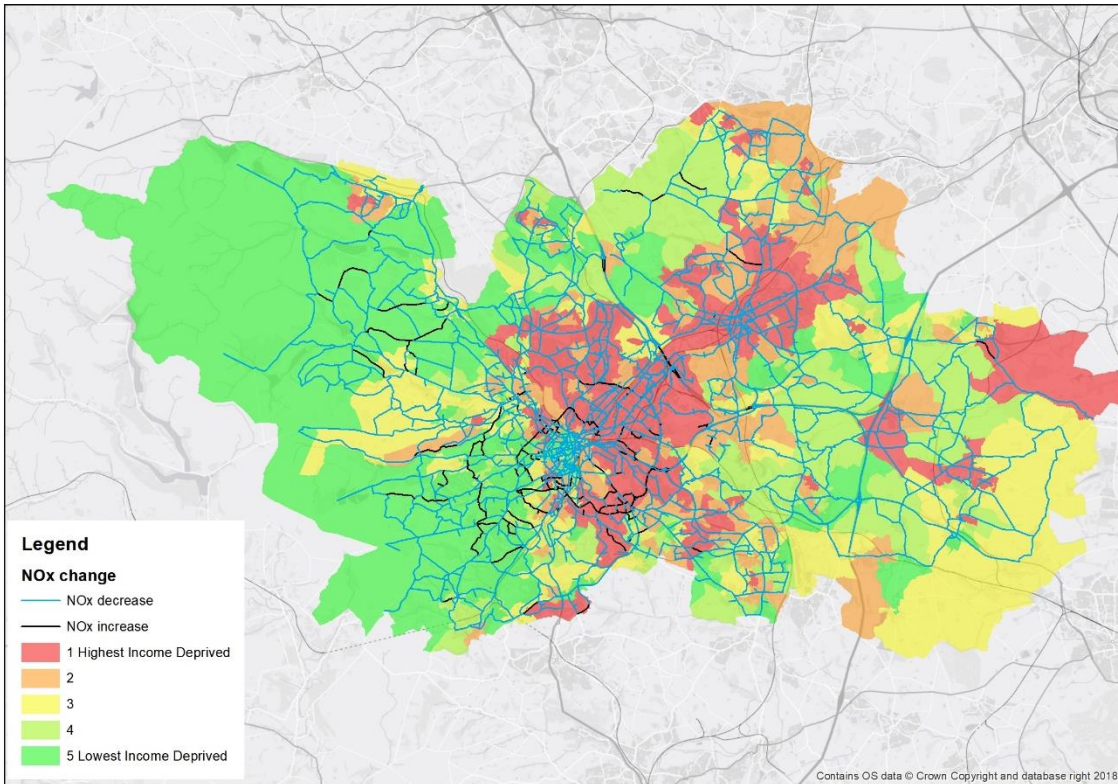
Figure 15.   Impact of CAZ D on PM$_{10}$ in impact area
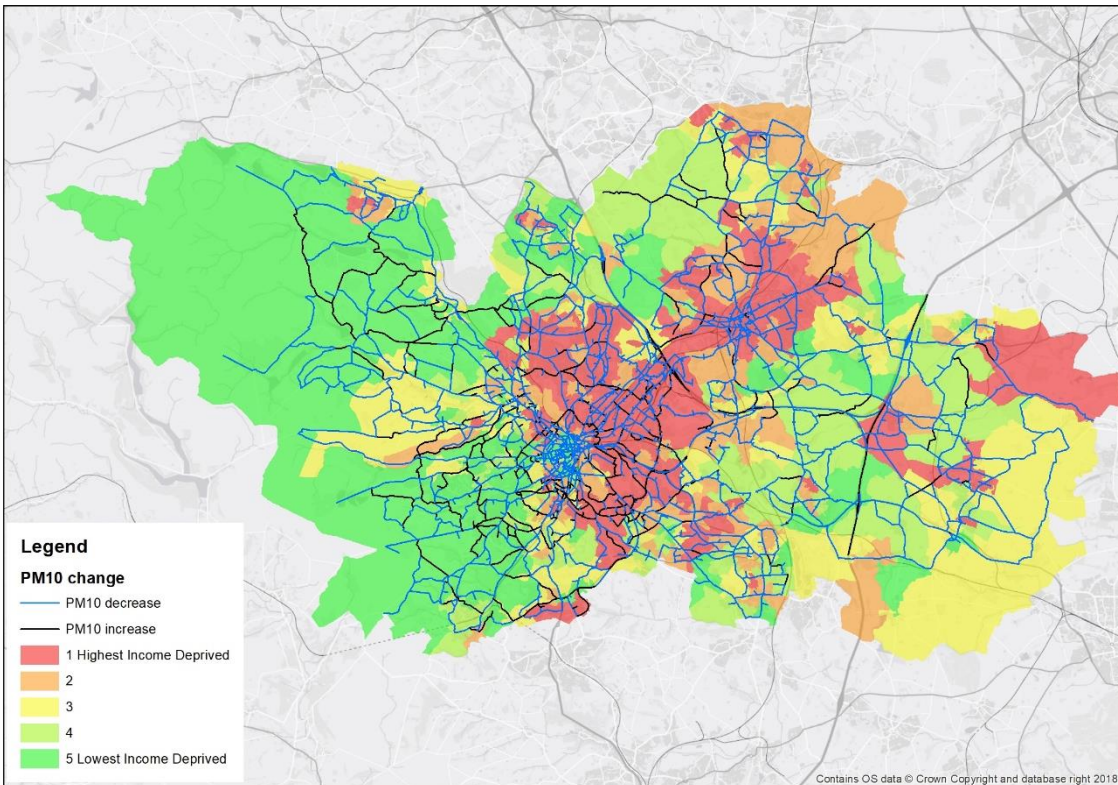
An assessment has also been undertaken to consider the changes in air quality forecast for schools in the area within and around the proposed CAZ boundary. Figure 16 and Figure 17 display the forecast change in NO_x and PM_{10} concentrations within this area for the CAZ C+ option. Overall, it would appear that most schools and education amenities within the area are forecast to see air quality improvements in terms of NO_x and PM_{10}.

Figure 16.   Impact of CAZ C+ on NO$_x$ around and within CAZ boundary
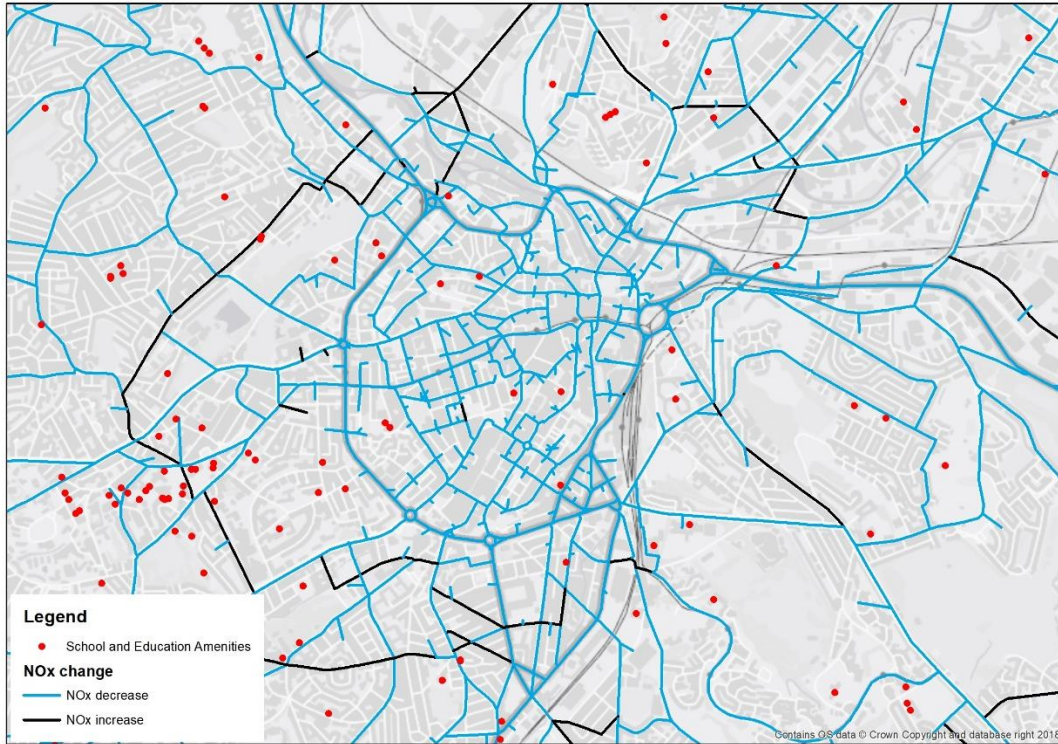
Figure 17. **Impact of CAZ C+ on PM$_{10}$ around and within CAZ boundary**
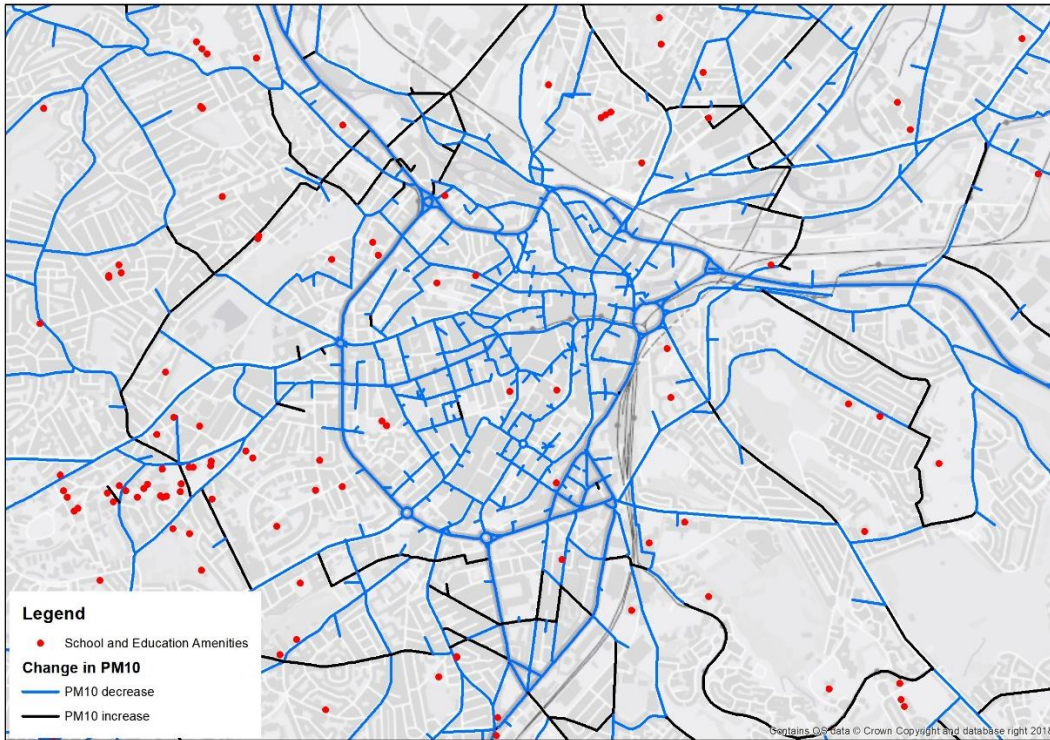
Figure 18 and Figure 19 show the forecast changes in air quality around and within the CAZ boundary for the CAZ D option. Similar to CAZ C+, on the whole it would appear that most schools are forecast to see air quality improvements in the area within and around the CAZ boundary for the CAZ D option.

Figure 18. **Impact of CAZ D on NO$_x$ around and within CAZ boundary**

Figure 19. **Impact of CAZ D on PM$_{10}$ around and within CAZ boundary**
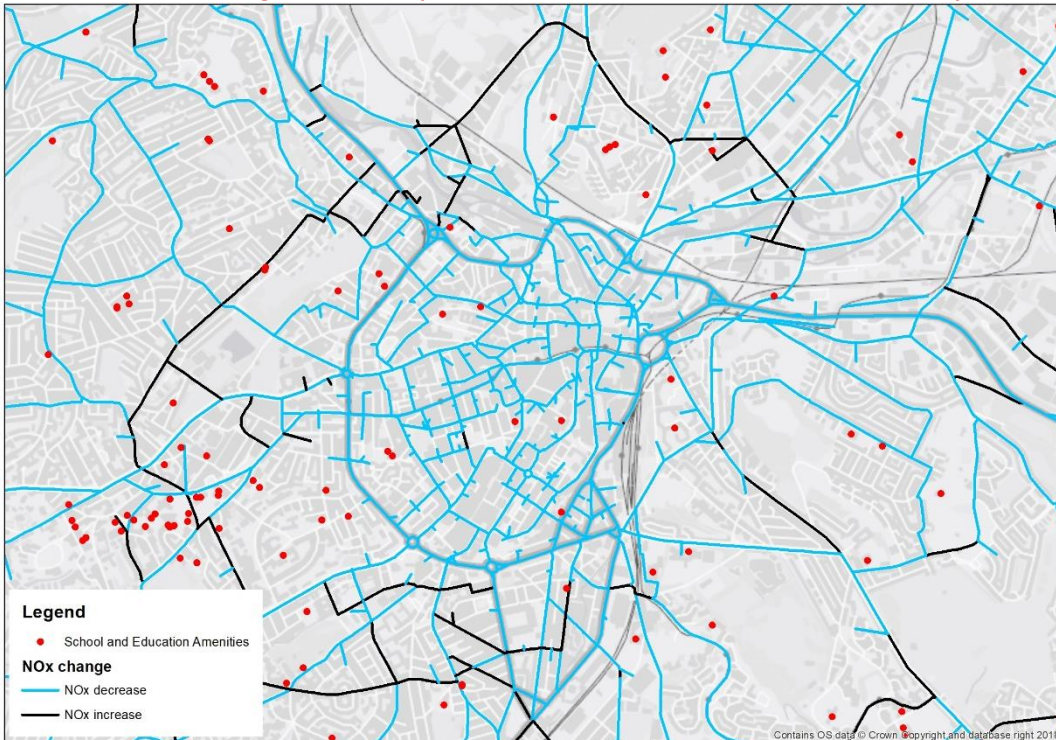
Figure 19. **Impact of CAZ D on PM$_{10}$ around and within CAZ boundary**
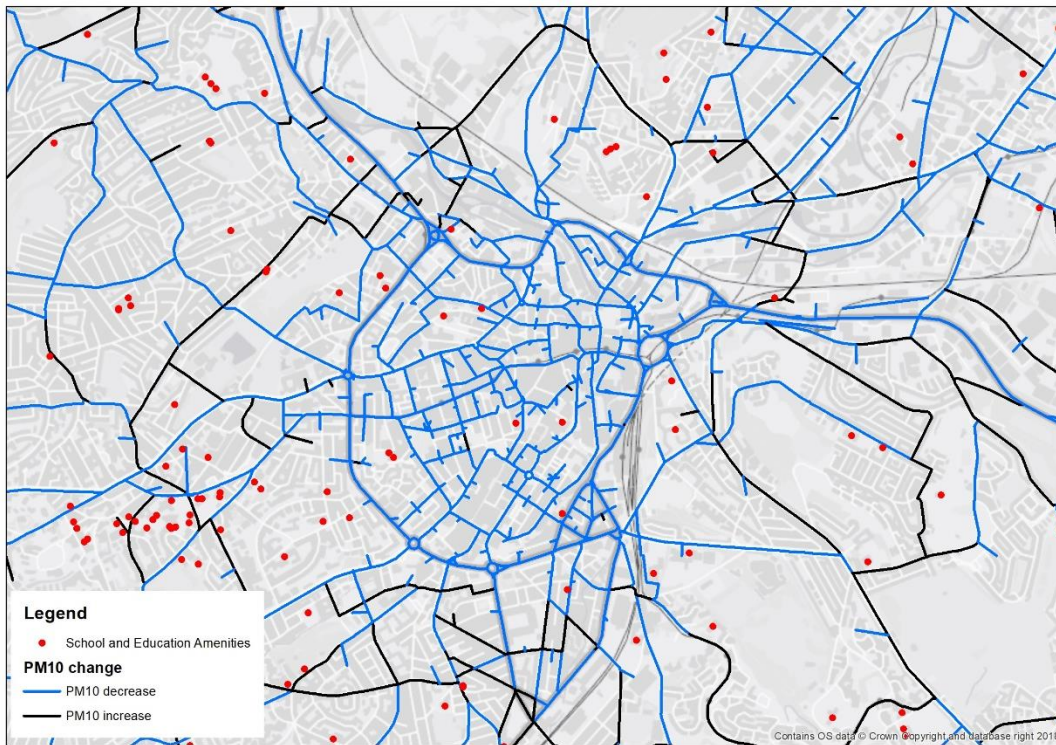
Analysis has also been undertaken to understand the relative numbers of people in the five income groups experiencing improve, deterioration or no change in air quality for each CAZ option.

Table 9 and Table 10 summarise the distributional analysis of air quality (NO$_x$ and PM$_{10}$) in terms of how the benefits will be experienced amongst the income group quintiles in the air quality impact area for CAZ C+.

Table 9. Air quality (NO$_x$) distributional impact analysis for CAZ C+

	INCOME DEPRIVATION					TOTAL
	1st quintile (most deprived)	2nd quintile	3rd quintile	4th quintile	5th quintile (least deprived)	
Number of properties with improved air quality	111,765	67,401	56,594	51,055	70,136	356,951
Number of properties with no change in air quality	2,053	0	1,177	599	0	3,829
Number of properties with worse air quality	3,652	733	0	675	491	5,551
Number of net winners / losers	108,113	66,668	56,594	50,380	69,645	351,400
Net winners / losers as a % of total	31%	19%	16%	14%	20%	100%
Share of total population in impact area	32%	18%	16%	15%	19%	100%
Assessment	✓✓	✓✓	✓✓	✓✓	✓✓	

The NO$_x$ results show that each income groups see a much large number of air quality 'winners' than losers brought about by CAZ C+. It is also noticeable that the benefits for each income group is broadly in line with the proportion of the group in the total population. For instance, 50% of the 'winners' are in the two lowest income quintiles which account for 50% of the impact area's population.

Similar to the NO$_x$ results, the PM$_{10}$ results for CAZ C+ (Table 10), show that the benefits for each income group are broadly in line with the proportion of the group in the total population. The only exception is for the lowest income group where the percentage of 'winners' is 5% less than the proportion of the group in the total population, a difference which according to WebTAG A4.2 can be deemed significant. However, despite this the biggest proportion of improvements are in the lowest income band.

Table 10. Air quality (PM$_{10}$) distributional impact analysis for CAZ C+

	INCOME DEPRIVATION					TOTAL
	1st quintile (most deprived)	2nd quintile	3rd quintile	4th quintile	5th quintile (least deprived)	
Number of properties with improved air quality	100,825	65,105	55,999	50,215	68,773	340,917
Number of properties with no change in air quality	2,053	0	1177	599	0	3,829
Number of properties with worse air quality	14,592	3,029	595	1,515	1,854	21,585
Number of net winners / losers	86,233	62,076	55,404	48,700	66,919	319,332
Net winners / losers as a % of total	27%	19%	17%	15%	21%	100%
Share of total population in impact area	32%	18%	16%	15%	19%	100%
Assessment	✓	✓✓	✓✓	✓✓	✓✓	

The results of the distributional analysis of air quality for CAZ D are presented in Table 11 and Table 12 for NO$_x$ and PM$_{10}$. When comparing CAZ D with CAZ C+, it is noticeable that the number of 'winners' is greater in the CAZ C+ scenario for both air quality measurements by around 17,000 (for NO$_x$) and 53,000 (for PM$_{10}$). The distribution of 'winners' by income group for CAZ D is shown to be broadly similar to that for CAZ C+ the impacts are distributed evenly across the income groups for both air quality measures by either CAZ option.

Table 11. Air quality (NO$_x$) distributional impact analysis for CAZ D

	INCOME DEPRIVATION					TOTAL
	1st quintile (most deprived)	2nd quintile	3rd quintile	4th quintile	5th quintile (least deprived)	
Number of properties with improved air quality	105,627	66,746	56,594	50,215	69,494	348,676
Number of properties with no change in air quality	2,053	0	1,177	599	0	3,829
Number of properties with worse air quality	9,790	1,388	0	1,515	1,133	13,826
Number of net winners / losers	95,837	65,358	56,594	48,700	68,361	334,850
Net winners / losers as a % of total	29%	20%	17%	15%	20%	100%
Share of total population in impact area	32%	18%	16%	15%	19%	100%
Assessment	✓✓	✓✓	✓✓	✓✓	✓✓	

Table 12. Air quality (PM$_{10}$) distributional impact analysis for CAZ D

	INCOME DEPRIVATION					TOTAL
	1st quintile (most deprived)	2nd quintile	3rd quintile	4th quintile	5th quintile (least deprived)	
Number of properties with improved air quality	92,868	62,901	51,547	45,153	62,169	314,638
Number of properties with no change in air quality	2,053	0	1,177	599	0	3829
Number of properties with worse air quality	22,549	5,233	5,047	6,577	8,458	47,864
Number of net winners / losers	70,319	57,668	46,500	38,576	53,711	266,774
Net winners / losers as a % of total	26%	22%	17%	14%	20%	100%
Share of total population in impact area	32%	18%	16%	15%	19%	100%
Assessment	✓	✓✓	✓✓	✓✓	✓✓	

Air quality summary assessment for CAZ C+: Moderate beneficial
Air quality summary assessment for CAZ D: Moderate beneficial

4.4 Distributional Impacts of Accidents

The distributional impact analysis for accidents considers the links where there is a significant change in overall traffic flows, HDV flows, speeds or pedestrian, cyclist and motorcyclist numbers. For the purposes of this appraisal, a 10% change or more on links with vehicle flows of over 1,000 has been considered to be significant when comparing the future Do Minimum and Do Something options.

Step 2a: Confirmation of areas impacted by the scheme
The focus of the air quality appraisal is the impact area as shown in Figure 2.

Step 2b: Identification of social groups in the impact area
The accidents analysis requires groups that are more susceptible to road and traffic accidents to be represented. Therefore, the analysis has considered the location of children and the elderly in relation to the significant changes in traffic/HDV flow and/or speeds as shown in Figure 4 and Figure 5.

The analysis of the distribution of children in the impact area has been previously discussed in Section 4.2.

Similar to the distribution of children, there are only very small pockets of the impact area with a high proportion of their population classed as elderly. The majority of the impact area is in the third and fourth quintile for elderly population with a significant area also within the lowest quintile, including all of the CAZ C+ cordon and the A6109 and A6178 corridors between Sheffield and Rotherham.

The accident analysis should also consider pedestrians, cyclists and motorcyclists, other groups who are more susceptible to road and traffic accidents. These groups are more transient with no dataset available to understand their distribution. However, assumptions can be made in terms of where concentrations of these groups may be found according to the location of amenities/attractors which is discussed in more detail below.

Step 2c: Identification of amenities in the impact area
As mentioned above, assumptions have been made on the locations where there are likely to be concentrations of pedestrians, cyclists and motorcyclists. It has been assumed that there are concentrations in the district centres of Rotherham and Sheffield which therefore includes the CAZ cordon area. There has therefore been a focus on understanding the proposed change in traffic flows within the cordon area when qualitatively assessing the impact of the options on accidents.

Step 3: Appraisal of impact
The figure below shows the difference in flows between the Do Minimum and CAZ C+ option in terms of increases or decreases in flow on SRTM3B model links. In total, the traffic flow comparison shows that 1603km of the SRTM3B model highway network is forecast to see a decrease in flow as a result of CAZ C+ whilst 1096km of the network is forecast to see an increase. The model results show the majority of the Rotherham district is expected to see a decrease in flows brought about by CAZ C+, especially on the A630 which continues into Sheffield on the A630 Sheffield Parkway. Sheffield is forecast to see increases on a significant number of links, but it is noticeable that within the CAZ cordon, the majority of links are forecast to see a decrease as highlighted in the top left of the figure.

Figure 20.   CAZ C+ and DM traffic flow comparison

Legend
- ── No change
- ── CAZ C+ Flow over 1000 less than DM
- ── CAZ C+ Flow 1-1000 less than DM
- ── CAZ C+ Flow 1-1000 more than DM
- ── CAZ C+ Flow over 1000 more than DM

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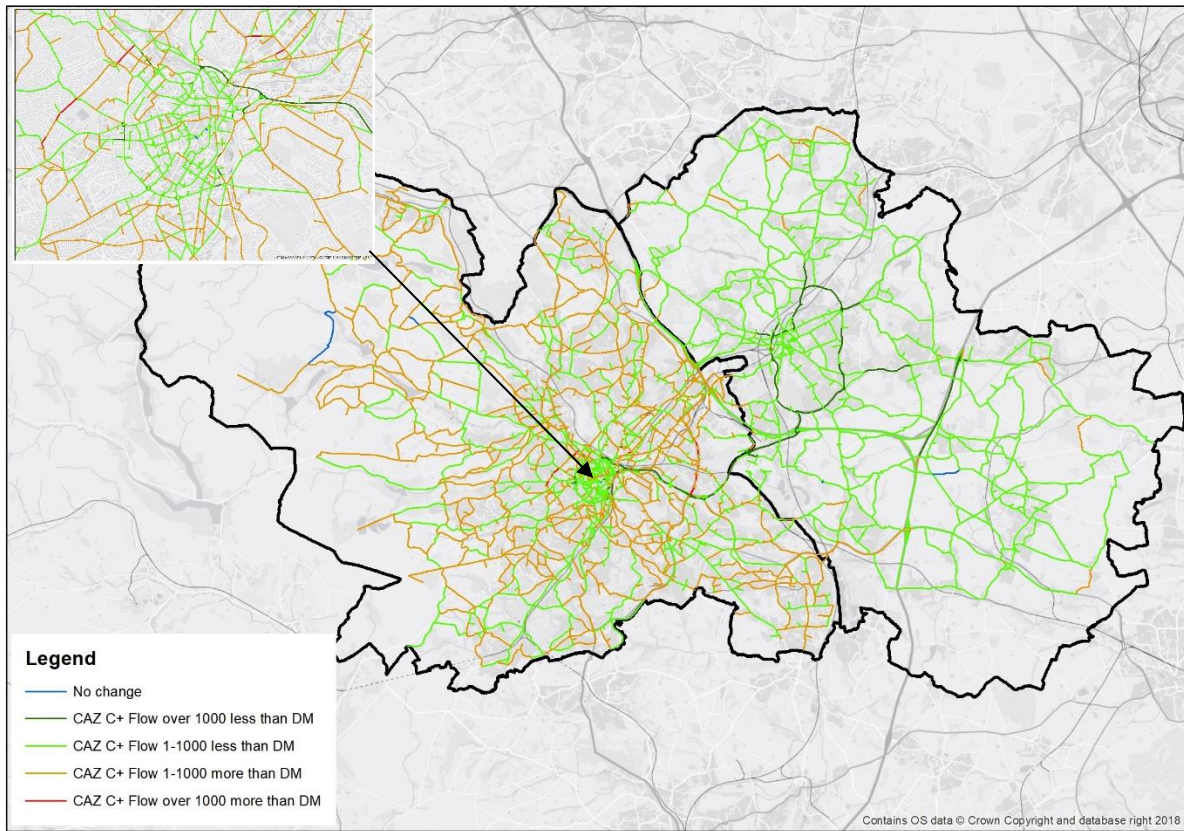
Figure 21 shows the difference in flow between the Do Minimum and CAZ D option in terms of increases or decreases in flow on links. In total, the traffic flow comparison shows that 1369km of the SRTM3B model highway network is forecast to see a decrease in flow as a result of CAZ D whilst 1322km of the network is forecast to see an increase. It is noticeable that a large decrease in flows in forecast on the Sheffield Inner Ring Road with it appearing that this traffic is being redirected onto links just outside of the CAZ boundary due to a reduction in traffic entering the CAZ.

Figure 21.   CAZ D and DM traffic flow comparison
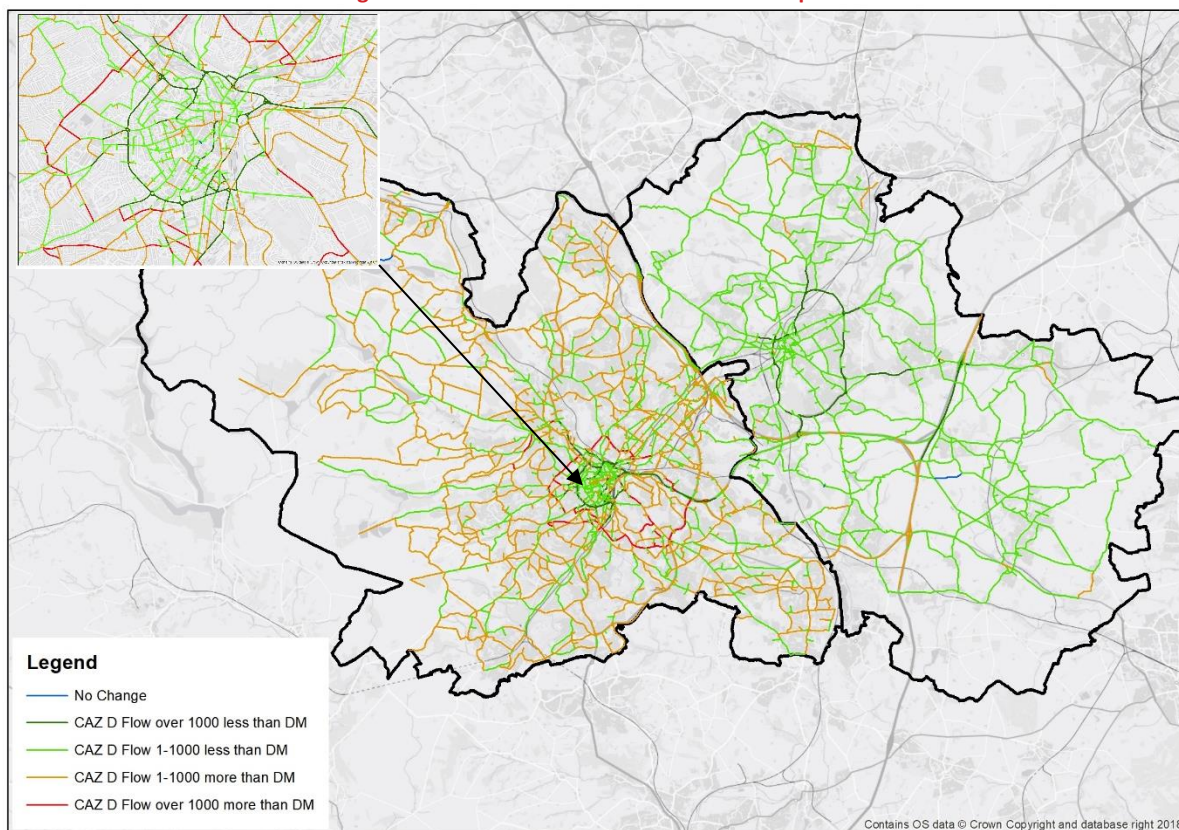
It would therefore appear that both CAZ C+ and CAZ D are redistributing traffic away from roads where there is a higher concentration of pedestrians and cyclists such as Sheffield city centre and Rotherham town centre onto other roads. This suggests that both options may have a benefit in terms of accident reduction without more detail accident analysis being undertaken.

Accident summary assessment for CAZ C+: Moderate beneficial
Accident summary assessment for CAZ D: Moderate beneficial

4.5   Distributional Impacts of Accessibility

Step 2a: Confirmation of areas impacted by the scheme

Accessibility assessment within a distributional impact appraisal focuses on public transport accessibility in terms of accessing employment, services and social networks. Discussion with both Sheffield and Rotherham Councils has taken place to understand any potential changes to bus services within the impact area for both options. The only location in which any alterations to bus services in Sheffield or Rotherham are proposed for both options is Rawmarsh in Rotherham with half of buses re-routing to use Barbers Avenue instead of Rawmarsh Hill (A633).

Figure 22 shows the extent of the re-routing scheme (and original bus route) with the impact area of the scheme being assumed to be 400m around the scheme, an identified walking catchment distance for a bus stop as outlined in WebTAG A4.2.

Figure 22.   Accessibility impact area
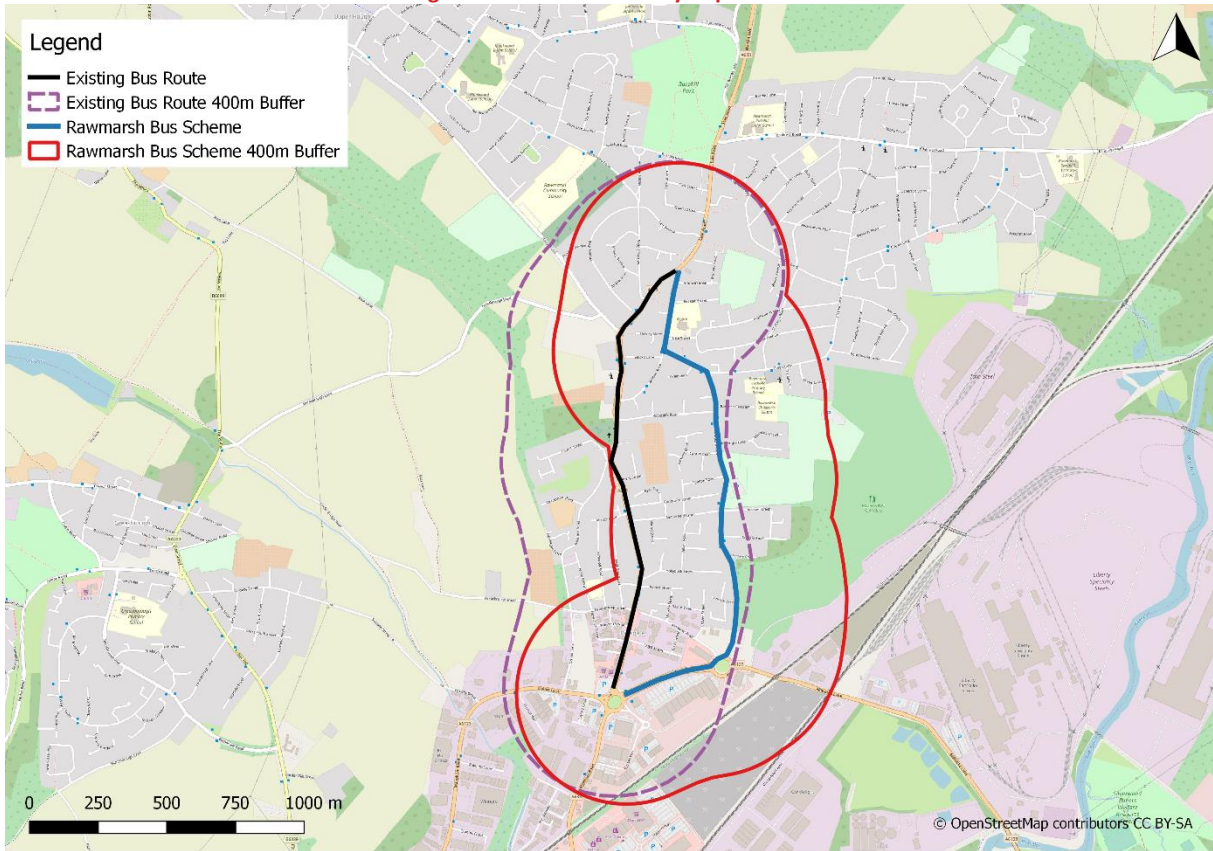
Step 2b: Identification of social groups in the impact area

The accessibility assessment should consider the social groups of: people on low incomes; children; the elderly; women; people with disability; and black and minority ethnic groups. Each of these maps have been previously produced for the Sheffield and Rotherham impact area (see Figure 3 to Figure 10), but to see in more detail the proportion of these social groups in the bus scheme's impact area, more detailed maps have been produced. These maps can be found in Sub Appendix B.

A comparison of the social groups within the bus routing scheme buffer and the original bus route buffer has been undertaken to understand the impact on social groups of rerouting the buses. Table 13 summarises the potential impact of the scheme by social group.

Table 13. Impact of bus rerouting scheme on social groups

SOCIAL GROUP	QUALITATIVE SUMMARY	EXPECTED IMPACT
Income deprivation	Income deprivation is predominantly in the highest quintile for both accessibility areas so the new route is unlikely to have any impact for those people on low incomes.	No impact
Children	The distribution of under 16s within both accessibility areas is more or less the same with the proportions being in the third and fourth highest quintiles.	No impact
Elderly	The distribution of over 65s is more or less the same within both accessibility areas with the proportions being in the lowest two quintiles.	No impact
Disability	A large proportion of the current bus route's accessibility area includes a population in the highest quintile of people with a disability. The new bus route's accessibility area also includes some of his population, but the shift eastwards mean less of this population is picked up compared to the current bus route. Instead a population with the second highest quintile in terms of people with a disability falls within the new accessibility area.	Slight adverse
Sex	Both areas contain very similar distributions of females, the proportions being in the highest two quintiles.	No impact
Ethnicity	The accessibility area for both bus routes are within an area which has a low non-white population.	No impact

As shown in the table, the rerouting of some buses will have a very minimal impact on social groups, a likely result due to the minor rerouting of the buses along a parallel road to the A633.

Step 2c: Identification of amenities in the impact area

The key destinations/amenities served by the current bus route have been identified to understand the potential impact of the bus rerouting scheme[2]. Figure 23 displays the amenities within the current and new bus route accessibility impact area. This shows that all of the amenities are located within the overlap area of the two accessibility impact areas suggesting that the accessibility of services will not be impacted by the bus rerouting scheme.

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[2] The amenities included in the analysis are those for which RMBC provided information on. A desktop review showed that there were several supermarkets and convenience stores located within the area covered by both accessibility impact areas.

Figure 23.   Amenities within accessibility impact area
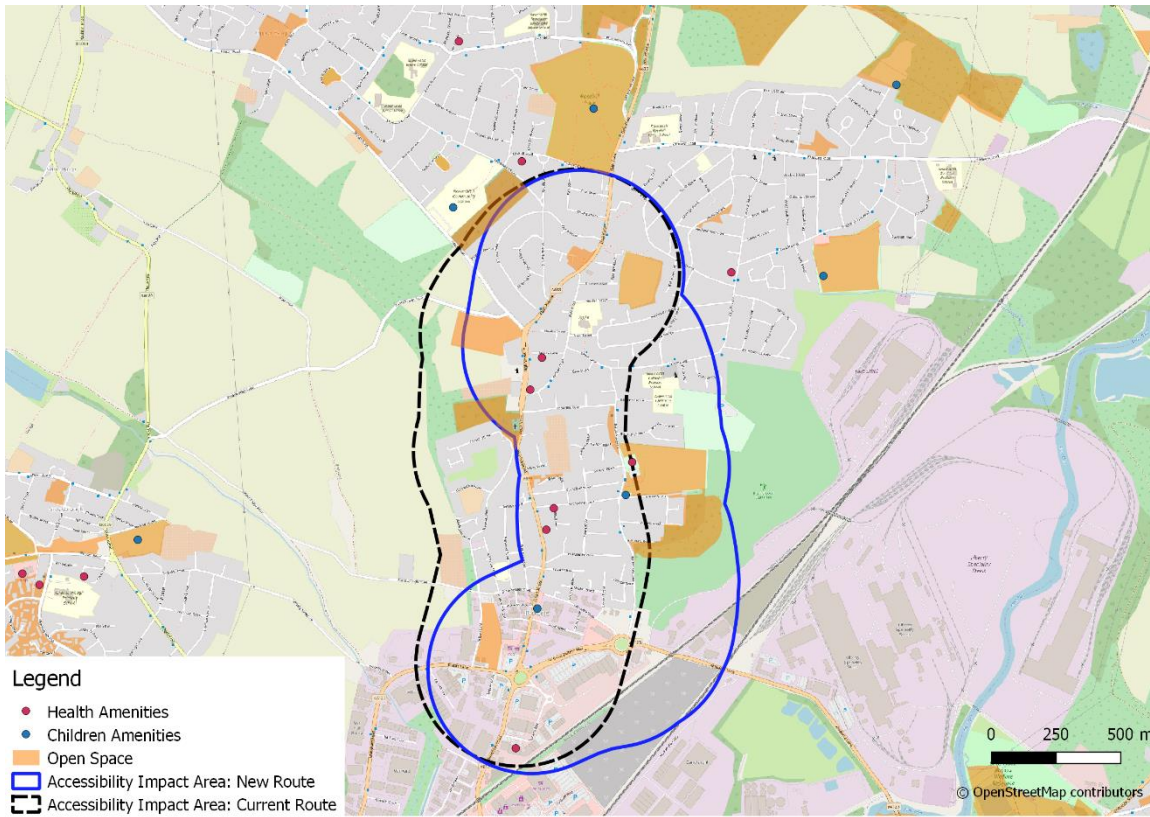
Step 3: Appraisal of impact

A desktop accessibility audit has been undertaken to consider how the bus rerouting scheme will impact on the public transport experience through various elements as identified in WebTAG A4.2. Table 14 qualitatively summarises the impact of the scheme on the identified end-to-end journey elements.

Table 14. Accessibility audit summary

ELEMENT OF END-TO-END JOURNEY	IMPACT OF BUS REROUTING SCHEME
Pre-journey info.	Will be affected due to the need to inform passengers of the route of the bus and where it will be allowing boarding/alighting.
Info. at transport stop	Will be affected due to the need to update the information to inform passengers of the destination of buses they can board at the stop.
Seating & protection	No impact.
Ability to board vehicle from kerb	All bus stops on the new route will be upgraded to accommodate tactile paving and kerbside boarding/alighting.
Ticket purchase and welcome from driver	No impact.
Ability to navigate inside vehicle	No impact.
Comfort of journey	No impact.
Information given during journey	No impact.
Ability to alight vehicle direct to kerb	All bus stops on the new route will be upgraded to accommodate tactile paving and kerbside boarding/alighting.
Movement within interchanges	No impact.

Accessibility summary assessment: Neutral

4.6 Distributional Impacts of Affordability

The introduction of charging within the CAZ would be likely to have a direct impact on the affordability of travel for some users.

As the principles are similar to the derivation of transport user benefits and transport user changes, elements of the affordability assessment can be captured as an output from TUBA. The appraisal has therefore considered the same impact area and social groups as those for the user benefits in Section 4.1.

Step 2a: Confirmation of areas impacted by the scheme
As mentioned, the impact area is the same as for the user benefits and is therefore displayed in Figure 2.

Step 2b: Identification of social groups in the impact area
As mentioned, the focus of affordability considers the same social groups as the user benefits – income deprivation. The analysis of the distribution of the income deprivation across the impact area has been previously discussed in Section 4.1.

Step 2c: Identification of amenities in the impact area
Guidance in WebTAG A4.2 states that the identification of amenities within the affordability distributional impact appraisal is not required due to the appraisal focusing on the impact across income deprivation quintiles and the impact area being too large to warrant identification of local attractors.

Step 3: Appraisal of impact

The distributional analysis of affordability for CAZ C+ and CAZ D has been appraised in terms of how the benefits will be experienced amongst the income deprivation quintiles, businesses and LGV locations in the affordability impact area.

The affordability benefits were calculated using TUBA software as outlined in section 4.2. For the purpose of this analysis, the following benefits were aggregated to determine the total affordability benefit:

- Tolls;
- Fuel vehicle operating costs; and
- Non-fuel vehicle operating costs

Table 15 to 0 summarise the distributional analysis of affordability for CAZ C+. The benefits have been distributed in terms of income deprivation for 'commute and other' trips and number of businesses / LGVs for business trips.

Table 15. Affordability distributional impact analysis for CAZ C+ (commute and other trips)

	INCOME DEPRIVATION (£M)					TOTAL
	1st quintile (most deprived)	2nd quintile	3rd quintile	4th quintile	5th quintile (least deprived)	
Total benefits	£17,761	£10,719	£4,915	£20,934	£6,041	£60,369
Total disbenefits	-£902,567	-£1,591,844	-£585,198	-£750,567	-£2,849,355	-£6,679,530
Number of people with improved affordability	9,467	13,369	3,115	8,545	4,371	38,867
Number of people with reduced affordability	251,006	132,664	125,580	110,734	149,657	769,641
Number of net 'winners'	-241,539	-119,295	-122,465	-102,189	-145,286	-730,774
Net 'losers' in each area as % of total	33%	16%	17%	14%	20%	100%
Share of total population in impact area	32%	18%	16%	15%	19%	100%
Assessment	××	××	××	××	××	

The results shown in the table above indicate that the majority of users undertaking a 'commute' or 'other' trip in the CAZ C+ scenario experience a affordability disbenefit. The results indicates that the distribution of 'losers' across income quintiles is broadly in line with the proportion of each group in the total population and does not disproportionally effect the lowest income groups.

The table below shows the distribution of affordability benefits across quintiles representing the number of businesses in an area. The number of net 'winners'/'losers' in this case represents the number of businesses within each area that experiences a benefit or disbenefit respectively.

Table 16. Affordability distributional impact analysis for CAZ C+ (business trips)

	NUMBER OF BUSINESSES					TOTAL
	1st quintile (most businesses)	2nd quintile	3rd quintile	4th quintile	5th quintile (least businesses)	
Total benefits	£1,049	£-	£-	£-	£-	£1,049
Total disbenefits	-£34,627,202	-£5,761,952	-£1,842,153	-£2,193,793	-£2,662,999	-£47,088,098
Number of people with improved affordability	12	-	-	-	-	12
Number of people with reduced affordability	12,133	6,670	4,507	2,800	2,140	28,250
Number of net 'winners'	-12,120	-6,670	-4,507	-2,800	-2,140	-28,238
Net 'losers' in each area as % of total	43%	24%	16%	10%	8%	100%
Share of total population in impact area	43%	24%	16%	10%	8%	100%
Assessment	××	××	××	××	××	

The results indicate that the majority of businesses are located within areas that experience a disbenefit as a result of the CAZ C+ scheme. The spread of these disbenefits, in terms of the number of businesses located in an area experiencing a disbenefit, is broadly in line with the spread of businesses across the impact area.

Table 17 shows the distribution of user benefits for CAZ C+ based on the number of LGVs in an LSOA. The number of net 'winners' or 'losers' in this case represents the number of LGVs located in each LSOA that experience a benefit or disbenefit respectively.

Table 17. Affordability distributional impact analysis for CAZ C+ (business trips)

	NUMBER OF LGVS					TOTAL
	1st quintile (most LGVs)	2nd quintile	3rd quintile	4th quintile	5th quintile (least LGVs)	
Total benefits	£-	£-	£1,049	£-	£-	£1,049
Total disbenefits	-£19,333,174	-£2,840,783	-£8,407,160	-£3,987,747	-£12,519,235	-£47,088,098
Number of LGVs with improved affordability	-	-	42	-	-	42
Number of LGVs with reduced affordability	15,707	5,805	4,678	3,583	2,358	32,131
Number of net 'winners'	-15,707	-5,805	-4,636	-3,583	-2,358	-32,089
Net 'losers' in each area as % of total	49%	18%	14%	11%	7%	100%
Share of total LGVs in impact area	49%	18%	15%	11%	7%	100%
Assessment	××	××	××	××	××	

Again, the table above shows that the majority of users undertaking business trips experience a disbenefit as a result of the CAZ C+ scheme. The spread of disbenefits, in terms of the net number of 'losers' (LGVs located in impact areas that experience disbenefits), is broadly in line with the spread of LGVs across the impact area.

0 to 0 presents the results of the distributional analysis of affordability benefits for the CAZ D scenario.

Table 18. Affordability distributional impact analysis for CAZ D (commute and other trips)

	INCOME DEPRIVATION (£M)					TOTAL
	1st quintile (most deprived)	2nd quintile	3rd quintile	4th quintile	5th quintile (least deprived)	
Total benefits	£-	£-	£-	£-	£-	£-
Total disbenefits	-£10,423,946	-£13,766,320	-£6,500,517	-£10,139,174	-£24,549,981	-£65,379,937
Number of people with improved affordability	-	-	-	-	-	-
Number of people with reduced affordability	260,473	146,033	128,695	119,279	154,028	808,508
Number of net 'winners'	-260,473	-146,033	-128,695	-119,279	-154,028	-808,508
Net 'losers' in each area as % of total	32%	18%	16%	15%	19%	100%
Share of total population in impact area	32%	18%	16%	15%	19%	100%
Assessment	✗✗	✗✗	✗✗	✗✗	✗✗	

The table above indicates that the majority of users undertaking 'commute' and 'other' trips experience disbenefits as a result of the scheme. The distribution of these disbenefits in terms of the number of net 'losers' is broadly in line with the proportion of each income group in the total population.

The table below shows the distribution of affordability benefits across quintiles representing the number of businesses in an area.

Table 19. Affordability distributional impact analysis for CAZ D (business trips)

	NUMBER OF BUSINESSES					TOTAL
	1st quintile (most businesses)	2nd quintile	3rd quintile	4th quintile	5th quintile (least businesses)	
Total benefits	£-	£-	£-	£-	£-	£-
Total disbenefits	-£46,496,576	-£8,635,145	-£3,092,530	-£3,973,171	-£4,027,087	-£66,224,509
Number of businesses with improved affordability	-	-	-	-	-	-
Number of businesses with reduced affordability	12,145	6,670	4,507	2,800	2,140	28,262
Number of net 'winners'	-12,145	-6,670	-4,507	-2,800	-2,140	-28,262
Net 'losers' in each area as % of total	43%	24%	16%	10%	8%	100%
Share of total businesses in impact area	43%	24%	16%	10%	8%	100%
Assessment	✕✕	✕✕	✕✕	✕✕	✕✕	

The table above indicates that the majority of users undertaking a 'business' trip will experience a disbenefit as a result of the CAZ D scheme. The spread of these benefits, in terms of the number of businesses located in an area which experiences a disbenefit, is in line with the spread of businesses across the impact area.

Table 20 shows the distribution of user benefits for CAZ D based on the number of LGVs in an LSOA.

Table 20. Affordability distributional impact analysis for CAZ D (business trips)

	NUMBER OF LGVS					TOTAL
	1st quintile (most LGVs)	2nd quintile	3rd quintile	4th quintile	5th quintile (least LGVs)	
Total benefits	£-	£-	£-	£-	£-	£-
Total disbenefits	-£25,723,370	-£4,284,732	-£11,601,608	-£6,067,556	-£18,547,244	-£66,224,509
Number of LGVs with improved affordability	-	-	-	-	-	-
Number of LGVs with reduced affordability	15,707	5,805	4,720	3,583	2,358	32,173
Number of net 'winners'	-15,707	-5,805	-4,720	-3,583	-2,358	-32,173
Net 'losers' in each area as % of total	49%	18%	15%	11%	7%	100%
Share of total LGVs in impact area	49%	18%	15%	11%	7%	100%
Assessment	××	××	××	××	××	

Similar to CAZ C+. the CAZ D results show that the majority of users undertaking a 'business' trip will experience a dis-benefit. The spread of benefits, in terms of the net number of 'losers' (LGVs registered in impact areas which experience a net disbenefit), is in line with the spread of LGVs across Sheffield and Rotherham.

Affordability summary assessment for CAZ C+: Moderate Adverse
Affordability summary assessment for CAZ D: Moderate Adverse

5.   CONCLUSION

This document has outlined the distributional impact appraisal that has been undertaken for the Sheffield and Rotherham CAZ options (CAZ C+ and CAZ D). The appraisal has followed guidance provided by JAQU and in WebTAG A4.2. The first stage involved a screening exercise which determined which of the 8 distributional impact indicators were to be assessed further for the CAZ scheme. The second stage involved confirming the impact area for each indicator that progressed and identifying the social groups and amenities within the impact area. The third and final stage quantitatively and qualitatively appraised the impact of the both options on the different social and business groups considered to understand the 'winners and losers' of the options.

Table 21 summarises the assessment score which has been assigned to each distributional impact for both options.

Table 21. Summary assessment scores for both CAZ options

	CAZ C+	CAZ D
User benefits: Commute / Other	Moderate beneficial	Moderate adverse
User benefits: Business	Moderate adverse	Moderate adverse
Air quality	Moderate beneficial	Moderate beneficial
Accidents	Moderate beneficial	Moderate beneficial
Accessibility	Neutral	Neutral
Affordability: Commute / Other	Moderate adverse	Moderate adverse
Affordability: Business	Moderate adverse	Moderate adverse

SUB APPENDIX A: DI SCREENING PROFORMA

Distributional Impact Appraisal Screening Proforma

Scheme description: Sheffield CAZ

Indicator	(a) Appraisal output criteria	(b) Potential impact (yes / no, positive/negative if known)	(c) Qualitative Comments	(d) Proceed to Step 2
User benefits	The 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, expected to be negative.	Both options are likely to result in an increase in user charges for vehicles which are not CAZ-compliant.	Yes
Noise	Any change in alignment of transport corridor or any links with significant changes (>25% or <-20%) in vehicle flow, speed or %HDV content. Also note comment in TAG Unit A3.	Expected to be marginal in extent.	Both options will result in the redistribution of traffic. It is considered unlikely that the level of redistribution will be above the specification outlined in the appraisal output criteria column.	No
Air quality	Any change in alignment of transport corridor or any links with significant changes in vehicle flow, speed or %HDV content: • Change in 24 hour AADT of 1000 vehicles or more • Change in 24 hour 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, expected to be positive.	Both options will result in the redistribution of traffic. This might be at a scale which may potentially result in significant changes on transport corridors.	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.	Subject to screening criteria	Both options will involve the redistribution of traffic which is likely to have an impact on accidents.	If yes, a qualitative assessment is to be made as no COBALT assessmsent will be run
Security	Any change in public transport waiting/interchange facilities including pedestrian access expected to affect user perceptions of personal security.	No impacts	Both options expected to have no impact on security.	No
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.	No impacts	Both options expected to have no impact on severance.	No
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, localised impacts in Rawmarsh.	Bus routing alterations in Rawmarsh are proposed as part of both options with buses using Barbers Avenue.	Qualitative assessment.
Affordability	In cases where the following charges would occur; Parking charges (including where changes in the allocation of free or reduced fee spaces may occur); Car fuel and non-fuel operating costs (where, for example, rerouting or changes in journey speeds and congestion occur resulting in changes in costs); Road user charges (including discounts and exemptions for different groups of travellers); Public transport fare changes (where, for example premium fares are set on new or existing modes or where multi-modal discounted travel tickets become available due to new ticketing technologies); or Public transport concession availability (where, for example concession arrangements vary as a result of a move in service provision from bus to light rail or heavy rail, where such concession entitlement is not maintained by the local authority[1]).	Yes, expected to be negative.	CAZ D option may negatively impact on low income households who are unable to afford new vehicles which are CAZ-compliant. People with reduced mobility (disabled) may also be negatively impacted if their vehicle is not compliant because of the more limited transport choices available to this group.	Yes

SUB APPENDIX B: RAWMARSH BUS REROUTING SCHEME SOCIAL GROUP MAPS

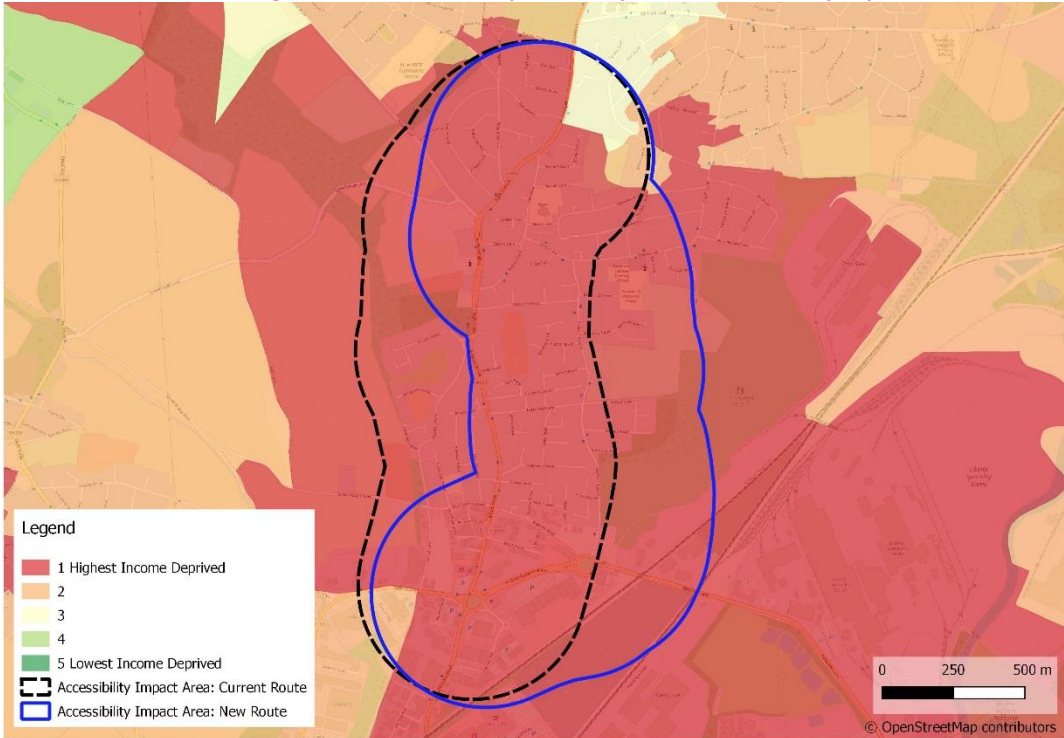**Figure 24.**   **Income deprivation by LSOA in accessibility impact area**

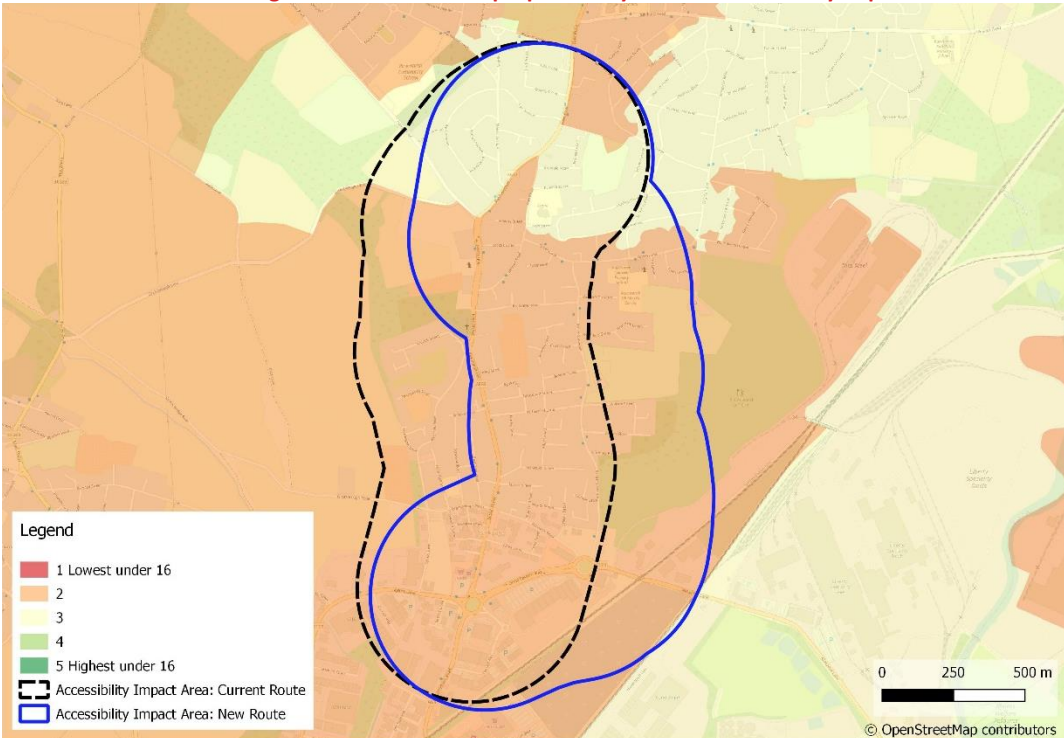**Figure 25.**   **Children proportion by LSOA in accessibility impact area**

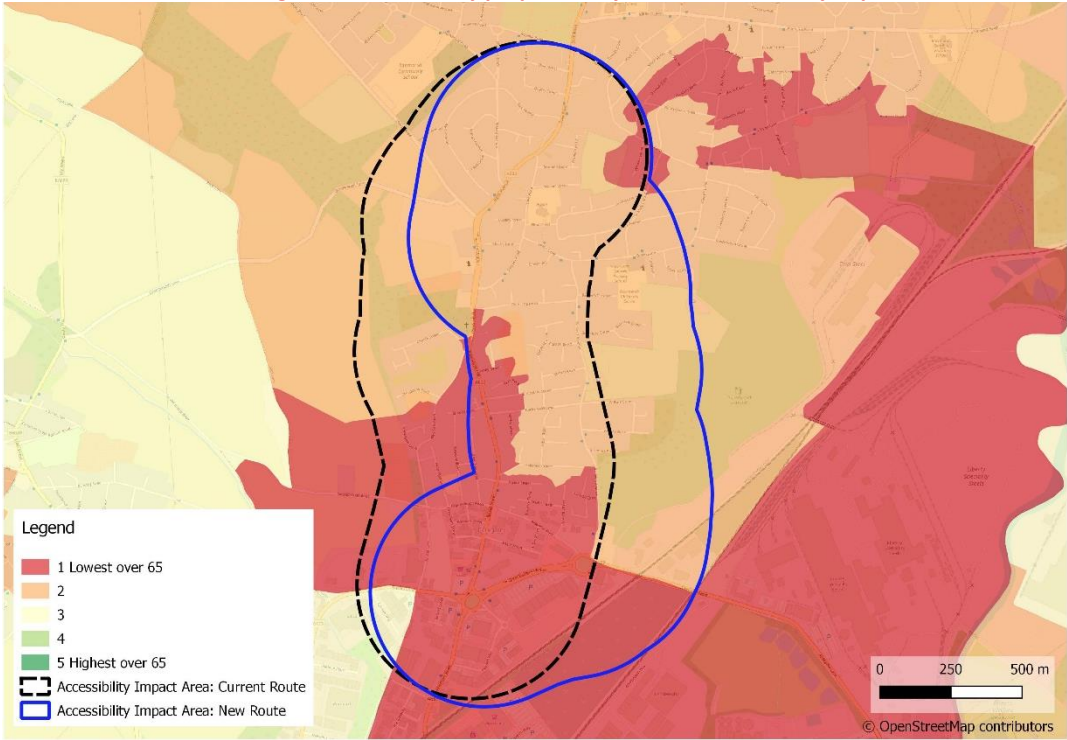**Figure 26.** **Elderly proportion by LSOA in accessibility impact area**

Legend

- 1 Lowest over 65
- 2
- 3
- 4
- 5 Highest over 65
- Accessibility Impact Area: Current Route
- Accessibility Impact Area: New Route

0   250   500 m

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Figure 27. **Female proportion by LSOA in accessibility impact area**

Legend

- 1 Lowest female (%)
- 2
- 3
- 4
- 5 Highest female (%)
- Accessibility Impact Area: Current Route
- Accessibility Impact Area: New Route

0   250   500 m

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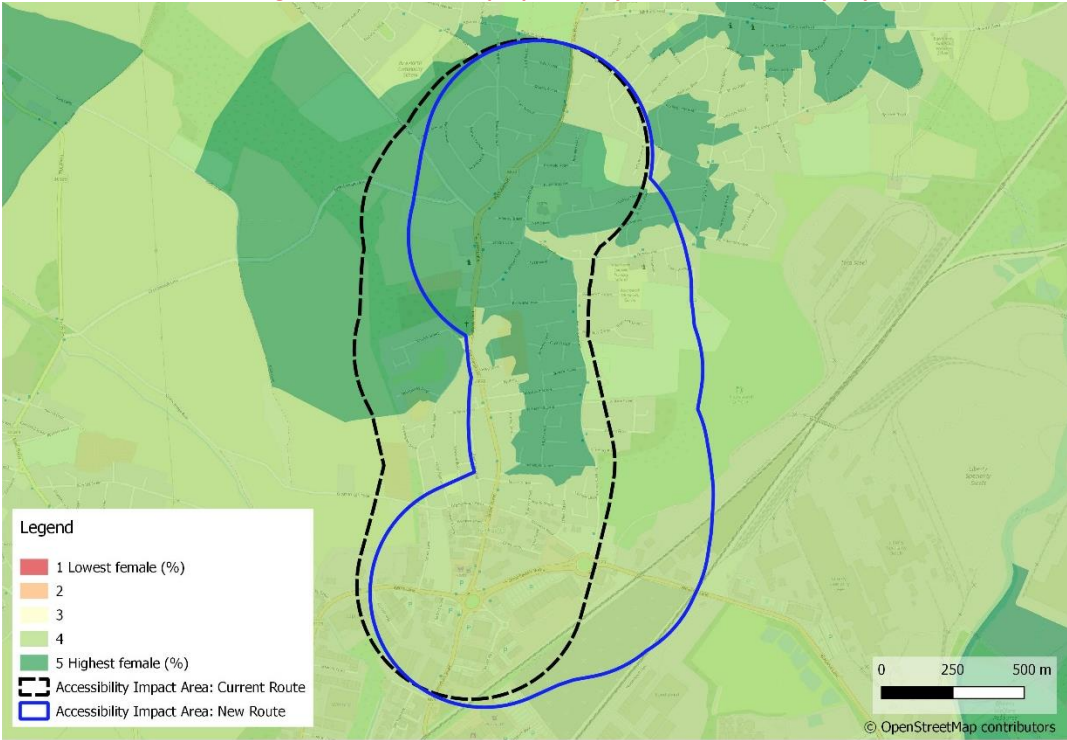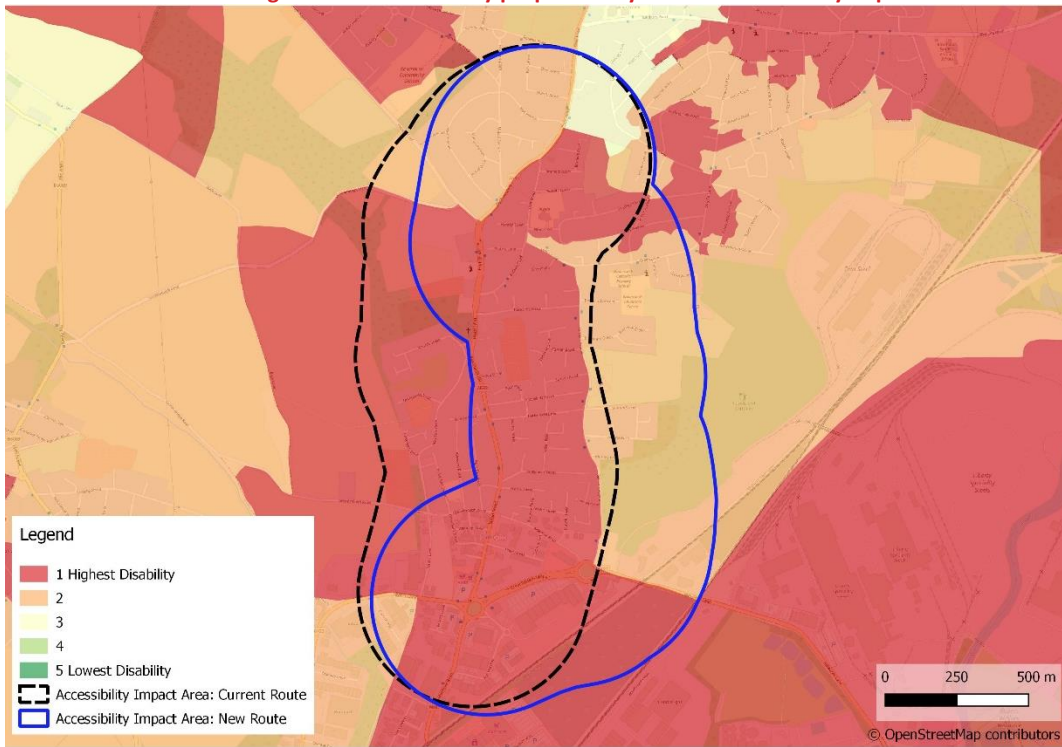**Figure 28.** **Disability proportion by LSOA in accessibility impact area**

Figure 29. **Ethnicity by LSOA in accessibility impact area**