

Sheffield & Rotherham Clean Air Zone Feasibility Study Supporting Document 12: Distributional Impact Appraisal April 2022

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Section 1 Introduction

1.1 Overview

1.1.1 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. The purpose of this report is to set out the Distributional Impact Appraisal methodology and results to inform the FBC; it will be included as an appendix to the FBC submission.

1.2 Context

1.2.1 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.

1.2.2 The UK has been in breach of the legal limit for nitrogen dioxide (NO₂) 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 NO₂ in 2017 exceeded the legal limit of 40µg/m³, in some places by as much as 30%.

1.2.3 Evidence from local air quality monitoring and traffic data in Sheffield and Rotherham demonstrates that there are multiple places in the area where NO₂ emissions currently breach the legal limit and it is expected this will continue for the foreseeable future. Specifically, the Sheffield NO₂ problem is:

- Road-based – 50% of Sheffield's NO₂ 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, 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 NO₂ emissions from road transport; and
- Predominantly focused on the city centre – whilst there are multiple sites across the city where NO₂ emissions breach the legal limit of 40µg per m³, 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.

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

- 1.2.5** 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 a specific area in a vehicle that does not meet a specific minimum standard – broadly this means diesel vehicles that are older than Euro VI/ 6 (around 2016) or petrol vehicles that are older than Euro 4 (around 2006).
- 1.2.6** 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.

1.3 The Preferred Option

- 1.3.1** The proposed preferred option is for a CAZ which covers the Sheffield and Rotherham local authority districts (shown in the figure below) and will ensure compliance with air quality limits across the entirety of the two districts. This CAZ will be formed of several measures including a charging CAZ in Sheffield City Centre.

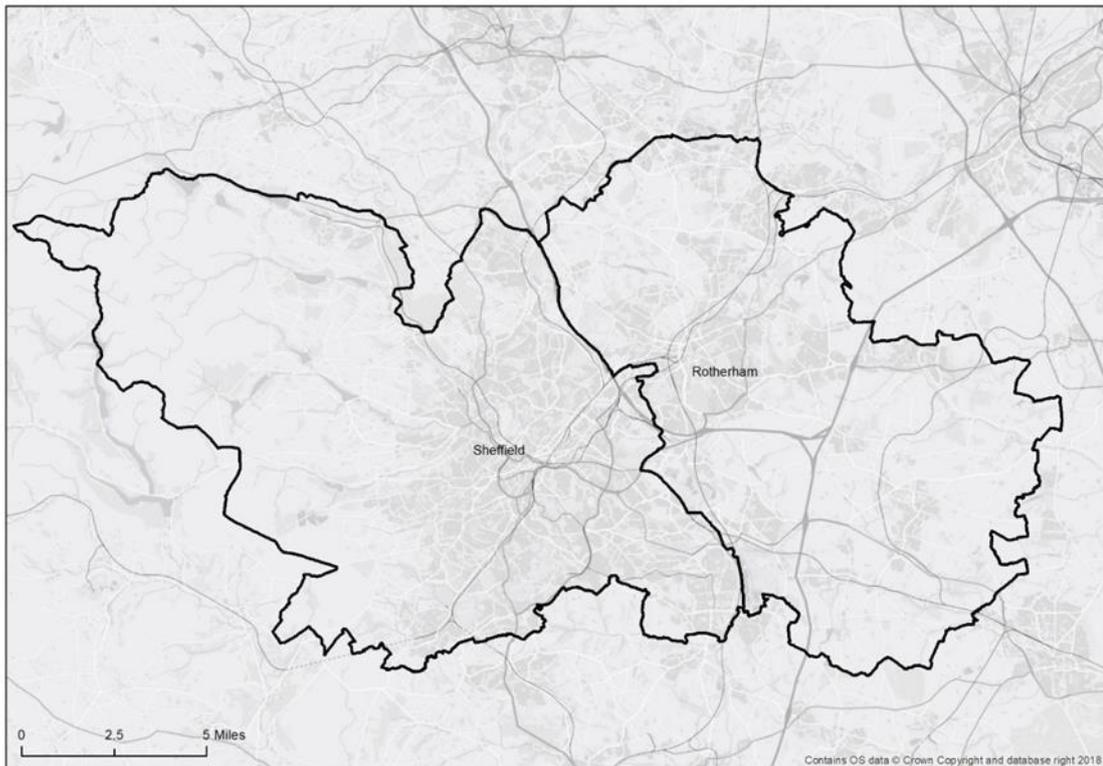


Figure 1. Sheffield and Rotherham Clean Air Zone

- 1.3.2** The Sheffield charging CAZ will cover the area bounded by the inner ring road, including the inner ring road itself. The proposed charging 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 2022. The table

below summarises the compliance levels and charges for the vehicles which would be impacted by the preferred option.

Table 1. Compliance levels and charges for the preferred option		
Vehicle Type	Compliance Level Required	Non-Compliant Vehicle Charge
Hackney Carriage	Euro 6 diesel, EV or LPG retrofit	£10/day
Private Hire Vehicle	Euro 4 petrol, Euro 6 diesel or EV	£10/day
Van/Light Goods Vehicle	Euro 4 petrol, Euro 6 diesel or EV	£10/day
Heavy Goods Vehicle	Euro VI diesel	£50/day
Bus/Coach	Euro VI diesel	£50/day

1.3.3 The extent of proposed charging area is shown in Figure 2 below.

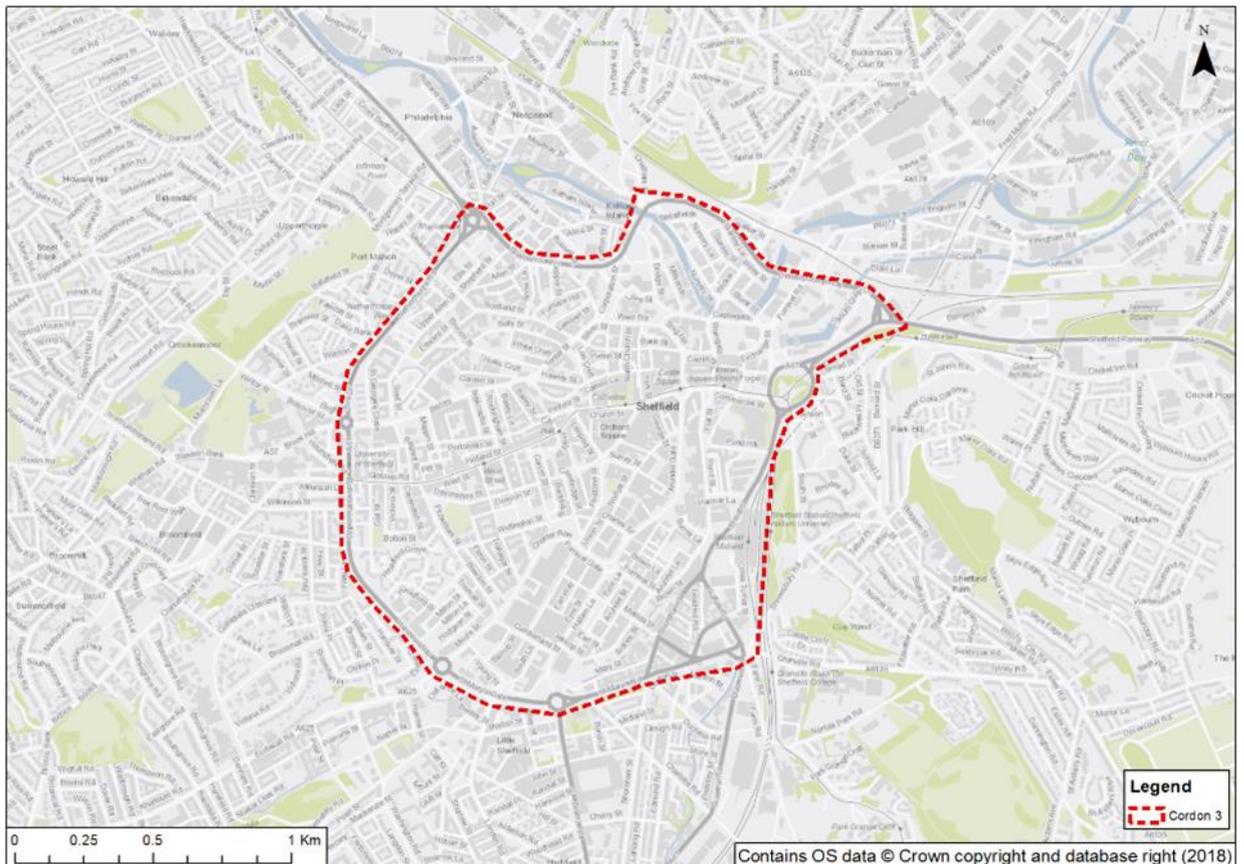


Figure 2. Preferred Option Charging Area

1.3.4 Within the preferred option a charging zone is not required in Rotherham, instead several schemes have been proposed for RMBC as listed below:

- Reduction of speed limit to 50 mph on the Rotherham section of the Parkway, associated with proposals to increase the capacity of the Parkway;
- Improvements to the Rotherham bus and taxi fleets;

- Proposal to re-route some buses from the A633 Rawmarsh Hill to Barbers Avenue with improvements to Dale Road and Barbers Avenue to support this measure;
- Proposals to improve traffic flow on the A630 Fitzwilliam Road; and
- Restrictions on HGVs on the northbound carriageway of the A629 Wortley Road/Upper Wortley Road, in Kimberworth and Thorpe Hesley.

1.3.5 Hereafter, the preferred option will be referred to as CAZ C.

1.4 Report Background and Purpose

1.4.1 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.

1.4.2 The impacts considered are:

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

1.4.3 This distributional impact appraisal has been undertaken in line with guidance outlined in the Joint Air Quality Unit’s (JAQU) Option Appraisal guidance and TAG 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 TAG criteria as shown below in Table 2.

Table 2. 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 (XX)
Adverse and the population impacted is significantly greater than the proportion of the group in the total population	Large adverse (XXX)

- 1.4.4** 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.

1.5 Social and Equality Impacts

- 1.5.1** The standard TAG approach to Distributional Impact Appraisal considers the impacts a scheme would have on the following:
- Transport users;
 - People living within the impact area; and
 - People travelling within the impact area.

- 1.5.2** The TAG approach considers the characteristics of the people listed above in terms of socio-demographic indicators such as age, gender, disability or deprivation and aims to determine whether certain social groups would be disproportionately impacted by a scheme.

1.6 Business Impacts

- 1.6.1** In addition to the analysis of social groups briefly described above, the JAQU Options Appraisal Guidance requires distributional analysis to be undertaken to understand the impact a CAZ scheme would have on micro, small and medium businesses. This analysis of businesses is not part of the standard DI appraisal process and TAG unit A4.2 paragraph 2.1.4 states 'it is not appropriate to conduct DI analysis of business journeys, because these impacts are experienced by businesses and not individuals'.

- 1.6.2** However, it is known that the charging CAZ scheme would have an impact on businesses as charges would be imposed directly to businesses (for example to non-compliant taxis, buses, LGVs and HGVs entering the cordon). Therefore, the DI analysis has been adapted to quantify the impacts of the scheme on businesses where possible. However, instead of considering the distribution of social groups, this analysis will consider the distribution of business indicators such as number of businesses or LGVs located within an LSOA.

- 1.6.3** The main impacts on these businesses will be:

- Buses and taxis – For these businesses they will operate in the charging zone on a daily basis and will therefore be frequently exposed to the charge. These businesses often are operating on relatively low margins; and
- LGV and HGV – Several businesses with these fleets operate from within the charging zone and / or regularly use routes within the charging zone in particularly the IRR and so will therefore be subject to regular charging if they cannot upgrade.

1.7 Health Impacts

- 1.7.1** The scheme's aim is to improve the health of the citizens. The health impact looks at monetising the health benefits with changes in NOx and PM2.5 and the distribution across household income.

1.8 Report Structure

- 1.8.1** Section 2 of this report outlines the methodology for undertaking distributional impact appraisal and focuses on steps 1 and 2 of the process (screening and identification of social groups / amenities within the impact area).
- 1.8.2** Section 3 of this report considers the local context of Sheffield and Rotherham. It presents the results of stage 2 of the distributional impact appraisal (identification of social groups / amenities within the impact area) and how these users may be impacted by a CAZ charge.
- 1.8.3** Section 4 reports the findings of stage 3 of the Distributional Impact Appraisal in relation to social and equality impacts and considers the overall impact the CAZ C scheme would have on each of the impact criteria.
- 1.8.4** Section 5 reports the findings of stage 3 of the Distributional Impact Appraisal in terms of business impacts.
- 1.8.5** Section 6 reports the health impacts of the preferred option.
- 1.8.6** Finally, section 7 summarises the overall results of the Distributional Impact assessment.

Section 2 Methodology

2.1 Approach

2.1.1 The approach set out in TAG Unit A4.2 *Distributional Impact Appraisal* has been followed. This is a three stage process comprised of:

- 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.

2.1.2 The assessments have also been carried out in line with the JAQU Option Appraisal Guidance, which has been prepared specifically for CAZ schemes.

2.2 Screening

2.2.1 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

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

2.2.3 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.

2.3 Steps 2 and 3 Overview

2.3.1 The approaches taken forward to step 2 (identification of impact area) and step 3 (appraisal of impacts) for the above distributional impacts are given in the following

sections. Although there is a separate method to assessing each distributional impact there are common themes which are considered throughout.

Identification of impact area

- 2.3.2** Step 2 first 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).
- 2.3.3** The impact area has been developed to economically appraise the two options. The extent of the impact area for the distributional impact appraisal is shown in Figure 3. 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).

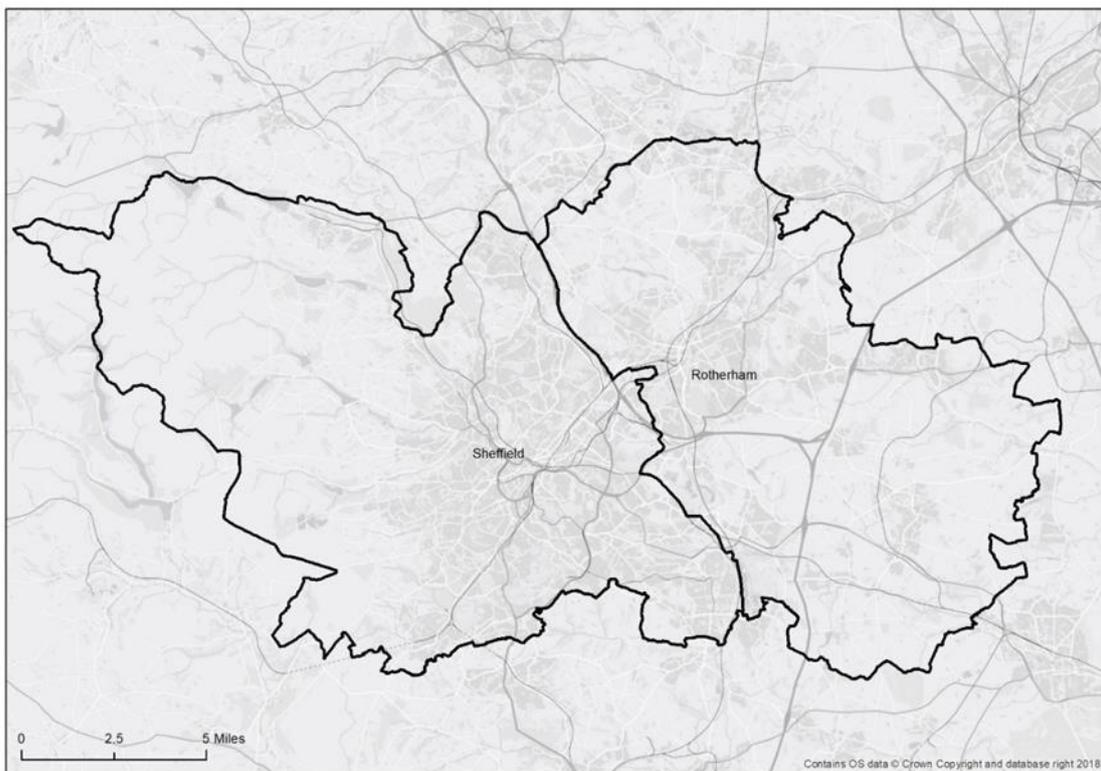


Figure 3. Defined distributional impact area

Identification of social groups

- 2.3.4** The second part of step 2 involves analysis of the characteristics of people in the impact area likely to be affected by the scheme. The groups analysed as part of each distributional impact are summarised below. These are in line with Table 2 of *TAG Unit A4.2 Distributional Impact Appraisal*.

Table 3. 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			✓		

2.3.5 These characteristics have been mapped, and described in more detail, in section 3 which covers the local characteristics of Sheffield and Rotherham.

2.3.6 The following sections present more detailed methodology for the appraisal of the variables which have been progressed to step 2.

2.4 Method of Appraisal for User Benefits

2.4.1 Based on guidance given in TAG Unit A4.2 a quantitative appraisal of the distributional impacts of user benefits has been undertaken. The impact area considered is the Sheffield and Rotherham districts as shown in Figure 3. The areas of the SCRTM1 model outside of Sheffield and Rotherham have been deemed as an external sector.

2.4.2 To assess the distributional impacts of user benefits monetised outputs from the TUBA model have been assigned to LSOAs. Outputs were extracted from TUBA for geographical zones which could be assigned to LSOAs. Once the benefits and disbenefits had been assigned to LSOAs these were compared to the distribution of social groups in the impact area at LSOA level. The TAG approach to analysis of user benefits involves comparing income deprivation distribution to the distribution of user benefits. In addition to this the JAQU approach, given in the Options Appraisal Guidance, requires an understanding of how these benefits are distributed in comparison to the distribution of LGVs and businesses to understand the business impacts of the scheme.

2.4.3 The distribution of these three groups: income deprivation, LGVs and businesses, are presented in the local context section of this document.

2.4.4 The following results were aggregated from the TUBA outputs to determine the impacts on user benefits:

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

2.4.5 Analysis of amenities within the impact area has not been conducted for user benefits as TAG Unit A4.2 states that this 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.

2.5 Method of Appraisal for Affordability

2.5.1 The introduction of charging within the CAZ would be likely to have a direct impact on the affordability of travel for some users. Therefore, a quantitative assessment of personal affordability has been undertaken following guidance in TAG Unit A4.2. 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.

2.5.2 The following results were aggregated from the TUBA outputs to determine the impacts on personal affordability:

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

2.5.3 As with user benefits, guidance in TAG Unit 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.

2.6 Method of Appraisal for Accidents

2.6.1 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.

2.6.2 As with all of the other distributional impacts, the focus of the appraisal is the impact area shown in Figure 3.

2.6.3 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.

2.6.4 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. It has been assumed that there are concentrations in the district centres of Rotherham and Sheffield which therefore includes the charging 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.

2.7 Method of Appraisal for Air Quality

2.7.1 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 PM10. This requires assigning each affected link to an LSOA to calculate the number of properties¹ affected by any air quality changes. As with the above distributional impacts, the focus of the air quality appraisal is the impact area as shown in Figure 3.

2.7.2 The focus of the air quality assessment is on the distribution of income deprivation and children, as per table 6 of the *Options Appraisal Package*.

2.7.3 For the purposes of identifying amenities, there has been a focus on the immediate area within and around the proposed charging 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.

2.7.4 As the air quality assessment predominantly relates to health impacts, the impact on businesses has not been considered.

2.8 Method of Appraisal for Accessibility

2.8.1 Unlike the other distributional impacts which are more likely to be spread throughout the Clean Air Zone, the distributional impacts of accessibility are likely to be limited to a specific area surrounding one scheme.

2.8.2 TAG Unit A4.2 provides guidance on undertaking an accessibility appraisal. This guidance 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 in direct response to air quality requirements of the clean air zone for both options is Rawmarsh in Rotherham with half of buses re-routing to use Barbers Avenue instead of Rawmarsh Hill (A633). It should be noted that the bus re-routing on Pinstone Street has been developed as part of the business case for the Connecting Sheffield City Centre Transforming Cities Funded (TCF) Scheme and the equalities impact assessment and economic case have been developed within the TCF business case for that scheme.

2.8.3 Figure 3 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 TAG A4.2.

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

2.8.4 The impacts of accessibility on business has not been considered.

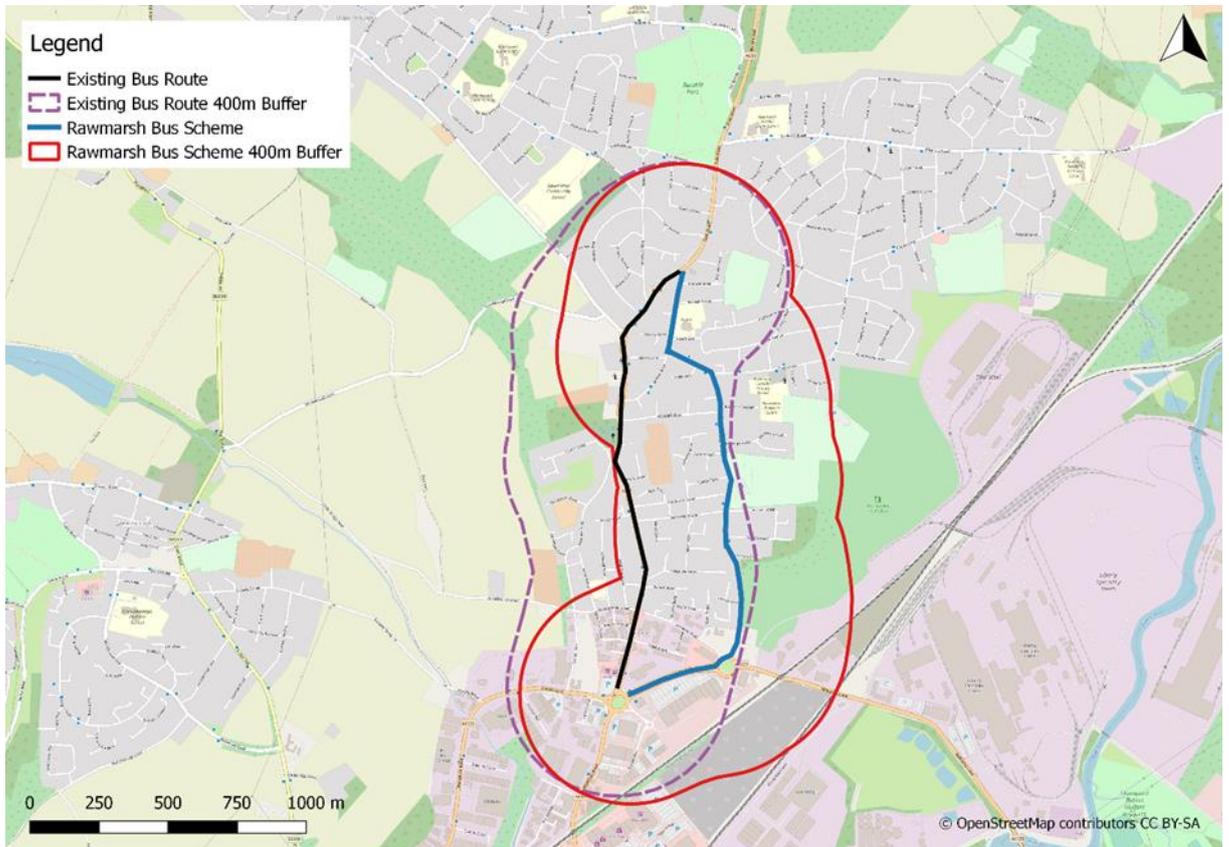


Figure 4. Accessibility Impact Area

2.8.5 The detailed consideration of social groups and amenities impacted by this scheme are discussed in section 4.

2.9 Health Impact Methodology

2.9.1 It is recommended by Defra (2004) that a full impact pathway analysis is conducted when air quality impacts are valued at more than £50m using damage costs, or when air quality is the main objective of the proposal. The main objective of the CAZ is to reduce the health impacts.

2.9.2 The health impact analysis for the air quality indicator has focused on the change in NO_x and PM_{2.5} emissions from vehicle traffic as calculated from the tail-pipe emissions on a link to link bases. The links have been assigned to an LSOA to calculate the number of households affected by the changes in emissions. As with the distributional impacts, the focus of the health impact is the impact area as shown in Figure 3.

2.9.3 The change in emissions has been costed using values from DEFRA.

Table 4. Damage Costs per Tonne of Emissions (2017 prices)		
Pollutant Pathway	NO _x	PM _{2.5}
NO ₂ Chronic Mortality	£2,223	0

NO ₂ Asthma (Small Children)	£1,958	0
NO ₂ Asthma (Older Children)	£580	0
PM2.5 Chronic Mortality	£593	£40,238
PM2.5 Productivity	£52	£3,515
PM2.5 CHD	£417	£28,282
PM2.5 Stroke	£157	£10,642
PM2.5 Asthma (Children)	£309	£20,959
Other Pollutants	£-90	£2,200
Total Health Impact	£6,199	£105,836

2.10 Consultation

2.10.1 Public consultation on the Outline Business Case (OBC) Preferred Option was undertaken between 1st July and 26th August 2019. Three different online consultation questionnaires were created to target three audiences: citizens, taxi drivers and businesses. The onset and impact of COVID-19 in March 2020 prompted a review of the CAZ proposals and a repeat of the consultation exercise with two different online consultation questionnaires created to target citizens and businesses (including the taxi trade). The consultation was undertaken between 22nd November 2021 until 17th December 2021. Some of the results from both of these consultations have been used to supplement the local context information and inform the appraisal.

Section 3 Context

3.1 Introduction

3.1.1 This section reports step 2 of the appraisal process. It provides an assessment of the context of the impact area that could be impacted by the CAZ in terms of social groups and amenities present within the impact areas. This section also presents the relevant business context in Sheffield and Rotherham.

3.2 Population

Population Size

3.2.2 The latest available population estimates from Nomis (2019) estimate that the Sheffield and Rotherham local authority districts have a combined population of 850,264.

Low income household

3.2.3 Figure 5 shows the distribution of income deprivation in the impact area using LSOA data, according to the 2015 English Indices for Deprivation. JAQU and TAG 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.

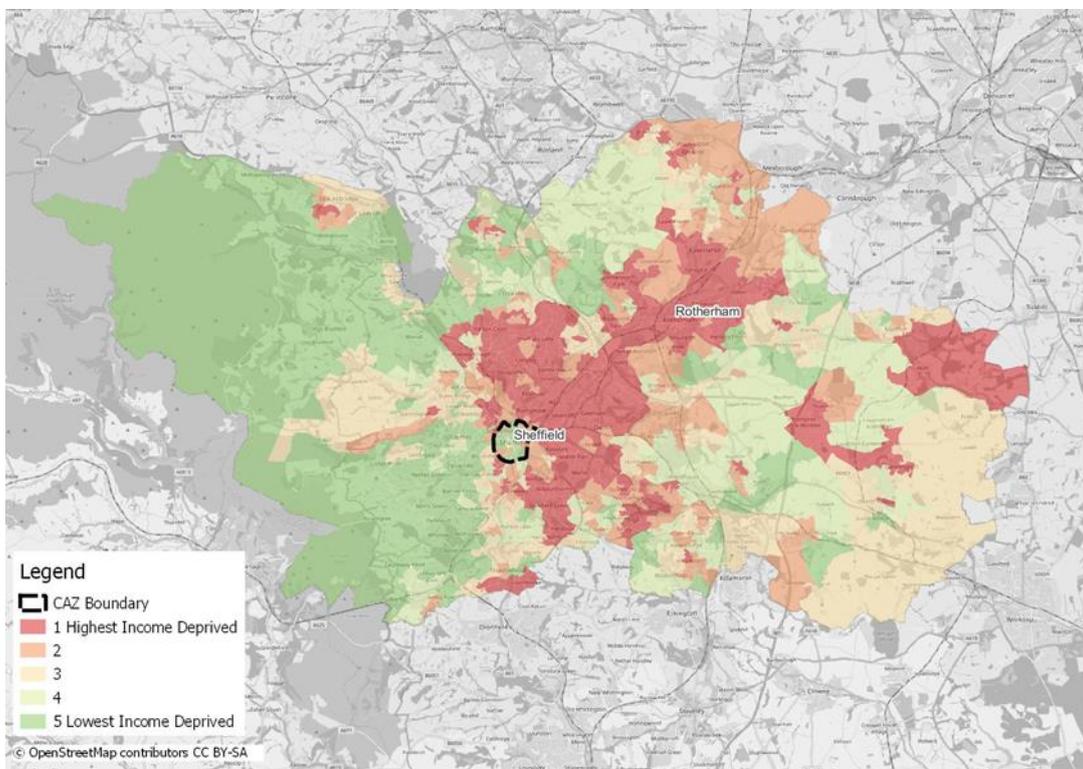


Figure 5. Income deprivation by LSOA across impact area

3.2.4 The income deprivation distribution map, as shown in Figure 5, shows that there is a considerable spread of income deprivation across the 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.

3.2.5 In terms of distribution in relation to the charging CAZ area, the area within the zone is predominantly not very deprived. However, there are some pockets of more deprived areas around the edges of the cordon.

Children

3.2.6 The distribution of children (under 16s) across the impact area's LSOAs (Figure 6) has been mapped based on ONS mid-year (2017) population estimates, 2017 population estimates have been retained for consistency with the OBC.

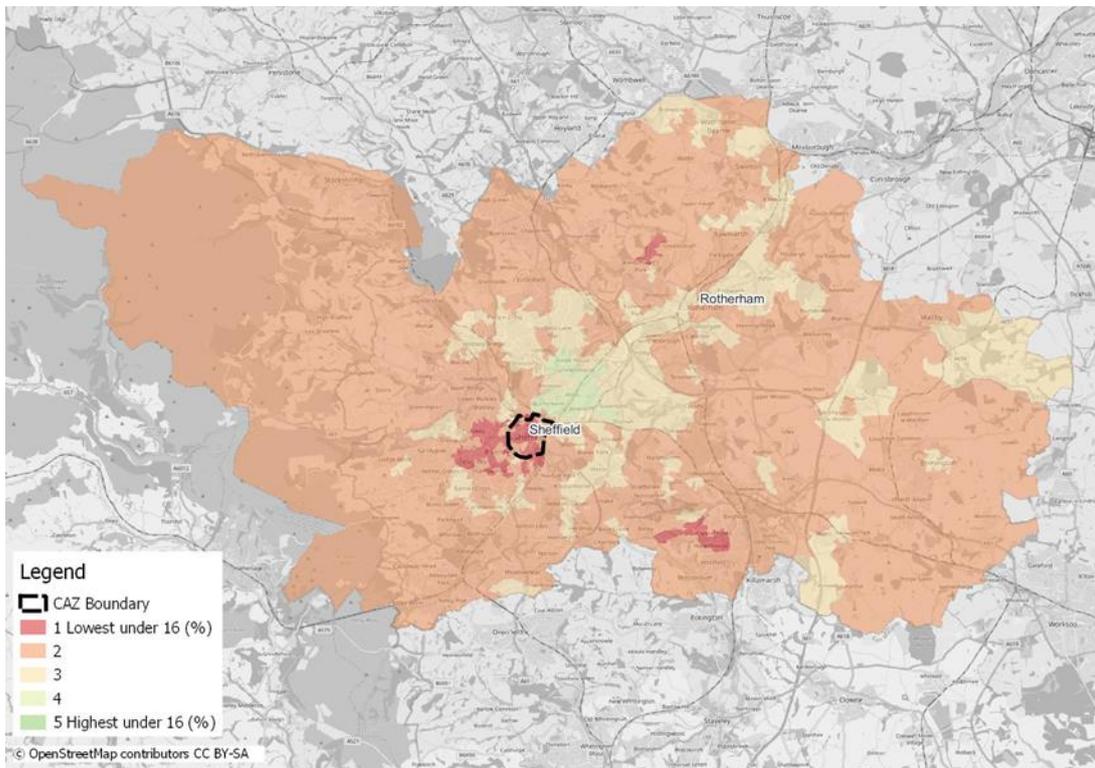


Figure 6. Children proportion by LSOA across impact area

3.2.7 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 area of the Charging CAZ C which is shown to mostly be in the lowest quintile in terms of the proportion of the population classed as children.

3.2.8 In addition, the location of education amenities (nurseries, schools and other education facilities) used by children have been mapped and are displayed in Figure 7. This shows that there is a relatively low number of schools located within the charging CAZ.

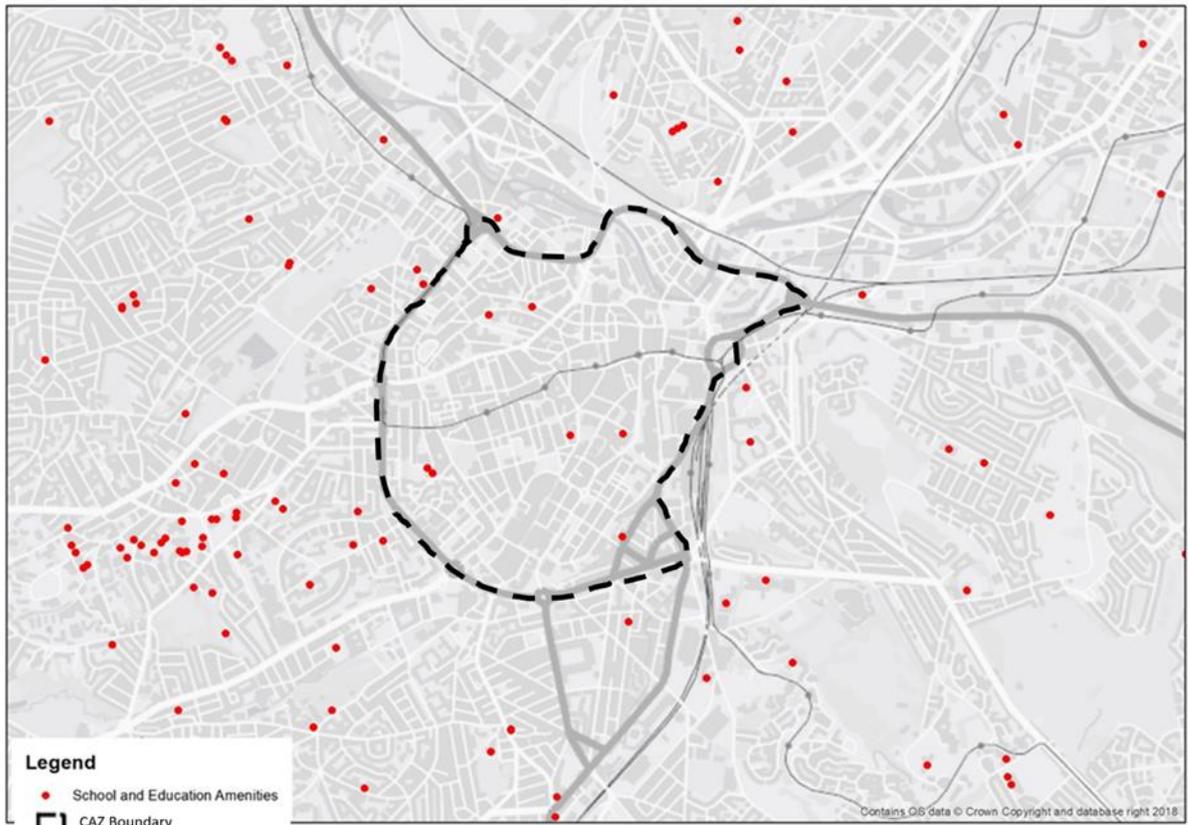


Figure 7. Location of education amenities around and within Charging CAZ boundary

Elderly people

3.2.9 The distribution of elderly (over 65s) across the impact area's LSOAs has been mapped (Figure 8) based on ONS mid-year (2017) population estimates, 2017 population estimates have been retained for consistency with the OBC.

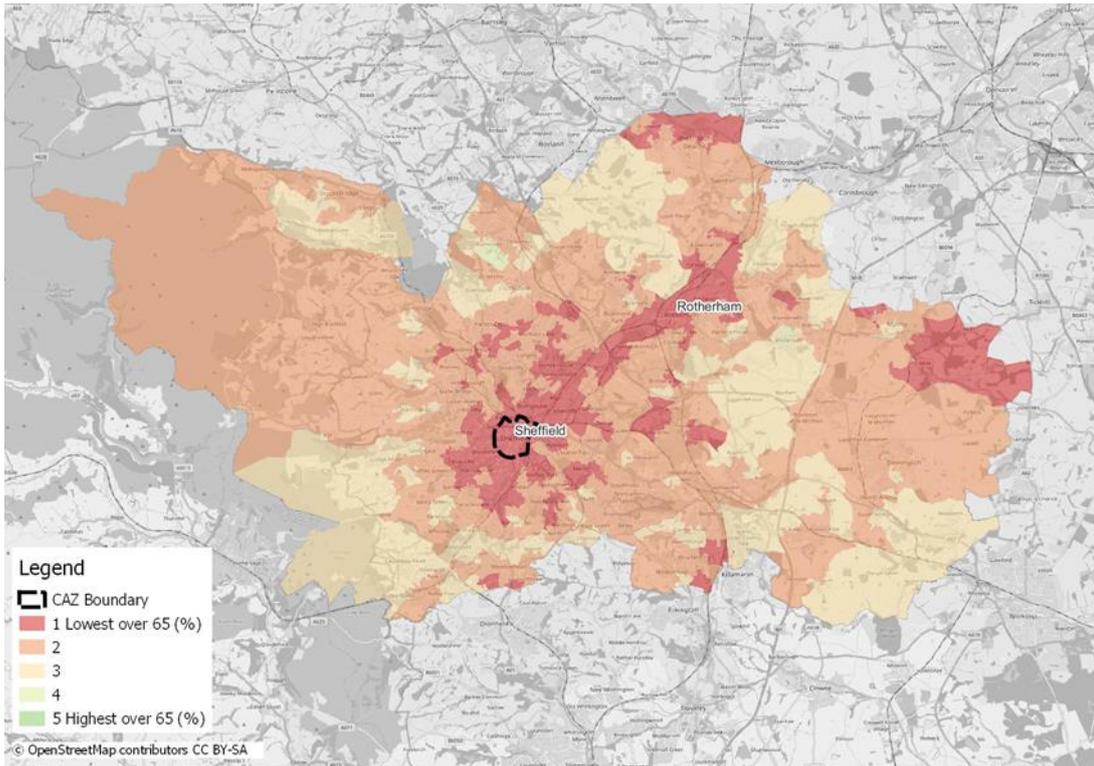


Figure 8 Elderly proportion by LSOA across impact area

3.2.10 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 charging CAZ C area and the A6109 and A6178 corridors between Sheffield and Rotherham.

Disabled people

3.2.11 The distribution of disability across the impact area's LSOAs has been mapped (Figure 9) based on the comparative illness and disability indicator, an underlying indicator of the 2015 English Indices of Deprivation.

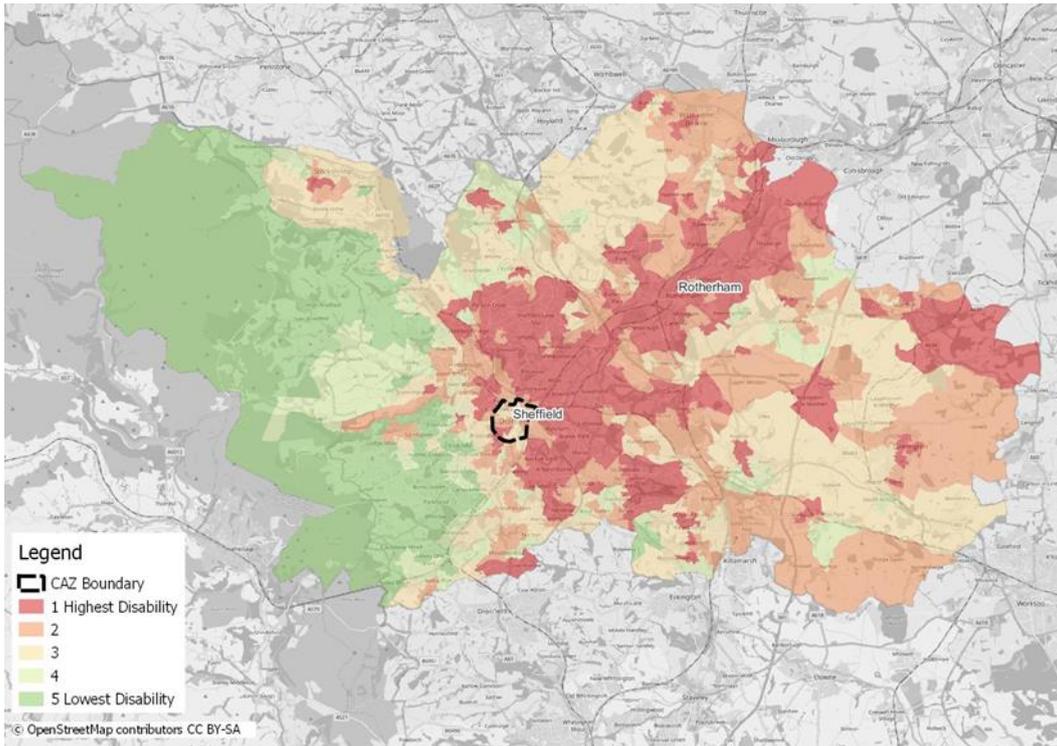


Figure 9. Disability proportion by LSOA across impact area

Women

3.2.12 The distribution of sex (proportion of females) across the impact area's LSOAs (Figure 10) has been mapped based on ONS mid-year (2017) population estimates, 2017 population estimates have been retained for consistency with the OBC.

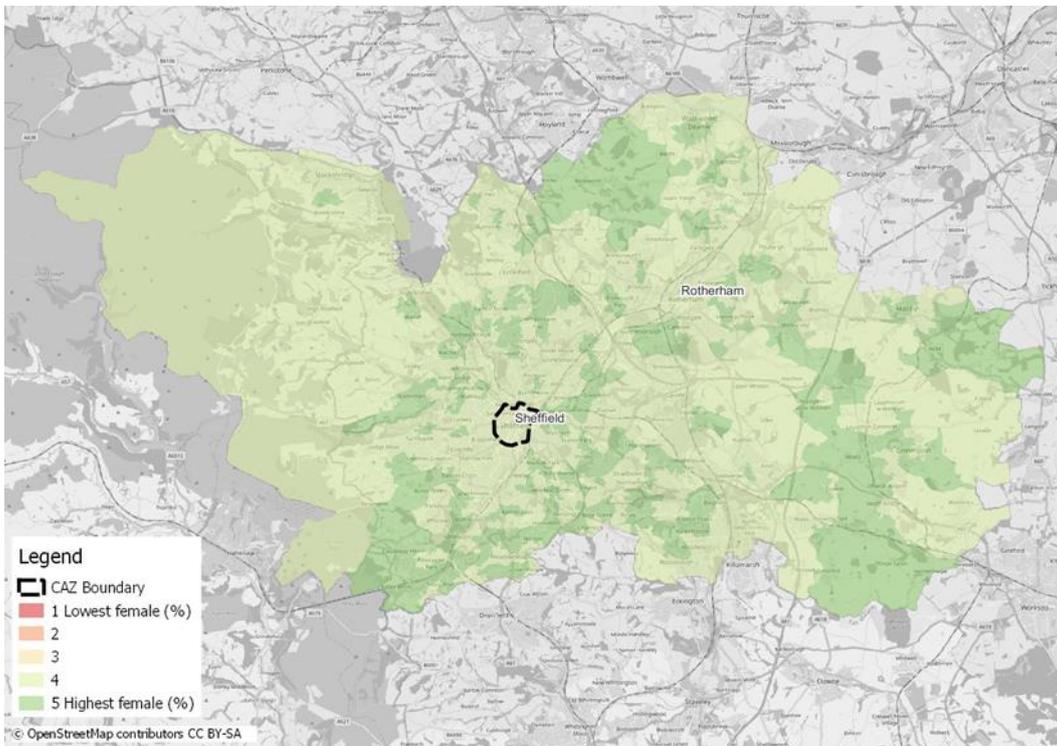


Figure 10. Female proportion by LSOA across impact area

3.2.13 The proportion of female residents (50.93% in Rotherham and 50.67% in Sheffield) is generally in line with the England and Wales average of 50.83%.

Ethnicity

3.2.14 The distribution of ethnicity (non-white proportion) across the impact area's LSOAs has been mapped (Figure 11) based on outputs from the 2011 census.

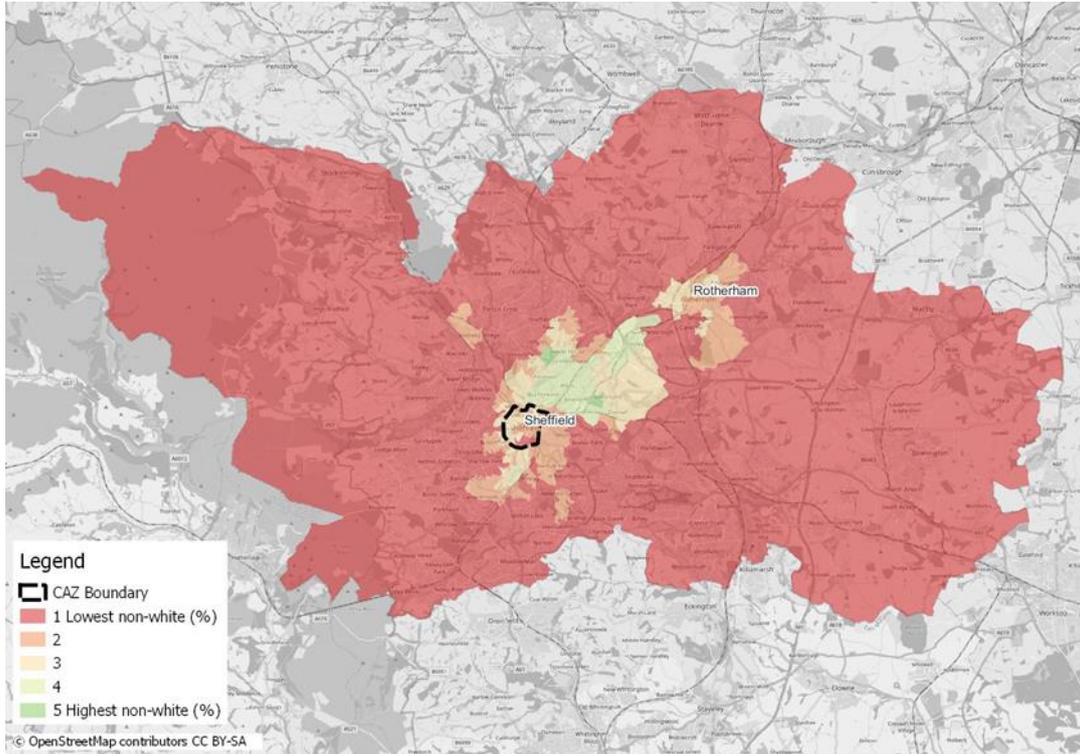


Figure 11. Ethnicity by LSOA across impact area

3.2.15 The higher proportions of non-white population are towards the centres of Sheffield and Rotherham. Within the charging CAZ area there is a small portion of the area which sits in quintile 1, however it is predominantly quintiles 2 and 3. North-east of Sheffield city centre (just outside the cordon) there is a large area which sit in quintile 4 (the second highest proportion of non-white population).

Health

3.2.16 The health of the people in Sheffield and Rotherham could be considered as generally worse than the national average as evidenced by several markers. Life expectancies in Sheffield and Rotherham are lower than the national average for both males and females and vary greatly by electoral ward (Office for National Statistics). Sheffield and Rotherham experience higher death rate per 1,000 for under 75's than the rates for England overall from all cardiovascular diseases, cancer, liver disease and respiratory disease considered preventable. Another important indicator of population health is the infant mortality rate. In Sheffield this is higher than the national average, and in Rotherham, slightly lower. The proportion of adults who are overweight or obese is also higher than the national average in both Sheffield and Rotherham, as is the estimated proportion of people with common mental health disorders. The proportion of adults who regularly undertake physical exercise in Rotherham is significantly lower than the national rates, yet for Sheffield the rates are slightly higher than national.

3.3 Business Context

Economy

3.3.1 The Sheffield district had an economic output of £11,433m in 2016, whilst the Rotherham district had an economic output of £4,529m in terms of Gross Value Added (GVA) (ONS, 2018). In 2016, the gross value per head was £19,870 in Sheffield and £17,289 in Rotherham (both of which are lower than the average UK figure of £26,584) (ONS, 2018). The table below summarises the employment by broad industrial group for the Sheffield and Rotherham districts in 2018. The table also presents this breakdown for the LSOAs in which most of the LSOA would fall within the CAZ charging area. 2019 BRES figures have been retained for consistency with the OBC.

Table 5. Employment by broad industrial group (source: Business Register and Employment Survey, 2018)

Broad Industrial Group	Charging CAZ Area	Sheffield (excluding Charging CAZ)	Rotherham	Great Britain
Health	6%	18%	13%	13%
Education	12%	12%	10%	9%
Retail	7%	11%	9%	9%
Manufacturing	3%	11%	15%	8%
Business administration & support services	11%	7%	9%	9%
Professional, scientific & technical	11%	7%	4%	9%
Accommodation & food services	9%	6%	6%	8%
Wholesale	1%	5%	4%	4%
Transport & storage (inc postal)	3%	4%	5%	5%
Arts, entertainment, recreation & other services	3%	4%	3%	4%
Construction	1%	4%	5%	5%
Information & communication	8%	3%	4%	4%
Financial & insurance	8%	2%	2%	3%
Motor trades	0%	2%	2%	2%
Public administration & defence	16%	2%	6%	4%
Property	2%	1%	1%	2%
Mining, quarrying & utilities	0%	1%	2%	1%

Agriculture, forestry & fishing	0%	0%	0%	1%
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3.3.2 As shown in the table above a significant proportion of those within the charging CAZ area are employed in higher value service jobs compared to the wider districts (e.g. ‘professional, scientific & technical’ and ‘financial and insurance’). Furthermore, 21% of all employment in the Sheffield local authority district is located within the proposed CAZ charging zone.

Business count

3.3.3 The distribution of businesses across the impact area’s MSOAs has been mapped (Figure 12) based on information available from 2017 Nomis labour market statistics, 2017 population estimates have been retained for consistency with the OBC.

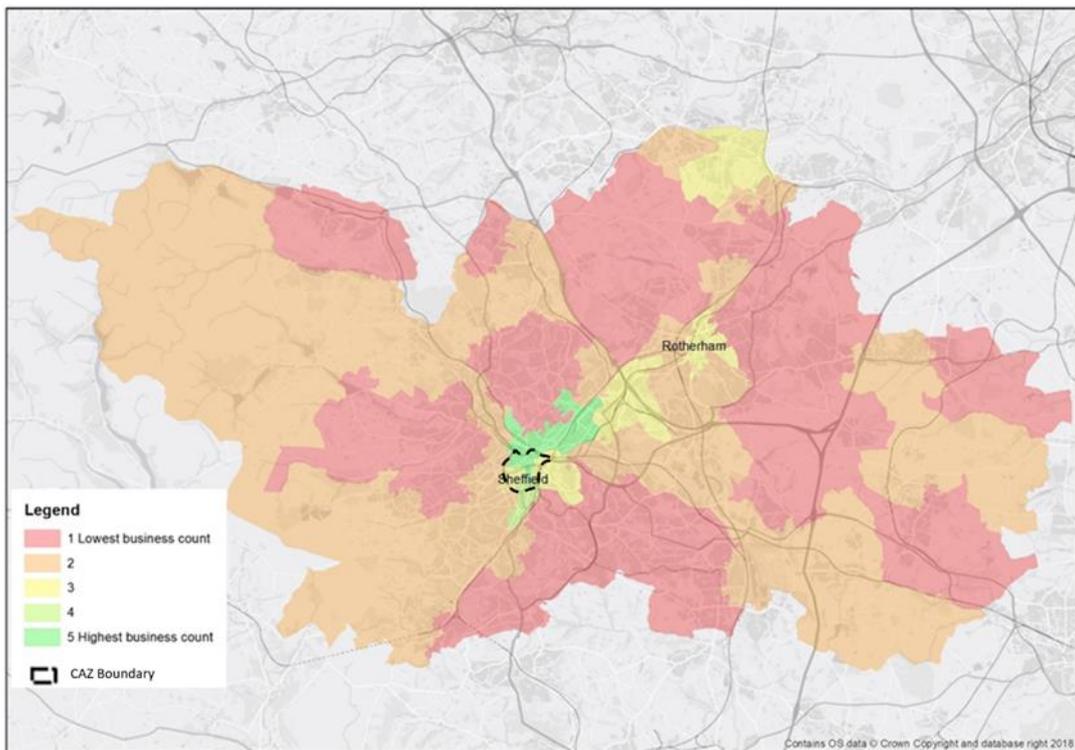


Figure 12. Business count (micro, small and medium businesses) by MSAO across impact area

3.3.4 The figure above shows that the area within the charging CAZ area largely falls within the two highest quintiles, indicating that this is the area with the highest number of businesses.

Business size

3.3.5 The size of a business would partially determine its resilience to a CAZ charge. Larger businesses, which generally have more resources and are more able to spread costs, would probably be better able to cope with a CAZ charge compared to smaller businesses. However, there will be some larger companies within the CAZ area which operate to a very tight business model who may also require assistance.

Table 6. Local units by business size across the Sheffield district and within the cordon (source: UK Business Counts, 2019)

Employment Size Band	Charging CAZ Area	Sheffield Excluding Charging CAZ	Cordon As % of District
Micro (0 to 9)	1970	13725	13%
Small (10 to 49)	590	2540	19%
Medium-sized (50 to 249)	125	565	18%
Large (250+)	25	85	23%
TOTAL	2710	16915	14%

3.3.6 The table above shows that there are almost 17,000 businesses located within the district. Of these 17,000 businesses, 14% of them are located within the proposed charging CAZ area. The majority of businesses across the district are micro businesses (80% of total businesses).

3.3.7 13% of all micro businesses and 19% of all small businesses across the district are located within the charging CAZ area. As referenced above, it is likely that these businesses will be less resilient to the CAZ charge, although some larger businesses may have a low level of resilience too.

Business use of vehicles

3.3.8 Of those that responded to the 2021 consultation, 82% of businesses stated that they used vehicles within the proposed Sheffield Clean Air Zone area. However, it should be noted that this percentage of businesses forms only a small sample of the businesses affected by the CAZ and is likely skewed towards fleet owning businesses.

3.3.9 The figure below indicates the importance of diesel vehicles to the business community in Sheffield, with 67% of businesses owning at least one diesel van / minibus. The second most popular vehicle used by respondents was diesel cars, with 46% of businesses owning at least one such vehicle.

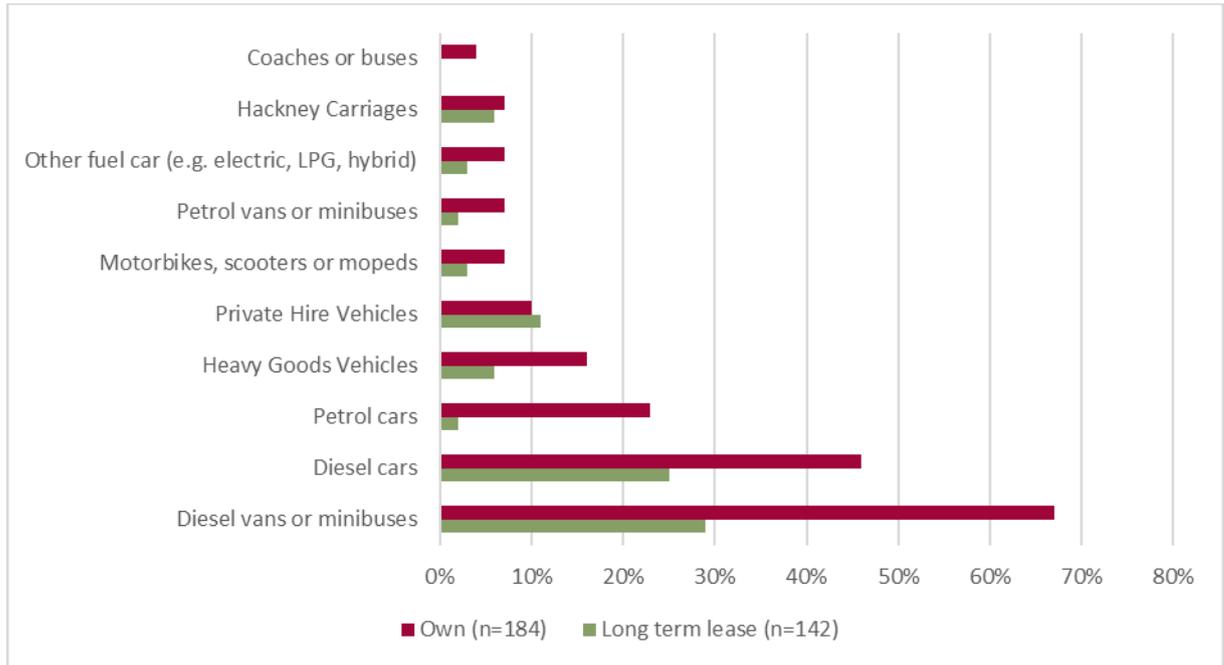


Figure 13. Vehicles owned or long term leased by businesses in Sheffield and used within the CAZ (2021 consultation)

3.3.10 When asked in the 2019 consultation, businesses reported numerous vehicle trips within the charging CAZ area as part of their operations, the most common type of trip reported was supplying goods or services to users based in the proposed Clean Air Zone area.

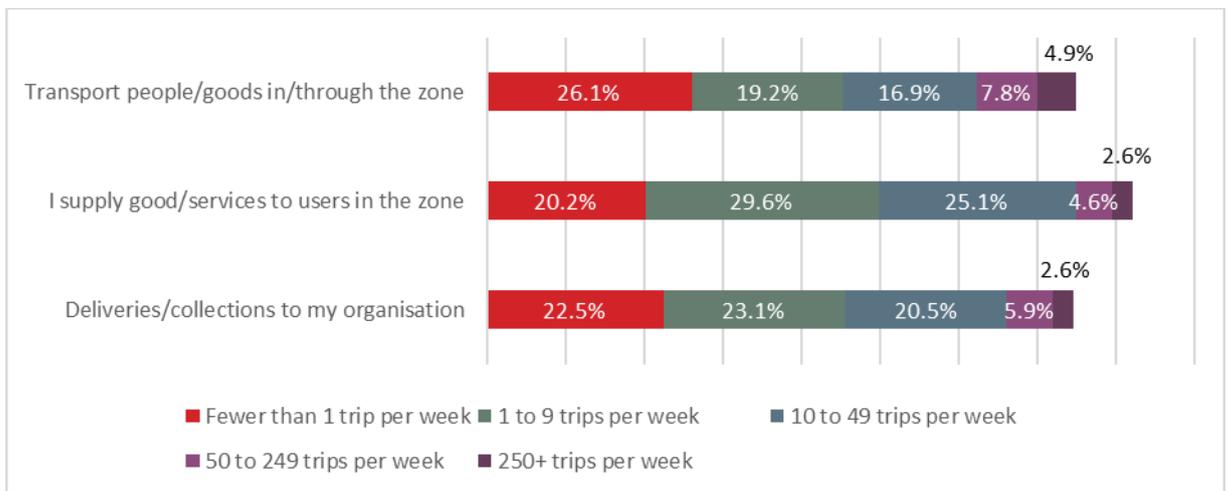


Figure 14. The number of vehicle trips per week made in the proposed charging CAZ area as part of business operations (2019 consultation)

3.3.11 Given the nature of the vehicles most commonly owned or leased by businesses in Sheffield, the majority of respondents in 2019 (84.7%) stated that at least some of their current fleet would be charged to drive in the Clean Air Zone, with 66% of those saying at least half of their current fleet would be charged. The impact upon microbusinesses is more pronounced, with 57.2% of those responding in 2019 saying that all their fleet would be charged to drive in the charging CAZ area, compared to only one in five other businesses (those that employ 10 or more people) saying that all of their current fleet would be charged.

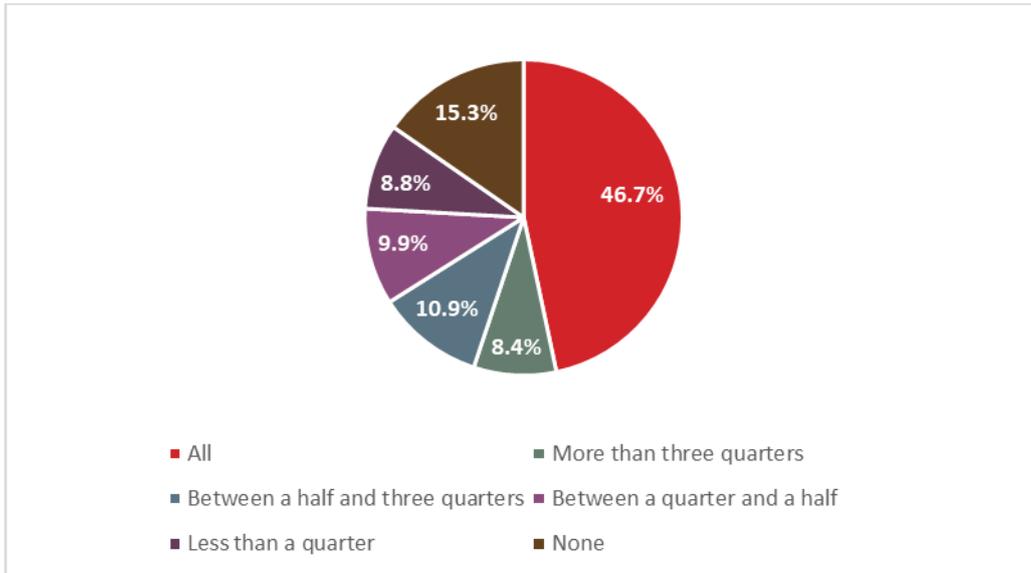


Figure 15. The proportion of businesses vehicle fleet that would be charged to drive in the proposed Clean Air Zone (n=274) (2019 consultation)

- 3.3.12** When asked in 2021, the majority of organisations (80%) consider they drive or own a non-compliant vehicle, while around one in five (20%) believe that they do not. This figure is slightly lower than the 2019 consultation, in which 85% of business representatives thought they owned at least one vehicle which would be charged to drive within the CAZ.
- 3.3.13** With regards to upgrading or replacing their business vehicles, 20.5% of respondents said that they upgrade their fleet at least every four years. However, there are a significant number of businesses that replace their vehicles much less frequently, with 41.1% saying they upgrade their vehicles less than every six years, highlighting that many businesses will likely be affected by the CAZ charge for extended periods of time before replacing any current non-compliant vehicles.

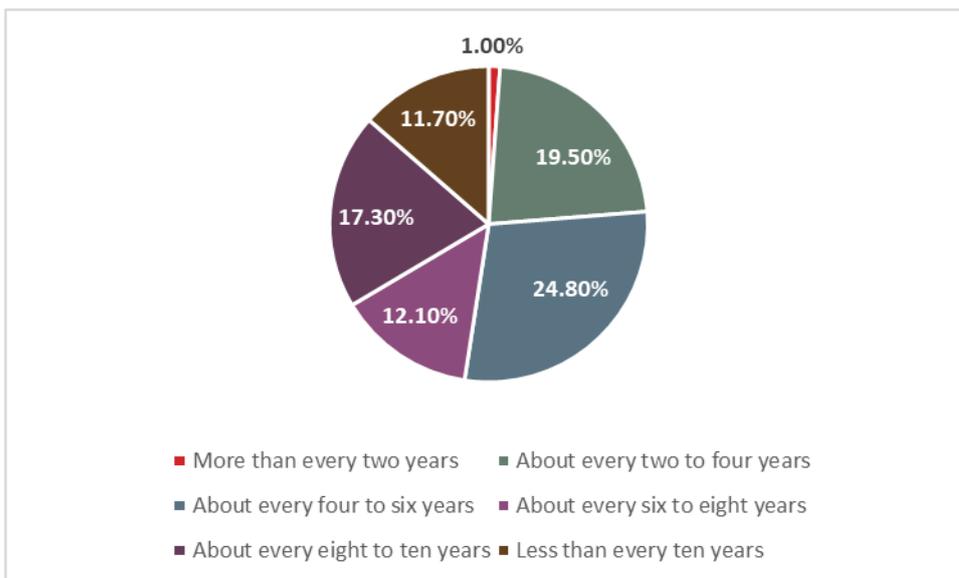


Figure 16. The frequency with which businesses upgrade or replace vehicles used by their organisation (2019 consultation) (n=307)

- 3.3.14** When asked about the overall impact following the introduction of a Clean Air Zone in Sheffield, businesses overwhelmingly felt it would have a negative impact upon their own

business and businesses across Sheffield. 74% of respondents think the introduction of a charging CAZ would have a negative impact upon their business compared to only 12% thinking it would have a positive impact. A notable theme of the 2019 consultation with businesses was how just under one quarter of businesses stated that they would in fact have to stop serving customers within the boundary and / or close their business as a result of the charging CAZ introduction.

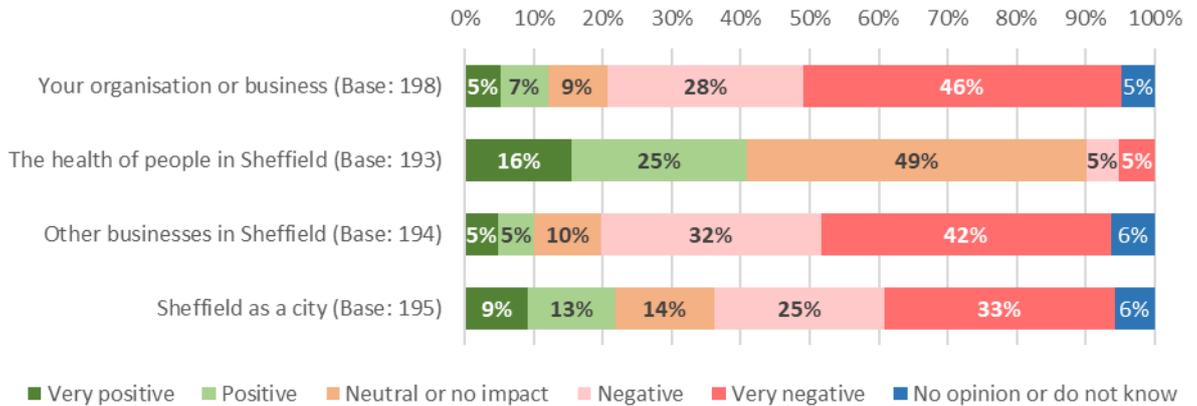


Figure 17. The impact businesses feel the introduction of a Clean Air Zone would have (2021 Consultation)

Provision of extra support

3.3.15 When asked whether their business would require extra support following the introduction of the charging CAZ, nearly 70% of respondents stated they would require this. The proposed support package considered to be most beneficial was the provision of grants towards upgrading to electric vans, with over half of businesses (53.6%) saying that it would help them to a great or moderate extent.

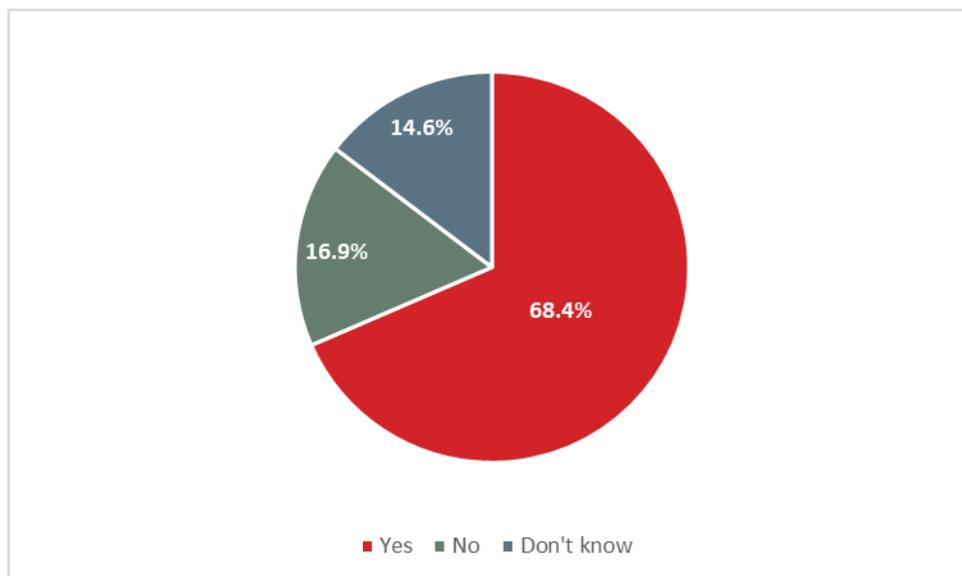


Figure 18. Figure 18. The requirement for extra support following the introduction of a Clean Air Zone (n=307) (2019 Consultation)

LGVs

3.3.16 The distribution of LGVs across the impact area's LSOAs has been mapped on Figure 19 below based on information provided by JAQU.

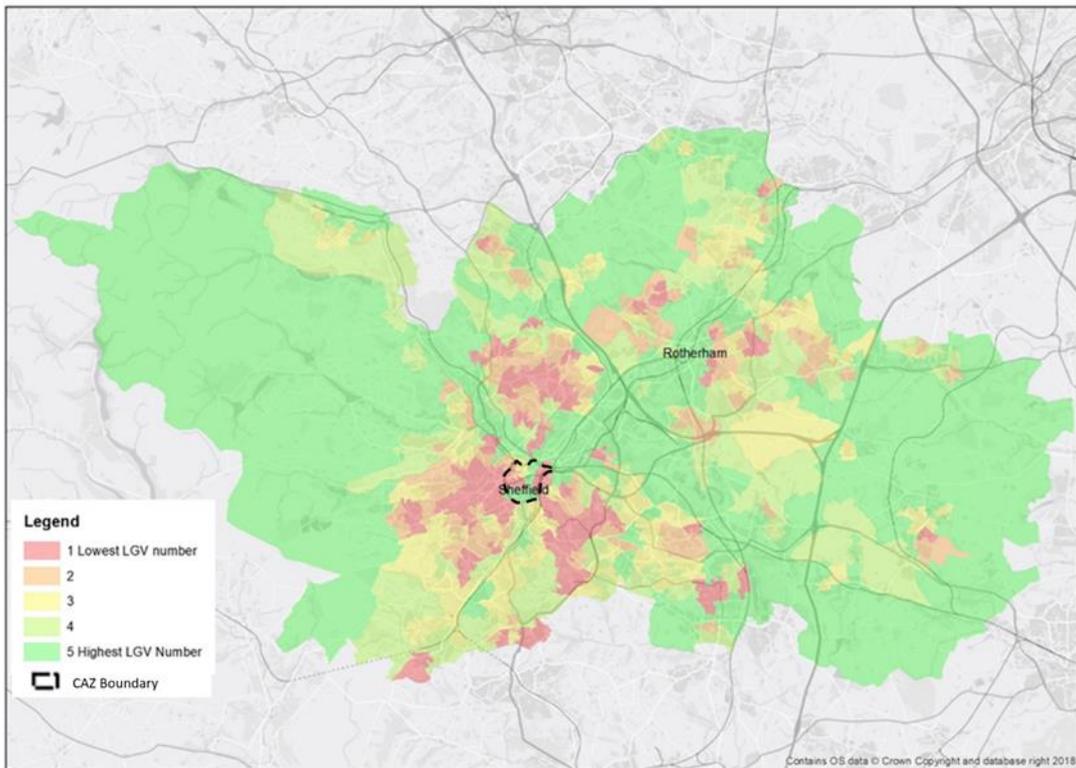


Figure 19 LGV number by LSOA across impact area

3.3.17 The figure above indicates that the LSOAs with the highest number of LGVs registered are not in the centre of Sheffield (where the charging CAZ will be implemented). However, the MSOAs with most businesses are located within the proposed charging CAZ area as seen in Figure 12. There is also a significant number of LGV owning businesses located in Rotherham, these will be directly impacted less by the charging area, but those that regularly make trips to Central Sheffield will need to be considered.

3.3.18 Based on the transport model, LGVs travel a total of 872,094 vkm on an average day which result in approximately 0.735T of NO_x. This is approximately 22.6% of the total daily emissions and corresponds to 0.84g of NO_x per vkm which is more than 3 times higher than any private car user class.

Taxis

3.3.19 The Preferred Option (along with changes to licensing) will encourage approximately two thirds of vehicles operational in Sheffield to upgrade or retrofit. In Rotherham, 60 vehicles will be required to upgrade. The map below shows the distribution of taxi registrations across postcode districts in Sheffield and Rotherham, LSOAs within the most deprived income quintile (quintile 1) have also been shown on the map.

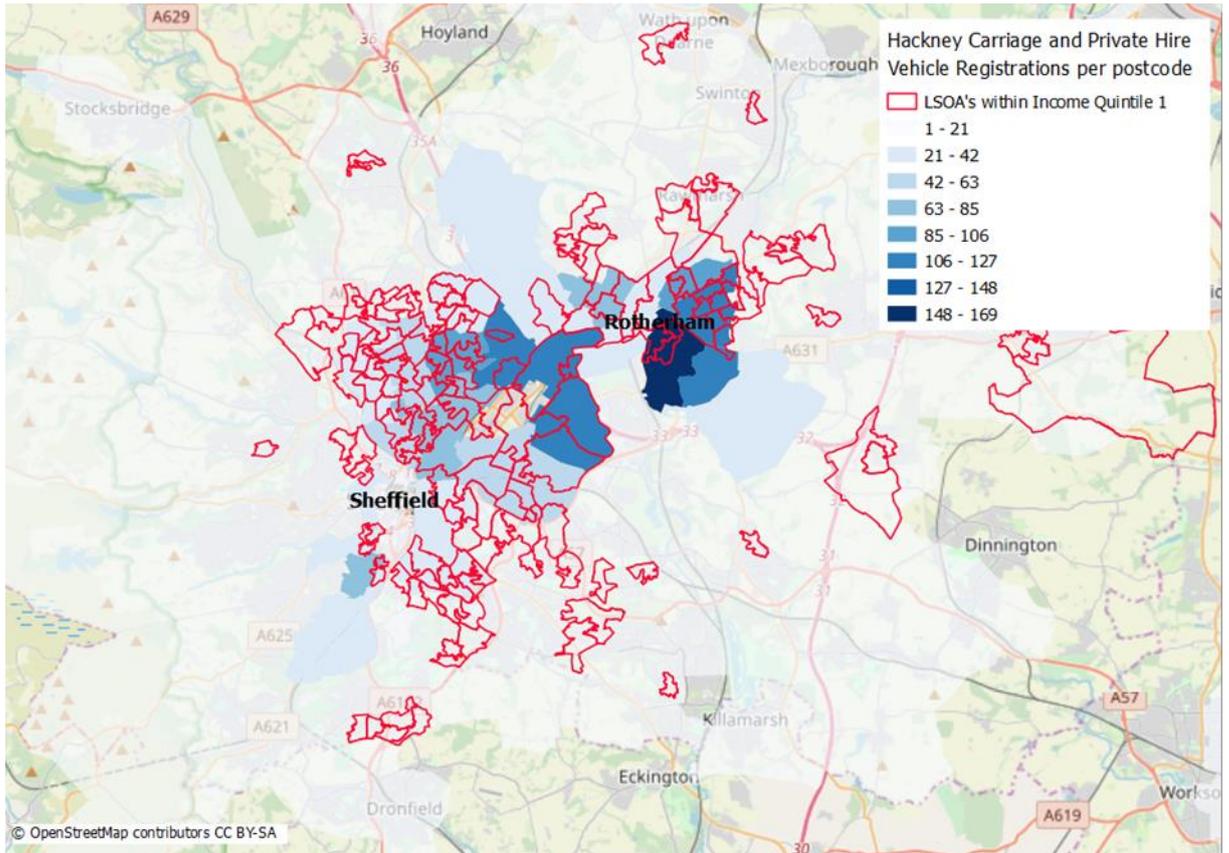


Figure 20. PHV and hackney carriage registrations per postcode district

3.3.20 The table below summarises the distribution of taxi registrations within all income quintiles.

Table 7. Distribution of taxi registrations across income quintiles		
Quintile	Count	%
1 (most deprived)	2224	60.1%
2	738	19.9%
3	260	7.0%
4	293	7.9%
5 (least deprived)	188	5.1%

3.3.21 As can be seen in the table and figure above, private hire vehicle and hackney carriage registrations appear to be concentrated in high deprivation. The majority of all registrations (60.1%) are located within the most deprived income quintile.

3.3.22 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.

Section 4 Social and Equality Impacts

4.1 Introduction

4.1.1 This section presents the results of the social and equality impacts analysis.

4.2 Accessibility

4.2.1 A desktop accessibility audit has been undertaken to consider how the Rawmarsh Hill bus rerouting scheme will impact on the public transport experience through various elements as identified in TAG A4.2. Table 8 qualitatively summarises the impact of the scheme on the identified end-to-end journey elements.

Table 8. 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.
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.

4.2.2 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 9 summarises the potential impact of the scheme by social group.

Table 9. 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 this population, but the shift eastwards mean slightly less of this population is picked up compared to the current bus route. As indicated in the table above, all bus stops will be upgraded to accommodate tactile paving and kerbside boarding/alighting meaning that the overall impact is neutral.	Neutral
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

4.2.3 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.

Accessibility summary assessment: Neutral

4.3 Personal Affordability

4.3.1 The distributional analysis of affordability for the preferred option 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.

4.3.2 The affordability benefits were calculated using TUBA software as outlined in section 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

4.3.3 Table 10 summarises the distributional analysis of affordability for the preferred option. The benefits have been distributed in terms of income deprivation for ‘commute and other’ trips and number of businesses / LGVs for business trips.

4.3.4 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 10. Affordability distributional impact analysis for CAZ C (commute and other trips)						
	Income Deprivation					
	1 st Quintile (most deprived)	2 nd Quintile	3 rd Quintile	4 th Quintile	5 th Quintile (Least Deprived)	Total
Total benefits	£35,528	£11,154	£20,674	£14,883	£43,230	£125,470
Total disbenefits	-£271,360	-£360,396	-£152,053	-£149,450	-£572,862	-£1,506,121
Number of people with improved affordability	63,253	32,860	41,801	32,863	43,776	214,553
Number of people with reduced affordability	241,364	139,318	99,285	107,856	135,816	723,639
Number of net winners / losers	-178,111	-106,458	-57,484	-74,993	-92,040	-509,086
Net ‘losers’ in each area as % of total	35%	21%	11%	15%	18%	100%
Share of total population in impact area	33%	18%	15%	14%	19%	100%
Assessment	XX	XX	XX	XX	XX	

4.3.5 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 an affordability disbenefit. The results indicate that the distribution of ‘losers’ across income quintiles is broadly in line with the proportion of each group in the total population.

All quintiles are expected to experience a net affordability disbenefit. The above results indicate that the affordability disbenefits of the scheme would be distributed in proportion to income distribution in the study area.

4.4 User Benefits

- 4.4.1** 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 SCRTM1 transport model and travel cost changes implied by the proposed scheme.
- 4.4.2** The TUBA assessment was undertaken for the expected duration of the CAZ charging scheme (2022 – 2026) for all vehicle types / user classes included in the SCRTM1 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
- 4.4.3** 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.
- 4.4.4** The benefits were distributed across the impact area in two groups (business trips and commute / other trips).
- 4.4.5** Table 11 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.
- 4.4.6** 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 11. User benefit distributional impact analysis for CAZ C (commute and other trips)						
	Income Deprivation					
	1 st Quintile (most deprived)	2 nd Quintile	3 rd Quintile	4 th Quintile	5 th Quintile (Least Deprived)	Total
Total benefits	£267,100	£144,788	£154,750	£155,768	£243,965	£966,371
Total disbenefits	-£136,941	-£268,339	-£107,506	-£90,001	-£648,361	-£1,251,149
Number of people with improved user benefits	200,655	117,674	100,270	97,280	145,011	660,890

Number of people with reduced user benefits	148,427	79,901	48,277	43,962	55,748	376,315
Number of net winners / losers	52,228	37,773	51,993	53,318	89,263	284,575
Net 'losers' in each area as % of total	18%	13%	18%	19%	31%	100%
Share of total population in impact area	33%	18%	15%	14%	19%	100%
Assessment	✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓ ✓	

4.4.7 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. The distribution of these benefits across income quintiles is broadly in line with the proportion of each group in the total population.

The above results indicate that all groups would be expected to receive a net benefit. The user benefits of the scheme would be distributed in proportion to the distribution of income quintiles.

User benefit summary assessment for CAZ C: Moderate Beneficial

4.5 Accidents

4.5.1 The figure below shows the difference in flows between the Do Minimum and the CAZ C in terms of increases or decreases in flow on SCRTM1 model links.

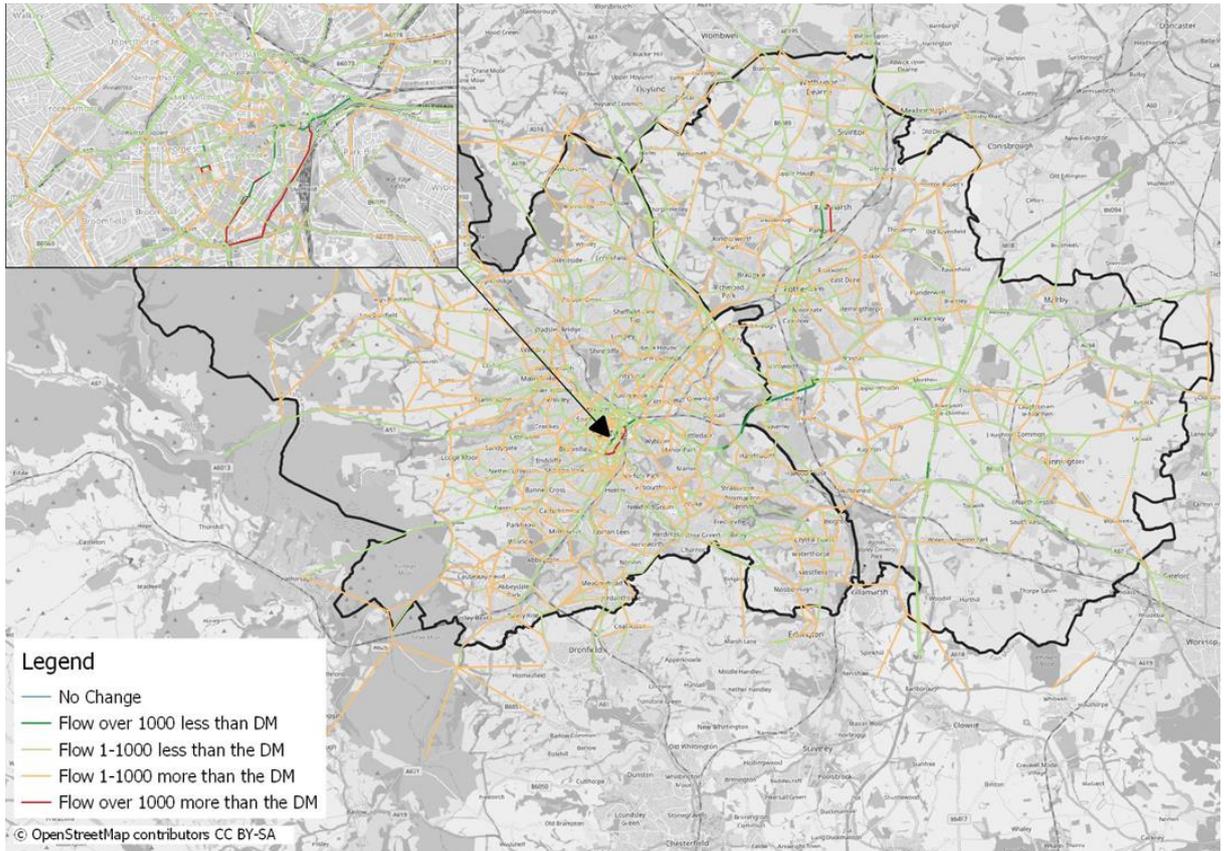


Figure 21. CAZ C and DM traffic flow comparison

4.6 Distributional Impacts of Air Quality

4.6.1 The following figures display the forecasted change in NO_x and the forecasted change in PM₁₀ on SCRTM1 links as a result of the scheme. 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.

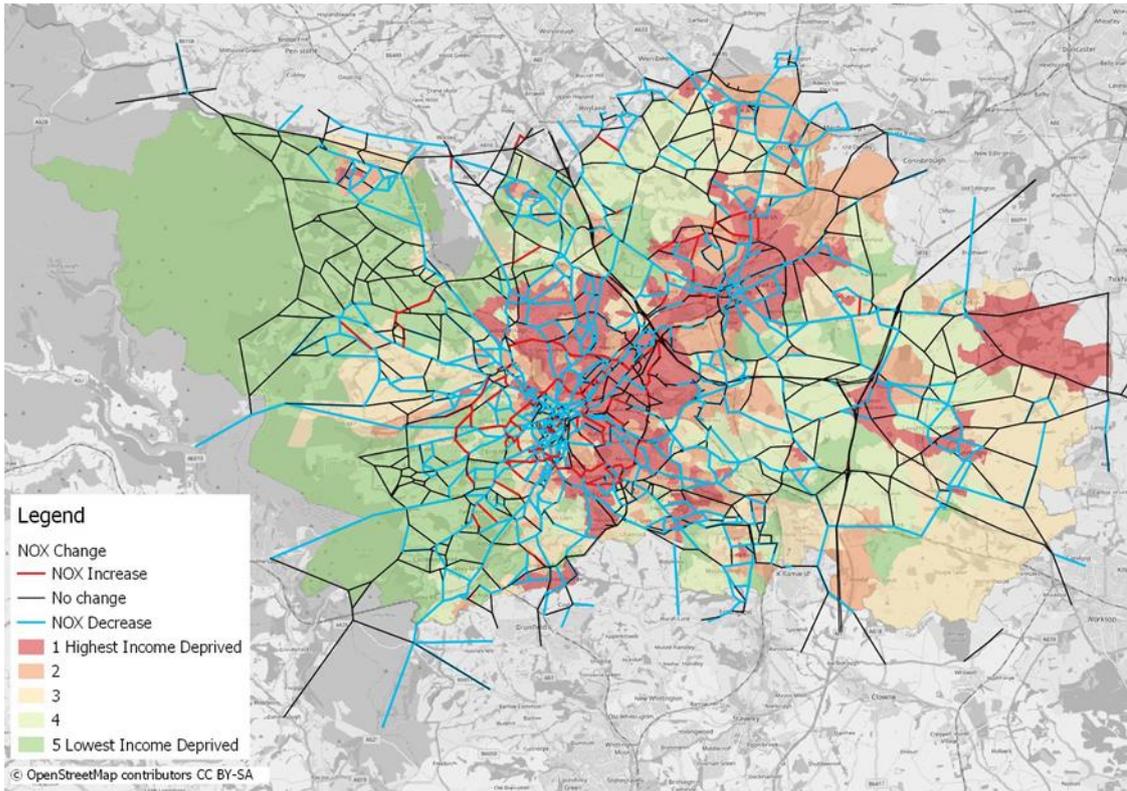


Figure 22. Impact of CAZ C on NO_x emissions in impact area

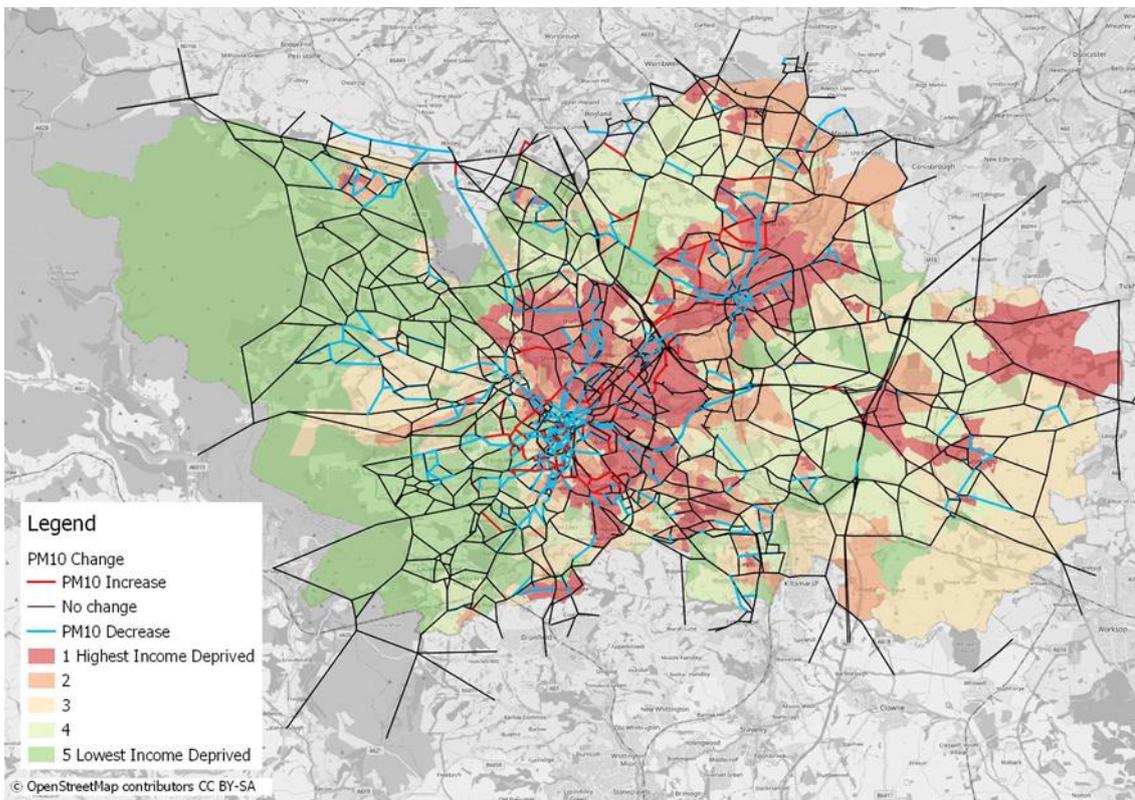


Figure 23. Impact of CAZ C on PM₁₀ emissions in impact area

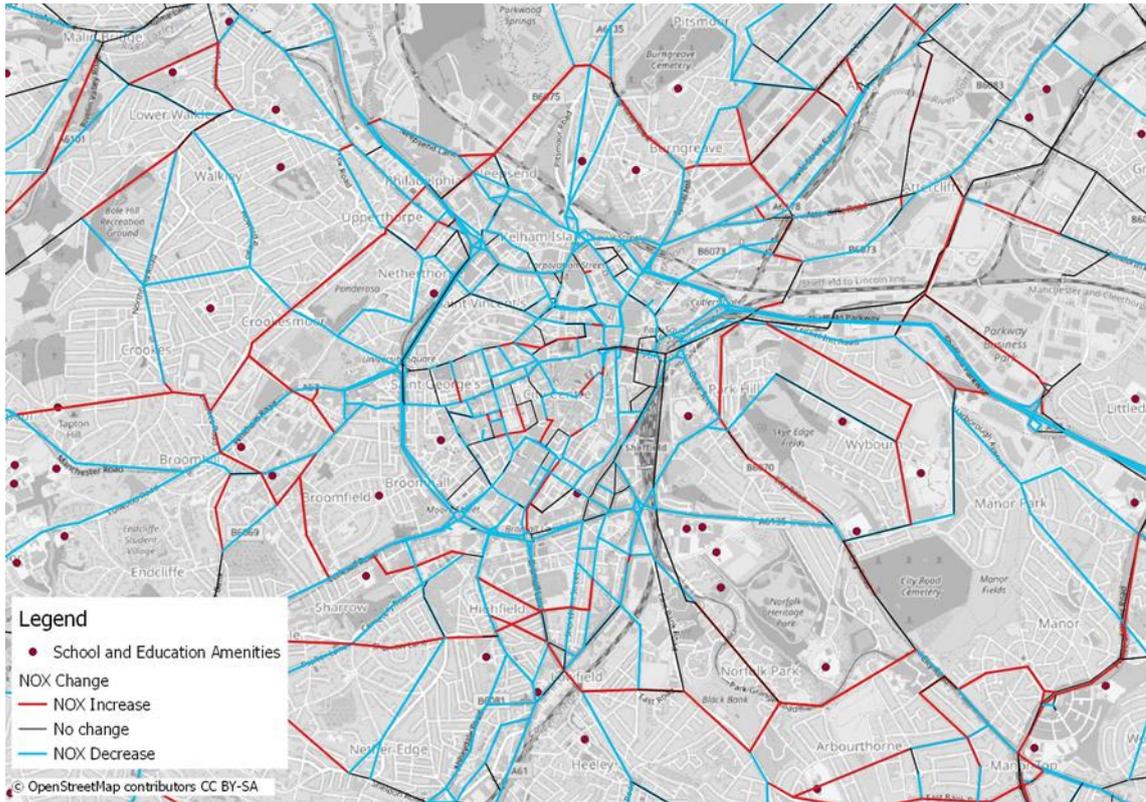


Figure 24. Impact of CAZ on NO_x emissions around and within CAZ boundary



Figure 25. Impact of CAZ on PM₁₀ emissions around and within CAZ boundary

4.6.2 Table 12 and Table 13 summarise the distributional analysis of emissions (NO_x and PM₁₀) in terms of how the benefits will be experienced amongst the income group quintiles in the air quality impact area for the CAZ C option.

Table 12. Air quality (NO_x) distributional impact analysis for CAZ C						
	Income Deprivation					
	1st Quintile (most deprived)	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile (Least Deprived)	Total
Number of properties with improved air quality	76,149	56,057	44,284	42,535	54,119	273,144
Number of properties with no change in air quality	0	0	0	0	0	0
Number of properties with worse air quality	15,612	3867	4974	1848	7922	34,223
Number of net winners / losers	60,537	52,190	39,310	40,687	46,197	238,921
Net winners as a % of total	25%	22%	16%	17%	19%	100%
Share of total population in impact area	30%	19%	16%	14%	20%	100%
Assessment	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	

Table 13. Emissions (PM₁₀) distributional impact analysis for CAZ C						
	Income Deprivation					
	1st Quintile (most deprived)	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile (Least Deprived)	Total
Number of properties with improved air quality	71,728	52,378	42,489	40,560	48,096	255,251
Number of properties with no change in air quality	0	0	0	0	0	0
Number of properties with worse air quality	20,033	7546	6769	3823	13,945	52,116
Number of net winners / losers	51,695	44,832	35,720	36,737	34,151	203,135

Net winners / losers as a % of total	25%	22%	18%	18%	17%	100%
Share of total population in impact area	30%	19%	16%	14%	20%	100%
Assessment	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	

User benefit summary assessment for CAZ C: Moderate beneficial

Section 5 Business Impacts

5.1 Introduction

5.1.1 This section presents the impacts of the preferred option on businesses. Note that the results presented in this section are based on the modelled outputs and Census data, not the results of the 2019 OBC consultation.

5.2 User benefits

5.2.1 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 14. User benefit distributional impact analysis for CAZ C (business trips)

	Number of Businesses (Micro, Small and Medium)					Total
	1 st Quintile (most Businesses)	2 nd Quintile	3 rd Quintile	4 th Quintile	5 th Quintile (Least Businesses)	
Total benefits	£103,779	£19,412	£0	£5,226	£60,805	£189,222
Total disbenefits	-£17,156,767	-£3,313,862	-£1,639,127	-£1,955,297	-£1,376,181	-£25,441,235
Number of businesses with improved user benefits	3,312	522	-	27	470	4,331
Number of businesses with reduced user benefits	16,275	5,180	3,167	2,923	1,893	29,438
Number of net winners / losers	-12,963	-4,658	-3,167	-2,896	-1,423	-25,107
Net 'losers' in each area as % of total	52%	19%	13%	12%	6%	100%
Share of total businesses in impact area	56%	17%	10%	9%	7%	100%
Assessment	XX	XX	XX	XX	XX	

5.2.2 The outputs from the TUBA assessment indicate that the vast 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.

The above results indicate that all groups would be expected to receive a net disbenefit. The user disbenefits of the scheme would be distributed in proportion to the distribution of businesses in the study area. Therefore, those LSOAs which contain the most businesses are not expected to receive a disproportionately greater disbenefit.

5.2.3 Table 15 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 15. User benefit distributional impact analysis for CAZ C (business trips)						
	Number of LGVs					
	1st Quintile (most LGVs)	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile (Least LGVs)	Total
Total benefits	£10,552	£2,716	£94,592	£25,822	£55,540	£189,222
Total disbenefits	-£13,655,184	-£2,379,241	-£2,139,430	-£1,922,378	-£5,345,003	-£25,441,235
Number of LGVs with improved user benefits	452	114	229	281	235	1,311
Number of LGVs with reduced user benefits	15,597	5,614	4,444	3,375	2,157	31,187
Number of net 'losers'	-15,145	-5,500	-4,215	-3,094	-1,922	-29,876
Net 'losers' in each area as % of total	51%	18%	14%	10%	6%	100%
Share of total LGVs in impact area	49%	18%	14%	11%	7%	100%
Assessment	XX	XX	XX	XX	XX	

5.2.4 The results show that the majority of users undertaking business trips experience disbenefits 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.

The above results indicate that all groups would expect to receive a net disbenefit as a result of the scheme. These user disbenefits would generally be distributed in proportion to the

distribution of LGVs in the study area. Therefore, those LSOAs which contain the most LGVs are not expected to receive a disproportionately greater disbenefit.

User benefit summary assessment for CAZ C: Moderate Adverse

5.3 Affordability

5.3.1 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 LGVs					Total
	1 st Quintile (most businesses)	2 nd Quintile	3 rd Quintile	4 th Quintile	5 th Quintile (Least businesses)	
Total benefits	£5,404	£50	£0	£0	£0	£5,454
Total disbenefits	-£15,598,888	-£2,806,697	-£1,396,667	-£1,763,646	-£1,179,430	-£22,745,330
Number of people with improved affordability	1,753	52	-	-	-	1,805
Number of people with reduced affordability	16,805	5,383	3,167	2,923	2,269	30,547
Number of net 'losers'	-15,052	-5,331	-3,167	-2,923	-2,269	-28,742
Net 'losers' in each area as % of total	52%	19%	11%	10%	8%	100%
Share of total population in impact area	56%	17%	10%	9%	7%	100%
Assessment	XX	XX	XX	XX	XX	

5.3.2 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 in line with the spread of businesses across the impact area.

All quintiles are expected to experience a net affordability disbenefit. The above results indicate that the affordability disbenefits of the scheme would generally be distributed in proportion to the distribution of LGVs in the study area. Therefore, those LSOAs which contain the most businesses are not expected to receive a disproportionately greater disbenefit.

5.3.3 Table 21 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 - LGV)						
	Number of LGVs					
	1 st Quintile (most LGVs)	2 nd Quintile	3 rd Quintile	4 th Quintile	5 th Quintile (Least LGVs)	Total
Total benefits	£139	£0	£4,662	£602	£50	£5,454
Total disbenefits	-£12,300,088	-£2,029,804	-£1,808,960	-£1,634,694	-£4,971,784	-£22,745,330
Number of LGVs with improved affordability	134	-	44	32	29	239
Number of LGVs with reduced affordability	15,707	5,671	4,587	3,548	2,328	31,841
Number of net 'losers'	-15,573	-5,671	-4,543	-3,516	-2,299	-31,602
Net 'losers' in each area as % of total	49%	18%	14%	11%	7%	100%
Share of total LGVs in impact area	49%	18%	14%	11%	7%	100%
Assessment	XX	XX	XX	XX	XX	

5.3.4 Again, the table above shows that, from the TUBA analysis, 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 in line with the spread of LGVs across the impact area.

All quintiles are expected to experience a net affordability disbenefit. The above results indicate that the affordability disbenefits of the scheme would be distributed in proportion to the distribution of LGVs in the study area. Therefore, those LSOAs which contain the most LGVs are not expected to receive a disproportionately greater disbenefit.

Affordability summary assessment: Moderate Adverse

Section 6 Health Impacts

- 6.1.1** Table 18 sets out the monetised health benefits from the reduction in NO_x and PM_{2.5} emissions which total at £0.69m across Sheffield and Rotherham.

Table 18. Monetised Health Impacts (£) for 2021 for CAZ C (2017 prices)			
Pollutant Pathway	Sheffield	Rotherham	Total
NO ₂ Chronic Mortality	£122,372	£70,252	£192,624
NO ₂ Asthma (Small Children)	£107,784	£61,877	£169,661
NO ₂ Asthma (Older Children)	£31,928	£18,329	£50,257
PM _{2.5} Chronic Mortality	£64,836	£44,214	£109,051
PM _{2.5} Productivity	£5,675	£3,869	£9,543
PM _{2.5} CHD	£45,582	£31,083	£76,665
PM _{2.5} Stroke	£17,157	£11,699	£28,856
PM _{2.5} Asthma (Children)	£33,778	£23,034	£56,812
Other Pollutants	-£3,194	-£1,451	-£4,646
Total Health Impact	£425,918	£262,906	£688,824

- 6.1.2** Table 18 shows that the overall health benefit to Sheffield and Rotherham totals £0.69m. This is the benefit in a single year (2021) compared to the 'Do Minimum' scenario. The majority of this benefit is derived from reduced rates of Chronic Mortality associated with NO₂ followed by reduced rates of asthma in small children associated with NO₂.
- 6.1.3** The distribution across the household income does not show any significant difference in health impact distribution as shown in Table 19.

Table 19. Distributional Impacts of Health Impacts for CAZ C – Low Income Households



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	Quintile				
	1 st (Least deprived)	2 nd	3 rd	4 th	5 th (Most Deprived)
NO ₂ Health Impact	£128,105	£140,051	£80,118	£88,319	£100,552
PM2.5 Health Impact	£27,229	£54,072	£24,725	£22,338	£23,314
Share of NO ₂ health impact	24%	26%	15%	16%	19%
Share of PM2.5 health impact	18%	36%	16%	15%	15%
Share of total population in impact area	32%	18%	16%	15%	19%
NO ₂ Assessment	✓	✓✓✓	✓✓	✓✓	✓✓
PM2.5 Assessment	✓	✓✓✓	✓✓	✓✓	✓✓

Section 7 Conclusion

- 7.1.1** This document has outlined the distributional impact appraisal that has been undertaken for the Sheffield and Rotherham CAZ preferred option. The appraisal has followed guidance provided by JAQU and in TAG 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.
- 7.1.2** Table 20 summarises the assessment score which has been assigned to each distributional impact for both options.

Table 20. Summary assessment scores for the preferred option	
	Preferred Option
User benefits: Commute / Other	Moderate beneficial
User benefits: Business	Moderate adverse
Air quality	Moderate beneficial
Accidents	Moderate adverse
Accessibility	Neutral
Affordability: Commute / Other	Moderate adverse
Affordability: Business	Moderate adverse

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Appendix 1

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 <ul style="list-style-type: none"> • 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 assessment 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.	CAZD 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

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Appendix 2

Rawmarsh Bus Rerouting Scheme Social Group Maps

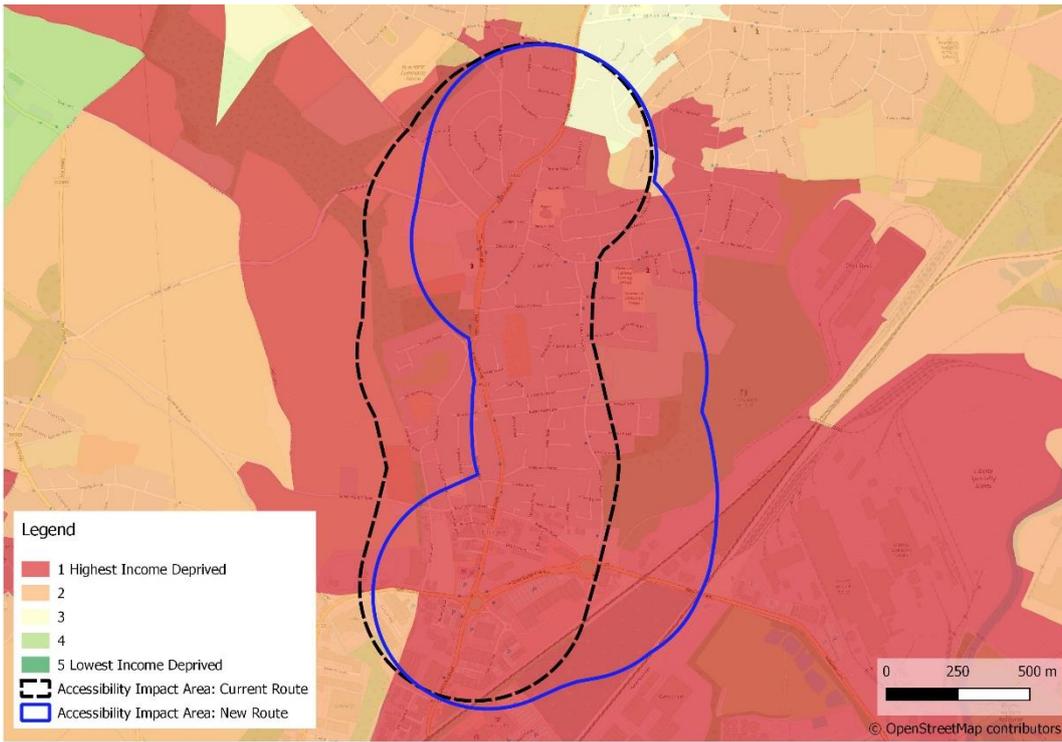


Figure 26. Income deprivation by LSOA in accessibility impact area

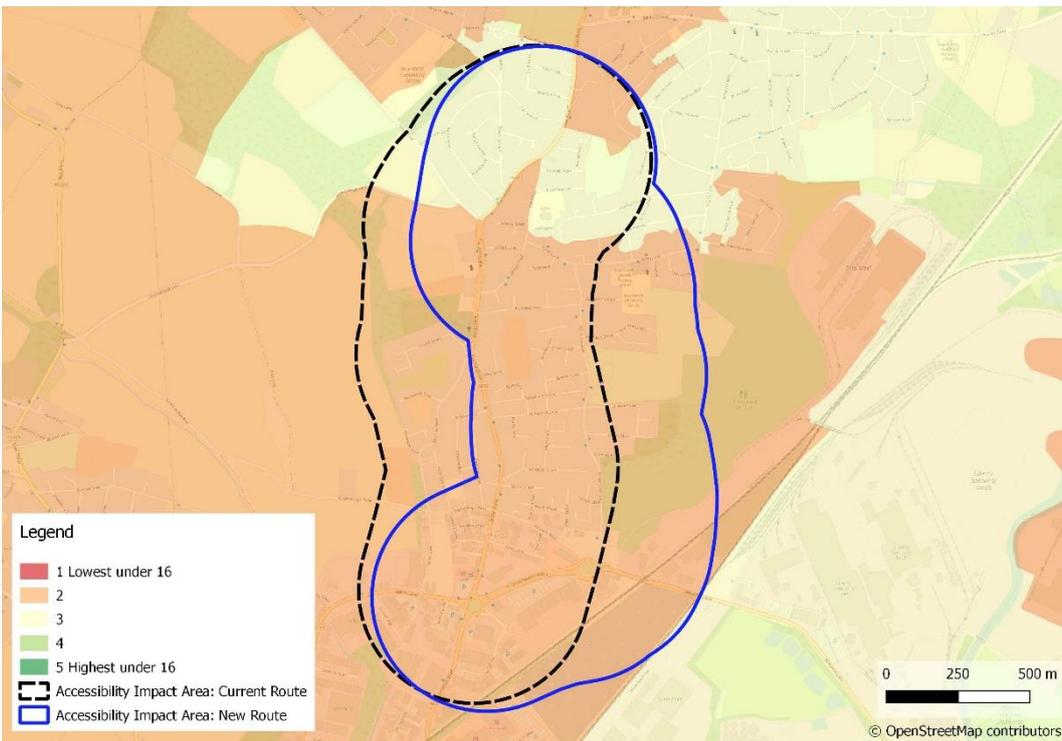


Figure 27. Children proportion by LSOA in accessibility area

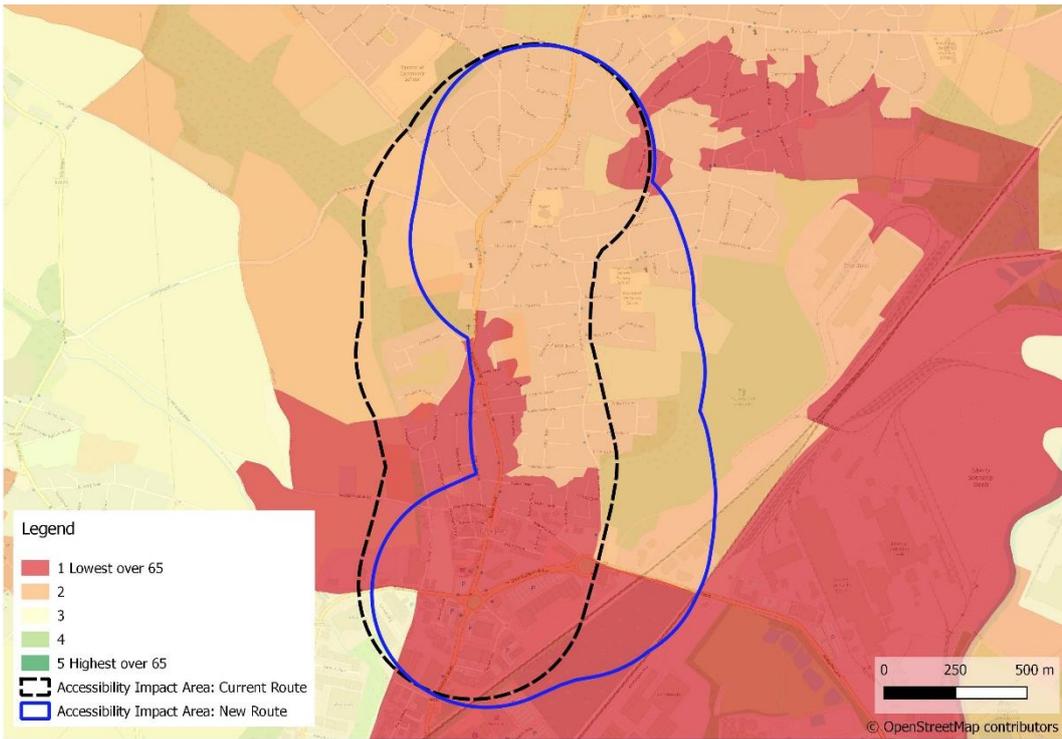


Figure 28. Elderly proportion by LSOA in accessibility impact area

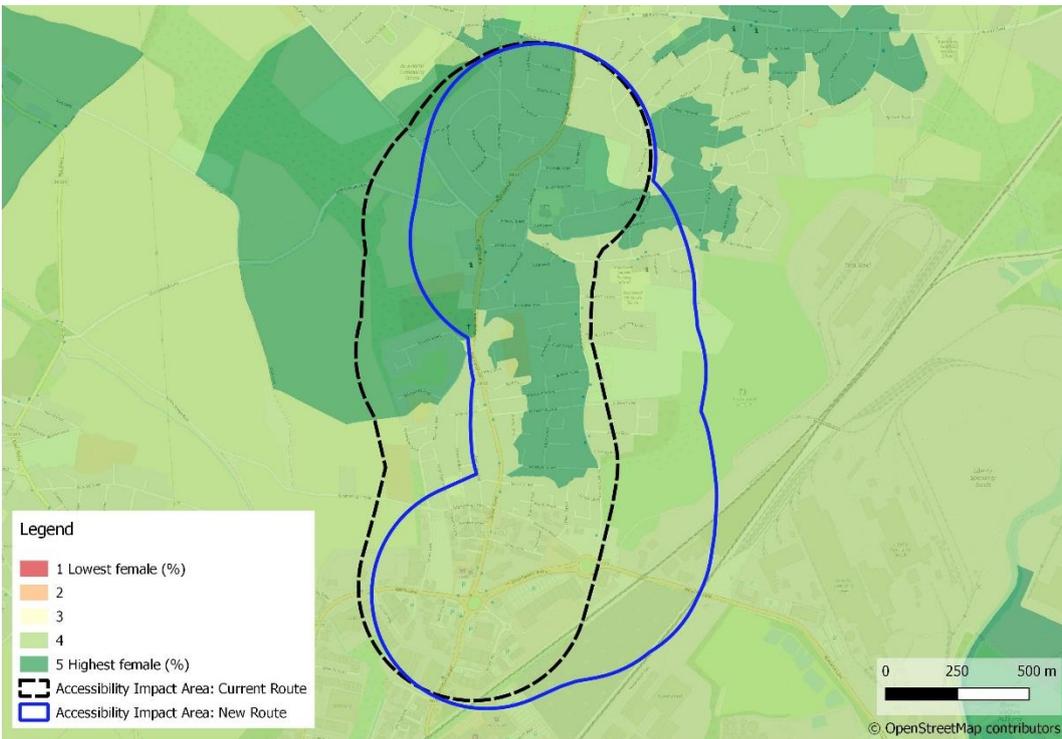


Figure 29. Female proportion by LSOA in accessibility impact area

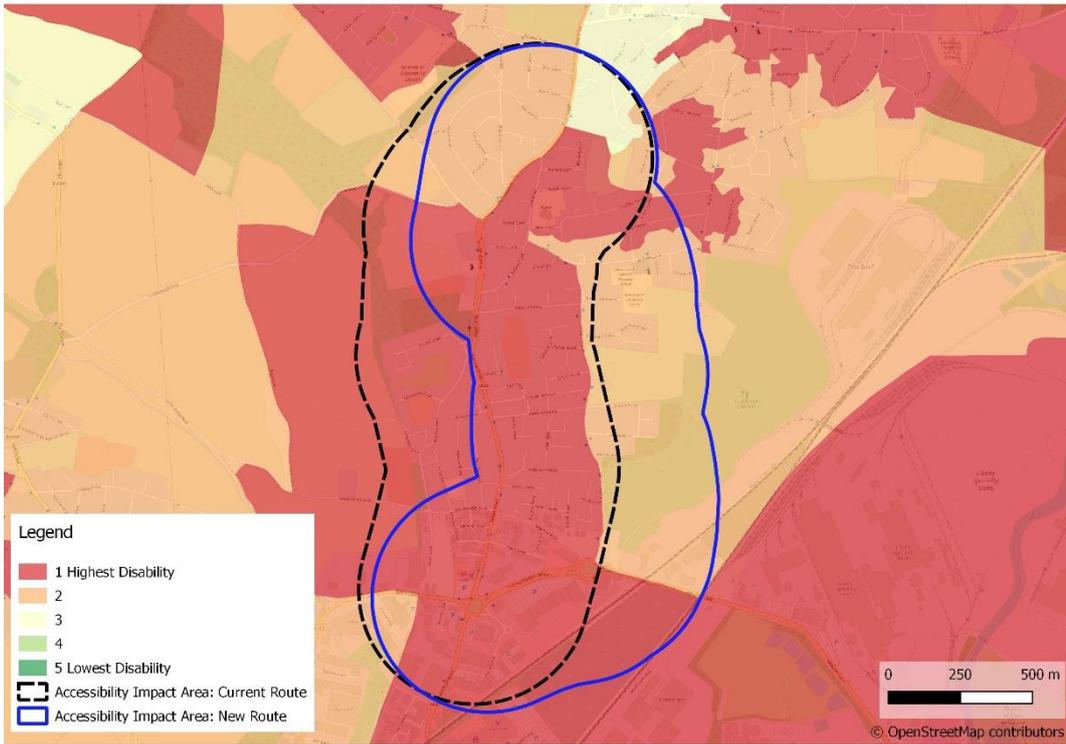


Figure 30. Disability proportion by LSOA in accessibility impact area

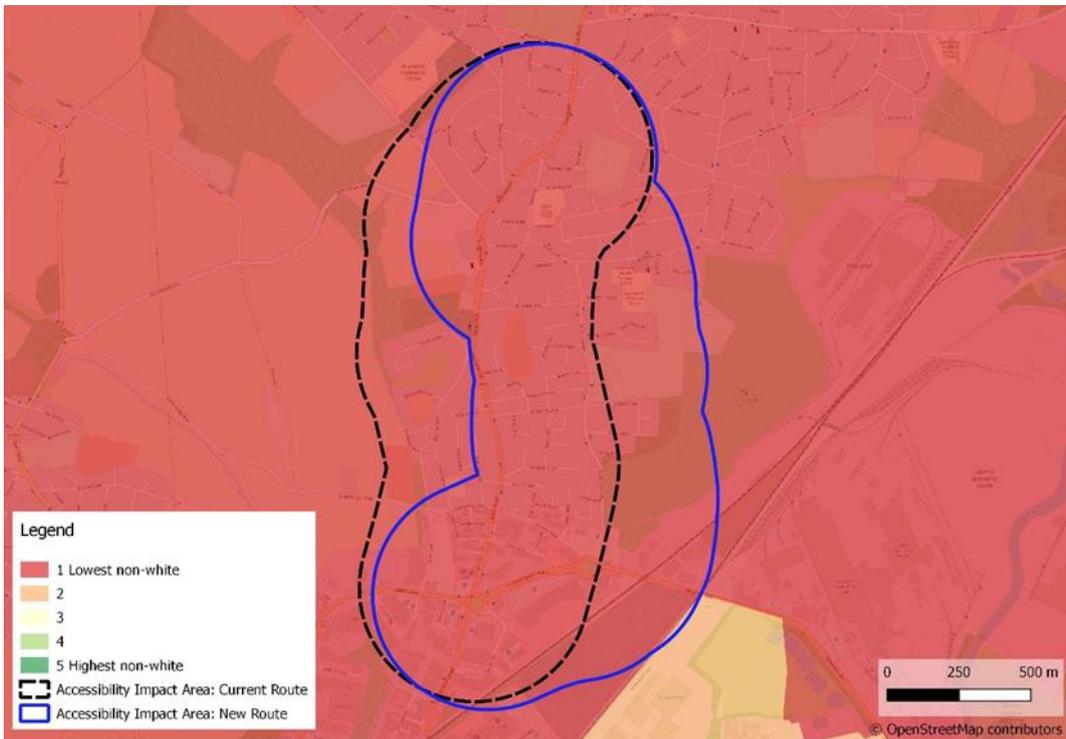


Figure 31. Ethnicity by LSOA in accessibility impact area