Gateshead Council | Newcastle City Council | North Tyneside Council

AIR QUALITY FEASIBILITY STUDY
ECONOMIC CASE

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

2. ECONOMIC CASE

Please refer to the summary position provided by the Tyneside Authorities within the Strategic Case regarding the current modelled option that achieves compliance in the shortest time.

2.1 Introduction

2.1.1 This Economic Case assesses options to identify all their impacts, and the resulting value for money. The economic, environmental, social and distributional impacts of a proposal are all examined, using qualitative, quantitative and monetised information.

2.1.2 To ensure that the most effective solution is implemented efficiently within the Tyneside Authority areas, a comprehensive modelling process was required to assess and evaluate all of the options considered. At this stage, the appraisal tools have been developed in a very short timescale and are subject to future verification through the development of a more robust set of appraisal tools. It is acknowledged that a Preferred Option would be one that achieves compliance to EU standards, whilst minimising the overall impact on residents and businesses.

2.1.3 This Economic Case evaluates the performance of the CAZ options taken forward to the 'short-list' within the SOC and assesses the overall benefits and costs to identify the impacts of each option. The *E1_Tyneside_Economic Appraisal Methodology Report* provides detail in relation to the methodology used for economic appraisal. The *E2_Tyneside_ Economic Model* provides the full set of data sources and assumptions applied in the study, as well as presenting the summary of economic impacts.

2.1.4 The methods applied within the appraisal of each of the CAZ schemes are consistent with the JAQU guidance. In order to ensure results are comprehensive, alternative methods and additional steps have been undertaken to encompass all factors associated with each parameter of the scheme. These are set out in the *E1_Tyneside_Economic Appraisal Methodology Report* .

2.1 Scope of impacts assessed

2.1.1 The CAZ options will have an impact on the economy, environment and society. The economic assessment of each of the schemes seeks to quantify and monetise impacts which will be affected as a result of the implementation of the CAZ schemes. Impacts which have been assessed are set out as follows.

2.1.2 Health and environmental – Changes in NO_x, PM and CO_2

2.1.3 The air quality impact upon the population as a result of changes in emissions such as NO_x and PM. To calculate the economic impact of changes in harmful emissions, an air quality and transport model are used to provide outputs based on the parameters of each CAZ option for CO2, NOx and PM_{10}. As well as harmful emissions resulting from road traffic, results generated by the air quality model are used to calculate the morbidity savings resulting from a scheme.

2.1.4 Upgrade costs

2.1.5 The impact on those vehicle owners which respond to the CAZ scheme by replacing their existing vehicles with a EURO 6 compliant vehicle. These encompass the costs associated with owners switching from a non-compliant to a compliant vehicle, including scrappage costs, transaction costs and consumer welfare impacts, as outlined within the JAQU guidance.

2.1.6 Government costs

2.1.7 As well as costs incurred by road users resulting from the implementation of a CAZ scheme, there will also be costs associated with the implementation and enforcement of a scheme by the authority. This will be based around estimates developed for the Financial Case within the OBC, which presents detailed implementation costs.

2.1.8 Fuel switch costs

2.1.9 Savings or additional costs associated with the implementation of a CAZ scheme. Analysis of transport systems suggests that when a scheme is implemented, road users may choose to change fuel type. This includes any changes in fuel consumption, as well as in operating and maintenance costs.

2.1.10 Greenhouse gas (GHG) impacts

2.1.11 Changes in traffic composition, and the number of vehicles upgrading or cancelling their journeys will have an impact on fuel consumption, which in turn affects the quantum of GHG emissions. This takes into account re-routing of non-compliant traffic, and assesses the impact within the study area and model wide.

2.1.12 Consumer welfare impact

2.1.13 Where road users avoid the charging zone, cancel their journey or switch mode, there will be a cost associated with having to choose alternative modes or routes. Thus, where a trip is cancelled, the road user loses value in the trip that would have been gained if they were able to continue with their original choice of trip. It is assumed that the average cost is therefore equal to half of the charge value, as outlined within JAQU guidance.

2.1.14 Indirect taxation

2.1.15 Indirect tax revenues accrue to the government which perceives those revenues in the factor cost unit amount.

2.1.16 Traffic flow impact

2.1.17 The implementation of a CAZ scheme will have an impact on traffic flow, subsequently impacts road user travel times – this affects the monetisation of road user times. Where vehicles cancel a trip, or are forced to reroute in order to avoid the charging zone, this can lead to re-distribution of traffic elsewhere on the network which can reduce or increase journey times. This is encompassed within the Transport Modelling economic assessment using TUBA, which adheres to WebTAG guidance in the monetisation of benefits, or otherwise, as a result of the scheme.

2.1.18 Impacts not assessed

2.1.19 Given the stage of the study, some economic impacts were not assessed, these include:

- Safety;
- Reliability; and
- Wider economic impacts.

2.2 Tools and data sources

2.2.1 In the analysis of the impacts assessed, as listed above, a number of tools and data sources have been utilised to provide an understanding of the performance of each of the schemes. An overview of tools and data used in the assessment is provided below.

Table 2-1 Tools and data sources used within the analysis

IMPACT	OUTPUTS GENERATED	ECONOMIC VALUES
Health and environment	Outputs for air quality emissions of each option generated using the EfT toolkit.	$PM_{2.5}$ and NOx damage costs are provided within the JAQU guidance documents.
GHG emissions	Combining the number of vehicle upgrades with the vkm (vehicle kilometres) travelled per annum with emission factors provided.	BEIS carbon prices used.
Traffic flow improvements	Flow difference plots across the scenarios, as well as user time benefits resulting from scheme implementation.	Input data such as Value of time provided within the WebTAG databook.
Consumer welfare impact	Traffic flow data showing the number of vehicles impacted within and around the charging zone.	By calculating the number of vehicles that avoid, cancel their journey, or switch mode (unique vehicles), this can be multiplied by half the charge to generate the welfare loss.
Fuel switch costs	Changes to vehicle fleet composition combined with vkm travelled per annum and fuel consumption per km, captured within TUBA.	Fuel prices provided by BEIS and Fuel Consumption from WebTAG databook.
Costs associated with fleet change	Traffic data and JAQU behavioural responses used to define the number of vehicles upgrading from non-compliant to compliant	Vehicle prices and depreciation rates provided within JAQU guidance.
Government costs	Capital and operational costs.	Unit costs associated with the implementation of the scheme.

2.3 Scenarios

2.3.1 The options tested as part of the OBC included a Do Minimum Scenario and three shortlisted CAZ scenarios.

2.3.2 Do Minimum scenario

2.3.3 To provide a comparison for the assessment of the various measures proposed, a 'Do Minimum' scenario has been defined, which consists of schemes within the Early Measures Fund and Clean Bus Technology Fund projects, and other committed and/or fully funded schemes, such as road schemes and junction improvements. Each of the Do Something scenarios been compared with the Do Minimum to ascertain their performance in relation to the Critical and Secondary Success Factors. Table 2-2 provides the assumptions included in the Do Minimum. Further detail can be found in the *E2_Tyneside_ Economic Model*.

Table 2-2 Do Minimum scenario

OPTION	DESCRIPTION
Do Minimum	Public transport upgrade of buses to Euro6 (+) (retrofit/new) Urban Traffic Management Control on selected corridors Expansion of Tyne and Wear UTMC Walking & cycling corridors Car park management information ANPR Planned Road Schemes Housing Infrastructure Fund junctions Fully integrated PT ticketing (multi-modal)

2.3.4 Do Something scenarios

2.3.5 The CAZ options considered within the economic appraisal for the OBC are set out in Table 2-3. Note, it is not expected that any CAZ will be delivered in isolation. Specification of the complementary measures are still under consideration due to the complexities of the impacts and deliverability of each scheme and it is expected that this will be tested in the Full Business Case, both in isolation, and with a CAZ scenario.

Table 2-3 Do Something scenarios

OPTION	DETAILS
CAZ B	Introduced in 2021 CAZ applies to HGVs, taxis, coaches and buses 100% taxi compliance assumed
CAZ C	Introduced in 2021 CAZ applies to LGVs, HGVs, taxis, coaches and buses 100% taxi compliance assumed
CAZ D	Introduced in 2021 CAZ applies to Cars, LGVs, HGVs, taxis, coaches and buses 100% taxi compliance assumed

2.4 Detailed analysis

2.4.1 Government costs

2.4.2 The table below shows the capital expenditure (CAPEX) and operational expenditure (OPEX) for each scenario. CAPEX costs comprise inception costs and roadside costs associated with the implementation of a CAZ scheme. Inception costs includes aspects such as marketing and communications, while roadside costs encompass infrastructural requirements such as ANPR cameras and signage. Operational costs comprise the back-office staff, client interface, management of estate, and management of penalty charge notices.

2.4.3 As noted within the Strategic Case, mitigation has not been factored in due to the uncertain funding environment. These would increase Government costs.

Table 2-4 CAPEX and OPEX Costs for CAZ Operation (£s)

CAZ	COSTS	TOTAL
B	Capital expenditure	£3,592,600
	Operational expenditure	£6,941,324
C	Capital expenditure	£2,842,600
	Operational expenditure	£19,568,797
D	Capital expenditure	£2,842,600
	Operational expenditure	£27,875,224

[1], [2]

2.4.4 Health and environmental appraisal

2.4.5 Air quality emissions

2.4.6 Based on emission concentrations, the table below summarises the cumulative changes in levels of both NO_x and PM_{10}. The below table shows that only CAZ B and C achieve reductions in NO_x. For CAZ D, there is an increase in NOx, likely to be due to the increase in vehicle kms travelled by drivers choosing to avoid the charge and take different routes to get to their destination. This is also represented in the increase in Greenhouse Gases for CAZ D (Table 2-8). All CAZs result in a reduction of PM_{10} tonnes per year.

[1] The costs outlined in the table above have been generated using 2018 prices, in accordance with the JAQU guidance. All benefits, which are summarised in the subsequent section, are also in 2018 prices adapting a consistent approach in the appraisal of each of the schemes.

[2] *Note: C = Capital Expenditure (CAPEX) & O = Operational Expenditure (OPEX)*

Table 2-5 2021 Air quality cumulative effect (tonnes per year)

	NO_X	PM_{10}	NO_X CHANGE (2021)	PM_{10} CHANGE (2021)
Do Minimum	1137.12	114.27	-	-
CAZ B	1126.42	113.57	-10.70	-0.70
CAZ C	1107.97	113.58	-29.15	-0.69
CAZ D	1157.53	112.49	20.41	-1.78

2.4.7 The cumulative air quality changes per tonne per year in 2021, as shown above, have been quantified in terms of monetised benefits using the Defra air pollution valuation tool recommended by JAQU, which accounts for damage costs and calculates figures into 2018 prices based on data entries.

2.4.8 Changes in PM_{10} results are summarised below showing that all three CAZ scenarios have positive benefits, with CAZ D showing the greatest benefit.

Table 2-6 Particulate matter valuation (£s)

CAZ	2021	2022	2023	2024	2025	2026	TOTAL
CAZ B	£61,257	£53,382	£44,946	£36,564	£28,739	£21,825	**£246,714**
CAZ C	£60,037	£52,319	£44,051	£35,835	£28,166	£21,390	**£241,798**
CAZ D	£154,878	£134,967	£113,638	£92,445	£72,661	£55,180	**£623,768**

2.4.9 For NOx, both CAZ B and CAZ C have economic benefits, however CAZ D has a negative impact. This can be attributed to the vehicle mileage, as commercial vehicles are not able to avoid the CAZ as a destination, whereas private vehicle operators respond differently in terms of mode and destination due to increased flexibility in their choices.

Table 2-7 Nitrogen Oxides valuation (£s)

CAZ	2021	2022	2023	2024	2025	2026	TOTAL
CAZ B	£52,434	£45,694	£38,473	£31,298	£24,600	£18,681	**£211,179**
CAZ C	£142,853	£124,488	£104,815	£85,267	£67,019	£50,895	**£575,338**
CAZ D	-£100,021	-£87,163	-£73,389	-£59,702	-£46,925	-£35,635	**-£402,835**

2.4.10 Across each of the scenarios, CAZ C has the most benefits when combining both PM_{10} and NO_x as air quality impact indices. Across both measures of air quality, **CAZ C** has a total of **£817,136** worth of benefits when forecasted over an appraisal period between 2021-2026. **CAZ D** demonstrates £220,933 worth of benefits between 2021-2026.

2.4.11 Greenhouse gas impacts

2.4.12 Changes to people's travel behaviour, including modal shift and vehicle type has an impact on the levels of Greenhouse Gas (GHG) emissions resulting from untraded carbon emissions. The table below presents the cumulative difference in GHGs between the 'Do Minimum' scenario and each of the CAZ schemes.

Table 2-8 2021 GHG cumulative effect (tonnes per year)

	CO2	CHANGE (2021)
Do Minimum	516,917.70	-
CAZ B	512,636.65	-4,281.05
CAZ C	514,824.82	-2,092.88
CAZ D	520,547.67	3,629.96

2.4.13 Based on outputs derived from air quality modelling, CAZ B and C are expected to demonstrate a decrease in CO_2 tonnage per year in 2021 when compared with the 'Do Minimum' scenario. These quantum changes in CO_2 emissions therefore represent a decrease in GHG emissions being within the Tyneside study area.

2.4.14 The changes in carbon tonnes per year outlined with the table above are monetised using the Department for Business, Energy and Industrial Strategy (BEIS) central carbon price per tonne in 2021 (**£69.20**).

2.4.15 When comparing the CAZ options, CAZ B has the most positive economic impact on carbon reductions within the Air Quality Modelled area, with CAZ D resulting in a disbenefit. As with NOx, this disbenefit is likely to be caused by a larger number of non-compliant private vehicles choosing to re-route to avoid the CAZ, increasing the amount of carbon emissions across the network.

Table 2-9 CO_2 valuation (£s)

	2021	2022	2023	2024	2025	2026	TOTAL
CAZ B	£311,604	£271,545	£228,634	£185,994	£146,189	£111,018	**£1,254,983**
CAZ C	£152,334	£132,750	£111,772	£90,927	£71,468	£54,273	**£613,523**
CAZ D	-£264,213	-£230,247	-£193,861	-£157,706	-£123,956	-£94,133	**-£1,064,117**

2.4.16 Transport economic appraisal

2.4.17 Upgrade costs

2.4.18 Upgrade costs comprise vehicle scrappage costs and transaction costs associated with the upgrade of a vehicle by a road user.

2.4.19 As part of the process of upgrading to a compliant vehicle, it is assumed the existing vehicles will be scrapped in order to purchase a newer vehicle. This has been derived by estimating the price of vehicles purchased and scrapped using the depreciation rates, based on the assumption that upgrades resulting from implementation of the CAZ will be made immediately prior to its introduction and realised in 2021 figures. For vehicle owners who purchase a new vehicle, there is a supplementary cost associated with the time and resource expended searching for it. Market inefficiencies including intermediary (dealer) profits are also included. The values have been derived from the data provided by the JAQU.

Table 2-10 Scrappage and transaction costs by vehicle class (£000s)

CAZ	VEHICLE TYPE	SCRAPPAGE COSTS	TRANSACTION COSTS
CAZ B	Car	-	-
	LGV	-	-
	HGV	-£2,819.00	-£0.68
CAZ C	Car	-	-
	LGV	-£1,417.89	-£3.87
	HGV	-£2,819.00	-£0.68
CAZ D	Car	-£12,090.88	-£15.2
	LGV	-£1,417.89	-£3.87
	HGV	-£2,819.00	-£0.68

Table 2-11 Cumulative scrappage and transaction costs (£000s)

CAZ	SCRAPPAGE COSTS	TRANSACTION COSTS
CAZ B	-£2,819.00	-£0.68
CAZ C	-£4,236.89	-£4.55
CAZ D	-£16,327.78	-£19.76

2.4.20 Table 18 and 19, demonstrate upgrade costs associated with a CAZ scheme up to 2021, they summarise that all options result in a negative impact.

2.4.21 Fuel switch costs

Table 2-12 Fuel switch costs

IMPACT	CAZ B	CAZ C	CAZ D
Fuel Switch Costs	-£1,760.08	-£4,120.39	-£8,856.06

2.4.22 The change in fuel switch costs reflects the change in vehicle operating costs to the user. The above table illustrates the costs of switching fuel types based upon the CAZ charging scheme.

2.4.23 The most substantial change in switching of fuel occurs within the CAZ D scenario, because all non-compliant vehicles are charged.

2.4.24 Consumer welfare impacts

2.4.25 In the Do Something models with a clean air zone charge, a number of vehicles choose to re-route to their destination, alter their destination or transfer to rail/metro in order to avoid having to pay the charge. This traffic flow reflects the overall welfare disbenefit as these users are adversely affected by the establishment of the charge. Welfare loss is calculated by subtracting the do minimum flow (i.e. reference scenario with no charge) from do something flows and multiplying by half the CAZ charge (rule of half). This calculation is performed for each Do Something scenario, reflecting the application of charge to the relevant vehicle type. Transfer payments (user toll costs and government revenues) are excluded.

Table 2-13 Consumer welfare loss – behavioural impacts and travel pattern changes

IMPACT	DM	CAZ B	CAZ C	CAZ D
Daily vehicles entering the CAZ (2021)	59,738	58,839	52,486	18,921
Daily vehicles entering the CAZ (2026)	20,958	20,809	18,719	6,633
Welfare loss (vehicles cancelling/avoiding the CAZ) (2021-2026)	NA	-£6,885	-£27,833	-£105,821

2.4.26 Indirect taxation

2.4.27 Indirect taxation Is shown below.

Table 2-14 Indirect taxation (£000s)

IMPACT	CAZ B	CAZ C	CAZ D
Indirect taxation	£848.45	£1,963.17	£24,435.02

2.4.28 The benefits described in Table 2-14 may be a result of increased fuel consumption for longer distance travelled to avoid the charge for non-compliant vehicles.

2.4.29 Traffic flow impact

2.4.30 TUBA has been used to assess the impact of each of the options of traffic flow. The table below summarises impacts on Journey time benefits.

Table 2-15 Aggregated traffic flow impact (£000s)

IMPACT	CAZ B	CAZ C	CAZ D
Traffic Flow Impact	-£1,039.50	-£6,953.07	-£31,502.42

2.4.31 Although each of the CAZ options has an overall disbenefit, when disaggregated into 'compliant' and 'non-compliant' vehicles, there are journey time benefits for compliant vehicles, albeit significantly lower than the disbenefits experienced by non-compliant vehicles.

Table 2-16 Disaggregated Traffic Flow Impact (£000s)

IMPACT	CAZ B		CAZ C		CAZ D	
	Compliant	Non-Compliant	Compliant	Non-Compliant	Compliant	Non-Compliant
2021	-£616.78	-£419.71	-£717.57	-£2,265.54	-£992.87	-£8,616.87
2022	-£344.49	-£326.44	-£323.43	-£1,881.93	-£484.40	-£7,264.47
2023	-£84.24	-£236.18	£52.65	-£1,520.89	£0	-£5,985.78
2024	£163.97	-£150.43	£412.19	-£1,176.40	£463.34	-£4,768.76
2025	£401.66	-£67.70	£756.68	-£846.94	£907.12	-£3,605.91
2026	£630.32	£10.53	£1,089.14	-£531.03	£1,335.86	-£2,489.69
Total (2021-2026)	£150.43	-£1,189.93	£1,269.66	-£8,222.73	£1,229.05	-£32,731.47

2.5 Results of analysis

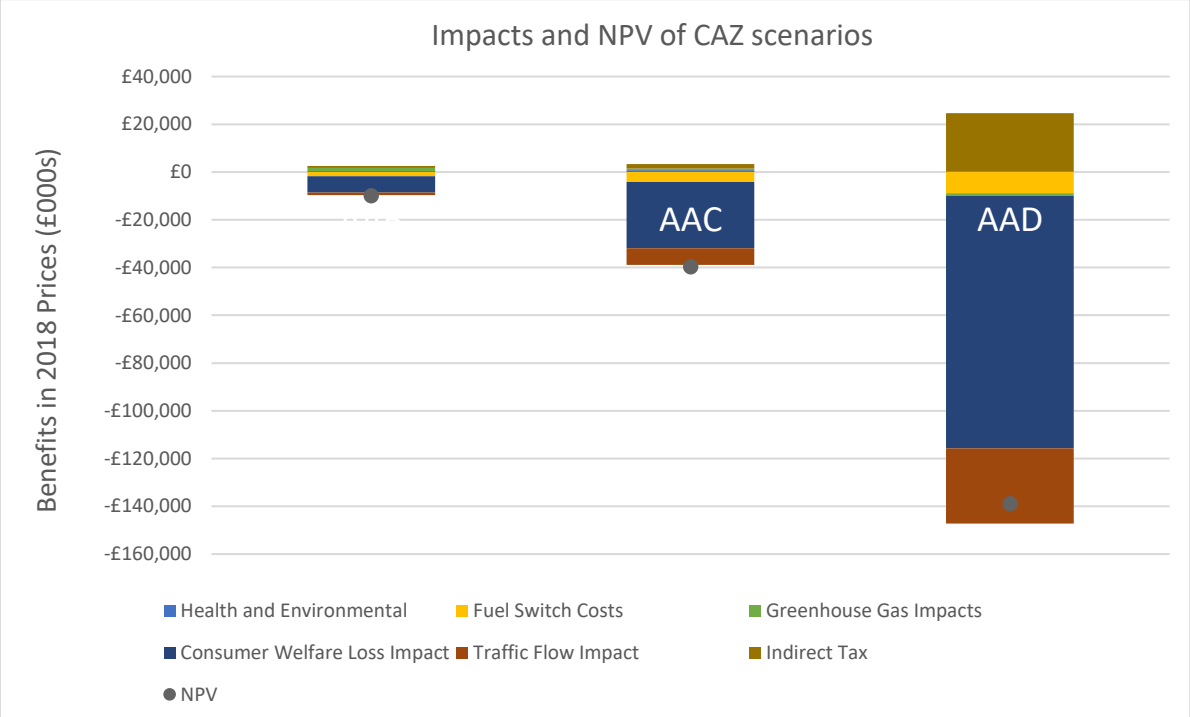
2.5.1 The monetised benefits for each of the CAZ scenarios are summarised within Table 2-17 and Figure 2-1 below. These are estimates of the cumulative benefits accrued over the appraisal period, between 2021 (scheme implementation) and 2026, with the exception of 'upgrade costs' which relate to disbenefits realised prior to the introduction of the scheme.

Table 2-17 Summary of calculated benefits in 2018 prices (£m)

IMPACT	CAZ B	CAZ C	CAZ D
Government costs	6.9	19.6	27.9
Health and environment	0.5	0.8	0.2
Upgrade costs	-2.8	-4.2	-16.3
Fuel switch costs	-1.8	-4.1	-8.9
Greenhouse gas impacts	1.3	0.6	-1.1
Consumer welfare loss impacts	-6.9	-27.8	-105.8
Indirect tax	0.8	2.0	24.4
Traffic flow impact	-1.0	-7.0	-31.5
NPV	**-9.9**	**-39.8**	**-138.9**

**Government Costs not included in NPV or in Figure 2-1*

Figure 2-1 Comparison of the options



2.6 Distributional and equality impact analysis

2.6.1 A *E3_Tyneside_Distributional Analysis Methodology Report* details the methodology and process used to undertake the distributional impacts analysis.

2.6.2 The report discusses the impacts specifically on air quality, businesses and households.

2.6.3 Air quality

2.6.4 The charging options deliver an overall reduction in NO_2 concentrations, with CAZ D showing the highest impact within the CAZ domain. However, due to rerouting outside the CAZ boundary, the CAZ D also shows the lowest reduction in air pollutant concentrations across the full modelled domain, and the largest number of Lower Super Output Areas (LSOAs) with a deterioration in air quality. This effect has important distributional implications for the options.

2.6.5 CAZ B and C could initially be observed to have a progressive impact: greater numbers of LSOAs and population see an improvement in air quality for the lowest income domain (IMD) quintile. However, it is difficult to pick out a defined trend of winners and losers given that the number of LSOAs vary between quintiles: e.g. indeed for IMD, the lowest quintile sees the greatest number of LSOAs and population with improving air quality, but also the greatest numbers observing worsening air quality. The WebTAG quintile analysis adds further insight here as it considered the proportion of winners and losers relative to the proportions in the overall population. For CAZ B and C, no distributional impact is observed as the populations that benefit are in line with their proportion of the population as a whole. This is the case for both IMD and proportion of children.

2.6.6 However, looking within these results, a trend does emerge: the improvement in air pollution appears to be higher for less deprived LSOAs and those with fewer children. Hence CAZ B and C are unlikely to have a regressive impact (as most LSOAs see an improvement), but they do not deliver a progressive impact either.

2.6.7 Conversely, CAZ D appears to have a regressive impact:

- In terms of a simple LSOA and population count, there are a greater number of LSOAs and population in the lowest IMD quintile (most deprived) and highest children quintile (most children) that observe a worsening of air quality, rather than an improvement;
- Under the quintile analysis, there is a lower proportion of net winners in the poorest IMD quintiles and the quintiles with the greatest numbers of children, relative to the share of those quintiles of the overall population, i.e. under CAZ D, poorer LSOAs and LSOAs with greater numbers of children are proportionally worse off; and
- Again where improvements are observed, the size of the air quality improvement is higher for those in less deprived LSOAs and those with fewer children.

2.6.8 Impacts on businesses

2.6.9 The extent to which businesses will be affected by the CAZ will depend on the type of business, its location, size and price sensitivity. The majority of the actions that businesses can take in order to meet the new regulations will incur a cost. Smaller firms and sole traders

are usually more price sensitive and therefore are likely to be the most affected, as a result of the CAZ charge.

2.6.10 Under a CAZ D, all vehicle types will be impacted, however, a CAZ B and C will directly impact businesses rather than households. All vehicles will see a rise in operating costs as a result of the charge. Upgrading or retrofitting vehicles will be an action taken by many businesses, whilst other, generally larger firms, might redistribute their fleet.

2.6.11 Smaller HGV firms in general will be impacted more than larger firms. This is due to their limited financial resources and size of area in which they operate. Larger firms could redistribute their fleet to areas where there is no CAZ, whereas smaller firms might only operate within the CAZ and so will be subject to upgrading their fleet or paying the charge. Smaller firms usually upgrade their fleet less often than larger firms. Upgrading vehicles before they might usually do so will impose a significant additional cost to these firms and will impact heavily on firm's profitability.

2.6.12 Tyneside Authorities have successfully secured the Clean Bus Technology Funding (CBTF), which will minimise the impact on local buses following the implementation of the CAZ. Meanwhile, Gateshead Metropolitan Borough Council has also secured funding from the Air Quality Grant Fund, part of which will assist taxi drivers in reducing their emissions. Self-employed taxi drivers may still be negatively affected by the charge if they personally do not receive this government funding, as their cash availability to upgrade their vehicle is minimal. If they don't upgrade or retrofit their vehicle they will not be able to compete as effectively in the market place against rival taxi firms.

2.6.13 There is a risk that some firms might reduce their activity within the CAZ or even cease trading as a result of the additional costs placed on them. Firms who simply move their business away from the CAZ may simply be contributing to a displacement in emissions from the CAZ to more suburban areas; ultimately making no difference to air quality itself within the wider local area. However, within the context of a CAZ, it is expected that most businesses, utilising government funding wherever possible, will look to upgrade their vehicles and business activity to lower emission options. The type of CAZ implemented will ultimately determine the extent to which businesses will be impacted and the level to which air quality might improve.

2.6.14 Impacts on households

2.6.15 All CAZ options will have some regressive impacts on households through CAZ compliance costs. All options place costs on:

- Buses: which are used more so by poorer households, the young (0-16) and the elderly (60+)
- Taxis: which are often relied upon by disabled persons who are unable to drive, and hence could also face a disproportionate share of any costs passed through.

2.6.16 In addition, the CAZ D will have a direct impact on household affordability through charges placed on cars.

2.6.17 Some level of cost will fall on all LSOAs. That said, poorer households tend to own older vehicles and so are more likely to have a non-compliant car. However, both the quantitative

analysis and the WebTAG quintile analysis illustrates that the direct impacts of the CAZ D will fall greatest on:

- the least deprived population (quintile 5 of IMD), with costs then decreasing as one moves up the IMD quintiles;
- lowest proportion of under 16s (i.e. LSOAs with an older adult demographic);
- lowest ratio of "non-white" people; and
- highest ratio of persons with disabilities.

2.6.18 In this case, the groups which experience greater effects mirrors those demographic groups which make a greater number of trips to the CAZ area, those living north-west of Newcastle city centre.

2.6.19 It is important to note that even if costs are smaller for the most deprived quintile of the population, those costs might represent a greater proportion of budget and therefore a greater impact. Furthermore it is important not to overlook a narrative regarding 'potential' trips: the reason poorer households are less affected under this analysis is they make less trips to areas of employment in the centre of the city. This is potentially due to lower employment rates in more deprived areas, or lower employment rates in higher salaried jobs in the city centre. The CAZ could present a further barrier preventing achievement of employment (or higher paid employment) in the city centre.

2.6.20 Equality Impact Assessment

2.6.21 An Equality Impact Assessment (EqIA) was also carried out and is included in the *E3_Tyneside_Distributional Analysis Methodology Report.* It found that the impacts from the CAZ charge might negatively affect some vulnerable groups, such as the elderly, young and disabled. This could be due to some taxis and public transport services passing on the additional costs from the charge to their customers; or they may even cease operation within the CAZ altogether. These more vulnerable individuals rely on these services to help them move from place to place and so with a higher charge for the service or the removal of services completely, these individuals will have their ability to move freely, stifled. It is suggested that the Tyneside Authorities invest in affordable, sustainable transport, as well as delegating the various government funds to public transport and taxi operators, in order to try and prevent this increased cost and possible reductions in services.

2.6.22 Overall, the policy will not discriminate against any particular group, as an improvement in air quality will not benefit one group more than others. The CAZ scheme will take any necessary steps to ensure the equality of opportunity in regard to affordability, accessibility and availability of transport options, irrespective of age, race, sex, religion, sexual orientation, marriage, pregnancy or disability.

2.7 Risk and uncertainty

2.7.1 There are delivery risks associated with the options presented, that have the potential to limit their effectiveness or act as a barrier to their implementation. These risks largely fall into the following categories:

- Public and political acceptability
- Co-operation with other bodies
- Procurement
- Unrealistic cost estimates
- Land take
- Environmental constraints, such as archaeology, biodiversity and landscape issues
- Legal challenge

2.7.2 The possible risks for the CAZ and non-CAZ options have been identified and then assessed based on their likelihood and impact, in both time and monetary costs. Each risk has been scored on a scale of 1 to 5 for both likelihood and impact, and the product of these values provided the overall risk grade. Relevant mitigation measures that are proportionate to the risk have also been proposed. This information is detailed in the relevant risk registers, which are provided in Appendix A2.2.

2.7.3 The most significant risks associated with non-CAZ options are:

Table 2-18 Non-CAZ Key Risks

RISK	RISK TYPE	DESCRIPTION
Public and political acceptability	Project Programme Environmental	Scheme design. Education about alternative modes / supporting measures to reduce impact.
Full Business Case	Project Programme	Early resolution of any procurement procedures for production of FBC, continued development of FBC while awaiting feedback from JAQU on OBC.
Procurement	Programme Project	Detailed procurement strategy required.
Exceedances remain	Project	Continued monitoring / evaluation. Review of the scheme, sensitivity tests to ensure that objectives are met across a variety of scenarios.
Legal challenge	Project Programme	Seek independent legal advice throughout the process - including during OBC & FBC.

2.7.4 The most significant risks associated with CAZ charging options are:

RISK	RISK TYPE	DESCRIPTION
Legal challenge	Project Programme	Seek independent legal advice throughout the process - including during OBC & FBC.

RISK	RISK TYPE	DESCRIPTION
Scheme costs based on outline scheme and market estimate	Cost	Understanding from other authorities' likely costs. Work up design of scheme.
Public and political acceptability of queue relocation	Project Programme Environmental	Scheme design. Education about alternative modes / supporting measures to reduce impact.
Full Business Case development	Programme Project	Early resolution of any procurement procedures for production of FBC, continued development of FBC while awaiting feedback from JAQU on OBC.
Procurement	Programme Project	Detailed procurement strategy required.
Exceedances remain	Project	Continued monitoring / evaluation. Review of the scheme, sensitivity tests to ensure that objectives are met across a variety of scenarios.

2.8 Project dependencies

2.8.1 The main risk associated with the project is represented in trying to achieve compliance in the shortest time possible. As the CSF is to deliver a scheme that will improve air quality across the Tyneside Authorities in the shortest time possible, there are a number of dependencies around which the project is based – Table 26 summarises these dependencies:

Table 2-19 Project Dependencies

DEPENDENCY FACTOR	REASON
Central Government	National polices/incentives to support move from diesel across all sectors.
Highways England	Potential exceedances on the Strategic Road Network.
Transport for the North	Development of the Strategic Transport Plan and investment strategy and delivery of strategic transport interventions in the North East that could change travel patterns and emissions.
Bordering local authorities	Adverse distributional impact on neighbouring authorities.
Bus companies	Upgrade to fleet.

DEPENDENCY FACTOR	REASON
Taxi and private hire licencing	Upgrades to fleet.
Freight	Upgrades to fleet or other measures to reduce adverse impact on air quality.
DVLA	Accessing necessary information.
JAQU	Approval of AQ Plan and release of funding.
Local population	Changes to sustainable modes.
Economy	Greater prosperity results in more people owning and using cars. Global economic and political trends affecting fuel prices will impact on the costs of running a car and also bus fares.

2.8.2 There are a number of committed interventions which should be coordinated in a way which avoids any disproportionate disruption to traffic. The committed schemes summarised in Table 2-20 below are assumed to be delivered prior to the expected 2021 implementation date of the scheme within this OBC paper.

Table 2-20 Committed schemes across the Tyneside Authorities

LOCAL AUTHORITY	JUNCTION IMPROVEMENT	STATUS
North Tyneside	A189 Salters' Lane Improvement Scheme	
	NBotT - A193 Tynemouth Road / Churchill Street	Under construction
	A191 Holystone Bypass (inc B1505 Rbt and ASDA Rbt)	Under construction
	A189 / A1056 Weetslade Roundabout	Programmed for April 2019 start and November completion
	A186 Station Road Corridor	Programmed to Start in early 2019 once A19 Silverlink is complete
	A19 Silverlink	Under construction
	A1056 Rotary Way / Great North Road	Estimated 2020 end date

LOCAL AUTHORITY	JUNCTION IMPROVEMENT	STATUS
	Murton Gap - Main Access (A191 between Park Lane and Norham Road)	Programmed for 2019 start linked to HIF funding
	Murton Gap - Secondary Access (limited to 250 units)	Programmed for 2019 start linked to HIF funding
	Murton Gap - Link Road connection (A186)	Estimated 2022 end date
	Killingworth Moor - Northern Access (A1056)	Programmed for 2019 start linked to HIF funding
	Killingworth Moor - A19 Killingworth Interchange	Programmed for 2020 start linked to HIF funding
	Killingworth Moor - B1505 Access (Forest Gate)	Programmed for 2019 start linked to HIF funding
	Killingworth Moor - B1505 Great Lime Road approach to A191 Rbt	Programmed for 2020 start linked to HIF funding
	Killingworth Moor - Link Road (southern section)	Estimated 2022 end date
	Killingworth Road	Expected to start in Summer 2018
Newcastle	Killingworth Road Improvements	Under Construction
	Stamfordham/A1 Junction (9)	Detailed Design and Implementation
	Brunton Lane/Brunton Road Junction (22)	Detailed Design and Implementation
	Blucher Interchange (38)	Detailed Design and Implementation
	Stamfordham Road / Pooley Road Junction (41)	Detailed Design and Implementation

LOCAL AUTHORITY	JUNCTION IMPROVEMENT	STATUS
	Stamfordham Road / Springfield Road Junction (42)	Detailed Design and Implementation
	Ponteland Road / Station Road Junction (52)	Detailed Design and Implementation
Gateshead	Blaydon roundabout	Under Construction
	Watermark junction	Complete
	Sunderland Road Link	Under Construction
South Tyneside	A194 / B1306 Mill Lane Roundabout Improvement Scheme (NPIF)	Funding from DfT
	A19 / A194 to A19/A185 Lane Gain/Lane Drop Arrangement (NPIF)	Funding from DfT
Sunderland	Sunderland Strategic Transport Corridor Phase 2	Under Construction/Complete
	Northern Spire Bridge	Complete
	Northern Gateway	Under Construction