Bath Clean Air Plan

Bath and North East Somerset Council

Distribution and Equalities Impact Analysis

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1. Introduction

Poor air quality is the largest known environmental risk to public health in the UK[1]. Investing in cleaner air and doing more to tackle air pollution are priorities for the EU and UK governments, as well as for Bath and North East Somerset Council (B&NES). B&NES has monitored and endeavoured to address air quality in Bath, and wider B&NES, since 2002. Despite this, Bath has ongoing exceedances of the legal limits for Nitrogen Dioxide (NO_2) and these are predicted to continue until 2025 without intervention.

In 2017 the government published a UK Air Quality Plan for Nitrogen Dioxide[2] setting out how compliance with the EU Limit Value for annual mean NO2 will be reached across the UK in the shortest possible time. Due to forecast air quality exceedances, B&NES, along with 27 other Local Authorities, was directed by Minister Therese Coffey (Defra) and Minister Jesse Norman (DfT) in 2017 to produce a Clean Air Plan (CAP). The Plan must set out how B&NES will achieve sufficient air quality improvements in the shortest possible time. In line with Government guidance B&NES is considering implementation of a Clean Air Zone (CAZ), including both charging and non-charging measures, in order to achieve sufficient improvement in air quality and public health.

Jacobs has been commissioned by B&NES to produce an Outline Business Case (OBC) for the delivery of the CAP; a package of measures which will bring about compliance with the Limit Value for annual mean NO2 in the shortest time possible in Bath. The OBC assesses the shortlist of options set out in the Strategic Outline Case[3], and proposes a preferred option including details of delivery. The OBC forms a bid to central government for funding to implement the CAP.

This Distributional and Equalities Impact Analysis Report is written to support the OBC and outlines the overarching framework and detailed analysis that underpins the assessment of the potential differential impacts of the Bath Clean Air Plan on relevant socio-economic groups. It presents the key assumptions, approach and structure of the impact analysis, leading to an identification of particular distributional and equality issues and concerns that are addressed in the Economic Case of the Outline Business Case (OBC).

Within this context, this report should be reviewed alongside the Economic Case presented in the OBC. The Economic Case itself outlines the key results of the economic appraisal and any requirements for mitigation, whilst this appendix focusses primarily on the methodology and background data underpinning the analysis.

1.1 Purpose of the Impact

The UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations (Defra/DfT July 2017) acknowledges that air quality issues, and NO_2 exceedances in particular, are highly localised. As such it is recommended that any interventions proposed to improve air quality should attempt to minimise their impact on local groups and businesses, especially vulnerable socio-economic groups. In line with JAQU's Options Appraisal Guidance (2017), the key local groups and businesses of interest are:

- Low income households;
- Children and young people;
- Elderly residents;
- Residents suffering from illness and disability;
- Female residents;
- Residents from ethnic minority groups; and
- Businesses, including small and medium enterprises (SMEs) and taxi/private hire firms.

[1] Public Health England (2014) Estimating local mortality burdens associated with particular air pollution. https://www.gov.uk/government/publications/estimating-local-mortality-burdens-associated-with-particulate-air-pollution
[2] https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017
[3] Bath and North East Somerset Council Clean Air Plan: Strategic Outline Case, March 2018 (http://www.bathnes.gov.uk/sites/default/files/siteimages/Environment/Pollution/strategic_outline_case_bath_28.03.2018_with_annexes.pdf)

The purpose of the report is to identify any positive or negative impacts of the proposed scheme on these interest groups. The social groups listed above (i.e. the first six groups listed) are included in the assessment to fulfil B&NES' statutory obligations under the Equality Act 2010. They include people with protected characteristics who may have less ability to adapt to the interventions proposed as part of the Bath CAP. The businesses referred to in the list above are included in the assessment as the charging CAZ element of the Bath CAP will produce direct costs to businesses. It may not be possible for some SME's to absorb these additional costs, meaning specific consideration of distributional impacts on these business groups is also required.

Establishing the specific impacts of the scheme on the groups listed above will help determine whether the scheme unduly advantages or disadvantages a particular group. This will enable recommendations about requirements for mitigation to address certain impacts or for more fundamental amendments to the scheme.

1.2 Report Structure

Within this context, the report is structured as follows:

- Chapter 2 presents the assessment methodology, drawing on JAQU's Options Appraisal Guidance, which in turn is informed by DfT's WebTAG unit A4-2 'Distributional Impact Appraisal'.
- Chapter 3 presents the screening stage of assessment, providing additional detail on the types of socio-economic groups and impact variables considered in the assessment.
- Chapter 4 outlines the socio-economic context in B&NES, which establishes the prevailing conditions within which socio-economic groupings and potential impacts can be assessed.
- Chapter 5 presents the distributional and equalities impact analysis
- Chapter 6 summarises the key findings of the assessment
- Chapter 7 summarises the proposed measures for mitigation.

2. Methodology

2.1 Approach

In accordance with JAQU's Options Appraisal Guidance and WebTAG unit A4-2, a three-step approach has been used for the distributional impact appraisal. These three steps involve:

- Step One - Screening: At this stage, the variety of impacts that the policy might have is considered and particular impacts are prioritised for further analysis so that only the most relevant indicators for the scheme are appraised to ensure proportionality.
- Step Two - Assessment: At this stage, information is collected on the geographical area likely to be affected by the policy and how different social and business groups are distributed within that geographical area.
- Step Three - Appraisal: At this stage, an assessment is made as to the extent of the impact of the policy on the social groups identified.

Many different methods including quantitative analysis of statistics and modelling outputs, spatial analysis of geographical datasets and qualitative appraisal drawing on available information and research is acceptable according to TAG guidance. JAQU guidance however, notes that 'light touch' appraisal is sufficient on some occasions, rather than the detailed guidance of TAG A4-2. This report will determine the impacts likely to be associated with the CAZ and what analysis would be best suited to investigating these impacts, depending on the data available and how sensitive the issue is to the CAZ project in Bath.

2.2 Identification of Study Area

A layered approach to identifying the study area for the assessment was adopted. This reflects the potential variation in spatial extent of any impacts that materialise. An immediate study area was defined as B&NES local authority area. A wider study area was also defined, covering B&NES and the other administrative areas forming the West of England sub-region (i.e. Bristol, South Gloucestershire and North Somerset). Further, Wiltshire was also included within the wider study area, due to its adjacent geographical position to B&NES and the high level of traffic flows between the two administrative areas[4]. The two study areas are outlined in Figure 2.1. The analysis presented in this report uses the appropriate study area definition based on the socio-economic group and impact variable being considered.

[4] Wiltshire represents the primary source of commuting inflows and the third most common destination of commuting outflows from B&NES, based on Census 2011 Journey to Work data

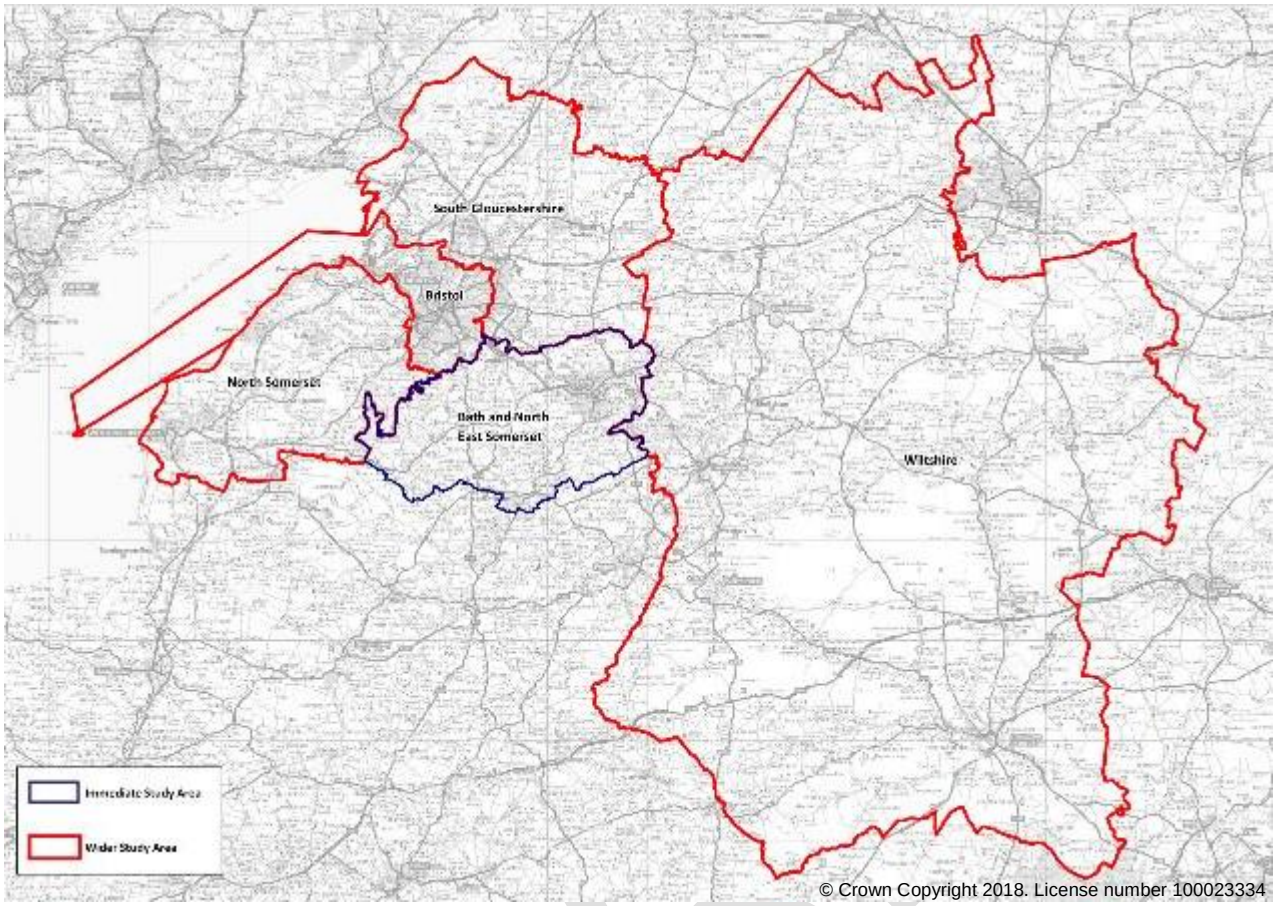

Figure 2.1. Study Area

2.3 Distributional Impact Assessment Criteria

In order to understand whether or not a particular group is being unduly disadvantaged by the proposed option, it is necessary to understand whether impacts are disproportionate. In order to investigate whether impacts are disproportionate, it is necessary to obtain an understanding of how impacts are occurring, whether they are acceptable or whether the option should be altered or mitigated. The following scale is used as a guide to determine the scale and extent of an impact.

Note that the assessment scoring outlined in Table 2.2 is undertaken relative to population sizes, comparing the proportion of net winners or losers in each socio-economic quintile to that socio-economic quintile's share of population in B&NES. Therefore, a larger score (of "✓✓✓" or xxx") is indicative of impacts falling disproportionately on a particular quintile relative to that quintile's population share across B&NES as a whole. So if 20% of an impact falls on socio-economic quintile x, but socio-economic quintile x only form 10% of the study area population, a large assessment score will be recorded.

Table 2.2. Distributional Impact Assessment Criteria

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

2.4 Appraisal Methodology

In line with JAQU's Options Appraisal Guidance, three core distributional impact variables have been identified as most relevant to the Bath CAP proposals; these are:

- Air Quality: The primary objective and critical success factor of the scheme is to improve air quality by ensuring compliance with NO_2 limit values and objectives. Therefore, the differential impacts of changes in air quality spatially and across socio-economic groups is an essential element of analysis.
- Accessibility: The charging CAZ element of the scheme could induce changes in travel patterns and behaviours by imposing a charge on non-compliant vehicles. As such, it is necessary to establish whether changes in accessibility will disproportionately affect the socio-economic groups of interest.
- Affordability: The charging CAZ element of the scheme will impose direct costs on local people and businesses who use non-compliant vehicles. As such, it is necessary to establish whether changes in accessibility will disproportionately affect the socio-economic groups of interest.

2.4.1 Method of Assessing Air Quality

Within the Outline Business Case (OBC) the economic analysis of air quality impacts has been undertaken following the Damage Cost Approach. This approach applies damage costs to changes in emissions data to monetise the impact of air quality improvements. For consistency, the distributional analysis pivots from the same approach, utilising changes in emissions data (as forecast at monitoring locations across the study area) to determine where air quality impacts would be most significant. This information was then overlaid on the spatial distribution of socio-economic groups to determine the variance in air quality impacts.

2.4.2 Method of Assessing Accessibility

Distributional impacts associated with changes in accessibility were assessed using qualitative and quantitative components. From a qualitative perspective, a mapping exercise that highlighted the spatial distribution of relevant socio-economic groups in comparison to the location key trip destinations (e.g. places of work and public amenities like schools, health facilities, playgrounds/parks etc) was undertaken, to highlight key corridors and arterial routes for the socio-economic groups of interest. From a quantitative perspective, outputs from DfT's Transport User Benefits Assessment (TUBA) software were utilised. These outputs determine the change in journey time and vehicle operating costs between combinations of Lower Super Output Areas (LSOAs[5]). Cross-referencing with the qualitative mapping exercise allows for estimation of different travel times and vehicle operating cost impacts between LSOAs with high concentrations of particular socio-economic groups and key trip destinations.

2.4.3 Method of Assessing Affordability

A similar approach to the accessibility assessment was adopted for assessing affordability. The TUBA outputs, particularly focused on vehicle operating costs and the cost of the CAZ charges, were distributed across LSOAs with high concentrations of particular socio-economic groups based on the mapping exercise described above.

[5] LSOAs are geographical areas that are used to report small area data.

3. Screening

3.1 Screening for Distributional Impacts

JAQU's Options Appraisal Guidance (2017) states that as a minimum, the following impacts should be investigated:

- Air Quality: Changes in the ambient concentrations of air pollutants that will affect the health of local people.
- Affordability: Changes in the costs of individuals or businesses using their vehicles or public transport.
- Accessibility: Changes to the ability and ease of individuals or businesses to get to places of work, social networks and public amenities.

3.2 Relevant Grouping Variables

The Guidance also outlines the interaction between impact variables and socio-economic groups (replicated in Table 3.1). The matrix overleaf provides an indication of how the impact variables and socio-economic groups can be grouped. It outlines the basis for understanding which impacts should be appraised for each socio-economic group.

Table 3.1: Impact categories in scope for each social or business group

Social or Business Group	Air Quality	Accessibility	Affordability	Justification for Screening
Deprivation / income	X	X	X	Low income households may be less able to adapt to the impacts of the Bath CAP. They may be less able to afford to replace vehicles, thus limiting their accessibility and connectivity. Further, low-income households are less likely to own motor vehicles, so any existing accessibility issues are likely to be exacerbated[6]. A higher concentration of non-compliant vehicles in low-income neighbourhoods may also impose localised air quality issues.
Children	X	X		Children and young people may be more vulnerable to the health impacts of air pollution[7]. Further, children require access to a range of key amenities (e.g. schools), so any change in accessibility could hinder their ability to reach such facilities.
The Elderly	X	X		Elderly people require access to a range of key amenities (e.g. health facilities), so any change in accessibility could hinder their ability to reach such facilities. Further, there is evidence to suggest that the elderly are disproportionately affected by the public health impacts of air pollution[8].
Disabled People		X		Disabled people are likely to have concerns over access to a range of key amenities (e.g. health facilities), so any change in accessibility could hinder their ability to reach such facilities.

[6] Census 2011 Table DC6403EW suggests 14% of residents aged 16-64 in B&NES have no access to a motor vehicle, but 27% of such residents ranked in the lowest social grades (i.e. grade D and E) do not have access to a car. Social grade is a proxy for income deprivation. Therefore residents in income deprived areas are nearly twice as likely not to have access to a motor vehicle

[7] World Health Organization (2013) *Review of evidence on health aspects of air pollution – REVIHAAP Project: final technical report.* http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/publications/2013/review-of-evidence-on-health-aspects-of-air-pollution-revihaap-project-final-technical-report

[8] Simoni et al., Adverse effects of outdoor pollution in the elderly, Journal of Thoracic Disease, January 2015 (URL:https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4311079/)

Social or Business Group	Air Quality	Accessibility	Affordability	Justification for Screening
Females		X		Females may be less likely to have access to a car[9] and are therefore more reliant on public transport. Any change in accessibility associated with the proposed scheme could further reduce their connectivity.
Ethnic Minorities		X		Ethnic minority groups may be less likely to have access to a car[10] and are therefore more reliant on public transport. Any change in accessibility associated with the proposed scheme could further reduce their connectivity.
Businesses - SMEs			X	SMEs may struggle to absorb the direct costs (e.g. CAZ charge) associated with implementing the scheme
Businesses – LGVs/HGVs			X	LGVs and HGVs represent a significant number of business trips. Owners of non-compliant LGVs and HGVs may struggle to absorb the direct costs (e.g. CAZ charge) associated with implementing the scheme
Businesses - Taxis			X	Taxis may struggle to absorb the direct costs (e.g. CAZ charge) associated with implementing the scheme

[9] Census 2011 Table DC4109EW1a suggests 57% of people residing in households without access to a car in B&NES are female. Females form 51% of the B&NES population. Therefore, women are more likely to lack access to a car relative to men.

[10] Census Table DC4203EW indicates that 15% of residents in 'white' households do not have access to a motor vehicle. In comparison, 30% of residents in ethic minority households do not have access to a motor vehicle. Therefore, ethnic minorities are twice as likely to not have access to a motor vehicle relative to the white population.

4. Socio-economic Context

4.1 Social Groups and Demographics

4.1.1 Population Size

The population of B&NES was estimated at 188,678 in 2017 (ONS Population Estimates), an increase of more than 9% since 2007. Population density in B&NES varies between the city centre core and the rural hinterland. The city centre core, which is the proposed location of the charging CAZ element of the CAP, is the most densely populated region within the local authority area. Based on 2011 Census data, the three most densely populated lower super output areas (LSOAs) in B&NES are located within the city centre core and will be directly affected by implementation of the CAZ.

4.1.2 Low Income Households

The distribution of low income groups in B&NES was determined through analysis of the 2015 Indices of Multiple Deprivation's (IMD) 'Income Domain'. The IMD ranks LSOA areas in terms of levels of income, measured by the number of people that are out-of-work and those that are in work but who have low earnings. The income domain therefore acts as a suitable proxy for defining low-income groups.

Figures 4.1 and 4.2 map the distribution of low income LSOAs, and by proxy, low income households across B&NES. Figure 4.1 provides the distribution of income deprivation within the wider study area. Figure 4.2 provides a comparison of national levels of income deprivation. Both figures demonstrate that generally, B&NES is a relatively affluent location in the context of the wider study area and nationally.

However, the analysis also shows that some neighbourhoods around the Twerton area and in central Bath are amongst the most income deprived areas both regionally and nationally. At a national level, communities in Twerton on the western edge of Bath City are within the 0-20% quintile for income deprivation, indicating that these communities are amongst the 20% most income deprived nationally. Similarly, some locations in the city centre core feature within the 20-40% quintile for income deprivation at a national level. Within this context, as the CAZ is located within the city centre core, some neighbourhoods with a high proportion of low-income households could be directly affected by the CAZ.

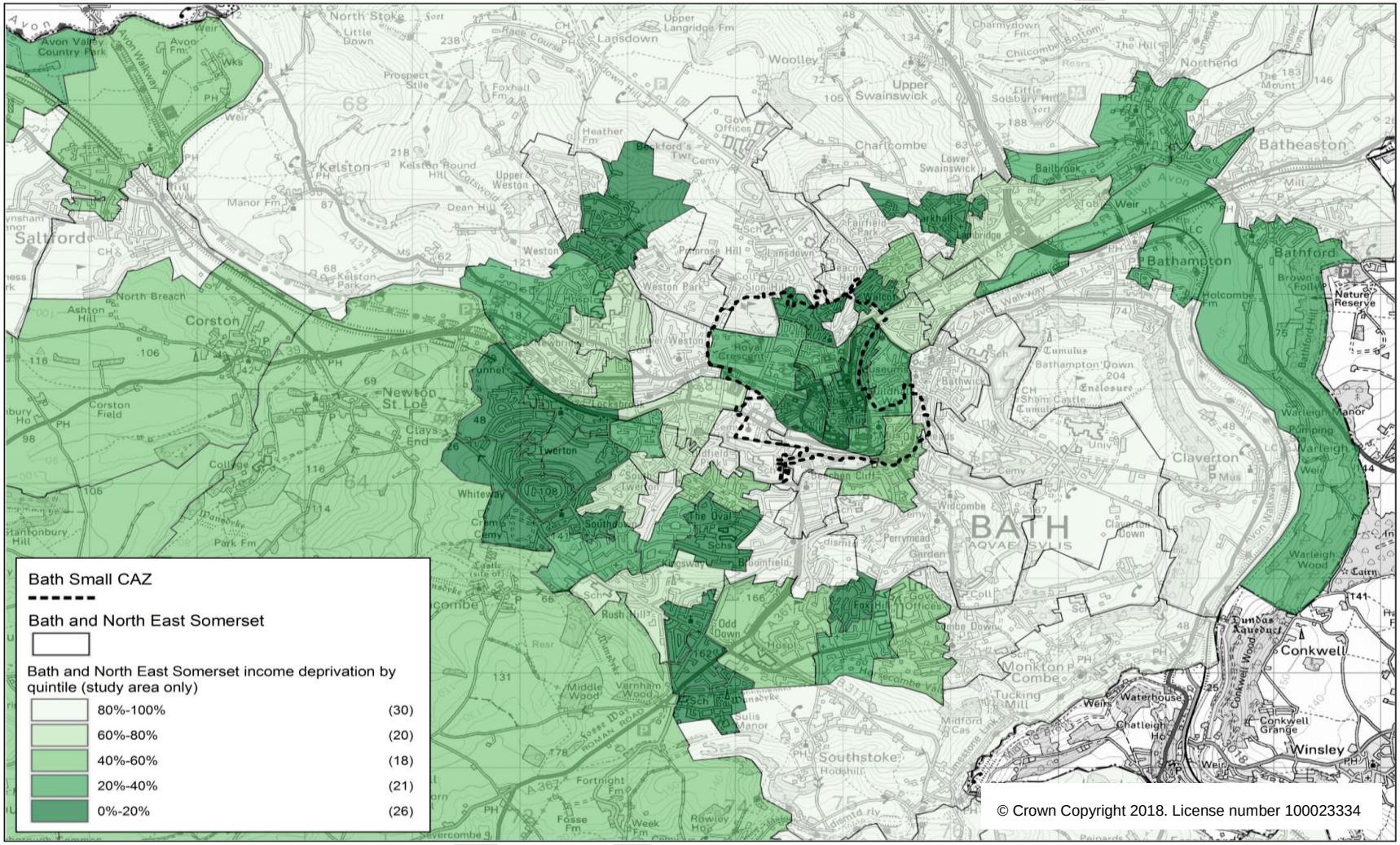

Figure 4.1: Concentration of Low Income Households in B&NES Relative to Wider Study Area

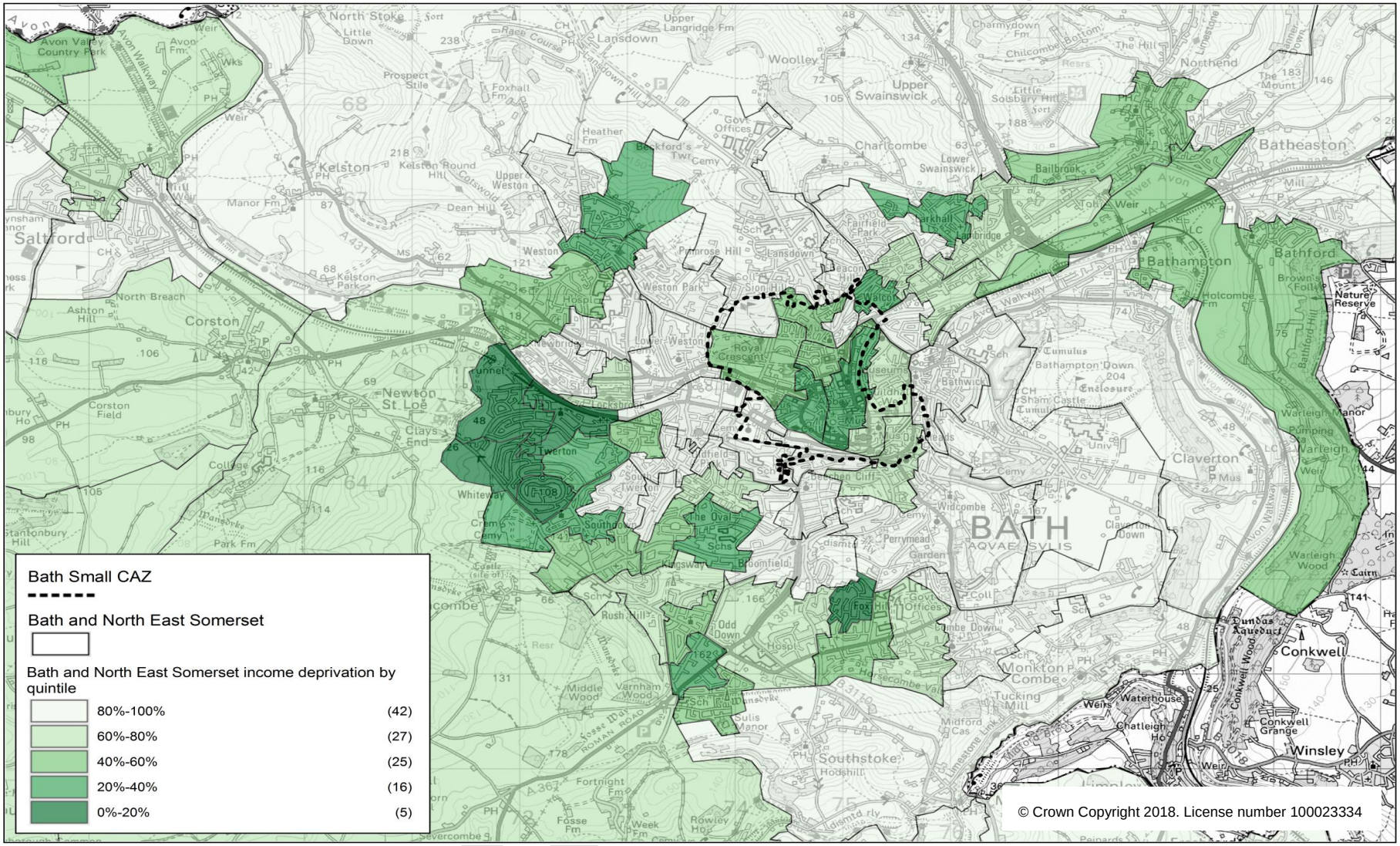

Figure 4.2: Concentration of Low Income Households in B&NES Relative to National Benchmarks

4.1.3 Children

Figure 4.3 presents the distribution of children across B&NES and demonstrates that there are few areas with a high concentration of children in the immediate study area. Those that do exist are concentrated at the west and southern edges of Bath. The communities covered by the proposed CAZ itself have a low concentration of children. Nevertheless, some of the facilities used and relied on by children on the outskirts of Bath City may be located in the city centre core or children may need to pass through the CAZ to access these facilities (locations of these facilities are considered later in this chapter). Hence, imposition of a CAZ in the central area could inhibit accessibility for children living further out.

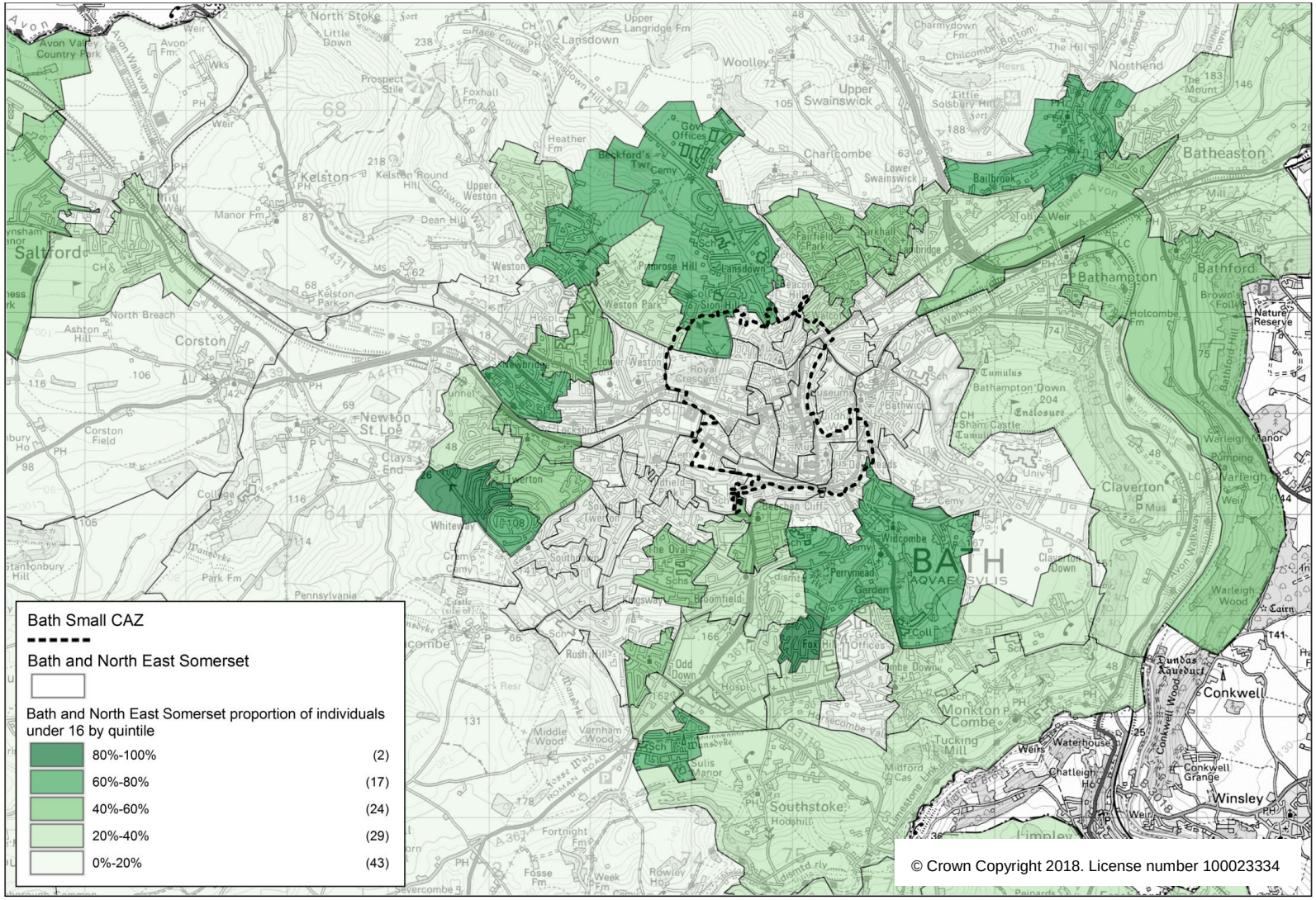

Figure 4.3: Concentration of Children in B&NES Relative to National Benchmarks

4.1.4 Elderly People

Figure 4.4 presents the distribution of elderly people (aged over 65) across Bath and North East Somerset and shows that the immediate study area is home to a large elderly population. The elderly population is primarily concentrated on the peripheral areas of Bath City, outside of the proposed CAZ boundary. That said, there is a concentration of elderly people in a central LSOA that falls within the boundary. The elderly people living in these communities will be directly impacted by any change in accessibility or air quality generated by the proposed scheme. At the same time, where key amenities used by elderly people are located within or on the opposite side of the city centre, imposition of a CAZ in the central area could inhibit accessibility to these amenities for residents living further out in B&NES (locations of these facilities are considered later in this chapter).

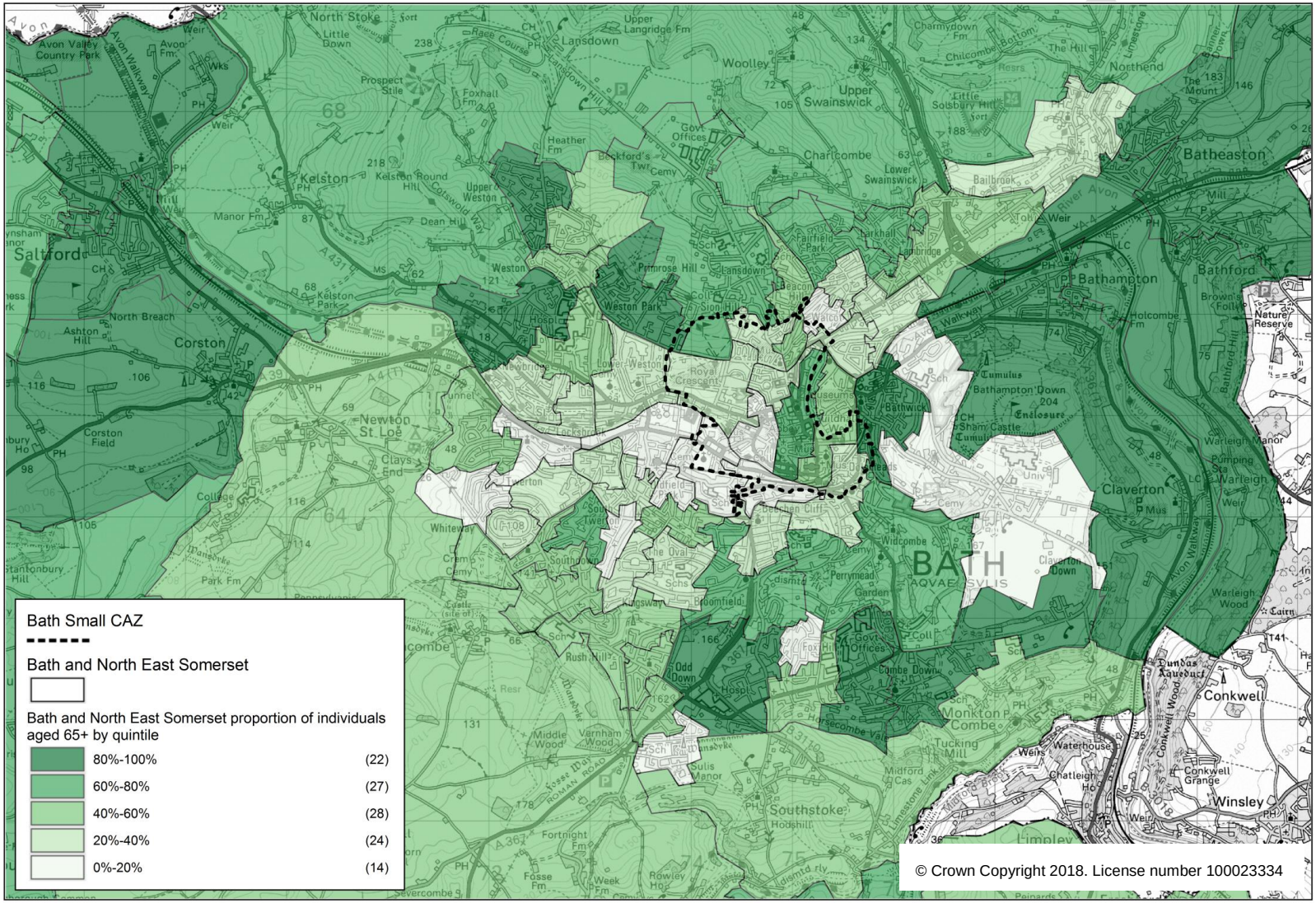

Figure 4.4: Concentration of Elderly People in B&NES Relative to National Benchmarks

4.1.5 Disabled People

Figure 4.5 presents the distribution of disability deprivation across B&NES, measured using the 'illness and disability ratio' (IMD, 2015). This indicates the number of residents with work-limiting morbidity and disability, based on the number receiving benefits due to inability to work through ill health. The map indicates that communities with a high disability ratio are located throughout the immediate study area and are particularly concentrated in central Bath and on the western periphery. The disabled population in central Bath may suffer from reduced accessibility with the imposition of the proposed CAZ scheme. Further, disabled residents on the western periphery (and elsewhere) could suffer from reduced access to the central area with a CAZ in place.

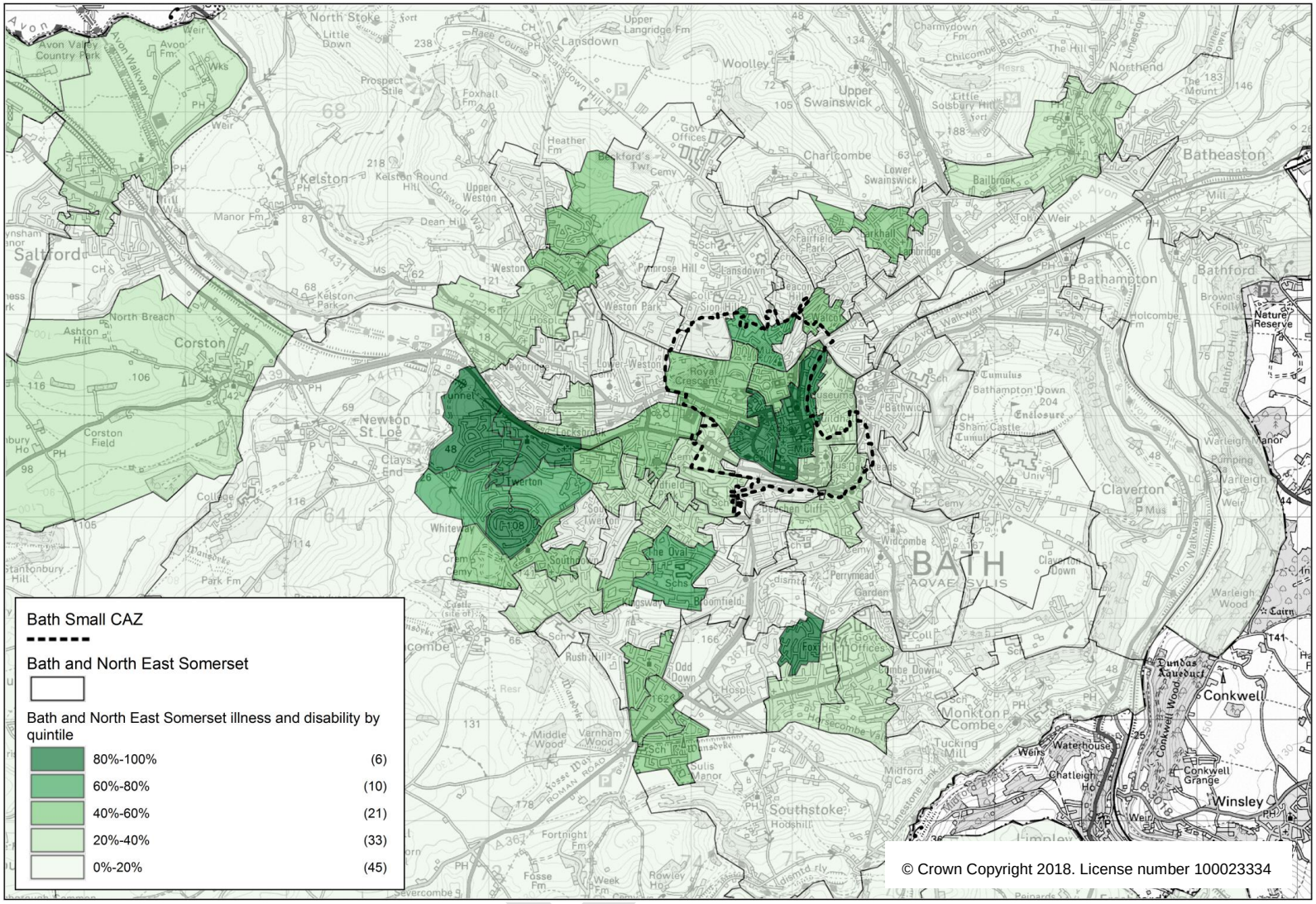

Figure 4.5: Concentration of Disabled People in B&NES Relative to National Benchmarks

4.1.6 Women

Figure 4.6 provides the distribution of females across B&NES and demonstrates that females are disproportionately located on the periphery of Bath City. Central areas are home to communities with a relatively low proportion of women. Females in the central and peripheral areas may be impacted by the scheme, if the scheme acts to reduce accessibility to any key trip destinations in the city centre core or that involve passing through the CAZ.

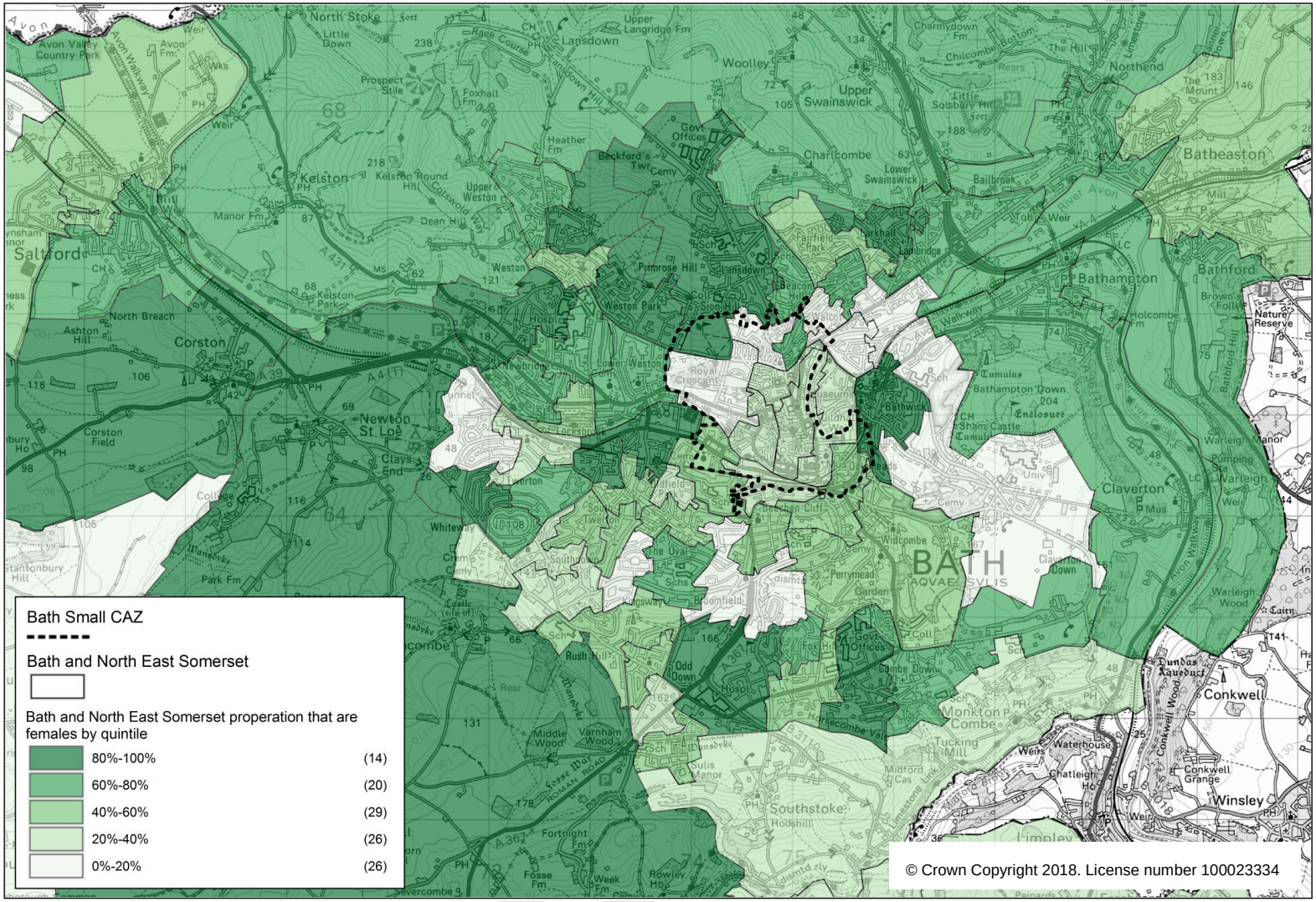

Figure 4.6: Concentration of Females in B&NES Relative to National Benchmarks

4.1.7 Ethnic Minorities

Figure 4.7 provides the distribution of ethnic minorities across B&NES and demonstrates that few people with ethnic minority backgrounds reside in the study area.

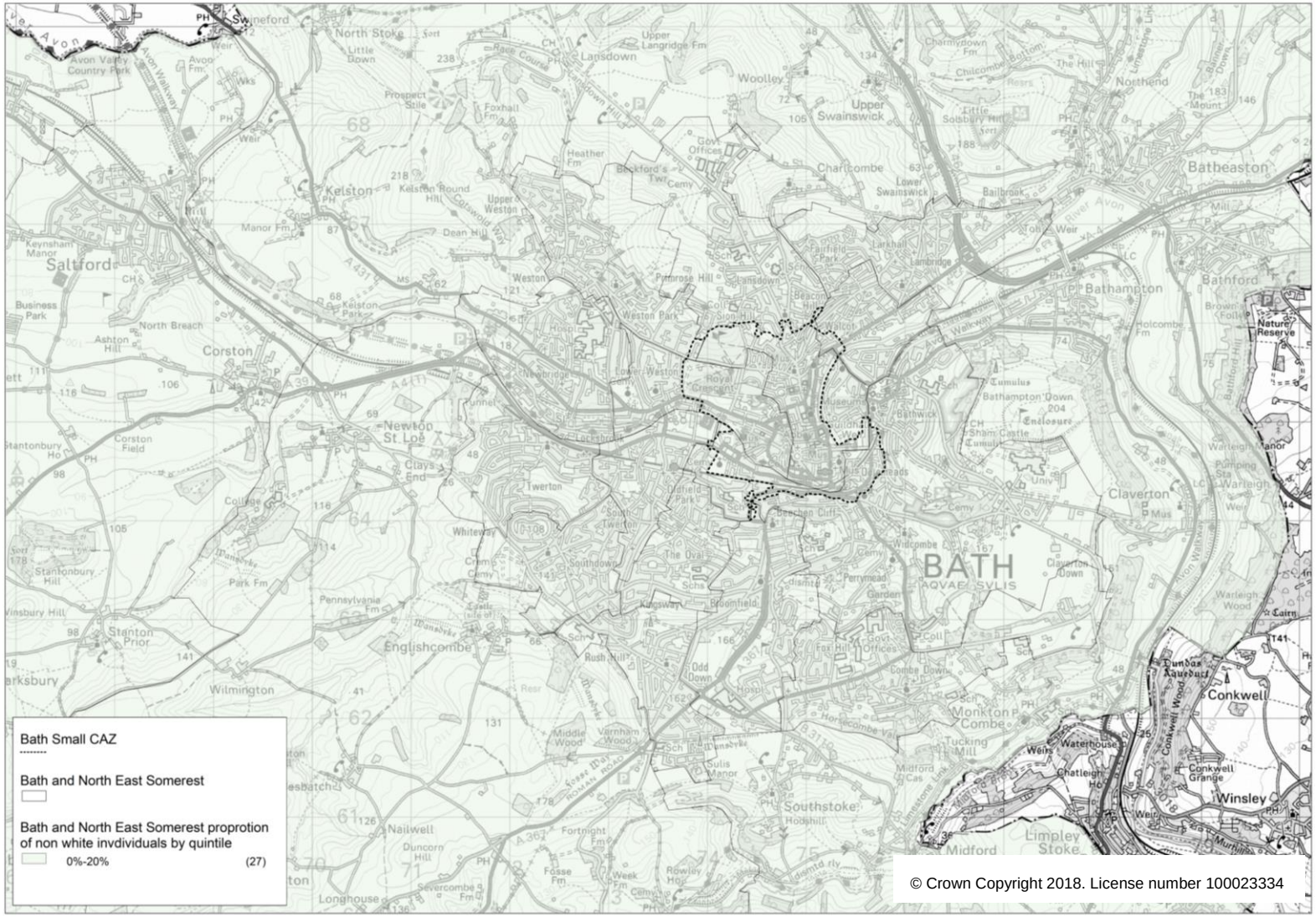

Figure 4.7: Concentration of Ethnic Minorities in B&NES Relative to National Benchmarks

4.2 Economy

4.2.1 Economic Output and Employment

Bath is a major economic hub within the West of England, acting as a key centre for employment and economic activity. The city contributed the majority of the economic output of £4.8 billion generated across the wider B&NES area in 2016. Further, B&NES was more productive than most benchmarks, achieving gross value added (GVA) per filled job of nearly £55,000, well above regional (<£51,000) and national (<£53,000) averages. B&NES also supports a buoyant tourist economy, driven by nearly 5 million day-trips and 1 million overnight trips by domestic and international visitors in 2014. In light of B&NES' strong economy, future economic growth and development in the region is earmarked for the city centre core as part of the Bath City Riverside Enterprise Area. This will further strengthen and build resilience in the B&NES economy.

The B&NES economy supported some 84,000 jobs in 2016. The sectoral split of employment in the area is presented in Table 4.1.

Table 4.1: Sectoral Profile of Employment (Business Register and Employment Survey [2016])

Employment Sectors	Employment Within CAZ	% of Employment within the CAZ	Employment within Bath (Excluding CAZ)	% of Employment within Bath (Excluding CAZ)
Financial and insurance activities	1,200	51%	1,175	49%
Human health and social work activities	1,940	13%	12,690	87%
Accommodation and food service activities	4,680	57%	3,520	43%
Wholesale and retail trade; repair of motor vehicles and motorcycles	5,320	40%	8,000	60%
Education	1,215	10%	11,130	90%
Public administration and defence; compulsory social security	620	31%	1,355	69%
Other service activities	945	47%	1,075	53%
Information and communication	2,530	61%	1,615	39%
Real estate activities	450	30%	1,070	70%
Professional, scientific and technical activities	2,080	32%	4,360	68%
Manufacturing	270	6%	4,060	94%
Construction	185	5%	3,800	95%
Transportation and storage	640	49%	665	51%
Arts, entertainment and recreation	900	50%	905	50%
Mining and quarrying	0	0%	30	100%
Electricity, gas, steam and air conditioning supply	0	0%	50	100%
Water supply; sewerage, waste management and remediation activities	0	0%	1,555	100%
Administrative and support service activities	1,030	27%	2,740	73%
Total	**24,005**	**29%**	**59,795**	**71%**

Table 4.1 demonstrates that around 30% of all employment in B&NES is concentrated within the city centre core that will be affected by implementation of the CAZ. High value service sector jobs such as those within finance and insurance and information and communication are predominantly located within the proposed CAZ boundary too.

4.2.2 Businesses

The B&NES economy consists of 8,200 businesses. The vast majority of these businesses are micro businesses (7,220) or SMEs (660). A sizeable proportion of the businesses (20% of micro businesses and 40% of SMEs) are located within LSOAs that are directly within the proposed CAZ boundary. Further, Figure 4.8 presents the distribution of SME and micro businesses across B&NES. The mapping demonstrates high concentrations of SME and micro businesses in central Bath, which will be directly affected by the introduction of the CAZ.

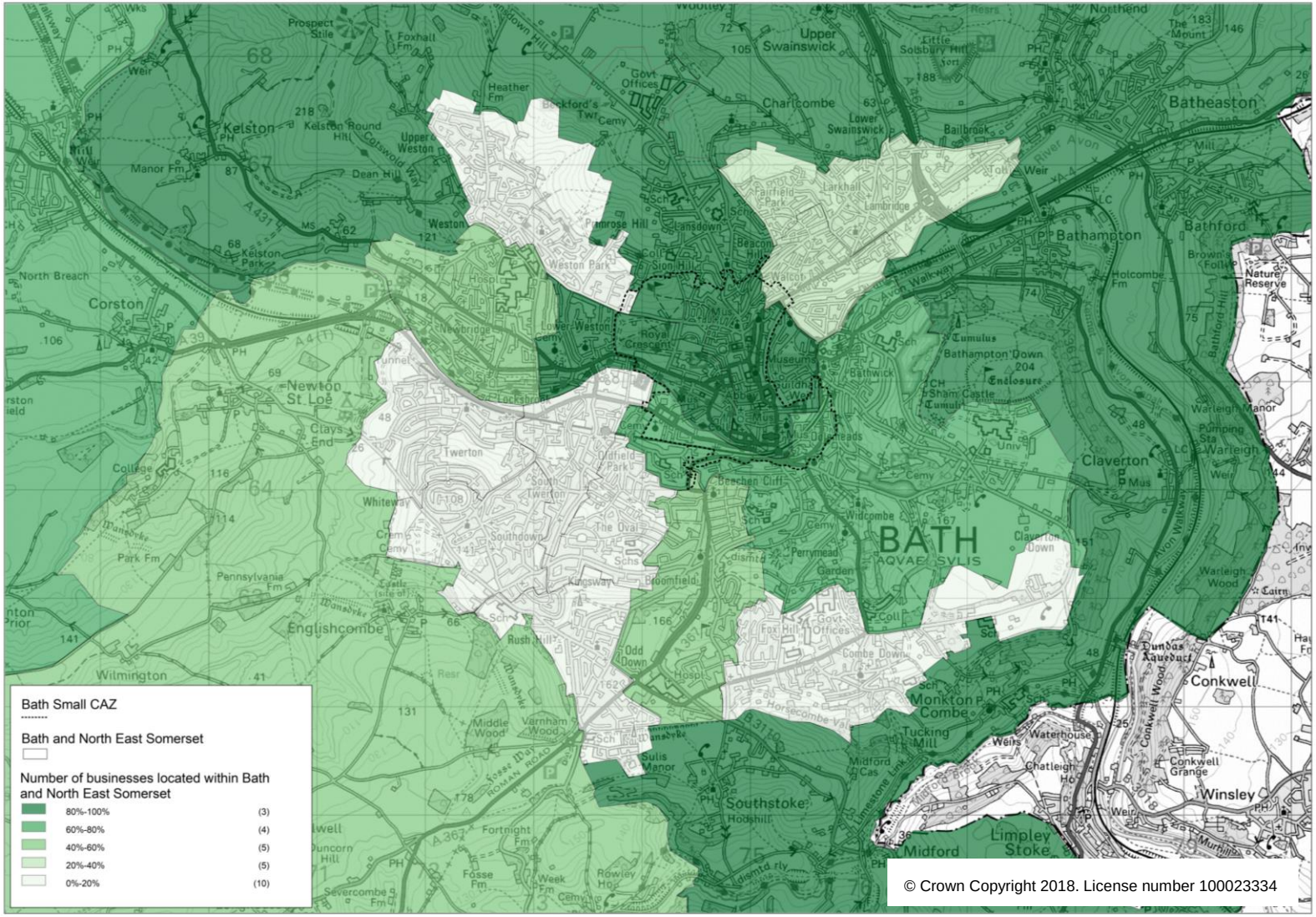

Figure 4.8: Concentration of Businesses in B&NES Relative to National Benchmarks

4.2.3 Transport

Based on Census 2011 data, the most common mode of travel to work in B&NES is via private car. More than 48,000 journeys to work are undertaken as car driver or passenger, equivalent to 57% of commuting journeys. For residents within the CAZ boundary itself, this proportion falls to 16%, reflecting around 1,500 commuting journeys. Further, 44% of all journeys to work in central Bath are undertaken by private car. Within this context, there is significant potential for accessibility and affordability to be compromised by the implementation of the CAZ.

Impacts of this nature are expected to fall on those individuals using non-compliant vehicles. Across B&NES as a whole, vehicle registration data suggests that approximately 77% of all diesel cars and 31% of petrol cars are non-compliant and would therefore be charged to drive within the CAZ. As a result the owners of these vehicles could suffer from reduced accessibility or affordability issues. These proportions drop to 36% and 20% respectively within the CAZ boundary. The projected compliance in 2021 is that approximately 79% of all cars will be compliant. Nevertheless, a significant number of car drivers across B&NES could be directly or indirectly impacted.

Businesses are heavily reliant on use of LGVs and HGVs for their day-to-day operations. However, a significant portion of the fleet for these vehicle classes is non-compliant and may face access and affordability issues following implementation of the CAZ. Vehicle registration data for B&NES suggests more than 90% of the LGV fleet is non-compliant. Whilst this figure drops to 64% for those LSOAs located within the proposed CAZ boundary, the analysis suggests that the majority of LGV drivers within the CAZ will be directly impacted. Moreover, the projected compliance in 2021 for LGVs is approximately 59%. Figure 4.9 presents the distribution of LGVs across the immediate study area, indicating that there are LSOAs with a high concentration of LGVs in close proximity to the CAZ boundary.

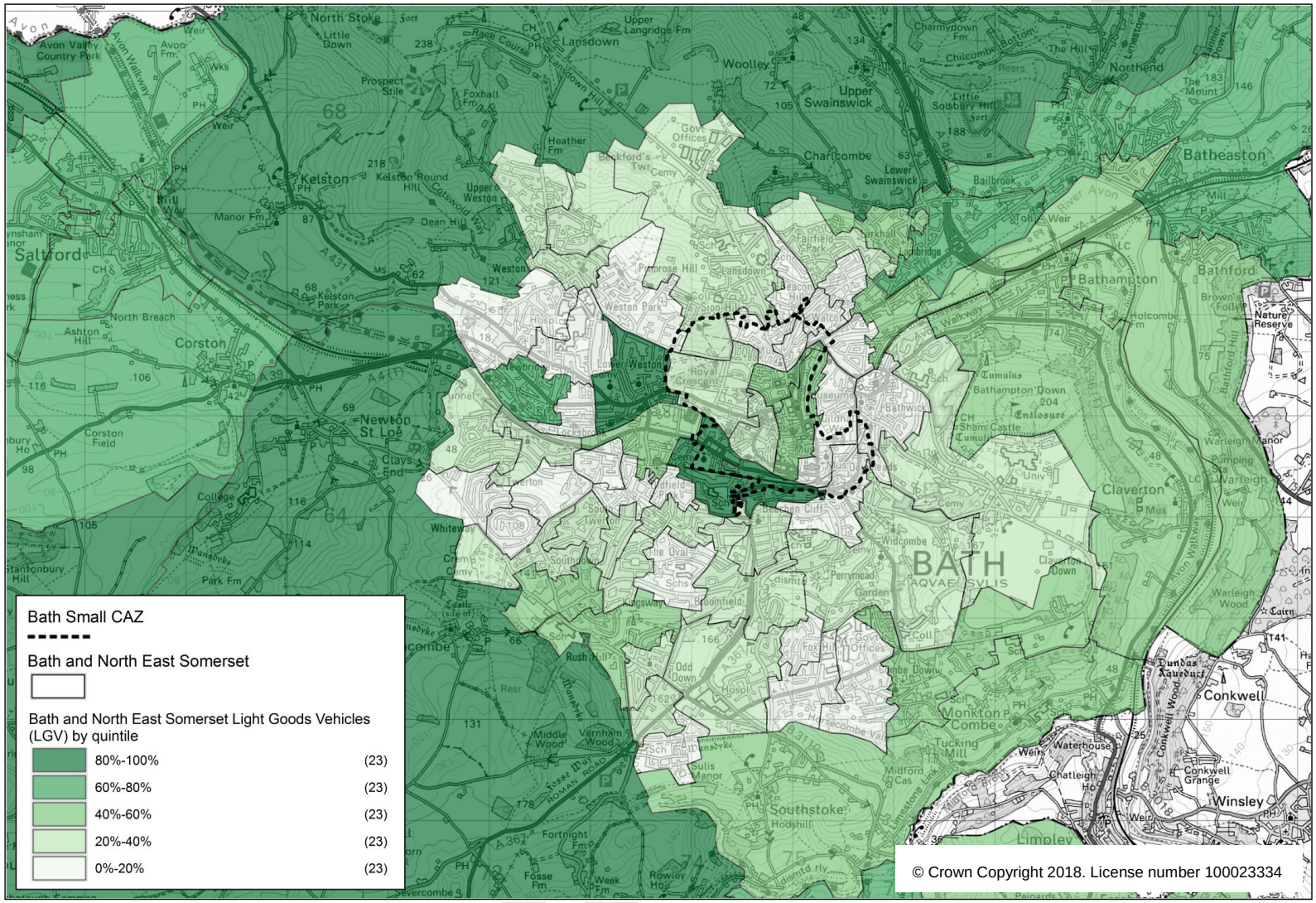

Figure 4.8: Concentration of LGVs in B&NES Relative to National Benchmarks

4.3 Key Facilities and Social Infrastructure

Figure 4.9 highlights the distribution of amenities and social infrastructure within the immediate study area. The mapping demonstrates that there are schools, community centres, care homes and green space all located within the proposed CAZ boundary. Further, the retail and employment core is located within the proposed CAZ boundary. As such, all trips made using non-compliant vehicles to these facilities and amenities are likely to be affected by imposition of the CAP.

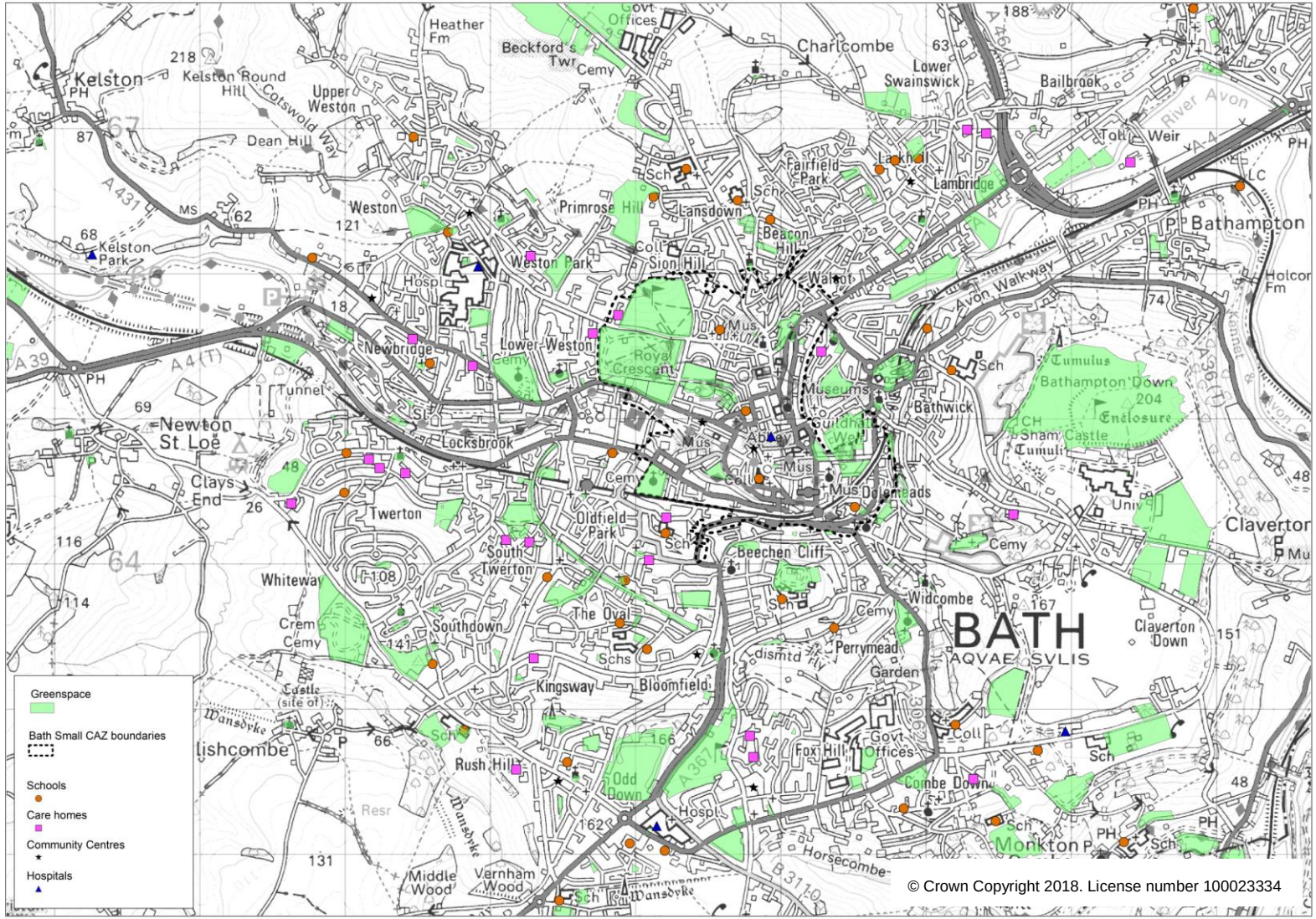

Figure 4.9: Key Social Infrastructure Within B&NES

5. Distributional and Equalities Impact Analysis

5.1 Air Quality

Figure 5.1 and 5.2 present the change in NO_2 concentrations forecast in 2021 at relevant receptors, following implementation of the Bath CAP. The figures indicate that with the exception of one receptor north west of Bath on Lansdown Road, NO_2 concentrations are predicted to remain unchanged or fall in response to the CAP. Compliance is achieved in all locations, with further details available in OBC-11 'AQ3 Air Quality Modelling Report' within Appendix D of this OBC. The largest reduction in NO_2 concentration is forecast along the key arterial routes into Central Bath (i.e. London Road, Wells Road and Upper Bristol Road) and within the central area itself. Hence, the CAP is forecast to contribute only to positive impacts within Bath from an air quality perspective, and these are likely to be felt most strongly in those communities that lie alongside the key arterial routes and within central Bath.

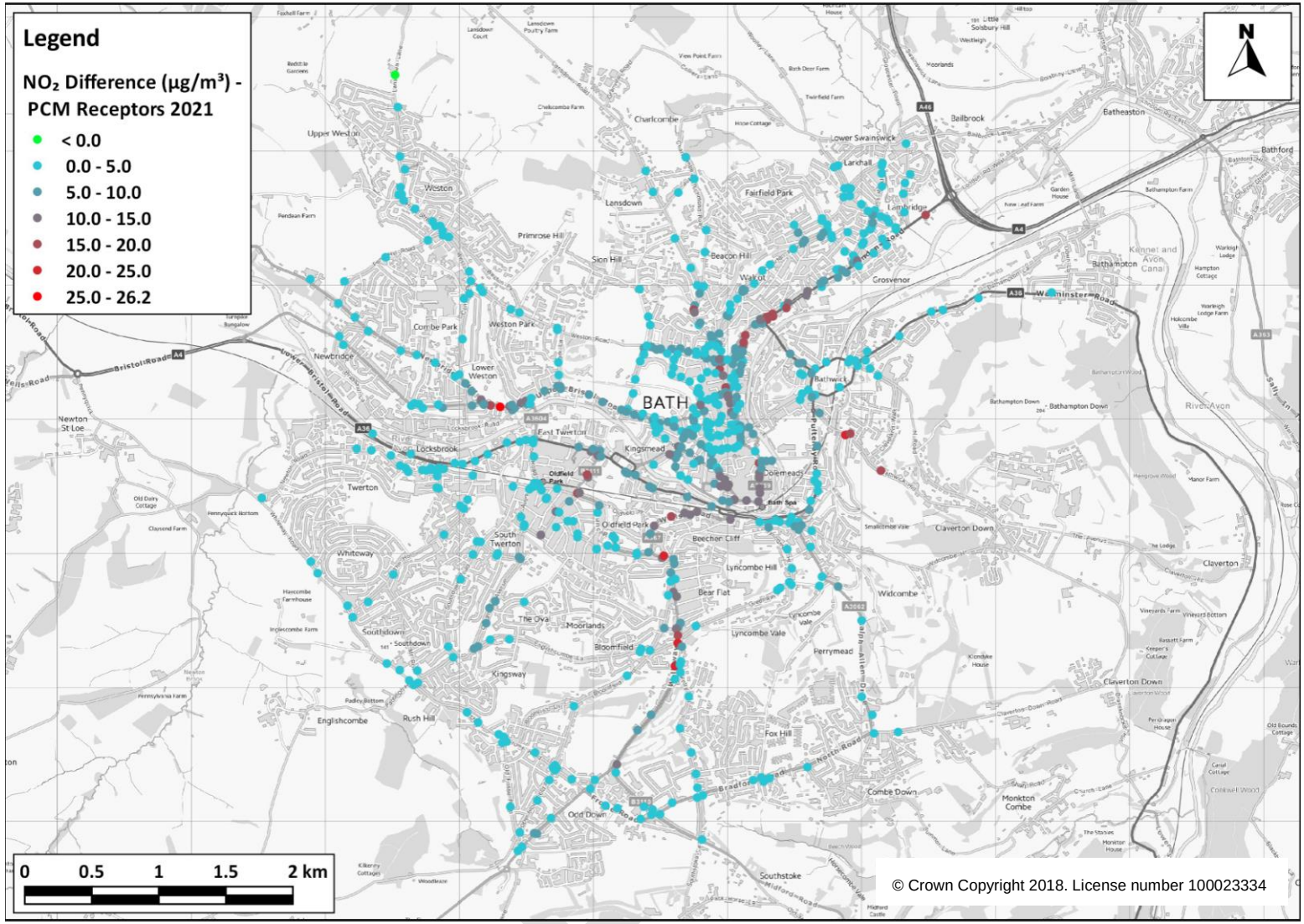

Figure 5.1: Change in NO_2 Concentrations based on LAQM Receptors (CAZ D 2021)

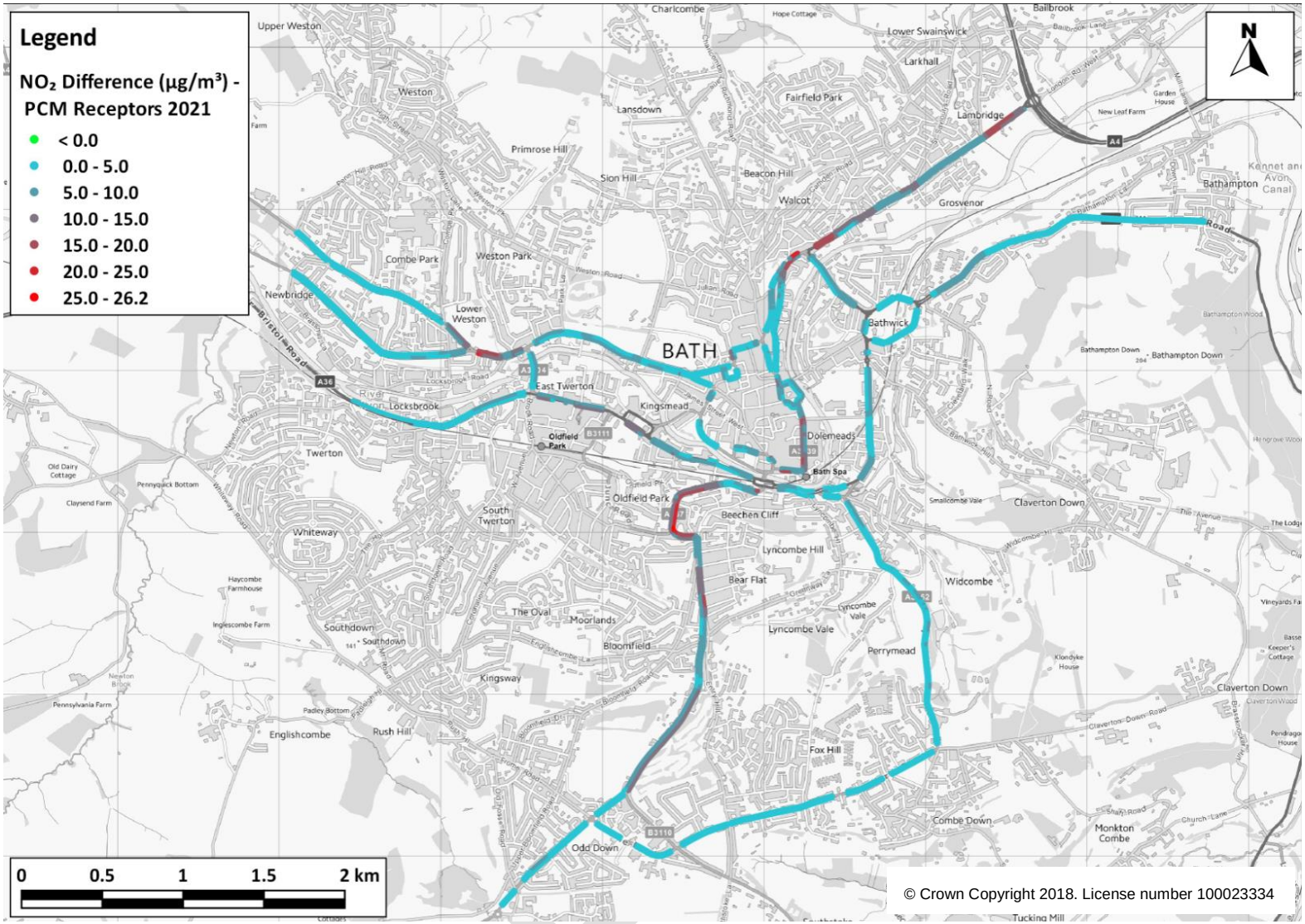

Figure 5.2: Change in NO_2 Concentrations based on PCM Receptors (CAZ D 2021)

5.1.1 Low Income Households

Figures 4.1 and 4.2 indicate that the most acute concentrations of low income households are located in Twerton on the western outskirts of the city. Figures 5.1 and 5.2 demonstrate that the receptors in these communities report a decline in NO_2 concentrations of between 0 and 5 micrograms. Pockets of income deprivation were identified from Figures 4.1 and 4.2in central Bath too (albeit less severe than on the western periphery). Figures 5.1 and 5.2 demonstrate a more significant reduction in NO_2 concentrations in these low-income communities, contributing to a notable beneficial air quality impact in these communities.

In light of this appraisal, Table 5.1 presents the appraisal matrix for the combination of low-income household grouping and air quality impact variable. It demonstrates that beneficial impacts accrue across all low-income groups, with significantly greater proportions of low-income households (i.e. those in areas that are most income deprived) benefitting relative to this group's share of the overall population in B&NES.

Table 5.1: Air Quality Impacts on Low Income Households

		Income Deprivation Quintiles					Total
		0-20% (most deprived)	20-40%	40-60%	60-80%	80-100% (least deprived)	
A	No. of people with improved air quality	7,653	14,422	14,095	20,038	35,229	**91,437**
B	No. of people with reduced air quality						**0**
C	No. of net winners [A - B]	7,653	14,422	14,095	20,038	35,229	**91,437**
D	Total no. of winners across all groups [Sum of C]						**91,437**
E	Net winners in each areas as % of total [C/D]	8%	16%	15%	22%	39%	**100%**
F	Share of population in immediate study area	4%	13%	21%	25%	37%	**100%**
G	Assessment for immediate study area	✓✓✓	✓✓	✓	✓	✓✓	

5.1.2 Children

Figure 4.3 demonstrates that the distribution of children and young people in B&NES is similar to the distribution of low-income households, with specific concentrations on the western and southern periphery of the built-up area. As a result, cross-referencing this distribution with the change in air quality concentrations in Figures 4.1 and 4.2 reveals similar distributional impacts as reported for low-income households, i.e. air quality is expected to improve for children in all communities in the immediate study area, with more significant improvements recorded in central areas.

Table 5.2 presents the appraisal matrix for the children grouping and air quality impact variable combination. It demonstrates that beneficial impacts accrue across all children in built-up Bath, with significantly greater proportion of children benefitting in areas where there are fewer children.

Table 5.2: Air Quality Impacts on Children

		Children Quintiles					Total
		0-20% (fewest children)	20-40%	40-60%	60-80%	80-100% (most children)	
A	No. of children with improved air quality	4,339	2,883	2,695	1,932	2,099	**13,948**
B	No. of children with reduced air quality						**0**
C	No. of net winners [A - B]	4,339	2,883	2,695	1,932	2,099	**13,948**
D	Total no. of winners across all groups [Sum of C]						**13,948**
E	Net winners in each areas as % of total [C/D]	31%	21%	19%	14%	15%	**100%**
F	Share of population in B&NES	19%	20%	26%	15%	19%	**100%**
G	Assessment for B&NES	✓✓✓	✓✓	✓	✓✓	✓	

5.1.3 The Elderly

Figure 4.3 demonstrates that the distribution of elderly residents in B&NES differs from the distribution of low-income households and children, with a concentration of communities with a high proportion of elderly residents on the northern boundary of the urban area plus some pockets in central Bath, within the proposed CAZ boundary. Cross-referencing this distribution with the change in air quality concentrations depicted in Figures 5.1 and 5.2 suggests that air quality improvements are expected for elderly residents in all communities in the immediate study area. Those communities with a high proportion of elderly residents in central Bath will benefit from the most significant improvements in air quality, as air quality is expected to improve to the greatest extent in the city centre core based on Figures 5.1. and 5.2.

Table 5.3 presents the appraisal matrix for the elderly resident grouping and air quality impact variable combination. It demonstrates that beneficial impacts accrue across all elderly residents in built-up Bath, with significantly greater proportion of elderly residents benefitting in areas where there is a smaller proportion of elderly residents.

Table 5.3: Air Quality Impacts on the Elderly

		Elderly Resident Quintiles					Total
		0-20% (fewest elderly residents)	20-40%	40-60%	60-80%	80-100% (most elderly residents)	
A	No. of elderly residents with improved air quality	1,489	3,608	4,154	2,778	2,327	**14,356**
B	No. of elderly people with improved air quality						
C	No. of net winners [A - B]	1,489	3,608	4,154	2,778	2,327	**14,356**
D	Total no. of winners across all groups [Sum of C]						**14,356**
E	Net winners in each areas as % of total [C/D]	10%	25%	29%	19%	16%	**100%**
F	Share of population in B&NES	7%	15%	23%	28%	26%	**100%**
G	Assessment for B&NES	✓✓	✓✓✓	✓✓✓	✓	✓	

5.2 Accessibility

5.2.1 Low Income Households

Based on outputs from TUBA Model runs, Table 5.4 outlines the proportional share of journey time benefits for the income deprivation quintiles. The analysis demonstrates that the journey time benefits are predominantly concentrated in the 60-80 and 80-100% quintiles of income deprivation (i.e. the least income deprived quintile) though there are also substantial benefits for the 20-40% quintile. There are minimal journey time benefits for communities with the highest concentration of low income households.

Table 5.4: Accessibility Impacts on Low Income Households

Low Income Quintiles	Proportion of Overall Journey Time Savings %
1 (0-20%)	1%
2 (20-40%)	30%
3 (40-60%)	8%
4 (60-80%)	28%
5 (80-100%)	33%
Total	**100%**

Journey time changes are only one factor affecting accessibility. They only capture benefits to those who continue to make highway trips following the implementation of the CAP. Some people are expected to cancel journeys or make journeys to alternative locations as a behavioural response to the charging CAZ component of the CAP. Journey time changes do not capture the accessibility impacts on those individuals that respond in this manner. The behavioural response rates suggest that around 38% of non-compliant trips will be cancelled, diverted or switched mode. These responses could lead to adverse accessibility impacts for all households, irrespective of their relative level of income deprivation, as outlined in Table 5.5. However, underlying accessibility issues could be compounded for low-income groups, where there is an established lower propensity for motor vehicle ownership (see Table 3.1).

Table 5.5: Accessibility Impacts on Low Income Households

		Income Deprivation Quintiles					
		0-20% (most deprived)	20-40%	40-60%	60-80%	80-100% (least deprived)	Total
A	No. of people with improved accessibility	0	0	0	0	0	**0**
B	No. of people with reduced accessibility	7,653	14,422	14,095	20,038	35,229	**91,437**
C	No. of net winners [A - B]	-7,653	-14,422	-14,095	-20,038	-35,229	**-91,437**
D	Total no. of winners across all groups [Sum of C]						**-91,437**
E	Net winners in each areas as % of total [C/D]	-8%	-16%	-15%	-22%	-39%	**100%**
F	Share of population in B&NES	4%	13%	21%	25%	37%	**100%**
G	Assessment for B&NES	xxx	xx	x	x	xx	

Note that the assessment scoring in Table 5.5 is relative, comparing the proportion of net winners or losers in each quintile to that quintile's share of population in B&NES. Therefore, a larger score is indicative of impacts falling disproportionately on a particular quintile relative to that quintile's population share across B&NES as a whole.

5.2.2 Children

Based on outputs from TUBA Model runs, Table 5.6 outlines the proportional share of journey time benefits for the LSOA quintiles based on concentration of children. The analysis demonstrates that the journey time benefits are predominantly concentrated in the 0-20% quintile of LSOAs for children concentrations (i.e. the LSOAs with the lowest concentration of children). There are minimal journey time benefits for communities with the highest concentration of children.

Table 5.6: Accessibility Impacts on Children

Children Quintiles	Proportion of Overall Journey Time Savings %
1 (0-20%)	67%
2 (20-40%)	17%
3 (40-60%)	9%
4 (60-80%)	6%
5 (80-100%)	1%
Total	**100%**

As with low income households, journey time changes are only one factor affecting accessibility. They only capture benefits to those who continue to make highway trips following the implementation of the CAP. Some people are expected to cancel journeys or make journeys to alternative locations as a behavioural response to the CAZ component of the CAP. Journey time changes do not capture the accessibility impacts on those individuals that respond in this manner. The behavioural response rates suggest that around 38% of non-compliant trips will be cancelled, diverted or switched mode. These responses could lead to adverse accessibility impacts for children across all areas, irrespective of the concentration of children in each area as set out in Table 5.7.

Table 5.7: Accessibility Impacts on Children

		Children Quintiles					
		0-20% (fewest children)	20-40%	40-60%	60-80%	80-100% (most children)	Total
A	No. of people with improved accessibility	0	0	0	0	0	**0**
B	No. of people with reduced accessibility	4,339	2,883	2,695	1,932	2,099	**13,948**
C	No. of net winners [A - B]	-4,339	-2,883	-2,695	-1,932	-2,099	**-13,948**
D	Total no. of winners across all groups [Sum of C]						**-13,948**
E	Net winners in each areas as % of total [C/D]	-31%	-21%	-19%	-14%	-15%	**100%**
F	Share of population in B&NES	19%	20%	26%	15%	19%	**100%**
G	Assessment for B&NES	xxx	xx	x	xx	x	

Note that the assessment scoring in Table 5.7 is relative, comparing the proportion of net winners or losers in each quintile to that quintile's share of population in B&NES. Therefore, a larger score is indicative of impacts falling disproportionately on a particular quintile relative to that quintile's population share across B&NES as a whole

5.2.3 The Elderly

Based on outputs from TUBA Model runs, Table 5.8 outlines the proportional share of journey time benefits for the LSOA quintiles based on the concentration of elderly residents. The analysis demonstrates that the journey time benefits are predominantly concentrated in the 0-20% quintile of LSOAs for elderly concentrations (i.e. the LSOAs with the lowest concentration of elderly). There is abroad spread of journey time benefits for the other concentration quintiles.

Table 5.8: Accessibility Impacts on Elderly

Elderly Quintiles	Proportion of Overall Journey Time Savings %
1 (0-20%)	31%
2 (20-40%)	8%
3 (40-60%)	20%
4 (60-80%)	23%
5 (80-100%)	17%
Total	**100%**

Journey time changes are only one factor affecting accessibility. They only capture benefits to those who continue to make highway trips following the implementation of the CAP. Some people are expected to cancel journeys or make journeys to alternative locations as a behavioural response to the CAZ component of the CAP. Journey time changes do not capture the accessibility impacts on those individuals that respond in this manner. The behavioural response rates suggest that around 38% of non-compliant trips will be cancelled, diverted or switched mode. These responses could lead to adverse accessibility impacts for the elderly across all areas, irrespective of the concentration of elderly people in each area as set out in Table 5.9.

Table 5.9: Accessibility Impacts on Elderly

		Elderly Quintiles					Total
		0-20% (fewest elderly)	20-40%	40-60%	60-80%	80-100% (most elderly)	
A	No. of people with improved accessibility						**0**
B	No. of people with reduced accessibility	1,489	3,608	4,154	2,778	2,327	**14,356**
C	No. of net winners [A - B]	-1,489	-3,608	-4,154	-2,778	-2,327	**-14,356**
D	Total no. of winners across all groups [Sum of C]						**-14,356**
E	Net winners in each areas as % of total [C/D]	-10%	-25%	-29%	-19%	-16%	**100%**
F	Share of population in B&NES	7%	15%	23%	28%	26%	**100%**
G	Assessment for B&NES	xx	xxx	xxx	x	x	

Note that the assessment scoring in Table 5.9 is relative, comparing the proportion of net winners or losers in each quintile to that quintile's share of population in B&NES. Therefore, a larger score is indicative of impacts falling disproportionately on a particular quintile relative to that quintile's population share across B&NES as a whole.

5.2.4 Disabled People

Based on outputs from TUBA Model runs, Table 5.10 outlines the proportional share of journey time benefits for the LSOA quintiles based on concentration of disabled residents. The analysis demonstrates that the journey time benefits are predominantly concentrated in the 0-20% quintile of LSOAs for disabled concentrations (i.e. the LSOAs with the lowest concentration of disabled residents). There is also a sizeable proportion of benefits accruing to the 80-100% quintile (i.e. the LSOAs with the highest concentration of disabled residents).

Table 5.10: Accessibility Impacts on Disabled

Disabled Quintiles	Proportion of Overall Journey Time Savings %
1 (0-20%)	45%
2 (20-40%)	18%
3 (40-60%)	7%
4 (60-80%)	1%
5 (80-100%)	29%
Total	**100%**

As above, journey time changes are only one factor affecting accessibility. They only capture those road users who continue to make trips following the implementation of the CAP. Some people are expected to cancel journeys or make journeys to alternative locations as a behavioural response to the CAZ component of the CAP. Journey time changes do not capture the accessibility impacts on those individuals that respond in this manner. The behavioural response rates suggest that around 38% of non-compliant trips will be cancelled, diverted or switched mode. These responses could lead to adverse accessibility impacts for disabled residents across all areas, irrespective of the concentration of disabled residents in each area (Table 5.11).

Table 5.11: Accessibility Impacts on Disabled

		Disabled Quintiles					
		0-20% (fewest disabled)	20-40%	40-60%	60-80%	80-100% (most disabled)	Total
A	No. of people with improved accessibility						**0**
B	No. of people with reduced accessibility	1,489	3,608	4,154	2,778	2,327	**14,356**
C	No. of net winners [A - B]	-1,489	-3,608	-4,154	-2,778	-2,327	**-14,356**
D	Total no. of winners across all groups [Sum of C]						**-14,356**
E	Net winners in each areas as % of total [C/D]	-10%	-25%	-29%	-19%	-16%	**100%**
F	Share of population in B&NES	7%	15%	23%	28%	26%	**100%**
G	Assessment for B&NES	xx	xxx	xxx	x	x	

Note that the assessment scoring in Table 5.11 is relative, comparing the proportion of net winners or losers in each quintile to that quintile's share of population in B&NES. Therefore, a larger score is indicative of impacts falling disproportionately on a particular quintile relative to that quintile's population share across B&NES as a whole.

5.2.5 Females

Based on outputs from TUBA Model runs, Table 5.12 outlines the proportional share of journey time benefits for the LSOA quintiles based on concentration of female residents. The analysis demonstrates that the journey time benefits are predominantly concentrated in the 60-80% and 80-100% quintiles of LSOAs for female concentrations (i.e. the LSOAs with the highest concentration of females). There are minimal journey time benefits accruing to those communities with a low concentration of females.

Table 5.12: Accessibility Impacts on Females

Female Quintiles	Proportion of Overall Journey Time Savings %
1 (0-20%)	1%
2 (20-40%)	30%
3 (40-60%)	8%
4 (60-80%)	28%
5 (80-100%)	33%
Total	**100%**

As above, journey time changes are only one factor affecting accessibility. They only capture benefits to those who continue to make highway trips following the implementation of the CAP. Some people are expected to cancel journeys or make journeys to alternative locations as a behavioural response to the CAZ component of the CAP. Journey time changes do not capture the accessibility impacts on those individuals that respond in this manner. The behavioural response rates suggest that around 38% of non-compliant trips will be cancelled, diverted or switched mode. These responses could lead to adverse accessibility impacts for females across all areas, irrespective of the concentration of females in each area as set out in Table 5.13.

Table 5.13: Accessibility Impacts on Females

		Female Quintiles					Total
		0-20% (fewest women)	20-40%	40-60%	60-80%	80-100% (most women)	
A	No. of people with improved accessibility						
B	No. of people with reduced accessibility	-6,356	-8,026	-11,218	-10,465	-10,804	**46,869**
C	No. of net winners [A - B]	-6,356	-8,026	-11,218	-10,465	-10,804	**-46,869**
D	Total no. of winners across all groups [Sum of C]						**-46,869**
E	Net winners in each areas as % of total [C/D]	-14%	-17%	-24%	-22%	-23%	**100%**
F	Share of population in B&NES	22%	22%	25%	17%	14%	**100%**
G	Assessment for B&NES	x	x	xx	xx	xxx	

Note that the assessment scoring in Table 5.13 is relative, comparing the proportion of net winners or losers in each quintile to that quintile's share of population in B&NES. Therefore, a larger score is indicative of impacts falling disproportionately on a particular quintile relative to that quintile's population share across B&NES as a whole.

5.2.6 Ethnic Minorities

The CAZ component of the CAP is expected to induce individuals to cancel journeys or make journeys to alternative locations as a behavioural response to the CAZ component of the CAP. The behavioural response rates suggest that around 38% of non-compliant trips will be cancelled, diverted or switched mode. These responses could lead to adverse accessibility impacts for ethnic minorities in the small number of communities where concentrations exist in B&NES (Table 5.14).

Table 5.14: Accessibility Impacts on Ethnic Minorities

		Ethnic Minority Quintiles					
		0-20% (most ethnic minorities)	20-40%	40-60%	60-80%	80-100% (fewest ethnic minorities)	Total
A	No. of people with improved accessibility						**0**
B	No. of people with reduced accessibility	0	5,331	2,086	0	0	**7,417**
C	No. of net winners [A - B]	0	-5,331	-2,086	0	0	**-7,417**
D	Total no. of winners across all groups [Sum of C]						**-7,417**
E	Net winners in each areas as % of total [C/D]	0%	-72%	-28%	0%	0%	**100%**
F	Share of population in B&NES	0%	56%	26%	15%	3%	**100%**
G	Assessment for B&NES	-	xxx	xx	-	-	

Note that the assessment scoring in Table 5.14 is relative, comparing the proportion of net winners or losers in each quintile to that quintile's share of population in B&NES. Therefore, a larger score is indicative of impacts falling disproportionately on a particular quintile relative to that quintile's population share across B&NES as a whole.

5.3 Affordability

5.3.1.1 Low Income Households

Based on outputs from TUBA Model runs, Table 5.15 outlines the proportional share of cost savings associated with journey time and vehicle operating cost change for the income deprivation quintiles. The analysis demonstrates that the cost saving benefits are predominantly concentrated in the 20-40% quintile (i.e. the second most deprived quintile) and the 60-80 and 80-100% quintiles (i.e. the least income deprived quintile). A minimal share of the costs saving accrues to those communities with the highest concentration of low income households.

Table 5.15: Affordability Impacts on Low Income Households

Low Income Quintiles	Proportion of Overall Journey Time Savings %
1 (0-20%)	1%
2 (20-40%)	40%
3 (40-60%)	10%
4 (60-80%)	22%
5 (80-100%)	27%
Total	**100%**

However, transport user cost savings are only one factor affecting affordability. Affordability impacts are also influenced by the ability of individuals and households to replace their vehicles or change travel patterns/behaviours. The average cost of replacing a car is estimated at almost £4,800 (see OBC-16 'Primary Behavioural Response Calculation Methodology' within Appendix E of this OBC for more details of this calculation). Whilst low income households may well spend far less replacing their vehicles, this cost represents a significant affordability issue for all households, but particularly for low-income households that have less capacity to replace non-compliant vehicles (Table 5.4). It should be noted that the assessment is a relative comparison. Therefore, a score of "xxx" only highlights that the most income deprived are impacted the most in comparison to the rest of the group.

Table 5.16: Affordability Impacts on Low Income Households

		Income Deprivation Quintiles					Total
		0-20% (most deprived)	20-40%	40-60%	60-80%	80-100% (least deprived)	
A	No. of people with improved accessibility						**0**
B	No. of people with reduced accessibility	7,653	14,422	14,095	20,038	35,229	**91,437**
C	No. of net winners [A - B]	-7,653	-14,422	-14,095	-20,038	-35,229	**-91,437**
D	Total no. of winners across all groups [Sum of C]						**-91,437**
E	Net winners in each areas as % of total [C/D]	-8%	-16%	-15%	-22%	-39%	**100%**
F	Share of population in B&NES	4%	13%	21%	25%	37%	**100%**
G	Assessment for B&NES	xxx	xx	x	x	xx	

Note that the assessment scoring in Table 5.16 is relative, comparing the proportion of net winners or losers in each quintile to that quintile's share of population in B&NES. Therefore, a larger score is indicative of impacts falling disproportionately on a particular quintile relative to that quintile's population share across B&NES as a whole.

5.3.2 Businesses

Businesses are affected in a number of ways. Firstly, the CAZ could deter footfall in central Bath as consumers and tourists opt to visit alternative locations. Secondly, the CAZ could result in increased charges for deliveries to/from businesses located in the central area, providing additional costs that would either need to be absorbed by the business (affecting profitability) or passed on to consumers (increasing prices and potentially deterring custom). Most businesses located within the CAZ are likely to be reliant on LGVs and HGVs to supply/undertake deliveries. Thirdly, some businesses rely on LGVs and HGVs as part of their day-to-day operations (e.g. trades people).

In light of the importance of LGVs and HGVs to business operation, the affordability impacts of the CAZ on use of LGVs and HGVS was assessed. Based on outputs from TUBA Model runs, transport user cost savings are positive for LGVs and HGVs. This means that journey time costs and vehicle operating costs for these vehicle types will reduce following implementation of the proposed scheme. This suggests that firms relying on these types of vehicles and operating in B&NES will benefit from costs.

However, the TUBA analysis does not take into account the significant cost of replacing LGVs and HGVs which is likely to outweigh the transport user benefits described above. The average cost of vehicle replacement is estimated to be around £5,900 for LGVs and in the range £18,000 to £24,500 for HGVs (see OBC-16 'Primary Behavioural Response Calculation Methodology' within Appendix E of this OBC for details of this calculation). For small firms operating on small margins or with low turnover and for bigger firms with multiple non-compliant vehicles, these vehicle replacement costs could deter the purchase of compliant vehicles. This could result in such firms incurring the CAZ charge as their vehicles enter central Bath, or firms avoiding central Bath altogether. This could impact on business profitability and consumer choice.

5.3.3 Taxis

Based on outputs from TUBA Model runs, transport user costs will increase for taxis. This impact is primarily driven by a significant increase in non-fuel vehicle operating costs, with journey times and fuel vehicle operating costs showing a marginal decrease in the intervention scenario. Non-fuel vehicle operating costs are expected to increase in response to increased distance related costs and vehicle capital costs associated with working vehicles. A net increase in transport user costs suggests that taxi firms operating in B&NES will suffer from additional costs and affordability issues.

Further, the cost of replacing a taxi to one of compliant standard is also likely to add to affordability issues for taxi firms. Vehicle replacement costs may be prohibitive to taxi owners, leading to taxis either incurring the CAZ charge or avoiding the CAZ area altogether. If taxis stop entering the CAZ, this could lead to subsequent accessibility impacts for people that rely on taxi journeys to access key amenities and social infrastructure.

6. Key Findings

Tables 6.1 to 6.3 present a summary of the key findings of the distributional and equalities analysis. The analysis conducted relates to the locations where the benefits/disbenefits accrue and it has been mapped to the individuals that live in those areas. The analysis represents the relative distribution of impacts on socio-economic quintiles compared to the quintiles' population share across B&NES. The key conclusions are:

- Air quality benefits are felt by all neighbourhoods in Bath. The positive impacts of improved air quality disproportionately fall on the most income deprived communities alongside those communities with the fewest children and elderly residents. These impacts are summarised in Table 6.1.

Table 6.1: Air Quality Impacts on Relevant Socio-Economic/Business Groups

Socio-Economic/Business Group	Quintiles					Are the Impacts Distributed Evenly?
	0-20% (most deprived)	20-40%	40-60%	60-80%	80-100% (least deprived)	
Low-Income Households (Income Deprivation)	✓✓✓	✓✓	✓	✓	✓✓	No
Socio-Economic/Business Group	**Quintiles**					**Are the Impacts Distributed Evenly?**
	0-20% (smallest grouping population)	**20-40%**	**40-60%**	**60-80%**	**80-100% (largest grouping population)**	
Children	✓✓✓	✓✓	✓	✓✓	✓	No
Elderly Residents	✓✓	✓✓✓	✓✓✓	✓	✓	No

- Accessibility impacts are adverse across the full range of relevant socio-economic groups. Accessibility impacts fall most heavily on the most income deprived communities, those communities with the fewest children and those communities that have the highest proportion of females. Further, impacts are disproportionately felt by those communities towards the middle quintiles in terms of concentration of ethnic minorities, elderly and disabled residents. It should be noted that these impacts are a relative comparison between the quintiles of the various communities identified. These impacts are summarised in Table 6.2.

Table 6.2: Accessibility Impacts on Relevant Socio-Economic/Business Groups

Socio-Economic/ Business Group	Quintiles					Are the Impacts Distributed Evenly?
	0-20% (most deprived)	20-40%	40-60%	60-80%	80-100% (least deprived)	
Low-Income Households	XXX	XX	X	X	XX	No
Socio-Economic/ Business Group	**Quintiles**					**Are the Impacts Distributed Evenly?**
	0-20% (smallest grouping population)	**20-40%**	**40-60%**	**60-80%**	**80-100% (largest grouping population)**	
Children	XXX	XX	X	XX	X	No
Elderly Residents	XX	XXX	XXX	X	X	No
Disabled Residents	XX	XXX	XXX	X	X	No
Females	X	X	XX	XX	XXX	No
Socio-Economic/ Business Group	**Quintiles**					
	0-20% (largest grouping population)	**20-40%**	**40-60%**	**60-80%**	**80-100% (smallest grouping population)**	**Are the Impacts Distributed Evenly?**
Ethnic Minorities	-	XXX	XX	-	-	No

- Affordability impacts are adverse across the full range of relevant socio-economic and business groups. Impacts are disproportionately felt by the most income deprived communities in B&NES. They also fall on businesses operating non-compliant LGVS and HGVS who are either based in central Bath or operate within central Bath. These impacts are summarised in Table 6.3.

Table 6.3: Affordability Impacts on Relevant Socio-Economic/Business Groups

Socio-Economic/Business Group	Quintiles					Are the Impacts Distributed Evenly?
	0-20% (most deprived)	20-40%	40-60%	60-80%	80-100% (least deprived)	
Low-Income Households (Income Deprivation)	XXX	XX	X	X	XX	No

7. Proposed Mitigation

7.1 Clean Air Fund

In order to mitigate with the key issues identified through the distributional and equalities impact analysis, JAQU have established the Clean Air Fund (CAF). The CAF aims to provide funding to deliver mitigation measures designed to alleviate any adverse distributional and equalities impacts identified above. Based on the range of adverse impacts, the following mitigation measures are proposed to support the transition towards the CAP for vulnerable and protected socio-economic groups:

- Provide additional cycle parking across the city centre in visible locations and pilot a management scheme to improve proper usage of cycle parking
- Expand proposal (included in Go Ultra Low package) to increase public electric car charging network in Bath
- Provide 24hr secure parking at all three P&R sites to encourage overnight use and facilitate extended operating hours
- Scoot/Cycle to School Initiative
- Financial support for replacing uncompliant vehicles with compliant ones
- Financial support for electric charging points on private land

More detail on the specification of each of these non-charging mitigation measures is provided in OBC-08 'Option Assessment Report' in Appendix C of this OBC. The following sections analyse the justification for seeking funding from the CAF to support these mitigation measures, in light of the distributional and equalities impacts identified above.

7.1.1 Provide additional cycle parking across the city centre in visible locations and pilot a management scheme to improve proper usage of cycle parking

The charging CAZ component of the scheme will have adverse impacts on affordability and accessibility for low-income households, businesses and a range of other socio-economic groups. Individuals within these groups and businesses that currently rely on non-compliant vehicles within the proposed CAZ zone could incur significant costs as a result of the CAZ. Further, individuals and businesses may be required to change their travel patterns and/or behaviours, for example, by changing mode of transport.

The provision of additional cycle parking both on footway and on carriageway could induce mode shift towards bicycles, reducing reliance on private cars. The provision of secure cycle parking could improve perceptions of safety and reduce risk of theft, leading to an uplift in cycling's share of trips to and from central Bath. As a result, this mitigation measure could facilitate growth in cycling, thus minimising the extent of reduced accessibility for the various social groups and businesses. It could also minimise affordability impacts, by providing safe and secure parking to support growth in a relatively cheap form of transport.

7.1.2 Expand proposal (included in Go Ultra Low package) to increase public electric car charging network in Bath

The CAZ component of the scheme will charge non-compliant vehicles for entering the defined CAZ boundary. This will contribute to the adverse affordability and accessibility impacts accruing to low-income households, businesses and the range of other socio-economic groups described above.

The expansion of the GUL West programme will facilitate a change in the fleet composition, encouraging individuals and businesses to upgrade to electric vehicles. This will benefit taxis and private hire firms who regularly travel into or through central Bath, as well as individuals who make regular trips into the city centre (e.g. commuters). This will mitigate some of the affordability impacts associated with upgrading to electric vehicles.

7.1.3 Provide 24hr secure parking at all three P&R sites to encourage overnight use and facilitate extended operating hours

The operating hours of existing Park and Ride sites will be extended to cater for a wider range of car drivers and journey purposes, including overnight visitors/tourists and commuters who work non-typical hours. This could facilitate increased patronage of the Park and Ride and provide a viable route into the city centre for a wider range of journeys. The measure may provide some mitigation for the anticipated reduction in accessibility for businesses in the city centre (particularly in the retail and tourism sectors). By increasing travel options for individuals, the measure could also mitigate against the increased cost and reduced accessibility facing drivers of non-compliant vehicles following imposition of the CAZ.

7.1.4 Scoot/Cycle to School Initiative

In order to address identified accessibility impacts accruing to children, the scoot/cycle to school initiative will seek to provide formal mode shift alternatives to using private vehicles for journeys to work. This measure proposes walking bus, cycle/scooter storage facilities and cycle training to promote mode shift to sustainable modes. The intention of the mitigation measure is to ensure that schools become increasingly accessible by alternative modes.

7.1.5 Financial Support for upgrading vehicles

Financial support is proposed to support socio-economic groups and businesses suffering from adverse affordability impacts associated with the cost of upgrading to compliant vehicles. Support will be provided to residents and businesses, with a focus on low-income households, taxi/private hire firms and businesses with a reliance on HGVs and LGVs. The measure intends to make replacing vehicles with a compliant one more affordable.

7.1.6 Financial Support for electric charging points on private land

Financial support is proposed to mitigate against the cost of replacing vehicles with electric ones. Support will be provided to residents and businesses to allow for the installation of electric charging points on private land. This will reduce the financial cost facing residents and businesses who wish to purchase an electric vehicle, thereby making the option more affordable.

7.1.7 Additional Work

Note that the proposed CAF measures introduced above are closely aligned with minimising impacts on low income households and children in particular. However, it is acknowledged that there is a gap in mitigation identified to minimise impacts on women and ethnic minorities. Further work is being progressed through the equalities impact assessment to identify appropriate mitigation relevant to women and ethnic minorities.

7.2 Proposed Exemptions and Concessions Under Consideration

Additional mitigation is proposed in the form of exemptions and concessions for certain groups. A summary of the proposed exemptions and concessions is provided below. Full details, and discussion around the selection of these, is provided in OBC-05 ‘Proposed System Design Features and Payment Exemptions’ within Appendix A of this OBC.

7.2.1 National exemptions in Defra’s CAZ framework

The national exemptions set out in Defra’s CAZ framework are included within the Bath CAZ scheme. These include:

- Historic vehicles in the Exempt Vehicles tax class
- Disabled passenger vehicles in the Exempt Vehicles tax class - this will benefit disabled groups allowing them to transport disabled persons throughout the CAZ without charge.
- Military vehicles by virtue of Section 349 of the Armed Forces Act 2006

- Ultra-Low Emission Vehicles (fully electric and hydrogen fuel cell)

7.2.2 Local exemptions

Local exemptions are proposed for the following vehicles:

- Vehicles in the Special Concessionary tax class not already exempt under the CAZ Framework including agricultural machines, mowing machines, electric, gritter, snowplough and steam vehicles
- Vehicle in the Motorcycle tax class not already exempt under the CAZ Framework
- Other vehicles in the Exempt Vehicles tax class not already exempt under the CAZ Framework including:
  - 'limited use' vehicles;
  - vehicles used by a disabled person (disabled tax class) and
  - National Health Service vehicles
- Vehicles passing through the CAZ on a valid trade licence plate

7.2.3 Local concessions

Concessions are under consideration for the following vehicle types until 01/01/2025:

- Emergency vehicles – to ensure continued access to all areas of the city.
- Recovery vehicles – to ensure continued access to all areas of the city.
- Euro 4/5 coaches with valid education trip permits - to ensure education services are continued

Concessions are under consideration for the following vehicle types until 01/01/2022:

- Euro 4/5 diesel registered blue badge holders - due to the difficulty in switching to an alternative transport modes and their possible lower socio-economic group, leading to difficulty in upgrading vehicles.
- Euro 5 diesel taxis and private hire vehicles – in recognition that taxi and private hire drivers may fall within the lower income households in B&NES, are not able to pass on to customers any of the costs associated with responding to the CAZ, provide a critical transport service within the city and may have purchased their vehicle in accordance with recent Government guidance
- Euro 4/5 wheelchair accessible vehicles used as taxis - to maintain access opportunities for disabled persons.
- Euro 4/5 vehicles registered to healthcare providers - would provide benefits to all key local groups, but particularly the ill and/or disabled, who will have continued access to their healthcare providers.
- Euro 4/5 diesel registered community transport providers - to maintain access for communities, schools and religious establishments. This will potentially benefit several of the key local groups identified in the distributional impact assessment.
- Diesel Hybrid Euro 5 vehicles – to acknowledge the positive step made by the owner to reduce their emissions.

All proposed exemptions and concessions are subject to further analysis in order to confirm that they would not impact upon the year in which compliance can be achieved by the scheme.

7.3 Summary of Measures Delivered Through Scheme Revenue

The following measures, detailed in OBC-08 'Options Assessment Report' in Appendix C of the OBC, could provide additional mitigation of the adverse impacts of the charging scheme for key local groups. However, they are not expected to be deliverable by 2021 and so are not proposed as CAF measures. Should the CAZ generate sufficient surplus revenue the measures under consideration for implementation are:

- Additional funding to provide additional cycle parking across the city centre, as discussed in Section 7.1.1.
- Options to improve cycling and walking experience
  - Would include extending cycling and walking priority schemes, park and pedal schemes and safer environments for active transport mode. This will increase the accessibility of these affordable transport modes by improving their perceived safety, with a potentially large impact on low-income households, business and a range of other key local groups.
- Additional funding to expand proposal (included in Go Ultra Low package) to introduce electric cycle hire and increase the public electric car charging in the city, as detailed in Section 7.1.2.
- Increased utilisation of car/van club network in Bath
  - This will improve the accessibility of a CAZ compliant vehicle to low-income households, local impacted businesses and SMEs, allowing them the option to 'rent' a vehicle when required.
- Implement public transport route improvements including bus priority, passenger information and waiting facilities (target particular routes or demographics) both on key corridors in/out of the city and within the CAZ
  - Adopting these changes to the bus system would improve the travel experience and encourage its use, thus providing a better alternative for those currently driving into the city. This would provide a large benefit to most key local groups discussed, particularly low-income households and elderly residents, who would be encouraged to use a more reliable public transport service to get around the city.
- Expand existing P&R site size. Provide additional P&R capacity at the university sites at weekends and during holiday periods. And provide Small P&R sites on existing bus routes.
  - This would provide benefits to low-income households and businesses in the surrounding areas, particularly rural areas, to Bath. Giving those unable to upgrade to a compliant vehicle an alternative to paying the CAZ charge.