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Air Quality Plan for the achievement of EU air quality limit values for nitrogen dioxide (NO_2) in Bristol Urban Area (UK0009)

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Contents

1. Introduction

1.1. This document

This document is the Bristol Urban Area (UK0009) air quality plan for the achievement of the EU air quality limit values for nitrogen dioxide (NO_2).

This plan presents the following information:

• General information regarding the Bristol Urban Area agglomeration zone
• Details of NO_2 exceedence situation(s) within the Bristol Urban Area agglomeration zone
• Details of local air quality measures that have been implemented, will be implemented or are being considered for implementation in this agglomeration zone.

This air quality plan for Bristol Urban Area should be read in conjunction with the separate UK overview document and the list of UK and national measures that are available on the Defra website (http://www.defra.gov.uk/environment/quality/air/air-quality/eu/). The UK overview document sets out, amongst other things, the authorities responsible for delivering air quality improvements and the national measures that are applied in some or all UK zones. The measures presented in this plan and the accompanying UK overview and list of UK measures show how the UK will ensure that compliance with the NO_2 limit values is achieved as soon as possible.

This plan should also be read in conjunction with the supporting UK technical report (http://www.defra.gov.uk/environment/quality/air/air-quality/eu/), which presents information on assessment methods, input data and emissions inventories used in the analysis presented in this plan.

1.2. Context

Two NO_2 limit values for the protection of human health have been set in the Air Quality Directive (2008/50/EC). These are:

• The annual limit value: an annual mean concentration of no more than 40 μgm^{-3}
• The hourly limit value: no more than 18 hourly exceedances of 200 μgm^{-3} in a calendar year

The Air Quality Directive stipulates that compliance with the NO_2 limit values will be achieved by 01/01/2010. However, where the limit values cannot be achieved by then, the Directive also allows Member States to postpone this attainment date until 01/01/2015 provided air quality plans are established demonstrating how the limit values will be met by this extended deadline.

1.3. Zone status

The assessment undertaken for the Bristol Urban Area agglomeration zone indicates that the annual limit value is likely to be exceeded in 2010 but achieved by 2015 through introduction of the measures included in the baseline, a low emission zone (LEZ) scenario (if applied) and the non-quantifiable local measures outlined in this plan. Postponement of the compliance date to 2015 is sought for this limit value in this zone.

The assessment undertaken for the Bristol Urban Area agglomeration zone indicates that the hourly limit value not exceeded in this agglomeration zone in 2008.

1.4. Plan structure

General administrative information regarding this agglomeration zone is presented in section 2.

Section 3 then presents the overall picture with respect to NO_2 levels in this agglomeration zone for the 2008 reference year of this air quality plan. This includes the declaration of exceedance situations

within the agglomeration zone and presentation of a detailed source apportionment for each exceedance situation.

An overview of the measures already taken and to be taken within the agglomeration zone both before and after 2010 is given in section 4.

Baseline modelled projections for 2010, 2015 and 2020 for each exceedance situation are presented in section 5. The baseline projections presented here include, where possible, the impact of measures that have already been taken and measures for which the relevant authority has made a firm commitment to take the measure(s). However, it has not been possible to quantify the impact of all measures. This section therefore also explains which measures have been quantified, and hence included in the model projections, and which measures have not been quantified.

Details of an LEZ scenario under consideration as part of our investigation of additional measures to achieve the NO_2 limit values is presented in section 6.

2. General Information about the Zone

2.1. Administrative information

Zone name: Bristol Urban Area
Zone code: UK0009
Type of zone: agglomeration zone
Reference year: 2008
Extent of zone: Figure 1 shows the area covered by the Bristol Urban Area agglomeration zone

Local Authorities within the agglomeration zone: Figure 2 shows the location of Local Authorities within the agglomeration zone. A list of these Local Authorities is also given below. The numbers in this list correspond to the numbers in Figure 2.

1. Bath and North East Somerset Council
2. Bristol City Council
3. North Somerset District Council
4. South Gloucestershire Council

(Note: Local Authority boundaries do not necessarily coincide with zone boundaries. Hence Local Authorities may be listed within more than one zone plan.)

Figure 1. Map showing the extent of the Bristol Urban Area agglomeration zone (UK0009).

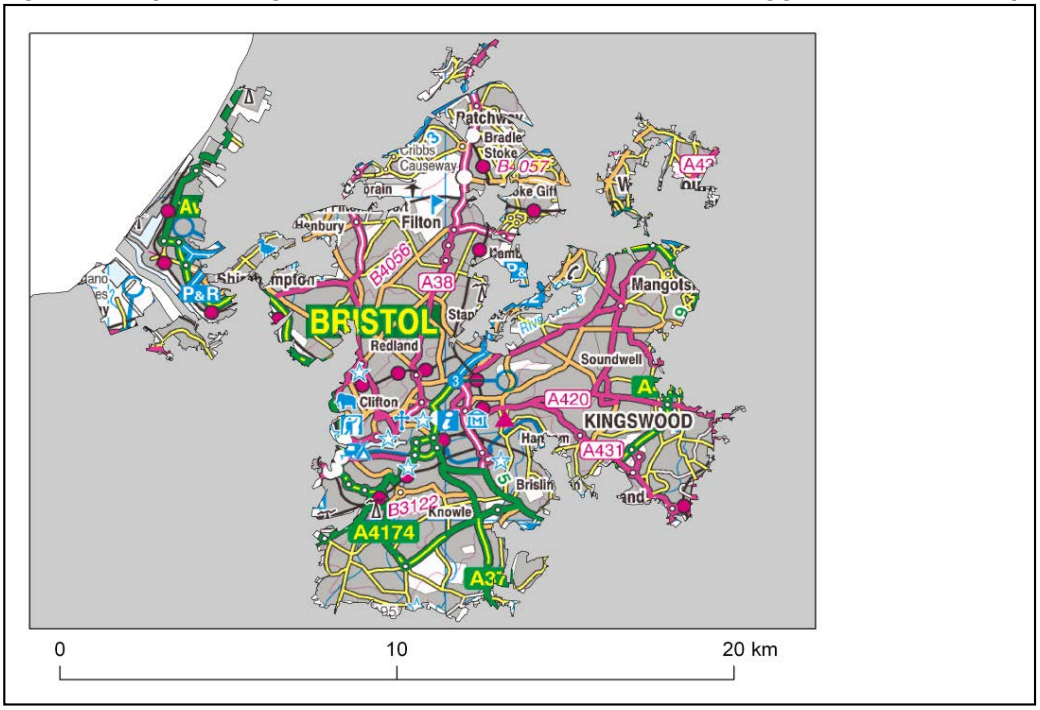

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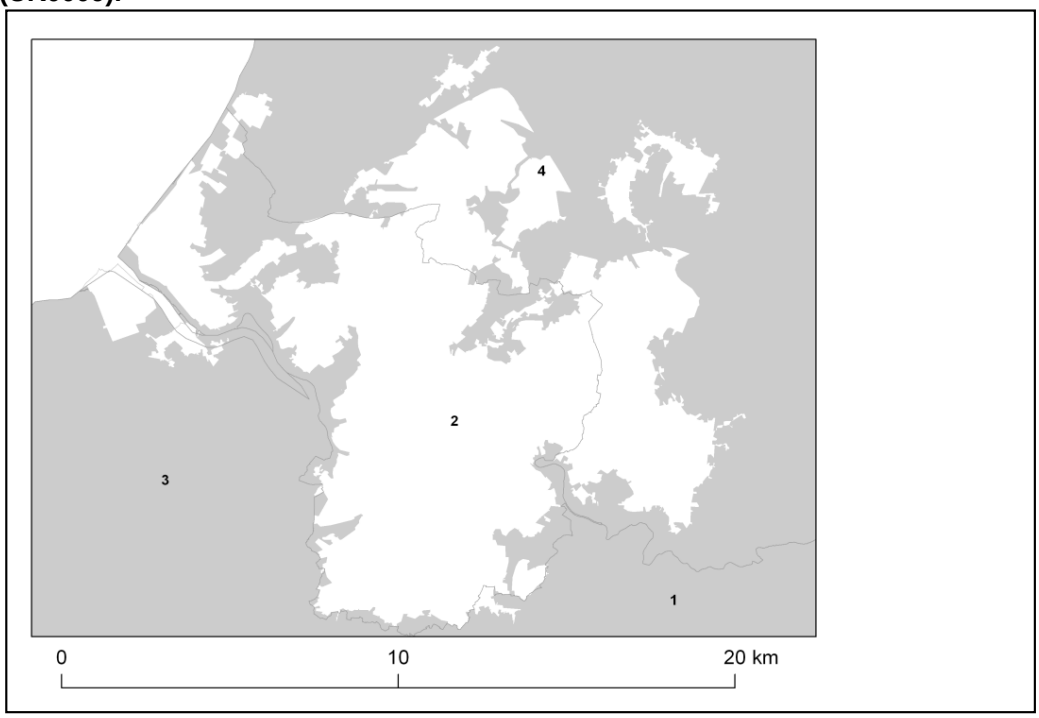
Figure 2. Map showing Local Authorities within the Bristol Urban Area agglomeration zone (UK0009).



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2.2. Assessment details

Measurements
NO_2 measurements in this zone were available in 2008 from the following national network monitoring stations (NO_2 data capture for each station in 2008 shown in brackets):

• Bristol Old Market GB0639A (99.4%)
• Bristol St Paul's GB0884A (99%)

Full details of monitoring stations within the Bristol Urban Area agglomeration zone are available from http://uk-air.defra.gov.uk/networks/network-info?view=aurn.

Modelling
Modelling for the 2008 reference year has been carried out for the whole of the UK (see the UK technical report). This modelling covers the following extent within this zone:

• Total background area within zone (approx): 142 km^2
• Total population within zone (approx): 488798 people
• Total road length where an assessment of NO_2 concentrations have been made: 116.2 km in 2008 (and similar lengths in previous years).

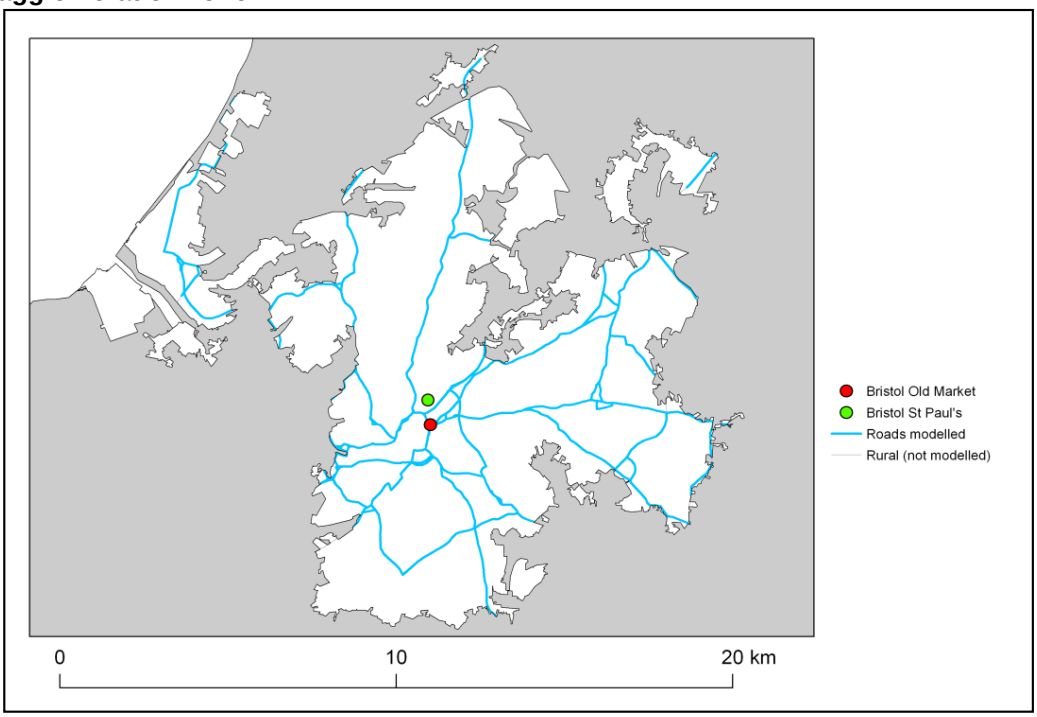
Zone maps
Figure 3 presents the location of the NO_2 monitoring stations within this zone for 2008 and the roads for which NO_2 concentrations have been modelled. NO_2 concentrations at background locations have been modelled across the entire zone at a 1 x 1 km^2 resolution.

2.3. Reporting Under European Directives

Since 2001 the UK has reported annually on air quality concentrations using a standard excel questionnaire (Decision 2004/461/EC). These questionnaires are available online from http://cdr.eionet.europa.eu/gb/eu/annualair

In addition, the UK has reported on air quality plans and programmes (Decision 2004/224/EC) on an annual basis depending on the reported concentrations in the previous year. Plans and programmes were first reported in this zone in 2003. Plans and programmes for 2003 and all other years for which they have been required are available from http://cdr.eionet.europa.eu/gb/eu/aqpp.

Figure 3. Map showing the location of the NO_2 monitoring sites with valid data in 2008 and roads where concentrations have been modelled within the Bristol Urban Area (UK0009) agglomeration zone.



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3. Overall Picture for 2008 reference year

3.1. Introduction

There are two limit values for the protection of health for NO_2. These are:

• The annual limit value (annual mean concentration of no more than 40 μgm^{-3})
• The hourly limit value (no more than 18 hourly exceedances of 200 μgm^{-3} in a calendar year)

Within the Bristol Urban Area agglomeration zone only the annual limit value was exceeded in 2008. Hence, one exceedance situation for this zone has been defined, NO_2_UK0009_Annual_1, which covers the exceedance of the annual limit value. This exceedance situation is described below.

For both NO_2 limit values, a margin of tolerance for 2008 and other years has been defined in the Air Quality Directive (2008/50/EC). Data comparing assessed concentrations at locations within this agglomeration zone with the 2008 margin of tolerance are presented in the annual reporting questionnaire for 2008 (http://cdr.eionet.europa.eu/gb/eu/annualair).

3.2. Reference year: NO_2_UK0009_Annual_1

The NO_2_UK0009_Annual_1 exceedance situation covers all exceedances of the annual mean limit value in the Bristol Urban Area agglomeration zone in 2008.

Compliance with the annual limit value in this exceedance situation has been assessed using a combination of air quality measurements and modelling. Table 1 presents measured annual mean concentrations at national network stations in this exceedance situation since the 1st Daughter Directive (1999/30/EC) came into force in 2001. This shows that there were measured exceedances of the annual limit value at Bristol Old Market (GB0639A) in 2008. Table 2 summarises modelled annual mean NO_2 results in this exceedance situation for the same time period. This table shows that, in 2008, 31.8 km of road length was modelled to exceed the annual limit value. There were no modelled background exceedances of this limit value. Table 2 also shows that the maximum modelled annual mean NO_2 concentration in 2008 was 80.2 μgm^{-3}. Maps showing the modelled annual mean NO_2 concentrations for 2008 at background and at roadside locations are presented in Figures 4 and 5 respectively. All modelled exceedances of the annual limit value are coloured orange or red in these maps.

The maximum measured concentration in the zone varies due to changes emissions and varying meteorology in different years. However, the models are also updated each year to take into account the most up-to-date science, so the modelled results for different years may not be directly comparable.

The modelling carried out for this exceedance situation has also been used to determine the annual mean NO_X source apportionment for all modelled locations, along with an indicative annual mean NO_2 source apportionment. Table 3 presents summary source apportionment information in this exceedance situation for 2008, including:

• The modelled NO_X and indicative NO_2 source apportionment for the section of road with the highest modelled NO_2 concentration in this exceedance situation in 2008. This is important information because it shows which sources need to be tackled at the point with the largest compliance gap in the exceedance situation. It is not possible to calculate an unambiguous source apportionment for annual mean NO_2 concentrations for the reasons discussed in the UK Technical Report. We have, however, developed a method to provide an indicative source apportionment for annual mean NO_2 concentrations for these air quality plans. This method involves calculating the maximum and minimum possible contribution from each source to the NO_2 concentration. The final source apportionment has been calculated as the average of the minimum and maximum contributions for each source, with the results normalised so that the contributions sum to the total modelled NO_2 concentration. Further information on the methods used for source apportionment are provided in the UK Technical Report.

• The maximum NO_X contribution from each source from across all the roads included in this exceedance situation in 2008. This is important information because it highlights all the key sources that need to be tackled within the exceedance situation in order to achieve compliance across the entire area of the exceedance situation.

Figure A1.1 in Annex 1 presents the annual mean NO_X source apportionment for each section of road within the NO_2_UK0009_Annual_1 exceedance situation (i.e. the source apportionment for all exceeding roads only) in 2008. Roads have been grouped into motorways, trunk roads and primary road in this figure.

Table 1. Measured annual mean concentrations at national network stations in NO_2_UK0009_Annual_1 for 2001 onwards, μgm^{-3}. (Data capture shown in brackets) (a)

Site name (EOI code)	2001	2002	2003	2004	2005	2006	2007	2008	2009
Bristol Centre (GB0585A)	38 (96%)	37 (96%)	36 (88%)	35 (97%)	34 (69%)				
Bristol Old Market (GB0639A)	54 (57%)		71 (64%)	54 (99%)	60 (99%)	67 (99%)	61 (98%)	62 (99%)	63 (82%)
Bristol St Paul's (GB0884A)						31 (54%)	31 (93%)	32 (99%)	30 (97%)

(a) Annual Mean Limit Value = 40 μgm^{-3}

Table 2. Annual mean NO_2 model results in NO_2_UK0009_Annual_1 for 2001 onwards

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Road length exceeding (km)	86.1	39.7	88.3	57.6	50.2	47.8	41.9	31.8	31.2
Background area exceeding (km^2)	0	0	6	0	0	0	0	0	0
Maximum modelled concentration (μgm^{-3}) (a)	64.4	62.7	83.6	70.6	82.4	76.1	77.3	80.2	60.8

(a) Annual Mean Limit Value = 40 μgm^{-3}

Table 3. Source apportionment summary information for 2008 in NO_2_UK0009_Annual_1 (μgm^{-3}).

Spatial scale	Component	Highest road link (a)		Maximum (b)
		NOx	NO2 (d)	NOx
Regional background sources (i.e. contributions from distant sources of > 30 km from the receptor)	Total	7.2	(c)	
	From within the UK	3.6	(c)	3.8
	From transboundary sources (includes shipping and other EU Member States)	3.5	(c)	3.7
Urban background sources (i.e. sources located within 0.3 - 30 km from the receptor)	Total	33.9	16.4	-
	From road traffic sources	15.8	9.8	28.6
	From industry (including heat and power generation)	1.7	(c)	13.7
	From agriculture	0.0	(c)	0.0
	From commercial/residential sources	7.2	(c)	9.5
	From shipping	4.0	(c)	4.6
	From off road mobile machinery	4.2	(c)	10.8
	From natural sources	0.0	(c)	0.0
	From transboundary sources	0.0	(c)	0.0
	From other urban background sources	1.0	(c)	4.9
Local sources (i.e. contributions from sources < 0.3 km from the receptor)	Total	164.7	63.8	-
	From cars	39.1	15.4	43.7
	From HGV rigid	8.5	3.5	42.2
	From HGV articulated	2.6	1.1	52.2
	From Buses	103.5	38.6	108.7
	From LGVs	10.6	5.1	13.2
	From motorcycles	0.5	0.2	0.6
Total (i.e. regional background + urban background + local components)		205.8	80.2	-

(a) The road with the highest modelled annual mean NO_2 concentration in this exceedance situation in 2008 is a section of the A38, traffic count point id 37053 (OS grid (m): 358600, 173000).
(b) This column gives the maximum contribution for each component from all the roads included in the exceedence situation.
(c) The combined modelled annual mean NO_2 concentration contribution for these components is 6.6 μgm^{-3}. A more detailed NO_2 source apportionment is currently unavailable for these sectors.
(d) Source apportionment for NO_2 is indicative, see UK Technical Report.

Figure 4. Map of modelled background annual mean NO_2 concentrations 2008. Modelled exceedances of the annual limit value are shown in orange and red.

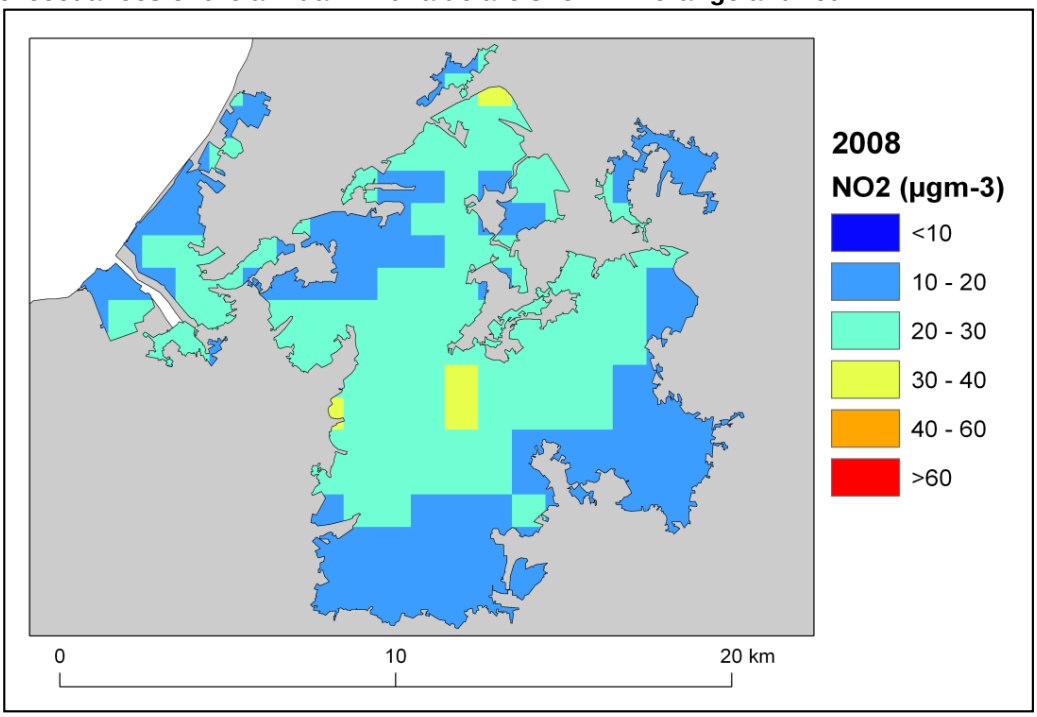

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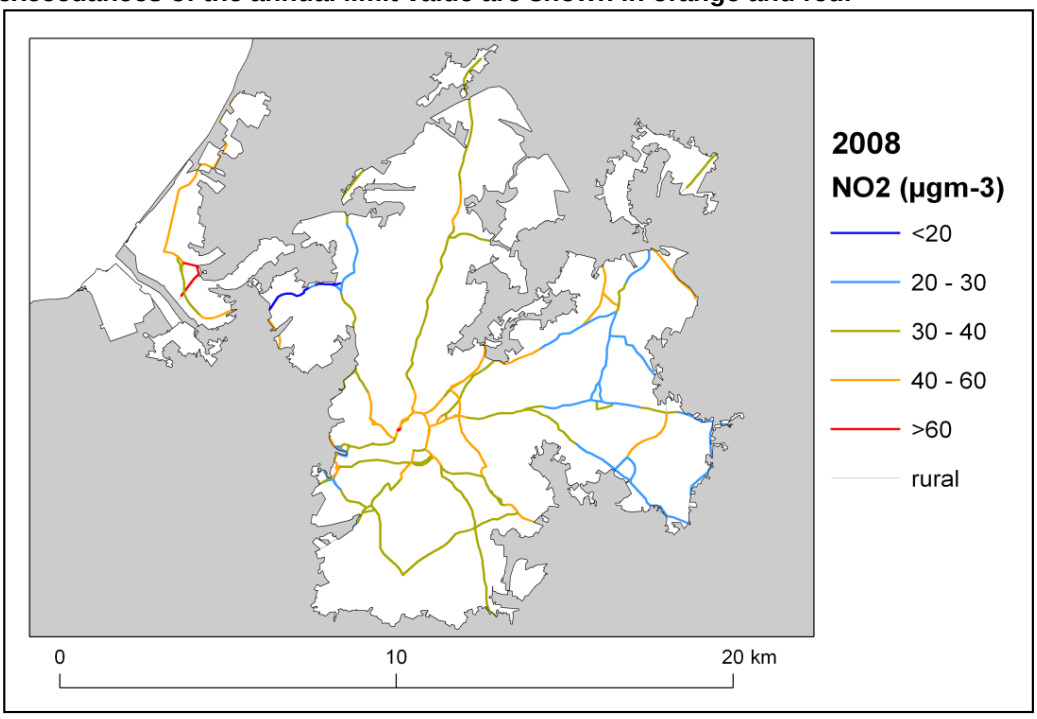
Figure 5. Map of modelled roadside annual mean NO_2 concentrations 2008. Modelled exceedances of the annual limit value are shown in orange and red.



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4. Measures

4.1. Introduction

This section (section 4) gives details of measures that address exceedances of the NO_2 limit values within Bristol Urban Area agglomeration zone. This includes both measures that have already been taken and measures for which there is a firm commitment that they will be taken.

Section 5 then explains the extent to which it has been possible to incorporate the impacts of these measures into the baseline modelling carried out for this assessment.

4.2. Source apportionment

It is important to understand which sources are responsible for causing the exceedance in order to most effectively tailor measures to address the NO_2 exceedance situation(s) described in section 3 above. This can be achieved by considering the source apportionment for the exceedance situation, also presented in section 3. A summary of what the source apportionment shows and the implications for which measures would therefore be appropriate is given here.

Local road traffic was the dominant source in this exceedance location in the reference year. The largest contribution was from buses at the location of maximum exceedance with a contribution of 103.5 ugm^{-3} of NO_X out of a total of 205.8 ugm^{-3} of NO_X. Articulated HGVs and cars were important sources on the motorway roads with the highest concentrations in this exceedance situation. Buses, cars and on some roads articulated HGVs and rigid HGVs were important sources on the primary roads with the highest concentrations.

This indicates that appropriate measures should impact on local road traffic sources in this zone. Other measures may also be beneficial depending on the source apportionment for the urban background.

4.3. Measures

Measures potentially affecting NO_2 in this agglomeration zone have been taken and/or are planned at a range of administrative levels. These are:

- European Union
- National (i.e. England, Scotland, Wales, Northern Ireland or whole UK)
- Local (i.e. UK Local Authorities)

Details of European Union measures (e.g. euro standards, fuel quality directives, integrated pollution prevention and control) can be found on the European Commission's website (http://ec.europa.eu/environment/air/index_en.htm). Details of national measures are given in the UK overview document and list of UK and National measures.

Relevant Local Authority measures within this exceedance situation are listed in Table A2.1 (see Annex 2). Relevant Local Authority measures are considered to be those measures which directly target, or are in close geographical proximity to roads and/or background grid squares in exceedance of one or other of the NO_2 limit values. Other Local Authority measures may also have been taken in this zone, but they are not listed in this table. All the measures listed in Table A2.1 have been carried out, are in the process of being carried out or a firm commitment had been made to carry them out on the timetables listed at the point at which information on local measures was collected.

4.4. Measures timescales

Timescales for national measures are given in the UK overview document and list of UK and National measures.

Information on local measures was collected in autumn 2009. Hence, any Local Authority action plans and measures adopted by Local Authorities after this time have not been included in this air quality

plan. Many of the measures listed in Annex 2 will either have happened before autumn 2009 or have been planned for implementation before or during 2010. Others will be planned for after 2010. It should be noted that many of the measures taken before or during 2010 will continue to have a beneficial impact on air quality after the end of 2010.

Local Authorities report on progress with the implementation of their action plans annually and review action plan measures regularly. Where future Local Authority measures to improve air quality are under consideration these would be included in future local authority action plans and published by the local authority.

5. Baseline Model Projections

5.1. Overview of model projections

Baseline projections for 2010
Model projections for 2010, starting from the 2008 reference year described in section 3, have been calculated in order to determine whether compliance with the NO_2 limit values is likely to be achieved for each exceedance situation by the original deadline for compliance of 01/01/2010. Details of the methods used for the baseline emissions and concentration projections modelling are provided in the the UK technical report.

For national measures, it has not been possible to quantify the impact of all measures on emissions and ambient concentrations. The impact for all quantifiable measures has been included in the baseline projections.

The impacts of the individual Local Authority measures have not been explicitly included in the baseline model projections. However, measures may have been included implicitly if they have influenced the traffic counts for 2007 (used as a basis for the compilation of the emission inventory) or in the traffic activity projections to 2010 and beyond (used to calculate the emission projections). It should be recognised that these measures will have a beneficial impact on air quality, even if it has not been possible to quantify this impact here.

A number of the local measures in Table A2.1 can be considered to be 'smarter choices' measures (see http://www.dft.gov.uk/pgr/sustainable/smarterchoices/ctwwt/ for a detailed description of this type of measure). We have quantified the impact of this group of measures on a national scale within the projections. Details of how this has been done can be found in the UK technical report. Table A2.1 indicates which local measures we have considered to be 'smarter choices'.

Baseline projections for 2015
Model projections for 2015, starting from the 2008 reference year described above, have been calculated in order to determine whether compliance with the NO_2 limit values is likely to be achieved for each exceedance situation by the revised deadline for compliance of 01/01/2015 on the basis of EU-wide measures and the measures currently planned. This modelling is described in detail in the UK technical report. Many of the measures listed in annex 2 of this document and the supporting list of UK and national measures will continue or will continue to have an impact beyond the original deadline for compliance of 01/01/2010.

5.2. Baseline projections: NO_2_UK0009_Annual_1

Table 4 presents summary results for the baseline model projections for 2010, 2015 and 2020 for the NO_2_UK0009_Annual_1 exceedance situation. This shows that the maximum modelled annual mean NO_2 concentration predicted for 2010 in this exceedance situation is 69.6 μgm^{-3}. By 2015, the maximum modelled annual mean NO_2 concentration is predicted to drop to 48 μgm^{-3}. Hence, the model results suggest that compliance with the NO_2 annual limit value is unlikely to be achieved by 2015 under baseline conditions in this exceedance situation.

The projected modelled NO_X and indicative NO_2 annual mean source apportionments for 2010, 2015 and 2020 at the location with the biggest compliance gap in 2008 are presented in Table 5. The model results suggest that this location will continue to have the highest annual mean NO_2 concentration within this exceedance situation in 2010, 2015 and 2020.This source apportionment information is useful because it shows which sources need to be tackled at the point with the largest compliance gap in the exceedance situation.

Table 6 shows the maximum NO_X contribution from each source apportionment component from any road across the whole exceedance situation. This source apportionment information is useful because it highlights all the key sources that need to be tackled within the exceedance situation in order to achieve compliance across the entire area of the exceedance situation. It should be noted that this table only includes roads which continue to be in exceedance in the relevant year. Hence, for

example, the road with the largest contribution from cars in 2010 may no longer be included in the table in 2015 if the road is predicted to be compliant in 2015.

Figures 6 and 7 show maps of projected annual mean NO_2 concentrations in 2010, 2015 and 2020 at background and roadside locations respectively. Maps for 2008 are also presented here for reference.

It should be noted that the baseline projections presented here include the impacts of measures, where they can be quantified, that have already been or will be implemented.

Table 4. Annual mean NO_2 model results in NO_2_UK0009_Annual_1

	2008	2010	2015	2020
Road length exceeding (km)	31.8	16.3	0.3	0.0
Background area exceeding (km^2)	0	0	0	0
Maximum modelled concentration (μgm^{-3}) (a)	80.2	69.6	48.0	30.8

(a) Annual Mean Limit Value = 40 μgm^{-3}

Table 5. Modelled source apportionment for 2010, 2015 and 2020 under baseline conditions for traffic count point 37053 on the A38 (the road section with the maximum modelled annual mean NO_2 concentration in 2008 in NO_2_UK0009_Annual_1. OS grid (m): 358600, 173000). 2008 results are also presented here for reference (units: μgm^{-3}).

Spatial scale	Component	NOx				NO2 (indicative)			
		2008	2010	2015	2020	2008	2010	2015	2020
Regional background sources (i.e. contributions from distant sources of > 30 km from the receptor)	Total	7.2	6.2	5.5	4.5	(a)	(b)	(c)	(d)
	From within the UK	3.6	3.2	2.8	2.3	(a)	(b)	(c)	(d)
	From transboundary sources (includes shipping and other EU Member States)	3.5	3.1	2.7	2.2	(a)	(b)	(c)	(d)
Urban background sources (i.e. sources located within 0.3 - 30 km from the receptor)	Total	33.9	28.1	22.3	19.3	16.4	14.2	11.9	11.0
	From road traffic sources	15.8	10.8	7.2	5.4	9.8	9.4	8.6	8.3
	From industry (including heat and power generation)	1.7	1.5	1.4	1.4	(a)	(b)	(c)	(d)
	From agriculture	0.0	0.0	0.0	0.0	(a)	(b)	(c)	(d)
	From commercial/residential sources	7.2	7.2	6.8	6.3	(a)	(b)	(c)	(d)
	From shipping	4.0	3.9	3.9	3.9	(a)	(b)	(c)	(d)
	From off road mobile machinery	4.2	3.9	2.1	1.5	(a)	(b)	(c)	(d)
	From natural sources	0.0	0.0	0.0	0.0	(a)	(b)	(c)	(d)
	From transboundary sources	0.0	0.0	0.0	0.0	(a)	(b)	(c)	(d)
	From other urban background sources	1.0	0.8	0.8	0.8	(a)	(b)	(c)	(d)
Local sources (i.e. contributions from sources < 0.3 km from the receptor)	Total	164.7	138.2	83.8	42.4	63.8	55.4	36.1	19.8
	From cars	39.1	26.3	18.1	12.0	15.4	11.1	8.2	5.8
	From HGV rigid	8.5	7.6	3.9	1.4	3.5	3.2	1.7	0.6
	From HGV articulated	2.6	2.2	1.1	0.4	1.1	0.9	0.5	0.2
	From Buses	103.5	92.7	54.7	25.2	38.6	35.4	22.5	11.4
	From LGVs	10.6	9.0	5.7	3.2	5.1	4.6	3.0	1.7
	From motorcycles	0.5	0.5	0.3	0.2	0.2	0.2	0.1	0.1
Total (i.e. regional background + urban background + local components)		205.8	172.6	111.5	66.2	80.2	69.6	48.0	30.8

(a) The total annual mean NO_2 contribution for all components labelled (a) in 2008 was modelled to be 6.6 μgm^{-3}.
(b) The total annual mean NO_2 contribution for all components labelled (b) in 2010 is predicted to be 4.7 μgm^{-3}.
(c) The total annual mean NO_2 contribution for all components labelled (c) in 2015 is predicted to be 3.3 μgm^{-3}.
(d) The total annual mean NO_2 contribution for all components labelled (d) in 2020 is predicted to be 2.6 μgm^{-3}.

Table 6. The maximum NO_X contribution from each source from across all the roads included in the exceedance situation on which exceedances remain in 2010, 2015 and 2020 under baseline conditions. Zeros indicate that there are no exceedances in the relevant year.

Spatial scale	Component	NOx			
		2008	2010	2015	2020
Regional background sources (i.e. contributions from distant sources of > 30 km from the receptor)	From within the UK	3.8	3.2	2.8	0.0
	From transboundary sources (includes shipping and other EU Member States)	3.7	3.1	2.7	0.0
Urban background sources (i.e. sources located within 0.3 - 30 km from the receptor)	From road traffic sources	28.6	22.2	7.2	0.0
	From industry (including heat and power generation)	13.7	11.9	1.4	0.0
	From agriculture	0.0	0.0	0.0	0.0
	From commercial/residential sources	9.5	9.6	6.8	0.0
	From shipping	4.6	4.4	3.9	0.0
	From off road mobile machinery	10.8	10.1	2.1	0.0
	From natural sources	0.0	0.0	0.0	0.0
	From transboundary sources	0.0	0.0	0.0	0.0
	From other urban background sources	4.9	3.1	0.8	0.0
Local sources (i.e. contributions from sources < 0.3 km from the receptor)	From cars	43.7	29.4	18.1	0.0
	From HGV rigid	42.2	37.5	3.9	0.0
	From HGV articulated	52.2	45.5	1.1	0.0
	From Buses	108.7	97.4	54.7	0.0
	From LGVs	13.2	11.3	5.7	0.0
	From motorcycles	0.6	0.6	0.3	0.0

Figure 6. Background baseline projections of annual mean NO_2 concentrations in 2010, 2015 and 2020. 2008 is also included here for reference. Modelled exceedances of the annual limit value are shown in orange and red.

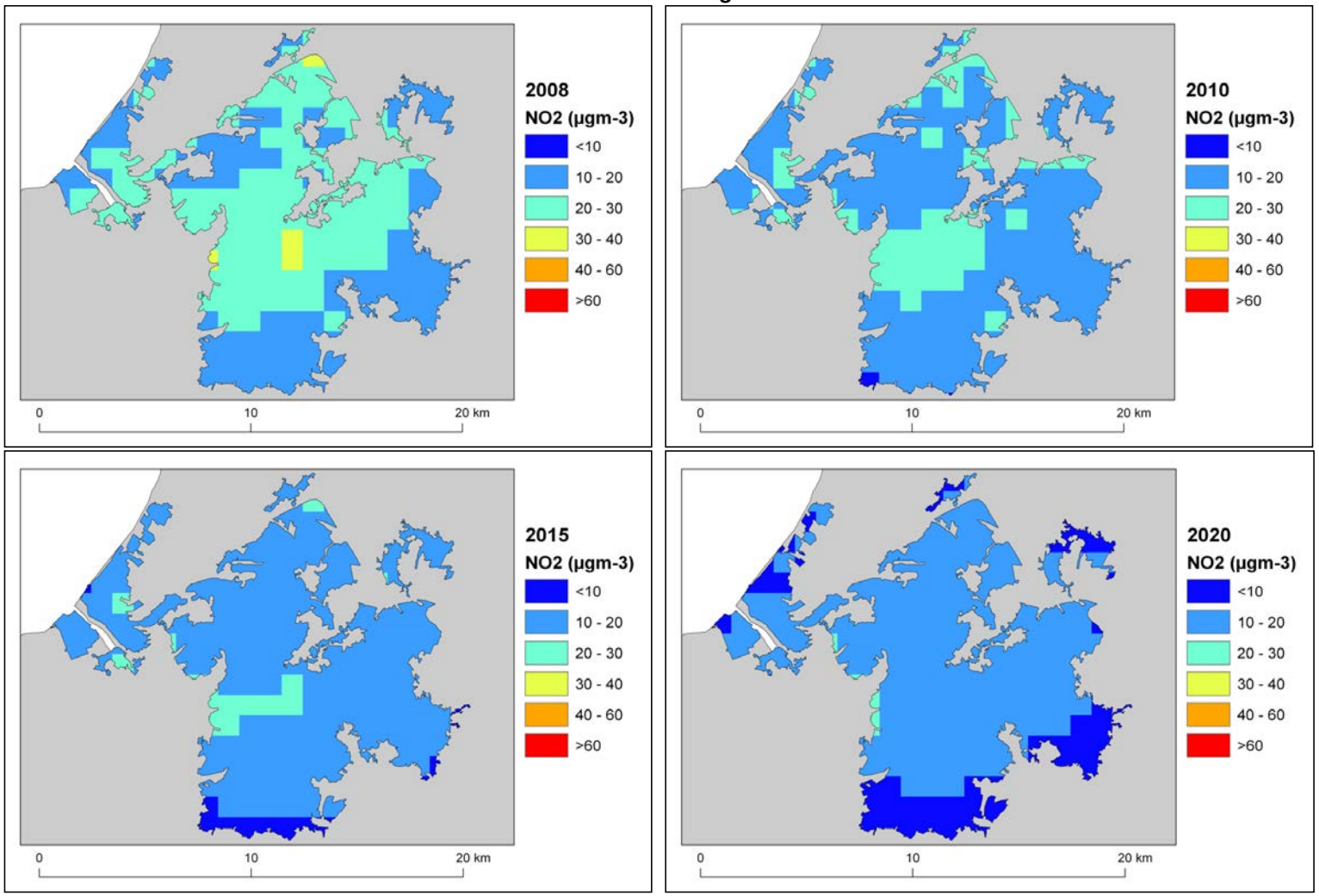

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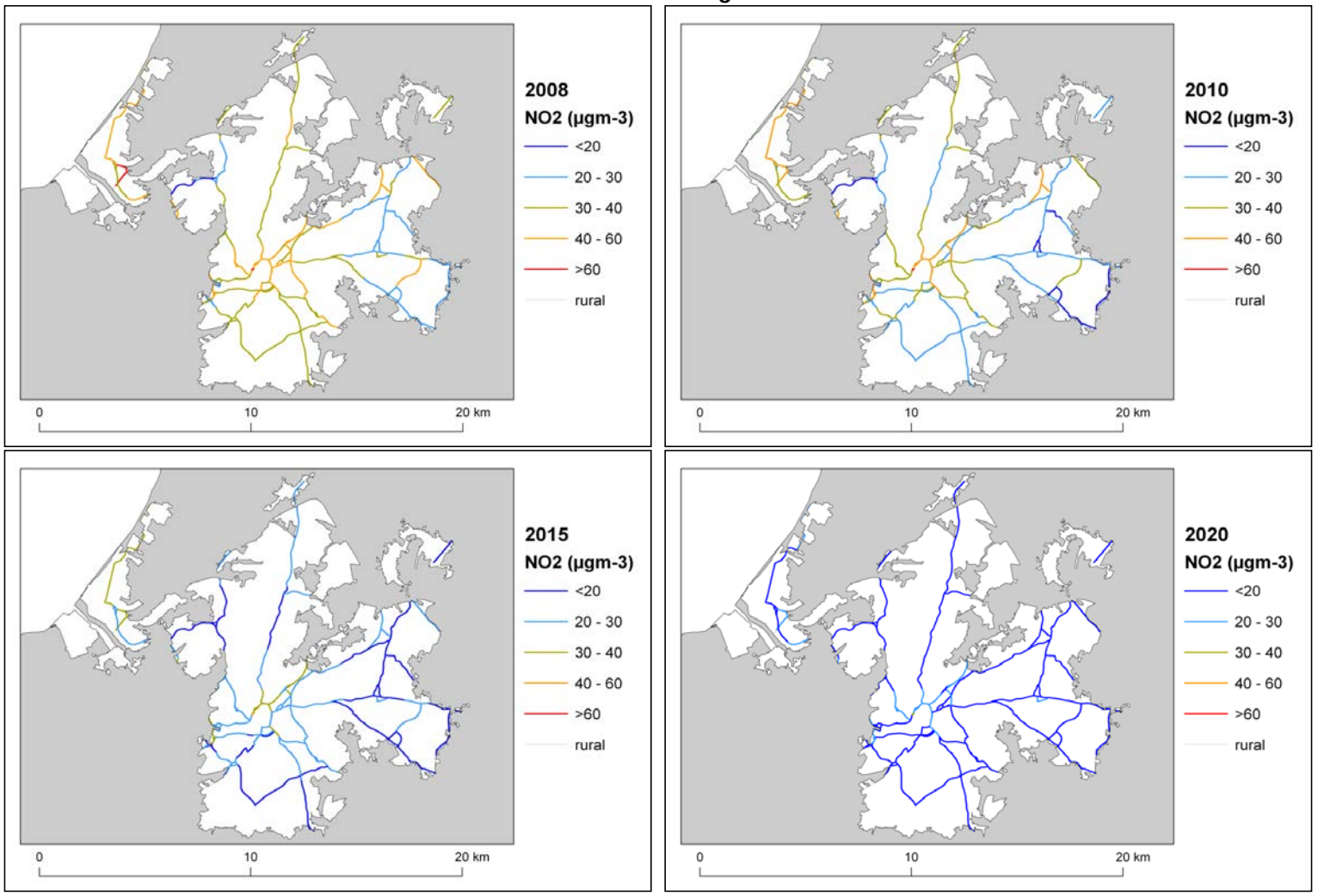
Figure 7. Roadside baseline projections of annual mean NO_2 concentrations in 2010, 2015 and 2020. 2008 is also included here for reference. Modelled exceedances of the annual limit value are shown in orange and red.



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6. Projections including the impact of the low emissions zone (LEZ) scenario

6.1. Overview of model projections

Further model projections for 2015 and 2020 have also been calculated that include the impact of the LEZ scenario. This scenario is under consideration as part of our investigation of additional measures to achieve the NO_2 limit values. The scenario modelled here would require all HGVs and buses to meet at least Euro IV emission standards for NO_X and PM_{10} in 2015 in order to travel on roads other than the strategic long distance road network within the selected Local Authority boundaries. More details of the work underway to explore the feasibility and costs of a national LEZ framework are provided in the UK overview document and a description of the modelling assumptions included in the LEZ scenario is available in the UK technical report.

The LEZ scenario has been modelled for this zone because initial screening work indicated that, should it be applied, it would be effective at either reducing the gap to or achieving compliance with the limit value. The model results for these projections are presented in this section.

Further work is underway to investigate the feasibility and practicality of a national framework for LEZ as an additional measure to reduce concentrations of NO_2. These investigations include:

• the likely effectiveness of any scheme at controlling air pollutant emissions and delivering increased compliance with European air quality standards within the timescales specified by the EU Ambient Air Quality Directive;
• the effectiveness and reliability of available NO_X abatement equipment, taking into account evidence on the performance of Euro standards;
• the cost and resource such a measure might place upon national and/or local government;
• administrative and enforcement considerations for the scheme and the implications of this for Government Executive Agencies;
• the likely take-up of the scheme by local authorities and others;
• how any scheme would relate to ongoing certification work at EU and UNECE level.

These investigations will continue over the coming months and decisions will be made following the investigation as to whether or not it is feasible to introduce a national LEZ Framework and the details of any scheme. Should a local authority decide to introduce an LEZ, final decisions on the nature and extent of such a measure would be for the local authority to make taking into account local circumstances and any national arrangements put in place. These might not reflect what has been modelled in the scenario.

The LEZ scenario examines the impact of a LEZ applied within the selected local authorities listed in the supporting technical report. The local authorities relevant to this zone are

• Bristol City Council

The impact of the LEZ scenario on projected NO_2 concentrations in 2015 will be greatest in these local authorities. There are also expected to be smaller benefits in other areas as a result of the changes to the national HGV fleets required to ensure LEZ compliance within the LEZ locations. The impact of these fleet changes on projected NO_2 concentrations in 2015 have been assessed in all zones for which the baseline projections do not show compliance with the annual mean limit value in 2015.

6.2. LEZ scenario projections: NO_2_UK0009_Annual_1

Table 7 presents summary results for the LEZ scenario model projections for 2015 and 2020 for the NO_2_UK0009_Annual_1 exceedance situation. This shows that the maximum modelled annual mean NO_2 concentration predicted for 2015 for the LEZ scenario in this exceedance situation is 39.1 μgm^{-3}. Hence, the model results suggest that compliance with the NO_2 annual limit value is likely to be achieved by 2015 for the LEZ scenario in this exceedance situation. Postponement of the compliance date to 2015 is sought for this limit value in this zone. The maximum modelled annual mean NO_2 concentration in 2020 is predicted to be 28.4 μgm^{-3}.

The projected modelled NO_X and indicative NO_2 annual mean source apportionments for 2010, 2015 and 2020 at the location with the biggest compliance gap in 2008 are presented in Table 8. The model results suggest that this location will continue to have the highest annual mean NO_2 concentration within this exceedance situation in 2010, 2015 and 2020. This source apportionment information is useful because it shows which sources need to be tackled at the point with the largest compliance gap in the exceedance situation.

Table 9 shows the maximum NO_X contribution from each source apportionment component from any road across the whole exceedance situation. This source apportionment information is useful because it highlights all the key sources that need to be tackled within the exceedance situation in order to achieve compliance across the entire area of the exceedance situation. It should be noted that this table only includes roads that continue to be in exceedance in the relevant year. Hence, for example, the road with the largest contribution from cars in 2010 may no longer be included in the table in 2015 if the road is predicted to be compliant in 2015.

Figures 8 and 9 show maps of projected annual mean NO_2 concentrations for the LEZ scenario in 2015 and 2020 at background and roadside locations respectively. Maps for 2008 and baseline projections for 2010 are also presented here for reference.

Table 7. Annual mean NO_2 model results in NO_2_UK0009_Annual_1. 2015 and 2020 results are for the LEZ scenario. Results for 2008 and baseline projections for 2010 are also shown

	2008	2010	2015	2020
Road length exceeding (km)	31.8	16.3	0.0	0.0
Background area exceeding (km^2)	0	0	0	0
Maximum modelled concentration (μgm^{-3}) (a)	80.2	69.6	39.1	28.4

(a) Annual Mean Limit Value = 40 μgm^{-3}

Table 8. Modelled source apportionment for 2015 and 2020 for the LEZ scenario for traffic count point 37053 on the A38 (the road section with the maximum modelled annual mean NO_2 concentration in 2008 in NO_2_UK0009_Annual_1 OS grid (m): 358600, 173000). 2008 and 2010 baseline projections results are also presented here for reference (units: μgm^{-3}).

Spatial scale	Component	NOx				NO2 (indicative)			
		2008	2010	2015	2020	2008	2010	2015	2020
Regional background sources (i.e. contributions from distant sources of > 30 km from the receptor)	Total	7.2	6.2	5.4	4.4	(a)	(b)	(c)	(d)
	From within the UK	3.6	3.2	2.7	2.2	(a)	(b)	(c)	(d)
	From transboundary sources (includes shipping and other EU Member States)	3.5	3.1	2.7	2.2	(a)	(b)	(c)	(d)
Urban background sources (i.e. sources located within 0.3 - 30 km from the receptor)	Total	33.9	28.1	21.5	19.2	16.4	14.2	11.9	11.0
	From road traffic sources	15.8	10.8	6.5	5.3	9.8	9.4	8.9	8.4
	From industry (including heat and power generation)	1.7	1.5	1.4	1.4	(a)	(b)	(c)	(d)
	From agriculture	0.0	0.0	0.0	0.0	(a)	(b)	(c)	(d)
	From commercial/residential sources	7.2	7.2	6.8	6.3	(a)	(b)	(c)	(d)
	From shipping	4.0	3.9	3.9	3.9	(a)	(b)	(c)	(d)
	From off road mobile machinery	4.2	3.9	2.1	1.5	(a)	(b)	(c)	(d)
	From natural sources	0.0	0.0	0.0	0.0	(a)	(b)	(c)	(d)
	From transboundary sources	0.0	0.0	0.0	0.0	(a)	(b)	(c)	(d)
	From other urban background sources	1.0	0.8	0.8	0.8	(a)	(b)	(c)	(d)
Local sources (i.e. contributions from sources < 0.3 km from the receptor)	Total	164.7	138.2	60.3	36.5	63.8	55.4	27.2	17.4
	From cars	39.1	26.3	18.1	12.0	15.4	11.1	8.4	5.9
	From HGV rigid	8.5	7.6	3.0	1.3	3.5	3.2	1.3	0.6
	From HGV articulated	2.6	2.2	0.9	0.4	1.1	0.9	0.4	0.2
	From Buses	103.5	92.7	32.2	19.4	38.6	35.4	14.0	9.0
	From LGVs	10.6	9.0	5.7	3.2	5.1	4.6	3.0	1.7
	From motorcycles	0.5	0.5	0.3	0.2	0.2	0.2	0.1	0.1
Total (i.e. regional background + urban background + local components)		205.8	172.6	87.2	60.2	80.2	69.6	39.1	28.4

(a) The total annual mean NO_2 contribution for all components labelled (a) in 2008 was modelled to be 6.6 μgm^{-3}.
(b) The total annual mean NO_2 contribution for all components labelled (b) in 2010 is predicted to be 4.7 μgm^{-3}.
(c) The total annual mean NO_2 contribution for all components labelled (c) in 2015 is predicted to be 3 μgm^{-3}.
(d) The total annual mean NO_2 contribution for all components labelled (d) in 2020 is predicted to be 2.6 μgm^{-3}.

Table 9. The maximum NO_X contribution from each source from across all the roads included in the exceedance situation on which exceedances remain in 2010, 2015 and 2020 under baseline conditions. Zeros indicate that there are no exceedances in the relevant year.

Spatial scale	Component	NOx			
		2008	2010	2015	2020
Regional background sources (i.e. contributions from distant sources of > 30 km from the receptor)	From within the UK	3.8	3.2	0.0	0.0
	From transboundary sources (includes shipping and other EU Member States)	3.7	3.1	0.0	0.0
Urban background sources (i.e. sources located within 0.3 - 30 km from the receptor)	From road traffic sources	28.6	22.2	0.0	0.0
	From industry (including heat and power generation)	13.7	11.9	0.0	0.0
	From agriculture	0.0	0.0	0.0	0.0
	From commercial/residential sources	9.5	9.6	0.0	0.0
	From shipping	4.6	4.4	0.0	0.0
	From off road mobile machinery	10.8	10.1	0.0	0.0
	From natural sources	0.0	0.0	0.0	0.0
	From transboundary sources	0.0	0.0	0.0	0.0
	From other urban background sources	4.9	3.1	0.0	0.0
Local sources (i.e. contributions from sources < 0.3 km from the receptor)	From cars	43.7	29.4	0.0	0.0
	From HGV rigid	42.2	37.5	0.0	0.0
	From HGV articulated	52.2	45.5	0.0	0.0
	From Buses	108.7	97.4	0.0	0.0
	From LGVs	13.2	11.3	0.0	0.0
	From motorcycles	0.6	0.6	0.0	0.0

Figure 8. Background projections of annual mean NO_2 concentrations in 2015 and 2020 for the LEZ scenario. 2008 and baseline projections for 2010 are also included here for reference. Modelled exceedances of the annual limit value are shown in orange and red.

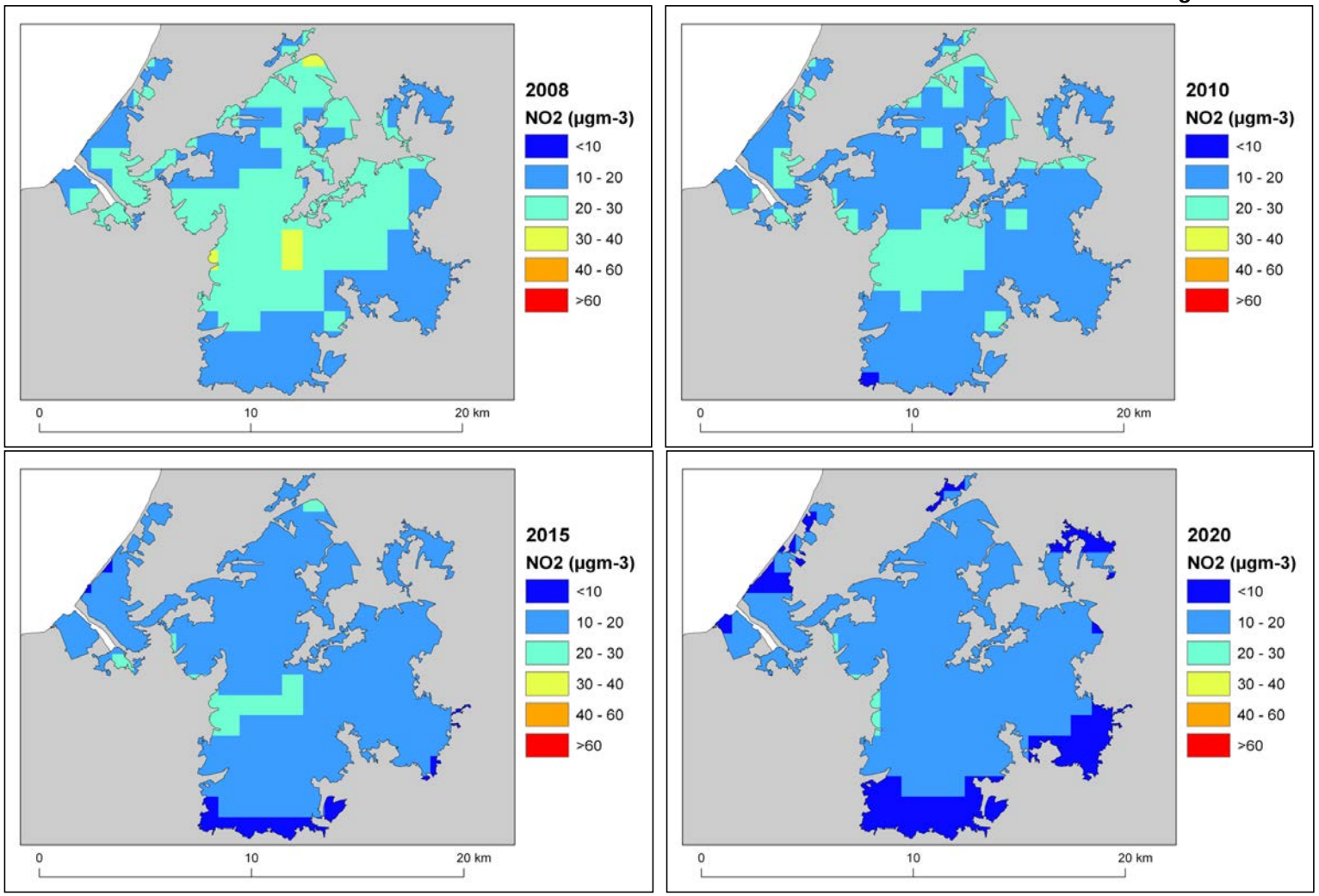

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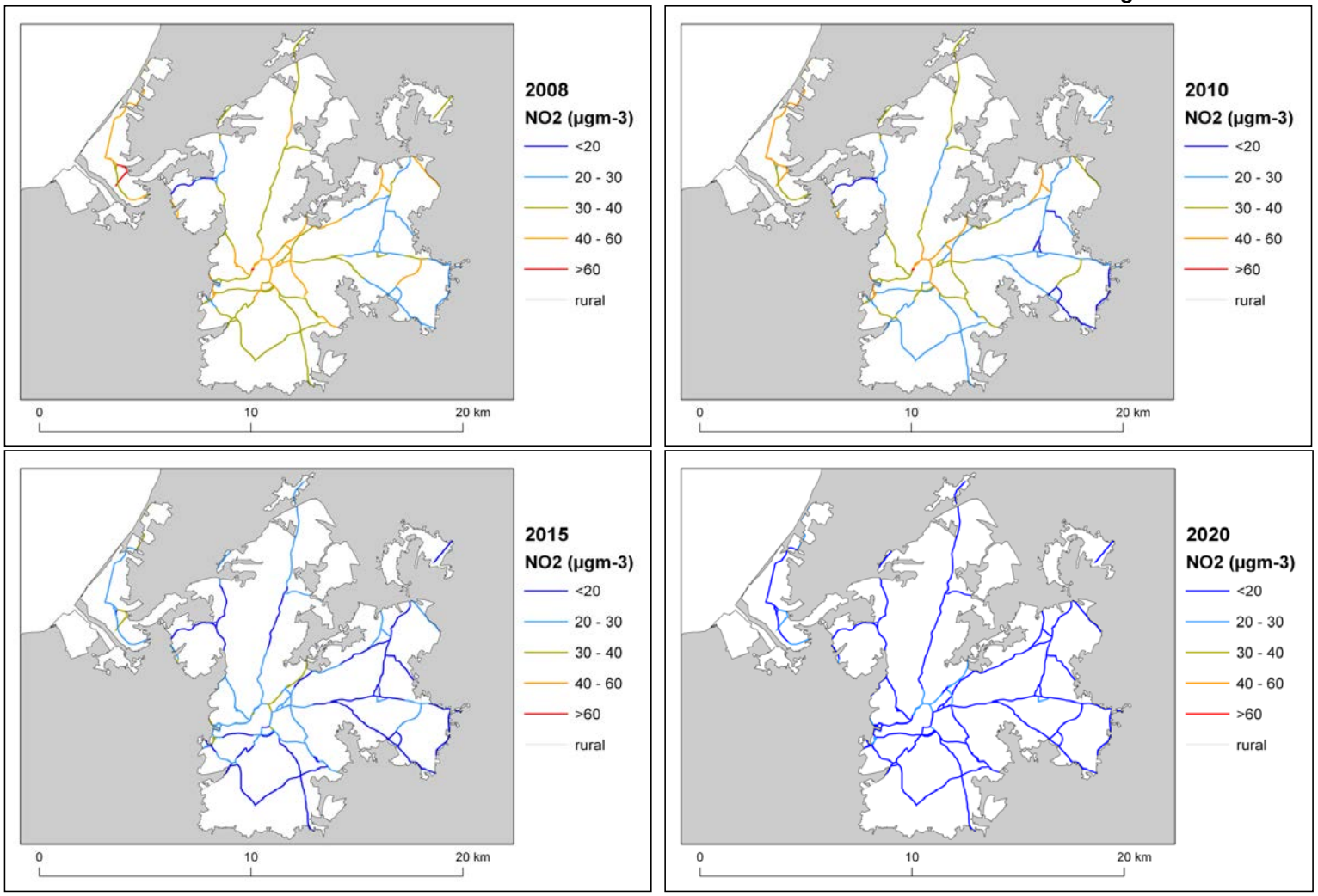
Figure 9. Roadside projections of annual mean NO_2 concentrations in 2015 and 2020 for the LEZ scenario. 2008 and baseline projections for 2010 are also included here for reference. Modelled exceedances of the annual limit value are shown in orange and red.



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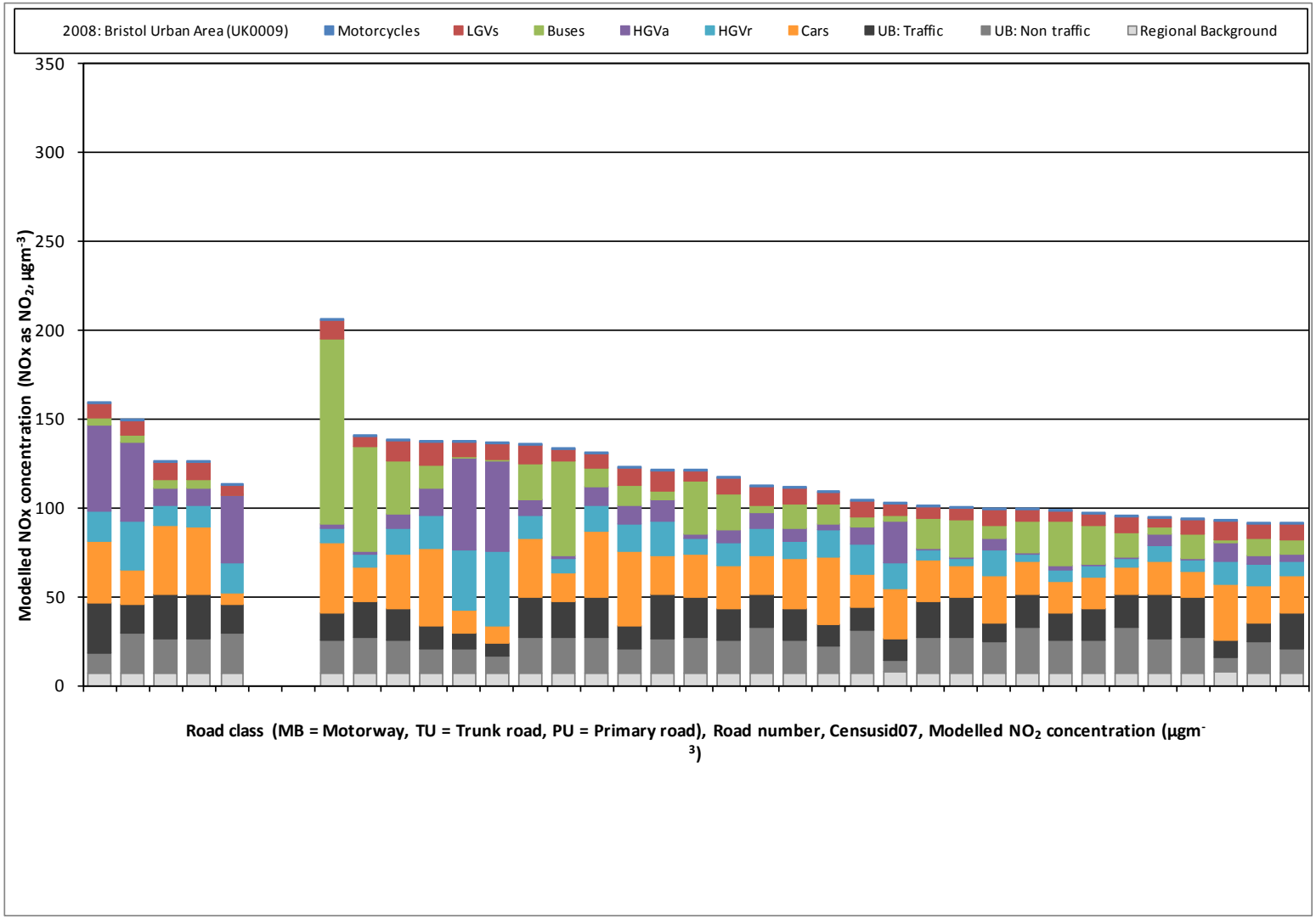
List of Annexes

Annex 1: Source apportionment graphs
Annex 2: Tables of measures

Annex 1: Source apportionment graphs

Figure A1.1 Annual mean roadside NO_X source apportionment plots for all roads exceeding the annual mean NO_2 limit value in 2008



Annex 2: Tables of measures

Table A2.1 Relevant Local Authority measures taken before or during 2010 within Bristol Urban Area (UK0009)

LA (a)	Measure code (b)	Title	Description	Other information
Bristol	Local_Bristol_H1	Area speed reduction through 20mph zones within AQMA	Progress on 20 mph zones around schools and adjacent to Showcase bus routes delivered through LTP. Draft Road Hierarchy Review proposes 20 mph speed limit in all residential areas.	• Type: Technical; Education/information • Sources affected: Transport • Spatial scale: local • Implementation date: 2007 • Reduction timescale: Short term • Regulatory: No • Smarter Choices (c) : No • Reference (d): Local_zone9_Bristol_AQActionplan_1
Bristol	Local_Bristol_H2	Extend and improve further the planned cycling facilities AQMA	Pedestrian and cycle improvements to be incorporated into Greater Bristol Bus Network Major Scheme (GBBN) programme of works now due to commence in 2008/09. Connect2 cycle route from Nailsea to Bristol to be developed in partnership with Sustrans. Pilot city centre bike rental scheme (Hour Bike) to commence in 2008. Internet cycle trip planner to go live in 2008.	• Type: Technical; Education/information • Sources affected: Transport • Spatial scale: local • Implementation date: 2008 • Reduction timescale: Long term • Regulatory: No • Smarter Choices (c) : Yes • Reference (d): Local_zone9_Bristol_AQActionplan_1
Bristol	Local_Bristol_C1	Expand Council green fleet/ trial new technologies	Bristol City Council maintains a large fleet of alternative fuel fleet vehicles, which totals over 100 LPG and hybrid vehicles. New fuels / technologies will be evaluated when they become viable.	• Type: Technical • Sources affected: Transport • Spatial scale: local • Implementation date: 2007 • Reduction timescale: Medium term • Regulatory: No • Smarter Choices (c) : No • Reference (d): Local_zone9_Bristol_AQActionplan_1
Bristol	Local_Bristol_H3	Discuss freight transhipment centre and undertake study to cost and quantify AQ benefits	The Bristol freight consolidation scheme now serves 63 retailers in central Bristol and will be integrated in to the new £500m shopping centre (Cabot Circus) from September 2008.	• Type: Technical • Sources affected: Transport • Spatial scale: local • Implementation date: 2008 • Reduction timescale: Long term • Regulatory: No • Smarter Choices (c) : Yes • Reference (d): Local_zone9_Bristol_AQActionplan_1
Bristol	Local_Bristol_G1	Travel Plans with increased incentives for schools and organisations within the	Continued progress being made on workplace travel plans through LTP and Planning process. Sustainable Schools Strategy being developed. Additional focus on school travel plans to increase the take-up rate and achieve the target of all schools having a travel plan by 2010. 118 schools now have travel plans.	• Type: Education/information • Sources affected: Transport • Spatial scale: local • Implementation date: 2007 • Reduction timescale: Long term • Regulatory: No

LA (a)	Measure code (b)	Title	Description	Other information
		AQMA		• Smarter Choices (c) : Yes • Reference (d): Local_zone9_Bristol_AQActionplan_1
Bristol	Local_Bristol_H4	Safer routes to Schools to be extended within the AQMA	SRS approach being integrated into the Health Schools initiative described in 2 above and delivered through LTP.	• Type: Education/information • Sources affected: Transport • Spatial scale: local • Implementation date: 2008 • Reduction timescale: Long term • Regulatory: No • Smarter Choices (c) : Yes • Reference (d): Local_zone9_Bristol_AQActionplan_1
Bristol	Local_Bristol_F1	Extension of travel marketing	Continued promotion of driver behaviour materials and integration of air quality issues into wider BCC publicity and transport awareness work. Improved Air Quality web pages on Council's web site. Real-time bus information now available on web site.	• Type: Education/information • Sources affected: Transport • Spatial scale: local • Implementation date: 2008 • Reduction timescale: Short term • Regulatory: No • Smarter Choices (c) : Yes • Reference (d): Local_zone9_Bristol_AQActionplan_1
Bristol	Local_Bristol_G2	Expand car clubs to include private developments and business clubs	The Bristol Car Club has continued to expand and now has 39 cars and 600 members. Since the pilot project ended in 2006 the club has continued to operate without Council subsidy. Growth of the club continues to be boosted by funding secured by the Council through Section 106 contributions from planning applications.	• Type: Education/information • Sources affected: Transport • Spatial scale: local • Implementation date: 2008 • Reduction timescale: Long term • Regulatory: No • Smarter Choices (c) : Yes • Reference (d): Local_zone9_Bristol_AQActionplan_1
Bristol	Local_Bristol_A1	Speed management strategy through LTP would have additional resources targeted in AQMA	Some progress through LTP but no additional AQAP measures introduced.	• Type: Education/information • Sources affected: Transport • Spatial scale: local • Implementation date: 2008 • Reduction timescale: Long term • Regulatory: No • Smarter Choices (c) : No • Reference (d): Local_zone9_Bristol_AQActionplan_1
Bristol	Local_Bristol_E1	Extend use of SVD to buses inside AQMA and co-ordinate UTC with other measures	A strategy to clean up buses is still being considered and may result in a formal approach to the Traffic Commissioner regarding the use of new powers to regulate emissions from buses.	• Type: Technical • Sources affected: Transport • Spatial scale: local • Implementation date: 2008 • Reduction timescale: Long term • Regulatory: No • Smarter Choices (c) : No • Reference (d): Local_zone9_Bristol_AQActionplan_1

LA (a)	Measure code (b)	Title	Description	Other information
Bristol	Local_Bristol_H5	Undertake study of 'hot-spots' in AQMA where engineering measures feasible	Scheme being progressed to alleviate traffic problems at one of the worst polluted junctions in Bristol (adjacent to Junction 3 of M32).	• Type: Education/information • Sources affected: Transport • Spatial scale: local • Implementation date: 2007 • Reduction timescale: Long term • Regulatory: No • Smarter Choices (c) : No • Reference (d): Local_zone9_Bristol_AQActionplan_1
Bristol	Local_Bristol_H6	Additional staff resources to enforce parking/delivery restrictions to ease/speed flows	Review of Council's parking strategy and enforcement programme is completed. Targeted enforcement remains a core activity of the Council's parking management strategy and Showcase bus route programme. Plans to introduce extensive Controlled Parking Zones are being drawn up.	• Type: Technical • Sources affected: Transport • Spatial scale: local • Implementation date: 2008 • Reduction timescale: Short term • Regulatory: No • Smarter Choices (c) : No • Reference (d): Local_zone9_Bristol_AQActionplan_1
Bristol	Local_Bristol_F2	Air quality awareness, advice for motorists, promotion of alternative fuels, real-time pollution information	There will be an increased focus on Smarter Choices measures including information and awareness provision.	• Type: Education/information • Sources affected: Transport • Spatial scale: local • Implementation date: 2008 • Reduction timescale: Short term • Regulatory: No • Smarter Choices (c) : Yes • Reference (d): Local_zone9_Bristol_AQActionplan_1
Bristol	Local_Bristol_A2	M32 bus lane and detrunking progressing through LTP and further study planned	Proposals for a new 1250m bus lane and reduced speed limits through junction 3 of the M32 are awaiting final completion of Greater Bristol Bus Network funding agreements with DfT.	• Type: Technical; Education/information • Sources affected: Transport • Spatial scale: local • Implementation date: 2008 • Reduction timescale: Long term • Regulatory: No • Smarter Choices (c) : No • Reference (d): Local_zone9_Bristol_AQActionplan_1
Bristol	Local_Bristol_A3	RUC key measure in LTP and could be anticipated for 2008	Major upgrade of Bristol's UTMC system is underway including a new traffic control room, expansion of the SCOOT network and automatic number plate recognition (ANPR) and CCTV systems, which will enable better management of traffic and handling of road incidents.	• Type: Technical; Education/information • Sources affected: Transport • Spatial scale: local • Implementation date: 2008 • Reduction timescale: Long term • Regulatory: No • Smarter Choices (c) : No • Reference (d): Local_zone9_Bristol_AQActionplan_1
Bristol	Local_Bristol_G3	Personalised	7th PTP project completed in Bristol in 2007. The	• Type: Education/information

LA (a)	Measure code (b)	Title	Description	Other information
		Travel Planning (PTP)	project was extended to promote the newly completed showcase bus route through a nearby area. Changing driver behaviour to reduce emissions was an integral part of this project. Previous projects have achieved around a 10% decrease in car trips among participating households. Further areas planned for 2008/09.	• Sources affected: Transport • Spatial scale: local • Implementation date: 2007 • Reduction timescale: Long term • Regulatory: No • Smarter Choices (c) : Yes • Reference (d): Local_zone9_Bristol_AQActionplan_1

(a) Name of responsible Local Authority.
(b) The Letter in the measure code indicates the main source sector that will be affected by the measure. Letters are assigned as follows: A - measures to reduce emissions from mobile sources, B - measures to reduce emissions from stationary sources, C - fuels and petrol stations, D - Economic incentives to reduce emissions (e.g. congestion charging, controlled parking zones), E - measures related to traffic planning/redesigning infrastructure, F - information/educational measures, G - change of transport mode (e.g. scheme to encourage people out of cars and onto bikes), H - Other.
(c) Measures have been classified as 'smarter choices' or not based on expert judgement
(d) References available for download from: http://uk-air.defra.gov.uk/library/NO_2ten/