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Air Quality Plan for the achievement of EU air quality limit values for nitrogen dioxide (NO_2) in Teesside Urban Area (UK0013)

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Llywodraeth Cymru
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Contents

1. Introduction

1.1. This document

This document is the Teesside Urban Area (UK0013) 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 Teesside Urban Area agglomeration zone
• Details of NO_2 exceedence situation(s) within the Teesside 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 Teesside 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 Teesside Urban Area agglomeration zone indicates that the annual limit value is likely to be exceeded in 2010 and in 2015 but achieved by 2020 through introduction of measures included in the baseline modelling, a low emission zone (LEZ) scenario (if applied) and the non-quantifiable local measures outlined in this plan.

The assessment undertaken for the Teesside 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: Teesside Urban Area
Zone code: UK0013
Type of zone: agglomeration zone
Reference year: 2008
Extent of zone: Figure 1 shows the area covered by the Teesside 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. Middlesbrough Council
2. Redcar and Cleveland Borough Council
3. Stockton-on-Tees Borough 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 Teesside Urban Area agglomeration zone (UK0013).

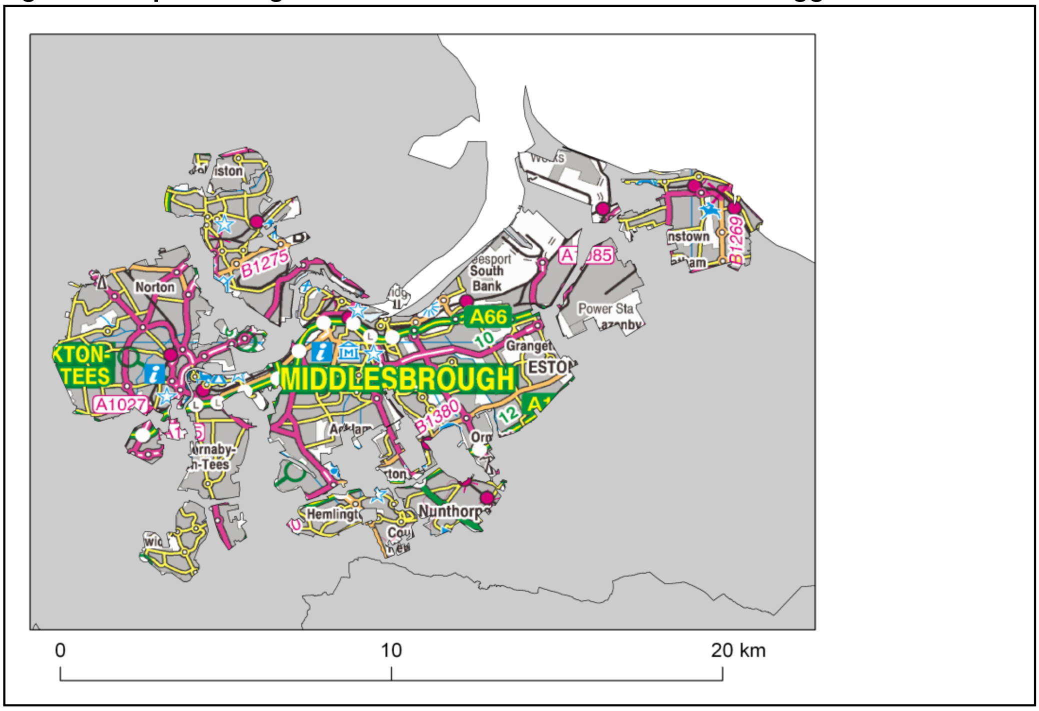
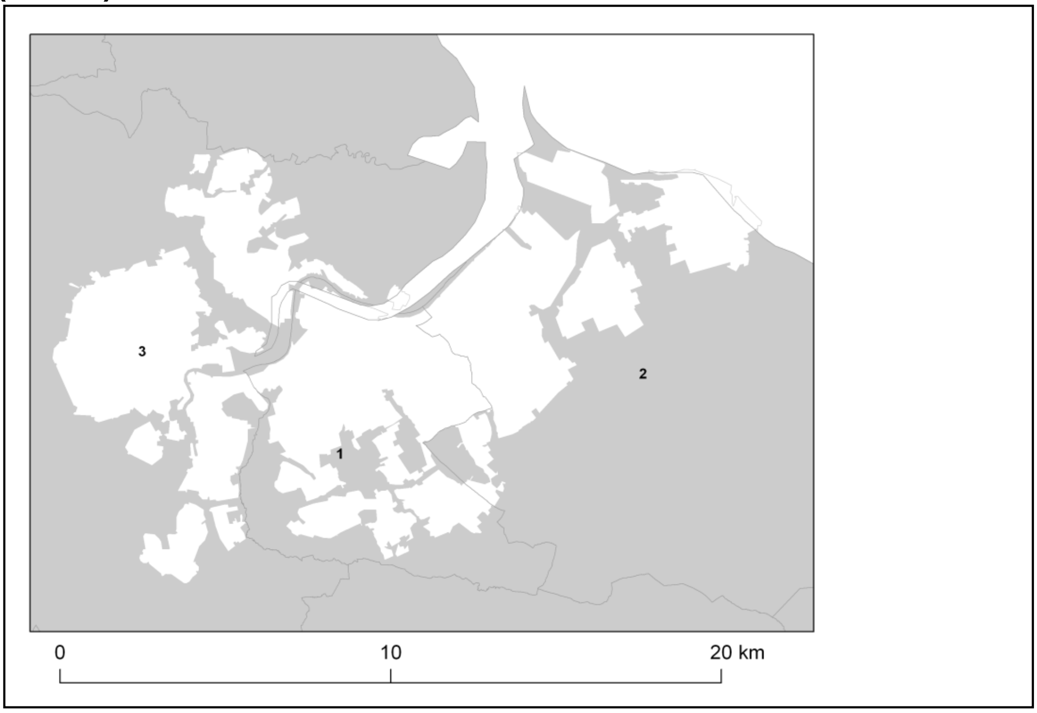


Figure 2. Map showing Local Authorities within the Teesside Urban Area agglomeration zone (UK0013).



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):

- Billingham GB0421A (98.6%)
- Middlesbrough GB0583A (98.6%)

Full details of monitoring stations within the Teesside 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): 114 km^2
- Total population within zone (approx): 302559 people
- Total road length where an assessment of NO_2 concentrations have been made: 66.8 km in 2008 (and similar lengths in previous years).

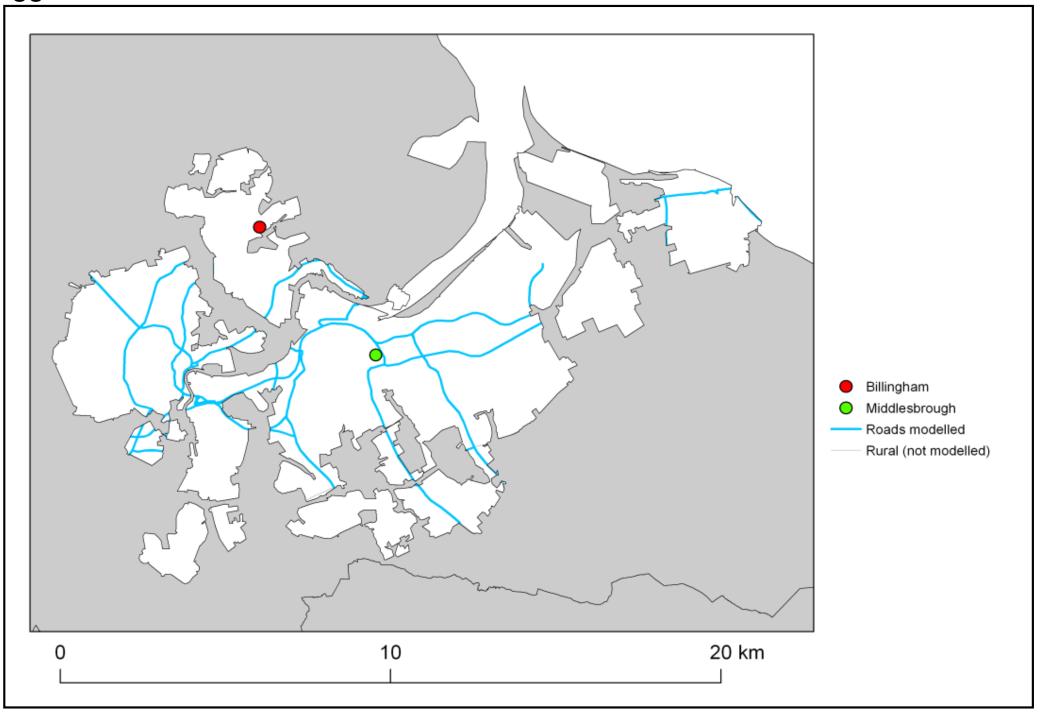
Zone maps
Figure 3 presents the location of the NO_2 monitoring stations within this zone for 2008 and the roads for which NO_2 concentrations have been modelled. NO_2 concentrations at background locations have been modelled across the entire zone at a 1 x 1 km^2 resolution.

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 2005. Plans and programmes for 2005 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 Teesside Urban Area (UK0013) agglomeration zone.



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 Teesside 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_UK0013_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_UK0013_Annual_1

The NO_2_UK0013_Annual_1 exceedance situation covers all exceedances of the annual mean limit value in the Teesside 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 no measured exceedances of the annual limit value in this zone 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, 8.9 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 84 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_UK0013_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_UK0013_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
Billingham (GB0421A)	32 (95%)	30 (98%)	32 (97%)	29 (99%)	27 (98%)	29 (98%)	28 (96%)	27 (99%)	28 (88%)
Middlesbrough (GB0583A)	25 (96%)	26 (82%)	25 (93%)	24 (65%)	25 (93%)	22 (96%)	21 (99%)	21 (99%)	19 (97%)
Redcar (GB0679A)	25 (83%)	23 (94%)	25 (96%)	22 (98%)	25 (51%)	22 (84%)	17 (65%)		

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

Table 2. Annual mean NO_2 model results in NO_2_UK0013_Annual_1 for 2001 onwards

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Road length exceeding (km)	10.2	3.2	34.3	20.6	16.4	15.7	12.2	8.9	10.0
Background area exceeding (km^2)	1	0	0	0	0	0	0	0	0
Maximum modelled concentration (μgm^{-3}) (a)	48.8	43.1	79.9	72.1	76.6	74.0	72.3	84.0	75.8

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

Table 3. Source apportionment summary information for 2008 in NO_2_UK0013_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	6.9	(c)	
	From within the UK	4.1	(c)	4.1
	From transboundary sources (includes shipping and other EU Member States)	2.8	(c)	2.8
Urban background sources (i.e. sources located within 0.3 - 30 km from the receptor)	Total	37.7	17.7	-
	From road traffic sources	23.4	8.1	23.4
	From industry (including heat and power generation)	4.5	(c)	10.8
	From agriculture	0.0	(c)	0.0
	From commercial/residential sources	5.3	(c)	6.5
	From shipping	0.7	(c)	3.4
	From off road mobile machinery	2.4	(c)	5.3
	From natural sources	0.0	(c)	0.0
	From transboundary sources	0.0	(c)	0.0
	From other urban background sources	1.3	(c)	3.6
Local sources (i.e. contributions from sources < 0.3 km from the receptor)	Total	167.8	66.4	-
	From cars	53.5	20.4	53.5
	From HGV rigid	25.3	10.1	25.6
	From HGV articulated	60.4	23.2	60.4
	From Buses	11.2	4.5	11.2
	From LGVs	17.3	8.3	17.3
	From motorcycles	0.1	0	0.1
Total (i.e. regional background + urban background + local components)		212.4	84	-

(a) The road with the highest modelled annual mean NO_2 concentration in this exceedance situation in 2008 is a section of the A66, traffic count point id 46643 (OS grid (m): 448000, 519100).
(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 9.6 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.

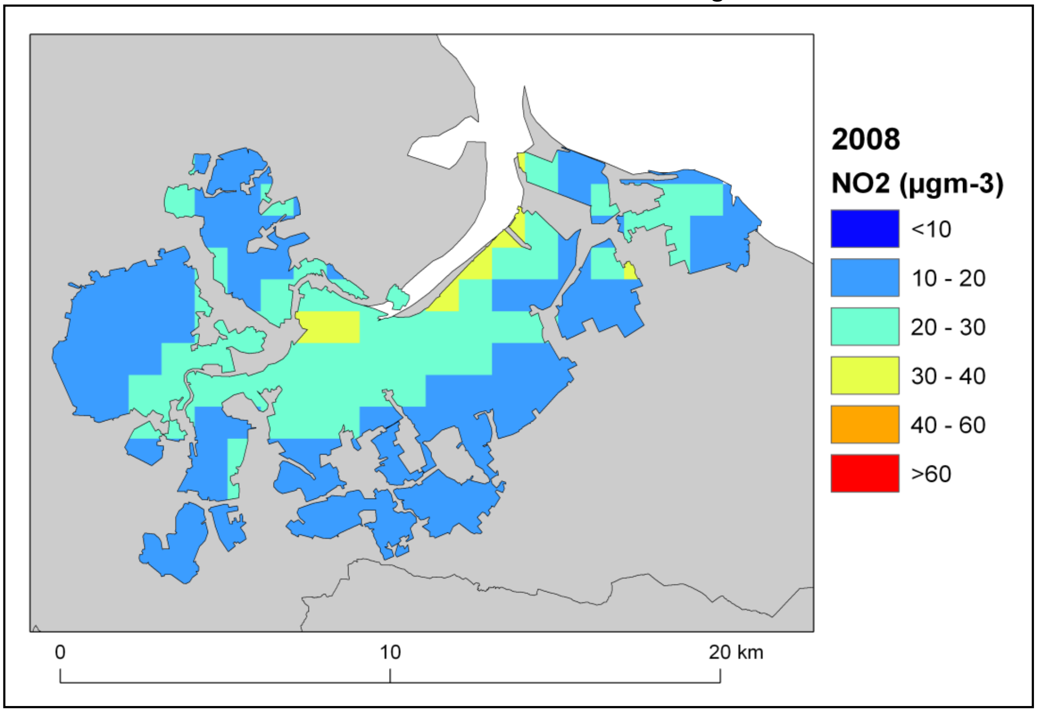
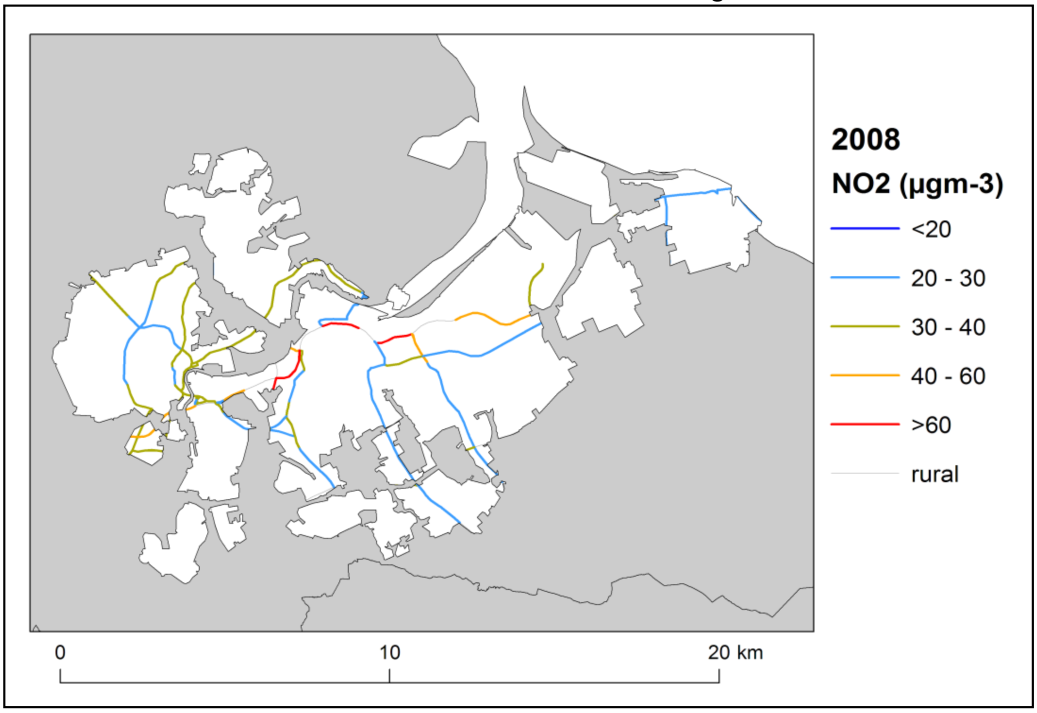


Figure 5. Map of modelled roadside annual mean NO_2 concentrations 2008. Modelled exceedances of the annual limit value are shown in orange and red.



4. Measures

4.1. Introduction

This section (section 4) gives details of measures that address exceedances of the NO_2 limit values within Teesside 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 articulated HGVs at the location of maximum exceedance with a contribution of 60.4 ugm^{-3} of NO_X out of a total of 212.4 ugm^{-3} of NO_X. Articulated HGVs and cars were important sources on the trunk roads with the highest concentrations. Articulated HGVs and cars 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.

At the time of data collection (autumn 2009), there were no relevant locally implemented action plans as these are not always appropriate.Where compliance in the zone is not predicted by 2015 under baseline conditions, additional action at a local level is being investigated with the local authorities to determine the need and scope for local action to tackle the exceedence situation and bring about compliance as soon as possible.

4.4. Measures timescales

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

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 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_UK0013_Annual_1

Table 4 presents summary results for the baseline model projections for 2010, 2015 and 2020 for the NO_2_UK0013_Annual_1 exceedance situation. This shows that the maximum modelled annual mean NO_2 concentration predicted for 2010 in this exceedance situation is 70.9 μgm^{-3}. By 2015, the maximum modelled annual mean NO_2 concentration is predicted to drop to 47.1 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_UK0013_Annual_1

	2008	2010	2015	2020
Road length exceeding (km)	8.9	7.0	2.4	0.0
Background area exceeding (km^2)	0	0	0	0
Maximum modelled concentration (μgm^{-3}) (a)	84.0	70.9	47.1	28.2

(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 46643 on the A66 (the road section with the maximum modelled annual mean NO_2 concentration in 2008 in NO_2_UK0013_Annual_1. OS grid (m): 448000, 519100). 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	6.9	6.0	5.2	4.2	(a)	(b)	(c)	(d)
	From within the UK	4.1	3.5	3.1	2.5	(a)	(b)	(c)	(d)
	From transboundary sources (includes shipping and other EU Member States)	2.8	2.5	2.1	1.7	(a)	(b)	(c)	(d)
Urban background sources (i.e. sources located within 0.3 - 30 km from the receptor)	Total	37.7	29.2	22.0	16.6	17.7	14.5	11.9	9.9
	From road traffic sources	23.4	16.0	10.5	6.1	8.1	7.6	7.1	6.9
	From industry (including heat and power generation)	4.5	3.9	3.9	3.7	(a)	(b)	(c)	(d)
	From agriculture	0.0	0.0	0.0	0.0	(a)	(b)	(c)	(d)
	From commercial/residential sources	5.3	5.3	4.7	4.2	(a)	(b)	(c)	(d)
	From shipping	0.7	0.7	0.7	0.7	(a)	(b)	(c)	(d)
	From off road mobile machinery	2.4	2.2	1.2	0.8	(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	1.3	1.1	1.0	1.0	(a)	(b)	(c)	(d)
Local sources (i.e. contributions from sources < 0.3 km from the receptor)	Total	167.8	135.9	78.2	37.2	66.4	56.4	35.2	18.3
	From cars	53.5	35.9	24.8	16.5	20.4	14.8	11.3	8.2
	From HGV rigid	25.3	22.5	11.6	4.1	10.1	9.2	5.0	1.9
	From HGV articulated	60.4	52.6	26.5	8.7	23.2	20.7	11.3	4.1
	From Buses	11.2	10.0	5.9	2.7	4.5	4.2	2.6	1.3
	From LGVs	17.3	14.8	9.4	5.2	8.3	7.4	4.9	2.8
	From motorcycles	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Total (i.e. regional background + urban background + local components)		212.4	171.2	105.4	58.0	84.0	70.9	47.1	28.2

(a) The total annual mean NO_2 contribution for all components labelled (a) in 2008 was modelled to be 9.6 μgm^{-3}.
(b) The total annual mean NO_2 contribution for all components labelled (b) in 2010 is predicted to be 6.9 μgm^{-3}.
(c) The total annual mean NO_2 contribution for all components labelled (c) in 2015 is predicted to be 4.8 μgm^{-3}.
(d) The total annual mean NO_2 contribution for all components labelled (d) in 2020 is predicted to be 3 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	4.1	3.5	3.1	0.0
	From transboundary sources (includes shipping and other EU Member States)	2.8	2.5	2.1	0.0
Urban background sources (i.e. sources located within 0.3 - 30 km from the receptor)	From road traffic sources	23.4	16.0	10.5	0.0
	From industry (including heat and power generation)	10.8	9.5	6.6	0.0
	From agriculture	0.0	0.0	0.0	0.0
	From commercial/residential sources	6.5	6.5	5.9	0.0
	From shipping	3.4	3.3	1.1	0.0
	From off road mobile machinery	5.3	5.0	2.6	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	3.6	2.9	2.8	0.0
Local sources (i.e. contributions from sources < 0.3 km from the receptor)	From cars	53.5	35.9	24.8	0.0
	From HGV rigid	25.6	22.8	11.7	0.0
	From HGV articulated	60.4	52.6	26.5	0.0
	From Buses	11.2	10.0	5.9	0.0
	From LGVs	17.3	14.8	9.4	0.0
	From motorcycles	0.1	0.1	0.1	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.

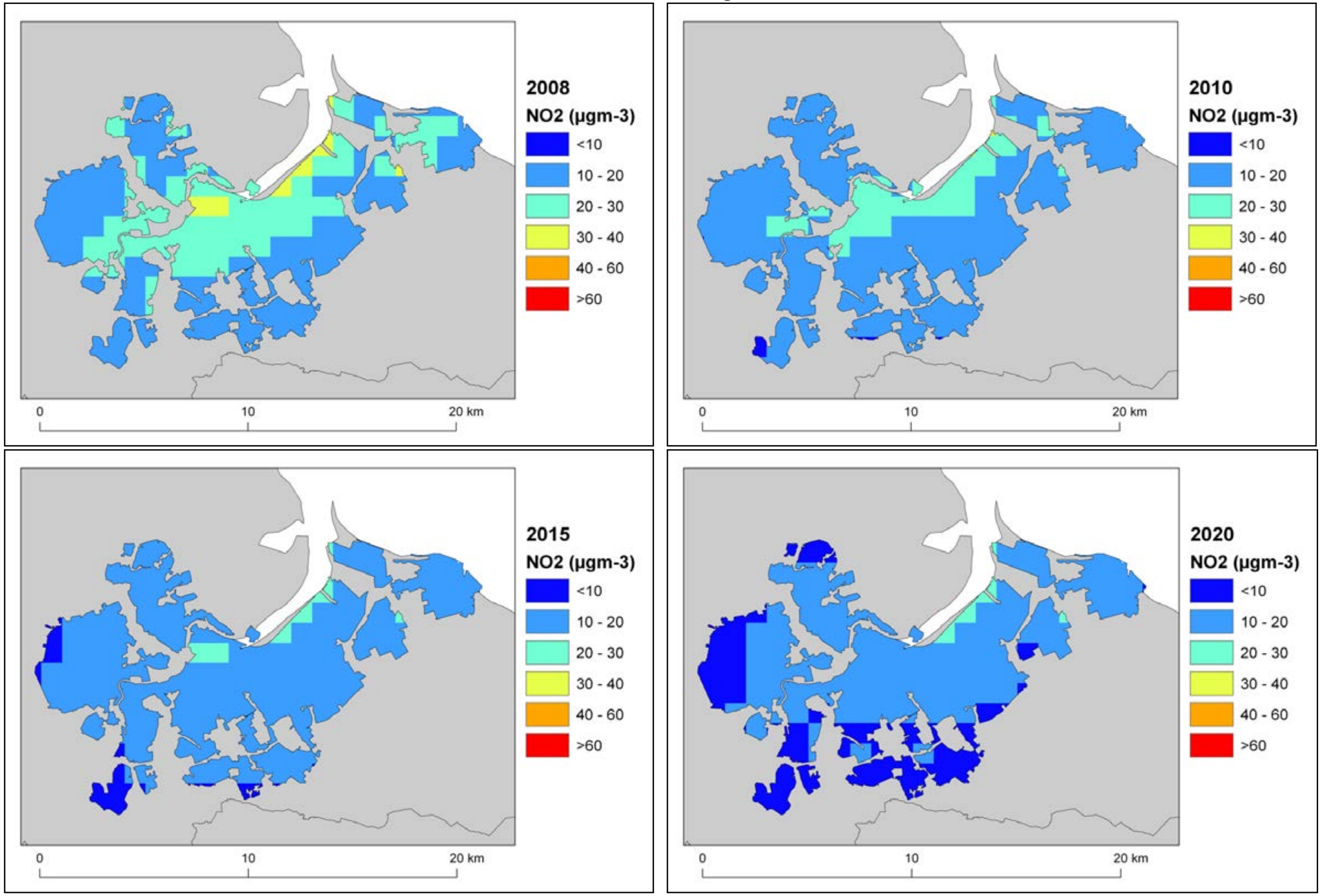
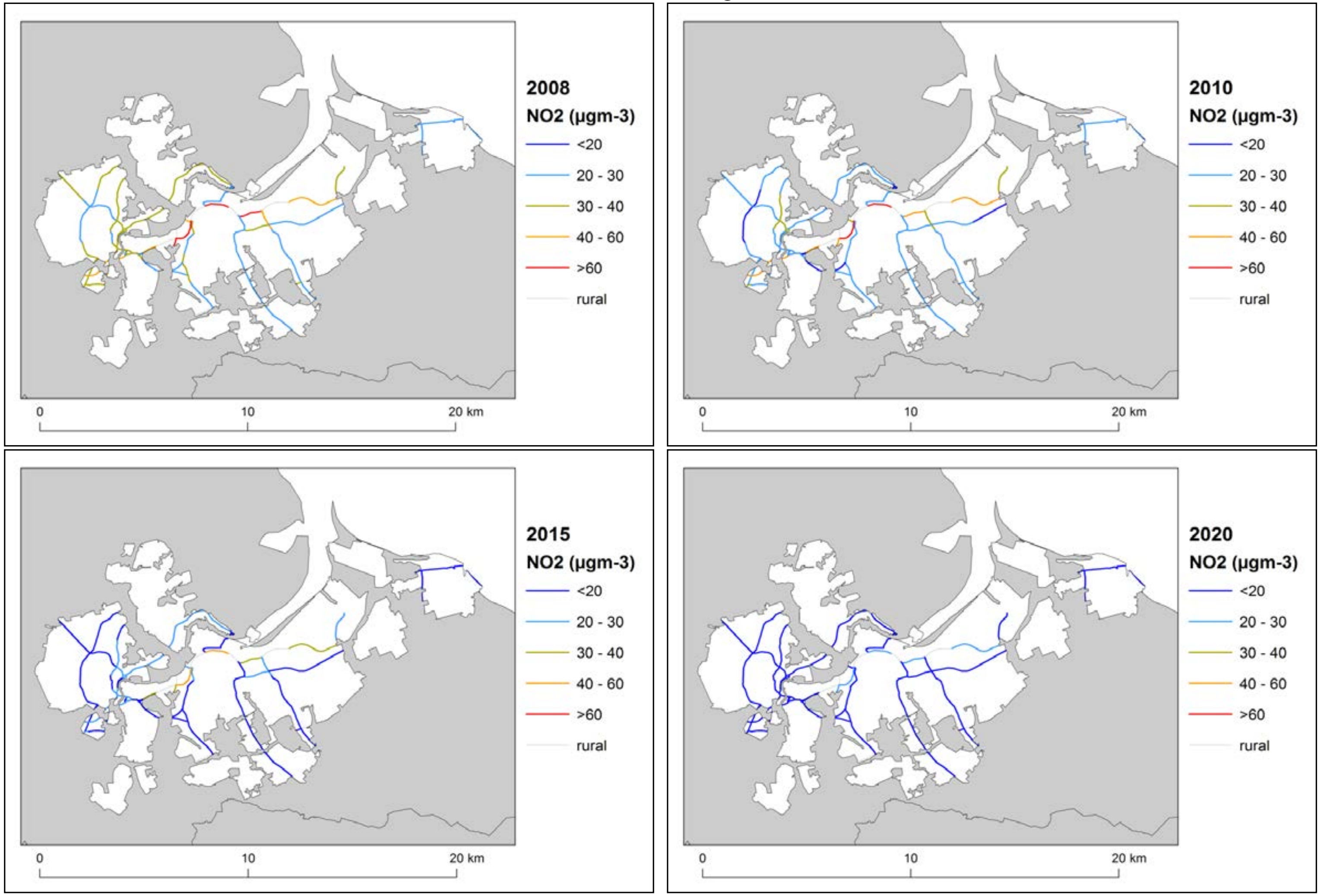


Figure 7. Roadside baseline projections of annual mean NO_2 concentrations in 2010, 2015 and 2020. 2008 is also included here for reference. Modelled exceedances of the annual limit value are shown in orange and red.



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

• Middlesbrough 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_UK0013_Annual_1

Table 7 presents summary results for the LEZ scenario model projections for 2015 and 2020 for the NO_2_UK0013_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 42.9 μgm^{-3}. Hence, the model results suggest that compliance with the NO_2 annual limit value is unlikely to be achieved by 2015 for the LEZ scenario in this exceedance situation. The model results do, however, show that the NO_2 annual mean limit value is likely to be achieved in this exceedance situation in 2020, when the maximum modelled annual mean NO_2 concentration predicted to be 27.8 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_UK0013_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)	8.9	7.0	1.3	0.0
Background area exceeding (km^2)	0	0	0	0
Maximum modelled concentration (μgm^{-3}) (a)	84.0	70.9	42.9	27.8

(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 46643 on the A66 (the road section with the maximum modelled annual mean NO_2 concentration in 2008 in NO_2_UK0013_Annual_1 OS grid (m): 448000, 519100). 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	6.9	6.0	5.2	4.2	(a)	(b)	(c)	(d)
	From within the UK	4.1	3.5	3.0	2.5	(a)	(b)	(c)	(d)
	From transboundary sources (includes shipping and other EU Member States)	2.8	2.5	2.1	1.7	(a)	(b)	(c)	(d)
Urban background sources (i.e. sources located within 0.3 - 30 km from the receptor)	Total	37.7	29.2	20.9	16.4	17.7	14.5	11.6	9.9
	From road traffic sources	23.4	16.0	9.4	5.9	8.1	7.6	7.2	6.9
	From industry (including heat and power generation)	4.5	3.9	3.9	3.7	(a)	(b)	(c)	(d)
	From agriculture	0.0	0.0	0.0	0.0	(a)	(b)	(c)	(d)
	From commercial/residential sources	5.3	5.3	4.7	4.2	(a)	(b)	(c)	(d)
	From shipping	0.7	0.7	0.7	0.7	(a)	(b)	(c)	(d)
	From off road mobile machinery	2.4	2.2	1.2	0.8	(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	1.3	1.1	1.0	1.0	(a)	(b)	(c)	(d)
Local sources (i.e. contributions from sources < 0.3 km from the receptor)	Total	167.8	135.9	68.2	36.3	66.4	56.4	31.3	17.9
	From cars	53.5	35.9	24.8	16.5	20.4	14.8	11.4	8.2
	From HGV rigid	25.3	22.5	8.9	4.0	10.1	9.2	3.9	1.9
	From HGV articulated	60.4	52.6	21.6	8.5	23.2	20.7	9.4	4.0
	From Buses	11.2	10.0	3.5	2.1	4.5	4.2	1.5	1.0
	From LGVs	17.3	14.8	9.4	5.2	8.3	7.4	4.9	2.8
	From motorcycles	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Total (i.e. regional background + urban background + local components)		212.4	171.2	94.3	56.9	84.0	70.9	42.9	27.8

(a) The total annual mean NO_2 contribution for all components labelled (a) in 2008 was modelled to be 9.6 μgm^{-3}.
(b) The total annual mean NO_2 contribution for all components labelled (b) in 2010 is predicted to be 6.9 μgm^{-3}.
(c) The total annual mean NO_2 contribution for all components labelled (c) in 2015 is predicted to be 4.4 μgm^{-3}.
(d) The total annual mean NO_2 contribution for all components labelled (d) in 2020 is predicted to be 3 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	4.1	3.5	3.0	0.0
	From transboundary sources (includes shipping and other EU Member States)	2.8	2.5	2.1	0.0
Urban background sources (i.e. sources located within 0.3 - 30 km from the receptor)	From road traffic sources	23.4	16.0	9.4	0.0
	From industry (including heat and power generation)	10.8	9.5	3.9	0.0
	From agriculture	0.0	0.0	0.0	0.0
	From commercial/residential sources	6.5	6.5	4.7	0.0
	From shipping	3.4	3.3	0.7	0.0
	From off road mobile machinery	5.3	5.0	1.2	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	3.6	2.9	1.0	0.0
Local sources (i.e. contributions from sources < 0.3 km from the receptor)	From cars	53.5	35.9	24.8	0.0
	From HGV rigid	25.6	22.8	8.9	0.0
	From HGV articulated	60.4	52.6	21.6	0.0
	From Buses	11.2	10.0	3.5	0.0
	From LGVs	17.3	14.8	9.4	0.0
	From motorcycles	0.1	0.1	0.1	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.

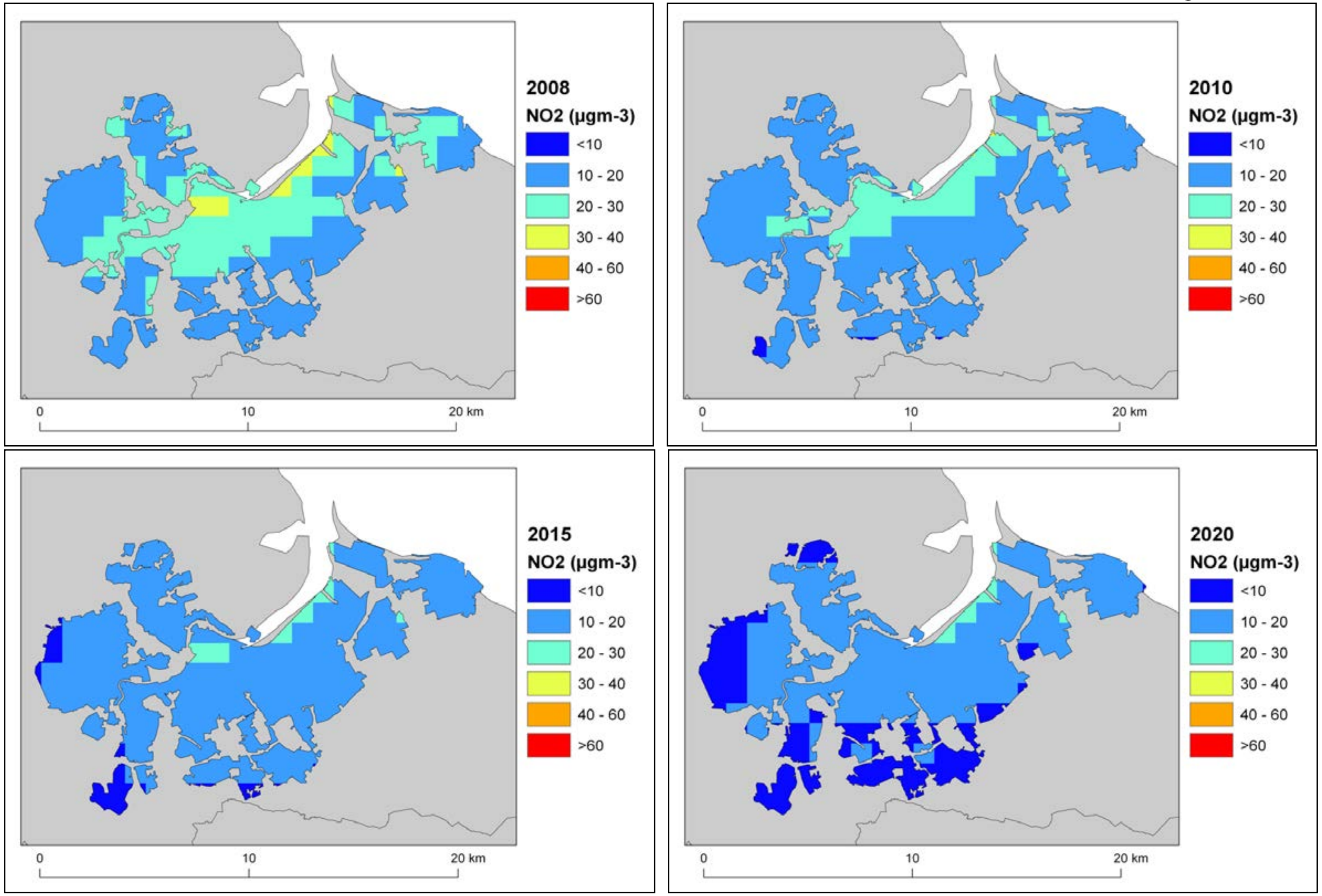
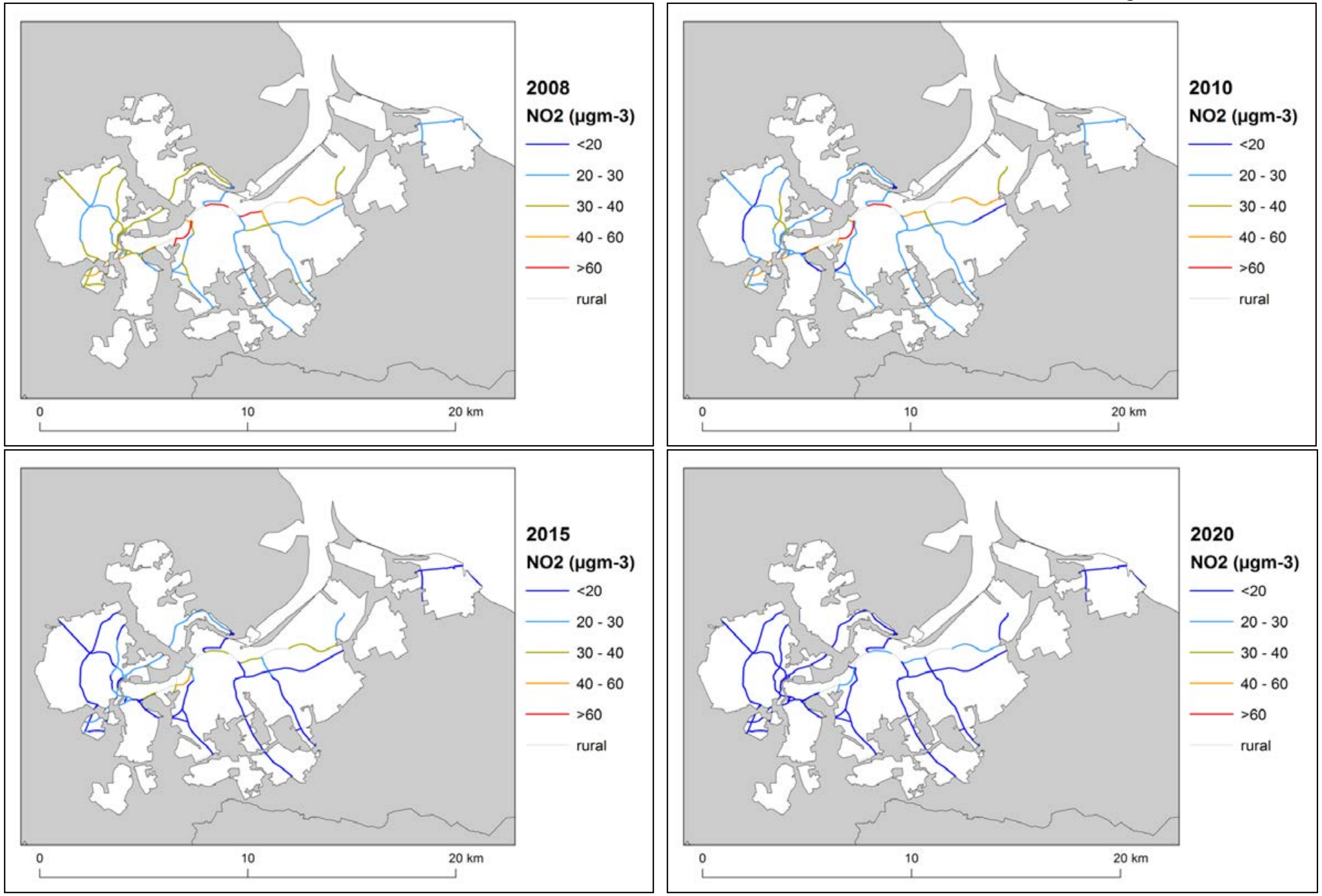


Figure 9. Roadside projections of annual mean NO_2 concentrations in 2015 and 2020 for the LEZ scenario. 2008 and baseline projections for 2010 are also included here for reference. Modelled exceedances of the annual limit value are shown in orange and red.



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List of Annexes

Annex 1: Source apportionment graphs

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