UK Approach to its Application for Time Extension Notification to Nitrogen Dioxide Limit Value deadline

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UK approach to Application for Time Extension Notification to Nitrogen Dioxide Limit value Deadline under Article 22 of EU Directive 2008/50/EC.

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1 Overview of why this work is necessary

1.1 Summary and scope of the paper

1 In 1999 the UK agreed with other European Union (EU) Members States binding limits on concentrations of nitrogen dioxide (NO_2) and other pollutants in ambient air. These limits were set in Directive 1999/30/EC) and for NO_2 were due to be met in 2010. Latest predictions are that we will not meet these limits by 2010 especially alongside majore roads in urban areas of the UK. The recent European Directive (2008/50/EC) allows Member States to apply for extensions to this limit value deadline for up to 2015.

2 This paper describes the task for the UK to meet the limit value, the measures that might be necessary and the approach we propose for identifying and appraising options to reduce exceedences of NO2 to within the limit value. It also sets out a framework for appraising the most suitable measures for achieving the limit value. The paper reviews the current position in the UK on NO2 exceedences of the EU limit value, now contained in Directive 2008/50/EC. It provides an overview of the extent and source apportionment of these exceedences and summarises the gap to be bridged in order to bring the UK into line with its EU obligations by 2015. The paper also sets out a timetable for the remainder of the work and summarises the main stakeholders and how Defra and the devolved administrations propose to work with them. The paper has been developed with the devolved administrations for Scotland, Wales and Northern Ireland and other government departments through the Inter-departmental Group (IDG). It sets out a joint approach to the management of the UK's application for an extension until 2015 of the 2008/50/EC Directive's limit value deadline for NO2 and the development of measures to enable the UK to meet this deadline.

1.2 Legal national and European background

3 The UK Government and the devolved administrations' first national Air Quality Strategy, published in 1997, set out national objectives for a number of air pollutants including NO_2. The strategy set an objective of 40µg.m^{-3} annual mean and 200µg.m-3 1 hour mean not to be exceeded more than 18 times a year. The aim was to meet those objectives by 31 December 2005. Those objectives are retained in the current strategy, published in 2007. In 1996 the Framework Directive (1996/62/EEC) on air quality was adopted and, through a daughter directive (1999/30/EC), set mandatory limit values for NO_2 which Member States are legally obliged to achieve by 1 January 2010.

4 The UK did not meet the strategy's 2005 policy objective for the NO_2 and, like nearly all other major Member States, is not likely to meet the Directive's 1 January 2010 deadline for the NO_2 limit values. This is in part because, following publication of the strategy in 1997 and the revisions of 2000 and 2003, predictions for decline in roadside pollutants did not follow through as expected in part because Euro standards for vehicle emissions did not deliver the expected reductions in NOx and a significant increase in the number of diesel vehlcles increased emissions of NOx especially. This meant that the rate of decline was not as expected.

5 In May 2008 the EU agreed a new Ambient Air Quality Directive (2008/50/EC) which

will consolidate directive 1999/30/EC and two other daughter directives. In recognition of the significant challenge faced by most Member States in reducing levels of NO_2, the new directive included provision for Member States to apply for an extension of the limit value deadlines until 2015, subject to having in place plans to meet the revised deadline. This paper initiates the process of preparing a UK application for the extension of the EU directive NO_2 limit value deadline.

1.3 Why should we be concerned about NO_2?

6 All combustion processes in air produce oxides of nitrogen (NOx). Nitrogen dioxide (NO_2) and nitric oxide (NO) are both oxides of nitrogen and together are referred to as NOx. Road transport is the most important source of emissions, followed by the electricity supply industry and other industrial and commercial sectors.

7 NO_2 is associated with adverse effects on human health, and at high levels causes inflammation of the airways. Long-term exposure may affect lung function and cause respiratory symptoms. NO_2 also enhances the response to allergens in sensitive individuals. The annual mean limit value for NO_2 is the same as the World Health Organisation (WHO) Guideline value.

8 High levels of NOx can have an adverse effect on vegetation, including leaf or needle damage and reduced growth. Deposition of pollutants derived from NOx emissions contribute to acidification and/or eutrophication of sensitive habitats, which in turn can lead to loss of biodiversity, often at locations far removed from the original emissions. NOx also contributes to the formation of secondary particles and ground level ozone, both of which are associated with ill-health effects. Ozone also damages vegetation.

1.4 Summary of exceedences of NO_2 limit value for 2010 to 2020

9 Table 1.1 below summarises the number of measured and modelled exceedences in the UK of the limit value reported to the European Commission for 2005, 2006 and 2007.

Table 1.1 Exceedences of limit values + margin of tolerance (MOT[1]) 2005 to 2007

Pollutant	Metric	Zones and agglomerations exceeding		
	Limit value + MOT	2005	2006	2007
NO_2	Hourly mean concentration > 240 µgm^{-3} (18 exceedences allowed)*	1 (1 measured*)	1 (1 measured*)	1 (1 measured*)
NO_2	Annual mean concentration >50 µgm^{-3} (LV + MOT in 2005)	35 zones (6 measured + 29 modelled)-	-	
	Annual mean concentration >48 µgm^{-3} (LV + MOT in 2006)	-	38 zones (6 measured + 32 modelled)	-
	Annual mean concentration >46 µgm^{-3} (LV + MOT in 2007)		-	39 zones (6 measured, 33 modelled)-

* No base year modelling available for this metric due to the high uncertainty.

10 Modelling studies have been conducted to determine the future expected exceedences. These studies indicate that for 2010, the UK is projected to have exceedences

[1] MOT – Margin of Tolerance – defined in 2008/50/EC as the percentage of the limit value by which that value may be exceeded subject to the conditions laid down in this Directive.(2008/50/EC).

of the annual mean NO_2 limit value in approximately 35 zones and agglomerations out of 43. This includes 1 zone (Greater London) exceeding at background locations (8 km^2 in 2015 and 1 km^2 in 2020) and around 2,500 km of exceedences at road side distributed as detailed in table 1.2 below. We also expect to have exceedences of the limit value plus margin of tolerance in 16 zones at over 331 km of roadside.

Table 1.2 UK Road lengths in exceedences of limit value (40 µg m^{-3}) and limit value + maximum margin of tolerance (MOT; 60 µg m^{-3})

Road length exceeding (km)		Total assessed	Year						
			2005	2008	2010	2011	2012	2015	2020
>40	London	1891	1599	1373	1117	969	792	520	174
	Rest of England	9645	2903	1909	1286	1089	928	313	2
	Scotland	1096	188	105	56	49	38	8	0
	Wales	647	63	43	28	24	17	4	0
	Northern Ireland	601	71	45	9	5	4	4	0
	Total	**13880**	**4823**	**3475**	**2496**	**2135**	**1779**	**849**	**176**
>60	London	1891	587	360	213	149	70	23	4
	Rest of England	9645	525	270	116	32	4	0	0
	Scotland	1096	19	8	1	1	1	0	0
	Wales	647	6	1	1	1	0	0	0
	Northern Ireland	601	4	4	0	0	0	0	0
	Total	**13880**	**1141**	**643**	**331**	**184**	**75**	**23**	**4**
	percentage >40		34.75 %	25.04 %	17.99 %	15.38 %	12.82 %	6.12 %	1.27 %
	percentage >60		8.22 %	4.64%	2.39 %	1.32 %	0.54 %	0.16 %	0.03 %

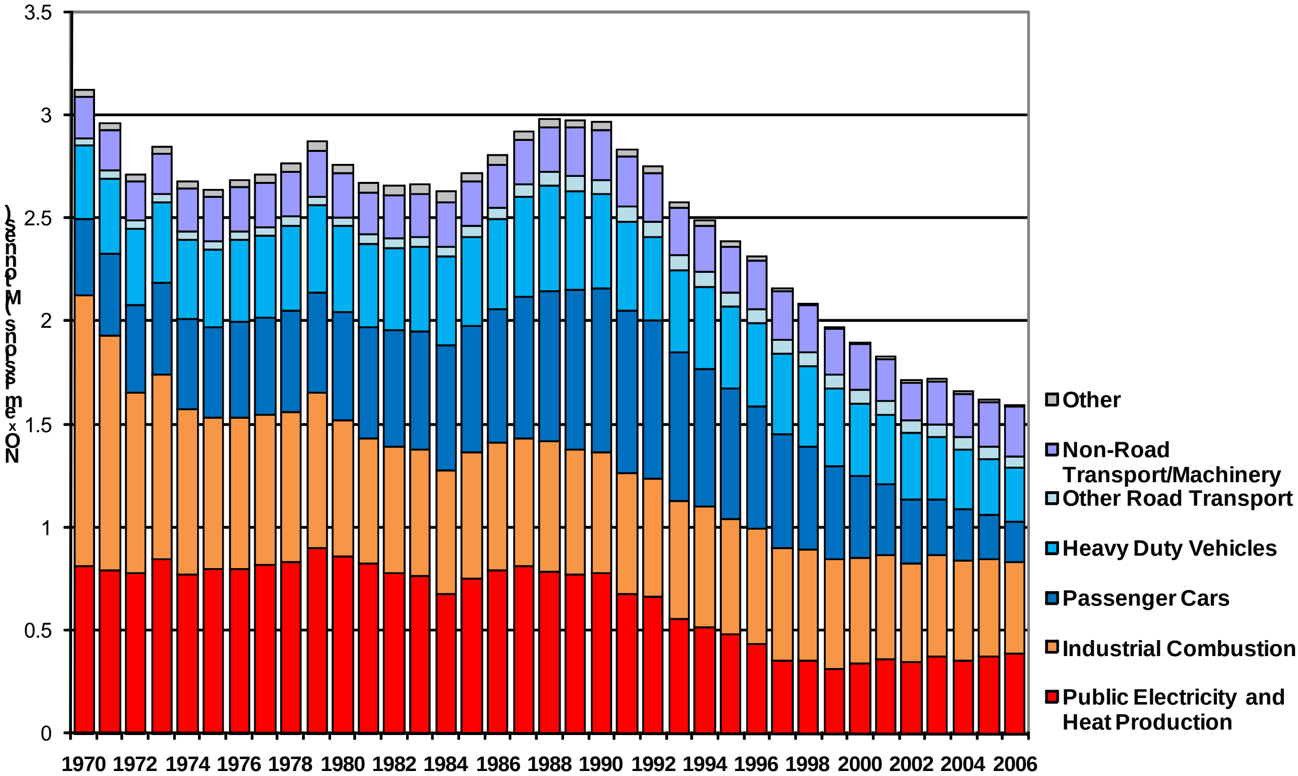
11 Table 1.2 above presents the change in road length exceedences over time from modelling studies. On the basis of current measures alone by 2015 we expect to exceed the NO_2 limit value over about 850 km of road lengths with 23 km being over the limit value plus MOT. By 2020 (5 years after the latest date for the limit value extension), on the basis of current measures alone, this is modelled to reduces to 176 km and 4 km respectively. In 2010, 45% of the road links showing an exceedence are located in London with the remainder distributed across the rest of England (51.5%), Scotland (2%), Wales (1%) and Northern Ireland (less than 1%). In 2015, 61% of the road links in exceedences are expected to be located in London, 37% in the rest of England and the remaining 2% in the devolved administrations.

1.5 The UK Position in the context of other European Countries

12 Emissions of NO_X arise almost exclusively from combustion sources. In the UK, road transport is currently the largest source of NO_X, accounting for approximately one third of the UK total emission. Estimation of emissions from road vehicles is complex as the nitrogen can be derived from either the fuel or atmospheric nitrogen. The emission is highly dependent on the conditions of the combustion and for road transport sources, vehicle speed, load and even state of maintenance are important. Power generation and industrial combustion also make significant contributions to the national total. Figure 1.1 below shows

the historic UK NOx emissions in millions of tonnes by source.

Figure 1.1 UK NO_2 emissions by source (million tonnes)



13 Figure 1.1 above, shows that there have been significant reductions in emissions from the road transport sector since 1990. This is due to the introduction of more stringent emissions control. Since 2000, there has been a steady increase in emissions from electricity generation. This is because, on a price basis, coal has become increasingly attractive compared to oil and gas, and coal-fired electricity generation produces more NOx per unit of electricity generated.

14 One of the most important factors contributing to exceedence of the NO_2 limit value is the impact of emissions from road transport. Whilst other sources can give rise to significant emissions, these are typically released at higher levels often outside urban areas, and are therefore more effectively dispersed in the atmosphere. At the street level, it is the emissions from low level sources, such as road transport, which have the most significant impact on ambient concentrations. Whilst there have been significant reductions of the emissions from road transport in recent years, this source currently gives rise to the most significant contribution in areas exceeding the limit value, and is expected to do so in 2010 and 2015.

15 This situation is not unique to the UK, and many other countries in Europe are expected to apply for a time extension to 2015. The following table (Table 1.3) shows the percentage of zones currently exceeding the limit value in each Member State (as a percentage of total zones in each country), and the population density (for 2006). There is an indicative relationship between the two, showing that increased population density typically results in a higher percentage of zones exceeding the yearly limit value.

16 This relationship is indicative only, and there are reasons for the exceptions. In small island locations, such as Malta, the population density may be very high, but there is usually

very good dispersion of any pollutant emissions. At the other extreme, Sweden has a very low population density. However, much of the population live in a few densely populated urban centres giving rise to exceedences.

Table 1.3 Zones Currently Exceeding the NO_2 Yearly Limit value (expressed as a percentage of the total zones in each country – zone size may vary from country to country), and the Road Transport Emissions of NO_X per capita

Country	Zones Exceeding NO_2 Yearly Limit value, 2007 (%)*	Population Density (people/km^2), 2006
Austria	82%	99
Belgium	36%	344
Bulgaria	17%	70
Cyprus	0%	83
Czech Republic	47%	130
Denmark	33%	126
Estonia	0%	30
Finland	7%	16
France	21%	100
Germany	52%	231
Greece	75%	84
Hungary	18%	108
Ireland	0%	60
Italy	42%	195
Latvia	50%	36
Lithuania	0%	52
Luxembourg	Not available	181
Malta	50%	1282
Netherlands	Not available	393
Poland	4%	122
Portugal	12%	115
Romania	10%	91
Slovakia	10%	110
Slovenia	0%	99
Spain	14%	86
Sweden	50%	20
United Kingdom	95%	249

* Zones sizes may vary from one Member States to another.

1.6 Summary

17 The ambient air quality directive agreed in June 2008 allows Member States to seek an extension to the limit value deadline for NO_2 . On the basis of modelled data for 2010 and 2015 the UK has concluded that it will be necessary for it to seek an extension for a large number of its zones and agglomerations. The UK is not alone in this position and it is very likely that most major Member States will also have to seek an extension to this limit value deadline. Only one (the Netherlands) has so far submitted its application. The next chapter considers the current situation in terms of exceedences; the contribution of different sources to these and how they differ across the UK. This is followed by a consideration of

uncertainties in the work and the impact this might have on the selection of measures. Finally there is consideration of the range of measures that might need to be considered to achieve the limit value and the proposed approach to assessing these is described.

2 Review of Current Position

2.1 Measurements to Date

18 A summary of the UK position reported to the European Commission for the calendar years 2005, 2006 and 2007 is provided in Chapter 1, section 1.4 (see Table 1.1). Monitored exceedences for 2008 provisionally indicate that there will be 7 zones exceeding the limit value + MOT (44 μg m-3 in 2008) compared to 6 zones in the previous 3 years. This includes three exceedences at urban background locations at Glasgow City Chambers, London Hillingdon and London Bloomsbury. These results for 2008 are still provisional, the finalised results not being completed until mid 2009.

2.2 Modelling Future Exceedences- Methodology

19 Modelling assessments have been undertaken using the Pollution Climate Mapping (PCM) models[2] to assess NO_2 concentrations near roads across the UK in current and future years. By drawing on well established models and assessment tools, the modelling assessments have been able to:

- identify the locations where the NO_2 limit value was not achieved in 2001-2007;
- identify the locations where the NO_2 limit value may not be achieved by 2015;
- quantify the extent to which the NO_2 limit value would be exceeded in 2015;
- provide source apportionment and gap analysis information, to help the formulation of strategies to address the predicted exceedences; and
- provide technical assessment of the impact of any existing and proposed new measures on concentrations, exceedences and population in exceeding areas, to input into cost benefit analysis.

20 Further information on the methodology used for the modelling assessments can be found in Kent et al (2007)[2] and the methodology will be detailed in the consultation document for the NO_2 Time Extension Notification plan. But a short overview of the modelling approach, and the assumptions used to model NOx (and from this calculate NO_2) are given in the following table (Table 2.1).

Table 2.1 Input data used by the PCM Model

[2] Kent, A., Grice, S., Stedman, J., Cooke, S., Bush, A., Vincent, K., Abbott, J. (2007) UK air quality modelling for annual reporting 2006 on ambient air quality assessment under Council Directives 96/62/EC, 1999/30/EC and 2000/69/EC. AEAT/ENV/R/2502 Issue 1 http://www.airquality.co.uk/archive/reports/cat09/0807231621_dd12006mapsrep_v2.pdf

Input Dataset	Purpose	Reference
Emissions inventory	Provides mapped emissions by source as a base year for the projections	NAEI 2005: UK emissions inventory, compiled under contract for Defra[3].
Roadside concentration measurements	Used to calibrate the relationship between emissions and concentrations	UK AURN: UK monitoring network, operated under contract for Defra
Meteorology	Used in determining the relationship between emissions and concentrations	2005: Waddington meteorological data from the Meteorological Office
Energy forecast	Provides the drivers that are applied to the base year emissions	UEP 30: UK Energy forecast, compiled by DECC
Traffic activity	Used to provide detailed activity indicator of road links	London: TfL Rest of the UK: DfT
Proportion of primary NO_2	Used to convert NOx emissions and concentrations into NO_2	Oxidant partitioning model: Jenkin (2004)

21 UK Emission maps (from the NAEI) and meteorological data are combined with concentration measurement data (from the AURN) to establish the relationship between emissions and resulting concentrations. This allows concentration maps of the base year to be compiled. Future concentration maps are then generated by using energy and traffic forecast data to adjust the emissions input dataset.

22 In order to estimate the NO_2 concentrations, the modelled NO_X concentrations derived from the PCM models are converted to NO_2 using an oxidant partitioning model which describes the complex inter-relationships of NO, NO_2 and ozone as a set of chemically coupled species (Jenkin, 2004)[4]. This approach provides additional insights into the factors controlling ambient levels of NO_2 (and ozone), and how they may vary with NO_X concentration.

23 The PCM modelling of NO_X and NO_2 has been restricted to estimation of annual mean concentrations for comparison with the annual mean limit values. No attempt has been made to model hourly concentrations for comparison with the 1-hour limit value. This is due to the considerable uncertainties involved in modelling at such a fine temporal scale. In addition, the annual mean limit value is expected to be more stringent than the 1-hour limit value in the majority of situations (AQEG, 2004)[5].

24 The PCM models were used to calculate future roadside concentrations for 10,027 major road links in the UK (A-roads and motorways), and therefore to identify locations where the limit values may not be achieved. More specifically, these models identify the road links where the NO_2 limit values are not attained, and the contribution from transport emissions to this situation.

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[3] Dore, C. J., Watterson, J. D., Murrells, T. P., Passant, N. R. *et al.* (2007). UK Emissions of Air Pollutants 1970 to 2005. National Atmospheric Emissions Inventory, AEA Technology, Report AEAT/ENV/R/2526. ISBN: 0-9554823-3-X http://www.airquality.co.uk/archive/reports/cat07/0801140937_2005_Report_FINAL.pdf

[4] Jenkin, M. E. (2004). Analysis of sources and partitioning of oxidant in the UK-Part 1: the NOx dependence of annual mean concentrations of nitrogen dioxide and ozone. *Atmospheric Environment* **38** 5117–5129.

[5] Air Quality Expert Group (AQEG, 2004). Nitrogen Dioxide in the United Kingdom. http://www.defra.gov.uk/environment/airquality/publications/nitrogen-dioxide/index.htm

25 To assess compliance with the NO_2 air quality limit values, each road link is considered to comply with the extended deadline for attaining the limit values if the annual mean concentration of NO_2 is equal to or less than 40 µg m^{-3} by 2015.

26 The approach used for this exceedence modelling is to identify the contribution from local and background sources. These sources include large and small point sources, distant sources (characterised by the rural background concentration) and local area sources. At locations close to busy roads an additional roadside contribution is included to represent the road traffic sources. Summing all of these contributions gives the concentration at a specific location and indicates whether the limit value is exceeded.

27 It is important to appreciate that there will be significant uncertainties in any modelling assessment, and no contingency has been built in to the process.

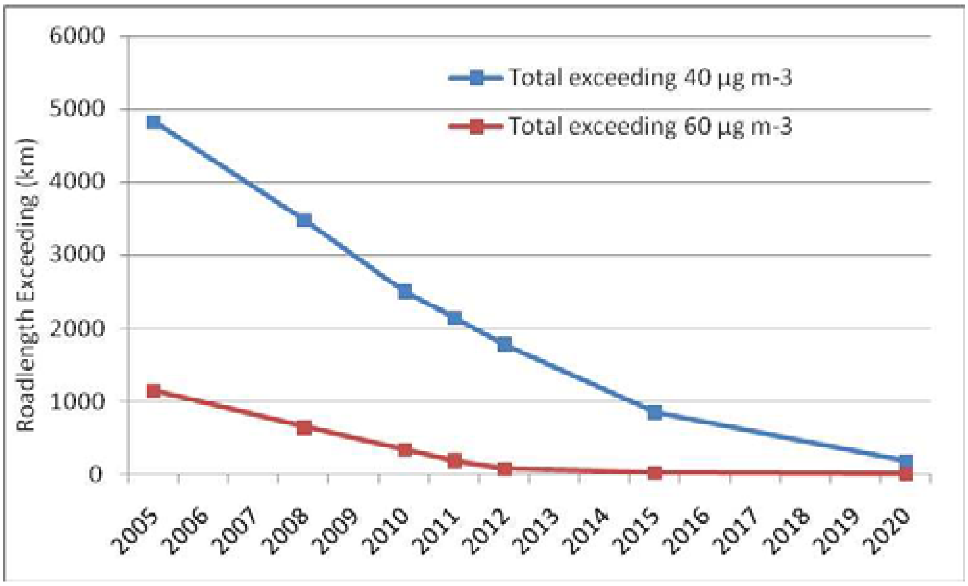
28 This approach of summing contributions to the total concentration means that source apportionment information is inherently available from the modelling method. The contribution from the local traffic source can be broken down into different vehicle classes.

29 These results therefore not only provide the concentration reduction that is required to meet the limit value for a specific target year, but also show which are the major sources in contributing to predicted exceedences. This allows local measures to be individually designed, to deliver specific reductions from each targeted source.

2.3 Modelling Future Exceedences- Results

30 Exceedences of the NO_2 limit value were assessed across the timeline from 2005 to 2020. Figure 2.1 below shows that the road length exceeding falls considerably with time. By 2015, it is expected that 23 km will be exceeding the NO_2 limit value. This is a reduction from 1141 (out of a total of 13,880 km assessed) exceeding the limit value in 2005.

Figure 2.1 Road length (km) Exceeding the NO_2 Limit Value (40 µg m^{-3}) and limit value plus maximum margin of tolerance (60 µg m^{-3})



31 The NO_2 exceedences are expected to be near busy roads in densely populated areas. This is because road transport emissions provide a significant source of NO_2, and there is typically limited dispersion in densely populated areas. The 26 zone/agglomerations

which are predicted to have exceedences in 2015 are listed in Table 2.2 below, with the number of specific exceedences within the zone/agglomeration.

Table 2.2: Overview of predicted exceedences of NO_2 annual mean limit value in zones and agglomerations in 2010 and 2015

Zone/Agglomeration	2010		2015	
	Road links	Road length (km)	Road links	Road length (km)
Agglomerations				
Greater London Urban Area	1397	1117	802	520.5
West Midlands Urban Area	145	185	30	44.6
Greater Manchester Urban Area	211	206	36	37.0
West Yorkshire Urban Area	77	76	22	17.8
Tyneside	34	28	8	7.3
Liverpool Urban Area	70	49	9	2.0
Sheffield Urban Area	42	50	8	17.7
Nottingham Urban Area	27	22	2	2.0
Bristol Urban Area	17	11	1	0.5
Portsmouth Urban Area	7	9	1	1.9
Teesside Urban Area	11	12	5	5.4
The Potteries	14	16	9	10.1
Kingston upon Hull	14	20	5	8.0
Southampton Urban Area	6	11	1	1.7
Glasgow Urban Area	30	48	3	8.2
Belfast Metropolitan Urban Area	3	9	1	3.9
Zones				
Eastern	33	71	11	26.3
South East	37	81	3	6.2
East Midlands	22	42	2	4.0
North West & Merseyside	74	126	12	20.2
Yorkshire & Humberside	52	152	21	78.4
West Midlands	23	44	8	15.5
North East	21	31	6	6.9
Central Scotland	3	4	1	0.1
South Wales	9	20	1	1.3
North Wales	4	8	1	2.3
Other zones and agglomerations	48	40	-	-
TOTAL	**2423**	**2496**	**1,009**	**849.5**

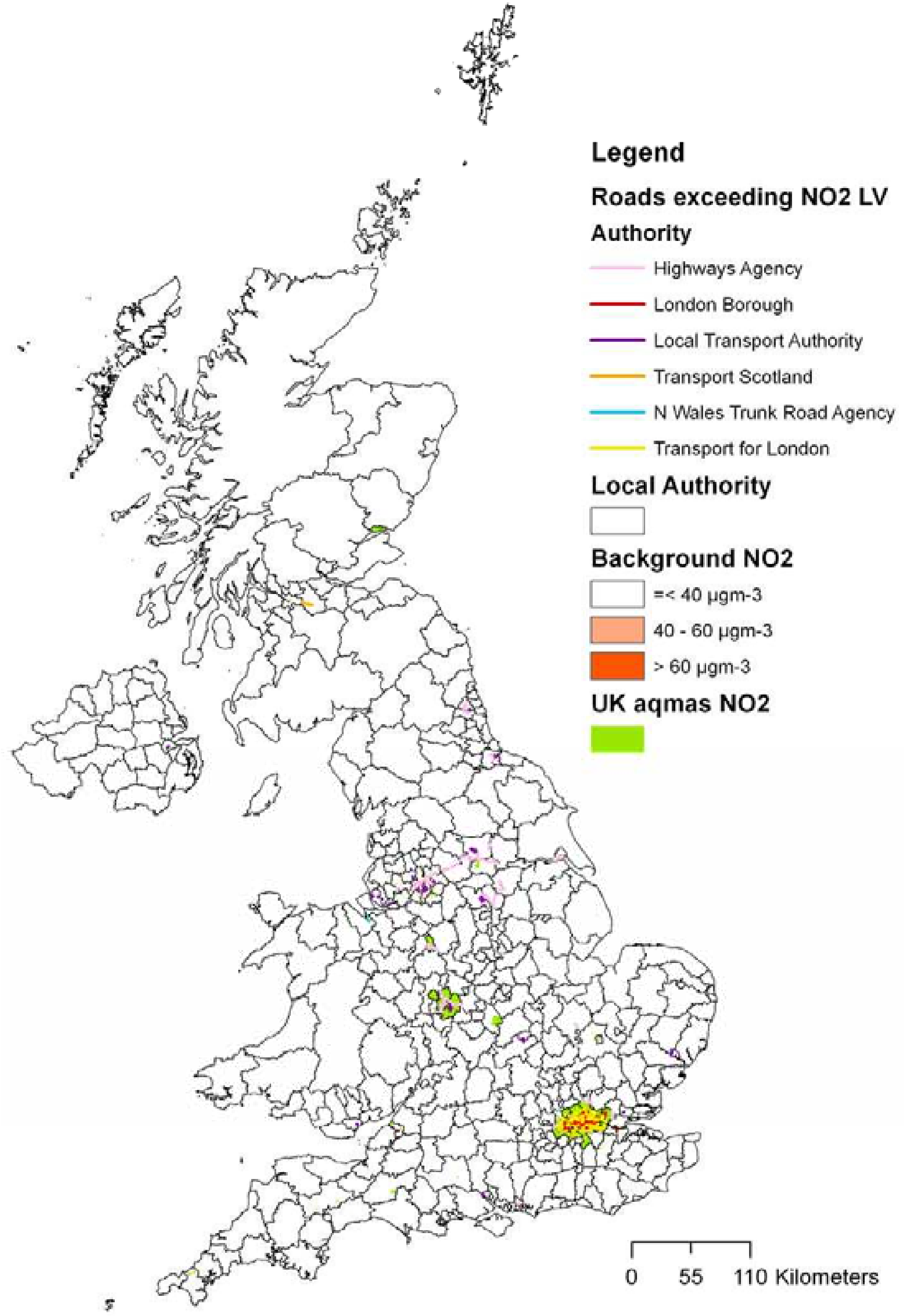
32 The Greater London area accounts for the vast majority of the exceedences[6]. This is because London Boroughs experience high levels of traffic activity over a geographically constrained area, and this contributes to both heightened background pollution levels across Greater London, as well as relatively high emissions from the roads themselves.

33 The exceedences in Table 2.2 are presented in the following map of the UK (Figure 2.2), which also indicates the authority responsible for the relevant road links. This map illustrates that the modelled exceedences for 2015 are primarily concentrated in larger urban

[6] Note that since links can be of any length, the number of exceedences does not indicate the size of exceedence area or scale of the problem within the zone. However, sites in Greater London are expected to be broadly similar in nature.

areas and the strategic network corridors between them.

Figure 2.2: Map of UK exceedences of the NO_2 limit value in 2015



34 Within London many exceedences are found on the network managed by Transport for London, and many are also found on roads managed by the Boroughs themselves. In locations other than London, a significant number of the exceedences are found on the strategic road network managed by the Highways Agency. However, there are still many examples of exceedences on roads managed by the local unitary or county transport

authority.

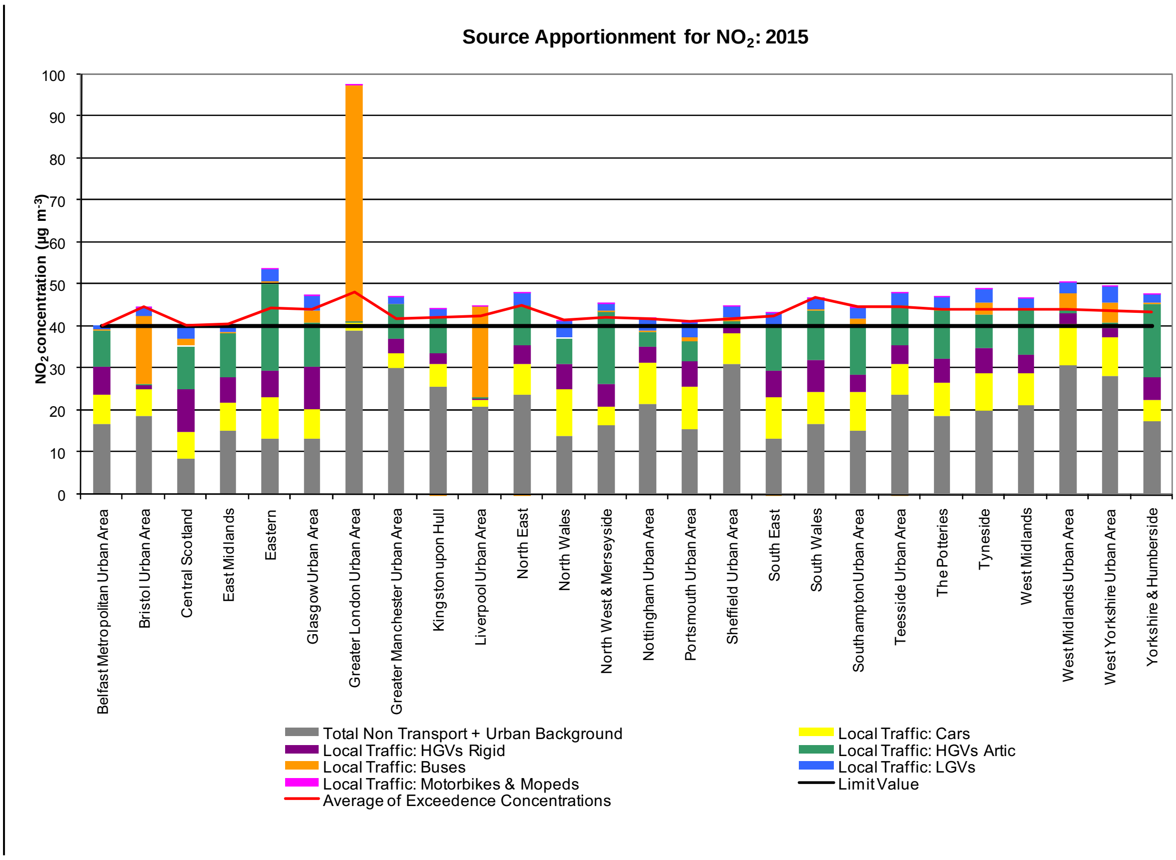
2.4 Assessing the most important sources at exceedence locations in 2015

35 The modelling results provide information on the levels of contribution from the different sources to the total NO_2 concentrations, as well as the extent to which the concentrations will exceed the limit value in 2015. The following sections consider the different source make-up (or "source apportionment") in different locations across the UK.

Source apportionment

36 Source apportionment calculations were conducted for the maximum roadside exceedence in each of the relevant zones, for 2015, and results are shown in Figure 2.3 below.

Figure 2.3: Source apportionment NO_2 (2015) for the highest exceedence in each Zone or Agglomeration in the UK



37 It is important to appreciate that the source apportionment shown in Figure 2.3 is that for the maximum roadside exceedences in each zone. This may not be representative of **all** of the exceedence locations in the relevant zone. For example, there are 802 road links predicted to exceed in the Greater London area, and some are likely to have significantly different source profiles to that shown above. However, whilst there are expected to be differences, the majority of the exceedences within each zone are likely to be broadly similar, and consequently Figure 2.3 does provide a useful illustration of the issues which need to be addressed in the different zones. Obviously detailed data for each exceedence location will be used when considering a localised plan to meet the limit value.

38 The red line in Figure 2.3 shows the average concentration of all exceedences locations in the relevant zone. This provides useful context when considering the maximum exceedences, and shows a more representative level of all exceedences across the UK. This can be used in conjunction with the data on the number of exceedences in each zone (Table 2.2).

39 The source apportionment data in Figure 2.3 shows a number of important features. These are briefly considered here (more detailed comments are provided in later sections):

- the vast majority of exceedences in 2015 are close to the 40 µg m^{-3} limit value, with only three of the 26 zones predicted to have maximum concentrations above 50 µg m^{-3};

- the contributions from ‘Non Transport’ and ‘Urban Background’ sources are significant for most locations. It should be noted that the ‘Urban Background’ source does also include road transport from beyond the local area. Measures targeted at reducing NO_2 emissions from road transport are well placed to result in the attainment of the NO_2 limit value;

- London, Liverpool and Bristol Urban Areas show large contributions to the total concentration from local buses. This is a direct result of the traffic mix at these locations. Detailed comments about individual locations are provided below;

- many locations have significant contributions from local articulated HGV’s, with some being particularly pronounced e.g. Eastern, North West & Merseyside, Yorkshire and Humberside;

- the absolute contribution from local cars varies by a relatively small amount from zone to zone; and

.

- the contribution from non-transport sources and urban background varies considerably between different locations.

40 From these observations it is possible to sort the locations into several broad categories shown in Table 2.3.

Table 2.3: Categorising maximum NO_2 exceedence locations in each zone and agglomeration

Category	Zone/Agglomeration
High HGV	Eastern
	North West & Merseyside
	Yorkshire & Humberside
High Bus, High Background	Bristol Urban Area
	Greater London Urban Area
	Liverpool Urban Area
High Background	Greater Manchester Urban Area
	Kingston Upon Hull
	North East
	Sheffield Urban Area
	West Midlands Urban Area
	West Yorkshire Urban Area
Balanced, close to limit value	Belfast Metropolitan Urban Area
	Central Scotland
	East Midlands
	North Wales
	Nottingham Urban Area
	Portsmouth Urban Area
Balanced	Glasgow Urban Area
	South East
	South Wales
	Southampton Urban Area
	Teesside Urban Area
	The Potteries
	Tyneside
	West Midlands

2.5 Reduction measures at the national scale and local scale

41 To address the predicted exceedences, it is possible to use a wide range of different approaches, from implementation of measures at the national level, to very localised measures. For example, the contribution to an exceedence of emissions from Heavy Goods Vehicles could be significantly reduced by implementing a national abatement retrofitting programme, or restricting the weight of vehicles in the relevant road link. In practise, it is expected that a combination of both national and local measures will be the most effective approach, and a successful plan would need measures to be implemented in coordinated fashion by several agencies including Highways Agency, Transport for London and local transport authorities (London Boroughs, Counties and other unitary authorities). For the devolved administrations actions would be need to be taken by the administration working with local authorities and other agencies as appropriate.

42 Options and measures are considered in more detail in Chapter 4, but comments are included here on the different exceedence categories identified in Table 2.3.

High HGV

43 This is potentially the most straightforward of the categories to assess, because reducing emissions from one source may prove sufficient to meet the limit value. In practice, it is likely that there will be a range of contributing measures in place. Options may be limited if the road is a major link road or motorway.

44 A number of different options may be available, depending on the road type. At the local level, it might be possible to do one or several of the following options:

- reduce the weight limit of the road (unless the road is a major link road or motorway);
- reduce the time window in which HGV's can use the road. This would encourage the use of other routes, dispersing the emissions;.
- introduce a charging scheme for HGVs (or other vehicle classes).

45 At the national level, the most obvious option would be to target the emissions, and ensure introduction of abatement equipment, or stringent emission standards. Other options would also be to consider measures which would encourage mode switching (to move freight off the roads).

High Bus, High Background

46 The relatively high contribution from buses at these locations is likely to reflect the localised traffic mix. The location shown in Figure 2.3 for London is Oxford Street, where buses account for a high fraction of the traffic count compared to other London locations. It would be possible to reduce the impact of the buses through local measures, but careful planning will be needed. For example, re-routing the buses might simply move the exceedence problem to another location. A better outcome may be achieved by targeting the emissions from the buses (and e.g. requiring the use of low emission buses, either through the use of abatement, or alternative technologies).

47 It is assumed that the high contribution from buses is correlated with high contributions from non-transport and urban background because this simply reflects the conditions in the centre of large urban areas. It may be that measures to reduce road transport emissions, when applied across a large geographical scale, will also give rise to a lowering of the urban background. However the impact of this may be small. So it will be important to understand the localised emissions in some detail (e.g. the split between the urban background and the non-road transport sources).

48 It is likely that the high levels observed from the non-transport and urban background sources simply reflect the extent to which the site is influenced by the general activities of a densely populated urban area. If this is the case, then reducing the impact of these emissions will be challenging, as there will be many contributing sources across a wide area.

49 Only three locations of this type are shown in Figure 2.3, but it is likely that there are other locations not shown in Figure 2.3, which will have a similar source apportionment, reflecting the situation in the centres of town and cities.

High Background

50 Comments are made above relating to reducing the impact of background emissions. This is likely to be challenging due to the diverse nature of the sources, and the geographical scale of the area which would need to be addressed. As a result, it is likely that measures at the local scale would have a lesser impact.

Balanced, close to limit value

51 A significant number of locations are predicted to be very close to the limit value, with no dominant source. National level measures to reduce road transport emissions in general are likely to provide the reductions needed to attain the limit value. For example, policies to

reduce the emissions from localised road transport would also decrease the contribution of the urban background source (as road transport emissions in nearby locations were also reduced).

Balanced

52 In many cases there is no single source, or mode of transport which dominates at the exceedence location. Focusing on one source is therefore unlikely to achieve the required reductions to attain the limit value.

53 As with many of the different categories, it is expected that a range of measures will be needed (both at the national and local scales) to address the problem.

54 The appraisal and selection of options is considered in Chapter 4.

2.6 An overview of the gap to be bridged

55 Section 2.5 above has considered the different source apportionment, and the types of measures which would be best suited to reduce the concentration levels. However it has not considered the extent to which the limit value is predicted to be exceeded, and therefore the levels of reduction required.

56 Figure 2.3 shows the extent to which the limit value is exceeded for the maximum exceedence in each zone or agglomeration. In many zones, the maximum exceedence is predicted to be only slightly above the limit value. This is encouraging, as additional measures will only need to deliver a relatively small reduction in NO_2 concentration at this, and all other exceeding locations in the relevant zone.

57 However, some zones (most notably in the Greater London urban area), show exceedence by a considerable margin, and the combined impact of numerous measures may still prove to be inadequate to reduce concentrations to the NO_2 limit value. As the most extreme example, Oxford Street in London would only be compliant with the limit value if the contribution from almost all local transport was removed (although the urban background might be expected to decrease as an indirect effect of measures being implemented in other London locations). Ensuring complete compliance with the limit value across London by 2015 is expected to be challenging, and will require significant, well co-ordinated action.

Conclusions

58 In conclusion, the situation is very variable across different locations in the UK. Many of the zones show a maximum exceedence which is not substantially above the 40 $\mu g\ m^{-3}$ limit value, and the measures to address this may not prove to be too onerous.

59 However, numerous locations (most notably large urban centres, and Greater London), are projected to exceed the limit value by a substantial extent. Both the level of exceedence, and the source apportionment will make meeting the NO_2 limit value challenging, and will require a well co-ordinated and holistic approach across local and national Government. It may be that creative measures will be needed if all locations are to meet the limit value by 2015.

3 Uncertainties

60 There are uncertainties associated with estimating future emissions, and then further uncertainties associated with applying the models to these data to derive estimates of future ambient concentrations. Consequently the results shown in Chapter 2 should be regarded as high in uncertainty, and it is important to appreciate that no level of contingency has been built into the results.

61 There have already been a number of studies undertaken to assess the levels of uncertainty and sensitivities of models used to estimate projected concentrations (see Air Quality Strategy (2007) Volume 2, Section 1.5.2.1). The following sections draw on this work, and consider the different aspects of uncertainty in making estimates of future NO_2 roadside concentrations.

3.1 Baseline measures – how well are these likely to perform overtime

62 There are a number of policy measures which have been (or will be) implemented to reduce emissions from road transport. Whilst these can be included in the modelling studies, it is usually difficult to estimate the uptake and effectiveness of new measures. Past experience has shown that projections are often overly optimistic regarding the effectiveness of new policy measures. It is important to understand this in some detail, because this type of exceedence modelling is often trying to assess a relatively small percentage reduction, which must be achieved at all locations. As a result, relatively small “offset” errors can have a very large impact on the number of sites projected to comply with the limit value.

63 Consequently, it will be important to draw on past experience in determining the effectiveness of policy measures, and even consider building in some contingency to account for the levels of uncertainty.

3.2 Changes in current fleet make up and activity

64 The projected emissions of NO_2 are heavily dependent on evaluating the fleet mix, both in terms of vehicle types, but also age (which determines the emissions standard to which the vehicle was manufactured).

65 The NAEI uses traffic forecasts from Department for Transport’s (DfT’s) FORGE model which takes into account the Ten Year Plan for Transport. The rate at which new vehicles penetrate the fleet and old ones are taken out are calculated by a fleet turnover model based on average survival rates and figures from DfT’s Vehicle Market Model (VMM) on new car sales. The survival rates are based on averages of historical survival rates over the last 10 years.

66 The most up to date information is used to allow best estimates and in general, the future vehicle fleet mix can be reasonably well predicted as most trends are relatively long-term. However, some of the more difficult aspects to account for include:

- **the rate of new cars entering the fleet:** Usually this is considered to be well characterised, but the current economic circumstances are impacting on new car purchases. As a result, fewer new cars (which have more stringent emission standards) will enter the fleet.

- **the petrol-diesel car mix and engine sizes:** Whilst there is a historic trend to draw on, future trends are affected by e.g. fuel prices and economic circumstances. It may be that a stronger trend towards purchasing of more fuel efficient vehicles emerges. The introduction of, or changes to, policy directed at climate change may also impact on the future fleet mix in ways which have not yet been accounted for.

- **car usage:** The economic climate may result in people using their cars less frequently. This has not yet been taken into account in projections, and may prove difficult to estimate.
- **performance to new emission standards:** New, more stringent, emission standards are continually being introduced. However, until a number of these vehicles have undergone real world emission tests, it is difficult to accurately assess the typical NO_2 emissions per km. This source of uncertainty is known to have caused significant revisions to past calculations, where results from laboratory emission test cycles gave significantly different results to real world driving conditions.

3.3 Meteorology and influence of weather on exceedences

67 Day-to-day changes in weather have a great influence on air quality. Levels of pollutants that are relatively high on a still day when dispersion is limited can be much lower the next day, or even the next hour, if conditions become windier. Emissions of air pollutants may not have changed in that period, but measured concentrations will be much lower. When these effects are averaged out over a year, there can be quite large differences in average concentrations, or in the number of days that an objective has been exceeded between different years. NO_2 emissions changed little between 2002 and 2003 but there were large differences in the air pollution climate.

68 Experience has shown that the concentrations which the projections are based on has a great influence on the projected air quality in a future year. Projection calculations which use a relatively poor year for air quality as a starting point will result in higher projected exceedences than basing the calculations on a year of relatively good air quality.

69 Air pollutant emissions generally do not change substantially from one year to the next, so these large inter-annual variations are mostly a result of the different weather patterns between years.

70 The estimates presented here are all calculated on an annual average basis, to ensure consistency with the basis of the NO_2 limit value. The base year (2005) for the calculations presented in Chapter 2 was not considered to be a particularly extreme pollution year, so the impact of inter-year variability is not thought to be significant in this case.

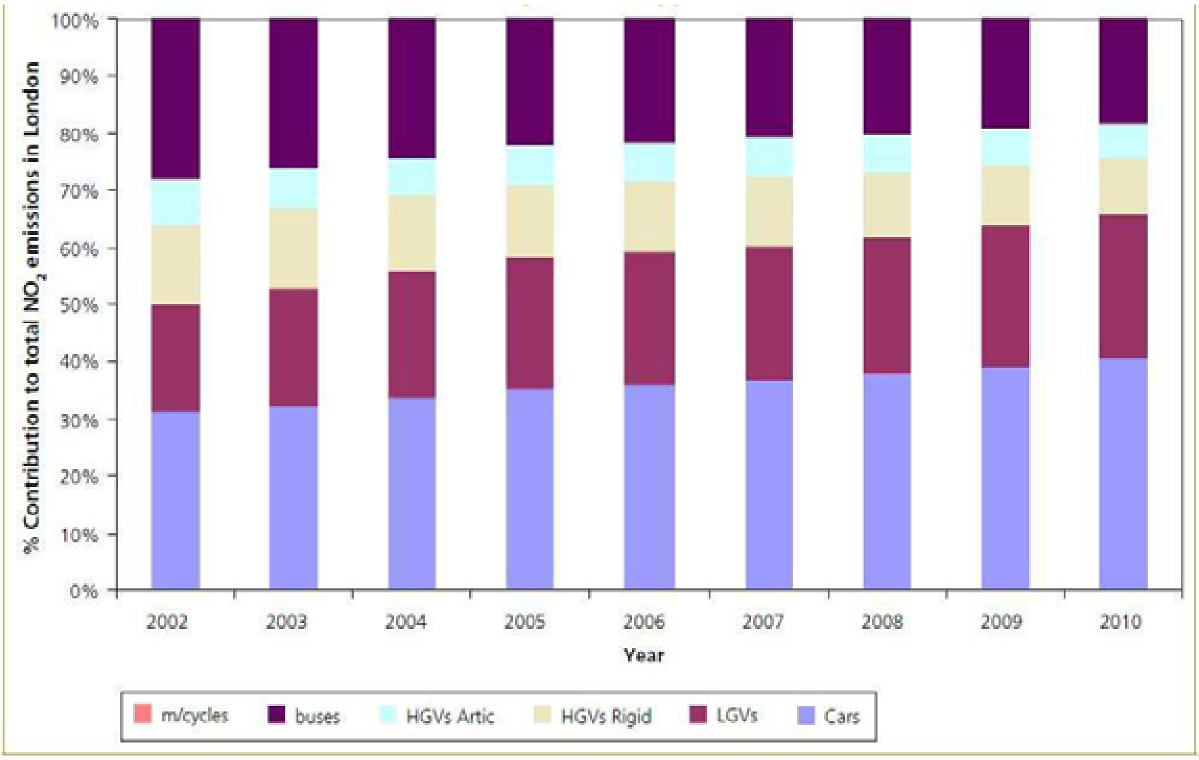
3.4 NOx/NO_2 issues

71 Emission inventories (the NAEI included) provide estimates of NOx emissions. Previously it was assumed that NO_2 represented a constant fraction of the NOx emissions from the NAEI. However recent studies have shown that this is not the case (Air Quality Strategy (2007) Vol.2 Section 1.5.3.1). In 2002, the NO2:NOx emissions ratio from all vehicles combined was approximately 11%. This is predicted to increase to 18% by 2010. In London a similar increase is predicted over this period.

72 Figure 3.1 shows the proportion that each vehicle type contributes to the total NO_2

emissions in London across a time series. The analysis shows that cars and light goods vehicles (LGVs) will contribute proportionately greater amounts of NO_2 in the future. This is as a result of the increasing numbers of diesel cars and increasing numbers of both cars and LGVs conforming to Euro III and Euro IV emission standards. The analysis has showed that HGVs and buses are of less importance as their contribution to total NO_2 emissions in urban areas is predicted to fall over time. This is because the NAEI forecasts at present assume that there is no widespread use of particulate traps on Euro IV and IV+ vehicles. This assumption obviously has large implications on the total NO_2 emissions predicted in urban areas.

Figure 3.1: Percentage contribution to total London NO_2 emissions by vehicle type for 2002 - 2010



73 Sensitivity studies have been conducted with the PCM model to assess how variable the roadside concentration estimates are with slight variations to the input data, or other assumptions. The results from the different scenarios shows that the baseline data (used in this report) may under predict the future NO_2 roadside concentrations, but this will depend on the NO_2 emissions from vehicles built to comply with emission standards Euro 5 and Euro 6 (see the last bullet point under Section 3.2). It is possible that the percentage of road length exceeding the 40 µg m^{-3} limit value in 2015 is 50% higher than the baseline estimates shown in this report. As a result, it is sensible to consider building in contingency when planning the required measures to meet the limit value.

4 Selection and appraisal of measures to meet the limit value

4.1 Available measures for reducing exceedences of NO_2

74 Given the extent of exceedences across the UK and the fact that we are unlikely to achieve these without additional measures at a national, regional and local level we are faced with a significant challenge to collect and appraise the package of measures that will bring us into compliance by an extended limit value deadline of 2015 and to present a robust case for this to the European Commission.

75 An evaluation of the Air Quality Strategy, published by Defra in 2005, concluded that policies in the road transport and electricity sectors had had a major impact in reducing air pollution and were shown to be very cost beneficial. The picture now in the UK is one where limit values even for NO_2 are met across 99% of the UK at background but at urban roadsides we continue to have a large number of hotspots and as Chapter 2 of this paper describes a number of very significant exceedences in some urban areas. These hotspots reflect high levels of pollution from road transport (especially buses and HGVs but also private vehicles). However, background pollution whilst for the most part below the limit value does in some places contribute significantly to concentrations at roadside and makes exceedences of the limit value more likely. Therefore in order to meet the limit value and to realise further health benefits we must consider measures that not only tackle roadside emissions but might also contribute to reducing background levels of NO_2 and thus concentrations overall and particularly at roadside.

76 The analysis in Chapter 2 does show that in some parts of the UK exceedences are relatively close to the limit value and here compliance might be achieved by targeted regional measures taking into account the most significant sources of NO_2 in the locality. In other cases (for example, in London and some of the bigger urban areas) the analysis suggests that the scale of exceedences is such that if regional measures alone were pursued these would have to be significant and might be difficult to achieve without concerted effort. The most realistic approach might therefore be a combination of both national and well targeted local/regional measures taking into account the source apportionment characteristics and other considerations for particular regions. Even here radical measures such as significantly accelerating improvements in vehicle emission standards or pushing forward new drive systems such as gas driven buses or electric vehicle initiatives are likely to be needed and to be successful would need significant Government impetus behind them These would be essential to support regional and local measures to meet the limit value.

77 The Air Quality Strategy, published in 1997 and updated in 2000 and 2003, set a comprehensive foundation for the analysis of air quality in the UK and the identification of measures to improve air quality. The most recent version of the strategy was published in 2007. In the development of this there was a thorough process of consultation and appraisal of measures to improve air quality particularly with respect to NO_2 and PM_{10}. Detailed modelling of these measures identified a number of options which had the potential to bring about significant reductions in emissions of road transport pollutants including NO_2. This process identified three new measures that would be taken forward as soon as possible:

- incentivising the early uptake of tighter European vehicle Emission standards (Euro standards);
- increased uptake of low or zero emission vehicles; and
- reducing emissions from ships[7]

78 Modelling showed that these measures could generate significant benefits to the UK net of costs in the region of £0.033bn to £1.21bn per annum. It concluded that these were likely to be the most effective combination of measures and could lead to a reductions of roadside exceedences of 50% by 2020. It should be noted that however that even this would not be sufficient to remove all exceedences by 2020 (let alone by 2010 or an extended deadline of 2015).

79 Other measures the Air Quality Strategy recommended should be kept under review but that would not taken forward immediately were:

- a hypothetical national road pricing scheme;
- London and other low emission zones;
- retrofitting of HGV and other vehicles; and
- reducing emissions from small combustion plants

80 For these measures the strategy concluded that they were unlikely to generate positive net benefits at the present time but that they would be kept under review.

81 However, as the strategy concluded, it is unlikely that any of these measures alone or even in combination would achieve the extent of reduction in exceedences needed to meet the NO_2 limit value by 2015. For example, as stated above, if implemented the first three new measures identified in the strategy would reduce roadside exceedences by 50% by 2020.

82 Therefore in order to achieve the level of reduction projected for 2020 by 2015 (i.e. 5 years earlier than envisaged) and to meet the limit value across the UK it would not only be necessary to implement all the three new measures as a minimum but also to significantly ratchet up any delivery mechanisms (such as incentives) to encourage the up-take by 2015.

83 Furthermore, even if UK were to implement the three new measures identified by the strategy on their own these would not eliminate all exceedences in the UK and a number of urban areas, especially in London, would continue to have exceedences towards 2020. Therefore in order to have any confidence of meeting the limit value across the whole of the UK by 2015 it will be necessary to revisit the other measures in the strategy that were to be kept under review (listed above) and even those other measures in the strategy which were rejected at the time as not being cost beneficial or considered less feasible (eg measures to incentivise the phasing out of most polluting vehicles or measures affecting domestic and industrial sources). All these measures will have to be revisited and reconsidered in terms of their effectiveness and feasibility in reducing roadside exceedences in particular.

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[7] A measure to reduce emissions from ships has already been taken forward at an international level and will be implemented in due course.

84 Moreover some of these options might have to be implemented on a radical scale to achieve the necessary reductions. For example large scale retrofitting of pre Euro 5 and 6 vehicles to reduce emissions; significant support to electric vehicle programmes; and extensive introduction of hybrid/gas fuelled vehicles for captive fleets would need to be given serious consideration in order to present a credible case to have our limit value deadline extended to 2015. This would require significant close working with the devolved administrations, the Greater London Authority and other regional and local authorities to ensure agreement to measures and to facilitate the delivery of improvements on the ground and potentially significant funding. Whilst the Air Quality Strategy sets out in detail the costs and benefits of various measures and combinations, detailed work to assess the financial costs of particular measures has not been carried out but is likely to be significant. As an example, other Member States such as the Netherlands have set aside up to €250 million to support local initiatives and have a combined budget of €2billion to support their application for time extension for both PM_{10} and NO_2.

85 Clearly therefore the costs to government if all measures required to achieve the limit value by 2015 were implemented are likely to be significant and in cost benefit terms particular measures or combinations of measures might appear at best to be neutral and in some cases negative.

86 In addition to the above measures other national policies not directly related to air quality can make important contributions to emissions. Climate change in particular is one of these. The Air Quality Strategy recognised the importance of achieving win-wins between climate change and air quality. For example, moves towards cleaner fleets especially in urban areas would benefit both air quality and carbon reduction. There are also trade-offs to manage carefully. The planning system can also have significant impacts on the reduction or increase of emissions especially at the local level. The UK Government and devolved administrations provide guidance to planning authorities on this and measures to support sustainable development can be important in their contribution to reducing the need to travel by private car etc. Where opportunities arise we will work with other government departments and agencies to ensure national policies take account of air quality interests and acknowledge the obligation to meet EU limit values.

4.2 Review of Local Air Quality Action Plans and Measures

87 Table 4.2 summarises the number of local authorities that have declared local air quality management areas (AQMAs) for NO_2 compared to other pollutants and the total number of local air quality management areas declared. A map of the distribution of NO_2 AQMAs across the UK is given at figure 4.1. National regional and local measures will be required to ensure we are able to meet the limit value across the whole of the UK. Local action in particular can be expected to make an important contribution where, for example, targeted measures to improve captive fleets or control traffic flows in particular hot spots are required. National Indicator 194 which tasks LAs to reduce emissions from their own fleets will be important here too.

88 Local authorities and in London the GLA and London Boroughs are required to work towards the Air Quality Strategy objectives. In London the mayor is required to publish an Air Quality Strategy that will set out his proposals for the implementation of policies within the Secretary of State's Air Quality Strategy and the achievement of the Government's air quality objectives within London. Defra and the devolved administrations will review local air quality

action plans for all those local authorities that are modelled to have exceedences of the NO_2 limit value from 2010. This will be to ensure:

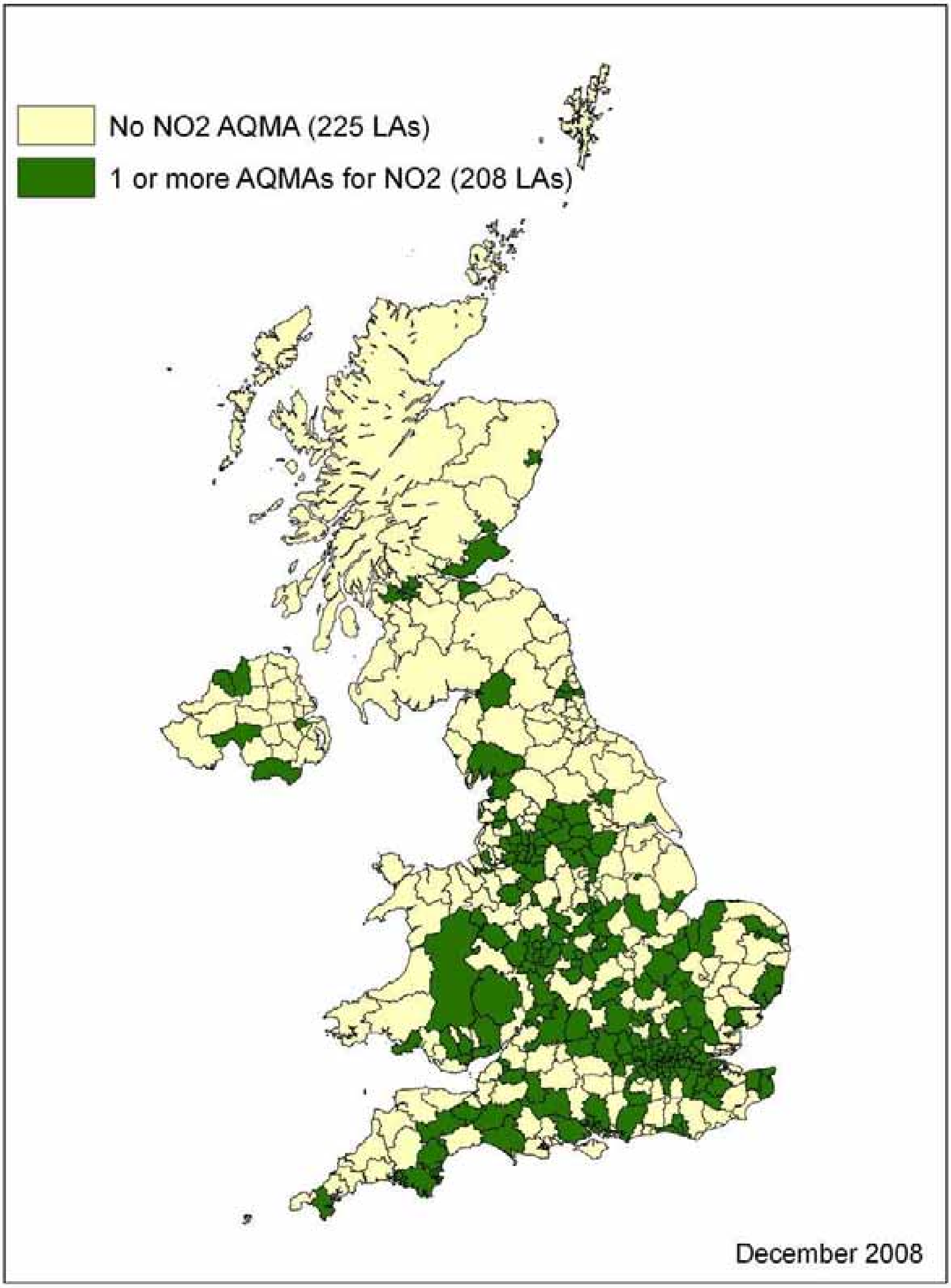
- that the measures contained are taken into account in our time extension application; and
- where necessary to provide further advice/ to LAs to ensure their action plans are sufficiently robust and have given due consideration to all available measures.

89 Defra will also work with the Mayor of London; the GLA; TfL and the London Boroughs to explore what action will be necessary within London to reduce the significant number and scale of exceedences within London and to work towards the achievement of the limit values.

Table 4.2: Summary of air quality management areas

Region	Las with Current AQMAs	Total Of All know AQMAs	Benzene	NO_2	PM_{10}	SO_2
England (excluding London)	166	201	1	155	36	9
London	33	61	-	33	28	-
Northern Ireland	11	12	-	6	5	1
Scotland	12	12	-	7	4	1
Wales	8	8	-	7	1	-

Figure 4.1: Distribution of nitrogen dioxide air quality management areas (AQMA) in December 2008



4.3 Framework for appraisal and selection of options

90 In addition to the contribution of each measure to meeting the NO_2 limit value, the selection of options would need to provide an appraisal of their impacts in terms of costs and benefits (health, eco-systems, climate change etc) and their feasibility in terms of delivery mechanisms and available technology. To value the different options we propose to apply the impact-pathway approach developed by the Interdepartmental Group on Costs and Benefits Air Quality subject group (IGCB(A)). This approach is the interdepartmentally agreed best practice approach to evaluate air quality impacts in the UK.

91 The main steps in applying the impact pathway approach are:

- quantification of air pollutant emissions for both the baseline and additional measures;
- conversion of projected emissions into population weighted concentrations for the baseline and differing policy scenarios. This is used to quantify the exposure of people, the environment and building to changes in air quality;
- quantification of health and non-health impacts associated with the change in pollutants, for example, using concentration-response functions that estimate the relationship between changes in air pollutants and changes in health outcomes;
- valuation (monetisation) of health and non-health impacts;
- assessment of costs associated with the implementation of each of the policy scenarios;
- comparison of costs and benefits on a consistent basis; and
- description and analysis of uncertainties associated with the quantification and valuation of impacts.

92 More detail on the application of the impact pathway approach is available from the IGCB(A) website www.defra.gov.uk/

93 Given the challenge that exists in terms of identifying a package of cost beneficial options consideration will need to be given to how this approach is tailored to this piece of work. In particular, whether a cost effectiveness approach is appropriate for the identification of measures given that in some instances measures will not be cost beneficial.

4.4 Framework for assessing options

94 In addition to the costs and benefits arguments and the source apportionment and geographical arguments of Chapter 2 there is a need to weigh these up alongside delivery, technical and policy considerations that might affect the selection of measures locally, regionally and nationally. The range of criteria that might impact upon decisions regarding measures is summarised below:

- **target sources and locations**: Some measures might be best targeted at captive fleets such as buses or particular classes of vehicles such as HGVs or vans. These and other measures might also be best targeted at particular regions or cities eg low emission zones or retrofitting of bus fleets;

- **impact on NO_2 concentrations:** This will be key to the selection of options, the greater the impact upon NO_2 concentrations, the better the contribution should be to reaching the NO_2 limit value. Some proposals might have significant impact on NO_2 concentrations but at great cost;

- **health and other benefits:** Different options will have different health and ecosystems benefits and might also have differing contributions to abatement of NO_2 or other pollutants. Furthermore some options might have climate change impacts which would need to be taken into consideration;

- **policy, technical, legal and other considerations:** Any of the options introduced will have their own policy implications or technical considerations to be addressed. For example, if a decision was made to retrofit all bus fleets how would this be funded and would there be sufficient equipment available to achieve this within the required timescales? Other proposals might have socio-economic implications. For example, a decision to scrap older cars might impact negatively upon disadvantaged groups and also rural communities and hence have social exclusion implications. Proposals to incentivise Euro 6 might have small climate change costs, whereas proposals to incentivise hybrid or electric vehicles might have significant climate change benefits; and

- **delivery mechanisms available:** The delivery mechanisms available would impact upon the cost of the option and the speed with which it could be implemented. Some fiscal measures can only be introduced by the Chancellor through the Budget. Other measures might require additional funding for local authorities to implement (eg upgrading all bus fleets to higher emission standards). The pros and cons of delivery mechanisms would have to be assessed to ensure the most appropriate and cost effective measures were identified.

4.5 Process to identify measures

95 A framework to compare and appraise measures against these criteria is proposed in Table 4.1 below . Using this framework Defra, the devolved administrations and other government departments can explore with stakeholders, such as regional and local authorities, the available measures that could contribute to meeting the EU limit value by the extended deadline and determine what combination would bring us closest to the limit value. For each measure consideration will be given to the potential target source for the measures, the geographical targeting of the measure and the possible delivery mechanisms available. These would then be compared against the contribution the measure would make to meeting the EU limit value concentrations and the relative costs and benefits, policy considerations and other considerations set out above.

96 This initial discussion stage of the process will not be a formal consultation exercise on the application by the UK to the European Commission for a time extension; that will come later this year and be subject to full consultation. Rather it will be a sharing of knowledge and understanding to identify the most suitable combination of options that will allow the UK to meet the limit value by the extended deadline. Once generic options have been identified there would be further more detailed modelling and engagement especially with other government departments and regional and local authorities to identify the combinations of options that could be taken forward and the delivery mechanisms or arrangements needed to effect these.

97 Chapter 2 of this paper highlighted regional features which affected the sources of pollution and hence possible options for tackling this. Where the information on source apportionment suggests that there are solutions available which could be amenable to a specific regional or sectoral approach these will be discussed with the relevant local and/or sectoral stakeholders. The purpose of this engagement would be mainly to consider how the available measures (described above and in the AQS) could be taken forward regionally and locally to achieve the concentration limit value (taking into account evidence we have from source apportionment and other analysis). These regional approaches will be built into our framework for appraisal of measures to ensure that where appropriate measures are targeted to best effect in both regional and sector terms.

98 In tandem with this process we will prepare the necessary forms and technical papers to support the UK's application (as was done for PM_{10}). These will form the basis of application for time extension which will be formally consulted upon in the late autumn of 2009. The project timetable is set out in Chapter 5.

Table 4.1 Framework for testing and selection measures to meet NO2 limit value by 2015

Measures/options {NB these are examples for illustration]	Target sources	Delivery Mechanisms	Impact				Barriers and opportunities for delivery					
			Abatement of NO_2	Health benefits	Other Benefits	Costs	Political	Technical	Legal	Behavioural	Social and economic	Climate change
Retro-fit catalyst particulate filters to Euro 5 standard	Buses and coaches HGVs Cars LGVs	Conditions in operator's license										
Incentivise LEVs	Buses and coaches HGVs (articulated) HGVs (rigid)	Conditions in operator's license Tax incentives										
Promote/mandate LEZs												
Road pricing												
Phase out most polluting vehicles												
Sustainable distribution schemes												
Traffic speed changes												
Smarter choices												
Etc												

5 Project timetable and milestones

99 The timetable below provides an outline of the milestones and key decision points towards putting a submission forward to the EC.

Date	Key Milestones
Feb 24 2009	Air Quality Forum discuss paper and general approach, advise on potential measures and progress on assessments so far.
March/April	Develop generic packages of measures for meeting limit values in zones/agglomerations
May – June	Discussions options with stakeholders, regional/local authorities, etc to take account of regional variations
June	Progress report to Ministers
July	Update approaches paper with assessments of potential measures/barriers for inclusion in consultation document
August/September	Detailed modelling of refinement of options prior to consultation
September	Air Quality Forum meeting
October/November	Prepare draft consultation document and impact assessment of options
November	Ministerial clearance to issue formal consultation document on NO2 plan
Nov/Dec	Issue consultation document for 12 week consultation period
March 2010	Deadline for comments
April	Air Quality Forum meeting
May	Revise UK Plan in light of comments received
August	Ministerial agreement for final Plan
September	Submit UK plan to European Commission

6 Stakeholder engagement

6.1 Key stakeholders

Internal	External
Devolved administrations (DAs) for Scotland, Wales and Northern Ireland	Air Quality Forum (AQF)*
Department for Transport (DfT)	Mayor and the Greater London Authority
Dept for Business, Enterprise and Regulatory Reform (BERR)	Transport for London (TfL)
HM Treasury (HMT)	Local authorities (English and devolved administration)
Dept of Energy and Climate Change (DECC)	Local authority associations
Dept of Health (DoH) and Health Protection Agency (HPA)	Local Air Quality management (LAQM) Regional co-ordinators group
Inter-departmental Group (IDG) on air quality *	Highway authorities (counties)
Environment Agency (EA)	
Highways Agency (HA)	*See Annex B for list of Forum members and key government departments

6.2 Stakeholder engagement

Internal

100 Defra and the devolved administrations will initiate **early engagement** with key stakeholders, in particular, with the devolved administrations and DfT, BERR, DoH and HMT, to agree the approach proposed here.

101 Wider discussions and negotiations will take place primarily through meetings of the **Interdepartmental Group (IDG)** which comprises the key government departments concerned, but also more widely with the air quality community and others who can potentially influence the achievement of the limit value.

102 Bilateral with individual departments will take place outside IDG. In particular a majority of the measures will need to focus on reducing emissions from road transport where **DfT** have policy levers. **BERR** will be concerned with any proposals for stationary sources. **HMT'**s will be primarily concerned with any options involving possible incentivisation. **DOH** and **Health Protection Agency** will be concerned about health impacts of proposed measures. **DECC** will focus on impact of potential measures and opportunities for climate change.

External

103 The **Air Quality Forum** will be the main means for informing and sounding out early views of outside stakeholders. The Forum can begin to consider in detail the general approach at its meeting on 24 February 2009. The Forum could meet again in Autumn 2009

to discuss development of potential new measures, ahead of formal consultation, currently planned to start towards the end of 2009 , and convene again in Spring 2010 ahead of formal submission of the UK's NO2 flexibility plan to the EC.

104 Defra and the devolved administrations will enable individual stakeholders and groups the opportunity for bilateral discussions outside the Forum meetings. As well as through their associate membership of the Forum, local authorities will be kept informed of progress via Defra's 6 monthly meetings of Local Air Quality Management (LAQM) regional co-ordinators.

6.3 Communications

Reporting Progress

105 Updates and progress with the work will be published in Defra's Annual Reports and Autumn Performance Reports.

106 Progress will also reported via Defra's quarterly Public Service Agreement (PSA) system as part of the department's Natural Environment PSA.

107 Formal public consultation is currently planned to start in late 2009 and will run for the required 12 week period. Consultation will be via electronic means and Defra and the devolved administrations will publish details of responses on their websites.

ANNEX A: Air Quality Forum and government departments

Business and industry

Confederation of British Industry
Chemical Industries Association
Metals Forum
UK Petroleum Industry Association
Association of Electricity Producers
Society of Motor Manufacturers and Traders
Freight Transport Association
Confederation of Passenger Transport (UK)
Environmental Industries Commission
Federation of Small Businesses
Scottish Federation of Small Businesses

Voluntary sector/others

Environment Protection UK (EPUK)
Friends of the Earth
Campaign for Clean Air in London
Institute for Air Quality Management
National Farmers Union
Passenger Transport Executive Group
Automobile Association
Royal Automobile Club
National Trust
Royal Society for the Protection of Birds

Health groups

British Medical Association
British Lung Foundation
National Asthma Campaign
Chartered Institute of Environmental Health
Royal Environment Health Institute of Scotland

Local government

Local Government Association
Convention of Scottish Local Authorities
Welsh Local Government Association
Local Government Association and Chartered Institute of Environmental Health Northern Ireland
London Councils
Greater London Authority
Local Authority Co-ordinating Office on Regulatory Services (LACORS)

Government, devolved administrations and agencies

Central government departments
Scottish Government
Welsh Assembly
Department of Environment in Northern Ireland
Environment Agency
Scottish Environmental Protection Agency
Northern Ireland Industrial Pollution Inspectorate
Health and safety Executive