



Department
for Environment
Food & Rural Affairs

Draft plans to improve air quality in the UK

Tackling nitrogen dioxide in our towns and cities

UK overview document

September 2015



Llywodraeth Cymru
Welsh Government



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The Scottish
Government
Riaghaltas na h-Alba



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1. INTRODUCTION

1. A cleaner, healthier environment benefits people and the economy. Clean air is vital for people's health and the environment, essential for making sure our cities are welcoming places for people to live and work now and in the future, and to our prosperity. Our ambition is to make the UK a country with some of the very best air quality in the world.
2. Over recent decades, air quality has improved significantly thanks to concerted action at all levels, including investing some £2 billion since 2011 to increase the uptake of ultra low emission vehicles and cleaner transport, and supporting local authority action. Our environment has never been cleaner. Even in our busiest cities we have seen falls in harmful emissions, for example a 15% reduction in average roadside concentrations of nitrogen dioxide (NO₂) since 2010, but there is more we can do.
3. Tackling air pollution is a priority for Government. We will achieve this by exploiting new, clean technologies, such as electric and ultra low emission vehicles, to cut emissions and help our great cities function more smartly and efficiently. To spur further innovation we have opened up our data so that the whole country – people, businesses and the public sector – can use it to take better decisions and action. We will also work with our great cities to help them make the changes they need to become greater still. This could include improving their bus and taxi fleets, investing in cycling infrastructure and upgrading roads so they run more smoothly.
4. This document sets out the UK's approach to meeting the NO₂ limit values set out in the Ambient Air Quality Directive¹ in the shortest possible time. The limit values are set to protect human health. This overview together with the documents outlined below form the UK Air Quality Plan for NO₂. Subsequent implementation of the plan and progress towards compliance will be closely monitored. We submit compliance assessments to the Commission on an annual basis which demonstrate progress towards the limit values and we will keep the measures in this plan under review to ensure we do meet the limit values in the shortest possible time.
5. The UK is divided into 43 zones and agglomerations for air quality monitoring and reporting purposes (see map 1 in annex). This plan should be read alongside the individual local plans for each of the 38 zones currently exceeding the annual mean limit value for NO₂. A list of UK national measures will also form part of the final plan and will be influenced by the consultation responses. A technical report on the modelling and assessment methodology used in the preparation of the final plan will also be prepared.

¹ European Directive 2008/50/EC on ambient air quality and cleaner air for Europe. This sets maximum concentrations of key pollutants in ambient air, i.e. the air that we all breathe.

2. THE CHALLENGE

6. The Government's primary driver for action on air quality is the impact it can have on health and the environment.

2.1. Impact on health and the environment

7. Through improving air quality we can reduce both the short term and long term effects on people's health. It will have benefits to those who may find their conditions are made worse through exposure to air pollution, for example people with heart or lung conditions or breathing problems.
8. The evidence associating NO₂ with health effects has strengthened substantially in recent years as noted by the Committee on the Medical Effects of Air Pollutants (COMEAP) (see Box 1). It is estimated that the effects of NO₂ on mortality are equivalent to 23,500 deaths annually in the UK². Many of the sources of NO_x (NO₂ and NO)³ are also sources of particulate matter (PM). The impact of exposure to particulate matter pollution (PM_{2.5}) is estimated to have an effect on mortality equivalent to nearly 29,000 deaths in the UK⁴. The combined impact of these two pollutants represents a significant public health challenge.

Box 1: Statement on the evidence for the effects of nitrogen dioxide on health (March 2015)⁵

'Studies have shown associations of nitrogen dioxide (NO₂) in outdoor air with adverse effects on health, including reduced life expectancy. It has been unclear whether these effects are caused by NO₂ itself or by other pollutants emitted by the same sources (such as traffic). Evidence associating NO₂ with health effects has strengthened substantially in recent years and we now think that, on the balance of probability, NO₂ itself is responsible for some of the health impact found to be associated with it in epidemiological studies'.

9. Improving air quality will also reduce damage to water quality, biodiversity and crops. Oxides of nitrogen can contribute to eutrophication of waterways affecting aquatic life. They can react in the atmosphere with volatile organic compounds to create ground level ozone which damages crops as well as having its own health impacts.

² Defra analysis using interim recommendations from COMEAP's working group on NO₂. The working group made an interim recommendation for a coefficient to reflect the relationship between mortality and NO₂ concentrations (per µg/m³). COMEAP has not yet made any estimates of the effects of NO₂ on mortality. Any analysis will be subject to change following further analysis by the working group and consultation with the full committee.

³ Oxides of nitrogen (NO_x) is the term used to describe the sum of nitrogen dioxide (NO₂) and nitrogen oxide (NO). Ambient NO₂ concentrations include contributions from both directly emitted primary NO₂ and secondary NO₂ formed in the atmosphere by the oxidation of NO.

⁴ [The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom](#)

⁵ [Statement on the evidence for the effects of nitrogen dioxide on health](#)

2.2. Current compliance with EU standards

10. The EU Ambient Air Quality Directive sets legally binding limits for ambient concentrations of certain pollutants in the air. For NO₂ there are two limit values⁶ for the protection of human health. These requires Member States to ensure that:
 - (i) annual mean concentration levels of NO₂ do not exceed 40µg/m³; and
 - (ii) hourly mean concentration levels of NO₂ do not exceed 200µg/m³ more than 18 times a calendar year.
11. Member States were required to meet these limits by 1 January 2010 unless an extension was granted for up to 5 years to 1 January 2015.
12. The UK assesses compliance with these limits through a UK wide system of over 145 air quality monitoring stations known as the Automatic Urban and Rural Network (AURN), together with a Pollution Climate Mapping (PCM) model.
13. The UK is required to report air quality data on an annual basis. In 2013 five zones (Table 1) met the limit value for annual mean NO₂ concentrations, with an additional 7 zones being compliant with the Directive within a margin of tolerance due to an agreed time extension⁷. The remaining 31 zones had measured or modelled exceedances over the limit and no time extension.

TABLE 1: UK zones and agglomerations meeting limit values in 2013

Zones meeting the annual mean limit value for NO ₂ in 2013:	Zones exceeding the annual mean limit value, but within the annual mean limit value plus margin of tolerance
Blackpool Urban Area	Portsmouth Urban Area
Preston Urban Area	Birkenhead Urban Area
Highland	Southend Urban Area
Scottish Borders	Edinburgh Urban Area
Northern Ireland	Swansea Urban Area
	Central Scotland
	North Wales

14. In 2013 the UK met the limit value for hourly mean NO₂ in all zones except for Greater London.

⁶ Limit values are expressed in terms of µg/m³ (micrograms per cubic metre). This may also be written as µgm⁻³

⁷ The UK has been granted a time extension for compliance with the NO₂ annual mean limit value in 12 zones and agglomerations. Where a time extension applies the UK is required to provide the Commission with data indicating that the annual mean NO₂ concentrations in these zones have remained at or below the annual limit value plus the maximum margin of tolerance of 60 µg/m³

2.3. Assessment of future compliance

15. We are committed to bringing all exceeding zones into compliance in the shortest possible time. To evaluate the measures we need to put in place to achieve compliance, and ensure they are focused on the right areas and issues, we have based our assessment on the most up to date information available.
16. We have used our Pollution Climate Mapping (PCM) model to project future NO₂ concentrations, which provide expected UK compliance dates for each of the UK zones.
17. These projections look at five year intervals going forward with a baseline year of 2013. The quantifiable impacts of measures implemented and planned since we last submitted plans in 2011 have been included. The projections show we expect 35 zones to be compliant with the limit values for NO₂ by 2020. Eight zones are still projected to be non-compliant in 2020 without further additional action. Table 2 summarises the projected compliance dates for individual zones, together with estimated compliance dates based on additional measures in this plan.
18. The revised projection differs from that published in July 2014, where 28 zones were projected to be non-compliant by 2020. This improvement is mainly due to the incorporation in the PCM model of updated information on vehicle emissions factors. This is provided by COPERT⁸, the recommended method for calculating vehicle emissions by the European Monitoring and Evaluation Programme and the European Environment Agency Emissions Inventory Guidebook; other member states will use a similar approach. The most significant changes impacting on the projection are a revised assessment of the performance of both Euro 5 and Euro 6 light duty diesel vehicles and a significant drop in the expected emissions from Euro VI heavy duty vehicles; early independent evidence has already demonstrated that the newest lorries and buses are emitting significantly less NO_x. There are also other factors such as changes in fleet composition.
19. Although the new COPERT factors show an improved Euro 6 performance, this is still based on limited data. This is due to the relatively small number of vehicles available and tested. Within this set there is significant variation in emissions performance amongst vehicles. This introduces uncertainty into both the projections, and the likelihood of any measures based on the performance of Euro 6 to deliver.
20. The modelling does not include any impact from the forthcoming real world emissions testing requirement for light duty diesel vehicles, which is expected to be introduced in 2017 at the earliest under Euro 6c. The impact from the new standard and testing procedures, when in force, will provide additional benefits to the measures we are taking to achieve compliance and may bring compliance forward.
21. Due to the sensitivity of the modelling to the delivery of real world emissions improvements from the Euro 6 and 6c standards, it will be important to monitor the

⁸ COPERT 4v11. Computer Programme to Calculate Emissions from Road Transport:
<http://emisias.com/copert>

performance of Euro 6 vehicles as they come to market. The government will therefore investigate the most appropriate way of obtaining this data.

22. The projections cannot take into account expected emission reductions from a number of the other current and planned measures outlined in this document and the associated zones plans, where we have not been able to quantify the reduction based on the current evidence. These measures are likely to bring compliance dates forward.
23. Table 2 summarises the expected compliance dates taking into account the additional measures in this plan.

TABLE 2: Summary of 2013 exceedance of NO₂ limit values and projected dates of compliance

2013 assessment ⁹					Projections for 2020		Compliance	
Zone/Agglomeration	Maximum annual mean limit value exceedance	Km of road exceeding limit value	Maximum annual mean ($\mu\text{g}/\text{m}^3$)	Hourly limit value exceedance	Km of road exceeding annual limit value	Maximum annual mean ($\mu\text{g}/\text{m}^3$)	Compliance with NO ₂ limit values projected with no new measures	Compliance estimate based on this plan
Greater London Urban Area	Y	1078.3	126	Y	240.1	71	2030	2025
West Midlands Urban Area	Y	189.9	70	N	4.3	47	2025	2020
Greater Manchester Urban Area	Y	170.3	61	N	0.0	38	2020	2020
West Yorkshire Urban Area	Y	82.7	74	N	2.7	47	2025	2020
Tyneside	Y	47.2	65	N	0.0	39	2020	2020
Liverpool Urban Area	Y	38.6	57	N	0.0	36	2020	2020
Sheffield Urban Area	Y	34.9	57	N	0.0	38	2020	2020
Nottingham Urban Area	Y	33.6	65	N	0.8	42	2025	2020
Bristol Urban Area	Y	18.3	53	N	0.0	35	2020	2020
Brighton/Worthing/Littlehampton	Y	0.8	41	N	0.0	27	2015	2015
Leicester Urban Area	Y	19.4	53	N	0.0	39	2020	2020
Portsmouth Urban Area	Y	10.0	53	N	0.0	37	2020	2020
Teesside Urban Area	Y	9.7	65	N	0.0	39	2020	2020
The Potteries	Y	19.9	58	N	0.0	35	2020	2020
Bournemouth Urban Area	Y	11.2	49	N	0.0	34	2020	2020
Reading/Wokingham Urban Area	Y	6.9	49	N	0.0	36	2020	2020
Coventry/Bedworth	Y	15.0	52	N	0.0	34	2020	2020
Kingston upon Hull	Y	21.1	54	N	0.0	31	2020	2020

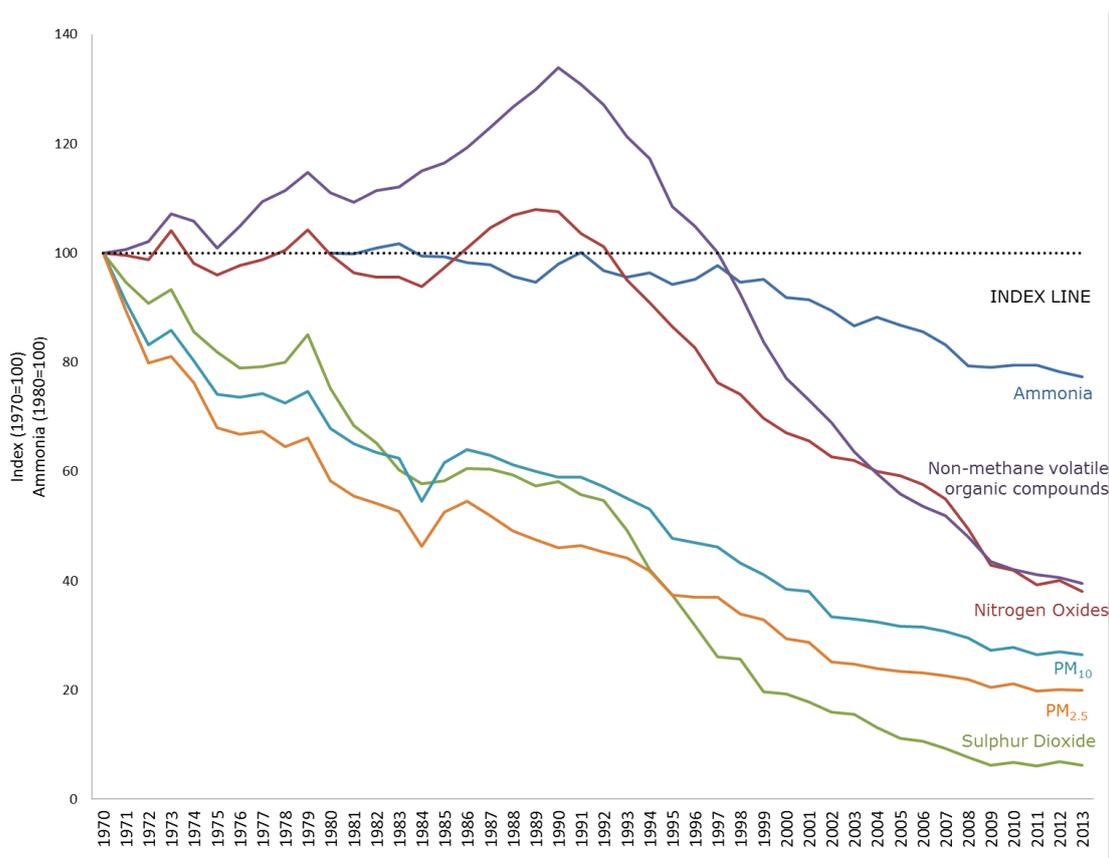
⁹ Note this assessment differs from data submitted to the Commission in September 2013. To ensure we use best available evidence the 2013 assessment has been updated to take account of latest emission factors. This data will be resubmitted in due course.

2013 assessment ⁹					Projections for 2020		Compliance	
Southampton Urban Area	Y	18.4	68	N	0.3	41	2025	2020
Birkenhead Urban Area	Y	5.3	47	N	0.0	31	2020	2020
Southend Urban Area	Y	7.1	56	N	0.0	37	2020	2020
Blackpool Urban Area	N	0.0	34	N	0.0	22	Compliant	Compliant
Preston Urban Area	N	0.0	40	N	0.0	28	Compliant	Compliant
Glasgow Urban Area	Y	76.2	68	N	0.0	38	2020	2020
Edinburgh Urban Area	Y	8.8	50	N	0.0	34	2020	2020
Cardiff Urban Area	Y	19.8	54	N	0.0	37	2020	2020
Swansea Urban Area	Y	2.7	48	N	0.0	33	2020	2020
Belfast Metropolitan Urban Area	Y	51.8	64	N	0.0	37	2020	2020
Eastern	Y	40.1	84	N	1.1	47	2025	2020
South West	Y	31.8	52	N	0.0	35	2020	2020
South East	Y	107.4	59	N	0.0	37	2020	2020
East Midlands	Y	65.3	64	N	0.9	43	2025	2020
North West & Merseyside	Y	60.7	72	N	0.0	40	2020	2020
Yorkshire & Humberside	Y	49.8	57	N	0.0	37	2020	2020
West Midlands	Y	43.3	60	N	0.0	39	2020	2020
North East	Y	47.2	65	N	0.0	39	2020	2020
Central Scotland	Y	21.4	51	N	0.0	34	2020	2020
North East Scotland	Y	7.9	52	N	0.0	34	2020	2020
Highland	N	0.0	32	N	0.0	19	Compliant	Compliant
Scottish Borders	N	0.0	26	N	0.0	17	Compliant	Compliant
South Wales	Y	30.3	66	N	2.1	41	2025	2020
North Wales	Y	7.7	55	N	0.0	35	2020	2020
Northern Ireland	N	0.0	37	N	0.0	22	Compliant	Compliant

3. OPPORTUNITIES FOR ACTION

24. There have been significant improvements in air quality over the last five decades through the introduction of a range of measures in the UK. There have been significant falls in emissions across a range of pollutants, (figure 1). Emissions of nitrogen oxides alone have fallen by 62% since 1970¹⁰.
25. This is largely due to the regulatory frameworks put in place or supported by Government at local, national, European or international level, and significant investment by industry in cleaner processes. For example, reductions in emissions from power stations have been driven by improved combustion technologies (such as low-NO_x burners and by retro-fitting coal-fired power stations), legislation including the Large Combustion Plant and Industrial Emissions Directives and the shift in the UK fuel mix away from coal towards nuclear, gas and renewables. The UK continues to meet international and European ceilings for emissions of NO_x. The UK will continue to implement and enforce regulatory controls over industrial processes in the UK to ensure that their contribution to NO_x emissions continues to decline.

Figure 1: Trends in UK sulphur dioxide, nitrogen oxides, non-methane volatile organic compounds, ammonia and particulate matter (PM₁₀, PM_{2.5}) emissions 1970 – 2013



¹⁰ [Defra National Statistics Release: Emissions of air pollutants in the UK, 1970 to 2013](#)

26. We have also been successful in reducing ambient concentrations of NO₂. These have decreased since 1990 (Annex, figure 5). Our ambition is to ensure these trends continue. These reductions have been achieved through stricter vehicle and tailpipe emission regulations (Euro standards) which have been very effective for petrol vehicles. However, the reductions have not been as rapid as expected as the standards have worked less well for diesel light duty vehicles.

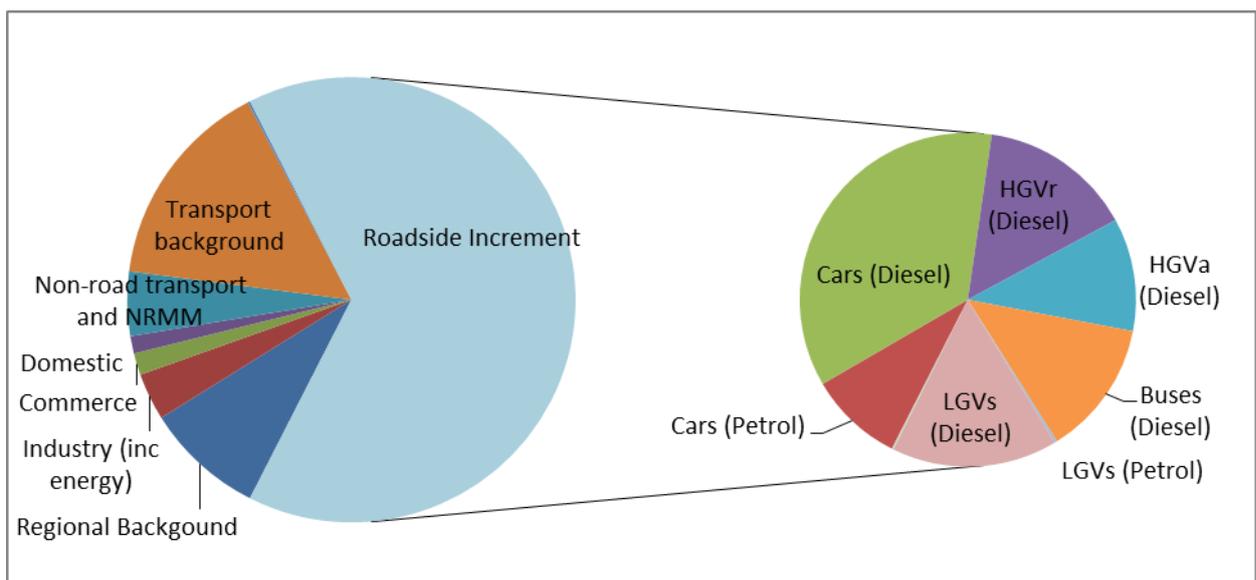
3.1. Targeting the problem

27. We are taking national action to reduce NO₂ concentrations, including to deliver effective Euro standards and accelerated uptake of both cleaner and low carbon transport. This is complemented by action at a local, community and individual level.

28. The failure of the Euro standards to deliver the expected emission reductions under real world driving conditions means that road transport is by far the largest contributor to NO₂ pollution in areas where the UK is exceeding NO₂ limit values. Figure 2 provides an overview of the breakdown of NO_x emissions in 2013 and of the traffic sources. A more detailed breakdown of source apportionment by road link is available in the accompanying zone plans.

29. On average around 80% of NO_x emissions in areas where the UK is exceeding NO₂ limits are due to transport, although non-transport sources of NO₂ are still considerable contributors. The largest source is emissions from diesel light duty vehicles (cars and vans) where both the emissions standards have had least impact and there has been significant growth in vehicle numbers over the last ten years.

Figure 2: Average NO_x source apportionment on UK road links outside London exceeding an annual mean NO₂ concentration of 40µg/m³ in 2013



30. Addressing transport therefore presents a significant opportunity to improve air quality. Transport is a key part of almost everything we do, as individuals or businesses, and its impacts are much wider than air quality. As such it is essential we take an integrated approach. By the careful choice of measures, recognising the economic impact and value, we can deliver much broader benefits alongside air quality.
31. Transport is a major source of atmospheric carbon dioxide (CO₂) and many of the measures which will improve air quality will also reduce CO₂ emissions and reduce long term climate change. The opportunities are not limited to transport. A significant proportion of background emissions still come from non-transport sources and we are also taking measures to tackle these.
32. The Government's approach to avoiding the risk of dangerous climate change has at its heart the Climate Change Act 2008. As the world's first long-term legally binding national framework, the Act requires the UK to reduce its emissions by at least 80% by 2050 and 34% by 2020 based on a 1990 base year. This followed advice from the Committee on Climate Change who deemed that 80% was a fair share from the UK to an international effort to avoid dangerous climate change.
33. The Act also puts in place a system of five-yearly 'carbon budgets' to keep the UK on an emissions pathway to 2050. Carbon budgets provide a framework for meeting our statutory targets by setting a limit on UK emissions over each five-year period. We have set the first four carbon budgets in law covering the period from 2008 to 2027. The fourth carbon budget is set at 1950 MtCO₂e¹¹, this is equivalent to halving UK emissions relative to 1990 by 2023-27 (the fourth carbon budget period) and we must set the fifth carbon budget (2028-2032) in law by June 2016.
34. Through the Climate Change Act 2008 and carbon budgets, the UK has reduced CO₂ emissions by around 30% since 1990. The drive to be more efficient in how we heat our homes to reduce the CO₂ impact and save consumers and business money will, alongside actions to address transport and industrial emissions and other sources of NO₂, also have air quality benefits.
35. The most significant action to benefit both air quality in the longer term as well as carbon is electrification of the vehicle fleet, alongside other ultra low emission technologies. Combined with increasing use of low carbon energy to provide the power from the National Grid, these vehicles can become truly zero emission, not just when in use.
36. The UK is a leader in the development of clean transport technologies. Accelerating the uptake of these technologies will help drive growth and the economy as well as improve air quality.
37. Congestion on our road network costs our economy billions of pounds every year. Enhancing the road network to improve traffic flows and reduce the number of vehicles sat idling in traffic queues and improving public transport both have the potential to significantly improve air quality and deliver a more productive economy.
38. Addressing transport emissions, including through accelerated electrification, is at the core of our plan. Government is committed to increasing the uptake of ultra-low

¹¹ Million Tonnes of Carbon Dioxide Equivalent

emission vehicles, green transport initiatives and supporting local authorities to take action. These measures have helped to address both PM and NO₂.

39. As well as acting across sources, opportunities exist to drive action at a number of levels – individual, local, regional, national and European.

3.2. Individual action

40. Access to data and information is key to our ability to make informed choices to tackle the sources of, and reduce exposure to, pollution. The Government is committed to fully available air quality data and working with others to develop innovative tools.

3.2.1. Public information, health information and communication

41. In the immediate term up to date and accessible information about current and forecast air quality levels helps everyone to take action to mitigate the short-term effects of air pollution on their health. This is particularly important for those who may be vulnerable because of, for example, heart or lung conditions. In the longer term this information also helps raise wider awareness of the problem and the development of solutions.
42. The UK is providing near real time monitoring information for a range of pollutants on the UK-Air website¹². Separate sites are also provided by the devolved governments. This includes hourly mean NO₂ levels, and health advice for the general public, including children and other vulnerable groups. This information is presented using a Daily Air Quality Index (DAQI) of 5 pollutants, including NO₂, and provides a clear 10-point scale of pollution from low to very high. Each DAQI banding is accompanied by health messages for at-risk individuals, and for the general population.
43. To allow the public to look ahead and plan for poor air quality the UK government is providing daily 5-day pollution forecasts based on the DAQI scale. During periods of forecast and monitored elevated levels of air pollution social and other media are used to further communicate and highlight episodes of poor air quality. This includes working with representative NGO health groups to reach at-risk individuals in vulnerable groups. We will continue to examine and develop how best to reach those who may be affected by poor air quality, including examining the potential for introducing a formal air quality warning system alongside the current processes.
44. We are using local channels to encourage action to mitigate air pollution. This includes local authorities, elected officials and Directors of Public Health. We have published a toolkit¹³ to assist local decision makers in engaging with their communities. This includes information on the evidence to help them argue the case for action and advice on communicating with the public and others.
45. We are continuing to develop advice and guidance for local authorities and communities. Public Health England (PHE) has developed a programme in support of national and local government to reduce mortality in England attributable to air

¹² uk-air.defra.gov.uk

¹³ [Directors of Public Health Air Quality toolkit](#)

pollution. This will be achieved by helping raise awareness of the health effects of air pollution and by further developing and synthesising the evidence on the health effects of air pollutants, including NO₂, particulate matter and ozone. PHE will focus its efforts on promoting actions that can bring multiple health co-benefits.

46. Together these measures will help ensure that we raise both professional and individual awareness of the challenge we face and the opportunities for personal action.

3.3. Local Action

3.3.1. Local authorities

47. Local authorities have a central role in achieving improvements in air quality. Their local knowledge and interaction with the communities that they serve mean that they are better able to know the issues on the ground in detail and the solutions that may be necessary or appropriate. Within the UK there are over 400 local authorities, including 33 London Boroughs in Greater London. As zones and agglomerations move closer towards and into compliance, the problem areas are likely to become more isolated and local action key to addressing them.
48. Through the Local Air Quality Management (LAQM) system local authorities are required¹⁴ to assess air quality in their area and designate air quality management areas (AQMA) if improvements are necessary. Where an air quality management area is designated, local authorities must produce an air quality action plan describing the pollution reduction measures to be put in place.
49. UK local authorities have designated over 700 active AQMAs, more than 670 of which concern NO₂, and put in place local air quality action plans to address their air quality issues including any exceedances.
50. In order to maximise the public health benefits of their action we will ensure local authorities operate in the right framework. We want to make sure that the LAQM system is focused on making it easier for local authorities to take action to improve air quality and in particular on priority pollutants such as NO₂. We are introducing guidance changes to reduce reporting burdens on local authorities to enable them to direct more of their resources to delivering action. A key element is to streamline the LAQM reporting process so that while the quality of information is retained, the requirements are more consistent and less burdensome and enable local authorities to clearly point to the actions that are being or need to be taken.
51. We will continue to provide the tools to help local authorities to assess the impact of NO₂ and other pollutants. An Emission Factors Toolkit enables local authorities to assess the emissions in their area. It provides the ability to develop localised assessments of air quality, including calculating road vehicle NO_x emissions for a specified year, road type, vehicle speed and vehicle fleet composition. We are planning to revise the toolkit to include the latest data on emissions standards.

¹⁴ Under the Environment Act 1995 and Environment (Northern Ireland) Order 2002

52. The Public Health Outcomes Framework¹⁵ outlines the desired outcomes for public health in England. It is providing a means for driving improvement within and across authorities. The framework includes an air pollution indicator: the percentage of mortality attributable to particulate (PM_{2.5}) air pollution. This is intended to raise awareness of the impact of air pollution on public health and allow Directors of Public Health to prioritise action on air quality in their local area to help reduce the health burden from air pollution. PHE has also published estimates of the mortality burden attributable to particulate air pollution in local authority areas in the UK¹⁶. Although these estimates are based on studies of the health effects associated with particulate pollution, many of the measures and the drivers behind improvements will have wider benefits, including reducing NO_x emissions and NO₂ concentrations.
53. Together these tools, and those noted above related to individual action, provide a framework for local authorities to identify those areas with the greatest public health risk and target action to address these.
54. A number of local authorities have already investigated the use of access restrictions to change the fleet mix in their cities, with four having been implemented. The London Low Emission Zone is the largest in Europe covering a range of vehicles including buses, lorries and vans. Oxford, Norwich and most recently Brighton have implemented low emission zones to ensure the use of cleaner buses. Both local authorities and businesses have identified the need for a framework to replace the current city by city approach. This provides the opportunity to deliver a consistent approach towards the introduction of emissions based access controls for the most polluting vehicles. Implementing such controls on a consistent basis gives a clear market signal and allows businesses and individuals to make vehicle choices which are then eligible to be driven within any city. This is discussed further in section 4.3.6.

3.3.2. Greater London

55. In Greater London, the Mayor of London is required¹⁷ to produce a London Environment Strategy, which must contain provisions dealing with air quality. The Mayor also has powers¹⁸ to direct the boroughs in the performance of their LAQM functions which may be used to require action to be taken for the purpose of meeting the UK's obligations under the Directive, particularly as regards any current breach of NO₂ limit values. The Mayor may also give boroughs guidance as to how they are expected to discharge their LAQM functions.
56. The Greater London zone currently has the highest NO₂ exceedance in the UK. The size and complexity of the Capital's transport networks means the task of reducing NO_x emissions, and NO₂ concentrations to legal limits, is the most challenging in the country.

¹⁵ <https://www.gov.uk/government/publications/healthy-lives-healthy-people-improving-outcomes-and-supporting-transparency>

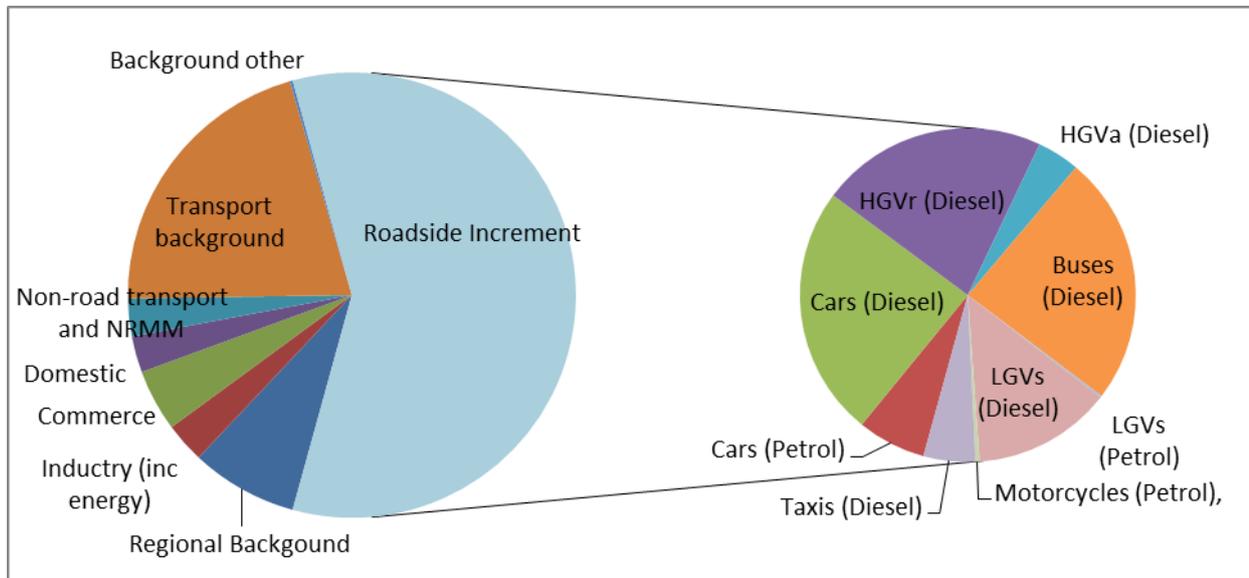
¹⁶ <https://www.gov.uk/government/publications/estimating-local-mortality-burdens-associated-with-particulate-air-pollution>

¹⁷ Under the Greater London Authority Act 1999

¹⁸ Under the Environment Act 1995

57. In London, the breakdown of traffic sources is considerably different to that for elsewhere in the UK (figure 3). Emissions from diesel vehicles continue to dominate, but the distribution includes a broader range of vehicles including cars, heavy goods vehicles, light goods vehicles, buses and taxis.

Figure 3: Average NO_x source apportionment on UK road links in London exceeding an annual mean NO₂ concentration of 40µg/m³ in 2013



58. In 2010 the Mayor of London published his Air Quality Strategy. This is a statutory document which commits the Greater London Authority and Transport for London to implement certain measures, most of which are now in place. In 2013 the Mayor announced a further package of measures, including the Ultra Low Emission Zone (see section 4.2.1), to be implemented in the years up to 2020.

59. Overall, the Mayor has been taking forward a comprehensive and ambitious package of measures to bring London into compliance with NO₂ limit levels. This includes actions to:

- Reduce emissions from buses. By 2016 NO_x emissions from the London bus fleet will have been halved compared to 2008 due to the introduction of: 1,700 hybrid buses; the world's largest bus retrofit programme; and trials of new technologies such as electric and hydrogen buses.
- Reduce emissions from taxis. The introduction of an age limit for taxis has retired more than 6,000 of the most polluting taxis, and from 2018 (subject to consultation) it is expected that London will require new taxis to be zero emission capable.
- Reduce emissions from other sources. Air quality neutral requirements in planning provisions are reducing emissions from future developments; energy efficient retrofit programmes have reduced emissions from more than 500,000 buildings across the capital; and from September 2015 London is introducing new minimum emissions standards for construction equipment.

- Tackle local hotspots. A new £20m Mayor's Air Quality Fund is supporting London boroughs in tackling local air quality. The first round of funding of £6m is already supporting 42 projects in 29 boroughs.
60. Alongside these actions the Mayor is consulting on a new bespoke approach to Local Air Quality Management reflecting the capital's unique challenges and opportunities. This system will help ensure that the boroughs' statutory responsibilities are simplified and clear and will also provide support, coordination and resource to help ensure effective action at the local level.
 61. The zone plan for Greater London sets out more detail on these and other actions being undertaken to improve air quality in London.

3.4. National Action

3.4.1. National and devolved governments

62. Responsibility for meeting air quality limit values in the UK is devolved to the national administrations in Scotland, Wales and Northern Ireland. The Secretary of State for Environment, Food and Rural Affairs has responsibility for meeting the limit values in England and the Department for Environment, Food and Rural Affairs (Defra) co-ordinates assessment and air quality plans for the UK as a whole.

3.4.2. England

63. Our projections show that due to the measures already implemented since our 2011 plans, and natural vehicle fleet turnover, all but seven zones in England will be compliant in 2020 compared to the 2013 baseline. We have taken a comprehensive approach addressing all zones in exceedance to bring these forward to compliance in the shortest possible time. We have used a combination of local assessment and targeted local action supported at the national level, integrated with wider action to electrify the vehicle fleet and retrofitting of buses to the latest standard.
64. The most significant challenge relates to the seven zones in England that are projected to exceed the limit values in 2020. In the key cities in these zones – London, Birmingham, Leeds, Nottingham, Derby and Southampton - additional targeted measures will be required to address the particular issues, and areas within them that are causing the exceedance. These cities should consider the role of access restrictions for certain types of vehicles appropriate to achieve the outcomes set out in section 5. We are proposing that decisions on such restrictions are locally led but taken forward on the basis of a national framework for new Clean Air Zones discussed in section 4.3.6. Local Authorities are, however, best placed to identify if a combination of other measures will deliver the required reductions in NO₂.
65. In modelling complex systems such as future air pollutant emissions and concentrations, there are always inherent uncertainties and various assumptions are required, for example estimating the future vehicle fleet composition. This means that the reality in the future may differ from the projected situation; what is key is to ensure that future air quality projections are based on the best current available evidence.

For example, addressing particular exceedance issues in one place could also displace causes and lead to issues elsewhere in ways that are difficult to predict. The date for introducing real world testing under Euro 6c is still under discussion, meaning future vehicle emissions performance standards are also uncertain. Our comprehensive approach is also designed to ensure as far as possible that we mitigate these uncertainties.

3.4.3. Scotland

66. Four out of six zones and agglomerations in Scotland were in exceedance in 2013. Our projections indicate that by 2020, with measures presently in place, all zones in Scotland should be compliant with NO₂ limit levels.
67. The Scottish Government is currently developing a national Low Emission Strategy¹⁹ which sets out in detail how Scotland intends to deliver further improvements to air quality over the coming years, including full compliance with Directive requirements in Scotland by 2020. Key elements in the Strategy will be a national Low Emission Zones Framework, a national air quality modelling methodology and a national communications strategy to convey the health effects of poor air quality. The Strategy will be consistent with and complementary to this UK plan and the individual zone plans for Scotland. The Scottish Government is consulting separately on the UK plan and the Scottish zone plans.

3.4.4. Wales

68. Controlling air pollution in Wales is a high priority for the Welsh Government. The driver is not only compliance with European legislation, but a commitment to protect human health and the environment. The Welsh Government takes very seriously the fact that our assessment shows four zones and agglomerations in Wales were in exceedance in 2013. However our projections show that in 2020 three out of four of the zones will be compliant. In the South zone a section of road, not more than 500 metres in length, remains the only location within Wales which is predicted to exceed the limit value beyond 2020 based on current projections. The Welsh Government will continue to work towards further improvement and, in particular, with relevant stakeholders to develop additional measures to achieve nationwide compliance before 2020.
69. In 2012 the Welsh Government launched a grant scheme for local authority-led projects to improve air quality, noise and the provision of tranquil urban green space, with an annual budget of £500,000. In 2014 it was combined with a broader local environment quality grant scheme called Tidy Towns, and in 2015 Tidy Towns was combined with other funding streams to make a single local authority revenue grant for environment and sustainable development work. Action to improve air quality (over and above statutory duties under local air quality management) remains a stated purpose of this ongoing Welsh Government funding stream for local authorities.

¹⁹ [Low Emission Strategy for Scotland consultation](#)

70. In 2015, the purposes to which Welsh Government core funding for third sector organisations and small-scale project funding for community groups could be put were broadened to include action to improve air quality. Prior to 2015, these funding streams could not be used for air quality work.
71. Reducing the contribution of transport to air pollution and other harmful emissions is a key output within the Welsh Government's Welsh Transport Strategy²⁰. The Welsh Government published a National Transport Finance Plan in July 2015 setting out investment priorities for transport focusing on the next five years and beyond.
72. The interventions identified seek to improve air quality by promoting a modal shift from private motor vehicle use to active travel and integrated public transport, and supporting highway schemes designed to reduce traffic congestion. Key transport investments and proposals that will have a positive impact on air quality include:
- Taking forward the Cardiff Capital Region Metro project – an integrated public and active travel system for South Wales focused on joining up and improving rail infrastructure, rail stations, park and ride schemes, bus routes and walking and cycling schemes
 - Intelligent Transport Systems (ITS) and other innovative technical solutions to reduce congestion on our strategic road network
 - Continuing to support modal shift for freight from road through grant support schemes
 - Reflecting the introduction of the Active Travel (Wales) Act, directing funding at a local level for walking and cycling infrastructure and delivering specifically active travel routes in the urban nodes of Cardiff, Newport, Merthyr and Bridgend
 - Improvements to the trunk road network designed to reduce congestion such as relief roads and bypasses
 - Continuing to invest in the Bus Service Operators Grant and look to include broader outcomes, including reducing emissions and bus priority routes
 - Working with local authorities and bus operators to identify and resolve congestion and pinch points on the network that impact on bus reliability, with a view to developing a package of bus priority measures along key strategic corridors
 - Railway Improvements, including electrification of the Great Western Mainline and gauge enhancement and improvements to the Valleys Line in South Wales.

3.4.5. Northern Ireland

73. Of the two zones and agglomerations in Northern Ireland only the Belfast Metropolitan Urban Area was non-compliant in 2013. Our projections show that this zone should be compliant by 2020 as a consequence of measures currently in place. The Department of the Environment for Northern Ireland intends to start a comprehensive review of Northern Ireland's clean air and air quality policy and legislation in late 2015. The review will take account of ongoing research into pollution from residential emissions, as well as current problems with air pollution resulting from road transport

²⁰ <http://gov.wales/topics/transport/planning-strategies/?lang=en> .

emissions. The Department will work with local authorities in Northern Ireland to review the Local Air Quality Management regime, so that funding support is shifted away from monitoring and onto specific outcome-based measures which will improve air quality in problem areas.

74. Northern Ireland remains committed to the principle of sustainable development and improved air quality through the setting and implementation of new national policies which guide local planning including development plans and infrastructure investments. The Regional Development Strategy for Northern Ireland 2035 provides a spatial development framework and includes the policy, “Reduce our carbon footprint and facilitate migration and adaptation to climate change whilst improving air quality.” A New Approach to Regional Transportation Strategy 2012 – A Sustainable Transport Future includes the high level aim: “To reduce the environmental impact of Transport.” The document’s more explicit supporting objectives comprise: “to reduce greenhouse gas emissions from transport; to protect biodiversity; and to reduce water, noise and air pollution.”
75. The production of a new family of transport plans and local development plans in line with the new national policies have just begun. In the interim, a number of strategic initiatives have already been undertaken that will reduce private car use and tail-pipe emissions, including:
 - The Active Travel Strategy for Northern Ireland 2011–20 aimed at increasing walking and cycling and including four demonstration projects in regional towns and cities.
 - The development of the Northern Ireland Strategic Transport Model – a forecast model to test the change in travel behaviour likely to arise from possible changes in land use (new development), transport policy (eg changes in costs of parking or public transport fares) or new infrastructure (eg increased road capacity or more frequent rail services).
 - The Active School Travel Programme 2013–16 focused on long term behavioural change to reduce car dependency and increase use of active travel modes.
 - E-car charging infrastructure. This project has installed over 350 charging points across Northern Ireland and provided grants for home charging equipment to encourage the purchase and use of electric vehicles with zero tail-pipe emissions.
 - The Bicycle Strategy 2015–40 due to be finalised in the summer of 2015 and followed by a Delivery Plan including capital schemes.
 - Provision of around 2000 additional park and ride spaces over the last 2 years at strategic locations across Northern Ireland to encourage use of public transport for onward travel to congested urban centres.
76. There are a number of relevant major infrastructure schemes that are planned for delivery during the 2016-2020 period, including:
 - Belfast Rapid Transit – an urban public transport system with two primary arterial routes forecast to result in a significant shift from private car.
 - Railway track improvements between Coleraine and Derry – to facilitate further growth in rail passenger numbers and modal transfer from private car.

- York Street Interchange Belfast - providing full grade separation of the three most highly trafficked roads in Northern Ireland and removing traffic queues that contribute to poor local air quality.
- Belfast Transport Hub – a flagship project to develop and construct a new modern public transport facility integrating rail and coach services with new commercial developments and car-parking, to provide ‘best in class’ public transport access to the city centre.

3.5. International Action

3.5.1. European Commission

77. While the UK is taking action locally, regionally and nationally to reduce NO₂ concentrations, there is also a need for action at European level to ensure that relevant standards and regulations support reductions in NO₂ concentrations.
78. One of the main reasons the UK and 16 other Members States are not meeting legal limits is that the introduction of increasingly strict standards for NO_x emissions from diesel light duty vehicles (cars and vans) has not delivered the expected emission reductions in real world use. Diesel light duty vehicles have emitted more in practice than under test conditions. This disparity has meant that up until the introduction of the new Euro 6 standard the expected improvements in air quality from the introduction of stricter Euro emission standards have not materialised.
79. The new Euro VI standard for heavy duty diesel vehicles is delivering significant NO_x emissions reductions. The Commission is seeking to replicate this for light duty diesel vehicles by introducing a new ‘real driving emissions’ test procedure. The UK has been pressing for this new test procedure to be introduced for new models in 2017 and all cars in 2018. However, a timetable for application of the new test procedures has still to be agreed in Europe. Once introduced, it will still take some time for older vehicles to be replaced by new ones with lower real world NO_x emissions and for this to impact on NO₂ concentrations in towns and cities in the UK due to the rate of fleet turn over. The UK will continue to strongly make the case in Europe for a robust test procedure which applies as soon as possible.

4. MEASURES TO BRING FORWARD COMPLIANCE

80. This section provides an overview of the measures we plan to take to ensure all zones are in compliance with legal limits for NO₂ concentrations in the shortest possible time.

4.1. Challenges in the zones

81. Meeting our long term goal of electrification of the fleet will be critical to the delivery of sustainable permanent improvement in air quality and the decoupling of economic growth from both CO₂ emissions and air pollution.

82. In tandem with this goal of transforming the national fleet our approach focuses on the immediate challenges in each zone, and in some zones this means the particular roads that present the most intractable problems. At this detailed local level different approaches are needed depending on the causes of an exceedance and local authorities will ultimately be able to make the best assessment of both the problem and the solution. This detailed approach is necessary in zones where only a few roads are projected to exceed the limit value (a zone is classified as non-compliant if it has even only one point in exceedance). However, we equally recognise that poor air quality often extends beyond a single road and we want to avoid the risk of displacing problems. Therefore broader measures that can also have an immediate effect are required.

83. The measures identified below reflect this multi-layered approach of improving the situation on specific roads, addressing the wider air quality issues in an area and driving longer term fleet turnover to embed the air quality improvements.

84. In developing our measures we have discussed with local authorities the nature and their understanding of the issues in order to provide a fully rounded picture of what steps need to be taken.

4.2. Incentivising ultra low emission vehicles

85. The UK wants to be at the global forefront of ultra low emission vehicle (ULEV) development, manufacture and use. Electric vehicles, hydrogen fuel cell vehicles and plug-in hybrids (when driven in electric mode) produce no pollution at point of use and are the long-term answer to road transport air quality problems. Our aim is for nearly every car and van to be a zero emission vehicle by 2050.

86. The last Government provided £400m to support the uptake of ultra-low emission vehicles and we have committed to £500m more over the next five years to build on progress so far. The UK had the highest number of registrations of ULEVs in the EU

in 2014²¹ and we wish to maintain that momentum. For example, claims for the plug in car grant grew four-fold between 2013 and 2014 and we have the largest publicly-funded rapid charging network in Europe.

87. Through the Office of Low Emission Vehicles (OLEV) the Government is providing a package of funding for businesses, consumers and local authorities that puts the UK at the cutting edge of investment and innovation. A number of schemes have already been announced, as shown in table 3, and further details of Government support for the sector continue to be announced.
88. There is also potential for future Growth Deals or Devolution Deals to include measures to encourage the uptake of ultra low emission vehicles.

Table 3: Details of key OLEV schemes for 2015-20 which have already been announced.

Ultra Low Emission Vehicle Programme	
Plug-in Car Grant	Grants for ultra low emission cars to help offset the upfront cost differential of these vehicles. Grants of up to £5,000 will continue to be paid until at least February 2016.
<i>Go Ultra Low</i> communications campaign	A joint-funded campaign in partnership with the automotive industry to provide consumer information on ultra low emission vehicles and increase understanding.
<i>Go Ultra Low</i> Cities Scheme	Support for 2-4 key urban areas to become national and international exemplars in driving uptake of ultra low emission vehicles by implementing innovative policies.
Ultra-Low Emission Taxis	Support for local authorities and transport operators to transition their taxi fleets to new ultra low emission models and provide supporting infrastructure.
Chargepoint Infrastructure	Funding for electric vehicle infrastructure including domestic premises, destination and rapid chargers, public sector workplaces and residential on-street charging.
Hydrogen	Match funding for an initial hydrogen refuelling network, with funding already committed for 12 stations.
Research and development	Funding for ultra low emission vehicle related technology development in the UK.
ULEV Readiness programme	Funding for central government and wider public sector organisations to drive uptake in ULEVs and help inform decision-making in public sector fleets.

²¹ SMMT

4.2.1. London Ultra-Low Emission Zone

89. In line with our plans nationally to incentivise the use of cleaner vehicles, the Mayor of London is introducing an Ultra-Low Emission Zone (ULEZ) in London from September 2020.
90. Within the zone TfL is committed to ensuring that, by 2020, all 3000 double deck buses will be hybrid diesel-electric and all 300 single decks will be zero tailpipe emissions (i.e. hydrogen or pure electric). All taxis will be required to operate in zero emission mode. This will require the transition of all London taxis to zero emission capable.
91. In addition all cars, motorcycles, vans, minibuses and Heavy Goods Vehicles (HGVs) travelling within the zone will need to meet strict exhaust emission standards or pay an additional daily charge. The Mayor has defined the emission standards to be met to include Euro 6 diesel vehicles, Euro 4 petrol vehicles and Euro VI buses and coaches.
92. The introduction of the ULEZ will contribute to a significant reduction in NO_x emissions and roadside NO₂ concentrations in London. The majority of traffic entering the ULEZ will be from outside the zone, leading to wider benefits on roads across Greater London and potentially further afield. The GLA estimate this will lead to around 80% of central London having a mean concentration of less than 40µg/m³, while the number of people living in areas of exceedance would reduce by 72% in central London and 42% in outer London.

4.2.2. Government procurement

93. Central and local government must set a lead in addressing air quality through ensuring their operations and purchasing power supports reductions in NO₂ and other pollutants. If the public and business are expected to change behaviours then government action should support the same aims.
94. The Government Buying Standards (GBS) for vehicles set down minimum mandatory and best practice standards requirement for cars, vans, buses and trucks. All central government departments and their related organisations must ensure that they meet the minimum mandatory GBS. They can further their sustainable procurement by voluntarily following or specifying the best practice standard in tenders. The wider public sector, including local government, is also encouraged to specify the GBS standards in tenders.
95. We are revising the standards with the intention of encouraging the purchase of ultra-low emission vehicles where appropriate. The current GBS is focused primarily on reducing CO₂ emissions. We are updating the standard for cars and vans in order to show continued leadership. It will seek to ensure that NO_x emissions are taken into account in procurement decisions and will aim to help procurers make an informed decision as to the size and type of vehicle required, reflecting the area in which the vehicle will be used and the type of usage.

96. The expectation is that the revised GBS will reward manufacturers who reduce the carbon and NO_x emissions of their vehicles, sending a clear message to the market that it is not only carbon emissions that need to be reduced but also vehicle pollutant emissions. We aim to publish the revised GBS later this year.

4.3. Local Action

97. Local authority action is critical to delivering improvements in air quality and the protection of public health. The measures local authorities are employing to tackle air quality range from multi-council coordination of transport strategies to specific improvements to tackle a hotspot.
98. As the UK moves towards full compliance, air quality hotspots are going to become even more localised and the importance of local authority action will increase. National government plays a key role in supporting that action through a range of funding and guidance.
99. Individual actions by local authorities to address NO₂ are set out in detail in each of the 38 zone plans that accompany this document. In total these highlight around 6000 measures that have been undertaken, are underway or are planned. These actions demonstrate how a range of innovative and targeted approaches to managing local air quality issues is addressing NO_x emissions and roadside NO₂ concentrations. The actions taken vary according to the particular circumstances of the local NO₂ issue, but they encompass a range of measures including encouraging cleaner vehicles and changing behaviours.
100. The technical requirements for assessment of air quality differ between the local and national level, primarily in terms of what is considered relevant exposure. Those local authorities with the most persistent national exceedances will need to develop a coherent approach to tackle these alongside locally identified issues. The Government will assist them in identifying and applying the most appropriate measures.

4.3.1. Examples of local authority action

101. Many local authorities are looking to encourage cleaner ways of travel through encouraging a shift of transport from private cars, for example the promotion of cycling including new cycle routes, walking, and park and ride. Local authorities are also encouraging cleaner vehicles, using more ULEVs in their fleet and providing infrastructure such as charging points for electric vehicles. Many of these are identified in the zone plans, for example the West Yorkshire Urban Area is looking to be a leader in encouraging ULEVs through its transport plan.
102. Innovative ideas to support behaviour change including vehicle sharing are also being trialled. For example in Bristol a car club is: trialling six new diesel electric vehicles and comparing them with conventional vehicles; trialling electric powered cycles; and promoting eco-driving. In Southend's Urban Area a social enterprise offers recycled cycles at affordable prices. The enterprise offers advice on all sustainable modes of transport as well as bike hire, bike service and repair.

103. In Bournemouth the local authority has seen the use of rail, bus, walking and cycling rise appreciably, including significant increases in bus patronage and those cycling to work, due to the contribution of their approach to local transport policy. New suburban rail and rapid bus schemes in Bristol are helping provide public transport alternatives and support improved air quality through modal shift.
104. Middlesbrough has installed cycle paths and infrastructure along transport corridors to improve journeys and connect major trip-generating locations to areas of housing, while businesses have the opportunity to establish fleets of pool bikes. Cycle training and promotional events have also been introduced. Leicester has encouraged taxi operators to change vehicles to achieve emission reductions through a 50% reduction on the licence fee for taxis at Euro 6 standard.
105. Air quality projects funded by the Welsh Government since 2012 include:
- the Swansea Nowcaster Project, which links a real-time air quality modelling system to variable traffic message signs for road users;
 - traffic signal optimisation in Rhondda Cynon Taf to improve traffic flow in air quality management areas;
 - targeted tree planting to absorb air pollutants in Neath Port Talbot; and
 - road layout changes in Merthyr Tydfil to reduce nitrogen dioxide concentrations at the facades of residential properties.

4.3.2. Infrastructure and land use planning

106. New infrastructure and other developments need to be sensitively planned to ensure they do not add to, or cause, significant additional air quality issues. Air quality should be considered early in any development so that mitigation measures can be developed where necessary.
107. The National Planning Policy Framework (2012)²² sets out national planning policies and principles for England and how these are expected to be applied. It provides a Framework within which local people and their accountable councils produce their own distinctive local and neighbourhood plans which reflect the needs and priorities of their communities.
108. Air quality considerations are firmly embedded within national policy which includes strong protections to safeguard people from unacceptable risks from air pollution. The Framework is clear that the planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by, unacceptable levels of air pollution. New development should be appropriate for its location, taking proper account of the effects of pollution on people's health.

²² <http://planningguidance.planningportal.gov.uk/blog/policy/achieving-sustainable-development/delivering-sustainable-development/11-conserving-and-enhancing-the-natural-environment/>

109. Local authority planning policies should sustain compliance with and contribute towards meeting limit values for pollutants, which includes NO₂, taking into account the presence of Air Quality Management Areas, and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should also ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan.
110. The Framework also includes policies on promoting sustainable transport and is absolutely clear that the transport system needs to be balanced in favour of sustainable transport modes. It sets out that plans should protect and exploit opportunities for the use of sustainable modes including, where practical, incorporating facilities for charging plug-in and other ultra low emission vehicles and give priority to pedestrian and cycle movements and have access to high quality public transport facilities.
111. To support the National Planning Policy Framework, we have published Planning Practice Guidance²³ on air quality which provides guiding principles on how planning decisions should take account of the impact of new development on air quality.
112. Local plans, prepared by local councils working with their local communities are key to delivering sustainable development. They inform individual decisions on the location of new development. In making decisions on planning applications local planning authorities take into account whether what is proposed is sustainable development, in line with the Framework and supporting guidance and any local action to improve air quality and mitigation measures proposed as part of the development in question.
113. England and Wales have a bespoke planning system for major infrastructure projects introduced through the 2008 Planning Act – the Nationally Significant Infrastructure Planning (NSIP) regime. In England the regime covers transport infrastructure, including the provision of road and rail infrastructure, which is also subject to strict consideration of air quality requirements.
114. The National Networks National Policy Statement (2014)²⁴ sets out the need for, and policies to deliver, nationally significant road and rail infrastructure projects in England. It recognises that increases in emissions of pollutants during the construction or operation of projects can result in the worsening of local air quality in some cases. Accordingly decisions on projects are required to consider air quality impacts over wider areas which are likely to be affected, as well as areas in the near vicinity of a scheme.
115. The statement sets out how decisions on road and rail infrastructure must take account of relevant statutory air quality thresholds, including those for NO₂. Where a road or rail project is likely to lead to a breach of the thresholds appropriate mitigation measures should be secured to ensure, so far as possible, they are not breached. It also sets out that consent should be refused where, after taking into account mitigation, the air quality impacts of a scheme will result in a currently compliant zone or agglomeration becoming non-compliant; or affect the ability of a non-compliant

²³ <http://planningguidance.planningportal.gov.uk/blog/guidance/air-quality/>

²⁴ <https://www.gov.uk/government/publications/national-policy-statement-for-national-networks>

area to achieve compliance within the most recent timescales reported to the European Commission at the time of the decision.

116. Scotland's forthcoming Low Emission Strategy will provide further information on land use planning and the approach being taken to air quality in Scotland.
117. Planning Policy Wales²⁵ (PPW) sets out the land use planning policies of the Welsh Government with regard to air quality. It states that both the effects of development on air quality and the effects which existing land uses may have on new development proposals should be considered both when preparing development plans and when determining planning applications. It emphasises that local development plans are important vehicles for the promotion of environmental protection, having a valuable role to play in avoiding or minimising the adverse effects of any environmental risks on present or future land use.
118. When preparing strategies for future growth and allocating land for particular uses, local planning authorities should consider the effects which proposed developments may have on air quality, as well as the effects that air quality in an area would have on the acceptable future use of land. In doing so, development plan strategies and policies should be compatible with strategies and policies contained in regional transport plans, road traffic reduction reports, and air quality management plans.
119. When determining planning applications, statutory air quality objectives, together with the results of air quality reviews and assessments and any air quality management plans or area action plans should be taken into account and local planning authorities should work closely with pollution control authorities when considering applications.

4.3.3. National support for Local authorities

120. Government operates a number of schemes through which local authorities can access support to deliver improved air quality in their areas.
121. Defra's air quality grant scheme supports expenditure by eligible local authorities on measures to improve air quality. The scheme has awarded over £10.5 million in funding in the last 10 years to a variety of projects to help local authorities in making air quality improvements. In recent years we have further targeted funding at those authorities who are exceeding limits for NO₂ in their area. It is supporting a wide range of projects, including scoping studies for low emission zones and behaviour change and community engagement projects. This year we will provide £0.5 million to local authorities.
122. In Scotland, £0.5million of funding is available annually to local authorities to assist them with air quality monitoring. In addition, £1million is available annually for supporting action plan measures.

²⁵ <http://gov.wales/topics/planning/policy/ppw/?lang=en>

4.3.4. Supporting local greener transport initiatives

123. Local transport initiatives are a key element of our plans to tackle pollution, reduce NO_x emissions, and create local growth. The UK Government is supporting, through a range of initiatives, local authorities, public transport providers and others to increase the uptake of ULEVs and support local people in reducing emissions from their journeys. The Low Emission Strategy for Scotland will provide further details of actions and support to reduce NO_x emissions through greener transport initiatives in the country.
124. The UK Government, through the Local Sustainable Transport Fund, has invested £600m over 2011-2015 on a wide range of projects focused on local needs. The fund has supported 96 projects across 77 local authorities to increase the use of buses, cycling, walking and on other local transport initiatives, and includes funding for Bikeability cycle training. With match funding from local authorities over £1bn of investment has enabled more people to use sustainable transport for more of their everyday journeys, so reducing the contribution of NO₂ and other pollutants. An additional £64.5m in revenue funding for 2015-16 is supporting 44 local authorities to continue their work in this area.
125. Buses are a significant contributor to NO₂ and particulate matter as well as CO₂. Between 2009 and 2013 an £89m Green Bus fund helped bus operators and local authorities in England put over 1,200 cleaner buses on the road. Continuing this investment, a new Low Emission Bus Scheme, now extending to Wales as well as England, is providing £30m for bus operators and local authorities to bid for low emission buses and supporting infrastructure.
126. The UK Government is also supporting local authorities to reduce emissions from their older, more polluting buses by funding national retrofit schemes. In 2013, the Government committed £7.3m to help local authorities outside London upgrade older buses operating in congested areas with NO_x emission reducing technologies, through the Clean Bus Technology Fund.
127. The £8m Clean Vehicle Technology Fund provided, in 2014, grants of up to £500,000 to upgrade vehicles with technology to reduce emissions in areas of poor air quality. 23 local authorities have been awarded grants for cutting-edge, pollution reducing technologies which are now being fitted to over 1,200 vehicles. A further £5m of funding for 2015 will support the introduction of clean vehicle technologies focusing in particular on enabling local authorities to retrofit buses and reduce their emissions.
128. The use of alternative fuels also presents opportunities, for example through increased use of liquid petroleum (LPG) in taxi fleets where appropriate.
129. In Wales, the Sustainable Travel Centres Initiative was completed in 2012/13, supported by over £40 million investment from the Welsh Government. The programme comprised a range of active travel and integrated transport infrastructure improvements together with active travel promotion, including better integration at transport interchanges, between bus services and railway stations - for example linked to access to park-and-ride and park-and-share facilities, and cycling routes.

130. In terms of outcomes, in Cardiff for example there has been a positive shift towards commuting using sustainable modes. The Bike-It project in Cardiff has resulted in a 31% increase in children cycling since the project started. Bus priority measures in Cardiff city centre have reduced bus journey times and improved journey time reliability. Average car occupancy in Cardiff has increased to 1.41 compared to 1.37 in 2007 and for the average mean household, travel by car dropped from 44% in 2011 before the interventions, to 40% after the initiative was completed.

4.3.5. Incentivising cycling, walking and shifts to cleaner ways of travel

131. Encouraging more cycling and walking, and shifting to other cleaner ways of travel is another element of the UK approach to improving air quality. As well as providing health benefits, increased cycling and walking can reduce the number of car trips and ease congestion, leading to reduction in NO_x emissions.

132. The Government wish to double the number of journeys made by bicycle, which will reduce pollution and improve air quality.

133. About 10% of people cycled recreationally in 2013/14 at least once per month, and almost 7% cycled for utility purposes (commuting, shopping or visiting friends). 42% walked for at least 10 minutes at least once per week recreationally, and 50% for utility purposes at least once per week. We will continue to support healthier more active travel.

134. The Infrastructure Act 2015 (which received Royal Assent in February) included a duty on the Secretary of State for Transport to set a Cycling and Walking Investment Strategy for England which must set out objectives and the financial resources to be made available to meet these objectives. Work is currently underway to develop the first Strategy.

135. The UK Government's Cycling and Walking Investment Strategy will build on a range of investment already put in place. Between 2011 and 2015 £374m was invested by the UK Government in cycling (including £151m through the Local Sustainable Transport Fund). 95 of the 96 projects funded through the Local Sustainable Transport Fund between 2011 and 2015 contained an element of cycling or walking, with some of the funding directly supporting Bikeability cycle training²⁶. For 2015/16, all projects will seek to improve cycling and walking levels in some way.

136. The Department of Health's Walking Cities programme has provided five English cities (Cambridge, Manchester, Birmingham, Leeds/Bradford and Norwich) with £1.2m between 2013 and 2015 to increase walking through, for instance, health walks, community street audits and walking challenges.

137. The government's Cycle City Ambition programme seeks to grow the numbers of cyclists in eight English cities (Birmingham, Bristol, Cambridge, Leeds, Manchester, Newcastle, Norwich and Oxford). The first phase of this programme was awarded £77m in funding and is due to be completed in full by March 2016. The second phase has been awarded £114m and will run from 2015 through to 2017-2018.

²⁶ <https://bikeability.org.uk/>

138. In addition:

- £12m a year has been invested in Bikeability, a scheme to provide children and teenagers with the skills and confidence to cycle.
- Between 2011 and 2015 £35m was invested in improving cyclist safety at junctions in England, including £15m going to Transport for London to improve cycle safety in the capital.
- Between 2013 and 2015 £30m has been invested in improving cycle-rail links, and £15m will be invested in 2015/16 to improve cycle facilities at railway stations.

139. £100m of long-term funding through the Roads Investment Strategy has also been provided to Highways England to improve the conditions for cyclists and walkers alongside and crossing the Strategic Road Network.

140. In Wales, the Welsh Government has introduced and is implementing the Active Travel (Wales) Act 2013, requiring local authorities to continuously improve facilities and routes for pedestrians and cyclists and to prepare maps identifying current and potential future routes for their use. The Act also requires new road schemes (including road improvement schemes) to consider the needs of pedestrians and cyclists at design stage.

141. The Welsh Government is promoting the implementation of the Active Travel (Wales) Act through supporting Local Transport Plans by local authorities in Wales which include walking, cycling, public transport and highways schemes. Applications to deliver schemes are assessed and supported by Welsh Government through its local transport fund, which makes £15 million available a year.

4.3.6. Clean Air Zones

142. A number of authorities are already considering the use of access controls to tackle air pollution and several have already implemented them. Measures can vary from incentivising electric vehicles, through to introducing low emission zones or closing roads to certain vehicles. Access controls can play a role both by directly reducing the number of polluting vehicles in an area and by encouraging the uptake of alternatives.

143. However, different approaches in different cities can lead to conflicting signals to consumers. They make it difficult for businesses that operate across a number of cities to make straightforward, economic and operational decisions. We are therefore setting out a framework for the implementation by local authorities in England of new Clean Air Zones (CAZ). The CAZ framework can provide a focus for bringing together local actions on air quality underpinned with a nationally consistent approach.

144. We will develop a framework that aims to provide clarity and consistency of approach to support those authorities who after analysing their situation consider this to be an appropriate measure.

145. This framework is for those local authorities that decide emissions based access controls are the most effective solution for them to meet the limit values for NO₂. It could also be used by those authorities that have already implemented control areas. This means that if a network of emissions based access controls develops across the

country businesses and individuals will be able to make decisions against consistent criteria.

146. We will set out the full framework for Clean Air Zones in early 2016 and will work closely with local authorities to ensure that the framework gives the guidance they would find most relevant and useful.

Cleanest vehicles

147. The Clean Air Zone framework will set a standard for vehicles to achieve to ensure a consistent approach by local authorities. Those not meeting the standard will be subject to a charge or other restriction appropriate to the type of vehicle.

148. Four classes of access control are defined according to the types of vehicles which must meet the standards specified. Local authorities will decide whether all or a combination of the type of vehicles in these classes should be subject to control.

A – Buses, coaches and taxis only

B – Buses, coaches, taxis and heavy goods vehicles (HGVs)

C – Buses, coaches, taxis, HGVs and light goods vehicles (LGVs)

D – Buses, coaches, taxis, HGVs, LGVs and cars

149. Based on their understanding of local conditions, underpinned by national and local modelling and monitoring, local authorities will be able to determine if access control will address their air quality issues, what class of access control they may wish to adopt including the range of vehicles and its geographical extent.

150. Vehicle standards will be set based on emissions level for a vehicle type. This is to ensure that only the cleanest vehicles, including hybrid and vehicles using alternative fuels where appropriate, are encouraged to enter the area and where the option of retrofitting exists this can be effectively utilised.

151. The emission standards proposed are set out in the table below.

Vehicle type	NO _x Emissions limit (at first registration or post retrofit)
Bus/coaches	0.4 g/kWh
HGV	0.4 g/kWh
Van (1305-3500kg)	0.125 g/km
Car/light commercial (up to 1305kg)	0.08 g/km

152. Raising the emissions standard of existing vehicles through retrofit and/or alternative fuels is a key part of our approach to addressing air quality and bringing forward compliance. The access control approach can help to support this by providing an additional driver for conversion.

153. Similarly allowing ULEVs free access to the area can send a strong signal of support for their use and the air quality and carbon benefits they can deliver.
154. In keeping with the localism agenda, the principal responsibility for implementing geographically targeted measures will rest with relevant local authorities. The Government will consider the appropriate incentives required to help secure the delivery of the measures and the associated air quality improvements.
155. Both nationally and locally, any action to tackle air quality must use the best information and evidence to assess the impact of different approaches. To support the development of the framework we will continue to review the performance of the new Euro 6 light duty vehicles which are coming into service from this September. This will be relevant to any authority considering access controls which extend to light duty vehicles.

Wider impact

156. It is intended that the introduction of access control areas will also have an impact and guide investment outside a zone. This will include direct impacts, for example the provision of wider local passenger transport, but also more generally by acting as exemplar cities.

4.3.7. Developing a coherent local approach

157. The local measures outlined above are not mutually exclusive and a combination of measures will be needed to deliver the necessary air quality improvements. Individual road and junction improvements identified in the zone plans will help reduce congestion; local authorities can assess the impact of these and how much more action they need to take in terms of access controls and other measures to deliver the required reductions. Low emission strategies are one route to deliver this.
158. Clean Air Zones in particular can be a local focal point for action to enhance public transport and accelerate electrification of buses, taxis, vans and cars, both to increase local uptake and to support national ambition. We also want to encourage more walking and cycling and make the most of public transport.
159. Action might include: integrated public transport networks based on low emission vehicles; park and ride schemes; provision of infrastructure for electric charging or other alternative fuels; promotion of electric vehicle use, particularly in public sector fleets, public transport and last mile delivery; and preferential access for electric vehicles to a range of benefits for example, parking spaces or taxi ranks.
160. A Clean Air Zone can also enable a link to local authority and other initiatives on the promotion and facilitation of behaviour change. This could include promotional action such as school travel planning or direct action such as anti-idling enforcement.
161. Action within emissions based access control areas is not limited to transport. We will examine how emissions limits could be applied to Non-Road Mobile Machinery, particularly construction equipment and mobile generators, to ensure only the cleanest equipment can be used within areas.

162. Overall these measures delivered together and tailored to local needs will not only deliver air quality improvements but also enhance our cities as places to work, live and spend leisure time.

4.4. The National and Local Road Network

4.4.1. Road investment strategy

163. Vehicles that drive on the national road network are still a major source of air pollution at the roadside. Whilst there have been improvements in air quality in recent decades we recognise there is more to be done to continue to reduce pollution. Traffic that moves more freely improves both air quality and productivity.

164. The Road Investment Strategy (RIS) has committed £100 million of funding over the next 6 years to help support the development of innovative solutions to bring about changes in air quality. Highways England have committed to undertaking 10 studies within the first three years of the RIS, to help deliver on this commitment. The studies will look at the specific causes of pollution in a geographic area and will explore local options for reducing pollution or alternatively the effectiveness of a specific intervention and applicability to the wider network.

165. The work undertaken by Highways England as part of the RIS will help support scheme delivery, as well as the objective of achieving compliance with limit values in the shortest possible time. Highways England will aim to:

- explore and implement new and innovative approaches, where they are demonstrated to be viable and effective, on the motorway and trunk road network to improve air quality;
- work with partners, both across Government and locally, to develop and deliver policies to help improve air quality;
- build a clear picture of pollution across the national road network through improved air quality monitoring; and
- explore ways of actively managing the use of the road network to reduce air pollution

4.4.2. Specific road improvements

166. Alongside this national approach to improving the Strategic Road Network in England, existing investment and coordinated local action to reduce congestion is addressing air quality at particularly problematic road junctions. More detail is available in zone plans, where appropriate, but examples include:

- Northwest and Merseyside: As highlighted in the National Infrastructure Plan, a second Mersey crossing is being built, due to open in 2017. This is a major scheme to build a new six-lane toll bridge over the River Mersey between the towns of Runcorn and Widnes. The new bridge will relieve the congestion on the

current Silver Jubilee Bridge reducing traffic volume and thus pollution sources significantly. It will also enhance the general urban environment, while improving public transport links across the River Mersey and encouraging the increased use of cycling and walking. Over 70% of funding for the project is coming from the private sector.

- Southampton: The Road Investment Strategy announced plans to upgrade the M271/A35 Redbridge roundabout. This will improve traffic flows to Southampton docks and reduce congestion related pollution. The scheme will create a dedicated left-turn lane for traffic leaving the M271 for Southampton docks and city centre, plus an improved roundabout layout for traffic from the docks turning onto the M271.
- Nottingham: improvements to the Ring Road (A6514) to reduce congestion and delays, and thereby address pollution sources. It includes the upgrading and redesigning of key junctions, widening and reconstruction of the carriageway, and better road facilities for buses, pedestrians and cyclists. The scheme is due for completion in spring 2016.
- Birmingham: The remodelling of the Paradise Circus gyratory taking place in the city centre will help tackle pollution sources. A key change will be in vehicle access to and from Broad Street which will be restricted to buses and Hackney Carriages. This is expected to be completed by summer 2016. In addition the Metro is in the process of being extended to Centenary Square via the Paradise Circus redevelopment and is expected to be completed by 2018.

167. In Wales, the Welsh Government has set out its plans to invest in sustainable highway improvements in its National Transport Finance Plan²⁷ based on Improvements to the trunk road network designed to reduce congestion such as relief roads and bypasses. Specific schemes include:

- The M4 Corridor around Newport and complementary measures; and M4 J28 improvements, South East Wales
- Improvements to the A55/A494/A548 corridor in Deeside, North Wales
- The A483/A489 Newtown and A483 Llandeilo Bypasses in Mid Wales

4.5. Reducing emissions from buildings

4.5.1. Homes and businesses

168. Reducing CO₂ emissions to help tackle climate change can also reduce NO_x emissions. More efficient use of and lower demand for energy means less need for combustion for power generation and reduced associated NO₂ emissions. Over the last decade, the UK has introduced a range of energy efficiency measures for homes and buildings. These measures have included: progressive strengthening of the energy efficiency standards in national building regulations for new buildings and when boilers and windows are replaced in existing properties; domestic boiler

²⁷ <http://gov.wales/topics/transport/planning-strategies/ntp/?lang=en>.

scrappage schemes²⁸; the Warm Front scheme²⁹ and more recently the Energy Company Obligation.

169. The Government has statutory targets to improve the energy efficiency of fuel poor homes. They sit alongside broader climate goals, including statutory carbon budgets. Improving and decarbonising our homes, and realising the associated air quality benefits, will require consideration of both energy efficiency measures and heating systems in properties, and we are committed to considering both together, from a consumer perspective.
170. We have already made good progress by improving energy efficiency across the country with 3.8 million lofts and 2 million cavities insulated since April 2010, and around 1.5 million energy efficiency measures installed in 1.2 million properties through the Energy Company Obligation (ECO), Cashback, Green Deal Plans and the Green Deal Home Improvement Fund between January 2013 and April 2015. Our focus now is on developing a coherent and cost effective framework for home energy efficiency.
171. The Renewable Heat Incentive (RHI)³⁰ is the world's first long-term financial support programme for renewable heat. The RHI pays participants of the scheme that generate and use renewable energy to heat their buildings. From October 2012, incentivisation of renewable heat has been accompanied by NO_x and PM₁₀ emission limits for biomass-burning appliances below 20MW thermal capacity. Applicants on or after the 24 September 2013, will need to have emissions levels no higher than 30 grams per gigajoule (g/GJ) net heat input for PM₁₀ and 150g/GJ for NO_x³¹. From 5 October 2015, requirements for sustainable biomass in the RHI scheme were introduced which included a minimum 60% greenhouse gas emission saving³². The RHI has a budget agreed to 2015/16.
172. The roll-out of smart electricity and gas meters to all homes and small businesses by the end of 2020 is also expected to lead to improvements in air quality as a result of reductions in energy consumption by consumers.
173. The Welsh Government's Fuel Poverty Strategy was published in 2010. It set out the key action the Welsh Government would take to tackle fuel poverty, which is to improve the energy efficiency of the homes of low income households through demand-led and area-based schemes. The approach set out in the strategy remains valid.
174. The Welsh Government has a statutory obligation to eradicate fuel poverty, as far as is reasonably practicable, in all households in Wales by 2018.

²⁸ <http://www.energysavingtrust.org.uk/Home-improvements-and-products/Heating-and-hot-water/Boiler-Scrappage-Scheme>

²⁹ http://www.direct.gov.uk/en/Environmentandgreenerliving/Energyandwatersaving/Energygrants/DG_10018661

³⁰ http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/policy/incentive/incentive.aspx

³¹

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/128679/Gov_response_to_non_domestic_July_2012_consultation_-_26_02_2013.pdf

³² https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/403106/Non-domestic_RHI_-_Biomass_and_Biomethane_Sustainability_Feb15_Final.pdf

175. Welsh Government Warm Homes is the Welsh Government's strategic initiative to tackle fuel poverty by improving the energy efficiency of homes across Wales. The programme is targeted at those on low incomes living in deprived communities across Wales. Wales has a significant problems with fuel poverty with the most recent statistics reporting that 30% of households are living in in fuel poverty and about 30% are solid wall or hard to treat. Since 2012 Welsh Government Warm Homes has provided energy efficiency improvements to over 27,000 homes across Wales.
176. Welsh Government Warm Homes is delivered through two approaches:
- Welsh Government Warm Homes Nest which is demand led and responds to requests for support from individual households across Wales.
 - Welsh Government Warm Homes Arbed which targets deprived communities across Wales and delivers energy efficiency improvements on an area basis. This element of the initiative has been part funded by the European Union through EU structural funds.
177. Welsh Government Warm Homes is designed to work alongside wider UK Government schemes, particularly the Energy Company Obligation.
178. The Welsh Government Warm Homes Nest provides advice on saving energy, money management, fuel tariffs, benefit entitlement checks and information on other support available. In addition to advice and support, it offers a package of free home energy improvement measures to households who are in receipt of a means tested benefit and who live in a very energy inefficient home. Home energy improvement packages are designed for individual properties so there is no standard package of measures but it can include fuel switching when appropriate. Welsh Government Warm Homes Arbed takes an area based approach to providing households with energy efficiency improvements. It targets deprived communities across Wales. Each property in a scheme area is assessed individually and a whole house assessment is undertaken.
179. The Welsh Government is currently consulting on a new Energy Efficiency Strategy for Wales that will include action for households, businesses and public sector.

4.6. Reducing emissions from other sources

4.6.1. Shipping

180. Reduction in pollutant emissions from ships is driven by international legislation, notably the International Convention for the Prevention of Pollution from Ships (MARPOL). This international instrument regulates pollution from ships and the overwhelming majority of States, including the UK, are Parties.
181. MARPOL's Annex VI contains provisions which regulate emissions of NO_x from ships. The UK played a leading role in the International Maritime Organization's review of Annex VI and the revised text, adopted in 2008, sets out a staged progression of more stringent limits for sulphur oxides and NO_x both inside and outside waters designated by the IMO as an Emission Control Area (ECA).
182. The control requirements for NO_x apply to installed marine diesel engines of over 130 kilowatt (kW) output power other than those used solely for emergency purposes

irrespective of the tonnage of the ship onto which such engines are installed. Limit values are calculated in terms of grammes of NO_x per kilowatt hour (kWh), and there are three different 'Tiers' of control which apply based on the ship construction date.

183. The least demanding level, Tier I, applies to ships constructed on or after 1 January 2000. Tier II applies to ships constructed on or after 1 January 2011. The most stringent standard, Tier III, is applicable in designated NO_x ECA's³³ and applies to marine diesel engines installed on ships which were constructed on or after 1 January 2016 when operating in the ECA (otherwise they are subject to the Tier II standard) .
184. As a result of discussions in the International Maritime Organization in 2014, any States which propose further, new NO_x ECAs have the flexibility to apply the NO_x Tier III emission standard to ships constructed on or after the date of circulation of their proposal to the IMO for the adoption of the ECA.
185. The UK Government supports the IMO's three-tier regime and intends to implement these international provisions for regulating NO_x emissions from shipping through amendments to the UK's Merchant Shipping legislation. The UK Government is supportive of the case for a NO_x ECA in the North Sea in conjunction with other North Sea States and has engaged with stakeholders on the issue. The matter is currently subject to detailed discussions amongst North Sea States.
186. The reduction of NO_x emissions to Tier III standards requires mitigating technology. Selective catalytic reduction and exhaust gas recirculation are mature technologies which are being deployed by the shipping industry to enable engines to comply with the MARPOL standard.

4.6.2. Aviation

187. On 1 July the Airports Commission concluded that the proposal for a new Northwest runway at Heathrow was the strongest case for delivering new runway capacity in the South East and maintaining the UK's status as a global hub for aviation. The Airports Commission has undertaken considerable work on air quality and has made clear that any new capacity should only be released when it is clear that air quality around the airport will not delay compliance with EU limits. The impact on local air quality and how this affects the wider compliance with EU air quality standards is something the Government is considering carefully when making its decision on additional capacity.
188. Many of the larger UK airports have strategies in place to reduce their emissions of NO_x, within the airport perimeter, such as: cleaner aircraft; cleaner airfield support vehicles; cleaner airfield operations such as reduced taxiing and the provision of fixed electrical ground power; and, the use of auxiliary power units. Most of the NO_x close to airports will be road related and larger airports may have strategies to minimise the number of vehicle journeys to and from the airport.
189. NO_x emissions from aircraft engines are regulated over a simulated landing, taxi and take-off cycle. The most recent stringency tightening took effect in 2012. However, at the moment innovation by the manufacturers is developing new improved products without the need for a tighter standard. Lean burn technology has started to become

³³ There are currently two – the North American and the US Caribbean Sea ECAs

reality for some engines with certificated emissions levels reduced by more than 50%. Cruise emissions are reduced even more and the technology will spread to most sizes and makes of engines over the next decade. The UK Government will continue to monitor the progress of the technology and when appropriate will ask the International Civil Aviation Organisation to consider further tightening those standards to ensure that the latest available technology is incorporated into new products.

190. Technology transition is relatively slow in the aviation sector; new types of aircraft are typically built for 30 years or more with upgrades. Once built the aircraft will also operate for 30 years or more but as new aircraft enter service they displace less clean and less efficient ones so NO_x emissions will continue to fall around airports.
191. Airports are permitted to impose an element of emission related charges at airports which sends a strong signal to operators to use their cleanest aircraft to serve those airports.

4.6.3. Rail electrification

192. Whilst emissions from the rail sector are relatively low, the UK is committed to reducing them even further. Electric trains are zero emission at point of use which makes them ideal for use in air quality problem areas such as city centres. The Government has committed to a major rail electrification programme that will see diesel trains progressively replaced with electric equivalents.
193. The UK Government's investment in the Intercity Express programme will see the introduction of state-of-the-art electric and bi-mode trains. The bi-mode version will be able to draw electricity from overhead lines where it is available and switch to low emission diesel engine power where it is not.
194. Through the UK Government sponsored Future Railway programme, we are supporting a range of innovation projects to reduce rail's carbon footprint that will also provide benefits for air quality. Earlier this year one of the projects – a battery powered train – was successfully demonstrated in passenger service. The technology offers the prospect of extending the range of electric trains so that they can run on non-electrified lines and potentially replace conventional diesel trains. A number of train operators and manufacturers have expressed interest in commercialising the technology.

4.6.4. Freight

195. The UK Government provides freight grants to industry to encourage modal shift from road to rail or water, where the cost of using rail or water are higher than road; and where there are environmental benefits to be gained. These help to remove over 800,000 lorry journeys from Britain's roads annually, providing both carbon and air quality benefits.
196. Further significant air quality benefits are anticipated as the UK HGV fleet transitions to an increasing proportion of Euro VI engines. Where fleet turnover to higher Euro Standard HGV vehicles is expected to be low retrofitting is also an option. Alongside this the UK continues to explore innovative approaches to reducing CO₂ emissions that are expected to deliver benefits for air quality more generally.

197. Through the Low Carbon Truck Trial the Government is providing over £11m, with match funding from industry, to help operators establish and run fleets of low carbon HGVs. An additional £4m natural gas refuelling infrastructure fund is also being made available via the OLEV. The trial was launched in 2012 and is part-funding around 350 potentially low-carbon vehicles, with most using natural gas or dual fuel system (diesel and gas) and a minority trialling used cooking oil. The trial has also initiated publically-accessible gas refuelling infrastructure. The trial is generating a body of data to inform Government policy through better information on carbon emissions, air quality impacts, costs and operational performance.
198. A further DfT-funded study has developed a test protocol for measuring overall greenhouse gas and pollutant emissions from dual-fuelled (gas/diesel) and dedicated gas HGVs. Further work is planned during 2015/16 to use the protocol to test a range of technologies and further develop our evidence base.
199. A 10 year trial of longer semi-trailers (LSTs) was launched in January 2012 by the Department for Transport. This trial is ascertaining the environmental and economic benefits of two length variants of LST – one at 14.6m and the other at 15.65m. Both have a maximum permitted weight of 44 tonnes, as with the current largest standard sized lorries on UK roads. Some 3000 tonnes of carbon emissions are expected to be saved over the course of the trial from fewer lorries being needed to transport the same volume of goods. The latest annual report of the trial, published in July 2015, provides encouraging findings. In particular:
- The new estimated savings from using LSTs in the trial, to the end of 2013, is now between 1.4 and 1.7 million vehicle kilometres;
 - The total estimated savings from using LSTs in the trial to the end of 2014, is 4.2 to 5.2 million vehicle kilometres.
200. This suggests a beneficial outcome in terms of reduced emissions of carbon and air quality pollutants which, while not quantified in this report, is planned to be evaluated at the later stages of the trial.
201. Alongside these trials, we also continue to ensure the regulatory framework supports the adoption of new technologies. The amending Directive to 96/53/EC, which governs the maximum authorised weights and dimensions of vehicles on EU roads, was published in May 2015. The provisions of the new Directive include up to one tonne extra in weight for vehicles with alternative fuel powertrains, where these are heavier than conventional fuel systems. These include powertrains on vehicles with electric / hybrid and gas technologies.
202. Given that the Directive sets maximum authorised weights in relation to international journeys only, the Government also wishes to extend this benefit to purely national journeys within the UK and plan to consult as such later this year. While there is no guarantee that this extra weight provision would be taken up by a significant number of operators and it is therefore difficult to quantify what this might mean in terms of improved air quality, it provides an opportunity for improvement.
203. Freight consolidation provides an opportunity to reduce HGV movements within our cities. This is being taken forward in several areas. For example, Manchester is using European funding to support a freight consolidation scheme in the Oxford road area. Where freight consolidation can be linked to last mile ULEV or other low emission delivery this can be particularly beneficial in areas of poor air quality

4.6.5. Industry

204. While 80% of roadside NO₂ concentrations, where the UK is exceeding limits, are due to road transport, addressing background concentrations and therefore other key pollution sources is also important. For example, emissions from industry (including energy, manufacturing, construction industry and processes) are the largest overall source of NO_x in the UK accounting for 49% of UK NO_x emissions in 2013.
205. It is however, important to recognise the significant strides that have been made in reducing industrial emissions in the UK. There has been a continuous downward trend since the 1990s in emissions of NO_x from industry, with a 59% fall since 1990. This is largely due to the regulatory frameworks put in place by Government, and significant investment by industry in cleaner processes. The UK is continuing to implement and enforce regulatory controls over industrial processes in the UK to ensure that their contribution to emissions continues to decline in a sustainable and cost-beneficial manner without imposing an unreasonable burden on industry.
206. In the UK, approximately 3500 industrial sites are subject to the requirements of the Industrial Emissions Directive (IED). The IED aims to minimise pollution from industrial activities throughout the European Union, and continues the work of the seven previous European Commission Directives covering industrial emissions, including the Large Combustion Plants Directive and Integrated Pollution Prevention and Control Directive.
207. The IED covers many industrial sectors, ranging from farming of pigs and poultry to power stations and from food to speciality organic chemicals manufacture. It requires that the industrial installations covered by it comply with stringent standards on emissions, waste minimisation and energy efficiency commonly referred to as best available techniques. All installations need an environmental permit from the regulator³⁴ which also carries out inspections and monitoring of emissions to ensure compliance. This permit sets out site specific requirements, for example by setting emission limits for different pollutants. If an installation does not comply with the permit conditions, the regulator will take enforcement action.
208. The best available techniques are reviewed regularly which ensures that there is continued improvement in the environmental performance of UK industries. The implementation of the IED will ensure that emissions from industrial sources continue to decrease.
209. Smaller installations in England, Northern Ireland and Wales are regulated by local authorities, and in Scotland by SEPA, to monitor and control any pollution to air they may cause. There are about 18,000 industrial plant regulated by Local Authorities in England. This includes a wide range of businesses from dry cleaners to petrol stations. Businesses which operate these premises must have a permit which must include conditions to ensure the best available technique is used to minimise emissions.

³⁴ The Environment Agency in England; Natural Resources Wales in Wales; Scottish Environment Protection Agency in Scotland; The Industrial Pollution and Radiochemical Inspectorate of the Northern Ireland Environment Agency (NIEA) in Northern Ireland

210. The Medium Combustion Plant Directive (MCPD) will introduce a system of registration / permitting, regular monitoring and emission limits values (ELVs) for plants of 1-50MW. These plants are typically found on a range of industrial sites and also provide heat and emergency power to large buildings such as hospitals and Universities. There are approximately 11,000 such plant in the UK, 90% of which are within the 1-5 MW range and currently unregulated.
211. The MCPD package will improve air quality by reducing emissions of NO_x as well as other pollutants. It will also help to deliver compliance with revised National Emission Ceilings. The Directive is likely to come into force in November 2015 and must be transposed within 2 years. New plant will be required to meet the ELVs with effect from 12 months after the transposition deadline. For existing plant ELVs will apply in 2025 (for those greater than 5MW) and 2030 (for those 5MW and below).

4.6.6. Non Road Mobile Machinery

212. Engines in mobile equipment not directly related to the transportation of passengers or goods, such as excavators, bulldozers and cranes used in construction, are covered by regulations for Non Road Mobile Machinery (NRMM). Engines for sale must be approved to demonstrate compliance with pollutant emission standards, including NO_x.
213. It has been estimated by the GLA that about 12% of NO_x emissions in London are from NRMM on construction sites. At national level around 10% of emissions are from NRMM. While NO_x emissions from NRMM have reduced by nearly 50% since 2002 it is important to further reduce such emissions.
214. The European Commission has proposed measures which will further cut emissions of major air pollutants and improve the legal framework for NRMM. This revision includes extending the scope to cover all sizes of petrol and diesel engines. The new EU regulations are expected to come into force in January 2017, with new emissions standards being mandatory for engines being sold, for the first tranche of engine categories, from January 2019.
215. The UK will continue to support and press for revised regulations to be in place to this timetable to ensure NRMM equipment conforms to up-to-date and tighter emission standards. The revised standards are expected, on average, to lead to approximately a 4.0kt reduction in NO_x (and 1.6kt of PM) per year in the UK between when the regulation comes into effect in 2019 and 2040.
216. NRMM emissions particularly from the construction industry make a significant contribution to the NO₂ levels in London. Consequently, the Greater London Authority has introduced new requirements for NRMM being used on construction sites from 1 September 2015.

4.6.7. Emissions from other stationary sources

217. The Clean Air Act (1993) enables local authorities to designate Smoke Control Areas within their area. The Act prohibits emissions of smoke within these smoke control areas unless using an exempted appliance or authorised fuel. Only those stoves and boilers that have been exempted – that is they have been tested and shown to be

capable of burning solid fuel (including wood) in a way that produces none or very little smoke – are permitted for use in Smoke Control Areas. Non-domestic furnaces (e.g. boilers) must be notified to the local authority and under certain circumstances³⁵ their chimney height must be approved by the local authority before operation.

218. The UK Government and Devolved Administrations are reviewing the Clean Air Act to ensure that it continues to be effective in tackling air quality challenges and in particular will take account of source control measures under the Ecodesign Regulations and Medium Combustion Plant Directive. In England Ministers have also consolidated a number of regulations under the Act to reduce the regulatory burdens placed on businesses and local authorities.
219. European Eco-design Regulations will introduce efficiency and emission criteria for solid fuel boilers³⁶ and solid fuel local space heaters³⁷ (e.g. domestic wood burning stoves) with effect from 2020 and 2022 respectively. They will set emission criteria for a number of key pollutants, including NO_x, for solid fuel appliances up to 500KW rated thermal output. They should contribute to the further reduction of NO_x emissions across the UK by ensuring new products across the UK and Europe conform to emission limits, and will apply not just in Smoke Control Areas. Review clauses will ensure that consideration is given two years after coming into force of whether stricter emission limits may be possible. The UK will take a view on stricter emissions limits at that time.

4.6.8. Government sustainability

220. Programmes to improve energy efficiency and reduce carbon emissions in schools are also delivering air quality benefits alongside other environment savings. Since 2013, nearly £32m has been invested by the Department for Education and the Education Funding Agency in maintained and academy schools through Salix loans. This has enabled over 800 energy efficiency projects in 670 schools to take place, totalling £63m and 283,000tCO₂ expected financial and carbon savings over the lifetime of these projects.
221. Wider approaches on sustainable development across Government also support our ambition to improve air quality. The National Health Service's Sustainable, Resilient, Healthy People and Place Strategy sets out the ambitions of this sector to reduce emissions in line with the sector's Carbon Reduction Strategy based on the legal limits set by the Climate Change Act 2008. The strategy sets out an ambition for the NHS to reduce environmental impacts, including pollution by, for example, encouraging walking and cycling which have direct health benefits and reduce emissions.

³⁵ If burning either pulverised fuel, or any other solid matter at a rate of 45.4kg or more an hour, or any liquid or gaseous matter at a rate of 366.4 kilowatts or more

³⁶ [Ecodesign requirements for solid fuel boilers directive](#)

³⁷ [Ecodesign requirements for solid fuel local space heaters directive](#)

5. IMPACT OF MEASURES

222. As this plan sets out, action across a range of areas will help solve the problem of NO₂ exceedances within the UK. As we move forwards our projections show the issues become much more localised in nature. For each zone we have considered the trajectory between the most recently reported compliance data (2013) and the projection for 2020. Local authorities have provided information on action currently underway and planned including action on transport that could have significant air quality impacts.
223. As the modelling provides five year snapshots of the compliance situation we have not been able to identify more precise zone by zone compliance dates within these five year periods. It has also not been possible to quantify the impacts of all of the local and national level measures on emissions and ambient concentrations within the national Pollution Climate Mapping (PCM) model. In assessing the impact of certain measures we have therefore had to adopt a simplified approach based on a streamlined PCM model and implementation of example measures.
224. We have met with those local authorities who have roads projected to be only marginally compliant in 2020 to ensure that there is continuing action, in light of the uncertainties around the real world emissions performance of vehicles and the model projections. The individual zone plans describe local authority action which, combined with the measures outlined in this national plan, will help to bring forward compliance, and ensure it is by 2020, in these zones.
225. For those eight zones that are projected to still have exceedances in 2020 the action local authorities are already taking is not yet enough to reach compliance with the 40µg/m³ limit level earlier. We have used the streamlined version of the PCM model to assess the gap in 2020 between the projected concentrations and the EU limit value of 40µg/m³. This has enabled us to understand the level of local fleet change and/or journey frequency that we would need to instigate through additional measures in order to deliver compliance. The most straightforward approach to modelling this was to assume access restrictions on those roads as part of Clean Air Zones.
226. This modelling indicates that it is possible to deliver the level of change required to give compliance in the zones outside London by 2020. As with those zones already projected to be compliant by 2020 it is not possible to estimate a more specific compliance date within the 5 years before 2020 and there will be some variation between zones with some compliant earlier than modelled.
227. In reality local authorities can conduct a more detailed assessment of their needs and select the combination of measures to deliver the local fleet and journey change necessary to give compliance, which may or may not include access restrictions. Actions such as individual road improvements, other infrastructure changes and improvements to vehicle emissions performance, e.g. retrofitting, could in combination also bring forward compliance.
228. There are practical limits on how quickly all measures could be introduced, e.g. due to capacity and technical constraints on programmes, and we do not consider there is a combination of measures able to deliver compliance earlier than modelled in each and every zone outside London.

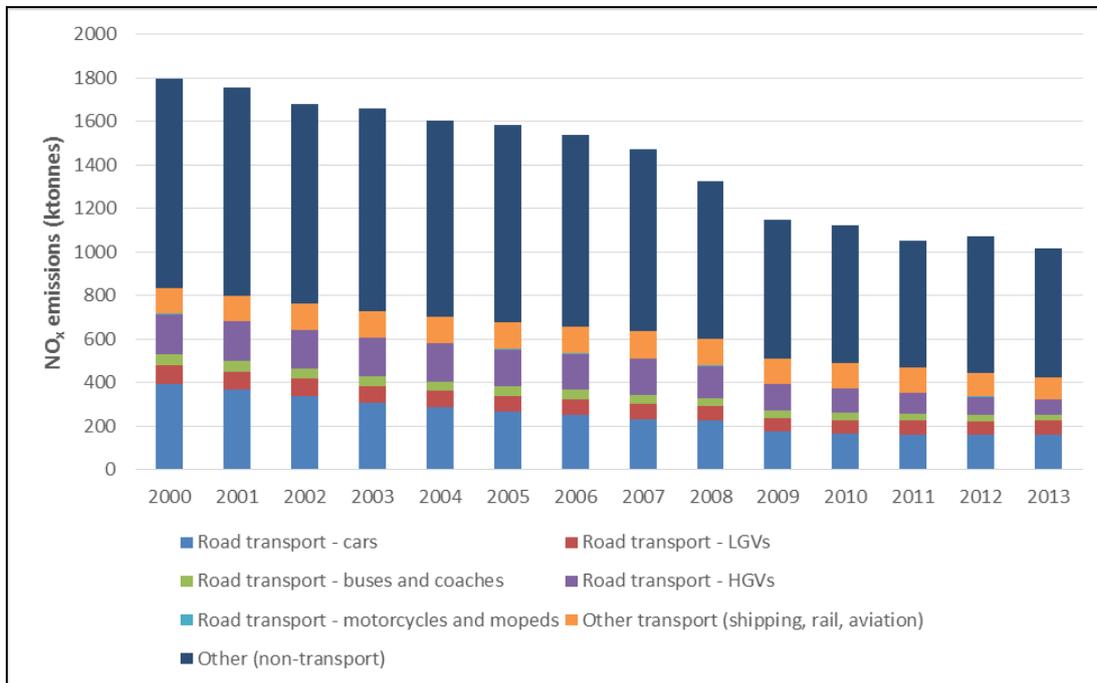
229. We therefore consider that the measures in the plans will improve the air quality in all zones outside London currently in breach sufficiently to achieve compliance with the Directive by 2020. However, compliance is expected to be reached in many individual zones before 2020.
230. London has a particular set of issues due to the scale of its population and the level of challenge presented by current levels of NO₂ concentrations. Many measures have already been put in place and we consider that the measures in these plans will improve air quality sufficiently to achieve compliance with the Directive in London before 2025.

6. ANNEX

6.1. Evaluation of progress towards meeting the NO₂ limit values

6.1.1. Nature and assessment of pollution

Figure 4: Annual UK emissions of NO_x since 2000



231. Figure 4, shows that between 2000 and 2013 total UK emissions of NO_x have decreased by 43%. While there has been a reduction across all sources of emissions, non-transport sources remain the largest contributor to total emissions. The relative proportion of emission sources' contribution to total emissions of NO_x has remained broadly similar over the time period, but with a slight increase in non-transport emissions as a proportion of the total in 2013 (53%) when compared to 2000 (58%).

Table 4: Trend data: number of zones and km of road exceeding limit values

YEAR	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Number of zones exceeding NO ₂ annual mean LV	38	36	42	39	38	39	41	40	40	40	40	38	38
Number of zones exceeding NO ₂ hourly mean LV	4	1	3	1	2	1	2	3	2	3	3	2	1
Km in exceedance of NO ₂ annual mean LV	5521	3346	7375	4902	5018	4720	4781	3594	3247	4192	2942	2721	2511
% of UK modelled road length exceeding	35%	21%	53%	35%	36%	34%	34%	26%	25%	32%	23%	21%	19%

232. Table 4 illustrates that, while the percentage and total km of UK modelled road length exceeding the annual mean limit value has declined in recent years, the number of zones in exceedance has remained fairly constant since 2001. This is in line with the situation described in section 2 that the issue of transport emissions in urban areas remains a challenge. In contrast the UK is meeting the NO₂ hourly mean limit value across the UK in all zones apart from Greater London.

Figure 5: Average annual mean NO₂ concentrations: background urban and traffic urban AURN sites



233. Figure 5 shows ambient concentrations of NO₂ (as measured by the AURN) have decreased since 1990. NO₂ concentrations are shown for the following groups of sites³⁸:

- All AURN urban non-traffic sites.
- A sub-set of eight long-running urban background sites operating since 1993 or earlier to show changes over time unaffected by variations in monitoring sites.
- All traffic-related urban monitoring sites since 1997
- A sub-set of eight long-running traffic urban sites in operation since 1998 to show changes over time without any effects due to variations in monitoring sites.

234. This illustrates that the annual mean NO₂ concentration averaged for:

- all urban non-traffic sites in the AURN shows a steady decrease until around 2007 before levelling off slightly.
- the eight long-running urban background sites shows a general decrease until around 2002 and is subsequently stable until around 2011.
- all urban traffic AURN sites is higher than the average for background sites, but shows a clear decrease over time, particularly since 2006.

³⁸ A full description of these sites is available in [Air Pollution in the UK 2013](#)

- the eight long-running urban traffic sites shows no clear increase or decrease, and considerable year-on-year fluctuation. There is some indication of a year-on-year decrease from 2010 onwards.

6.1.2. General background information on the UK

6.1.3. Climatic data and topography

235. The United Kingdom has a temperate, maritime climate with typical annual average wind speeds around five metres per second. The UK is well known for the variability of its weather - from day to day, season to season, year to year and place to place. Its position in the mid-latitude westerly wind belt on the edge of the Atlantic Ocean with its relatively warm waters, yet close to the continental influences of mainland Europe, plays a major role in this. The topography of much of the UK is relatively flat with the dispersion conditions in the majority of large urban areas not significantly influenced by large scale topography such as mountain valleys. Changes in topography and land use over relatively short distances, together with a long coastline and numerous islands, all add to the variety of weather.

236. Within the UK, England has mostly lowland terrain; the highest point is 978 metres above sea level. In Scotland, the main population centres are in the lowlands, which lie to the south and east and, in particular, the central belt between Glasgow and Edinburgh. The highest point is 1344 metres above sea level in the sparsely populated Highland region to the north and west of the country. Likewise in Wales, the main population centres including Cardiff and Swansea are in the south, away from the more mountainous regions of north and mid-Wales. The highest point is 1085 metres above sea level. Northern Ireland is best described as hilly, rather than mountainous. The highest point is 852 metres above sea level.

237. In general, places in the east and south of the UK tend to be drier, warmer, sunnier and less windy than those further west and north. Also, these favourable weather conditions usually occur more often in the spring and summer than in autumn and winter. But that is by no means the whole story, and climate descriptions illustrating the all-important regional and seasonal variations can be found at:
<http://www.metoffice.gov.uk/climate/uk/regional-climates>.

Map 1- UK Zones and Agglomerations for Ambient Air Quality Reporting

