Department for Environment Food & Rural Affairs

Department for Transport

Improving air quality in the UK: tackling nitrogen dioxide in our towns and cities

Draft UK Air Quality Plan for tackling nitrogen dioxide

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1. Introduction

1. The UK Government is committed to build a stronger economy and a fairer society. A cleaner, healthier environment benefits people and the economy. Clean air is essential for making sure the United Kingdom (UK) is a healthy and prosperous country for people to live and work.

2. Over recent decades, UK air quality has improved significantly thanks to concerted action at all levels but there is more to do. Poor air quality is the largest environmental risk to public health in the UK and investing in cleaner air and doing even more to tackle air pollution are priorities for the UK Government. That is why the UK has adopted tougher, legally binding ceilings for emissions of air pollutants for 2020 and 2030.

3. The most immediate air quality challenge is tackling the problem of nitrogen dioxide (NO_2) concentrations around roads - the only statutory air quality obligation that the UK is currently failing to meet. This document, accompanied by a Technical Report, provides an overview of the UK plan for doing so. Combined with the wider actions to reduce other harmful air pollution emissions, it will help our cities to become cleaner and help to grow the economy.

4. Alongside this plan, the UK Government is determined to be at the forefront of vehicle innovation by making motoring cleaner. The link between improving air quality and reducing carbon emissions is particularly important and the UK Government will continue to develop solutions which reduce NO_2 and carbon. Central to its objective of reducing NO_2 and carbon emissions is the UK Government's aim for almost every car and van to be a zero emission vehicle by 2050. The UK Government has committed more than £2 billion since 2011 to increase the uptake of ultra low emission vehicles (ULEVs) and support greener transport schemes. UK emissions of nitrogen oxides (NO_x) fell by over 19% between 2010 and 2015 and the UK is among the frontrunners in Europe in terms of electric vehicle manufacture and uptake. In the 2016 Autumn Statement, the UK Government committed an additional £290 million to 2020-2021 for reducing transport emissions via a new National Productivity Investment Fund (Annex A). The UK Government has also allocated over £11 million to local authorities via its air quality grant scheme since 2011 (Annex B).

5. In the 2016 Autumn Statement, the UK Government also committed an additional £4.7 billion to 2020-2021 for research and development. This includes a new Industrial Strategy Challenge Fund to support the development of innovative technologies such as electric vehicle batteries, that have the potential to make the UK a world leader and transform the UK economy (Annexes A and K). This was followed up with the industrial

strategy Green Paper,[1] setting out ten key pillars including delivering affordable energy and clean growth, alongside investing in science, research and innovation, upgrading infrastructure, cultivating world-leading sectors, and driving growth across the country.

[1] BEIS (2017) Developing a modern industrial strategy
www.gov.uk/government/news/developing-a-modern-industrial-strategy

2. The problem

6. Air pollution impacts on public health, the natural environment, and the economy.

2.1. Impact on public health

7. Poor air quality is the largest environmental risk to public health in the UK. It is known to have more severe effects on vulnerable groups, for example the elderly, children and people already suffering from pre-existing health conditions such as respiratory and cardiovascular conditions.[2] Studies have suggested that the most deprived areas of Britain bear a disproportionate share of poor air quality.[3]

2.2. Impact on the environment

8. Air pollution also results in damage to the natural environment. NO_2 contributes to acidification and eutrophication of soil and watercourses, which impacts on animal and plant life and biodiversity. It also contributes to local ozone production which damages agricultural crops, forests and plants.[4]

2.3. Impact on the economy

9. Air pollution has social costs[5] and threatens economic growth. It also impacts upon people of working age which can have economic effects, for instance if they have to take days off work. It is estimated that in 2012, poor air quality had a total cost of up to £2.7 billion through its impact on productivity. [6]

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[2] World Health Organization, 'Review of evidence on health aspects of air pollution – REVIHAAP Project', 2013
www.euro.who.int/__data/assets/pdf_file/0004/193108/REVIHAAP-Final

[3] Mitchell, G., and others (2015) Who benefits from environmental policy? An environmental justice analysis of air quality change in Britain, 2001–2011. Environmental Research Letters. DOI: http://dx.doi.org/10.1088/1748-9326/10/10/105009

[4] National Statistics (2016) Emissions of air pollutants in the UK, 1970 to 2015
www.gov.uk/government/statistics/emissions-of-air-pollutants

[5] Defra (2015) 'Valuing impacts on air quality: Updates in valuing changes in emissions of Oxides of Nitrogen (NOX) and concentrations of Nitrogen Dioxide (NO2)'
www.gov.uk/guidance/air-quality-economic-analysis

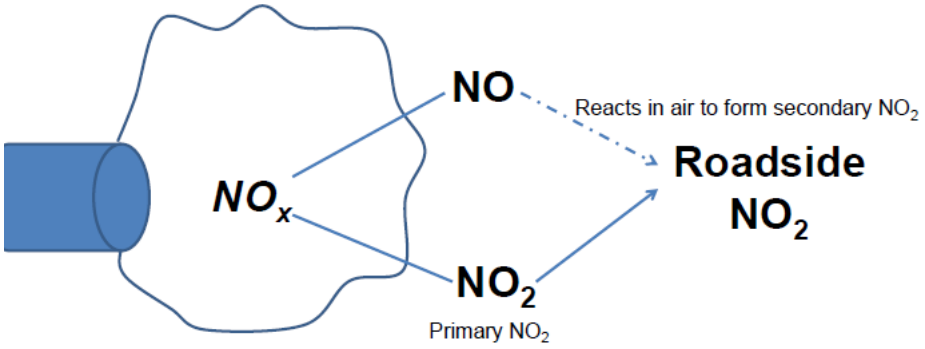
[6] Defra (2015) Report: Valuing the impacts of air quality on productivity
https://uk-air.defra.gov.uk/library/reports?report_id=832

3. Sources of nitrogen dioxide air pollution

10. Combustion of fossil fuels, for example in power generation, industrial processes, domestic heating, and vehicles, gives rise to air pollutants including NO_x. NO_x include both primary NO_2 and nitric oxide (NO) with the latter reacting in the atmosphere to produce secondary NO_2 (Figure 1). Other reactions can lead to the generation of additional pollutants, for example harmful ozone produced by the action of sunlight on NO_x and secondary PM produced by reactions involving NO_x.

11. Measures to tackle NO_x can have beneficial effects in terms of reducing other air pollutants, such as particulate matter.

Figure 1: The relationship between NO_x and NO_2



12. The UK is divided into forty-three zones for air quality monitoring and reporting purposes (Annex C). Annex D provides information on climate, topography and population density.

13. Although UK emissions of NO_x fell by almost 70% between 1970 and 2015[7] and by over 19% between 2010 and 2015 (see Section 10) and all but two UK zones met the statutory hourly mean limit value for NO_2 in 2015, thirty-seven zones exceeded the statutory annual mean limit value for NO_2 that year (Tables 1 and 2[8]). The limit values are based on the World Health Organization (WHO)'s air quality guidelines. It is important to note that exceedance could be limited to no more than one monitoring location or road link within the entire zone. For example, in 2015 the lowest length of

[7] National Statistics (2016) Emissions of air pollutants in the UK, 1970 to 2015
www.gov.uk/government/statistics/emissions-of-air-pollutants

[8] Defra (2016) Air pollution in the UK 2015 – Compliance assessment summary
https://uk-air.defra.gov.uk/library/annualreport/index

road in exceedance for any non-compliant zone was Swansea Urban Area with less than two miles of road.

Table 1: Statutory[9] limit values for NO_2

Averaging period	NO_2 limit value[10]
One hour	200 µg/m^3 not to be exceeded more than 18 times a calendar year
Calendar year	40 µg/m^3

Table 2: UK zones meeting statutory NO_2 limit values in 2015

UK zones meeting statutory NO_2 limit values in 2015	
Meeting hourly mean limit value for NO_2	All forty-three UK zones except: Greater London Urban Area South Wales
Meeting annual mean limit value for NO_2	Brighton/Worthing/Littlehampton Blackpool Urban Area Preston Urban Area Highland Scottish Borders Northern Ireland

14. Although non-transport sources of NO_x are considerable contributors (Figure 2) road transport is responsible for some 80% of NO_x concentrations at roadside, with diesel vehicles the largest source in these local areas of greatest concern (Figures 3a; 3b and 3c).[11] This is due to both the significant growth in vehicle numbers, particularly diesel vehicles, and improvements in real world testing showing that laboratory test-based

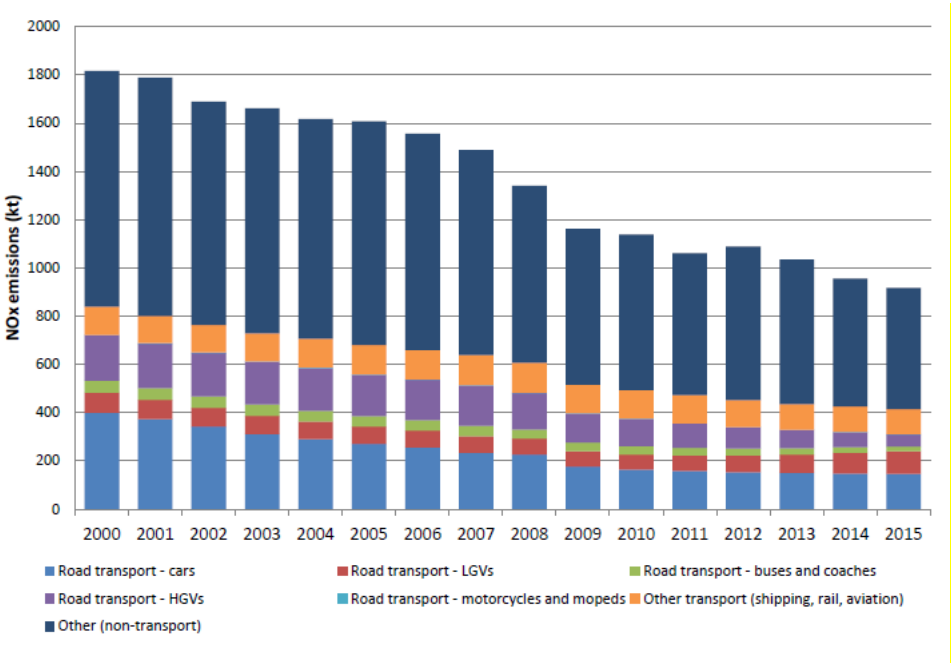
[9] The Air Quality Standards Regulations 2010; The Air Quality Standards (Scotland) Regulations 2010; The Air Quality Standards Regulations (Northern Ireland) 2010; The Air Quality Standards (Wales) Regulations 2010

[10] Micrograms per cubic metre

[11] Source apportionment for NO_X is used as a proxy for the source apportionment of NO_2. This is because it is not possible to calculate a precise source apportionment for annual average NO_2 concentrations because ambient NO_2 concentrations include contributions from both directly emitted primary NO_2 and secondary NO_2 formed in the atmosphere by the oxidation of NO.

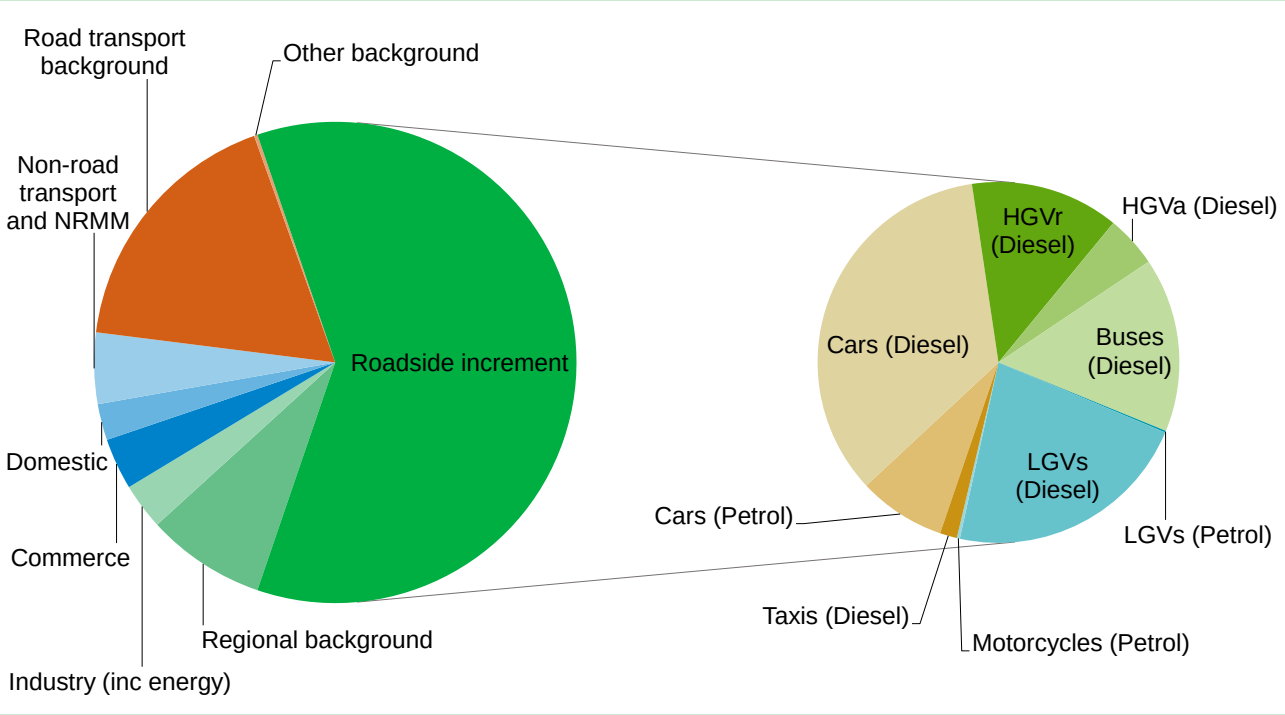
emission standards have not delivered expected reductions under real world driving conditions (see also Section 6).[12]

Figure 2: Annual UK emissions of NO_x since 2000



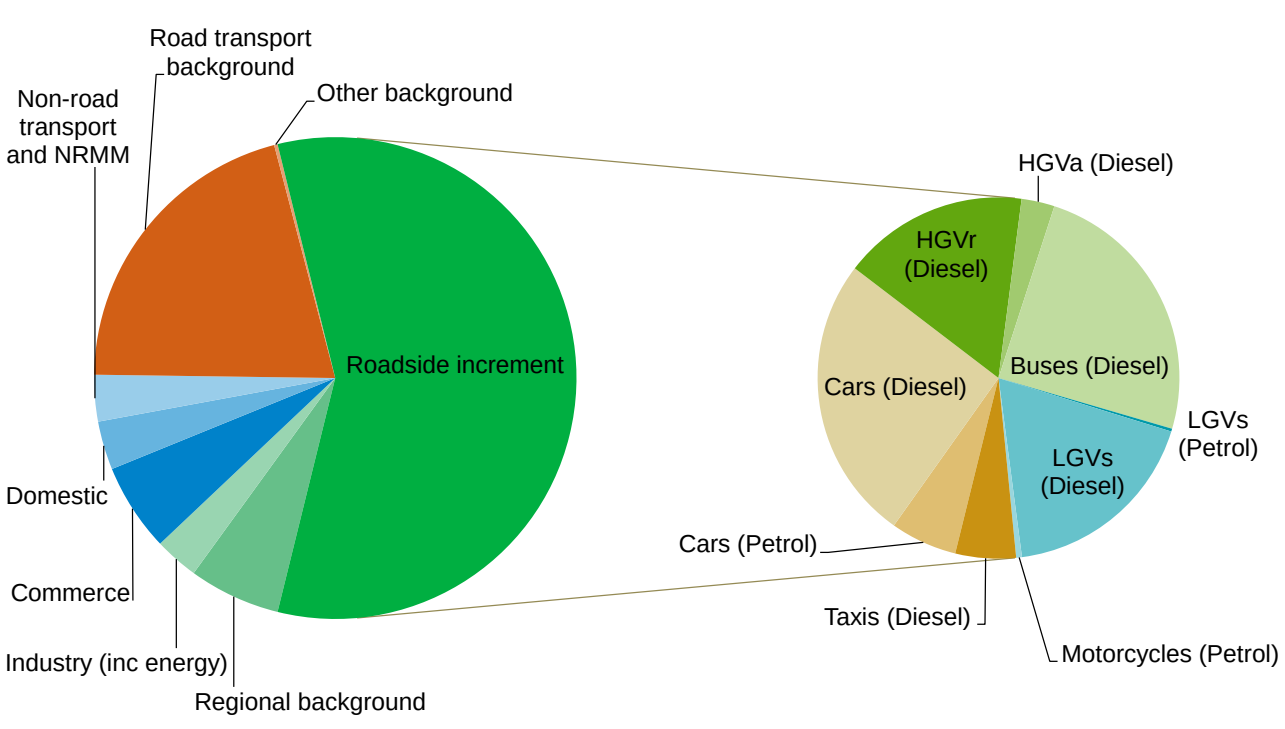
[12] DfT (2016) Vehicle Emissions Testing Programme report www.gov.uk/government/publications/vehicle-emissions-testing-programme-conclusions

Figure 3a: Breakdown of UK national average NO_x roadside concentration into sources, 2015



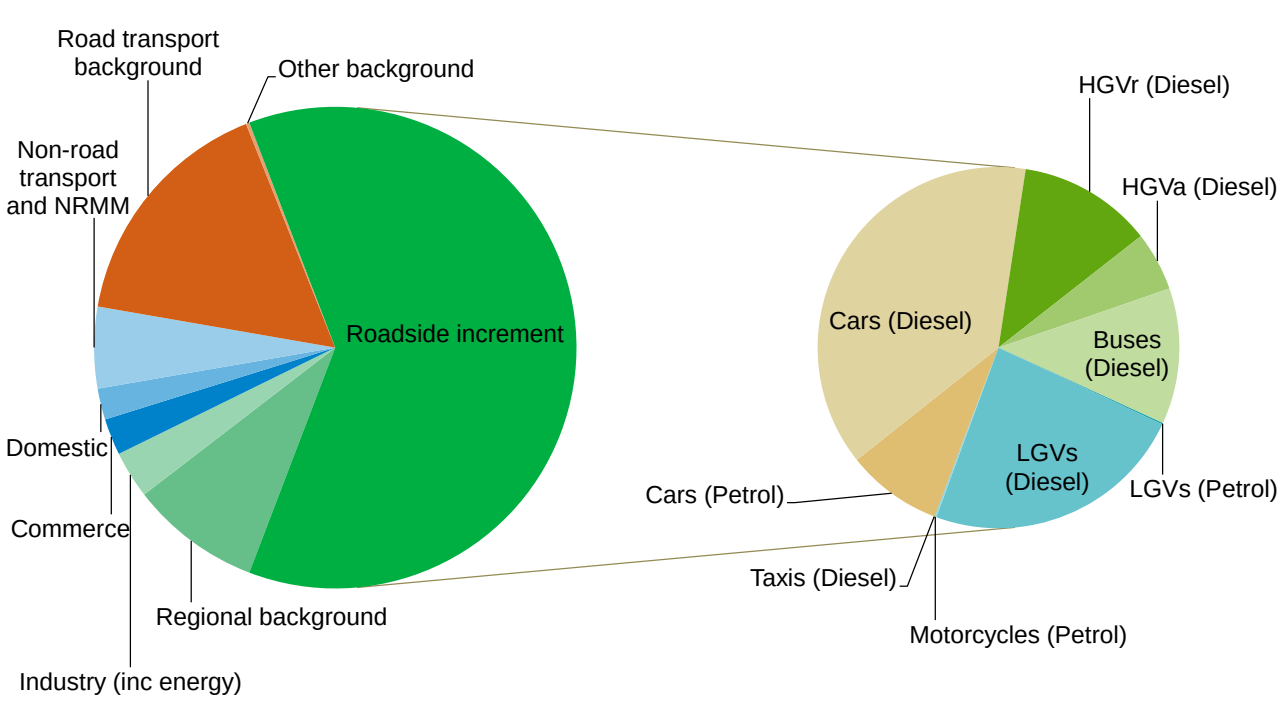
Note: The 'Roadside increment' in the large pie chart is the estimate of the proportion of NO_x roadside concentrations contributed by local traffic, which is shown in greater detail in the smaller pie chart. NRMM = Non-Road Mobile Machinery; LGV = Light Goods Vehicles; HGVr = Rigid Heavy Goods Vehicles; HGVa = Articulated Heavy Goods Vehicles.

Figure 3b: Breakdown of London average NO_x roadside concentration into sources, 2015



Note: The 'Roadside increment' in the large pie chart is the estimate of the proportion of NO_x roadside concentrations contributed by local traffic, which is shown in greater detail in the smaller pie chart. NRMM = Non-Road Mobile Machinery; LGV = Light Goods Vehicles; HGVr = Rigid Heavy Goods Vehicles; HGVa = Articulated Heavy Goods Vehicles.

Figure 3c: Breakdown of UK (excluding London) average NO_x roadside concentration into sources, 2015



Note: The 'Roadside increment' in the large pie chart is the estimate of the proportion of NO_x roadside concentrations contributed by local traffic, which is shown in greater detail in the smaller pie chart. NRMM = Non-Road Mobile Machinery; LGV = Light Goods Vehicles; HGVr = Rigid Heavy Goods Vehicles; HGVa = Articulated Heavy Goods Vehicles.

15. Total emissions of NO_x from vehicles depend on a combination of both average emission per vehicle and the number of vehicles (Figure 4) with higher average emission per vehicle from older vehicles with lower Euro emission standards (Figure 5)[13].

16. Between 2000 and 2015 in Great Britain: (i) the number of licensed cars increased from 24.4 million to 30.3 million; the percentage of diesel cars increased from 12.9% (3.2 million) to 37.8% (11.4 million). (ii) The number of licensed light goods vehicles (LGVs) increased from 2.4 million to 3.6 million; the percentage of diesel LGVs increased from 76.9% (1.8 million) to 95.9% (3.5 million).[14]

[13] European Commission (2016) Air pollutants from road transport
http://ec.europa.eu/environment/air/transport/road.htm

[14] Source: National Statistics (2016) Vehicle licensing statistics
www.gov.uk/government/collections/vehicles-statistics

Figure 4 - Average emissions of NO_x by vehicle type (grams/kilometre) and number of licensed vehicles in 2015

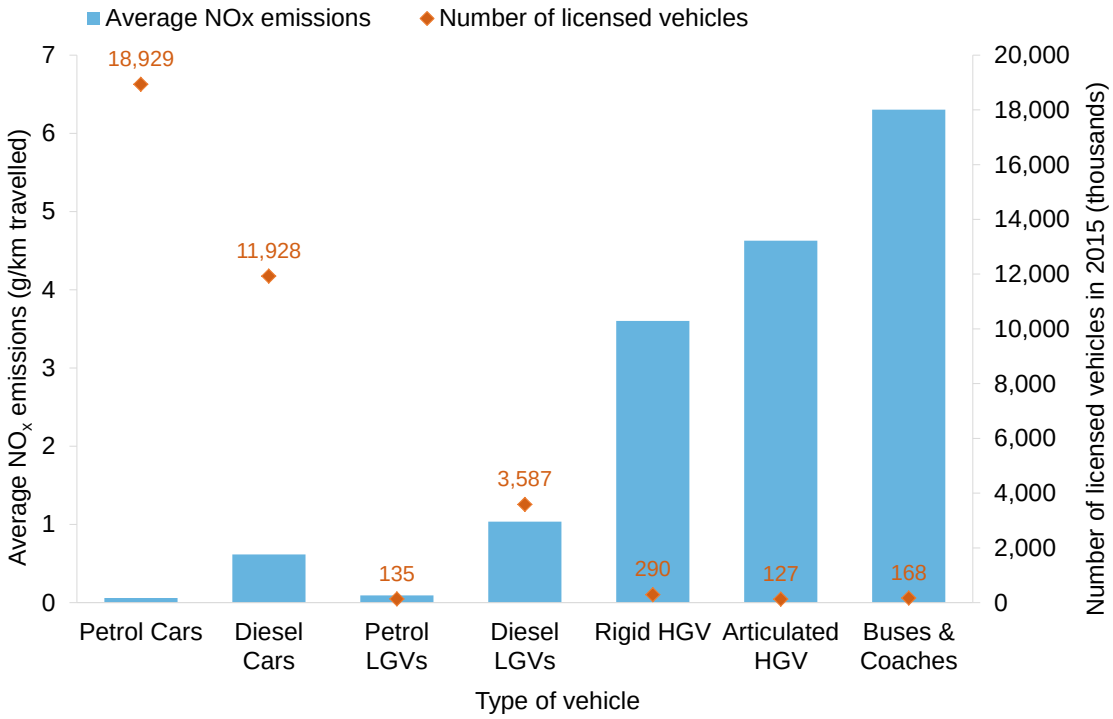
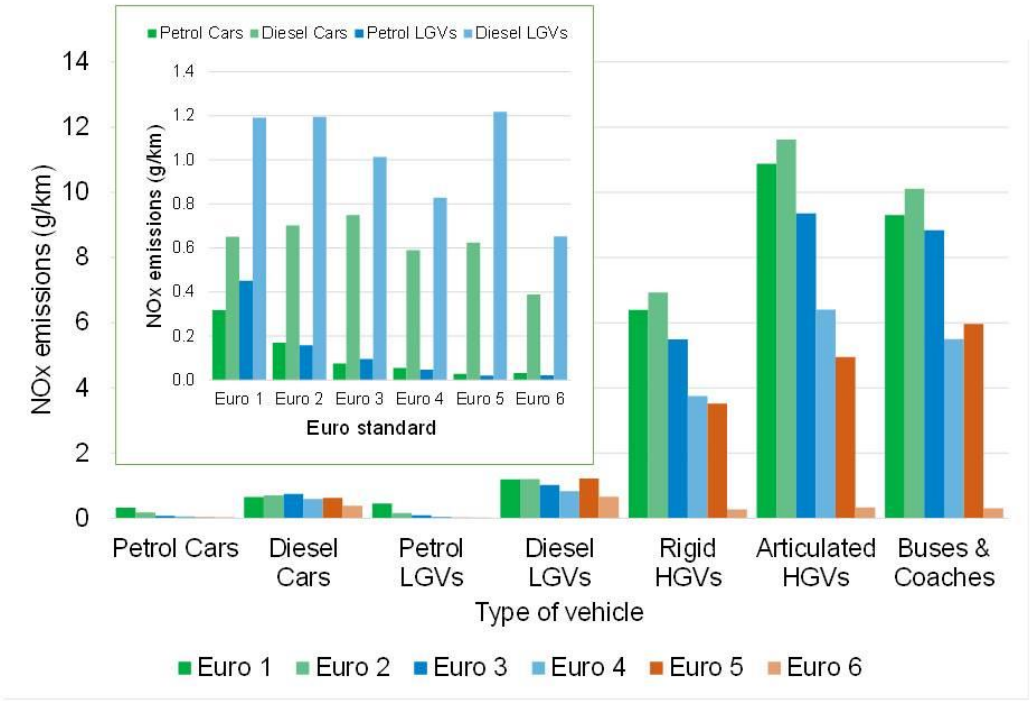


Figure 5 – Estimated emissions of NO_x by Euro emission standard (grams/kilometre)[15]



17. The UK situation is part of a wider problem with sixteen other European Union (EU) countries, alongside Norway and Serbia, recording NO_2 concentrations above the annual mean limit value, at one or more monitoring sites in 2014.[16]

18. In terms of wider air quality across the world, the WHO reported in 2016 that more than 80% of people living in urban areas that monitor generic air pollution in terms of particulate matter were exposed to levels that exceed WHO limits. While all regions of the world were affected, populations in low-income cities were the most impacted.[17]

[15] NO_x emissions figures are derived from COPERT speed emissions figures. These are estimates of real world emissions figures, based on the latest evidence from lab and real world tests

[16] European Environment Agency (2016) Air quality in Europe – 2016 report. doi:10.2800/413142

[17] World Health Organization (2016) Air pollution levels rising in many of the world's poorest cities www.who.int/mediacentre/news/releases/2016/air-pollution-rising/en/

4. Objective

19. Tackling poor air quality in all its forms is a priority for government. The UK currently meets its international commitments for emissions of all air pollutants. The only statutory air quality obligation the UK is failing to meet is on NO_2 concentrations.

20. The focus of this plan is on government's most immediate air quality challenge: to reduce concentrations of NO_2 around roads. The aim is to achieve the statutory limit values for the whole of the UK within the shortest possible time. The objective of the UK Government alongside the devolved administrations is to transform the UK's most polluted cities into clean and healthy urban spaces, supporting those most directly affected and ensuring that vehicle manufacturers play their part to improve the nation's air quality.

21. While tackling NO_2 concentrations is an important priority, government recognises the need to reduce harmful emissions of pollutants more widely. That is why the UK has adopted ambitious, legally-binding targets to reduce significantly emissions of NO_x and four other damaging air pollutants for 2020 and 2030. Details of plans to tackle air pollution from a wide range of everyday activities such as farming, heating homes and generating electricity to support innovation and create cleaner cities and a clean, green economy are set out in Section 10.

5. Roles and responsibilities

22. This section sets out roles and responsibilities for tackling air pollution

5.1. National government and devolved administrations

23. The UK Government and the devolved administrations have policy responsibility for air quality in England, Scotland, Wales and Northern Ireland respectively.

24. The UK Government and the devolved administrations support local authorities and public transport providers via central guidance and access to various grant funding schemes described in this document. The UK Government is also committed to supporting new technology and innovation though its industrial strategy.

25. In the event of air pollution episodes, a multi-agency response group is convened comprising representatives from Defra, the Department of Health, Public Health England, the Met Office and, where appropriate, the devolved administrations.

26. Annexes E and F provide further information on the roles and responsibilities of cross-Departmental units such as the Office for Low Emission Vehicles (OLEV) and government companies such as Highways England.

5.1.1 The Committee on the Medical Effects of Air Pollutants

27. The Committee on the Medical Effects of Air Pollutants (COMEAP)[18] is an expert committee of the Department of Health. COMEAP provides independent advice to UK government departments and agencies on how air pollution impacts on health.

5.1.2 The Air Quality Expert Group

28. The Air Quality Expert Group (AQEG)[19] is an expert committee of the Department for Environment, Food and Rural Affairs (Defra). It reports to Defra's Chief Scientific Adviser, Defra Ministers, Scottish Ministers, the Welsh Ministers, and the Department of Agriculture, Environment and Rural Affairs in Northern Ireland. AQEG considers current knowledge on air pollution and provides advice on such things as levels, sources and characteristics of air pollutants in the UK.

[18] Committee on the Medical Effects of Air Pollutants (2017) www.gov.uk/government/groups/committee-on-the-medical-effects-of-air-pollutants-comeap

[19] Air Quality Expert Group (2017) https://uk-air.defra.gov.uk/library/aqeg/

5.2. Local authorities

29. High concentrations of air pollutants are found in certain places for a host of local reasons. Local authorities know their areas best and are best placed to take the lead in rectifying the problem. Local authorities are required[20] to review and assess local air quality, in accordance with the statutory Local Air Quality Management (LAQM) guidance. Where a local authority identifies areas exceeding statutory limits and there is relevant public exposure, it is required to declare the geographic extent of exceedance as an Air Quality Management Area (AQMA) and to draw up an action plan detailing remedial measures to address the problem. The Mayor of London has additional statutory functions.

30. Local authorities in Great Britain also have powers to tackle local air pollution via the Clean Air Act 1993 and via the Road Traffic (Vehicle Emissions) (Fixed Penalty) (England) Regulations 2002 and equivalent legislation in Scotland and Wales.

5.3. Mayor of London

31. The Mayor of London is responsible for air quality in the capital and has reserve powers under Part IV of the Environment Act 1995 to reflect this. Under the Act the Mayor may direct the boroughs in the Greater London area concerning how they should assess and prioritise action in their areas.[21]

32. In 2010, the Mayor published an Air Quality Strategy,[22] a statutory requirement[23] which commits the Greater London Authority and Transport for London to implement certain measures, most of which are now in place.

5.4. Vehicle manufacturers

33. Vehicles must meet emission standards for a range of air pollutants - so-called 'Euro emission standards'.

34. Prior to the discovery in September 2015, that one car manufacturer – Volkswagen – had fitted software to its vehicles that distorted emissions test results for emissions of NO_x, the UK Government had already been working with the EU to develop new

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[20] Section 82, Part IV of the Environment Act 1995 or the Environment (Northern Ireland) Order 2002

[21] LAQM guidance published by the Mayor of London
www.london.gov.uk/what-we-do/environment/pollution-and-air-quality/working-london-boroughs

[22] Mayor of London (2010) Mayor's Air Quality Strategy
www.london.gov.uk/WHAT-WE-DO/environment/environment-publications/mayors-air-quality-strategy

[23] The Greater London Authority Act 1999

vehicle emissions tests and to encourage their early introduction. The UK Government pushed hard to ensure that Real Driving Emissions (RDE) tests would apply to new models sold from 2017. Under the new RDE tests from September 2017, vehicle manufacturers will be required to ensure that real world NO_x emissions for new models are increasingly aligned with lab-testing limits (see Section 7.3.1). This will entail using innovative technologies to bring forward new, cleaner vehicles that should deliver lower NO_x emissions across a wider range of operating conditions.

35. Vehicle manufacturers also have the opportunity to help consumers to understand how clean their vehicles are in terms of emissions of NO_x, in the same way as they are required to do for emissions of carbon dioxide (CO_2).[24]

5.5. Businesses, industry and the public

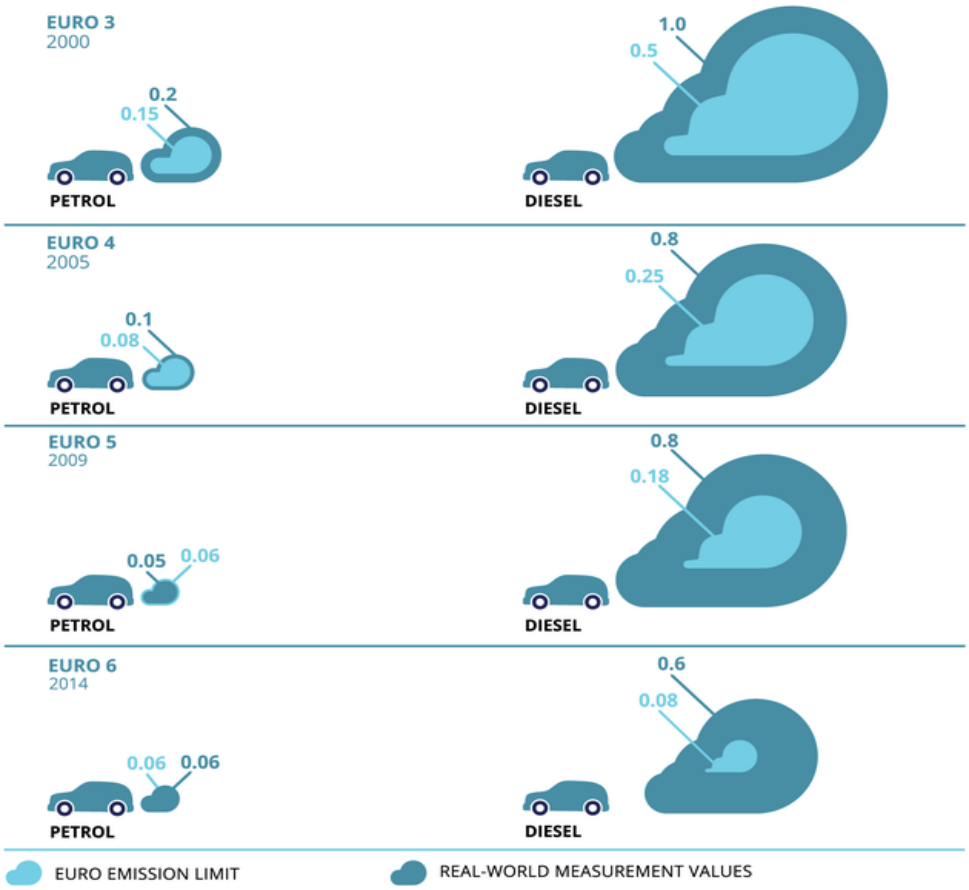
36. The UK Government is clear that any action to improve air quality must not be done at the expense of local businesses and residents. Therefore local authorities must work closely with local people to create an approach which works for them. Everyone has a role to play in helping to address NO_x by considering how they can reduce emissions through their day-to-day activities, for example by choosing cleaner vehicles.

[24] VCA (2017) Fuel Consumption Labelling
www.dft.gov.uk/vca/fcb/fuel-consumption-labelling.asp

6. Defining the solution

37. The introduction of increasingly strict vehicle emissions regulations (Euro standards) has not delivered the expected reduction in emissions of NO_x from diesel vehicles in real world use (Figure 6).

Figure 6 - Comparison of emissions of NO_x for different car Euro standards, by emission limit and real-world performance (grams/kilometre)



38. As a result, road transport is still by far the largest contributor to NO_2 pollution in the local areas where the UK is exceeding limit values. Addressing road transport emissions therefore presents the most significant opportunity to tackle this specific exceedance problem. However road transport is a key part of almost everything that we do as individuals or businesses with social and economic impacts which are much wider than air quality. This means setting new policies and incentives to promote new technology and innovation, speeding up the move to cleaner vehicles and supporting the industrial strategy to deliver cleaner air for UK towns and cities. The solution involves effective and appropriately targeted actions to:

    a. reduce emissions of NO_x from the current road vehicle fleet in problem locations now; and

b. accelerate road vehicle fleet turnover to cleaner vehicles to ensure that the problem remains addressed and does not move to other locations.

39. As mentioned in Section 3, a significant proportion of background emissions of NO_x come from other sources including other forms of transport, industry and buildings so the solution also involves effective and appropriately targeted actions to:

    a. reduce emissions of NO_x from other forms of transport such as rail, aviation and shipping;

    b. reduce emissions of NO_x from industry and non-road mobile machinery (NRMM); and

    c. reduce emissions of NO_x from buildings, both commercial and domestic, and other stationary sources.

7. Implementing the solution

40. This section includes the array of existing actions to tackle local NO_2 exceedance and reduce overall emissions of NO_x from road transport and other sources.

41. It also includes the additional actions which, when combined with these existing actions, will help our cities to become cleaner and help grow the economy, supporting those most directly affected and ensuring that vehicle manufacturers play their part.

7.1. Existing actions

42. Annexes A, B, E, F, G, H, I and J summarise the suite of actions currently in hand to tackle local NO_2 exceedance and reduce overall emissions of NO_x from road transport and other sources. Further detail is available in the air quality plan for NO_2 and supporting documents published in December 2015.[25]

43. Annex K provides details on some of the ongoing government-funded innovation, research and development of new technologies to support economic growth using cleaner transport.

7.2. Summary of additional actions across the UK

44. Table 3 provides a summary of the additional actions across the UK. These actions are described in more detail in the following sections.

Table 3: Summary of additional actions across the UK

Action	Lead	Partners	Timescale
Mandate local authorities to implement Clean Air Zones within the shortest possible time	Defra	Relevant local authorities in England	Work will begin immediately with the first Clean Air Zones in place as soon as possible
Consultation on proposal for a Clean Air Zone Framework for Wales	Welsh Government		Within 12 months

[25] Defra (2015) Air quality plan for nitrogen dioxide (NO_2) in UK (2015) www.gov.uk/government/collections/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2015

Action	Lead	Partners	Timescale
Consultation on a draft National Low Emission Framework	Scottish Government		Later in 2017
Commitment to establishing a Low Emission Zone by 2018	Scottish Government		In parallel with NLEF development
Tackling air pollution on the English road network	Highways England/DfT/Defra	Relevant local authorities in England	Work will begin immediately
New Real Driving Emissions requirements to address real world NO_x emissions	DfT	VCA	The second of four planned legislative packages comes into force in September 2017
Additional funding to accelerate uptake of hydrogen vehicles and infrastructure	DfT		The competition will be launched in Summer 2017
Additional funding to accelerate the uptake of electric taxis	OLEV/DfT		Launched in March 2017
Further investment in retrofitting alongside additional support for low emission buses and taxis	DfT/Defra/OLEV		Further information on scheme design, timings and how to apply will be issued later in 2017
Regulatory changes to support the take up of alternatively fuelled light commercial vehicles (vans)	OLEV	DfT	Within 12 months subject to outcome of consultation

Action	Lead	Partners	Timescale
Exploring the appropriate tax treatment for diesel vehicles	HMT		Within 12 months
Call for evidence on updating the existing HGV Road User Levy	DfT	HMT	Within 12 months
Call for evidence on use of red diesel	HMT		Within 12 months
Review of information to ensure wider environmental performance is apparent to consumers when considering purchasing cars including at the point of sale (car fuel efficiency label)	DfT/Defra/VCA	Low CVP	Within 12 months
Updating Government procurement policy	Defra/DfT		Within 12 months
New emissions standards for non-road mobile machinery (NRMM)	DfT/BEIS	VCA	New emission standards mandatory for new engines being sold, for the first tranche of categories, from January 2019
New measures to tackle NO_x emissions from Medium Combustion Plants (MCPs)	Defra, Welsh Government, Scottish Government, Department of Agriculture, Environment and Rural Affairs in Northern Ireland		By end 2018

Action	Lead	Partners	Timescale
New measures to tackle NO_x emissions from generators	Defra, Welsh Government, Scottish Government		By end 2018

7.3. Additional national actions

7.3.1. New Real Driving Emissions requirements

45. Under the new Real Driving Emissions regulations, vehicle manufacturers will be required to ensure that real world emissions of NO_x for new models are increasingly aligned with laboratory testing limits from September 2017. This will improve consumer confidence in manufacturers and deliver real improvements for air quality.

7.3.2. Additional funding to accelerate the uptake of hydrogen vehicles and infrastructure

46. In March 2017, the UK Government announced[26] a new £23 million fund to accelerate the take up of hydrogen vehicles and roll out more cutting-edge infrastructure. This announcement builds on the launch of the industrial strategy Green Paper in January 2017.

47. Hydrogen fuel providers will be able to bid for funding in partnership with organisations that produce hydrogen vehicles to help build high-tech infrastructure, including fuel stations. The funding will boost the creation of hydrogen fuel infrastructure and uptake of hydrogen-powered vehicles. A competition will be launched in Summer 2017, and will invite proposals from public organisations, businesses and hydrogen operators. The UK Government will provide match funding for successful bidders as part of its plans to cut carbon emissions, improve air quality and deliver economic opportunities for the UK.

7.3.3. Additional funding to accelerate the uptake of electric taxis

48. Alongside the opening of a new £300 million electric taxi factory in the Midlands in March 2017 supported by £16.1 million from the Regional Growth Fund, the Government announced[27] a further £64 million of investment, including £50 million from

[26] DfT (2017) £23 million boost for hydrogen-powered vehicles and infrastructure www.gov.uk/government/news/23-million-boost-for-hydrogen-powered-vehicles-and-infrastructure

[27] DfT, OLEV, BEIS (2017) 1,000 jobs created at new £300 million factory for electric taxis www.gov.uk/government/news/1000-jobs-created-at-new-300-million-factory-for-electric-taxis

the new National Productivity Investment Fund, to promote the uptake of electric taxis. This money will support two schemes:

a. A £50 million Plug-in Taxi Grant programme. This will give taxi drivers up to £7,500 off the price of a new vehicle.

b. £14 million of investment will deliver new dedicated chargepoints for electric taxis in ten council areas.

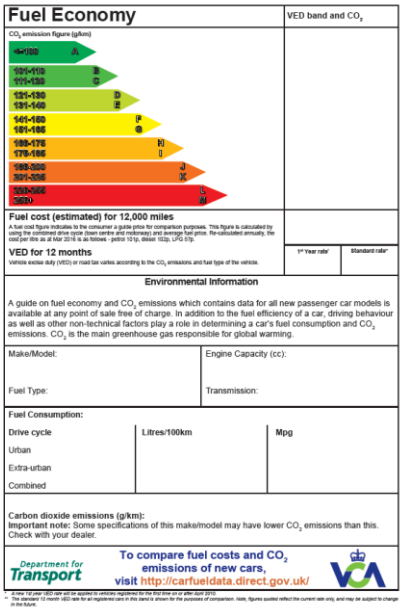
49. These projects are expected to deliver around 400 rapid and 150 fast chargepoints which will enable the take-up of around 23,000 ULEV taxis nationally including supporting existing plug in private hire vehicles.

50. The £50 million Plug-in Taxi Grant programme funding forms part of the £290 million for reducing transport emissions, announced from the National Productivity Investment Fund at Autumn Statement 2016.

7.3.4. Review of information available to car buyers

51. Fuel consumption and CO_2 emissions data is made available to consumers purchasing new cars. Vehicle dealers are required to display a label on every new car displayed for sale, and dealers also provide labels on used cars on a voluntary basis. The label shows the fuel consumption and CO_2 emissions, as well as information on the appropriate Vehicle Excise Duty (VED) for the vehicle (Figure 7). The label is designed to provide advice to help consumers make an informed choice at the point of purchase. The new car fuel efficiency label will be amended on 1 April 2017 as new VED rates and bands are introduced, and the used car label will be similarly amended as cars registered after this date enter the used market. The principle difference will be that only zero emission cars will attract no VED. The Vehicle Certification Agency (VCA) also publishes annually, a new car fuels efficiency guide and a database for both cars and light vans.

Figure 7: New car fuel economy label[28]



52. The Government is keen to enhance the information available to ensure the wider environmental performance of a car is apparent to consumers at the point of sale (and other sources of official test data, which will also cover light vans). This will be of particular value to consumers in light of the development of Clean Air Zones, where there will be a need to understand quickly and easily whether a given vehicle will be able to enter free of charge. In order to address this gap, a review of the vehicle label is being undertaken, supported by the Low Carbon Vehicle Partnership (Low CVP) a membership organisation bringing together government, manufacturers, technology companies, environmental organisations and other key stakeholders. This will enable consideration of the most appropriate way to display information on pollutants and ensure that future iterations of the vehicle label allow consumers clearly to determine the expected emissions of NO_x. This will help support wider work on engaging the public about the environmental performance of vehicles and build understanding of Clean Air Zone requirements and how to comply with them.

7.3.5. Regulatory changes to support the take up of alternatively fuelled light commercial vehicles

53. In 2017, the UK Government will consult on the implementation of regulatory changes to support the take up of alternatively fuelled light commercial vehicles (vans). Proposals include (i) increasing the weight limit of alternatively-fuelled vans that can be driven on a category B driving licence in the UK; (ii) exempting certain alternatively-fuelled vans from goods vehicle operator licensing requirements in Great Britain; and (iii) roadworthiness testing for electric vans in Great Britain. Vans spend much of their

[28] Note – the top half of the label (voluntary information) will be revised from 1 April 2017 when new Vehicle Excise Duty levels and bands are introduced

time completing driving routes around our towns and cities and over 96% of them are diesel powered. The UK Government wants to support the continued contribution of vans to the economy whilst also reducing their environmental impact. One way of achieving this is to encourage the uptake of cleaner fuels in our delivery vehicle fleet.

7.3.6. Exploring the appropriate tax treatment for diesel vehicles

54. The Government will continue to explore the appropriate tax treatment for diesel vehicles and will engage with stakeholders ahead of making any tax changes at Autumn Budget 2017.

7.3.7. Call for evidence on updating the existing HGV Road User Levy

55. The Government will launch a call for evidence on updating the existing HGV Road User Levy in due course. The Government will work with industry to update the Levy so that it rewards hauliers that plan their routes efficiently, to incentivise the efficient use of roads and improve air quality.

7.3.8. Call for evidence on use of red diesel

56. The Government has launched a call for evidence on the use of red diesel[29] in order to improve understanding of eligible industries and current use, particularly in urban areas.

7.3.9. New mandatory emissions standards for non-road mobile machinery

57. In January 2017, new legislation came into force with more stringent emission limits for major air pollutants from engines used in NRMM. It extends the scope of existing legislation to cover all sizes of petrol and diesel engines used in NRMM and it improves the legal framework. The new emission standards are mandatory for new engines being sold, for the first tranche of categories, from January 2019.

7.3.10. New measures to tackle emissions of NO_x from Medium Combustion Plants (MCPs) and generators

58. Medium Combustion Plants (MCPs) are used to generate heat for large buildings (offices, hotels, hospitals, prisons) and industrial processes, as well as for power generation, and have been largely unregulated for emissions to air. Within Great Britain there has been rapid growth in the use of generators which emit high levels of NO_x relative to other MCPs. Modelling indicates that such generators can lead to local breaches of the statutory hourly mean limit value for NO_2. In 2016, the UK Government

[29] HMT (2017) Red diesel call for evidence
https://www.gov.uk/government/consultations/red-diesel-call-for-evidence

and the devolved administrations in Wales and Scotland consulted on new statutory measures to reduce emissions from MCPs and generators with a view to introducing emission controls from the end of 2018, to improve air quality. The government will announce the measures in mid-2017.[30] [31]

7.4. Additional actions in England

59. This section includes actions focussed only in England.

7.4.1. Clean Air Zones

60. A Clean Air Zone defines an area where targeted action is taken to improve air quality and resources are prioritised and coordinated in a way that delivers improved health benefits and supports economic growth. They will also help the UK to meet its legally binding carbon targets as set out in the Climate Change Act.

61. Any local authority can implement a Clean Air Zone to address a local air quality issue. Following a consultation in 2016, the UK Government has published a Clean Air Zone Framework in England setting out the principles for the operation of Clean Air Zones in any cities which decide, or are required, to do so.

62. Clean Air Zones fall into two categories:

    a. Non-charging Clean Air Zones – These are defined geographic areas used as a focus for action to improve air quality. This action can take a range of forms including, but not limited to, those set out in Section 2 of the Framework but does not include the use of charge based access restrictions.

    b. Charging Clean Air Zones – These are zones where, in addition to the above, designated vehicles are required to pay a charge to enter or to move within the zone, if they are driving a vehicle that does not meet the particular standard for their vehicle type in that zone.

63. Where a charging Clean Air Zone would bring forward achievement of statutory NO_2 limit values, the UK Government believes that local authorities should have the opportunity to identify and implement equally effective non-charging alternatives. The Government will require local authorities to implement measures that will achieve statutory limits in the shortest time possible.

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[30] Defra (2016) Improving air quality: reducing emissions from medium combustion plants and generators www.gov.uk/government/consultations/improving-air-quality-reducing-emissions-from-medium-combustion-plants-and-generators

[31] Scottish Government (2016) Consultation on reducing emissions from medium combustion plants http://www.gov.scot/Publications/2016/12/3481

64. The Framework is designed to provide a consistent approach to the introduction of Clean Air Zones by local authorities in order to help businesses and individuals and support cities to grow and transition to a low emission economy.

65. The Framework identifies the outcomes that Clean Air Zones are expected to deliver:

    a. Immediate action to improve air quality and health by delivering the statutory NO_2 limit values within the shortest possible time.

    b. Supporting local growth and ambition (decoupling growth and pollution).

    c. Accelerating the transition to a low emission economy.

66. The Framework provides a range of non-charging measures which local authorities can use, for example:

    a. Exploring innovative retrofitting technologies and new fuels;

    b. Buying ULEVs and encouraging local transport operators to do the same;

    c. Encouraging private uptake of ULEVs via ensuring adequate chargepoints;

    d. Encouraging use of public transport, cycling, walking, park and ride schemes and car sharing;

    e. Improving road layouts and junctions to optimise traffic flow, for example by considering removal of road humps;

    f. Working with local businesses and neighbouring authorities to ensure a consistent approach.

67. Under the Framework, charging Clean Air Zones are sub-divided into classes A - D on the basis of the types of vehicles to which the charging schemes may apply (Table 4). More detailed descriptions of these categories and any exemptions are set out in the Framework. Any revenues collected by local authorities will be reinvested to support local transport policies, which could cover public health projects or better town and city planning, promoting cleaner air.

Table 4: Charging Clean Air Zone classes which local authorities may choose to deploy

Charging Clean Air Zone class	Vehicles potentially included[32]
A	Buses, coaches, taxis and private hire vehicles
B	Buses, coaches, heavy goods vehicles (HGVs) taxis and private hire vehicles
C	Buses, coaches, HGVs, large vans, minibuses, small vans/ light commercials, taxis and private hire vehicles
D	Buses, coaches, HGVs, large vans, minibuses, small vans/ light commercials, taxis and private hire vehicles, cars, motorcycles and mopeds

68. Vehicles which meet at least the minimum emission standard for the Clean Air Zone will be able to enter or move within the zone free of charge (Table 5). Fully electric or hydrogen fuel cell ULEVs will be able to enter or move within zones free of charge.

[32] More detailed descriptions of these categories and any exemptions are set out in the Clean Air Zone Framework.

Table 5: Charging Clean Air Zone minimum emission standards

Vehicle type	Clean Air Zone minimum emission standards
Buses and coaches	Euro VI
Heavy goods vehicles	Euro VI
Vans	Euro 6 (diesel) or Euro 4 (Petrol)
Cars	Euro 6 (diesel) or Euro 4 (Petrol)
Motorcycles and mopeds (optional)	Euro 3

69. In 2016, the UK Government consulted on draft secondary legislation which would enable the Secretary of State for Environment, Food and Rural Affairs to require local authorities in the five cities named in the UK Air Quality Plan for tackling nitrogen dioxide published in December 2015 - Birmingham, Leeds, Nottingham, Derby and Southampton - and, by notice, other authorities in England, to implement air quality charging schemes using their powers in the Transport Act 2000.

70. Annex L provides details of local authorities with roads with NO_2 levels above legal limits based on initial modelling. This evidence is subject to further analysis and government discussions are continuing with the local authorities concerned to understand their specific local circumstances. Local authorities will undertake local assessments to consider the best option to achieve statutory NO_2 limit values within the shortest possible time. Where a charging Clean Air Zone is proposed, the UK Government expects that it would take until the end of 2020 (or 2019 for the local authorities in the five cities named above) to introduce although local authorities would need to deliver sooner if they could.

71. Discussions with these local authorities have already started. They will continue through the period of this consultation and the development of the final plan aimed at ensuring swift action is taken locally to understand what options could be explored. If local authorities adopt a charging scheme, the UK Government believes that local authorities could achieve statutory NO_2 limit values in most cases by 2021, after charging has begun, although it will press local authorities to deliver Clean Air Zones earlier where this is possible. As above, the UK Government continues to expect local authorities in the five cities named above to deliver their Clean Air Zones by the end of 2019, with a view to achieving statutory NO_2 limit values within the shortest possible time, which the latest assessment indicates will be in 2020. Two of these local authorities, Birmingham and Leeds, have particularly high exceedances and are likely

to require a combination of measures such as improved signage and rerouting, switching to different forms of transport (e.g. use of park and ride schemes) road improvements and infrastructure for alternative fuels in order to achieve statutory NO_2 limit values within the shortest possible time.

72. It is for local authorities to develop innovative local plans that will achieve statutory NO_2 limit values within the shortest time possible. Given the potential impacts on individuals and businesses, when considering between equally effective alternatives to deliver compliance, the Government believes that if a local authority can identify measures other than charging zones that are at least as effective at reducing NO_2, those measures should be preferred. This includes considering all equally effective alternatives to charging zones. A proposed Clean Air Zone plan will only be approved by Government, and thus be considered for appropriate funding support, if it can show that:

    a. It is likely to cause NO_2 levels in the area to reach legal compliance within the shortest time possible;

    b. The effects and impacts on local residents and businesses have been assessed, including on disadvantaged groups, and there are no unintended consequences; and

    c. Proposals that request central Government funding support demonstrate value for money.

7.4.2. Tackling air pollution on the English road network

73. New evidence indicates that in addition to the urban locations referred to in Section 7.4.1, there are sections of the local road network outside towns and cities, where NO_2 levels exceed statutory limits. Annex L provides details of local authorities with roads with NO_2 levels above legal limits based on initial modelling. Measures set out elsewhere in this document to speed up fleet turnover will also contribute to tackling pollution on the local road network, but the UK Government will work with local authorities responsible for these roads to identify specific local solutions, ensuring they are delivered within the shortest possible time and considering the appropriate incentives to deliver this.

74. The new evidence also indicates that less than 1% of the strategic road network (motorways and major A roads) managed by Highways England could exceed statutory limits for NO_2. As above, measures to speed up fleet turnover could also contribute to tackling pollution on the strategic road network, and bespoke solutions will be considered to achieve statutory NO_2 limit values within the shortest possible time.

75. Highways England will continue to develop ways to improve air quality, for example, as explained in Annex F, by supporting the uptake of ULEVs by working to ensure that 95% of the network will have a chargepoint every 20 miles and that where possible, these will be rapid chargepoints.

76. Highways England will continue to work in partnership with a range of stakeholders, for example, it has been working with Transport for Greater Manchester to consider air quality on the strategic and local road networks together so that solutions benefit both.

77. The UK Government has considered potential measures to address exceedances on the strategic road network and has concluded that adjusting speed limits could be practicable. There is considerable uncertainty however on the real world impact of speed limits on NO_2 concentrations and there is limited data available showing the impact of speed limit changes. Given this, there is a need to collect data from further monitoring in real world conditions, for example at sites where variable speed limits are used already for traffic management purposes, to understand better the likely impact that different speed limits might have on air quality in differing circumstances. Modelling assumptions will be refined as more evidence becomes available. As explained in Annex E, Highways England is progressing this analytical work accordingly.

7.4.3. Further investment in retrofitting

78. Retrofitting refers to all or part of an engine being modified with pollution-reducing technology, reducing emissions of NO_x.

79. In the 2016 Autumn Statement, the UK Government committed a further £150 million in support for low emission buses and taxis which includes support for retrofitting 1,500 buses (Annexes A, E and F). This funding will support the development of Clean Air Zones and continue to drive forward the UK's retrofit industry, identifying innovative new technologies to tackle emissions from a range of vehicles. The Government will consider how to maximise support for the most polluted areas. Further information on scheme design, timings and how to apply will be issued later in 2017.

80. At a local level, the UK Government expects many local authorities will consider the impact retrofitting could have on their pollution levels, in particular for public transport fleets that need to enter Clean Air Zones, or more generally to set a lead in cleaning up their own fleets and meeting local air quality objectives.

7.4.4. Updating Government procurement policy

81. Central Government is determined to lead by example and is thus taking action to ensure its operations and purchasing power support reductions in NO_2 and other pollutants. The Government Buying Standards (GBS)[33] for vehicles set down minimum mandatory and best practice standards requirements for cars, vans, buses and trucks. All central Government departments and their related organisations must ensure that they meet the minimum mandatory GBS.

[33] Defra (2012) Sustainable procurement: the Government Buying Standards (GBS) www.gov.uk/government/collections/sustainable-procurement-the-government-buying-standards-gbs

82. The current GBS is focused primarily on reducing emissions of CO_2 but later this year the Government will publish revised standards with the intention of encouraging the purchase of ULEVs where appropriate. The UK Government is also updating the standard for cars and vans. The information note accompanying the revised standards will have a statement that central Government must play its part in reducing emissions of harmful pollutants, contributing to statutory limit values.

83. These actions will ensure that emissions of NO_x 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 (e.g. in an urban and/or residential area) and the type of usage.

84. The new standard will also encourage procurers to choose ULEVs where possible. Central Government departments can make their procurement more sustainable by specifying the best practice standard in tenders. The wider public sector, including local government, is also encouraged to use the GBS in tenders. The Government will work with the Energy Savings Trust and with local authorities to promote the use of GBS throughout the wider public sector and beyond in order to avoid purchasing diesel vehicles wherever possible.

85. The Government's 'Greening Government Commitments 2016-2020'[34] also require compliance with the GBS and commit to embedding them in departmental and centralised procurement contracts, within the context of the Government's overarching priorities of value for money and streamlining procurement processes.

86. The revised GBS will reward manufacturers who reduce the emissions of carbon and NO_x from 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.

7.4.5 Measures in Greater London

87. The Greater London urban area currently has the highest NO_2 exceedance in the UK. The size and complexity of the city means that the task of reducing NO_2 concentrations is the most challenging in the country.

88. The Mayor of London is taking forward a package of measures to achieve the statutory NO_2 limit values for London within the shortest possible time. As part of preparing the final plan, the UK Government will work with the Greater London Authority to ensure that compliance will be delivered by 2025 or sooner. This includes:

[34] Cabinet Office and Defra (2016) Greening Government Commitments
www.gov.uk/government/collections/greening-government-commitments

a. The introduction of an Emissions Surcharge ('T-Charge') from 23 October 2017, which will help discourage older (pre-Euro 4) polluting vehicles from central London;[35]

b. Launching an Ultra Low Emission Zone (ULEZ) in April 2019, subject to consultation, and extending it London-wide for heavy vehicles (HGVs, buses and coaches) and to the North and South Circular roads for all vehicles;[36]

c. Twelve low emission bus zones deploying the greenest buses on the most polluted routes;

d. For buses, phasing out pure diesel buses, retrofitting 5000 older buses, and a commitment to purchase only hybrid or zero-emission double decker buses from 2018;

e. For taxis (black cabs) no new diesel taxis will be licensed from 1 January 2018, with an expectation of 9,000 zero emission capable taxis by 2020;[37]

f. Introducing five low emission neighbourhoods spanning eight boroughs;

g. Issuing alerts for very high and high pollution alerts at 2,500 bus countdown signs, 140 road side variable message signs, and at all Tube stations. Messages (for high alerts) include encouraging people to walk, cycle and use public transport and to switch their car engine off when stationary;

h. Putting a significant shift towards walking, cycling and public transport use at the heart of the forthcoming Mayor's Transport Strategy;

i. Public realm improvements to reduce traffic on Oxford Street and across the West End; and

j. Setting emission requirements for non road mobile machinery through the planning system and developing tighter air quality planning requirements for Opportunity Area Planning Frameworks and Housing Zones.

7.5. Additional actions in Scotland

89. This section includes actions focussed only in Scotland.

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[35] TfL (2017) T Charge
https://tfl.gov.uk/modes/driving/emissions-surcharge?cid=emissions-surcharge

[36] GLA (2017) Mayor plans to introduce Ultra Low Emission Zone in April 2019
www.london.gov.uk/press-releases/mayoral/mayor-plans-to-introduce-ulez-in-april-2019

[37] TfL (2017) Taxi and private hire requirements
https://tfl.gov.uk/modes/driving/ultra-low-emission-zone/taxi-and-private-hire-requirements?intcmp=35073

90. In November 2015, the Scottish Government published 'Cleaner Air for Scotland – The Road to a Healthier Future' (CAFS) [38] Scotland's first separate air quality strategy. CAFS sets out in detail how Scotland intends to deliver further air quality improvements over the coming years, including full compliance with Directive requirements in Scotland by 2020.

91. CAFS sets out a national approach to improving air quality. The strategy contains 40 key actions within six policy areas – transport, health, climate change, legislation, placemaking and communications. CAFS also introduces two important new policy initiatives, the National Modelling Framework (NMF) and the National Low Emission Framework (NLEF).

92. The NMF promotes a standard approach to evaluating and assessing air quality, providing evidence to support the actions and decision making process around land use and traffic management to improve local air quality. A pilot project to develop and test the methodology was undertaken in Aberdeen in 2015/16, involving both air quality and traffic data. The approach has now been expanded to collect similar data in Glasgow, Dundee and Edinburgh, and a follow up exercise in Aberdeen using the refined methodology. Once the models for the four main cities have been finalised, a more strategic regional approach will also be developed.

93. The outputs from the NMF will be used to inform the NLEF. This is designed to enable local authorities to appraise, justify the business case for and implement a range of transport related policy interventions to improve local air quality. The draft NLEF will be issued for consultation later in 2017.

94. The Scottish Government's Programme for Government published in September 2016 commits to establishing Scotland's first Low Emission Zone by 2018. Plans for delivering this commitment will proceed in parallel with the NLEF development.

95. In Scotland, £4 million is available in 2017/18 to support air quality action.

7.6. Additional actions in Wales

96. This section includes actions focussed only in Wales.

97. The Welsh Government is firmly committed to improving air quality across Wales and it is clear Wales still faces a significant challenge in meeting nitrogen dioxide (NO_2) limits in some urban areas.

98. The Well-being of Future Generations (Wales) Act 2015 ("the WFG Act") details the ways in which specified public bodies must work, and work together to achieve the

[38] Scottish Government (2015) Cleaner Air for Scotland - The Road to a Healthier Future http://www.gov.scot/Publications/2015/11/5671

vision for Wales set out in the national well-being goals.[39] Public bodies are required to plan and act for the long term and think laterally about what they can achieve both on their own and collectively. Air quality can have fundamental impacts on human health, affecting both the quality and duration of peoples' lives. Reducing levels of air pollution to within legislative limits in the soonest possible time will contribute, either directly or through associated impacts, to the majority of the Well-being Goals.

99. To focus the Welsh public sector's attention on the problem, the Welsh Government has made average population exposure to NO_2 one of the national indicators under the WFG Act.[40]

100. Alongside the WFG Act, the new Environment (Wales) Act 2016 defines "natural resources" to include air and places a statutory duty upon the Welsh Ministers to prepare, publish and implement a national natural resources policy (NNRP). This must set out policies for the sustainable management of natural resources, together with what the Welsh Ministers consider to be the key priorities, risks and opportunities. The principles of the sustainable management of natural resources must be applied when drafting the NNRP. A Welsh Government consultation to inform the development of the NNRP closed in February 2017, and listed poor air quality as one of the key challenges to be addressed.[41]

101. Following the 2016 public consultation on Local Air Quality Management (LAQM) in Wales,[42] the Welsh Government will take the following steps:

a. The current process for Local Authorities to declare air quality management areas (AQMAs) more quickly, once locations suffering from poor air quality are confirmed, will be streamlined. Welsh Government will also take steps to ensure an effective local air quality action plan is put in place in a timely fashion once an AQMA has been declared.

b. New guidance will be issued to Local Authorities under the Environment Act 1995, stressing the greater public health benefits likely to result from actions to reduce air pollution in an integrated fashion for the population as a whole. The new annual progress report for LAQM in Wales will require Local Authorities to report on the policies they have in place to reduce average levels of air pollution

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[39] A prosperous Wales, a resilient Wales, a healthier Wales, a more equal Wales, a Wales of cohesive communities, a Wales of vibrant culture and thriving Welsh language, a globally responsible Wales.

[40] Welsh Government (2017) Stats Wales
https://statswales.gov.wales/Catalogue/Environment-and-Countryside/Air-Quality

[41] Welsh Government (2016) Consultation to inform the development of the Natural Resources Policy
https://consultations.gov.wales/consultations/natural-resources-policy-development

[42] Welsh Government (2016) Consultation: Local air quality and noise management in Wales
https://consultations.gov.wales/consultations/air-quality-and-noise-management-wales

at dwellings across their area. Furthermore, local air quality action plans will in future be required to state how actions are being taken forward not solely with a view to achieving technical compliance with the national air quality objectives, but also with a view to maximising their contribution to reducing average levels of air pollution at dwellings across the Local Authority area.

c. Guidance will be issued for Local Health Board Directors of Public Health, Local Authority Directors of Public Protection and Public Health Wales, encouraging collaboration to support the delivery of LAQM plans.

d. Action to improve local air quality will continue to be supported through the Environment and Sustainable Development Single Revenue Grant for Welsh Local Authorities.

e. The Well-being of Future Generations (Wales) Act 2015 will be amended to add air quality to the list of things to be taken into account by Public Services Boards when preparing assessments of local well-being.

f. In the production of Wales' first National Development Framework, the national planning policy and guidance will be reviewed in relation to air quality, taking responses to the recent consultation on LAQM into account. The review will be carried out with the close involvement of Local Authorities and other stakeholders.

g. Work will be taken forward with stakeholders to initiate an educational campaign on air quality for health professionals and the general public.

102. Current evidence based on Defra's new national assessment indicates where, without further action, non-compliance may exist between the years 2020 and 2025.

103. As Highway Authority for the Trunk Road and Motorway network in Wales, the Welsh Government will review what can be done to the Welsh Government network to improve NO_2 levels for locations where exceedances have been noted.

104. Actions have been already undertaken to help remove specific NO_2 related issues, such as at Newtown, Powys.

105. Further action on two areas where exceedances have been modelled are to be taken forward as follows:

a. M4 Corridor around Newport – currently being taken through statutory processes. If approved, it is likely to be open to traffic by 2022. The effect of the proposal as modelled for the Public Inquiry is to improve concentrations of nitrogen dioxide (NO_2) and particulate matter (PM_{10}), in the more populated areas of Newport adjacent to the existing M4 Corridor and the arterial routes to the north of Newport City Centre. The proposal results in increased pollutant concentrations at locations adjacent to the proposed new section of motorway however predicted concentrations remain well below the air quality objectives.

Evidence indicates that, excluding properties where changes in NO_2 concentrations would be negligible, 12,475 would experience a minor to major beneficial decrease in NO_2 concentrations, with only 117 properties experiencing a minor adverse increase in concentrations.

b. A55/A494/A548 Deeside corridor – options are currently being considered for the route. Consideration will include the air quality impacts of the options, alongside other environmental and non-environmental issues. If approved, the project is likely to be open to traffic by 2022.

106. As a minimum we expect all Local Authorities with areas currently exceeding the required levels to consider developing remedial plans. The plans could set out a range of commitments and actions to tackle pollution and improve public health, and be used to ensure they identify and exploit the national assistance available.

107. Subject to Defra's further assessment and our discussion with Local Authorities to understand local circumstances in Wales, one area in Wales which may benefit from a zonal approach to bring about compliance with statutory NO_2 limit values within the shortest possible time is in Cardiff.

108. Within the next 12 months the Welsh Government will consult on the detail of a proposal for a Clean Air Zone Framework for Wales and, where future evidence demonstrates clearly Clean Air Zones would bring about compliance before other measures and in the shortest possible time, we will set out how we propose to ensure their effective implementation. The Welsh Government will work closely with local authorities and other stakeholders to ensure that it provides the guidance which is relevant and useful to them.

109. The City of Cardiff Council's Local Development Plan includes the target of 50% of all journeys to be made by sustainable transport by 2026. Cardiff's Local Transport Plan, approved by the Welsh Government in May 2015, sets out the main transport infrastructure proposals which will support this significant modal shift. The Local Transport Plan recognises the need to improve air quality. Its programme prioritises: development of active travel networks to increase walking and cycling for local journeys: the provision of cycling infrastructure; the bus network; reduced speed limits; reducing congestion; improving transport efficiency and reliability; and bus based park and ride.

110. The Welsh Government will also continue to invest in measures designed to promote modal shift from road transport, including:

a. 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.

b. Taking forward a North East Wales Metro concept.

c. Other railway improvements, including electrification of the Great Western Mainline and gauge enhancement and improvements to the Valleys Line in South Wales.

d. Intelligent Transport Systems (ITS) and other innovative technical solutions to reduce congestion on our strategic road network.

e. Supporting modal shift for freight from road through grant support schemes.

f. Funding infrastructure and other projects that help implement 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.

g. Improvements to the Welsh trunk road network designed to reduce congestion such as relief roads and bypasses.

h. Investing in the Bus Service Operators Grant and providing enhanced grant for operators with fleets that reduce emissions.

i. 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.

j. The Welsh Government will also continue to look at opportunities for promoting the uptake of low carbon vehicles, including charging infrastructure and the case for establishing a separate, additional 'Green Bus' Fund for Wales (the UK Government's Low Emission Bus Fund extends to Wales – Annex F).

7.7. Additional actions in Northern Ireland

111. This section includes actions focussed only in Northern Ireland.

112. The Northern Ireland Executive Draft Programme for Government (PfG) 2016-2021,[43] contains strategic outcomes which, taken together, set a clear direction of travel and enable continuous improvement on the essential components of societal wellbeing. They touch on every aspect of government, including the attainment of good health and education, economic success, and confident and peaceful communities. In addition to merely fulfilling its statutory obligations, the Northern Ireland Executive will in future be able to target those things that make real improvements to the quality of life for the citizen. The outcomes are supported by fourteen primary indicators which are

[43] The status of the Draft Programme for Government 2016 – 21 and associated Delivery Plans is draft at present. Its contents are conditional upon formal approval in due course.

clear statements for change. Two outcomes in particular are relevant to delivering improvements in Northern Ireland's air quality:

a. PfG Outcome 2: We live and work sustainably – protecting the environment

b. PfG Outcome 13: We connect people and opportunities through our infrastructure

113. The Northern Ireland Executive has outlined below, the focus of the outcomes and the actions proposed in the PfG Delivery Plan to assist in the achievement of the outcomes.

PFG Outcome 2: We live and work sustainably – protecting the environment

114. This outcome reflects the importance the Northern Ireland Executive attaches to ensuring that its ambition for economic growth and social progress takes into account the impact on the environment and depletion of its finite resources, its natural capital. Northern Ireland benefits from the goods and services that its natural environment provides, including food, renewable energy, water purification, flood mitigation and places for recreation, education and inspiration. Ultimately, health and prosperity depend on its natural environment. Achieving economic growth at the cost of its degradation through over-exploitation or pollution is not sustainable.

115. This is recognised internationally through the Sustainable Development Goals (SDGs) contained in the 'Transforming our world: the 2030 Agenda for Sustainable Development'. The new goals and targets came into effect on 1 January 2016 and are designed to guide the decisions taken over the period up to 2030. The outcomes and indicators in the Draft Programme for Government will support the SDGs.

Air Quality and Sustainable Transport

116. Northern Ireland's geography and maritime position ensure it has a steady supply of good air; however NO_2 pollution from road traffic is a significant problem whilst the proportion of journeys made by public transport and active travel is fairly stable over time. This is despite the fact that the majority of journeys people undertake are short in distance and/or within areas or strategic corridors with access to public transport services. In 2015, 25% of all journeys made were by walking, cycling or public transport. This compares to 22% in 2014 and 25% ten years ago.

117. There are a number of factors underlying and impacting on the failure to shift this data-trend. The growth of the economy and population has increased the demand for transport, but increased prosperity has tended to result in an increase in travel by private vehicle. Achieving a shift from the car to bus or rail services for longer journeys and to walking or cycling for shorter journeys will reduce demand on the road network allowing it to work more efficiently; assist in the better movement of freight; reduce emissions and improve health by increasing levels of physical activity. Public transport

also contributes to economic growth, competitiveness and supports social inclusion. Cycling and walking have significant health and social benefits for individuals

Actions:

118. The Northern Ireland Executive will improve air quality and increase sustainable transport through the following actions:

a. Revise Northern Ireland's air quality policy and legislation and devise an Air Quality Action Plan.

b. Develop air quality planning guidance.

c. Promote the use of electric vehicles.

d. Ensure Local Development Plans and planning decisions take account of existing regional strategic planning and transport policies and guidelines to encourage the use of walking, cycling and public transport.

e. Invest in public transport, cycling and pedestrian infrastructure to encourage greater use of these modes.

f. Build a safe and accessible cycling infrastructure by delivering bicycle networks and a Strategic Plan for Greenways.

g. Establish Quality Bus Corridors and work with major employers to promote salary sacrifice and tax smart schemes for bike and public transport.

h. Engage employers, schools and hospitals to develop travel plans and enhance active travel and public transport linkages, including by integrating rural and accessible transport services with health and education passenger transport.

119. The Northern Ireland Executive will make Northern Ireland's energy use more sustainable, reducing greenhouse gas emissions through the following actions:

a. Address the future of energy policy and strategy, including the increased use of renewable and sustainable sources, through the Strategic Energy Framework Continue to support businesses to improve energy efficiency.

b. Expand the natural gas network to the west and south-east of Northern Ireland to deliver affordable warmth and boiler replacement schemes.

PfG Outcome 13: We connect people and opportunities through our infrastructure

120. Investment in Northern Ireland's infrastructure is vital to provide the physical and digital connectivity to allow it to compete on the global stage. That connectivity needs to be regionally balanced to ensure a level playing field of opportunity in terms of access to market and ability to establish and grow businesses. It also however needs to take account of the specific current and future economic needs of the region – that

includes in infrastructure terms the need to invest in better access to major population and business centres through our strategic road network in the West, and the need to support economic and housing growth including through enhancements to our water and digital infrastructure. The key themes are maintaining and developing Northern Ireland's infrastructure in line with wider economic and demographic changes so that its essential transport, water and telecommunications needs can be met going forward. Therefore the Northern Ireland Executive will invest both to enhance Northern Ireland's road network to support economic growth and to expand the numbers of people using public transport and active travel for their daily needs.

Transport

121. In relation to transport, the evidence shows that continued growth in private vehicles will exacerbate congestion particularly in Northern Ireland's urban centres and at key interfaces. It is clear that simply building more roads will not resolve the issues. Enhanced bus and rail services and greater take-up of those services will enable the transport network to be more efficient as well as reducing demand particularly at peak hours. In addition, there are wider societal benefits from public transport and also from increased use of cycling and walking as a means of transport in terms of health, air quality and quality of life benefits. That analysis underpins the identification of two transport indicators – those of improving transport connections measured by average journey times on key economic corridors and of increasing the usage of public transport and active travel.

Actions:

122. The Northern Ireland Executive will bring forward major works to improve travel times, ease congestion and support economic growth through the following actions:

a. Progression and delivery of strategic projects, including:

    i. Upgrades of strategic road corridors.

    ii. Belfast Rapid Transit (BRT).

    iii. Belfast Transport Hub Develop and deliver, subject to budget availability, other measures to improve connectivity.

b. Develop, expand and modernise public transport to make it a more viable option.

c. Develop the Derry/Londonderry Transport Hub and enhance public transport between Northern Ireland's population centres.

d. Develop in partnership with Translink, community transport and private operators' feeder services linking rural communities to regional public transport services.

e. Enhance the public transport infrastructure through investment in buses and trains, in track/platform upgrades and essential safety to maintain the rail network.

f. Encourage people to use alternative travel schemes.

g. Implement the Regional Strategic Plan for Greenways and urban Bicycle Network Plans.

h. Deliver an enhanced Active Schools Programme.

i. Measures to reduce local street congestion.

8. Raising awareness

123. Access to information is essential to enable the public to make informed choices to help tackle the sources of, and to avoid exposure to, air pollution.

124. The UK Government will continue to co-fund the *Go Ultra Low*[44] campaign with industry. The campaign promotes the uptake of ULEVs by helping motorists and fleets to understand the benefits, cost savings and capabilities of the wide range of ULEVs on the market.

125. The UK Government and the devolved administrations also publish near real-time air pollution monitoring and forecasting information,[45] with social and other media used to communicate actual or forecast episodes of high pollution.

126. Local authorities, non-government organisations and other stakeholders play a key role in disseminating advice and guidance to those affected by poor air quality.

127. Examples of local SMS messaging services available to inform vulnerable people about air pollution levels in their area include *airAlert*[46] and *airTEXT*[47].

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[44] *Go Ultra Low*
www.goultralow.com

[45] England https://uk-air.defra.gov.uk/ ; Scotland www.scottishairquality.co.uk/ ; Northern Ireland www.airqualityni.co.uk/ ; Wales www.welshairquality.co.uk/

[46] airAlert
www.airalert.info

[47] airTEXT
www.airtext.info

9. Monitoring and evaluation

128. The UK Government, the Scottish Government, the Department of Agriculture, Environment and Rural Affairs in Northern Ireland and the Welsh Government will closely monitor the implementation of the plan and evaluate the progress on delivering its objective. This will involve continued formal reporting processes and ongoing engagement with local authorities, industry, and other relevant parties.

10. Wider Air Quality Strategy

129. Air pollution is a mixture of particles and gases that can have adverse effects on human health. Tackling poor air quality in all its forms is a priority for Government. The focus of this plan is on the Government's most immediate air quality challenge: to reduce concentrations of NO_2 around roads.

130. However, the Government recognises that vehicles are not the only source of air pollution. Many everyday activities such as industrial activity, farming, heating homes and generating energy also have a detrimental effect on air quality. So, in addition to urgent action to tackle NO_2 hotspots around roads, we also need to reduce harmful emissions of other air pollutants. These everyday activities cannot stop. They are an essential part of our daily lives and our economy. But there are cost-effective changes that we can all make to secure cleaner cities and a clean, green economy. That is why the Government has adopted ambitious, legally-binding targets to reduce significantly emissions of five damaging air pollutants (Table 6) for 2020 and 2030.

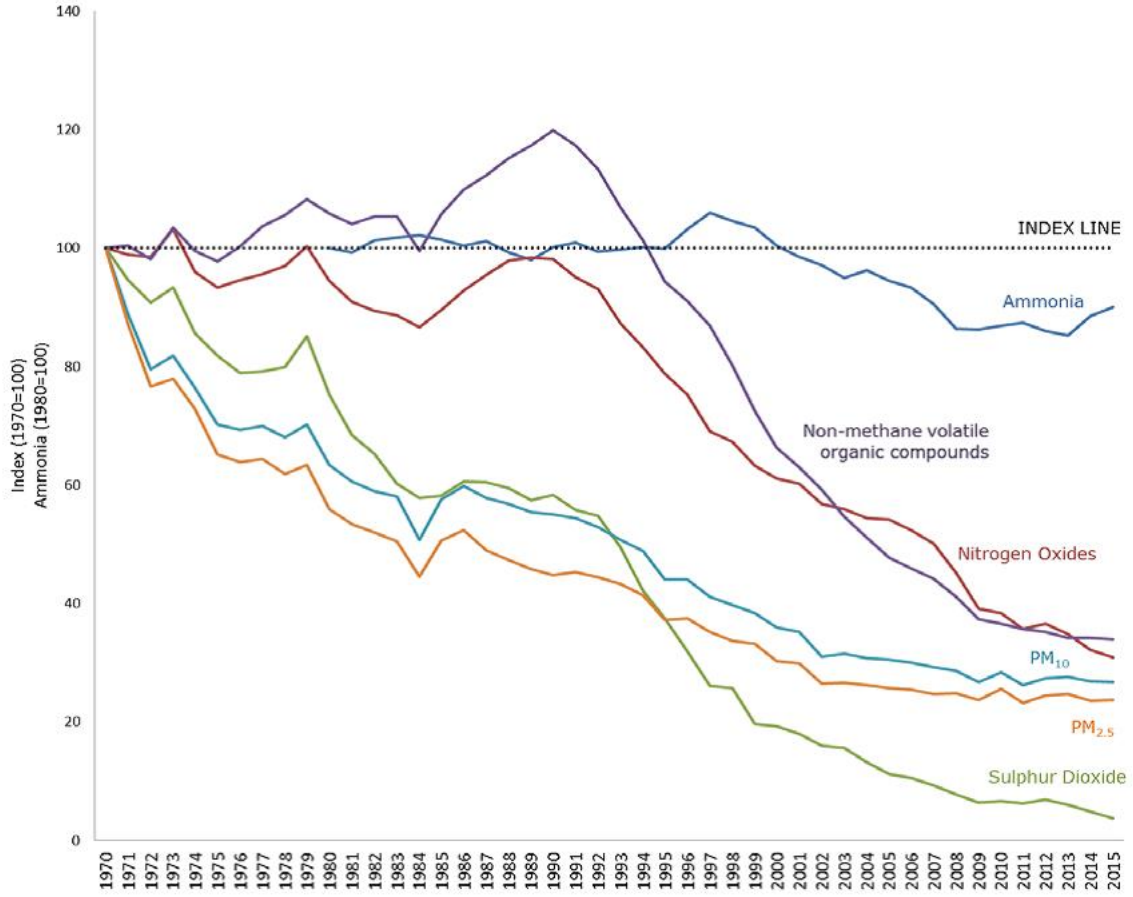
Table 6: Details of key air pollutants

Air Pollutant	Description
Nitrogen oxides	Nitrogen oxides (NO_x) include both primary nitrogen oxide (NO_2) and nitric oxide (NO) with the latter reacting in the atmosphere to produce secondary NO_2. Combustion of fossil fuels, for example in power generation, industrial processes, domestic heating, and vehicles, gives rise to air pollutants including NO_x. Short-term exposure to high concentrations of NO_2 can cause inflammation of the airways leading to, for example, coughing, production of mucus and shortness of breath. Road transport accounts for 34% of overall NO_x emissions.
Particulate matter	Particulate matter (PM) pollution is of particular significance as long term exposure over several years to elevated concentrations of $PM_{2.5}$ (particles smaller than 2.5 microns) shortens lives. PM can be composed of particles from combustion products, products from abrasion of engine components, brakes and tyres, generated during construction and agricultural processes, as well as components generated by chemical reactions in the air. Domestic wood and coal burning is a significant source of PM (39% of primary emissions of $PM_{2.5}$ in the UK).
Sulphur dioxide	Sulphur dioxide (SO_2) is a respiratory irritant that can cause constriction of the airways. People with asthma are considered to be particularly sensitive. Health effects can occur very rapidly, making short-term exposure to peak concentrations important. 54% of sulphur dioxide emissions come from the power generation sector.

Non-Methane Volatile Organic Compounds	Non-Methane Volatile Organic Compounds (NMVOCs) are ozone precursor pollutants. This means that they react with other air pollutants to produce ozone. During some weather conditions nitrogen dioxide, ozone and other pollutants can react and condense into PM, adding to that which has been directly emitted. Industry, both large and small, is responsible for 56% of NMVOC emissions.
Ammonia	Ammonia (NH_3) reacts in the atmosphere to produce secondary PM. Farming, specifically the use and storage of slurries, manures and fertilisers, is the biggest source of ammonia emissions (81%).

131. Air quality has improved significantly over recent decades through action taken by successive Governments (Figure 8). Investment by industry in cleaner processes and the shift away from coal towards cleaner forms of energy have been important in securing these improvements. As a result, we currently meet our international commitments for all emissions. The only legal target which the UK is currently failing to meet is on concentrations of NO_2.

Figure 8: Trends in emissions of UK sulphur dioxide, NO_x, non-methane volatile organic compounds, ammonia and particulate matter (PM_{10}, $PM_{2.5}$) 1970 - 2015



132. So we have made progress but more needs to be done. The reason that further action is required is that we now know more than ever before about the extent of harm caused by poor air quality. There is clear and compelling evidence of a link between exposure to air pollution, poor health and shortened life.

Who is most at risk?

133. Air pollution can affect anyone but it has a disproportionate impact on the young and old, the sick and the poor. It has the most acute impacts on the elderly, children, people suffering from chronic respiratory diseases like bronchitis or asthma; and heart disease. While it is important to reduce the overall emissions of these damaging air pollutants, the risk to individuals will depend on their levels of exposure to concentrations of air pollutants. So individual behaviours will have an impact but so will factors over which individuals have little control, like where they live or work. Deprived communities are more likely to be near sources of pollution, and are more likely to experience adverse health impacts.

The challenge

134. Much of the progress so far in reducing emissions of air pollution has focused on big sources of emissions such as industry and energy generation. As emissions from those sources have decreased, the relative contribution of more diffuse sources of air pollution, like open fires in homes and spreading manure on farms, has increased. That means that in future we will need a wider range of approaches to tackling harmful air pollution. We will still need to work with industry to reduce emissions and, in addition, we will also need to think about how we can influence everyday behaviours by individuals at home, on the road and at work.

Action underway

Farming Ammonia Reduction Grant Scheme

Agriculture is the main source of ammonia emissions; accounting for 81% of total emissions in 2015. Within this more than half comes from the dairy and beef sector.

As a first step to reduce ammonia emissions from farming the Government is providing practical help for farmers through the Farming Ammonia Reduction Grant scheme, which funds slurry store covers and advice for dairy and beef farmers to reduce ammonia emissions.

Covers placed on slurry tanks or lagoons could reduce ammonia emissions by between 50 - 90% when compared to an uncovered store. Covers also contribute to reducing emissions of volatile organic compound and can result in efficiencies and cost savings for farmers because reducing the loss of nitrogen from the slurry increases its value as a fertiliser.

Reducing emissions from stoves and open fires

Open Fires and solid fuel stoves account for more than one third (36%) of emissions of fine particulate matter ($PM_{2.5}$).

To help households to make the shift towards more efficient, cleaner fuels and stoves we are working with suppliers and retailers in the stove and fuel industry to increase consumer awareness of the benefits of installing modern efficient stoves, burning cleaner fuels and regular servicing. This will help to cut air pollution and produce more heat from less fuel.

Next steps

135. These changes outlined above will support vibrant, healthy places where people want to live, work and play and will help us to deliver the high-tech, efficient economy of the future.

136. To deliver this vision the Government will:

a. Set out its ambitious air pollution reduction targets in UK law, demonstrating leadership at both national and international levels; and

b. Produce a new UK Air Quality Strategy setting out clear commitments for achieving ambitious reductions in emissions of air pollutants.

11. Glossary

AQEG	Air Quality Expert Group
AQMA	Air Quality Management Area
BEIS	Department for Business, Energy and Industrial Strategy
BRT	Belfast Rapid Transit
CAFS	Cleaner Air for Scotland – The Road to a Healthier Future
CAV	Connected and autonomous vehicle
CBTF	Clean Bus Technology Fund
CNG	Compressed natural gas
CO_2	Carbon dioxide
COMEAP	Committee on the Medical Effects of Air Pollutants
COPERT	COmputer Programme to calculate Emissions from Road Transport
CVRAS	Clean Vehicle Retrofit Accreditation Scheme
CVTF	Clean Vehicle Technology Fund
DAERA	Department of Agriculture, Environment and Rural Affairs
DCLG	Department for Communities and Local Government
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DH	Department of Health
DVSA	Driver and Vehicle Standards Agency
ECA	Emission control area
EST	Energy Saving Trust
EU	European Union
Euro standards	EU-wide standards for exhaust emissions of air pollutants. Current standards for new vehicles are: ‘Euro 6’ for light duty vehicles (cars and vans) and ‘Euro VI’ for heavy duty vehicles.

EV	Electric vehicle
FCEV	Hydrogen fuel cell electric vehicle
GHG	Greenhouse gas
GLA	Greater London Authority
HGV	Heavy goods vehicle
HMRC	Her Majesty's Revenue and Customs
HMT	Her Majesty's Treasury
HRS	Hydrogen refuelling stations
IMO	International Maritime Organisation
LAQM	Local Air Quality Management
LCCT	Low Carbon Truck Trial
LEZ	Low Emission Zone
LGA	Local Government Association
LGV	Light goods vehicle
Low CVP	Low Carbon Vehicle Partnership
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
MARPOL	International Convention for the Prevention of Pollution from Ships
NMF	National Modelling Framework (Scotland)
NLEF	National Low Emission Framework (Scotland)
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides (includes NO and NO_2)
NPIF	National Productivity Investment Fund
NRMM	Non-road mobile machinery
OLEV	Office of Low Emission Vehicles

PFG	Northern Ireland Executive Draft Programme for Government
PHE	Public Health England
PM	Particulate matter
PSB	Public Services Boards (Wales)
R&D	Research and development
SDG	Sustainable development goals (Northern Ireland)
TfL	Transport for London
UK	United Kingdom
ULEV	Ultra low emission vehicle
ULEZ	Ultra Low Emission Zone
UNECE	United Nations Economic Commission for Europe
VCA	Vehicle Certification Agency
VED	Vehicle Excise Duty
WFG Act	Well-being of Future Generations (Wales) Act 2015
WHO	World Health Organization

Annex A – National Productivity Investment Fund

137. In the 2016 Autumn Statement, [48] the UK Government announced a new National Productivity Investment Fund (NPIF) targeted at four areas that are critical for productivity, including transport and research and development (R&D). The NPIF provides for £23 billion of spending between 2017-18 and 2021-22 taking total spending on housing, economic infrastructure and R&D to £170 billion over five years.

138. The NPIF will provide additional support in order to tackle congestion on the roads and ensure the UK's transport networks are fit for the future. It will also enhance the UK's position as a world leader in science and innovation. By 2020-21, the NPIF will:

a. provide an additional £1.1 billion in new funding to relieve congestion and deliver much-needed upgrades on local roads and public transport networks. On strategic roads, an extra £220 million will be invested to tackle key pinch-points;

b. invest a further £290 million for reducing transport emissions. This includes £150 million in support for low emission buses and taxis and £80 million to support ULEV charging infrastructure; and

c. provide an additional £4.7 billion for R&D, to fund both the Industrial Strategy Challenge Fund managed by Innovate UK and the research councils, and funding for innovation, applied science and research awarded by UK Research and Innovation.

139. The Spring Budget 2017[49] provided further detail of how NPIF funds will be invested in transport and R&D:

a. Local transport – NPIF allocations have already been made for 2017-18, supporting local projects like improvements in Blackpool town centre, improving the A483 corridor in Cheshire, major maintenance of the Leicester Outer Ring Road, and a new roundabout at Hales in Norfolk. £690 million more will be competitively allocated to local authorities, with £490 million made available by early autumn 2017.

b. Strategic road network – The Government has completed a strategic study on relieving congestion in the south-west sections of the M25 and will now develop

[48] HMT (2016) Autumn Statement 2016
www.gov.uk/government/publications/autumn-statement-2016-documents

[49] HMT (2017) Spring Budget 2017: documents
www.gov.uk/government/publications/spring-budget-2017-documents

options ahead of the next Road Investment Strategy. The Budget announced regional allocations of the £220 million NPIF investment for pinch points on the strategic road network. DfT will announce details of individual schemes in 2017.

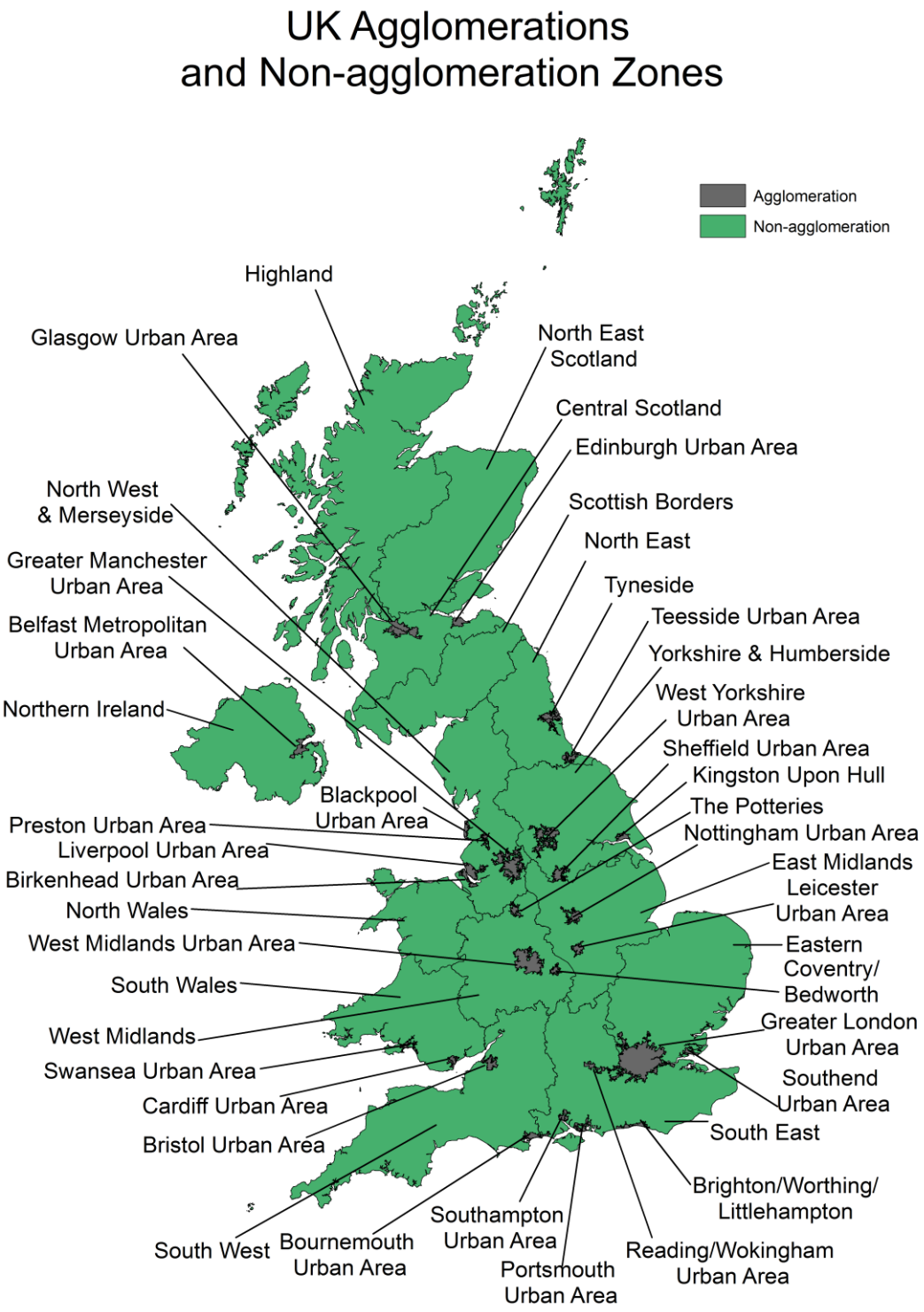
c. R&D - The new Industrial Strategy Challenge Fund will support collaborations between business and the UK's science base. Initial investment of £270 million in 2017-18 will kick-start the development of innovative technologies that have the potential to transform the UK economy. The first wave of challenges funded from the Industrial Strategy Challenge Fund will include leading the world in the development, design and manufacture of batteries that will power the next generation of electric vehicles, helping to tackle air pollution.

Annex B – Air quality grant scheme

140. The UK Government's air quality grant scheme[50] provides funding to eligible local authorities to help improve air quality. The scheme helps local authorities to make air quality improvements and to meet their statutory duties under the Environment Act 1995. It has awarded over £11 million in funding to a variety of projects since 2011. This has included projects to reduce NO_x emissions from the current road vehicle fleet in problem areas and projects to accelerate road vehicle fleet turnover to cleaner vehicles.

[50] Defra (2017) Air quality grant programme
www.gov.uk/government/collections/air-quality-grant-programme

Annex C – UK ambient air quality reporting zones[51]



[51] The forty-three UK zones include twenty-eight agglomeration zones (large urban areas) and fifteen non-agglomeration zones, often referred to as regions

Annex D - UK climatic data, topography and population

The UK climate

141. The UK lies in the latitude of predominately westerly winds where depressions and their associated bands of cloud and rain ('fronts') move eastwards or north-eastwards across the North Atlantic, bringing with them unsettled and windy weather particularly in winter. Between the depressions there are often small mobile anticyclones that bring fair weather. It is the sequence of depressions and anticyclones that is responsible for the UK's changeable weather.

142. The western and northern parts of the UK tend to lie close to the normal path of the Atlantic depressions. Consequently, in those parts of the UK winters tend to be mild and stormy while the summers, when the depression track is further north and the depressions less deep, are mostly cool and windy. The mountains in these regions have the effect of producing a marked increase in rainfall. The lowlands of England have a climate similar to that in continental Europe: drier with a wider range of temperatures than in the north and west. However, the winters are not as severe as those on the continent. Overall, the south of the UK is usually warmer than the north, and the west is wetter than the east. The more extreme weather tends to occur in mountainous regions where it is often cloudy, wet and windy.[52]

143. Detailed UK climatic data is available on the Met Office website.[53]

Topography and population distribution

144. The highest point in England is 978 metres above sea level in the upland Lake District in the North West. The population is concentrated in lowland urban areas, particularly in London and the South East, the Midlands, and the North East and North West.

145. The mountainous regions of north and west-Scotland include the highest point 1344 metres above sea level. The population is concentrated in the lowland central belt between the cities of Glasgow and Edinburgh.

146. The mountainous regions of mid and north-Wales include the highest point 1085 metres above sea level. The population is concentrated in the lowland South which includes Cardiff and Swansea.

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[52] National Meteorological Library and Archive Fact sheet 4 — Climate of the British Isles
www.metoffice.gov.uk/learning/library/publications/factsheets

[53] The Met Office
www.metoffice.gov.uk/

147. The highest point in Northern Ireland is 850 metres above sea level on the south-east coast. The population is concentrated around the city of Belfast on the east coast.

148. Detailed UK population density data is available from the Office of National Statistics.[54]

[54] Office of National Statistics
www.neighbourhood.statistics.gov.uk/HTMLDocs/dvc134_c/index.html

Annex E – Existing actions to reduce emissions of NO_x from the current road vehicle fleet in problem locations now

Low emission zones

149. London has had a Low Emission Zone (LEZ) in place since 2008.[55] Many local authorities outside London are taking steps to encourage cleaner ways of travel and support the uptake of cleaner vehicles through the introduction of low emission zones; retrofit programmes; increasing the proportion of ULEVs in their fleets; providing infrastructure such as electric vehicle charging points; introducing park and ride schemes; and promoting cycling and walking. Other cities outside London which have put in place LEZs include Oxford, Norwich, and Brighton and Hove.[56] [57]

Cycling and Walking Investment Strategy

150. In January 2017, the UK Government announced a combined additional £64 million of government funding from the Access Fund and the Cycling and Walking to Work Fund to encourage more cycling and walking to access work, education and training.[58] The funding will support local projects in England from 2017 to 2020 as part of a wider government package of more than £300 million to boost walking and cycling from 2015-20.

151. The UK Government consulted on a draft Cycling and Walking Investment Strategy for England in 2016. The long-term ambition up to 2040 is that walking and cycling should be a normal part of everyday life and the natural choice for shorter journeys such as the commute to school, college, work or leisure trips, or as part of a longer

[55] Transport for London
https://tfl.gov.uk/modes/driving/low-emission-zone

[56] Oxford City Council
www.oxford.gov.uk/info/20216/air_quality_management/208/oxfords_low_emission_zone_lez

[57] Brighton and Hove City Council
www.brighton-hove.gov.uk/content/parking-and-travel/travel-transport-and-road-safety/low-emission-zone

[58] DfT (2017) £64 million government funding to encourage more cycling and walking to work
www.gov.uk/government/news/64-million-government-funding-to-encourage-more-cycling-and-walking-to-work

journey. The final Cycling and Walking Investment Strategy was published on 21 April 2017.[59]

Investment in bus services

Bus Service Operators Grant

152. In the 2015/16 financial year, the Government invested over £250 million via the Bus Service Operators Grant to support bus services in England.[60]

Green Bus Fund

153. In addition, the Government has invested a total of almost £89 million via the Green Bus Fund to help bus companies and local authorities in England to put over 1200 new low carbon buses on the roads.[61]

Investment in the national and local road network

154. Traffic speed and flow can impact on NO_x emissions, which are typically higher when an engine is under higher loads, such as during acceleration. Infrastructure schemes to tackle road congestion, which reduce stop-start traffic and thus acceleration events can also have air quality benefits.

155. In the 2016 Autumn Statement, the UK Government announced new funding (Annex A) to relieve road congestion, including additional investment to tackle key pinch-points on the strategic road network (motorways and major A roads) in England.

Action by Highways England to improve air quality on the strategic road network in England

156. Highways England is the government company charged with operating, maintaining and improving England's motorways and major A roads.

157. Through the Road Investment Strategy,[62] the UK Government has allocated a ring-fenced £100 million for an Air Quality Fund available through to 2021 for Highways

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[59] DfT (2017) Cycling and walking investment strategy
www.gov.uk/government/publications/cycling-and-walking-investment-strategy

[60] DfT (2016) Bus Services: grants and funding
www.gov.uk/government/collections/bus-services-grants-and-funding

[61] DfT (2013) Details of the Green Bus Fund
www.gov.uk/government/publications/details-of-the-green-bus-fund

England to improve air quality on its network, to meet the dual vision of the Strategy of not only protecting the environment but also improving it, including air quality.

158. A programme of pilot studies is being delivered to help understand the air quality challenges alongside the motorway network and to try and identify the solutions to tackle it. Where the pilot studies demonstrate effective solutions to help manage the air quality challenge, Highways England working with others, will look to see how it can best deliver these solutions.

159. The UK Government has also allocated a ring-fenced £250 million for a Cycling, Safety, and Integration Fund available through to 2021 for Highways England to improve safety, increase provision for cyclists on and near its network, and enhance access for a variety of users, including pedestrians, horse riders and the disabled. This includes £100 million to deliver improvements for cyclists at 200 locations on the network.

Other roads

160. Local authorities are responsible for roads outside the strategic road network and many local authorities in England have put in place infrastructure schemes and other measures to tackle local congestion and improve air quality.

161. Defra's air quality grant scheme provides funding to eligible local authorities to help improve air quality (Annex B). The scheme has funded a variety of projects since it started in 1997, including traffic management measures.

162. Other measures to address air quality, both on local roads and on the strategic road network, are described throughout this document.

Retrofit technology and accreditation

163. Retrofitting refers to all or part of an engine being modified with pollution-reducing technology, reducing emissions of NO_x. Technologies include: exhaust gas treatment technologies, such as selective catalytic reduction technology, thermal management technology; fuel saving technologies such as hybridisation; and more extensive modification for fuel conversion to compressed/ liquefied natural gas, electric, hydrogen or liquefied petroleum gas. Retrofitting has the potential for significant reductions in emissions of NO_x.

164. The Government believes that continued development, promotion and implementation of innovative retrofit technology will be an important element of

[62] DfT (2015) Road investment strategy: 2015 to 2020
www.gov.uk/government/collections/road-investment-strategy

reducing emissions of NO_x and help bridge the gap in the journey towards zero emissions by 2050.

165. There is a small but successful retrofit industry in the UK which mainly focuses on larger vehicles. Several thousand vehicles have already been retrofitted in recent years under Department for Transport (DfT) programmes. Since 2013, Government has awarded over £27 million to retrofit almost 3,000 of the oldest vehicles (mainly buses) under the following three schemes:

    a. £5m was provided to Transport for London (TfL) to retrofit 900 buses;

    b. The Clean Bus Technology Fund (CBTF) [63] which has provided £14.1 million (over 2013/14 and 2015/16) to support the retrofit of nearly 1,000 local buses; and

    c. The Clean Vehicle Technology Fund (CVTF) [64] which has provided £8 million (in 2014/15) to local and transport authorities to retrofit over 1,200 vehicles using innovative pollution reducing technologies in a range of vehicles (buses, taxis, vans, fire engines and ambulances).

Clean Bus Technology Fund

166. The most recent of these schemes was the CBTF 2015/16, where 18 local authorities were awarded funds to retrofit 439 buses with technology to reduce nitrogen oxide emissions by at least 50% and up to 90%. The buses were fitted with exhaust gas treatment systems called selective catalytic reduction (SCR) and, as part of the award, councils must continue to monitor the schemes and provide evidence of their effectiveness. Due to their high mileage and long operational life, introducing greener buses can significantly help air quality in town and city centres. The buses upgraded from this fund will complete more than a million journeys a year.

Clean Vehicle Technology Fund

167. The CVTF started to expand retrofit to other types of vehicles, including coaches and taxis, and supported innovative technologies including solar panels on ambulances in Yorkshire and conversion of black cabs from diesel to Liquid Petroleum Gas in Birmingham. A prerequisite of the grant was for local authorities to undertake NO_x monitoring to demonstrate the performance of the retrofit technology.

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[63] DfT (2016) Clean Bus Technology Fund 2015
www.gov.uk/government/collections/clean-bus-technology-fund

[64] DfT (2016) Clean Vehicle Technology Fund
www.gov.uk/government/collections/clean-vehicle-technology-fund

Evaluation of Clean Bus Technology Fund and Clean Vehicle Technology Fund projects

168. The Government is carrying out a full evaluation of the projects under CBTF and CVTF in order to develop an evidence base on retrofit options and understand further the successes and shortcomings of past schemes. The evaluation will determine whether the retrofit technologies implemented achieved the expected NO_x reductions, help identify any common delivery issues and consider if there is a significant fuel consumption or greenhouse gas penalty. The evaluation will cover all technologies deployed so far. An important part of this work will be sharing the learning with stakeholders, including through a workshop with local authorities in summer 2017. This will help stakeholders to understand the retrofit market and develop input for any future schemes using this evidence. The evaluation project will also help to ensure that evidence and best practice is considered in the design of future retrofit schemes.

Clean Vehicle Retrofit Accreditation Scheme

169. With the development of Clean Air Zones, we also need to develop a framework to test, validate and certify retrofitted vehicles so that we understand further which technologies successfully reduce emissions and which technologies can qualify to enter a Clean Air Zone free of charge. In 2017-18, the UK Government will establish a Clean Vehicle Retrofit Accreditation Scheme (CVRAS) which will provide independent evidence that a vehicle retrofit technology will deliver the expected pollutant emissions reductions and air quality benefits. The scheme will enable drivers, technology manufacturers, businesses and local authorities to be confident that the retrofit technologies being used provide the appropriate emissions reductions for free entry to a Clean Air Zone. The scheme is expected to be in place in 2017. Alongside this, the UK Government will continue to explore the approach to enforcement as part of the implementation of Clean Air Zones to ensure that retrofitted vehicles can be recognised in enforcement and that any retrofit equipment is fitted and working appropriately.

Additional funding

170. In the 2016 Autumn Statement, the UK Government announced a further £150 million in support for low emission buses and taxis (Annexes A and F). Part of this funding will be used to reduce the emissions of 1,500 buses through retrofitting the vehicles to higher emissions standards, reducing their air pollutant emissions. The UK Government plans to announce further details on the funding allocation, timing and design for this scheme later in 2017. For a 2017/18 programme, it is likely that this will be similar to the design of the CBTF as this will be the quickest way to deliver a retrofit programme. The CBTF was open to all local authorities in England to apply but funding was prioritised to those towns and cities with the greatest air quality compliance challenge. Applicants were encouraged to consider forming partnerships with other local authorities.

Driving style

171. Excessive speed, maintaining high engine revolutions, and accelerating hard are all known to increase fuel consumption and can affect emissions of NO_x and PM. Currently, a £2.8 million programme is managed by the Energy Savings Trust (EST) to support businesses reduce their fuel use, though fleet choice and operation, and training drivers to improve their driving techniques. Fuel consumption is typically reduced by around 15% by the end of a single lesson, with longer term savings between 3% and 6%. A number of studies, including the 'ecoDriver' programme[65] that evaluated technology that supports improved driving technique, suggest that emissions will also decline. Fuel efficient driving is on the driving test syllabus but not a pass/fail element in the practical test, i.e. drivers may receive feedback. Many of the behaviours associated with safe driving (which is a pass/fail element) such as road awareness, anticipation and avoiding excessive speed will also support fuel efficient driving.

172. Around 11,000 drivers will receive subsidised efficient driver training this year through the EST programme, almost doubling uptake in the previous year. Training is delivered in partnership with commercial driving trainer companies; nearly 600 DVSA-registered fleet trainers have been trained to date, with 15 providers participating in the scheme. In addition to fleet trainers, the scheme expanded this year to include training for Advanced Driving Instructors who can incorporate the training in learner and other post-test learner lessons.

173. Work to increase the numbers of instructors trained in efficient driving, and the numbers of drivers who receive the training, is planned for the next financial year. Work to increase further the numbers of drivers who receive the training and extend the training to private motorists could potentially begin during 2017 subject to this being part of the 2017/18 EST programme. Early work suggested that there is no great demand from private motorists. This and other means to support improved driving style, for example the uptake of new technology and how best to target information, will continue to be explored with key stakeholders including motor manufacturers.

Alternative fuels

174. Alternative fuels such as natural gas, liquefied petroleum gas (LPG) and paraffinic diesel may have the potential to reduce emissions of NO_x from road transport vehicles. The type of energy used to power transport can also have a significant effect on greenhouse gas emissions. Both of these aspects should be considered when considering alternative fuels.

[65] ecoDriver (2016)
www.ecodriver-project.eu/events/ecodriver-final-event-2/

175. The environmental benefits of these fuels vary depending on the type of vehicle in which they are used and how that vehicle is used. For example, whilst the air quality benefits of switching from a Euro V truck to a new dedicated natural gas one may be significant, if the Euro V truck were converted to run on dual fuel (diesel/natural gas) the air quality benefit could be minimal (depending on the level of diesel substitution) and there is substantial risk of methane slip[66] which has considerable greenhouse gas (GHG) implications. Whilst emissions of NO_x from Euro VI gas trucks were seen to be lower than their diesel comparators in recent DfT trials, in real terms the air quality benefit was small due to improvements in technology reducing emissions of NO_x in the most recent heavy diesel vehicles. In addition there are some cases, such as paraffinic diesel, where the benefits are currently very uncertain and further research is planned (Annex K). Alternative fuels are used in only a small number of road vehicles currently. Increasing the use of specific alternative fuels in certain vehicles may have the potential to reduce emissions of NO_x. Further advice on this will be published within the next year in a long term strategy for the UK's transition to zero vehicle emissions.

176. Increased uptake of alternative fuels could be achieved by encouraging the purchase of manufacturer produced vehicles, by retro-fitting existing vehicles or, in the case of some 'drop-in' fuels, by increasing their use in existing vehicles.

177. Government support for alternative fuels is provided through reductions in Fuel Duty for gaseous fuels,[67] through a range of grant trial programmes and (for low carbon fuels) through the Renewable Transport Fuels Obligation as well as through the actions to accelerate turnover to cleaner vehicles set out in Annex F.

178. DfT is gathering evidence on the energy sources that are currently in use or might be used in future to power road transport, and analysing these data to develop a coherent picture of their environmental, economic and social impacts. The results will allow the Government to consistently compare a wide range of potential road transport energy pathways over the period to 2050. This will bring together greenhouse gas (GHG) and air quality emissions across a range of alternative fuels and vehicle types.

Compressed natural gas (CNG) or Liquefied natural gas (LNG)

179. Natural gas (methane) comes in two main forms as a transport fuel, either as compressed natural gas (CNG) or further pressurised and cooled to form liquefied natural gas (LNG). The use of natural gas in road transport in the UK has been limited to specific markets or niche applications, mainly on larger vehicle types such as buses (Annex F – Low Emission Bus Scheme) and HGVs. Natural gas is a significant change

[66] 'Methane slip' means emissions of unburnt methane into the atmosphere

[67] HMRC (2016) Fuel Duty
www.gov.uk/guidance/fuel-duty

from existing transport fuels in that it requires new dedicated infrastructure for refuelling and retrofit, or the purchase of new vehicles.

Low Carbon Truck Trial

180. The Government has provided over £11 million via the Low Carbon Truck Trial (LCTT) to part-fund around 370 alternatively-fuelled commercial vehicles, with most using a gas or dual fuel system (diesel and gas) plus gas refuelling sites. The trial has been successful in stimulating the gas truck and dual fuel retrofit conversion market and in delivering new and upgraded refuelling infrastructure. The trial has provided evidence to understand better the greenhouse gas and air pollution impacts associated with gas and duel-fuelled (diesel/gas) HGVs.[68] [69]

181. CNG and LNG demonstrate improvements in HGV NO_x emissions compared to older EURO V (and earlier) vehicles, however the improvements are marginal compared to newer EURO VI HGV vehicles.

Liquefied petroleum gas (LPG)

182. LPG is produced both from oil and gas extraction and as a by-product of fossil fuel refining. LPG is a well-established niche automotive fuel in a number of EU countries but is currently used in only a very small proportion of cars, vans and taxis in the UK. LPG is used in petrol engines so it is not well suited to use in heavy duty diesel vehicles such as buses and HGVs.

183. The Government has funded a Birmingham City Council project to convert taxis to LPG. Taxis are significant contributors to poor air quality in inner city Birmingham and other air quality hotspots. Data from this project will be used to ascertain whether or not the proposed benefits materialise in real world driving conditions.

[68] DfT (2017) Emissions testing of gas-powered commercial vehicles
www.gov.uk/government/publications/emissions-testing-of-gas-powered-commercial-vehicles

[69] DfT (2017) Low carbon truck and refuelling infrastructure demonstration trial: final report
www.gov.uk/government/publications/low-carbon-truck-and-refuelling-infrastructure-demonstration-trial-final-report

Annex F – Existing actions to accelerate road vehicle fleet turnover to cleaner vehicles to ensure that the problem remains addressed and does not move to other locations

Promoting uptake of ultra low emission vehicles (ULEVs)

184. The Office of Low Emission Vehicles (OLEV) works across government to support the early market for ULEVs. The Government has committed to spend more than £600 million between 2015-20, supplemented by an additional £270 million in the 2016 Autumn Statement, to position the UK at the global forefront of ULEV development, manufacture and use. This will contribute to economic growth and will help reduce greenhouse gas emissions and air pollution on our roads.

185. The number of new ULEV registrations has increased significantly since 2010 supporting the Government's aim for almost every car and van to be a zero emission vehicle by 2050.

186. During 2015, 29,963 new ULEVs were registered for the first time, up 89% from 15,833 during 2014. This amounted to 0.9% of all new vehicle registrations - up from 0.5% one year previously and 0.2% two years before - and market uptake is known to have grown further in 2016. Almost all of these registrations are of vehicles eligible for the plug-in car and van grants. Low emission vehicles also benefit from reduced or zero Vehicle Excise Duty, and preferential Company Car Tax rates if they are liable. The growth in ULEVs is being influenced by new models coming into the market, and increasingly, more competitive pricing.[70]

187. The UK Government's 2016 Autumn Statement included £80 million additional funding for ULEV charging infrastructure, £50 million for ULEV taxis, and to provide at least 550 new electric and hydrogen buses (Annex A). The Government is also funding research and development into electric vehicle batteries and a range of other ULEV technologies (Annex K).

[70] National Statistics (2016) Vehicle licensing statistics
www.gov.uk/government/collections/vehicles-statistics

Plug-in Car, Motorcycle, Van and Taxi Grants

188. OLEV provides funding for Plug-in Car, Motorcycle (introduced in 2016[71]) and Van (extended and expanded in 2016[72]) grants to assist consumers and businesses with the cost of new ULEV cars, vans and motorcycles.[73] In 2017, OLEV launched a new £50 million Plug-in Taxi Grant to assist drivers with the cost of new ULEV taxis (Section 7).

Charging infrastructure

189. The UK now has more than 11,500 public chargepoints for plug-in vehicles, including Europe's largest network of rapid chargepoints. OLEV continues to provide a range of support to grow the network further and to make it easy and convenient to own and use a plug-in vehicle.[74]

190. The Electric Vehicle Homecharge Scheme provides grants of up to £500 to help with the costs of installing a chargepoint for motorists with off-street parking. Evidence shows drivers do most of their charging at home.

191. In December 2016 the On-Street Residential Charging Scheme was launched, giving local authorities access to grant funding and guidance to support the installation of charging infrastructure for drivers without access to off-street parking.

192. A new Workplace Charging Scheme was also launched in November 2016. This provides support towards the purchase and installation of electric vehicle (EV) chargepoints in carparks, for eligible businesses, charities and public sector organisations. Charging at work provides another option for EV drivers without access to home charging, and facilitates longer EV commutes for those that do.

193. In addition to improving existing tax incentives for ULEVs in company car tax and salary sacrifice schemes, the Government announced additional tax incentives for

[71] OLEV (2016) £35 million boost for ultra low emission vehicles
www.gov.uk/government/news/35-million-boost-for-ultra-low-emission-vehicles

[72] OLEV (2016) £4 million boost to help businesses switch vans and trucks to electric
www.gov.uk/government/news/4-million-boost-to-help-businesses-switch-vans-and-trucks-to-electric

[73] OLEV (2017) Plug-in car and van grants
www.gov.uk/plug-in-car-van-grants

[74] OLEV (2016) Grant schemes for electric vehicle charging infrastructure
www.gov.uk/government/collections/government-grants-for-low-emission-vehicles

companies investing in chargepoints for electric vehicles in the 2016 Autumn Statement.[75]

194. To help support the use of electric and hybrid vehicles on the strategic road network (motorways and major A roads) Highways England is rolling-out a network of ULEV charging infrastructure to ensure that 95% of its network will have a charge point every 20 miles. Wherever possible these will be rapid chargepoints that can charge most ULEVs in less than 30 minutes.

Local measures

195. To encourage local action to accelerate uptake of ULEVs, OLEV is providing funding of £35 million through the *Go Ultra Low* City Scheme. This aims to help four cities (Bristol and the West of England, London, Milton Keynes, and Nottingham) become national and global exemplars with significantly increased uptake of ULEVs, through innovative measures such as rapid chargepoint hubs and access to bus lanes. The scheme is also providing £5 million of development funding for specific initiatives in Dundee, Oxford, York and the North East.

Hydrogen fuel cells

196. Government is currently providing £4.8 million through the Hydrogen for Transport Advancement Programme to support the creation of a geographically focussed network of 12 hydrogen refuelling stations (HRS). Hydrogen fuel cell electric vehicles (FCEVs) have the potential to play a significant role, alongside battery electric vehicles. The majority of these stations are now completed and publicly accessible. A £2 million funding programme for fleets to become early adopters of FCEVs is now underway with winning bids announced in October 2016.[76] This is supporting deployment of 50 vehicles in both public and private sector fleets, including local councils, emergency authorities and car hire firms. The deployment of the vehicles will help raise awareness of the technology, evaluate fleet user experience and support the utilisation of HRS.

[75] Gov.uk (2016) Capital allowances: first-year allowance for electric charge-points www.gov.uk/government/publications/capital-allowances-first-year-allowance-for-electric-charge-points/capital-allowances-first-year-allowance-for-electric-charge-points

[76] OLEV (2016) Government launches £2 million competition to promote roll-out of hydrogen-fuelled fleet vehicles www.gov.uk/government/news/government-launches-2-million-competition-to-promote-roll-out-of-hydrogen-fuelled-fleet-vehicles

Low Emission Bus Scheme

197. OLEV is also funding a Low Emission Bus Scheme,[77] which has three objectives:

a. To increase the uptake of low and ultra-low emission buses, speeding up the transition to an ultra-low emission bus fleet in England and Wales, and removing the need for subsidy support;

b. To support the improvement of local air quality; and

c. To support OLEV's commitment to attracting investment in the UK

198. In July 2016, funding of £30 million was awarded to thirteen successful bidders enabling them to add over 300 buses – including electric, hybrid, hydrogen and biomethane (natural gas) buses – to their fleets, and to install over £7 million worth of supporting infrastructure.

199. An additional £100 million from the 2016 Autumn Statement has been allocated for low emission buses (Annexes A and E). In 2017, the Government will announce how this funding will be distributed, including how various bodies can apply for a share of the funding for new bus procurement or retrofitting of existing buses. Deployment of low emission and zero emission buses and retrofitting can enable improvements in local air quality and deliver carbon savings.

Low Emission Freight and Logistics trial

200. In January 2017, the DfT, OLEV and Innovate UK announced twenty projects awarded over £20 million through the Low Emission Freight and Logistics trial.[78] The aim of the competition is to demonstrate new technologies and to encourage the widespread introduction of low and zero emission vehicles to UK fleets. It will bring over 300 low emission vehicles on to UK roads from mid-2017. As part of the competition the government will also be assessing the emissions of the vehicles and will produce a public report which assesses the benefits of the different technologies.

[77] OLEV (2015) Low Emission Bus Scheme
www.gov.uk/government/publications/low-emission-bus-scheme

[78] DfT (2017) Low emission freight and logistics trial competition winners announced
www.gov.uk/government/news/low-emmission-freight-and-logistics-trial-competition-winners-announced

Annex G – Existing measures to reduce emissions of NO_x from other forms of transport such as rail, aviation and shipping

Rail investment

201. Emissions from the rail sector are relatively low and the UK is committed to reducing them further. All new diesel locomotives and railcars are fitted with engines that meet non-road mobile machinery (NRMM) emissions standards. Recent train operating franchises that the Department for Transport has negotiated have included commitments to replace older diesel units with new units compliant with the latest standards.

202. Electric trains are zero-emission at the point of use which makes them ideal for areas at risk of air quality problems. The UK Government[79] and the Scottish Government[80] have been undertaking multi-billion pound rail electrification programmes that are resulting in a significant number of diesel trains progressively being replaced with electric equivalents.

Aviation

203. Emissions at airports are a small proportion of overall UK emissions, with aircraft contributing 1% of UK NO_x emissions and 0.1% of UK particulate (PM_{10}) emissions. Road transport sources are the main contributor of emissions around airports so airport surface access strategies are important in tackling air quality around airports, as well as all other measures to reduce emissions from road vehicles travelling to and from airports.

204. UK Government policy on aviation-related air quality is to seek improved international standards to reduce emissions from aircraft and to encourage the aviation industry to put in place measures to reduce emissions for which it is responsible. Industry is working together to reduce airport-related emissions through measures including operating aircraft more efficiently, introducing efficient new technology, using

[79] Network Rail - electrification
www.networkrail.co.uk/our-railway-upgrade-plan/key-projects/electrification/

[80] Transport Scotland – electrification programme
www.transport.gov.scot/project/electrification-programme

landing charges to incentivise cleaner aircraft, reducing vehicle emissions within the airport boundary and sustainable surface access.[81]

Ports and shipping

Ports

205. Connecting ships and other vessels to on shore electricity supply at ports and marinas can help reductions in pollutant emissions through alleviating the need for on board energy generation.

206. The UK Government has encouraged ports to design new developments so that the necessary equipment could be installed without undue cost and disruption, should it be decided in future to install shore-side electricity. For port development, especially for nationally significant infrastructure projects as defined in the Planning Act 2008, the National Policy Statement for Ports[82] provides that proposed developments should at least make reasonable advance provision for shore-side supply or explain why this would not be economically and environmentally worthwhile.

207. There are opportunities for existing development to explore the opportunities for shore-side electricity supply connections and further reduce emissions at port side. A technical standard for onshore electricity supply connections has been agreed.[83] This should provide confidence for those investing in these facilities that there is a common standard across the industry. The UK Government will continue to encourage ports and shipping companies to examine the opportunities available, particularly in areas identified as having poor air quality.

Shipping

208. The International Convention for the Prevention of Pollution from Ships (MARPOL)[84] regulates pollution from ships, and the overwhelming majority of states, including the UK, are parties to it.

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[81] Sustainable Aviation: UK Aviation and Air Quality www.sustainableaviation.co.uk/wp-content/uploads/2017/01/SA-A4_UK-Aviation-and-Air-Quality_Report1.pdf

[82] DfT (2012) National policy statement for ports www.gov.uk/government/publications/national-policy-statement-for-ports

[83] OLEV (2016) Consultation on alternative fuels infrastructure www.gov.uk/government/consultations/transposition-of-directive-201494eu-on-alternative-fuels-infrastructure

[84] IMO (1973) International Convention for the Prevention of Pollution from Ships www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-%28MARPOL%29.aspx

209. MARPOL's Annex VI sets out a staged progression of more stringent limits for sulphur oxides and NO_x emissions, both inside and outside waters designated by the International Maritime Organisation (IMO) as an emission control area (ECA). The UK Government has supported the introduction of a NO_x ECA for the North Sea (including the English Channel) and in October 2016, the IMO decided to apply this designation to the North Sea and the Baltic Sea. The NO_x ECA will impose strict Tier III NO_x limits from 2021 onwards, which in time will see a 75-80 % reduction in NO_x emissions from ships operating in these waters.

Annex H – Existing measures to reduce emissions of NO_x from industry and non-road mobile machinery

Industrial emissions

210. Significant strides have been made in reducing industrial emissions in the UK. Emissions from power stations and industrial combustion plants have reduced significantly, reflecting a long-term trend away from the use of coal and oil in favour of natural gas and renewable energy sources. The 16% decrease in total NO_x emissions between 2012 and 2015 occurred due to the closure of a number of coal-fired power stations.

Medium Combustion Plants and generators

211. Section 7 provides further information on the additional UK measures proposed to tackle NO_x emissions from Medium Combustion Plants and generators.

Non-road mobile machinery (NRMM)

212. Engines in mobile equipment not directly related to the transportation of passengers or goods, such as excavators and bulldozers used in construction, are covered by regulations for NRMM. Engines for sale must be approved to demonstrate compliance with pollutant emission standards, including NO_x. Section 7 provides further information on the latest developments of these standards.

Annex I – Existing measures to reduce emissions of NO_x from buildings, both commercial and domestic, and other stationary sources

Buildings

213. Emissions from commercial (non-industrial) and domestic building represent a small proportion of overall UK NO_x emissions. Over the last decade, the UK has introduced a range of energy efficiency measures for buildings and homes to reduce their use of fossil fuels including the Building Regulations, which set stringent standards for the insulating performance of newly constructed buildings. They also set standards for replacing thermal elements, such as windows, and standards for when a thermal element is renovated (e.g. loft insulation when re-roofing).

214. Each year in England about 1.2 million new boilers are installed in homes. The Building Regulations sets high efficiency standards for new boilers, which means that in normal circumstances when a boiler is replaced, it will be replaced with a condensing boiler. Modern condensing boilers typically produce far less NO_x than older boilers. Statutory guidance for Part L of the Building Regulations also sets standards for minimum controls when a heating system is installed, which should further reduce fuel consumption and emissions including NO_x. In December 2016, Government consulted on whether to strengthen these standards further.[85]

Other stationary sources

The Clean Air Act

215. The Clean Air Act (1993) enables local authorities throughout England, Scotland and Wales to designate Smoke Control Areas, in which smoke emissions are prohibited unless using an exempted appliance or authorised fuel.[86]

[85] BEIS (2016) Consultation on Heat in Buildings - The Future of Heat
www.gov.uk/government/consultations/heat-in-buildings-the-future-of-heat

[86] Gov.uk (2016) Smoke control areas: the rules
www.gov.uk/smoke-control-area-rules

Solid fuel boilers and local space heaters

216. In 2015 new laws on ecodesign requirements for solid fuel boilers and solid fuel local space heaters came into force introducing emission criteria for a number of pollutants including NO_x by at least 2020 and 2022 respectively. The Stove Industry Alliance has launched the Ecodesign Ready Scheme[87] to meet the new emissions standards ahead of the statutory deadline.

[87] Stove Industry Alliance: Ecodesign Ready stoves and Air Quality
http://www.stoveindustryalliance.com/ecodesign-ready-stoves-and-air-quality/

Annex J – Land use and infrastructure planning

217. The National Planning Policy Framework[88] sets out national planning policies and principles for England. To support the Framework, Planning Practice Guidance on air quality[89] provides guiding principles on how planning decisions should take account of the impact of new development on air quality.

218. The National Policy Statement for National Networks[90] presented under the Planning Act 2008, sets out:

a. the need for development of road, rail and strategic rail freight interchange projects on the national networks; and

b. the policy against which decisions on major road and rail projects will be made.

The Statement sets out how decisions must take account of impacts on air quality.

219. The Scottish Government's 'Cleaner Air for Scotland – The Road to a Healthier Future' sets out a national approach to improving air quality, including through placemaking: the way in which towns and cities are planned, designed and managed (See Section 7.5).

220. The Welsh Government's 'Planning Policy Wales'[91] sets out land use planning policies with regard to air quality.

221. The Northern Ireland Executive's Draft Programme for Government 2016-2021 includes outcomes relevant to delivering improvements in Northern Ireland's air quality (See Section 7.7).

[88] DCLG (2012) National Planning Policy Framework
www.gov.uk/government/publications/national-planning-policy-framework--2

[89] DCLG (2014) Planning Practice Guidance on Air Quality
http://planningguidance.communities.gov.uk/blog/guidance/air-quality/

[90] DfT (2014) National policy statement for national networks
www.gov.uk/government/publications/national-policy-statement-for-national-networks

[91] Welsh Government (2017) Planning Policy Wales (Edition 9, November 2016)
http://gov.wales/topics/planning/policy/ppw/?lang=en

Annex K – Innovation, research and development of new technologies

222. The Government is working in partnership with industry to deliver a long-term Industrial Strategy[92] to support economic growth. This includes investment in new technologies such as low carbon propulsion where the UK has the capacity to become a world leader. Innovate UK, a Non Departmental Public Body sponsored by the Department for Business, Energy and Industrial Strategy (BEIS) leads on working with stakeholders to drive science and technology innovations to grow the UK economy.

The Advanced Propulsion Centre

223. As part of the Industrial Strategy, the Government is co-funding the £1 billion Advanced Propulsion Centre UK,[93] a ten-year commitment between government and the automotive industry formed in 2013, to help companies to develop the next generation of low carbon propulsion technologies.

New low emission vehicle systems

224. In September 2016, OLEV, BEIS and Innovate UK announced[94] up to £24 million of competition funding for business projects to develop new vehicle technologies that deliver low emissions. Funding is available for three types of project:

a. Feasibility studies into technology that can achieve significant emissions savings in road vehicles;

b. Proof of concept for technologies that can achieve significant emissions savings in road vehicles; and

c. Collaborative research and development on projects that can achieve significant emissions savings in road vehicles and can produce results within one year.

225. The UK Government announced the seven successful applicants in April 2017 within a package of over £109 million of government funding, alongside significant

[92] BEIS (2014) Industrial strategy explained
www.gov.uk/government/publications/industrial-strategy-explained

[93] The Advanced Propulsion Centre UK
www.apcuk.co.uk/

[94] Innovate UK (2016) New low emission vehicle systems: apply for business funding
www.gov.uk/government/news/new-low-emission-vehicle-systems-apply-for-business-funding

industry funding, to help develop the next generation of driverless and low-carbon vehicles as part of the Industrial Strategy and the UK Government's Plan for Britain.[95]

Alternative fuels

226. Paraffinic diesel fuels are liquid fuels that can be synthetically manufactured from feedstock such as natural gas (gas-to-liquid), biomass (biomass-to-liquid), coal (coal-to-liquid) or from hydro-treating vegetable oil. The DfT is undertaking a testing programme to explore the potential air quality benefits of using paraffinic diesel in different vehicle types/ Euro standards based on laboratory and real world performance. Potential side-effects of this fuel will also be examined.

Batteries

227. Development of batteries to produce more power and store more energy focusses on new battery chemistries, materials for electrodes and electrolyte formulations, supported by advancements in battery control electronics. OLEV funding delivered through Innovate UK is supporting a range of R&D projects aimed at driving forward UK-based technology for alternative battery chemistries. These may offer benefits over the existing Lithium-ion chemistries, such as superior energy density and lower cost.

228. In 2015, OLEV identified a gap in the UK battery technology supply chain and capability, which was the design and manufacture of battery packs from cell level. A consortium led by Warwick Manufacturing Group won £10 million of dedicated funding to develop an automotive battery production scale-up facility in the UK.[96] For the first time, the project brings together in the UK the very best expertise in each area of battery production to design a flexible, scalable, modular battery architecture and aggregate demand at the component level. This allows product development to achieve standards of quality, safety and robustness more typical of high volume production.

229. The Government announced new challenge funding for electric vehicle battery development in the Spring Budget 2017 (Annex A).

[95] DfT & BEIS (2017) Over £109 million of funding for driverless and low carbon projects www.gov.uk/government/news/over-109-million-of-funding-for-driverless-and-low-carbon-projects

[96] BEIS (2015) Low carbon vehicles get government backing at annual sector show www.gov.uk/government/news/low-carbon-vehicles-get-government-backing-at-annual-sector-show

Annex L – Local authorities with roads with NO_2 concentrations forecast above statutory limits based on initial modelling

230. Table 1 below sets out the UK Government's best available forecast of UK local authorities with one or more roads with concentrations of NO_2 above statutory limits and for how long these exceedances would last if no additional measures were taken. The table excludes any roads managed directly by Highways England (strategic road network) Transport Scotland, Welsh Government and Transport Northern Ireland.

231. The UK Government will require local authorities outside of London in England to implement plans to address these exceedances within the shortest possible time as set out in Section 7.4.1. The UK Government is engaging with local authorities so as to help establish how quickly measures could be implemented in their areas.

232. Actions to tackle exceedances in London are the responsibility of the Mayor of London and are set out in Section 7.4.5. Actions to tackle exceedances in Scotland, Wales and Northern Ireland are set out in Sections 7.5, 7.6 and 7.7 respectively and are the responsibilities of the relevant devolved administrations.

233. The UK Government is undertaking further modelling using updated emissions and traffic data, which will be complete before the publication of the final plan and may result in some changes to forecasts. So far it has had some initial discussions with local authorities affected. A small number have put forward evidence which suggests that actual concentrations will be lower than those forecast below due to planned road schemes that will reduce traffic on the affected roads. This includes Halton Borough Council (Gateway Mersey Project) and Wakefield Metropolitan District Council (Eastern Relief Road) both due to be completed in 2017. The UK Government is also aware of planned road schemes in Fareham (Stubbington By-Pass) and Plymouth (Forder Valley Link Road).

Table 1: Local authorities with roads with concentrations of NO_2 forecast above legal limits based on initial modelling (subject to change) and assuming no additional measures. All figures are provided in µg/m^3 and 40 µg/m^3 is the statutory annual mean limit value for NO_2.

Note - excludes any roads managed directly by Highways England, Transport Scotland, Welsh Government and Transport Northern Ireland

Name	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Aberdeen City Council	**45**	**43**	40	38	37	35	34	32	31	30	30	29	28	28
Ashfield District Council	**43**	**41**	38	36	34	32	31	29	27	26	25	24	24	23
Basildon District Council	**52**	**50**	**48**	**46**	**44**	**41**	39	36	34	33	31	30	29	28
Basingstoke and Deane Borough Council	**45**	**43**	**41**	40	38	36	34	32	29	28	27	26	25	24
Birmingham City Council	**60**	**59**	**58**	**57**	**54**	**51**	**48**	**45**	**42**	**41**	39	38	37	35
Blaby District Council	**43**	**41**	39	38	36	34	32	31	29	28	27	26	25	24
Bolsover District Council	**48**	**46**	**43**	40	38	36	34	32	30	29	28	27	26	26
Bolton Metropolitan Borough Council	**50**	**48**	**47**	**45**	**43**	**41**	38	36	34	33	32	30	29	28
Bournemouth Borough Council	**45**	**44**	**42**	**41**	39	37	35	32	30	29	28	27	25	24
Bradford City Council	**48**	**46**	**44**	**43**	**41**	39	37	35	32	31	30	29	28	27
Bristol City Council	**50**	**47**	**45**	**42**	40	38	36	34	32	31	30	29	28	26
Broxbourne Borough Council	**42**	40	38	36	34	33	31	29	27	26	25	24	23	22
Broxtowe Borough Council	**41**	39	38	37	35	33	32	30	28	27	26	26	25	24
Burnley Borough Council	**44**	**42**	**41**	39	37	35	33	31	29	28	27	26	25	24
Bury Metropolitan Borough Council	**49**	**47**	**45**	**43**	40	38	36	34	32	31	30	28	27	26
Calderdale Metropolitan Borough Council	**44**	**42**	40	38	36	34	32	31	29	28	27	26	25	24
Cardiff County Council	**56**	**54**	**52**	**50**	**47**	**45**	**42**	39	37	35	34	32	31	29
Chelmsford Borough Council	**41**	40	39	37	36	34	32	30	29	27	26	25	24	23
Cheltenham Borough Council	**42**	**41**	39	38	36	34	32	31	29	28	27	25	24	23
Coventry City Council	**48**	**46**	**43**	40	38	37	35	33	31	30	29	28	27	27
Dartford Borough Council	**41**	39	37	35	33	31	29	27	25	24	23	23	22	21
Derby City Council	**57**	**55**	**53**	**51**	**48**	**46**	**43**	40	38	37	35	34	32	31
Doncaster Metropolitan Borough Council	**44**	**44**	**43**	**43**	**41**	39	37	35	33	32	31	29	28	27
Dudley Metropolitan Borough Council	**45**	**43**	**41**	39	37	35	33	31	29	28	27	26	26	25
Edinburgh City Council	**45**	**43**	**42**	40	38	36	34	32	30	29	27	26	25	24
Fareham Borough Council	**47**	**46**	**44**	**42**	40	38	36	34	32	30	29	28	27	26
Gateshead Metropolitan Borough Council	**52**	**50**	**48**	**46**	**44**	**41**	39	36	34	32	31	30	29	28
Greater London Authority	**103**	**96**	**90**	**84**	**78**	**72**	**66**	**59**	**53**	**51**	**48**	**46**	**43**	**41**
Glasgow City Council	**55**	**52**	**49**	**46**	**44**	**42**	39	37	34	33	32	31	29	28
Guildford Borough Council	**51**	**49**	**47**	**45**	**42**	40	38	35	33	32	30	29	28	27
Halton Borough Council	**58**	**55**	**52**	**48**	**46**	**43**	**41**	38	36	34	33	32	31	30
Kirklees Metropolitan Council	**45**	**43**	**41**	40	38	36	34	32	30	29	28	27	27	26
Leeds City Council	**60**	**59**	**59**	**58**	**55**	**52**	**49**	**45**	**42**	**41**	39	38	36	35
Leicester City Council	**46**	**45**	**45**	**44**	**43**	**41**	40	38	37	36	35	34	33	33
Liverpool City Council	**47**	**45**	**44**	**42**	40	38	35	33	31	29	28	27	26	25
Manchester City Council	**51**	**49**	**47**	**46**	**43**	**41**	39	37	35	33	32	31	30	29
Middlesbrough Borough Council	**60**	**56**	**51**	**47**	**45**	**42**	39	37	34	33	32	30	29	28
New Forest District Council	**52**	**50**	**47**	**45**	**42**	40	38	35	33	32	31	29	28	27
Newcastle City Council	**52**	**50**	**48**	**46**	**44**	**41**	39	36	34	33	31	30	29	28
Newcastle-under-Lyme Borough Council	**46**	**44**	**42**	40	38	36	34	32	30	29	28	27	26	25
North Tyneside Council	**47**	**45**	**43**	40	38	36	34	32	29	28	27	26	25	24
Northampton Borough Council	**41**	40	38	36	35	33	31	29	28	27	26	25	24	23
Nottingham City Council	**57**	**55**	**53**	**51**	**48**	**46**	**43**	40	38	36	35	34	32	31

Table 1: Local authorities with roads with concentrations of NO_2 forecast above legal limits based on initial modelling (subject to change) and assuming no additional measures. All figures are provided in µg/m^3 and 40 µg/m^3 is the statutory annual mean limit value for NO_2.

Note - excludes any roads managed directly by Highways England, Transport Scotland, Welsh Government and Transport Northern Ireland

Name	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Oldham Metropolitan Borough Council	**44**	**42**	39	37	35	33	32	30	28	27	26	26	25	24
Peterborough Council	**42**	40	38	36	34	32	31	29	27	26	25	24	23	22
Plymouth City Council	**46**	**45**	**44**	**42**	40	38	36	33	31	30	29	27	26	25
Poole Borough Council	**44**	**43**	**41**	39	38	36	34	32	30	29	28	27	26	25
Portsmouth City Council	**46**	**45**	**44**	**43**	**41**	39	37	35	33	32	31	30	29	28
Reading Borough Council	**45**	**44**	**42**	**41**	40	38	37	35	33	32	32	31	30	29
Rochdale Metropolitan Borough Council	**41**	39	38	37	35	33	31	30	28	27	26	25	24	23
Rochford District Council	**51**	**49**	**47**	**46**	**43**	**41**	39	36	34	32	31	30	29	27
Rotherham Metropolitan Borough Council	**52**	**50**	**47**	**45**	**42**	40	38	35	33	32	31	30	29	28
Rushmoor Borough Council	**51**	**49**	**47**	**45**	**43**	40	38	35	33	32	31	29	28	27
Salford Metropolitan Borough Council	**48**	**47**	**45**	**43**	**41**	39	37	35	33	32	31	30	29	27
Sandwell Metropolitan Borough Council	**46**	**44**	**42**	40	38	36	35	33	31	30	29	28	27	26
Sefton Metropolitan Borough Council	**45**	**44**	**42**	40	38	36	34	32	30	29	27	26	25	24
Sheffield City Council	**52**	**49**	**47**	**45**	**43**	**41**	39	37	34	33	32	31	30	29
Slough Borough Council	**42**	**41**	40	39	38	36	34	33	31	30	29	29	28	27
Solihull Metropolitan Borough Council	**48**	**45**	**41**	37	35	34	32	30	28	27	26	25	24	23
South Gloucestershire District Council	**44**	**43**	**41**	39	37	35	33	31	30	28	27	26	25	24
South Ribble Borough Council	**42**	40	39	37	35	33	32	30	28	27	26	25	23	22
South Tyneside Metropolitan Borough Council	**47**	**47**	**47**	**48**	**45**	**42**	40	37	34	33	32	31	29	28
Southampton City Council	**57**	**54**	**51**	**48**	**46**	**44**	**41**	39	37	36	35	33	32	31
Southend Borough Council	**44**	**42**	**41**	39	37	35	34	32	30	29	27	26	25	24
Stockport Metropolitan Borough Council	**49**	**47**	**45**	**43**	**41**	39	37	35	33	32	31	29	28	27
Stoke-on-Trent City Council	**46**	**44**	**42**	40	39	37	35	33	31	30	29	28	27	26
Sunderland City Council	**42**	**41**	39	37	35	33	31	29	27	26	25	24	23	22
Surrey Heath District Council	**50**	**48**	**46**	**45**	**42**	40	38	35	33	32	31	29	28	27
Tameside Metropolitan Borough Council	**52**	**50**	**48**	**46**	**44**	**42**	39	37	35	34	32	31	30	29
Trafford Metropolitan Borough Council	**47**	**46**	**44**	**42**	40	38	36	34	32	31	29	28	27	26
Wakefield Metropolitan District Council	**47**	**45**	**43**	**41**	39	37	35	33	31	30	29	28	27	26
Walsall Metropolitan Borough Council	**52**	**49**	**46**	**43**	**41**	39	37	34	32	31	30	29	28	27
Warrington Borough Council	**42**	40	39	37	35	33	31	30	28	27	26	25	24	23
Wigan Metropolitan Borough Council	**42**	**42**	**42**	**42**	40	38	36	33	31	30	29	28	27	26
Wolverhampton City Council	**49**	**47**	**44**	**41**	39	37	35	33	32	31	30	29	28	27