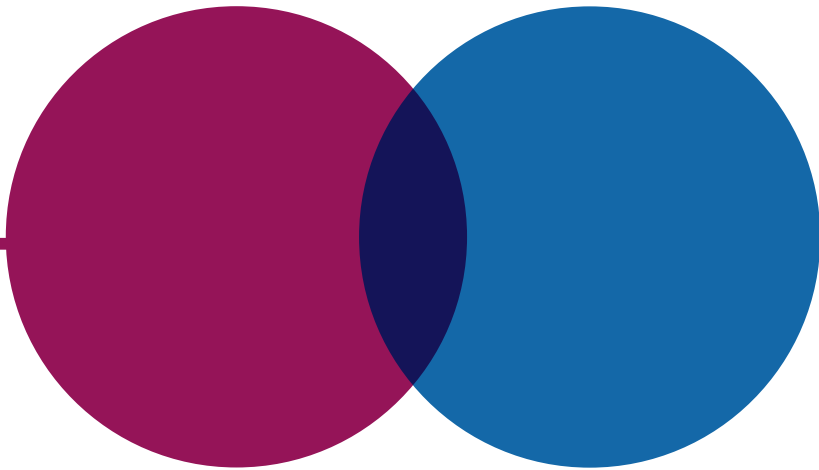




National Audit Office



Tackling local breaches of air quality

Department for Environment, Food & Rural Affairs
Department for Transport


REPORT

**by the Comptroller
and Auditor General**

SESSION 2022-23

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Tackling local breaches of air quality

Department for Environment, Food & Rural Affairs
Department for Transport

Report by the Comptroller and Auditor General

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Gareth Davies
Comptroller and Auditor General
National Audit Office

10 June 2022

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Key facts

2010

year since which the UK has been in breach of legal limits for localised concentrations of nitrogen dioxide (NO₂)

64

local authorities the government has directed to reduce NO₂ levels below legal limits since 2015

14

local authorities that government considers have implemented all of the measures expected to bring NO₂ levels below legal limits

2017

publication of government's 'UK plan for tackling roadside nitrogen dioxide concentrations', the current plan to tackle breaches of NO₂ limits

after 2030

date when government expects to achieve full compliance with legal limits for localised concentrations of NO₂

£883 million

lifetime budget committed to support for local authorities under the NO₂ programme

4.5 years

average length of time the 17 local authorities that are in the process of implementing measures had been involved in the NO₂ Programme as at 1 April 2022

17

number of sections of the Strategic Road Network with no 'viable' measures to bring forward compliance

7

number of local authorities which have yet to agree a full plan with government for tackling breaches

Summary

Introduction

1 While emissions of most air pollutants have been falling in recent decades in the UK, poor air quality continues to cause damage to people's health and the natural environment. Air pollution is unevenly distributed across the UK: urban areas tend to have higher concentrations of many pollutants and research suggests low-income and ethnically diverse neighbourhoods are particularly exposed. The UK has legal air quality limits for major pollutants at a local and national level, covering pollution from ammonia, particulate matter, nitrogen oxides, non-methane volatile organic compounds, sulphur dioxide, and more.

2 The UK complied with most of these legal limits between 2010 and 2019 with the exception of the nitrogen dioxide (NO₂) annual mean concentration limit, for which there have been longstanding breaches. In 2020, there was a large increase in compliance which government attributes to reduced road traffic flows brought about by the COVID-19 pandemic lockdown restrictions. While government expects all parts of the UK will eventually become compliant with the NO₂ limits as a result of trends in the transport sector such as growth in electric vehicles, government has a legal duty to draw up and implement plans to achieve compliance "within the shortest possible time".

3 The Department for Environment, Food & Rural Affairs (Defra) and the Department for Transport (DfT) established the Joint Air Quality Unit (JAQU) in 2016 to oversee delivery of government's plans to achieve compliance with NO₂ limits in as short a time as possible. This NO₂ Programme (the Programme) is government's largest dedicated air quality initiative and involves two main elements:

- Ministerial Directions to specified local authorities requiring them to assess potential breaches in their local area, and identify and implement measures to tackle the problem, with support and funding provided by JAQU; and
- work by National Highways, a government-owned company, to assess and tackle breaches on England's motorways and certain major A-roads known as the Strategic Road Network.

4 Measures to tackle NO₂ pollution include bus retrofit and traffic management schemes, and in some areas, Clean Air Zones where vehicle owners are required to pay a charge if their vehicle does not meet a certain emissions standard. As at May 2022, a lifetime budget of £883 million has been committed to the Programme to support local authorities. Separately government has spent £39 million to improve air quality on the Strategic Road Network from 2015-16 to 2019-20. Further funding is available to 2024-25.

5 When government published its 2015 plan for tackling NO₂ concentrations it required five local authorities to take action to achieve legal limits in their area in the shortest possible time. Government published a further plan for tackling NO₂ concentrations in 2017 and issued directions to an additional 23 local authorities. Between 2015 and 2017 research showed that diesel vehicles had much higher emissions in normal driving conditions than laboratory tests had predicted, and legal rulings found that government's original plans were not ambitious enough. Since 2017 government has expanded the Programme to issue directions to a further 36 local authorities, directing 64 in total. Government also commissioned National Highways to examine breaches on the Strategic Road Network in England. This analysis has confirmed 31 sections of the Strategic Road Network to be above the limit value and therefore non-compliant.

6 Government published a Clean Air Strategy in January 2019 outlining its approach to air quality more broadly. Government expects to publish an update of its National Air Pollution Control Programme in September 2022 to set out the measures that will be required for the UK to meet its 2030 national emissions limits.

Scope of this report

7 This report examines government's progress in tackling local breaches of NO₂ limits and gives an overview of its performance and approach to air quality more broadly. Drawing on our *Framework to review programmes* we evaluate whether government is on track to achieve value for money from its spending on the NO₂ Programme, within the constraints imposed by the legal requirement to deliver compliance in as short a time as possible. While a significant part of our focus is on NO₂, we recognise the level of concern about other pollutants, especially fine particulate matter, and that is covered in our broader overview of air quality.

8 As part of examining government's management of the Programme and its understanding of progress, we summarise the information government holds on local authorities' progress with measures to tackle NO₂ breaches, but we have not independently verified this information, or assessed the realism of government's expectations. We have not assessed, and make no judgement about, the performance of any individual local authority in relation to air quality.

9 The report covers:

- an overview of government's approach to air quality (Part One);
- government's approach to tackling local breaches of NO₂ in England (the NO₂ Programme) (Part Two); and
- progress made on the NO₂ Programme (Part Three).

Key findings

Government's performance and plans for its wider air quality targets

10 Existing policy measures will not be sufficient to achieve most of government's 2030 emissions ceilings and government is developing further plans. Government expects to outline the measures required to achieve its 2030 emissions ceiling targets in the upcoming update to the UK's National Air Pollution Control Programme in September 2022. Ammonia emissions have remained broadly stable since 2007 which Defra told us was due to difficulties it has experienced in influencing agricultural practices such as fertiliser use. The latest data would imply that the UK missed its 2020 ceiling for this pollutant, although the UK has applied for an adjustment to the method that calculates the emissions total which, if accepted, will mean that the UK was compliant. Defra told us that there are practical and behavioural challenges to reducing emissions of particulate matter, including because of the potential impact of increased energy prices on domestic wood burning (paragraphs 1.12 and 1.13).

11 There are particular concerns about the health impacts of fine particulate matter, and government will set a new long-term target for this pollutant by October 2022. In March 2022, government published proposed legal targets for air quality to be achieved by 2040, as part of a consultation required under the Environment Act 2021. The proposed targets relate to mean concentrations of, and population exposure to, fine particulate matter pollution. Government chose these targets on the basis that fine particulate matter is the air pollutant of greatest harm to human health. It does not propose to set legal 2040 targets for other serious pollutants, such as ammonia, and has not set out what its long-term objectives for these pollutants are. In 2020 we recommended that government clarify each of its environmental ambitions so that by the time it puts forward legislative targets, these are part of a coherent plan for the medium term (2030) to long term (2040 onwards) (paragraphs 1.7 to 1.9 and Figure 3).

12 Government does not bring together information on annual spend across all its air quality initiatives. While Defra tracks spend on its own air quality initiatives, it could not provide us with a breakdown of committed and actual spend across all the cross-government initiatives it expects to contribute to air quality improvements. As we have found when examining, for example, preparations for EU Exit and for achieving Net Zero, a lack of spending information at a cross-government level makes it harder for government to reprioritise when necessary. It also reduces public accountability (paragraphs 1.16 to 1.18).

13 Government has arrangements to manage the links between its work on air quality and Net Zero, although these could be strengthened. Government's approach to tackling climate change could have knock-on impacts for air quality, with some measures bringing risks as well as potential benefits. For example, increased uptake of electric vehicles will cut tail-pipe emissions of both greenhouse gases and NO₂, but not fine particulate matter from brakes and tyres. Defra has arrangements for managing the links between air quality and Net Zero including ensuring that Defra's air quality staff sit on and can influence decision-making on relevant Net-Zero related boards such as the Department for Business, Energy & Industrial Strategy's (BEIS's) Industrial Decarbonisation and Hydrogen board, and through its chairing of a cross-government group on clean air. It has agreed a process for resolving potential trade-offs with Net Zero across the different policy areas it is responsible for. However, government has not yet identified clear and specific senior responsibilities for handling the most significant trade-offs and opportunities across government more widely (paragraph 1.19 and 1.20).

14 Government does not clearly and consistently communicate air quality issues and its proposed solutions to the public. Government publishes many different sets of air quality data and an annual UK air quality report. However, these publications are inaccessible to members of the public not already familiar with the details of air quality legislation. As a result, residents cannot easily find out about air quality problems in their local area, whether pollution levels breach legal limits and what progress their local authority is making on tackling those problems. In June 2021 government committed to carry out a comprehensive review of its air quality information, following a coroner's report on the tragic death of a nine-year-old girl in 2013 who became the first person in the UK to have air pollution listed as a cause of death (paragraphs 1.21 to 1.23).

Progress and oversight of the NO₂ Programme

15 Government has made progress in tackling illegal levels of NO₂ pollution.

Over the course of the NO₂ Programme, government has identified 64 local authorities with potential breaches of NO₂ concentration limits, and 31 non-compliant sections of the Strategic Road Network. As at April 2022, information from JAQU showed that 14 of the 64 directed local authorities had implemented all of the measures agreed with central government, which are expected to bring NO₂ levels below legal limits: two of these local authorities have introduced charging Clean Air Zones, with twelve adopting non-charging measures such as improved road layouts or traffic signalling to reduce traffic queues. Seventeen authorities are in the process of implementing measures, including one which has already introduced a charging Clean Air Zone and is in the process of implementing additional non-charging measures. A further 16 authorities were found to be already compliant, based on local modelling, and seven are yet to agree a full plan with government for tackling breaches. National Highways has introduced speed limits in four of 31 non-compliant road sections on the Strategic Road Network to help tackle breaches, and is evaluating whether existing speed limits in a further four sections will bring forward compliance. Government has also established a digital vehicle charging service called the Central Clean Air Service to support local authorities in implementing charging clean air zones (paragraphs 3.2, 3.7, 3.14 and Figures 7 and 8).

16 However, progress has been slower than expected. In 2017, central government expected that measures would take three years or less to implement, with all measures outside London implemented by 2021. As of 1 April 2022, information provided by JAQU showed that the 17 local authorities still in the process of implementing measures had been involved in the NO₂ Programme for 4.5 years on average, with two of these having been in the Programme more than six years. JAQU does not have a firm expected completion date for most (12) of these 17 local authorities, 10 of which fall within Greater Manchester where plans are under review. Progress against local authority directions has not been consistently visible to residents and external stakeholders, limiting transparency and accountability (paragraphs 1.22 and 3.23).

17 While the COVID-19 pandemic has undoubtedly been a factor, it is not the only cause of delay, and the relative impact of different issues is not clear. JAQU told us that the COVID-19 pandemic has been the main cause of delay, and the pandemic clearly affected local authority capacity to develop and implement air quality plans. However, JAQU does not have summary data on the extent to which other factors have also contributed. Two local authorities have publicly attributed delays in their implementation of Clean Air Zones to the delivery of the central Clean Air Service, and some local authorities in our focus groups raised concerns about slow-decision making processes in JAQU. JAQU considers that of 38 local authorities that have implemented, are implementing or are planning measures, 25 missed a legal deadline for providing a full business case, and told us that it considers a further cause of delay has been due to local authorities submitting evidence late, or evidence not meeting required standards. Without a good overview of the underlying reasons for delay it is harder to identify where national action might be needed to tackle common barriers across local authorities (paragraphs 3.22 to 3.25).

18 Government has a robust methodology to evaluate the effect of local measures to tackle NO₂ pollution and early results are showing a positive impact on air quality. JAQU has commissioned Ipsos UK and the Institute for Transport Studies, University of Leeds to run the central evaluation of these plans, including seven deep dives into the effects of measures, but the COVID-19 pandemic and delays to the Programme slowed its delivery. Its evaluation plans should enable JAQU to understand the effects of measures and learn lessons. Local authorities also run their own monitoring and evaluation to estimate the effect of measures. Bath and North East Somerset is the first local authority to provide a progress update following the implementation of a Clean Air Zone and its preliminary analysis suggests it is likely helping to reduce the number of more polluting vehicles, changing people's travel behaviours, and improving the city's air quality. Bath and North East Somerset reported that when the Clean Air Zone first launched, 33% of chargeable vehicles travelling within it met the emission standards; three months later, that figure had risen to 82%. Local authorities' own modelling indicates that in those areas that have implemented all measures, the date by which they achieve compliance will be brought forward by 1.5 years on average, compared with doing nothing (paragraphs 3.3 to 3.6).

19 National Highways considers it is limited in what it can do in some places on the Strategic Road Network, which means full compliance will be delayed until after 2030. JAQU told us that at the time of the government's 2017 plan for tackling NO₂, it believed that measures could be found to bring forward NO₂ compliance across the Strategic Road Network. Since 2015, National Highways has carried out research aimed at improving air quality, including 10 pilots. Despite this, National Highways concluded that there were no viable measures for 17 of the 31 non-compliant sections of the Strategic Road Network. Government expects all these sections to come into compliance over time as a result of wider trends towards cleaner vehicles. However, National Highways' modelling predicts that up to four sections of the Strategic Road Network will still be in breach in 2030. This means that full compliance with legal limits will not be achieved until after 2030, more than four years later than government expected when it published its plan for tackling NO₂ in 2017 (paragraphs 3.9 to 3.16, and Figure 8).

20 There is a lack of transparency about decisions that there are no viable measures for particular road sections, and government has been slow to consider wider options. National Highways considers a 'viable' measure to be one that can reduce NO₂ levels by at least 1% of the limit value, which is physically possible to introduce and which will bring forward compliance by at least one year. However, government does not currently publish these criteria. National Highways also considers other factors such as the extent to which mitigations could create safety risks by diverting traffic onto local roads. Again, there are no published criteria that set out the point at which these types of issue render a particular measure non-viable. While government carried out a cost-benefit analysis of national measures to bring forward compliance as part of developing its 2017 plan, it did not review national options to help tackle persistent breaches on the Strategic Road Network until 2021, when JAQU began to assess the effectiveness of a targeted vehicle upgrade scheme. To date it has found that upgrades would be required on 34% to 89% of vehicles frequently using the network to bring forward compliance by two to four years. In January 2022, the Transport Select Committee recommended that government "assess the potential effect of a road pricing mechanism based on telematic technology on changing drivers' behaviour and delivering its wider policies" including air quality. JAQU's information shows seven local authorities were also deemed to have no viable measures for bringing forward compliance in their area (paragraphs 3.8, 3.15 and 3.19).

21 Locally-led public communications campaigns about Clean Air Zones do not appear to have been fully effective. Some local authorities planning to implement a Clean Air Zone or other clean air measures have faced political and public opposition. JAQU recognises the need for effective public engagement to address these risks. JAQU told us that after considering options for a national approach, government decided that local authorities should lead on communicating with people and businesses about the Clean Air Zone in their area. To support local authorities, JAQU has developed marketing materials to be used by local authorities and has led a programme of stakeholder engagement. Independent evaluations of the locally-led communications campaigns for the first two Clean Air Zones showed mixed results. Some of the local authorities we spoke to in focus groups raised concerns about the lack of a coordinated national communications campaign on NO₂. They felt a national campaign could help inform road users about the need for clean air measures in certain locations, and explain that there are different types of Clean Air Zone with different vehicle emissions requirements (paragraphs 3.26 to 3.30).

22 More than half of the £522 million awarded to local authorities in the Programme so far is for support to individuals and businesses. HM Treasury told us it has not set a firm limit on the funding for local authorities' implementation of measures to tackle breaches, because of the legal requirement that cost cannot be a limiting factor to achieving compliance within the shortest possible time. Local authorities must develop full business cases setting out their proposed measures, which are reviewed by an expert independent panel before ministerial approval. As at February 2020 government had allocated £522 million to local authorities through to 2021-22, with more than half (54%) to support those affected by the plans by making it easier, more attractive or more affordable for individuals and businesses to change to cleaner modes of transport (the Clean Air Fund), around one-third (35%) going towards the implementation of measures (the Implementation Fund) and 10% towards funding for feasibility studies (paragraphs 2.16 to 2.19 and Figure 6).

Conclusion

23 The NO₂ Programme, established to tackle illegal and dangerous levels of pollution, has become government's largest dedicated air quality initiative. Government has made progress, with measures fully implemented in 14 local authorities and four sections of the Strategic Road Network. However, the Programme has not moved as fast as expected. While this is undoubtedly due in part to the COVID-19 pandemic, other factors including the effectiveness of public engagement have likely played a role, and government has not had a good overview of the relative impact of different issues. It has also been slow to consider the case for national action to tackle the challenges on major roads and motorways that mean overall compliance cannot be achieved until after 2030. This is more than four years later than government expected when it published its plan for tackling NO₂ in 2017. For these reasons we cannot yet be confident that the Programme is on track to deliver value for money.

24 NO₂ is only one source of air pollution, and there is particular concern about the health risks from particulate matter and ammonia. Government is not yet clear how it will meet existing 2030 ceiling limits, and expects to set new long-term targets for particulate matter by October 2022. It will need to move quickly with robust plans to meet these targets if it is to put itself in a good position to meet them and secure value for money from its work on air quality.

25 Government publishes a lot of air quality data, but not in a way that gives the public accessible information about air quality problems and action in their area. There has been little public engagement at a national level about the purpose and progress of the NO₂ Programme and the choices government has made to tackle breaches. This creates a lack of transparency which risks undermining value for money because positive public engagement is important for success across the NO₂ Programme and government's wider work on air quality.

Recommendations

26 To ensure it is well placed to deliver value for money from its work on air quality:

Defra should:

- a** ensure that the update to the National Air Pollution Control Programme includes sufficient clarity on how proposed measures will enable the UK to achieve its 2030 targets and the timetable for implementation, given there are now eight years to the deadline, and policies will take time to develop and take effect;
- b** clarify its long-term (2040) ambitions for all major air pollutants, taking account of the plans of international partners, and identify interim (2030) objectives where these do not already exist;
- c** improve the accessibility and usability of air quality information for the public;
- d** collate information on government's committed/actual spend on measures it expects to make a substantial contribution to improving air quality, alongside the expected/actual impact these measures are having;
- e** together with BEIS, clarify its framework for making decisions about the interdependencies between its work on air quality and Net Zero, and identify clear and specific senior responsibilities for handling the most significant trade-offs and opportunities.

27 Defra, DfT and JAQU should:

- f** review and clarify interim milestones for the expected timetable for the remainder of the Programme, re-baselining to account for delays introduced by the COVID-19 pandemic;
- g** collate consistent and complete information on progress against these milestones, including reasons for any further delays and carry out a periodic (at least six monthly) stock-take of progress to consider overall trends and any solutions needed at a national or programme level;
- h** publish six-monthly updates on the progress of the Programme, including the measures local authorities expect to take, their expected implementation date and expected date of local compliance and consider encouraging local authorities to share an update of their progress publicly;

- i** **Defra should set and agree with DfT, JAQU and National Highways the outline criteria for 'non-viable' measures.** Defra should then publish these criteria. The Department for Transport, together with National Highways, should report on an annual basis on breaches where it considers there are no viable measures explaining what options were considered. This should cover no viable measures breaches both in local authorities and on the Strategic Road Network; and
- j** **review their approach to public engagement on Clean Air Zones** to do more to ensure that there is good understanding across the country of the purpose of these zones, how and why charging regimes differ and to ensure that all road users are aware of how to check whether their vehicle is compliant and make payments if needed. As part of this, JAQU should seek to coordinate with the behaviour change and public engagement team for Net Zero within BEIS, to understand whether public engagement about Clean Air Zones can be amplified alongside wider messaging about Net Zero where there is overlap in the policy options.

Part One

Overview of government's approach to air quality

1.1 This Part of the report introduces the causes and consequences of air pollution and sets out the UK's legal commitments to, and government's responsibilities for, clean air. It considers government's programmes, strategy and associated funding for air quality and the UK's current and historic performance against its air quality targets.

The causes and consequences of air pollution

1.2 Air pollution is the presence or introduction of any chemical, physical, or biological agent that modifies the natural characteristics of the atmosphere, such as nitrogen dioxide (NO₂) and particulate matter. Air pollutants are produced by many different types of activities including road transport, agriculture, industrial processes and domestic combustion (**Figure 1**).

1.3 While emissions of most air pollutants have been falling in recent decades, air quality continues to cause significant damage to people's health and the natural environment. In 2016, the Royal College of Physicians and Royal College of Paediatrics and Child Health reported that in the UK, the societal and personal costs of health problems resulting from exposure to air pollution add up to more than £20 billion every year. More recently, using results from studies of NO₂ and fine particulate matter, the Committee on the Medical Effects of Air Pollutants (COMEAP, 2018) estimated that human-made air pollution in the UK has an effect equivalent to between 28,000 and 36,000 deaths each year. A Public Health England review (2019) described air pollution as the largest environmental risk to the public's health in the UK. It reported good evidence for associations between air pollution and cardiovascular and respiratory disease, including lung cancer, and emerging evidence of other possible health effects such as dementia, low birth weight and diabetes.

Figure 1
Air pollutants and their sources in the UK in 2020

Each pollutant is emitted from a mix of sources and the major contributing sources vary between pollutants

Pollutant	Source	Contribution to UK annual emissions (%)
Ammonia	Agriculture	87
	Waste	3
	Other	10
Coarse particulate matter (PM10)	Industrial processes and use of solvents	34
	Manufacturing Industries and Construction	16
	Domestic Combustion	15
	Road Transport	12
	Other	23
Fine particulate matter (PM2.5)	Manufacturing Industries and Construction	27
	Domestic Combustion	25
	Industrial processes and use of solvents	14
	Road Transport	13
	Other	21
Nitrogen oxides	Road Transport	28
	Manufacturing Industries and Construction	21
	Energy Industries	20
	Non-road Transport	13
	Other	18
Non-methane volatile organic compounds	Domestic solvent use (household products)	23
	Agriculture	17
	Food and beverages industry	15
	Fugitive emissions	14
	Other	32
Sulphur dioxide	Domestic Combustion	32
	Manufacturing Industries and Construction	26
	Energy Industries	23
	Other	19

Notes

- 1 The table represents the contributions of each source to the annual national emissions of that air pollutant. Sources of high concentrations of an air pollutant in any one area may differ from those presented above.
- 2 Fugitive emissions are emissions that are not intended to reach the atmosphere but leak out of containers or pipelines.

Source: Department for Environment, Food & Rural Affairs national statistics on emissions of air pollutants

1.4 The impacts of and exposure to poor air quality are not equally distributed across society. Older people, children, pregnant women, those with health problems and low-income communities are more vulnerable to poor air quality. As well as being more vulnerable, those on low incomes are typically more exposed to poor air quality. Researchers from the University of Leeds reported in 2015 that 85% of people living in areas with illegal levels of NO₂ were amongst the 20% most deprived of the population. Research cited by government in 2017 found that concentrations of coarse particulate matter and nitrogen dioxide were higher in neighbourhoods in which less than 20% of the population was white.

1.5 Poor air quality can also harm the environment through eutrophication, in which airborne ammonia and NO₂ pollution leads to nitrogen deposition. Excessive amounts of nitrogen can lead to the loss of some species in sensitive habitats, such as grasslands, and to increased growth of algae in aquatic ecosystems, which has a cascade effect, causing other aquatic plants and animals to die and contributing to biodiversity decline.

The UK's air quality targets

1.6 The UK has air quality targets which specify legal limits of major pollutants at a local and national level. There are two types of air quality target in the UK – national emissions ceilings and local concentration limits:

- National emissions ceilings come from the National Emission Ceilings Regulations 2018 and are breached if too much of one pollutant is emitted across the UK within a calendar year.
- Local concentration limits come from the Air Quality Standards Regulations 2010 and are breached if the level of a pollutant in a specific area, and averaged over a given amount of time, is too high (**Figure 2**).

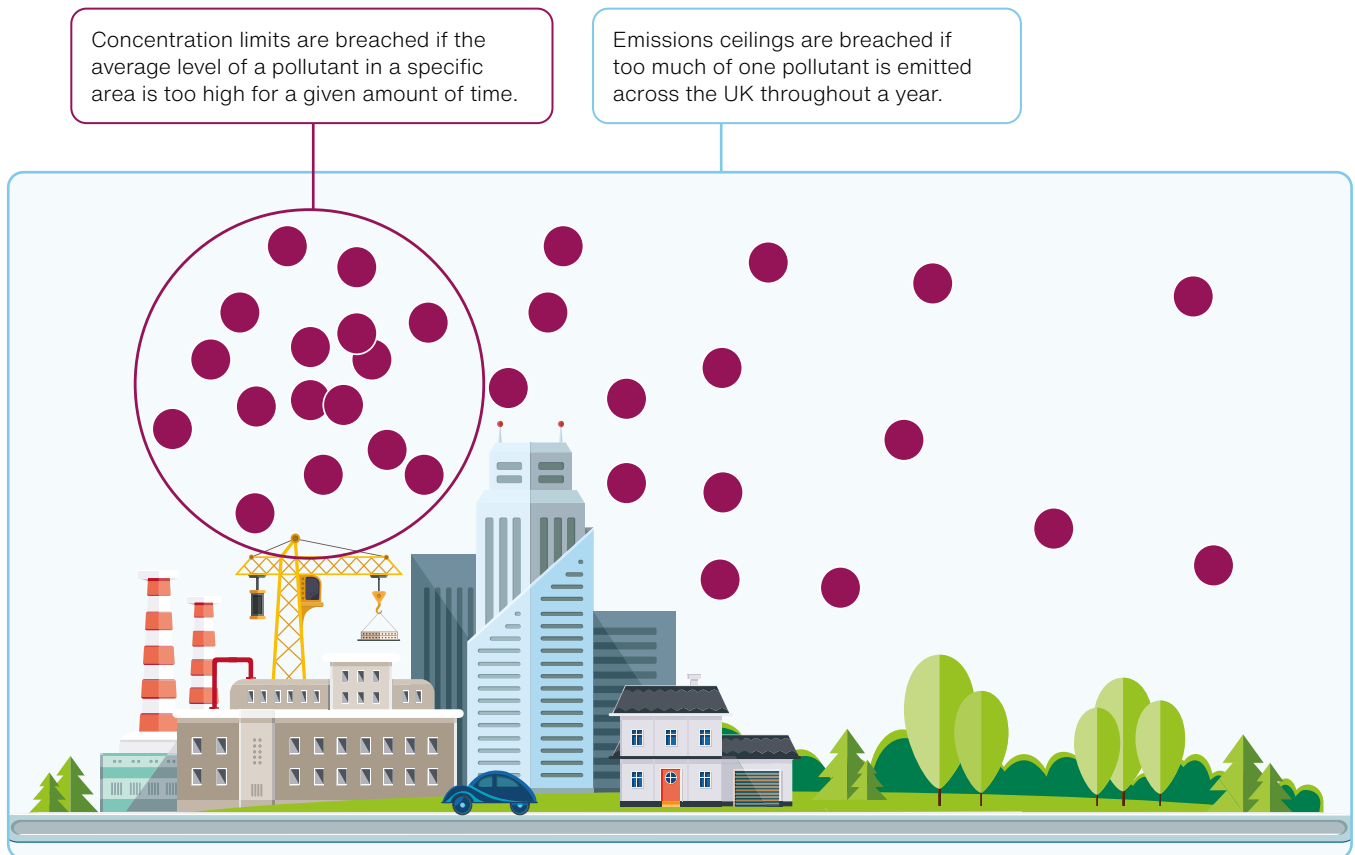
1.7 In addition, the Environment Act 2021 requires the Secretary of State for Environment, Food and Rural Affairs to set two legally binding air quality targets by 31 October 2022: a long-term (15 years or longer) target for air quality, and a target for fine particulate matter that may or may not be long-term. Government committed to setting a target for fine particulate matter because it is the air pollutant of greatest harm to human health. Public Health England estimated in 2018 that reducing fine particulate matter concentrations by 1µg/m³ could, over 18 years, prevent 50,900 cases of coronary heart disease, 16,500 strokes, 9,300 cases of asthma and 4,200 lung cancers. In its March 2022 consultation on the Environment Act 2021 targets, government has proposed targeting:

- an annual mean concentration of fine particulate matter of 10µg/m³ to be met across England by 2040; and
- a 35% reduction in population exposure to fine particulate matter compared with 2018 by 2040.

Figure 2

The difference between concentration limits and emissions ceilings

Emissions ceilings apply to the total amount of pollutants emitted in the UK while local concentration limits apply to localised air quality in specific locations



Pollutants subject to concentration limits: sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter (PM 2.5 and PM 10), lead, benzene and carbon monoxide.

Pollutants subject to emissions ceilings: ammonia, particulate matter (PM 2.5), nitrogen oxides, non-methane volatile organic compounds, and sulphur dioxide.

- Air pollutant
- Concentration limit
- Emissions ceiling

Notes

- 1 National emission ceilings are derived from the National Emission Ceilings Regulation 2018.
- 2 Local concentration limits are derived from the Air Quality Standards Regulation 2010.

Source: National Audit Office

1.8 The consultation does not propose setting legislative 2040 targets for other serious pollutants, such as ammonia, and government has not set out separately what its long-term objectives for these pollutants are. In our 2020 report on Achieving government's environmental goals we recommended that government clarify its environmental ambitions so that by the time it puts forward legislative targets, these are part of a coherent suite of environmental objectives that set specific and measurable ambitions for medium-term (2030) and long-term (2040 onwards) outcomes for each of its environmental goals. The Department for Environment, Food & Rural Affairs (Defra) told us that its long-term ambitions are tied up with a United Nations review of an international air quality agreement (the Gothenburg Protocol), because of the importance of international collaboration on transboundary air pollution. It expects this review to conclude in 2022.

1.9 The World Health Organization (WHO) sets guideline concentration limits for air pollutants that are recommended to protect health. It has not yet found a concentration of fine particulate matter below which no damage to human health is observed so, in 2021, WHO reduced its guideline level for the annual mean concentration of fine particulate matter from 10 to 5 $\mu\text{g}/\text{m}^3$. Government's current targets for air pollutant concentrations are less ambitious than the WHO guidelines for four of the five pollutants for which government has a target and the WHO has a guideline (**Figure 3**).

Responsibilities for air quality in government

1.10 Air quality is a devolved matter, and the devolved administrations in Scotland, Wales and Northern Ireland are responsible for air quality monitoring and for developing plans to tackle NO_2 exceedances in their nations. In England, improving air quality is a cross-government responsibility, and key responsibilities include:

- Defra, for overall air quality policy and strategy;
- the Department for Transport (DfT), for policy measures to reduce air pollution from transport;
- the Joint Air Quality Unit (JAQU), a government organisation established by Defra and DfT in 2016 to coordinate delivery of the government's plan for compliance with NO_2 limits (see Parts Two and Three);
- local authorities, which have had statutory air quality duties since 1995. These include responsibilities to review and assess air quality, designate air quality problem areas as 'Air Quality Management Areas' and develop action plans to resolve the problem. Local authorities also have a regulatory role in permitting for small-medium industry and in designating and enforcing smoke control areas; and
- the Mayor of London, who sets policies and leads on the implementation of air quality measures in the capital, The Mayor works with government, London's local authorities and other partners and has delegated powers to oversee local air quality management by London boroughs.

Figure 3

UK pollutant concentration limits compared to equivalent World Health Organization (WHO) guideline values

The UK's limit values under the Air Quality Standards Regulations are less ambitious than the World Health Organization's guideline values for sulphur dioxide, nitrogen dioxide, and for coarse and fine particulate matter

Pollutant	Averaging period	Air Quality Standards Regulations limit value ($\mu\text{g}/\text{m}^3$)	WHO guideline value ($\mu\text{g}/\text{m}^3$)
Carbon monoxide	Eight hours	10,000	10,000
Coarse particulate matter (PM10)	One day	50	45
	Calendar year	40	15
Fine particulate matter (PM2.5)	Calendar year	20	5
Nitrogen dioxide	One hour	200	200
	Calendar year	40	10
Sulphur dioxide	One hour	350	N/A
	One day	125	40

Notes

- 1 The Air Quality Standards Regulations levels are derived from the levels set under the European Union's Ambient Air Quality Directive last amended in 2015.
- 2 The WHO guideline values were last updated in 2021.
- 3 Benzene and lead have limit values under the Air Quality Standards Regulations but no WHO guideline level and have therefore not been included in the above table.
- 4 There is no WHO hourly limit for sulphur dioxide.
- 5 Local concentration limits apply to localised air quality in specific locations and are breached if the average level of a pollutant in a specific area is too high for a given amount of time.

Source: National Audit Office analysis of World Health Organization information

1.11 In January 2019 government published a Clean Air Strategy, outlining its plans to tackle all sources of air pollution with the aim of “making the air healthier to breathe, protecting nature and boosting the economy”. In March 2019 it published the National Air Pollution Control Programme with analysis on how plans and measures already in place contribute to its air pollution emission reduction commitments. Measures listed include:

- for agriculture: mandatory standards for livestock housing and regulation to reduce emissions from fertiliser use;
- for the domestic sector: legislation to prohibit sale of the most polluting fuels and local authority enforcement;
- for industry: improved control of emissions that escape from industrial processes; and
- for transport: influencing modal shifts in urban areas, major port air quality plans, plans in the Aviation Air Quality Strategy, and the UK’s Road to Zero Strategy for road vehicles.

Performance against emissions ceilings

Emissions ceilings are limits on the total amount of air pollutants emitted each year (Figure 2).

1.12 Government may not have met its legal ceiling for national emissions of ammonia in 2020. The UK had so far been compliant with all emissions ceilings since they began in 2010 except for the nitrogen oxides ceiling between 2010 and 2012.¹ However, ammonia emissions have remained broadly stable since 2007 and the latest data would imply that the UK missed the 2020 ceiling. The UK has applied for an adjustment to the method that calculates the emissions total which, if it is accepted, will mean that the UK was compliant with the 2020 emission ceiling. These adjustments are allowed where non-compliance is a result of applying improved emission inventory methods that have been updated in accordance with scientific knowledge. Most (87%) of ammonia emissions come from agriculture and Defra told us that the plateauing of ammonia emissions is because of challenges in influencing agricultural practices, such as fertiliser use.

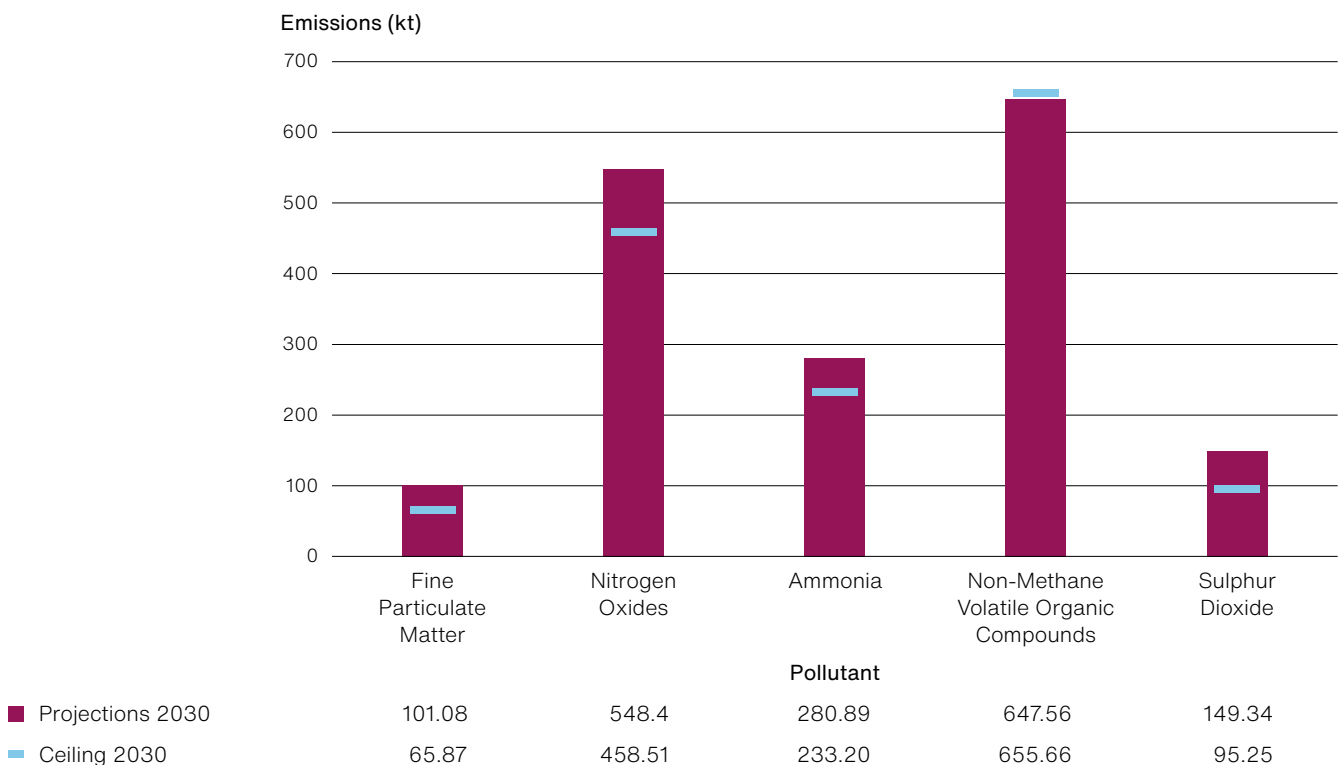
¹ Nitrogen oxides refers to nitric oxide (NO) and nitrogen dioxide (NO₂).

1.13 Existing policy measures will not be sufficient to achieve most of the 2030 emissions ceilings and government is developing plans for the new policies needed (**Figure 4**). Projections submitted to the EU in 2019 indicated that targets would be missed, but did not include (as required by the EU) a full modelled scenario showing how compliance with all of the emission reduction commitments could be achieved. Government plans to publish an update to the UK's National Air Pollution Control Programme in September 2022, in which it expects to outline in detail the measures required to achieve its emissions ceilings. Defra told us that there are technical and behavioural challenges to reducing emissions of particulate matter, including because of the potential impact of increased energy prices on domestic wood-burning.

Figure 4

UK projected emissions compared to emissions ceilings in 2030

The latest government projections show that existing policy measures are insufficient for the UK to achieve most of its 2030 emissions ceilings



Notes

- 1 Projections as at March 2021.
- 2 National emission ceilings are derived from the National Emission Ceilings Regulations 2018. Emissions ceilings apply to the total amount of pollutants emitted in the UK in a year. They are breached if too much of one pollutant is emitted in the UK throughout the year.
- 3 Some sources of these pollutants are excluded from the total emissions for the purposes of assessing compliance with Emissions Ceilings. For example, most agricultural emissions are excluded from the targets for nitrogen oxides and for non-methane volatile organic compounds, and aircraft emissions beyond the landing and take-off cycle are excluded for all. See the National Emission Ceilings Regulations 2018 for a comprehensive list.

Source: National Audit Office analysis of Department for Business, Energy & Industrial Strategy data available from: <https://naei.beis.gov.uk/data/data-selector>

Performance against concentration limits

Concentration limits cover the amount of air pollution within a specific area (Figure 2)

1.14 The UK has complied with most of the local concentration limits since 2010 (when the Air Quality Standards Regulations were transposed into UK legislation) except for NO₂, for which there have been longstanding breaches. Most of the UK's air quality reporting zones had one or more section of road in breach of the annual NO₂ limit between 2010 and 2019 (**Figure 5**). While government expects all parts of the UK will eventually become compliant with the NO₂ limits as a result of trends in the transport sector such as growth in electric vehicles, government has a legal duty to develop and implement plans to achieve compliance in "within the shortest possible time". Parts Two and Three examine government's approach to tackling these breaches under the Nitrogen dioxide Programme (the Programme).

1.15 Having set out a factual overview of government's overall approach to air quality, the remainder of this Part provides an evaluative commentary on how government funds and oversees its overall air quality policy and interventions, how it communicates with the public on air quality issues and how it ensures air quality interventions are consistent with its targets to achieve Net Zero. Parts Two and Three provide evaluative commentary specific to the government's NO₂ Programme.

Government funding for air quality initiatives

1.16 Government could not provide us with a breakdown of committed and actual spend across its portfolio of air quality initiatives. Government's largest dedicated air quality initiative is its NO₂ Programme (see Parts Two and Three). The other largest funding commitments in the 2019 Clean Air Strategy are directed at road transport, and cover the following funds, which are expected to deliver air quality benefits alongside other objectives such as Net Zero and local growth:

- Transforming Cities Fund of £2.4 billion, which improves public and sustainable transport.
- Spend of £1.5 billion to support the uptake of ultra-low emission vehicles.
- Cycling and Walking Investment Strategy, a £1.2 billion commitment to promote more active forms of travel.

1.17 The Air Quality and Industrial Emissions (AQIE) policy team within Defra administers the Air Quality Grant Programme, which local authorities can bid for to help them meet their statutory duties under the Environment Act 1995 to improve air quality. Since 1997, the grant programme has awarded £81 million to local authorities. AQIE spent £8.27 million in 2020-21.

Figure 5

Breaches of local concentration limits for air pollutants in the UK since 2010

There have been longstanding breaches of NO₂ limits, with most of the UK's air quality reporting zones having one or more section of road in breach of the annual limit between 2010 and 2019

Year	Zones in breach of annual NO ₂ limit value (out of 43)	Zones in breach of NO ₂ 1-hour limit (out of 43)	Zones in breach of 24-hour PM10 limit (out of 43)
2010	40	3	0 (+1 time extension)
2011	35 (+5 time extensions)	3	0 (+1 time extension)
2012	34 (+4 time extensions)	2	0
2013	31 (+7 time extensions)	1	0
2014	30 (+8 time extensions)	2	0
2015	37	2	0
2016	37	2	0
2017	37	2	0
2018	36	2	0
2019	33	1	0
2020 (COVID-19)	5	0	0

Notes

- 1 The UK is divided into 43 zones for the purpose of reporting compliance with local concentration limits. If any section of a road exceeds the concentration limit for a pollutant then the entire zone within which that section sits is non-compliant.
- 2 2020 is the latest compliance year reported on by the Department for Environment, Food & Rural Affairs in the 'Air Pollution in the UK – Compliance Assessment Summary' published in September 2021.
- 3 The reduction in the number of zones with NO₂ annual limit exceedances in 2020 is largely attributable to COVID-19. The 5 zones that were non-compliant were Greater London Urban Area, West Midlands Urban Area, Greater Manchester Urban Area, Bristol Urban Area and South Wales.
- 4 Between 2010 and 2015 time extensions were awarded to some zones. These meant that, although the zone exceeded a limit, they were considered compliant so long as they were within a specified margin of tolerance. The increase in the number of zones with NO₂ annual limit exceedances in 2015 is due to 2015 being the first year in which the UK was not granted time extensions.
- 5 Local concentration limits are derived from the Air Quality Standards Regulations 2010. Local concentration limits apply to localised air quality in specific locations and are breached if the average level of a pollutant in a specific area is too high for a given amount of time. Limits are applied as either a limit value, which are legally binding and must not be exceeded, or as target values and long-term objectives, which are not legally binding, but which the UK must take all necessary measures not entailing disproportionate costs to meet.
- 6 Pollutants with limit values not set out in the table above are fine particulate matter (PM2.5), sulphur dioxide, carbon monoxide, benzene and lead. There is also an annual limit value for coarse particulate matter (PM10). All these limit values were met in all zones in 2020.

Source: National Audit Office analysis of Department for Environment, Food & Rural Affairs annual air quality reports, available at: <https://uk-air.defra.gov.uk/library/annualreport/index>

1.18 By not tracking spend across its work on air quality, government risks being unable to evaluate the relative cost-effectiveness of its spending on the issue. Our work on government's preparations for EU Exit found that a lack of spending information at a cross-government level created risks to financial management, programme management, and public accountability. Similarly, in our report on Achieving Net Zero, we recommended that the Department for Business, Energy & Industrial Strategy (BEIS) and HM Treasury collate information on how much government is spending to achieve Net Zero overall.

Government's approach to managing links with Net Zero

1.19 It is important for government to manage the links between its work on air quality and on climate change because achieving its legislated target of Net Zero greenhouse gas emissions by 2050 will involve major transitions across the economy, which could have knock-on consequences for air quality. In some cases there will be 'win-wins'. For example, increasing the proportion of electric vehicles in the UK will decrease carbon emissions while also eliminating NO₂ emissions from those cars' tailpipes. But there are also risks to be managed because fine particulate matter is still produced by vehicle brake pads and tyre wear. Similarly, the process of turning biomass such as food waste into renewable energy can add to ammonia and fine particulate matter emissions.

1.20 Government has arrangements to manage these links. Defra chairs a Clean Air Cross-Government group, established in March 2021, which meets quarterly. The group discusses the interaction between developments in air quality policy or legislation and work being taken forward across government departments, which has included Net Zero work. Defra air quality staff sit on and can influence decision-making on relevant boards that may have an air quality impact such as BEIS's Biomass Strategy working group and the BEIS Industrial Decarbonisation and Hydrogen Board. It has agreed a process for resolving potential trade-offs with Net Zero across the different policy areas it is responsible for, which identifies senior responsible officers for key trade-offs, with escalation to Defra's Climate Portfolio Board if the issue cannot be resolved bilaterally. However, it has not yet identified senior responsibility for handling the most significant trade-offs and opportunities across government more widely.

Government's approach to public communication of air quality issues

1.21 Government acknowledges that the public need access to information about air quality to make informed choices to help tackle the sources of air pollution, and to avoid their own exposure to it. Government publications include:

- the UK AIR website which provides a high-level air pollution forecast, information about the effects of air pollution on health and allows users to download and manipulate air quality datasets;²
- air quality datasets from the Automatic Urban and Rural Network, and the UK Urban NO₂ Network provide data on background and roadside concentrations of pollutants averaged across daily, hourly or annual time periods; and
- an annual report on air pollution in the UK.³

1.22 These data sources can be used by informed stakeholders such as academics, non-governmental interest groups and local authorities to draw insights and conclusions about trends in air quality on national and local scales. However, they do not provide information in an accessible way for members of the public who are not already familiar with the details of air quality legislation. In particular:

- the UK Air website does not clearly present information on the legal limits for each pollutant, actions taken to date by the UK government and the progress being made, to put the air quality data it gives in context. This means that users are not aware that even 'moderate' levels of pollution can indicate that legal air quality limits are being breached, and it means that progress against local authority air quality directions is not clearly and consistently visible to residents and stakeholders, limiting transparency and accountability; and
- while information on targets and progress is available in the annual Air Pollution in the UK report, this is a long document (148 pages) and it only gives a breakdown of air quality information by the zones that are used for reporting compliance with legal limits. As a result, it would not help residents understand air quality in their local area, or whether National Highways or their local authority has not been able to identify a viable method of tackling a local air quality problem (see paragraphs 3.8 and 3.15 to 3.19).

2 Department for Environment Food & Rural Affairs, *UK AIR: Air Information Resource*. Available at: <https://uk-air.defra.gov.uk/>

3 Department for Environment Food & Rural Affairs, *Air Pollution in the UK 2020*, September 2021. Available at: https://uk-air.defra.gov.uk/assets/documents/annualreport/air_pollution_uk_2020_issue_1.pdf

1.23 Following the tragic death of a nine-year old girl in 2013, who became the first person in the UK to have air pollution listed as a cause of death, a 2020 coroner's report said that there was a low public awareness of the sources of information on pollution and that publicising this information needed national as well as local government action. As part of its June 2021 response to the coroner's report, government committed to take immediate action to increase public awareness about air pollution, including by carrying out a comprehensive review of existing air quality information to include more specific messaging for different population groups.

Part Two

Government's approach to tackling local air quality breaches

2.1 This Part examines government's approach to tackling longstanding breaches of localised nitrogen dioxide (NO₂) concentration limits. It sets out how government's overarching plans for tackling illegal NO₂ levels have developed over time, including in response to successful legal challenge. It assesses the strength of government's quality assurance arrangements over the modelling that underpins its identification of breaches. It also examines government's approach to allocating funding to tackle the problem.

Government's plans to tackle local air quality breaches

2.2 The UK has a longstanding problem with breaches of local concentration limits for NO₂ (Figure 5). In December 2015, the Department for Environment, Food & Rural Affairs (Defra) published a plan to reduce concentrations of NO₂ and bring the UK into legal compliance. This required local authorities for five cities to do scoping studies to determine how to achieve compliance "in the shortest possible time and at the latest by 2020." The plan specified that these authorities should introduce Clean Air Zones, defined as "areas where only the cleanest vehicles are encouraged...and action is focused to improve air quality."

2.3 In November 2016, the High Court concluded that the 2015 plan was not compliant with the relevant regulations. It found that the Defra Secretary of State fell into error in fixing on a projected compliance date of 2020 (and 2025 for London) because "the evidence demonstrates clearly that Clean Air Zones... could be introduced more quickly than 2020" and had adopted too optimistic a model for future emissions. It concluded that the Secretary of State should aim to achieve compliance by the soonest date possible, choosing a route which reduces exposure as quickly as possible, and should take steps which make meeting limit values not just possible, but likely.

2.4 Government considers that a key cause of non-compliance with air quality standards has been the failure of European vehicle emission regulations (Euro standards) to deliver expected emissions reductions. Research by the Department for Transport (DfT) showed that all diesel vehicles had much higher emissions under normal 'real world' driving conditions than laboratory tests had predicted, with average emissions for 'Euro 5'- and Euro 6'-rated vehicles more than six times higher than the legislated laboratory limit.

2.5 Defra and DfT published a new UK plan for tackling roadside NO₂ concentrations in July 2017. As part of developing this plan, its modelling identified a further 23 local authorities with exceedances that were expected to persist beyond three to four years. Government carried out a cost-benefit analysis of different options for bringing forward compliance, including national measures, and concluded that, of the shortlisted options, new charging Clean Air Zones would be the quickest and most cost-effective measure to tackle NO₂ exceedances on the majority of urban roads. The plan stated that where a local authority can identify and demonstrate that measures other than a charging Clean Air Zone are at least as quick to deliver compliance, those measures should be preferred. Government directed the 23 local authorities to do feasibility studies, to identify any measures which could accelerate compliance with NO₂ limits. It estimated that the plan would lead to full compliance in the UK by 2026.

2.6 However, a High Court ruling in 2018 found that by encouraging rather than directing a further group of local authorities to act, government's 2017 plan did not do enough to ensure compliance in the shortest possible time. The judge repeated the position from a 2016 judgement, saying "I reject any suggestion that the state can have any regard to cost in fixing a target date for compliance or in determining the route by which compliance can be achieved where one route produces results quicker than another." Government responded by legally directing a further 33 local authorities to develop feasibility studies for local air quality plans in 2018. Since 2018, a further three local authorities were directed to implement measures to accelerate compliance with NO₂ limits.

2.7 In total, government has issued Ministerial Directions to 64 local authorities in England to take action on NO₂ breaches, and its work with these local authorities, together with efforts to tackle breaches on the Strategic Road Network, constitute the main elements of its NO₂ Programme. The directions require local authorities to carry out studies or to implement actions to deliver compliance with the local concentration limits for NO₂ in the shortest time possible. Local authorities are expected to complete a feasibility study and/or business case for proposed plans and measures to bring forward compliance, which government must approve. These measures fall into two categories:

- Non-charging measures such as bus retrofit schemes, traffic management (for example, through improving road layouts to reduce congestion), and/or initiatives to encourage use of public transport.
- Charging Clean Air Zones (CAZ): zones where vehicle owners are required to pay a charge to enter, or move within, a zone if they are driving a vehicle that does not meet the particular standard for their vehicle type in that zone. Government has assessed that a charging CAZ is the measure most likely to bring about compliance in the shortest possible time. Therefore, while local authorities' proposals are not required to include a charging zone, they must compare the effectiveness of the measures they propose in reducing NO₂ against the impact of a charging CAZ.

2.8 National Highways has responsibility for England's motorways and certain major A-roads known as the Strategic Road Network. It has carried out analysis, pilot studies and introduced speed restrictions with the aim of tackling NO₂ breaches on the Strategic Road Network (see paragraphs 3.9 to 3.19).

Government's approach to identifying breaches

2.9 Government uses national and local modelling, together with a network of monitoring stations, to direct its actions on air quality. This consists of three main elements:

- a national Pollution Climate Mapping (PCM) model;
- two national monitoring networks, collecting 471 measurements (covering around 430 unique monitoring stations); and
- local modelling and monitoring by directed local authorities and National Highways.

2.10 Since we last examined government's approach to air quality in 2017, government has made improvements to the modelling assumptions that inform the national PCM model, expanded the monitoring network by adding a new UK Urban NO₂ Network (UUNN) of 300 sites (including 38 co-located with the 171 existing Automatic Urban and Rural Network (AURN) sites), and supported more detailed local modelling of areas where the national model indicates a potential breach. Improvements to the PCM model have involved updating the input data sets such as estimates of emissions from different types of vehicle, as well as making changes to how the model incorporates local data such as vehicle speed or weather data.

2.11 We found that there are quality assurance arrangements in place over government's modelling and monitoring which appear appropriate, although we have not carried out a full review to examine them in depth. They include:

- peer review of proposed improvements by external experts. For example, changes to the way that vehicle speed is incorporated into the model were reviewed by an independent expert group with technical expertise in air quality modelling;
- publication of the PCM model's data outputs online which is in line with our good practice guidance for government models;
- checking of the PCM model results against more detailed local modelling;
- five yearly reviews of the national network of AURN monitors to assess its fitness for purpose, with the latest review in train; and
- review of the local models' methodology and results by both the Joint Air Quality Unit (JAQU) and a Technical Independent Review Panel (TIRP). This panel is composed of chief scientific advisors in Defra and DfT as well as specialist academics from universities around the country.

2.12 Despite the increased number of monitoring sites, JAQU estimate that the overall model uncertainty remains around +/- 30%, as it was in 2017, although it has found that the model results are now more closely aligned to the results produced by the more detailed local models. This is the limit of what is permitted under the EU Ambient Air Quality Directive for modelling annual average NO₂ levels.

2.13 In focus groups, we spoke to some local authorities that had been directed to act by government who were concerned that this could create an unfair situation whereby other local areas might be experiencing high levels of NO₂ pollution but not be required to take action because the PCM model had not projected a breach of local concentration limits. Many more local authorities have declared an Air Quality Management Area (AQMA) for NO₂ than are involved in the programme: as of March 2022 there were AQMAs for NO₂ across 236 local authorities in England.

2.14 An AQMA signifies that national air quality objectives are not likely to be achieved. However, JAQU told us that this does not mean there are 236 local authorities with breaches of legal NO₂ limits set under the Air Quality Standards Regulation (AQSR) because there are strict requirements for how and where NO₂ levels are assessed under the AQSR. For example, according to the AQSR, air quality should not normally be assessed in locations within 25 metres of a major road junction whereas these locations would qualify for an AQMA.

2.15 JAQU told us that if local authorities' own air quality monitoring identifies a potential NO₂ breach they can contact JAQU. If JAQU deems the evidence to be sufficient, these local authorities would be subject to Ministerial Direction and eligible for funding through the NO₂ Programme. JAQU said that local authorities have approached JAQU with evidence of an alleged air quality problem on several occasions, however, in all cases JAQU concluded that the evidence was insufficient to demonstrate an NO₂ problem that would fall within the scope of the NO₂ Programme.

Government's approach to allocating funding

2.16 The lifetime programme budget for local authorities' work under the NO₂ Programme increased fifteen-fold between 2015 and 2020, from £55 million in 2015 to £883 million in 2020, with capital allocations representing 70% of available funding. There are three main tranches of funding available to local authorities in the Programme:

- The Implementation Fund, which provides funding to assist local authorities in developing and implementing clean air plans.
- The Clean Air Fund, which is to assist local authorities to support those affected by the plans and help to improve the local acceptability of clean air measures by making it easier, more attractive or more affordable for individuals and businesses to change to cleaner modes of transport, by enabling a local authority to implement plans that collectively impact on fewer people; or by reducing transport costs for people.
- Feasibility funding to support local authorities that were directed to conduct targeted feasibility studies to identify measures that could bring forward compliance.

2.17 As at February 2020 JAQU had awarded £522 million to local authorities through to 2021-22 with more than half (54%) to support individuals and business affected by the plans (through the Clean Air Fund), around one third of this (35%) going towards the implementation of measures (through the Implementation Fund) and 10% towards funding for feasibility studies. Government has also budgeted a further £180 million in 2022-23. HM Treasury told us that it has not set a firm limit for the budget for local authorities' implementation of measures to tackle breaches, in order to meet a legal requirement that cost cannot be a limiting factor to achieving compliance in the shortest possible time. It has set a budget in the usual way for the Clean Air Fund.

2.18 The proposed CAZ in Greater Manchester which is currently under review spanning 10 local authorities, accounts for £191 million of the awards to local authorities to 2021-22, with 69% (£132 million) of its allocation coming from the Clean Air Fund⁴ (**Figure 6**).

2.19 Government has taken steps to provide funding in a way that supports capacity and capability in local authorities. In March 2018, Defra announced that local authorities would be granted more than £40 million from the Implementation Fund to support them taking action as soon as possible to improve air quality. This included £11.7 million to the 28 local authorities with the biggest air quality challenges to support them to develop air quality plans, including securing resource and expertise. A further £1.65 million was awarded to support 33 local authorities that had been directed to conduct targeted feasibility studies to identify measures that could bring forward compliance. Local authorities we spoke to in focus groups had mixed views on the level of funding made available to tackle air quality: some local authorities were happy with the settlement they received, and others felt the amount received was insufficient for their needs or did not reflect their specific circumstances.

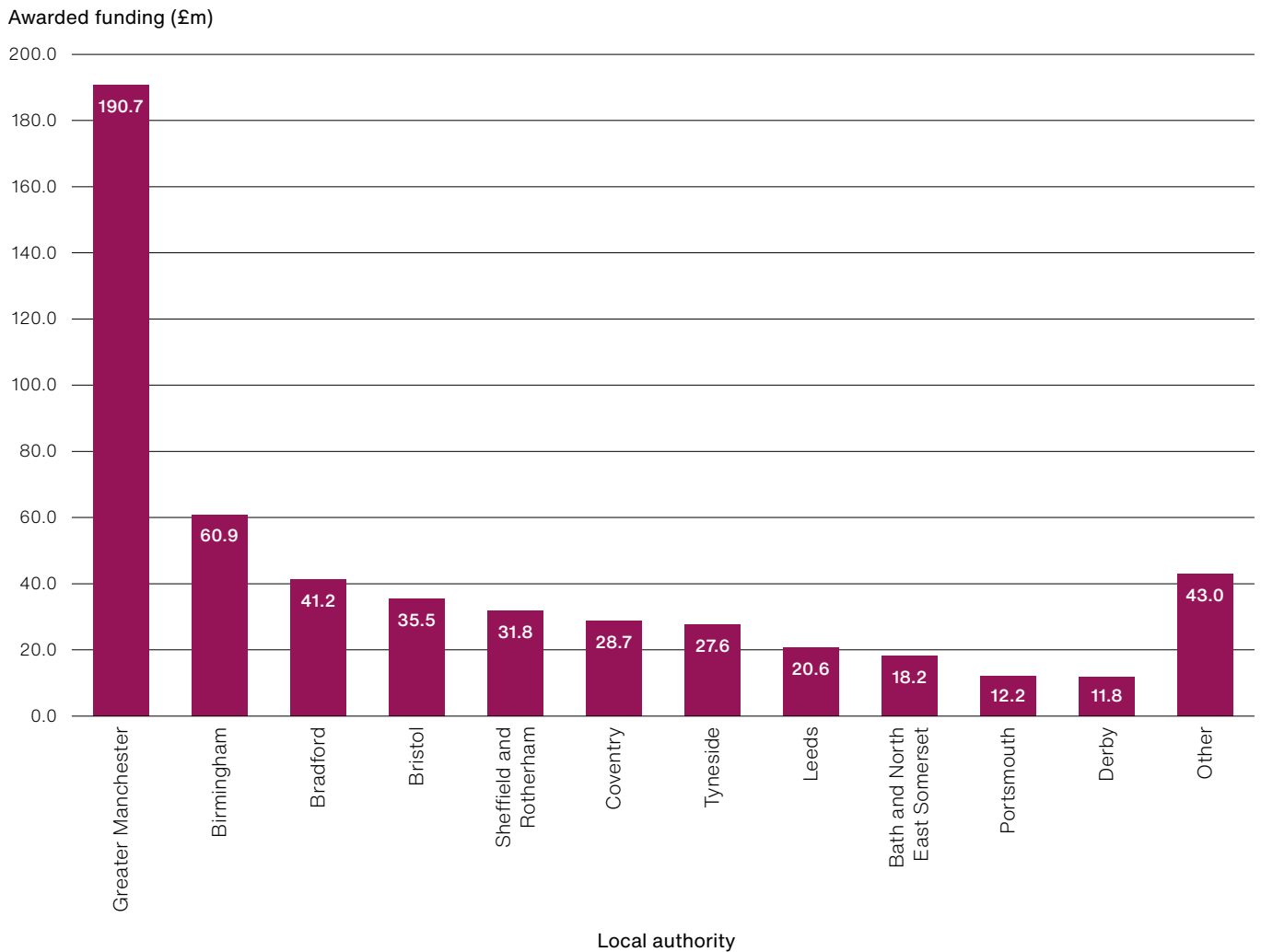
2.20 JAQU requires local authorities applying for air quality funding to develop a business case and works closely with local authorities throughout the business case process. Once a local authority submits a completed business case there is an eight-week turnaround target to carry out several layers of final scrutiny on cases before submitting them for ministerial approval. Scrutiny includes a review of technical documents and scientific evidence by the relevant leads who have already developed an understanding of the local authority's plans, and a review of the business case by an expert panel drawn from academia and local government. The Chief Analyst Office assesses the business case's value for money and provides assurance over evidence submitted by a local authority. Immediately before submitting for ministerial approval, business cases and summary evidence from all reviews are sent to the Programme board for approval. Bids over £10 million require approval from the Defra Investment Committee.

⁴ On 4th February 2022, government announced that it had granted permission to Greater Manchester Authorities to delay the implementation of their Clean Air Zone. On 8th February 2022, government directed ten Greater Manchester local authorities to review the local plan for NO₂ compliance and submit a revised plan by July 2022.

Figure 6

Total awards to local authorities in England under the Nitrogen dioxide Programme for the financial years 2016-17 to 2021-22

In total, the Joint Air Quality Unit has awarded £522 million to local authorities through to 2021-22

**Notes**

- 1 The 'Other' data point captures funding for all other 39 local authorities which have been allocated funding under the Nitrogen dioxide Programme. This includes those who were allocated funding for an initial feasibility study, but for whom it was determined that no further action would be taken.
- 2 Ten local authorities in Greater Manchester are implementing air quality measures together: Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Stockport, Tameside, Trafford and Wigan.
- 3 Sheffield City Council and Rotherham District Council are implementing joint clean air measures.
- 4 Tyneside refers to joint clean air measures being implemented by Newcastle City Council and Gateshead Council.
- 5 The £522 million funding awarded to local authorities by the Joint Air Quality Unit covers support to individuals and businesses affected by the plans (the Clean Air Fund), the implementation of measures (the Implementation Fund) and support for conducting feasibility studies.

Source: National Audit Office analysis of Joint Air Quality Unit data

2.21 JAQU told us that close, iterative, working has meant that, apart from Greater Manchester, no pushback on proposals has occurred near the end of the process. Some local authorities in our focus groups told us that JAQU's relationship managers were very engaged and generally good to work with, but others reported that high staff turnover was a source of frustration. Some also voiced concerns over JAQU's inflexibility and lack of understanding of local politics. Other concerns raised by local authorities in our focus groups included:

- incurring increased costs and delays arising from problems with JAQU's guidance and related information requests;
- the programme being too process-driven, rigidly focusing on demonstrating legal compliance; and
- too much emphasis placed on CAZs as the default option, instead of other measures that may be more suited to the area.

2.22 Government has also made funding available for tackling NO₂ breaches on the Strategic Road Network. In 2015, the DfT's first Road Investment Strategy introduced ringfenced capital for an Air Quality Fund to "ensure a specific focus and real improvements" to air quality on the Strategic Road Network. However, by the end of the first road period in March 2020, National Highways had spent £38.7 million of a £75 million budget which it attributed mainly to a lack of available measures. National Highways told us that lack of revenue funding was also a limiting factor, albeit to a lesser extent, which limited its ability to work with local authorities to encourage a switch to electric vans. There is no ringfenced air quality budget in the second five-year Road Investment Strategy, which began in 2020-21. However, the Strategy includes a £345 million Environment and Wellbeing fund, which National Highways can use for air quality measures alongside other environmental and wellbeing objectives.

Part Three

Progress on the Nitrogen dioxide Programme

3.1 This Part assesses whether the Nitrogen dioxide Programme (the Programme) is on track. It covers what the Programme has delivered so far, how government has evaluated the impact of its work to date, how government monitors and understands the Programme's progress and how it has managed potential barriers and delays.

What the Programme has delivered so far

Local authorities' implementation of measures

3.2 As at April 2022, 14 local authorities had implemented all the measures that they had agreed with the Joint Air Quality Unit (JAQU), which they expect are required to tackle local nitrogen dioxide (NO₂) breaches. Two of these local authorities introduced operational Clean Air Zones (CAZs) and twelve local authorities have completed all planned non-charging measures. A third CAZ is operational in Birmingham, which is in the process of implementing additional non-charging measures.

3.3 JAQU has a robust evaluation methodology that is likely to mean it will receive insights into the effectiveness of measures implemented to tackle local NO₂ breaches. As part of its evaluation strategy, JAQU asks local authorities within the NO₂ Programme to design and run their own monitoring and evaluation activities, to track progress and to understand the effectiveness and impacts of measures. JAQU has also commissioned Ipsos UK and the Institute for Transport Studies (ITS), University of Leeds to carry out a central evaluation of the effects of measures implemented to tackle local NO₂ breaches. The central evaluation approach involves several elements:

- Data monitoring and before-and-after analysis of local air quality and traffic data, provided by local authorities, to assess changes in air quality trends, vehicle flows and fleet composition in areas implementing local NO₂ plans;
- Rapid assessments, covering more detailed, thematic examinations of specific elements of a local plan or measure. Three rapid assessments are underway each with a different focus: one examines the impact of the COVID-19 pandemic on businesses' capacity to respond to CAZs, and the other two examine the responses of national fleet operators and taxi drivers in CAZ areas; and
- Deep-dive case studies to understand how and why air quality improvements have been achieved, and explore wider impacts on different stakeholder groups, primarily residents and small businesses. One case-study is complete and six are underway.

3.4 Ipsos UK and ITS have reported that the COVID-19 pandemic disrupted the evaluation work, including by delaying the implementation of measures and thereby delaying the evaluation of those measures' effects, and by making it more challenging to disentangle the effects of the plans from those of the pandemic. For example, JAQU told us that NO₂ concentrations fluctuate seasonally, are very sensitive to factors such as the weather, and were also affected by COVID-19 lockdowns. JAQU said that, together, these factors make the data very 'noisy' and difficult to analyse.

3.5 This approach to evaluation demonstrates several elements of good practice. For example, Ipsos UK and the ITS, University of Leeds created an extensive theory of change that outlines the assumptions that have been made, hypothesises how measures will impact air quality and covers any additional effects that measures may have on local communities including negative effects such as displacing traffic to surrounding areas. Creating a theory of change is an important step in designing an evaluation methodology because it highlights what potential effects measures could have and thereby indicates what data and analysis are needed to fully evaluate the effects of measures. The evaluation methodology clearly outlines the criteria that will allow areas that have implemented measures to be compared with appropriately similar areas that have not implemented measures. Choosing appropriate control areas in this way is good practice and will lead to JAQU gaining more robust insights into the effects of measures.

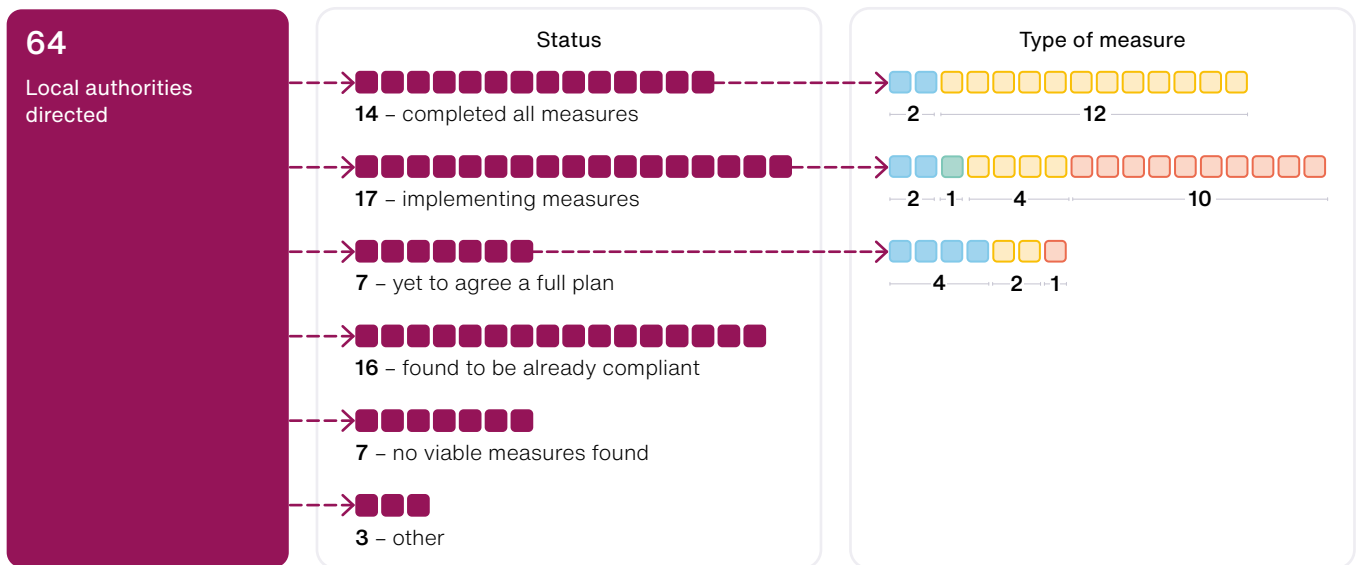
3.6 On a local authority level, and acknowledging that the results may still be affected by the effects of the COVID-19 pandemic, Bath and North East Somerset (BaNES) has provided a progress update following the implementation of its CAZ. Its preliminary analysis suggests that the CAZ is likely helping to reduce the number of more polluting vehicles, changing behaviour and improving the city's air quality in general. For example, BaNES reported that when the CAZ first launched, 33% of chargeable vehicles travelling within it met the emission standard; three months later, that figure had risen to 82%. Local authorities model the effects that measures will have prior to implementing those measures. JAQU's information reports that in the 14 local authorities that have implemented all measures, this modelling predicts that, on average, measures have or are expected to bring compliance forward by 1.5 years (beyond when an area would be expected to become 'naturally' compliant due to wider trends in the transport sector).

3.7 Of the 64 directed local authorities, 16 were found to be already compliant following local modelling and were not required to remain within the Programme. A further 17 local authorities are in the process of implementing measures (two of which JAQU considers have implemented the majority of measures required to deliver compliance, and 10 of which fall within Greater Manchester where plans are under review), and there are seven local authorities that are yet to agree a full plan with government for tackling breaches (**Figure 7**).

Figure 7

Summary of government information on local authority progress under the Nitrogen dioxide Programme, April 2022

Of the 64 local authorities directed to act under the Nitrogen dioxide (NO₂) Programme, 38 remain in the programme, 14 of which have implemented all of the measures they agreed with the Joint Air Quality Unit (JAQU)



- Clean Air Zone (CAZ)
- CAZ completed, non-charging measures being implemented
- Non-charging measures
- To be determined

Notes

- 1 This figure presents JAQU's understanding of the progress made by local authorities in England involved in the NO₂ Programme and does not represent a judgement on progress by the National Audit Office.
- 2 The 10 local authorities shown as implementing measures with plans to be determined are within Greater Manchester. In February 2022, government granted permission to Greater Manchester Authorities to delay the implementation of their Clean Air Zone and directed them to submit a revised local plan for NO₂ compliance by July 2022, to secure compliance in the shortest possible time and no later than 2026.
- 3 JAQU considers that two of the local authorities that are in the implementing measures category have already brought in the majority of measures required to deliver compliance.
- 4 Where local authorities have delivered a CAZ alongside non-charging measures, these local authorities have been included in the CAZ categories. There are currently three operational CAZs.
- 5 The local authorities in the 'yet to agree a full plan' category are either developing plans or awaiting central government approvals. These local authorities' measures are counted in the relevant category according to their preferred measure or what JAQU expects to be their preferred measure.
- 6 JAQU has determined that 26 of the 64 local authorities directed to act are no longer part of the programme. JAQU considers 16 were found to be already compliant following local modelling and were not required to remain within the Programme; and seven have had ministerial agreement to exit the programme after they were unable to find 'viable' measures to bring forward compliance. Three local authorities exited the programme for other reasons: two because the roads identified through national modelling were found not to qualify for inclusion; and, one because the road where there was a breach was found to be under the jurisdiction of National Highways.
- 7 The no viable measures category includes a local authority which has implemented some measures but where government has agreed there are no viable measures for one road link.

Source: National Audit Office analysis of Joint Air Quality Unit information

3.8 A further seven local authorities found no viable measures that would bring NO₂ concentrations below legal limits before the local authority was expected to become 'naturally' compliant. For example, available measures were not expected to accelerate compliance ahead of natural compliance or would disproportionately worsen air quality in neighbouring local authorities. JAQU told us that ministerial sign-off was needed to formalise 'no viable measure' decisions and that if options for these local authorities become available it would review them. There are three local authorities which were identified through JAQU's national modelling but have since exited the Programme. Two roads identified were found not to qualify for inclusion in the Programme and one road was found to be under the jurisdiction of National Highways.

Tackling breaches on the Strategic Road Network

Identifying mitigations

3.9 JAQU told us that at the time of the government's 2017 plan for tackling NO₂, it believed that measures could be found that would be effective on the Strategic Road Network and government expected full compliance with the NO₂ concentration limits across the UK in 2026. Government considered road charging unsuitable for the Strategic Road Network due to the safety and emissions impact of displacing vehicles onto local roads.

3.10 Since 2015, National Highways has carried out research aimed at improving air quality, including 10 pilots. Pilots included traffic management, speed management, work to bring forward uptake of zero emission vans and introducing air quality barriers.

Assessing non-compliance on the Strategic Road Network

3.11 JAQU's modelling for the 2017 NO₂ plan identified a number of sections of the Strategic Road Network where NO₂ levels were likely to exceed local NO₂ limits until at least 2018. JAQU commissioned National Highways to:

- carry out detailed local assessments to confirm whether sections actually exceeded legal limits; and
- develop measures to improve air quality in the shortest possible time for those sections confirmed as exceeding the limit value.

3.12 JAQU commissioned National Highways to examine two further groups of sections in 2019 and 2020. Across the three commissioning rounds JAQU has identified 129 potentially non-compliant sections on the Strategic Road Network for National Highways to assess.

3.13 In total 31 of the sections examined in the first two commissioning rounds were confirmed by National Highways as non-compliant with the balance assessed to be below limit values. All sections currently included within National Highways' air quality programme are defined as urban roads (which includes built-up areas).

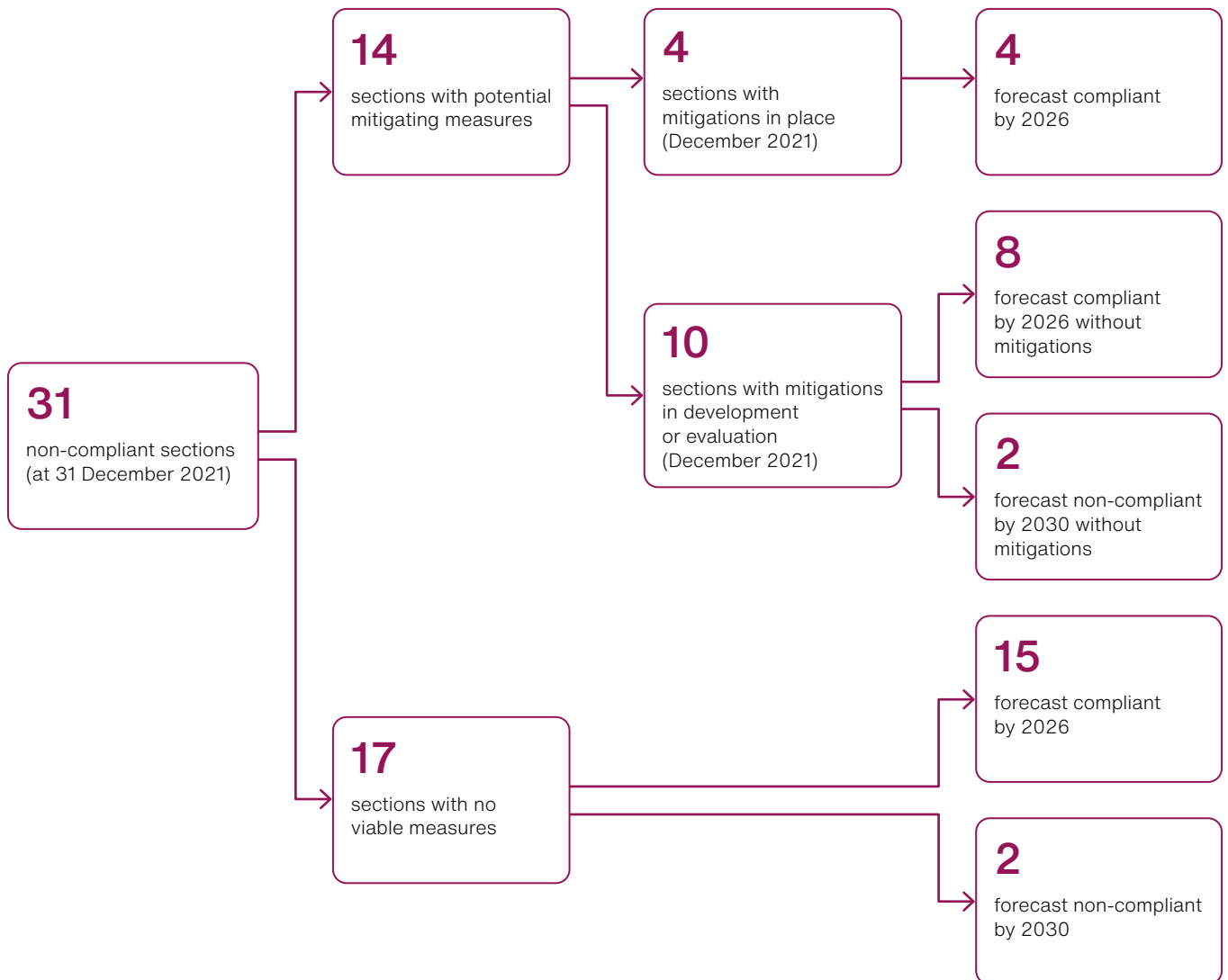
3.14 National Highways has little control over the volume and type of vehicles using the network and so is limited in the levers it has available to bring forward NO₂ compliance. Of the 31 non-compliant sections National Highways has identified 14 where potential mitigations could bring forward limit level compliance (**Figure 8** overleaf). It considers imposing speed limits to be the most effective measure with initial assessments showing a 17% reduction in emissions, but this is not an option at those non-compliant sections where heavy congestion already restricts speeds. National Highways has introduced speed limits to address four breaches on the Strategic Road Network. National Highways is evaluating whether existing speed limits in a further four sections will bring forward compliance. National Highways forecasts that 12 of these 14 sections will meet NO₂ limit levels by 2026 even in the absence of mitigations. The remaining two are not forecast to be compliant until 2030 at the earliest, although it is possible that mitigations could bring forward the point at which they are compliant.

3.15 National Highways has been unable to identify viable measures for 17 of the 31 non-compliant sections of the Strategic Road Network. National Highways told us that from its perspective a viable measure is one that can reduce NO₂ levels by at least 1% of the limit value, is physically possible to introduce or construct and that will bring forward limit level compliance by at least one calendar year. However, National Highways does not currently publish these criteria. National Highways also considers other factors such as the extent to which mitigations could create safety risks by diverting traffic onto local roads. Again, there are no published criteria that set out the point at which these types of issue render a particular measure non-viable.

3.16 Of the 17 sections with no viable measures, National Highways forecasts that 15 of them will reach NO₂ limit levels by 2026 nonetheless as a result of change in the vehicle fleet. The remaining two will not be compliant until 2030 at the earliest. These persistent breaches on the Strategic Road Network mean the date for expected full compliance with the NO₂ concentration limits has been put back by at least four years since government published its 2017 plan for tackling NO₂, when it expected full compliance by 2026 (see paragraph 2.5).

Figure 8
Mitigations for non-compliant sections of the Strategic Road Network

National Highways' modelling predicts that up to four sections of the Strategic Road Network will still be in breach of NO₂ concentration limits in 2030



Notes

- 1 Of the four sections of the Strategic Road Network with mitigations in place all have an air quality speed limit.
- 2 Of the 10 sections with mitigations in development six are being assessed for the feasibility of different types of intervention: HGV re-routing (two sections); traffic management (one section); speed limits (one section); relocating a cycle meeting point and then closing a cycleway (one section); and the installation of a nine metre high barrier (one section). The section where the feasibility of a barrier is being considered is also under consideration for an alternative cycleway and the introduction of a local electric vehicle scheme. There are four sections where National Highways is assessing the impact on air quality of speed limits already in force for traffic management (three sections) and safety (one section).
- 3 In the 17 sections deemed to have no viable measures, National Highways were unable to identify mitigations that would bring compliance forward. National Highways forecasts that 15 of these will be compliant by 2026 in the absence of mitigations due purely to turnover in the fleet. The remaining two will not be compliant until 2030 at the earliest.
- 4 The Strategic Road Network comprises 4,300 miles of motorways and major 'trunk' A-roads in England.

Source: National Audit Office analysis of National Highways data

No viable measures

3.17 In March 2021, National Highways requested direction from the Department for Transport (DfT) on next actions on the 17 sections of the Strategic Road Network where no measures are available. During 2021, it also held discussions with DfT and JAQU about its assessment on non-viable sections. In July 2021, DfT wrote to Ministers to inform them National Highways could not identify viable measures at 17 sections and included a copy to the Accounting Officer at DfT. The note set out a preferred option for National Highways to monitor these non-compliant sections and to continue to assess new technologies and other options that will support the reduction of NO₂ levels on the Strategic Road Network. This would then be reported annually by National Highways.

3.18 In September 2021, DfT wrote to National Highways requiring it to monitor actual NO₂ levels at the 17 sections of the Strategic Road Network by installing air quality monitoring equipment, publish an air quality progress report and to continue to seek and advise DfT on means to bring forward compliance. DfT confirmed that subject to these requests, National Highways had fulfilled its commission for non-viable sections of the Strategic Road Network.

3.19 In October 2021, the Infrastructure and Projects Authority identified that a major risk to delivery of the NO₂ Programme is compliance on the Strategic Road Network. It recommended JAQU, as policy owner, should lead work to review the current policy for meeting compliance on the Strategic Road Network. It would then be for Ministers to reflect on policy options. JAQU is currently carrying out policy work to assess the effectiveness of a targeted vehicle upgrade scheme. It currently estimates that upgrades would be required on 34% to 89% of frequent vehicles to bring forward compliance by two to four years. In January 2022, the Transport Select Committee recommended that government “assess the potential effect of a road pricing mechanism based on telematic technology on changing drivers’ behaviour and delivering its wider policies” including air quality.

Progress against schedule

3.20 It is an essential part of good programme management for programme leadership to receive timely reporting on progress and milestone achievements. This should include systematic reporting against clear criteria in a way that reduces reliance on individual judgments.

3.21 JAQU has established a Programme board with responsibility for the strategic direction for the Programme, for its delivery and for providing assurance and challenge. The Board is chaired by the Programme's directors, one from each of DfT and the Department for Environment, Food & Rural Affairs (Defra), who are its senior responsible officers (SROs)⁵. JAQU's relationship managers provide monthly updates to the Board on progress in the local authorities they work with, which has allowed the Board to identify potential risks for delivery of the Programme as a whole. Relationship managers use a 'red-amber-green' rating to report their 'delivery assessment', which indicates the local authority's progress against project milestones and government deadlines and a 'relationship assessment', which highlights any potential difficulties in the relationship between JAQU and local authority politicians or officials.

3.22 However, the Board has not had a sufficiently clear picture of the Programme's overall progress against schedule. The Board has not had complete and consistent information on estimated completion dates, nor has it had regular summary data on when and why local authorities missed interim milestones, including legal deadlines for submission of outline and full business cases set under Ministerial Direction. This risks limiting decision-makers' understanding of the extent to which common issues have materialised that might need national action to address, and could make it harder to judge when escalation is required.

3.23 Following information requests to JAQU, we established that the Programme's progress has been slower than expected:

- JAQU considers that of 38 local authorities that have implemented, are implementing or are planning measures, 25 missed a legal deadline for providing a full business case. JAQU told us it does not consider that all these local authorities were behind schedule because in some cases it released funding for local authorities to start implementation alongside final approval of the business case.
- Local authorities are also set a deadline for achieving compliance. JAQU considers that eight have missed their compliance deadlines. Due to monitoring data in 2020 being unrepresentative due to COVID-19 lockdowns, JAQU cannot yet be clear on whether a further 10 local authorities have missed their compliance deadlines, which have now passed.

⁵ The Programme is unusual in that it has two SROs. The IPA's review of the Programme in 2021 concluded that whilst unusual, the arrangement was working. The review recommended that these arrangements should be subject to regular review.

- In 2017 government estimated that CAZs would take up to three years to implement, and non-charging measures would only be considered if they delivered compliance as fast or faster than this benchmark, with all measures implemented by 2021. While JAQU's information on expected completion dates is incomplete, the data that are available show that it is taking many local authorities longer than three years to complete measures, and in some cases, are expected to take more than double that time. As of 1 April 2022, information provided by JAQU shows that the 17 local authorities still in the process of implementing measures had been involved in the NO₂ Programme for 4.5 years on average, with two of these having been in the Programme for more than six years. It does not have a firm expected completion date for most (12) of these 17 local authorities, ten of which fall within Greater Manchester where plans are under review. JAQU has firm expected completion dates for three of the seven local authorities that are yet to begin implementing measures. If these expectations are borne out, they will take an average of 4.5 years to complete measures.

3.24 JAQU told us it considers the COVID-19 pandemic has been the main cause of delays, and there is evidence that the COVID-19 pandemic contributed to delays in several ways:

- We heard from some local authorities that COVID-19 had disrupted their design and implementation of measures to tackle NO₂.
- In relation to developing the Central Clean Air Service, in 2020, the IPA reported concerns that the COVID-19 pandemic had reduced capacity within the local authorities to meet the various readiness requirements.
- The IPA also highlighted that the pandemic had led to factors which reduced the political will of local authorities to introduce a charging system that would involve charging businesses, when public and political acceptability of introducing charging had changed, and at a time when substantial reductions in traffic during the lock-down restrictions had improved air quality (albeit temporarily).
- The impact of the COVID-19 pandemic on supply chains was a reason given for the government's decision in February 2022 to grant permission to Greater Manchester Authorities to delay the implementation of their Clean Air Zone. This was based on evidence provided by Greater Manchester that COVID-19 impacts on the price and availability of second-hand vehicles will make it harder for people to upgrade to cleaner vehicles meaning that a CAZ would be unlikely to deliver compliance with legal limits by the original date of 2024. In February 2022, government directed 10 Greater Manchester local authorities to review the local plan for NO₂ compliance and submit a revised plan by July 2022, to secure compliance in the shortest possible time and no later than 2026.⁶

⁶ The February 2022 Ministerial Direction revoked an earlier Ministerial Direction (March 2020) to the 10 Greater Manchester local authorities to implement a local NO₂ plan (with measures including a CAZ), to achieve compliance with the legal limit value for NO₂ in the shortest possible time and by 2024 at the latest.

3.25 However, taken at face value the NO₂ Programme Delivery Board's reporting implies that significant risks of delay predate the COVID-19 pandemic, with a 'red' overall delivery risk rating reported in November 2019. JAQU told us this signified caution until the first CAZs and the supporting digital system for charging were operational, and that it considers the Programme was at most six months delayed before the pandemic. But the limitations in JAQU's progress information mean it cannot quantify COVID-19's contribution to delays. Local authorities we spoke to in focus groups recognised the impact of the COVID-19 pandemic in contributing to delays but some also pointed to other factors such as slow decision-making processes in JAQU and changes of personnel in JAQU requiring decisions to be revisited. We are aware of other factors which may have contributed to delays prior to the pandemic or which present potential barriers to the Programme's progress (paragraph 3.26 to 3.39). JAQU also told us that some delays will have been due to local modelling identifying more serious NO₂ problems than it anticipated in 2017, although it does not have information to quantify how often this has happened. JAQU told us that it considers a further cause of delay has been due to local authorities submitting evidence late, or evidence not meeting required standards.

Government's management of delays and potential barriers to progress

Government's approach to public engagement

3.26 An important aspect of delivering programmes is ensuring that the right people, such as users, implementing partners and suppliers are bought into the programme. In our focus group discussions we heard from some local authorities that it can be difficult to get buy in from both local people and businesses at the same time, and that local political debates could cause complications when implementing clean air measures. JAQU views communications with stakeholders as important for increasing awareness of and public support for clean air measures, and in helping the public and businesses to understand how to follow the rules and make payments.

3.27 JAQU told us that after considering options for a national approach, government decided that in areas implementing CAZs, local authority-led local and regional campaigns under branding developed by central government would be used to communicate with the public. JAQU developed a communications strategy to support the communications efforts of local authorities which included developing marketing materials for use by local authorities and leading a programme of stakeholder engagement. The strategy aims to support local authorities to raise awareness of the launch of CAZs with local people; direct drivers to the vehicle checker on gov.uk; encourage the use of cleaner transport; and inform people of the health harms of emissions.

3.28 This locally-led approach was used prior to the launch of the first two CAZs that became operational, Bath and North East Somerset (BaNES) and Birmingham. In both cities, existing levels of awareness of the upcoming CAZs among surveyed residents and businesses was more than 90%. However, surveys conducted following the communications campaign and launch of the CAZs found that:

- the campaigns did not result in a statistically significant increase in the percentage of residents who 'know a great deal' or 'fair amount' about the CAZ, although there was an increase in the percentage of businesses that 'know a great deal' about the CAZ;
- the reasons for the CAZ were misunderstood by a substantial minority of those surveyed in both cities. In both cities, the most frequent reason given for why the CAZ was being implemented by both residents and businesses was 'improving air quality' or 'reducing air pollution'. However, in both cities a substantial minority of respondents thought that CAZs aimed to increase council revenues (23% of residents and 21% of businesses in Birmingham and 15% of residents and 19% of businesses in BaNES).⁷ Under the Transport Act 2000 any excess revenue generated by charging CAZs (after operation costs are paid) must be re-invested by the local authority to help achievement of local transport policies; and
- 59% and 53% of businesses in BaNES and Birmingham respectively knew to check the online vehicle charge checker.

3.29 This locally-led approach was criticised by some of the local authorities we spoke to in our focus groups, who raised concerns about the lack of a coordinated national communications campaign, particularly to inform drivers of the need for clean air measures in certain locations and to help clear up confusion amongst drivers given that charging regimes differ between CAZs. JAQU recognises the need to communicate to a degree at the national level to people living outside of the relevant local authorities and the IPA noted in its 2018 review of the Programme that some stakeholders requested a national approach to communications. The IPA reported in 2020 that limited central government communication of the launch of the Central Clean Air Service risked "negative and uninformed messages being communicated at a local authority level, leading to reduced confidence and buy-in from local political leaders and public misunderstanding".

⁷ The percentages reported are taken from surveys conducted after the launch of the CAZs. Participants could provide multiple responses and therefore the percentages would not sum to 100%.

3.30 JAQU's communications campaign messaging is intended to complement wider government messaging to help achieve Net Zero by 2050 and encourage people to consider cleaner transport options. Behaviours which are being encouraged to improve air quality in CAZs, such as upgrading to cleaner vehicles including electric vehicles, and encouraging walking and cycling, can contribute to meeting Net Zero. In 2020, government set up a dedicated central government behaviour change and public engagement team in the Department for Business, Energy & Industrial Strategy (BEIS) for Net Zero which JAQU could seek to learn from.

Government's approach to developing the Central Clean Air Service

3.31 The timely operation of a functional digital vehicle checker and payments service is an essential element of the Programme, required for local authorities to identify non-compliant vehicles travelling within charging CAZs and collect payment. Government succeeded in delivering a functional service to support the launch of the first CAZ in March 2021. This allows users to check their vehicle's compliance status in CAZs and make payments for their vehicle (or for multiple vehicles in the case of fleet businesses). The service is used by the three operational CAZs operated by BaNES council, Birmingham City Council and Portsmouth City Council for vehicle-checking and payment collection. Ahead of the launch of a potential further three CAZs, systems developed by Bradford City Council, Bristol City Council and Greater Manchester Authorities have been added to the service to allow users to check whether a single or multiple vehicles meet the emissions standard in these areas, to encourage awareness of the CAZ ahead of the launch.⁸

3.32 While there are other digital payments services for charging road users using camera and Driver and Vehicle Licensing Agency (DVLA) vehicle data (for example, Transport for London (TfL) uses one such system for its charging schemes), government's vehicle-checking and payments service has elements of novelty and complexity.⁹ For example, the service uses live vehicle registration data from DVLA, in contrast to TfL's system which draws on monthly reports. In addition, as per Government Digital Service (GDS) standards the service delivers a single 'front end' on gov.uk, which provides one route for members of the public and businesses to check their vehicle and make payments for all CAZs in England. This required JAQU to build 'back end' functionality to allow individual local authorities operating CAZs to integrate with the central government-owned service.

⁸ JAQU expects the clean air zones being implemented by Bradford City Council and Bristol City Council to launch in 2022. In February 2022, government granted permission to Greater Manchester Authorities to delay the implementation of their Clean Air Zone and directed them to submit a revised local plan for NO₂ compliance by July 2022, to secure compliance in the shortest possible time and no later than 2026.

⁹ Transport for London's vehicle charging schemes which include the Congestion Charge, Low Emissions Zone and Ultra-Low Emission Zone are not considered 'Clean Air Zones' because they operate independently of central government's Nitrogen dioxide Programme and operate a different charging framework.

3.33 Independent reviews between 2018 and 2021 by the IPA and Government Internal Audit Agency (GIAA) have highlighted weaknesses in JAQU's approach to developing the service, as well as the improvements they have made to address these. In July 2018, the IPA reported that there were several major delivery risks to the project, including a lack of in-team project management and digital capability, a lack of a comprehensive project plan (including project milestones, dependencies and critical path) and poor project governance. JAQU responded by establishing several dedicated governance boards in 2019 and 2020 and by bringing in additional project management and technical capability and capacity. In March 2020, the GIAA recognised the "significant efforts and progress" made by JAQU to improve governance, resourcing and stakeholder engagement but noted that there remained no clear and fully integrated critical path identifying key actions, dependencies, and risks. In June 2020, the IPA reported that project management practices had improved significantly and that the team had done well to maintain their delivery schedule during the COVID-19 pandemic but identified stakeholder communications as an area which "could be significantly improved". The most recent review by IPA in October 2021 highlighted that JAQU have delivered the digital elements of the first two operational CAZs to time (a third CAZ has since become operational).

3.34 The GDS has also reviewed the Clean Air Service three times throughout its development, in January 2019, October 2019 and in May 2021, after the service was used to support the operation of the first CAZ which launched in March 2021. In each report, GDS concluded that all service criteria, which are intended to help government create and run good digital services, had been met. GDS's latest report from May 2021 highlighted that JAQU needs to make sure that the design works as more CAZs become operational and are added to the service, and requested that JAQU explore why failed payment percentages were so high (between 15 March and 2 May 2021, 11% of payments did not complete).

3.35 Leeds and Birmingham City Council attributed delays in the launch of their planned CAZs to delays in the development of the Central Clean Air Service. In April 2019, eight months before the original go-live dates of both CAZs and after the final business case of Birmingham (March 2019) and the outline business case of Leeds (November 2018) had been signed off, JAQU informed the local authorities that they, and not JAQU, would be responsible for delivering the reconciliation element of the 'payment, settlement and reconciliation' system needed for the service. This part of the project is particularly complex and required them to procure a service provider at a late stage. On 7 June 2019, JAQU informed the councils that a useable version of the vehicle checker would be ready in December 2019, not September 2019 as expected. In June 2019, Birmingham decided to delay the earliest launch date of its CAZ to 1 July 2020 because in its view, the central government part of the service was not advanced enough to allow them the six to twelve-month period it needed to develop its reconciliation system. Birmingham subsequently agreed a postponement to June 2021 because of the impact of COVID-19 on the city's economy and preparations for the CAZ, and in October 2020 following a joint review, Leeds City Council and central government agreed that as a result of air quality improvements made over the previous two years it had suitably demonstrated legal compliance, and therefore its CAZ was no longer required.

3.36 During this period GDS introduced a delivery risk to the Programme which JAQU had to manage at speed, when in May 2020 it withdrew from providing direct debit payment functionality. JAQU procured an alternative supplier on short time scales and completed testing and integration by October 2020, in time to complete testing for the first CAZ to launch in 2021.

Government's plan to decommission the NO₂ Programme

3.37 It is important that JAQU has a clear understanding of what needs to be achieved for the Programme to be decommissioned and that delivery bodies are clear on what they need to do to achieve compliance and exit the Programme.

3.38 In October 2021, JAQU approved an evidence framework through which local authorities will demonstrate the success of measures introduced under the Programme. Local authorities will monitor and model air quality for a minimum of two years (from the beginning of the first year in which NO₂ concentrations are below legal limits), to provide JAQU with evidence to assess whether an area is likely to remain compliant and the authority can begin to decommission their measures. JAQU is finalising its plans to decommission measures under the Programme and the process for confirming that Ministerial Directions placed on local authorities have been met.

3.39 JAQU does not yet have full data on when all local authorities in the Programme expect to have successfully completed their implementation of measures and reduced concentrations to within legal limits. Based on the information it has so far, it expects the last local authorities to reach compliance in 2026 and that decommissioning of the Programme will take place until 2028.

Appendix One

Our audit approach

1 This report examines government's progress in tackling local breaches of nitrogen dioxide (NO₂) limits and gives an overview of its performance and approach to air quality more broadly. We examined:

- government's approach to delivering its air quality targets, in terms of the programmes, strategies and associated funding for air quality, and the UK's current and historic performance against its air quality targets;
- government's approach to tackling local breaches of NO₂ in England, the NO₂ Programme (the Programme), in terms of how its overarching plans have developed over time, the quality assurance arrangements over its modelling and its approach to allocating funding to tackle the problem; and
- whether the Programme is on track, in terms of what it has delivered so far, how government has evaluated the impact of its work to date, how it monitors progress and how it has managed potential barriers and delays.

2 Our audit approach is set out in **Figure 9** on pages 52 and 53. Our evidence base is set out in Appendix Two.

Figure 9
Our audit approach

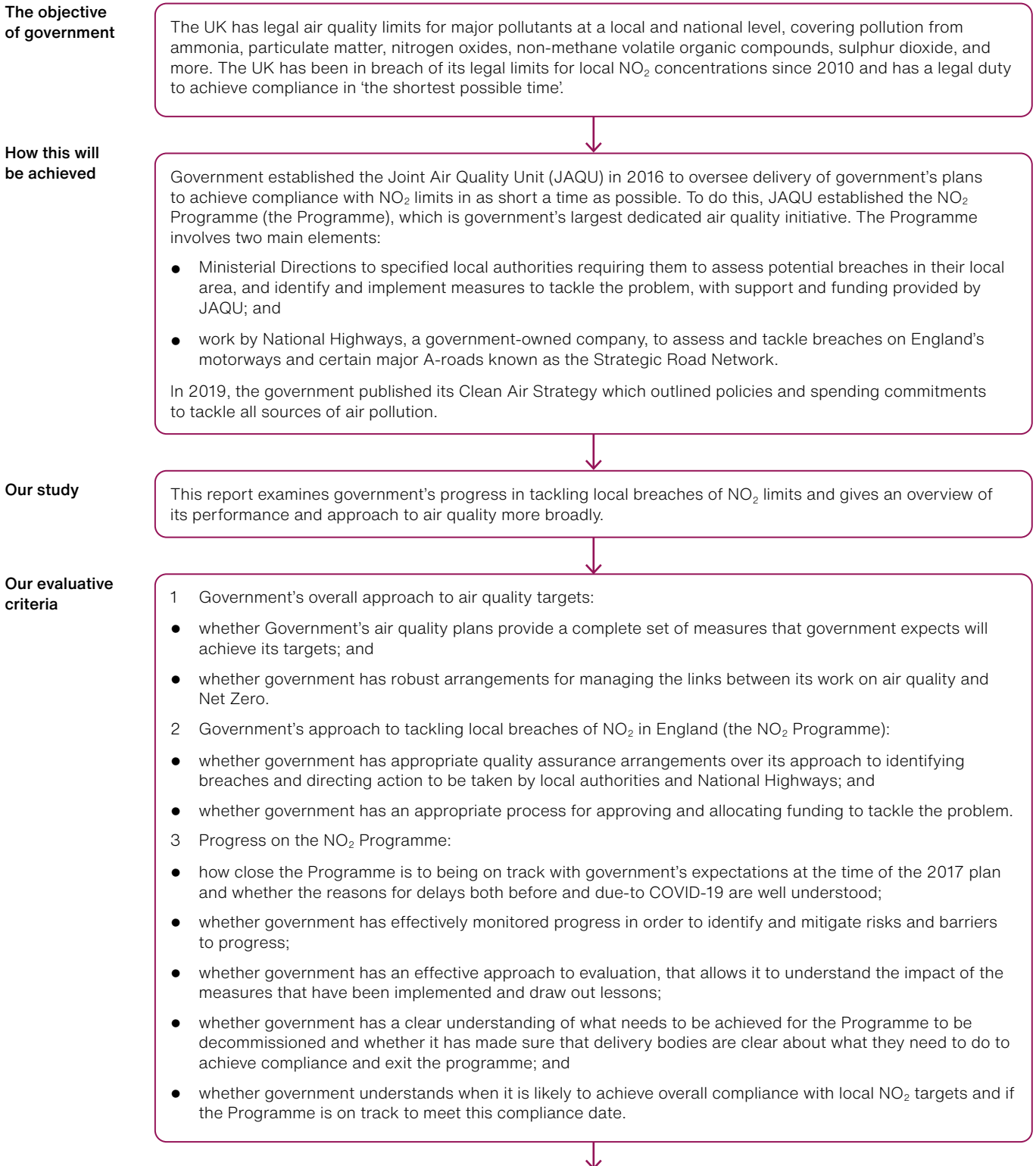


Figure 9 *continued*

Our audit approach

Our evidence

(see Appendix Two for details)

As part of our fieldwork:

- we interviewed officials at the Department for Environment, Food & Rural Affairs, the Department for Transport, National Highways and Driver and Vehicle Licensing Agency in addition to other delivery partners and stakeholders;
- we analysed publicly available air quality datasets;
- we ran focus groups with representatives from 20 local authorities who are delivering under the NO₂ Programme; and
- we analysed key central government evidence and policy documents.

Our conclusions

The NO₂ Programme, established to tackle illegal and dangerous levels of pollution, has become government's largest dedicated air quality initiative. Government has made progress, with measures fully implemented in 14 local authorities and four sections of the Strategic Road Network. However, the Programme has not moved as fast as expected. While this is undoubtedly due in part to the COVID-19 pandemic, other factors including the effectiveness of public engagement have likely played a role, and government has not had a good overview of the relative impact of different issues. It has also been slow to consider the case for national action to tackle the challenges on major roads and motorways that mean overall compliance cannot be achieved until after 2030. This is more than four years later than government expected when it published its plan for tackling NO₂ in 2017. For these reasons we cannot yet be confident that the Programme is on track to deliver value for money.

NO₂ is only one source of air pollution, and there is particular concern about the health risks from particulate matter and ammonia. Government is not yet clear how it will meet existing 2030 ceiling limits, and expects to set new long-term targets for particulate matter by October 2022. It will need to move quickly with robust plans to meet these targets if it is to put itself in a good position to meet them and secure value for money from its work on air quality.

Government publishes a lot of air quality data, but not in a way that gives the public accessible information about air quality problems and action in their area. There has been little public engagement at a national level about the purpose and progress of the NO₂ programme and the choices government has made to tackle breaches. This creates a lack of transparency which risks undermining value for money because positive public engagement is important for success across the NO₂ Programme and government's wider work on air quality.

Appendix Two

Our evidence base

Analysis and document review

- 1** We analysed data, guidance, policy and programme documents, from the Joint Air Quality Unit (JAQU), Department for Transport, Department for Environment, Food & Rural Affairs (Defra) and National Highways.
- 2** We analysed publicly available air quality data. The key publicly available data sources are:
 - Defra data on air pollutant emissions available from: www.gov.uk/government/statistical-data-sets/env01-emissions-of-air-pollutants;
 - *Air Quality in the UK* annual reports available from: <https://uk-air.defra.gov.uk/library/annualreport/index>; and
 - National Atmospheric Emissions Inventory data available from: <https://naei.beis.gov.uk/data/data-selector>.
- 3** We assessed how effectively government manages the Nitrogen dioxide (NO₂) Programme (the Programme) with reference to the National Audit Office's (NAO's) *Framework to review programmes* (April 2021). We analysed progress made by the Programme and the Programme's approach to modelling, identifying breaches, evaluation and monitoring progress.
- 4** We reviewed independent evaluations of the Programme by the Infrastructure and Projects Authority (IPA) and Government Internal Audit Agency (GIAA), independent evaluations of communications campaigns by Ipsos UK, and evaluations of the effects of measures by Ipsos UK and the Institute for Transport Studies (University of Leeds).
- 5** We reviewed external literature including research by academic, parliamentary and industry bodies such as the World Health Organization, Royal College of Physicians, European Environment Agency, European Union review of the UK's National Air Pollution Control Programme, parliamentary select committee reports and evidence to other parliamentary committees.

Interviews

6 We interviewed central government representatives from DfT, Defra, the Driver and Vehicle Licensing Agency, National Highways, the UK Health Security Agency, and the IPA.

7 We interviewed representatives from a range of organisations active in the air quality sector including the Association of Directors of Environment, Economy, Planning and Transport (ADEPT), the AIR Alliance, Client Earth, the Committee On the Medical Effects of Air Pollution, the Institute of Air Quality Management, the Local Government Association, and UK100. We also engaged with local authorities through interviews with stakeholder organisations and focus groups (see below).

Assessment of assurance of air quality modelling

8 We examined the assurance processes for the Pollution Climate Mapping model which is used to determine which local authorities should be directed to act on local concentrations of NO₂ in their area. We reviewed documentation recording the quality assurance and oversight for the national model of air quality. We reviewed quality assurance logs and technical expert discussions of model improvements with reference to the NAO's *Framework to review models* (January 2022), although we did not carry out a full review against this framework.

Focus groups with local authorities in the Programme

9 Local authorities are a key delivery body of the NO₂ Programme. Therefore, understanding their perspectives and range of experience as part of the programme was an important strand of evidence for our report.

10 We facilitated three online focus groups between January and February 2022 with representatives from local authorities involved in the NO₂ Programme. There were seven participants in two groups and six participants in the other, representing 20 local authorities.

11 We purposively sampled local authorities to achieve diversity on a range of sampling criteria. The primary sampling criteria were:

- geographic region;
- type of air quality measures being implemented;
- political leadership; and
- stage in the process of implementing air quality measures.

12 Because of the variation in the experience of local authorities in terms of the types of planned or implemented measures (charging or non-charging) and stage of implementation (from planning through to measures implemented), as far as was possible, participants were allocated to discussion groups with other local authorities at a similar stage or implementing a similar type of measures. Although our groups included a diverse range of local authorities, they were not, and were not intended to be, representative of all local authorities involved in the Programme.

13 Invited local authorities were asked to select the participant who would be best able to answer questions on their involvement in the NO₂ Programme and wider air quality work.

14 Participants were asked for their consent to be recorded; told of their right to withdraw at any time during the discussion or for up to a week after the discussion was held; and were informed of how their data would be stored and used to support the study.

15 The discussions were led by a facilitator using a topic guide to ask all three groups the same main questions. The main discussion topics included: local authorities' main air quality priorities; local authorities' experience of participating in the Programme; central government support to local authorities for implementing plans under the Programme; and future delivery of air quality priorities and obligations. Follow-up questions intended to provide clarity or ask other participants whether they agreed or disagreed were asked and varied between groups, depending on the topics raised by participants. At the end of the discussion participants were given an opportunity to share additional thoughts.

16 The discussions were recorded and transcribed. The transcripts were analysed to identify emerging themes by a member of NAO staff who was not involved in the study. This analysis was reviewed and agreed by the study team, triangulated with other sources of evidence and presentation of the findings was quality-assured by NAO qualitative experts.

17 In order to understand the experience and views of local authorities not involved in the Programme, in implementing wider air quality policies we interviewed representatives from local government stakeholder organisations (ADEPT and the Local Government Association) and attended a roundtable event on air quality held by UK100.

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