

# Policy Development: Improving Air Quality



REPORT BY THE COMPTROLLER AND AUDITOR GENERAL  
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# executive summary

- 1 The quality of the air that people breathe can have significant effects on their health and well-being. In advising Ministers on air quality, officials need, therefore, to ensure that they have effective processes to gather the evidence and analyses to develop sound policy proposals.
- 2 This report uses the development of the second national Air Quality Strategy for England, Scotland, Wales and Northern Ireland (the Strategy), published in January 2000 (Cm 4548), to examine the policy development processes of the Department for Environment, Food and Rural Affairs (the Department)<sup>1,2</sup>. It responds to the recent emphasis on modern policy development in government<sup>3</sup>, and focuses on the Department's processes for developing the Strategy.

## Introduction

- 3 Poor air quality is the result of pollution from a range of sources, including motor vehicles, industry, domestic heating and electricity generation. Poor air quality can seriously damage health but improving air quality can impose costs on both consumers and industry. The Strategy's purpose is to provide the best practicable protection to human health against the risks posed by air pollution, whilst taking into account both the costs and benefits of improving air quality. It seeks to do so by:
  - adopting air quality **standards** - which are levels, based on scientific and health evidence, at which pollutants are thought not to pose significant risks to health;
  - setting air quality **objectives** - which specify the actual levels below which the Department aims to reduce the concentration of each pollutant by a particular date.

The Strategy includes standards and objectives for eight pollutants. It does not itself include proposals for additional action to improve air quality, though it does impose some requirements on local authorities to act in areas of high pollution. Its aim instead is to set practical objectives to which policy makers across government should have regard when developing other policies affecting air quality.

1 *The Strategy covers England, Scotland, Wales and Northern Ireland and was developed jointly by the Department and the Devolved Administrations.*

2 *Prior to the re-organisation of Ministerial responsibilities on 8 June 2001, the Department of the Environment, Transport and the Regions was responsible for air quality policy and the Strategy. The Department published proposals for updating the Strategy on 17 September 2001, following a review that drew on the preliminary findings of this report.*

3 *In September 1999, the Cabinet Office published a report, Professional Policy Making for the Twenty First Century, which sets out the characteristics of modern policy-making. For further details, see Appendix 3.*

- 4 The Strategy was the result of a review of an earlier Strategy published in March 1997, and is therefore an updating of an existing policy rather than the development of a new one. We examined how, in developing the Strategy, the Department had:
- marshalled the evidence on the effect of poor air quality on health;
  - assessed the options for setting and delivering air quality objectives;
  - planned the implementation of the Strategy.

The Department acted to obtain the best evidence available at the time on the effect of air quality on health, and has commissioned work to improve the evidence

- 5 The Modernising Government agenda<sup>4</sup> encourages policy-makers to use the best available evidence from a wide range of sources. In adopting air quality standards the Department needed to assimilate complicated scientific research into the policy-making process.

The Department made good use of expert advice when it adopted the air quality standards

- 6 The Department adopted the air quality standards on the basis of advice from its Expert Panel on Air Quality Standards (the Panel), a committee of 13 independent experts appointed by the Department to assemble and review the relevant scientific and medical evidence, including leading researchers in this field of medicine. Both the Panel and the Department also drew on evidence from the Department of Health's Committee on the Medical Effects of Air Pollutants.
- 7 The Panel's advice was based on the published and peer-reviewed evidence available on, for example, the clinical effects of poor air quality and studies of the incidence of related diseases, such as respiratory and cardio-vascular diseases, in populations exposed to poor air quality. It also drew on unpublished evidence where it considered this to be of an appropriate quality. However, conclusive evidence could not in all cases be obtained. In particular:
- The Panel's advice on the air quality standard for particles considered only the effect of short-term exposures to particles, but the effect of long-term exposures may be greater. The Department received new evidence from the Department of Health's Committee in May 2001 on long-term exposure and is now reviewing the objective for particles.
  - The Strategy has so far focused on eight pollutants considered by the Department to have the most effect on health (see Appendices 1 and 2). The Department is now considering a Panel recommendation for an air quality standard for a ninth pollutant - polycyclic aromatic hydrocarbons.
  - The current air quality standards are based on recommendations made by the Panel between 1994 and 1998. More recent research may provide further information on the health effects of pollutants. The Panel is, for example, re-examining the standard for 1,3-butadiene in the light of further evidence that has become available since this standard was adopted in 1994.<sup>5</sup>



4 The Modernising Government agenda refers to the Government's aim to modernise public services as set out in the 1999 White Paper, *Modernising Government*, (Cm 4310) - see Appendix 3 for further details.

5 The proposals published by the Department on 17 September 2001 included more stringent air quality objectives for particles, benzene and carbon monoxide and a new air quality objective for polycyclic aromatic hydrocarbons.



The Department drew together evidence on the extent to which actual air quality affected health

- 8 Over many years, the Department has developed a national network of monitoring sites to measure current levels of air quality. This monitoring confirmed the need for the Strategy to improve air quality in many areas. For example, in 1998, when the Strategy was being reviewed, levels of particles exceeded the standards at 76 per cent of monitoring sites, nitrogen dioxide at 48 per cent and ozone at 16 per cent. And the Department of Health's Committee on the Medical Effects of Air Pollutants advised in 1998 that it would be prudent to presume that statistical associations of air pollution levels and hospital admissions and brought forward deaths reflect a causal link. On this presumption, it estimated using pollution data mainly from 1996 that, in that year, air pollution brought forward up to 24,000 deaths<sup>6</sup> and contributed to the causes of a similar number of additional or brought forward respiratory hospital admissions.

The Department conducted an evidence-based assessment of the options for setting air quality objectives, but the evidence was limited in some areas

- 9 Having adopted health-based air quality **standards**, the Department needed to consider the options for setting and achieving air quality **objectives**. The Cabinet Office's guidance *Professional Policy Making for the Twenty First Century* encourages policy-makers to assess trends, to explore the cost and benefits of achieving outcomes, and to establish "what works". Key stakeholders should also be consulted and involved.

The Department used forecasts of air quality to inform the choice of air quality objectives, but more could be done to assess the extent to which future air quality could differ from the levels forecast

- 10 The Department needed to estimate likely trends in air quality so as to assess the practicality of any objectives that it might set. It contracted AEA Technology to develop and maintain computer models to forecast air quality for this purpose.
- 11 Such forecasts may be subject to uncertainty as a result, for example, of mistakes or misunderstandings in the computer models; simplifications within the models; and the effect of factors, such as the weather, that affect air quality but whose exact impact cannot be predicted in advance. The Department and AEA Technology sought to address these risks by comparing the results of the modelling with measurements of air quality and with the results of similar modelling carried out overseas. They also forecast air quality under a range of weather conditions. The Department should, however, have also assessed the extent to which factors other than the weather, such as future levels of car use, could affect the forecasts, and should have made clear in the published Strategy the extent to which future air quality is likely to differ from the levels forecast.

<sup>6</sup> The Report was not able to quantify the degree to which deaths or hospital admissions had been brought forward, but noted that it was more likely to be by a few days or weeks rather than months or years.

The Department analysed some of the costs and benefits of achieving the proposed objectives but recognises that more needs to be done

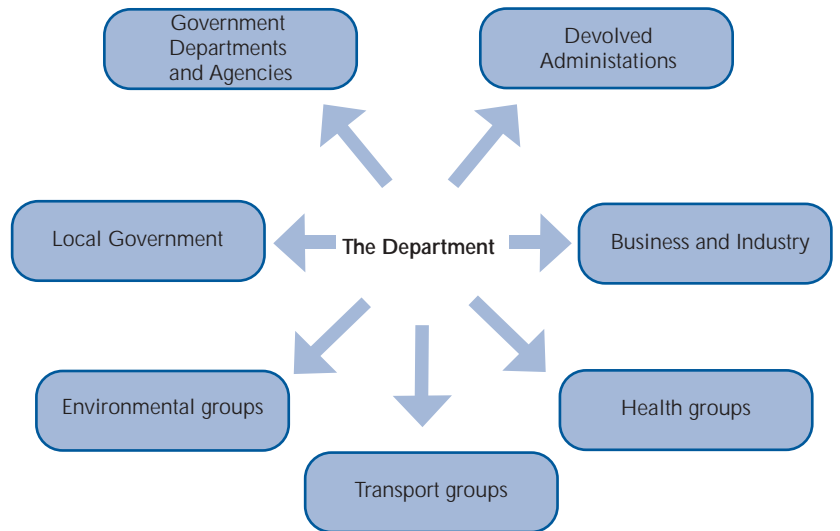
- 12 Some measures to improve air quality can be self-financing, such as improvements in the efficiency in the use of fuels, but most entail some costs, for example from the installation of equipment to reduce pollution. The 1997 Strategy included some assessment of the costs and benefits of improving air quality but the setting of the air quality objectives in the 1997 Strategy was not informed by cost benefit analysis. Recognising the importance of this type of work, the Department made a commitment to undertake such an analysis and in late 1997 established the Interdepartmental Group on Costs and Benefits (the Group) to do so.
- 13 In January 1999, the Group published its interim report, which provided the main input to the 2000 Strategy on costs and benefits. Although the Group concluded that significant health and non-health benefits would result from improved air quality, it was unable to put a monetary value on these benefits, or estimate all of the costs of achieving them. The Department's work on cost and benefits therefore influenced the air quality objectives in the 2000 Strategy only to a limited extent.
- 14 At the Department's request, the Group established the further work that was required and since January 1999 the Department has commissioned this work, including evaluation of a range of transport and non-transport measures and further consideration of the monetary value of health benefits. The Group's future work will be published in conjunction with reviews of individual pollutants. For instance, the Department is now reviewing the particles objective and expects to report on the costs and benefits of the measures needed to achieve any revised objective.

The Department consulted key stakeholders

- 15 Policy affecting air quality potentially affects many stakeholders (Figure 1), and the Department used several methods to consult them about the Strategy. In 1999, it published a consultation document setting out its proposals for amending the 1997 Strategy and inviting comments. The Department received just over 100 responses, most of which supported the proposals, although there were some critical comments, especially about the relaxation of the objective for particles. The Strategy was revised in the light of a number of the comments received, for example to standardise the units of measurement used for the pollutants.
- 16 The Department consulted other government departments and the Devolved Administrations through an interdepartmental working group, and established the Air Quality Forum to consult more than 40 key stakeholders both inside and outside of government departments. Consultation with other government departments influenced the policy development in several areas. For example, several departments expressed concerns over the proposed use of 'indicative' targets, intended to be included in the Strategy at tighter levels than the main objectives to act as pointers to the future direction policy was expected to take. The Department agreed on the balance of these arguments that they should be removed to avoid a confusing and potentially misleading number of targets. The Forum helped the Department assess, in particular, the reasonableness and practicality of its proposals. However, while most Forum members told us that the Forum made a worthwhile contribution to the development of the Strategy, some commented that more use of their expertise could have been made, and that the large number of Forum members sometimes hindered constructive debate.

## 1 Key stakeholders with an interest in air quality

*In reviewing the Strategy, the Department needed to work with a range of other stakeholders.*



Source: National Audit Office

The Department's proposals for setting air quality objectives were determined by the findings of its policy-making process

- 17 In assessing options for revising the air quality objectives, the Department took the objectives set out in the 1997 Strategy as the starting point from which it sought to make further progress. For four pollutants, the Department also needed to set objectives that met the requirements of the European Union's 1999 Air Quality Daughter Directive<sup>7</sup>, although this had little practical impact because the Directive's requirements were essentially no more demanding than the objectives set in the 1997 Strategy.
- 18 The findings of the Department's policy-making process determined its policy proposals for air quality objectives in several ways:

- The Department's forecasts of air quality indicated that existing policy measures would deliver the objectives of the 1997 Strategy earlier than expected for at least three pollutants (benzene, 1,3-butadiene and carbon monoxide) and that the deadlines for achieving these objectives could be brought forward at minimal cost.
- The forecasts indicated that the objective for lead could also be brought forward, but the Department's Expert Panel on Air Quality Standards advised that there would be health benefits in reducing lead levels even further. The Department therefore brought forward the date for achieving the objective set in the 1997 Strategy and set a more demanding objective to be achieved by the end of 2008.

<sup>7</sup> Directive 99/30/EC

- The Department's air quality forecasts, and its work on costs and benefits, indicated that achieving the objectives set in 1997 for nitrogen dioxide and sulphur dioxide would be challenging. The objectives for particles and ozone were unlikely to be achievable in all areas without significant costs from, for example, restricting industry and traffic. The Department therefore set a less demanding objective for particles for the time being, and undertook to revisit the objective for ozone, much of which comes from the Continent, in the light of discussion within the European Union on a proposed Directive to limit ozone levels. **Figure 2** summarises the changes made to the objectives as a result of this analysis.

**2 Changes in air quality objectives between the 1997 and 2000 Strategies**

*This table shows how the air quality objectives changed between the 1997 and 2000 Strategies.*

Pollutant	Change between 1997 and 2000 Strategies
<b>Benzene, 1,3-butadiene, carbon monoxide</b>	Date for achieving levels set in 1997 brought forward by two years.
<b>Lead</b>	Date for achieving the level set in 1997 brought forward by one year. A more demanding standard also incorporated as an objective for 2008.
<b>Nitrogen dioxide (two objectives in 1997 Strategy)</b>	One objective replaced and slightly strengthened by the new European Union target.
<b>Ozone</b>	No change.
<b>Particles<sup>1</sup></b>	1997 objective replaced by less demanding objective based on European Union requirements.
<b>Sulphur dioxide</b>	No change to 1997 objective, but two new European Union objectives introduced.

Note: 1. The Department viewed this objective as a staging post, rather than a final outcome, and will be considering a new, tougher objective in the future.

Source: National Audit Office

The Department established arrangements to implement the Strategy and monitor progress

- 19 Having established air quality objectives the Department needed to ensure that the Strategy was implemented. It also needed to establish processes to allow it to measure, monitor and evaluate progress, to manage risks to the achievement of the aims of the Strategy and to review the Strategy from time to time.



The Department provided guidance and direction to those responsible for implementation

- 20 Although some objectives were tightened in the 2000 Strategy, the Strategy did not propose additional policy measures to be taken nationally to improve air quality. It was developed on the basis that existing action would continue. In particular, local authorities are required to assess air quality in their areas against the air quality objectives, and to draw up action plans to improve air quality where necessary, for example by means of traffic management and planning controls. Achievement of the Strategy objectives is dependent, therefore, on the implementation of both national and local action. A key risk to the achievement of the objectives is that those responsible for implementation do not take this action.
- 21 The Department sought to manage this risk with regard to local authorities by providing guidance to them, for example through policy and technical guidance notes and helpdesks. It also monitored their submission of air quality assessments, and commissioned the University of the West of England and Air Quality Consultants to audit the assessments. As a result, most authorities submitted assessments by the end of 2000, as advised by the Department.
- 22 The Department plans to monitor local authorities' development of air quality action plans, which are advised to be submitted within one year of their assessments, and to commission audits of these as well. However, authorities are required to have regard to the costs, benefits and practicality of action to improve local air quality, and the Department acknowledges that some will find it very challenging to improve air quality sufficiently to meet all of the air quality objectives in some areas, mainly in London and other major conurbations. With regard to national action, the Department will continue to work with the Interdepartmental Group which co-ordinates central government action to achieve the air quality objectives.

The Department has established effective mechanisms to monitor progress

- 23 The Department needs to manage two further risks to achievement of the Strategy's aims. One is that inadequate monitoring of air quality may result in the Department being unaware of emerging air quality trends. The other is that new information, or other developments, may render the Strategy out of date.
- 24 The Department has taken action to monitor progress towards the objectives by:
- successful participation in European Union working groups to define objectives in terms that can be measured;
  - establishing a national network of over 100 air quality monitoring sites, and commissioning AEA Technology and the National Physical Laboratory to assess and control the accuracy and reliability of the results reported by the network;
  - commissioning AEA Technology to conduct a review of the number and location of monitoring sites against criteria set out by the European Union, which identified a need for 14 additional monitoring sites, and which the Department has now installed;
  - monitoring local authorities' progress in improving local air quality.



- 25 The Department intends to review the Strategy on a rolling pollutant by pollutant basis over the next few years, to take account of the latest health evidence and modelling. The first such review, of particles, benzene and carbon monoxide commenced in March 2001<sup>8</sup>. The review will take account of further work on the chronic effects of exposure to particles and further modelling work, as well as an examination of the costs and benefits of measures designed to reduce emissions of particles. The Department also intends to evaluate the Strategy in 2001 to consider the reliability of cost and benefit assessments and the efficacy of different policy mechanisms.

## Conclusions and recommendations

- 26 The Department's policy-making processes developed a Strategy that added value to the government's air quality policy in three main areas:

- **Assurance.** The Strategy provided an improved evidence base for air quality objectives and for assessing whether the United Kingdom (UK) was likely to meet its obligations for improving air quality under European Union law.
- **A focus for action.** The Strategy provided a catalyst for local authority action to improve air quality through policy measures such as low emissions zones, vehicle emission testing and control, and traffic management.
- **A focus for research.** The Strategy helped the Department identify where best to concentrate its work to improve knowledge of the effects of pollution, current and expected future levels of pollution and of the costs and benefits of improving air quality.

- 27 The Department's development of the Strategy also provided examples in action of the core competencies identified by the Cabinet Office's *Professional Policy Making for the Twenty First Century* report<sup>9</sup> as necessary for a fully effective policy-making process (Figure 3).

- 28 But we also identified a number of areas where processes might be enhanced, and we therefore make the following recommendations:

1 **In its planned review of the terms of reference and membership of its Expert Panel on Air Quality Standards, the Department should:**

- **In making new appointments to the Panel, include some lay members**, as recommended by the Office of Science and Technology in its guidelines<sup>10</sup> on scientific advice and policy making; and implement the recommendations of its own 1998 review, that vacancies on the Panel should be advertised and future appointments should be for fixed terms (paragraph 2.9).
- **Review the remit of the Panel**; limit values are being set for an increasing number of pollutants by the European Union and the Department needs to consider whether there is scope to make greater use of the Panel's expertise in the future in supporting the UK's input to policy-making within the European Union (paragraph 2.10).
- **Explore with the Department of Health the scope to amalgamate the Panel with the Department of Health's Committee on the Medical Effects of Air Pollutants**, in view of the close links between these bodies, to help ensure consistent and joined-up advice across government (paragraph 2.10).

<sup>8</sup> The proposals published by the Department on 17 September 2001 were the result of this review.

<sup>9</sup> See Appendix 3, Figure B.

<sup>10</sup> Guidelines 2000 - Scientific Advice and Policy Making, Office of Science and Technology, 2000.

### 3 The Department's policy-making processes and the *Professional Policy Making* competencies

*The Department exhibited the core professional policy-making competencies in various ways.*

Professional policy making competencies	Examples within the development of the strategy
<b>Forward looking: taking a long-term view</b>	The Department used forecasts based on modelling to assess whether air quality was likely to improve sufficiently to meet proposed air quality objectives or whether additional measures would be needed. These forecasts took into account both the impact of current economic and technological trends and that of existing and planned policies (paragraph 3.4).
<b>Outward looking: taking account of factors in the European and international situation</b>	The Department undertook to keep, but revisit at an early opportunity, the objective for ozone set in 1997 in the light of discussions within the European Union on their proposed Directive to limit ozone levels. Much ozone pollution is derived from the Continent and so not readily amenable to local control within this country (paragraph 3.41). The Strategy also took account of limit values in the first European Union Air Quality Daughter Directive (paragraph 3.39).
<b>Innovative and creative: open to the comments and suggestions of others</b>	The Department made itself open to the comments and suggestions of others through the Interdepartmental Group and the Air Quality Forum (paragraph 3.30).
<b>Using evidence: uses best available evidence from a wide range of sources</b>	To produce its reports, the Department's Expert Panel on Air Quality Standards reviewed a wide range of evidence from the UK and abroad (paragraph 2.8). The Committee on the Medical Effects of Air Pollutants adopted a similar approach when quantifying the effects of air pollution in the UK (paragraph 2.13).
<b>Inclusive: taking account of the impact of the policy on different groups</b>	When discussing the proposed objectives, the Department emphasised to the Interdepartmental Group that if future monitoring work did indicate that small industrial boilers were causing local air quality exceedences, no decision would be taken to enforce alteration or potential closure of these boilers without future interdepartmental agreement (paragraph 3.32, first bullet).
<b>Joined up: looks beyond institutional boundaries</b>	The Department established the Air Quality Forum to consult with stakeholders from a variety of different social and economic sectors (paragraph 3.33). It also intends to retain the Interdepartmental Group during the implementation phase, and expects other Departments to ensure that their policies help, if possible, towards the achievement of the objectives and that they consult it on matters affecting the Strategy (paragraph 4.14).
<b>Evaluates: builds systematic evaluation into the process</b>	The Department will soon evaluate the work used to support the option assessment process, in particular assumptions made about costs and benefits and the efficacy of policy mechanisms (paragraph 4.23).
<b>Reviews: keeps established policy under review</b>	The Department has started to review the Strategy again on a pollutant by pollutant basis (paragraph 4.22).
<b>Learns lessons: learns from what works and what does not</b>	The Department used pilot exercises to investigate the practical aspects of local air quality management before its full introduction (paragraph 4.7).

- 2 **The Department should develop a strategy for improving its knowledge of the health effects of poor air quality.** The Department has recognised the need to improve its evidence on the long term effects of particles, and has asked its expert panel to review new evidence on 1,3-butadiene. The Department of Health's Committee on the Medical Effects of Air Pollutants has advised that there are also shortfalls in the evidence available on the short and long term health effects of nitrogen dioxide and carbon monoxide. The Department needs up-to-date and comprehensive information on these matters to ensure that the air quality standards remain appropriate and to assess accurately the benefits of improving air quality. The Department should take stock of the gaps in its knowledge of the health effects, realistically assess its ability to improve this knowledge and the value of so doing, and draw up a plan and priorities for removing these gaps (paragraphs 2.15).
- 3 **The Department should establish a timetable for regular reviews of the air quality standards.** The Department plans to review the Strategy on a pollutant by pollutant basis, focusing primarily on the objectives set for each pollutant. The first standards were adopted in 1994 and the Department needs to ensure that its reviews keep pace with the developing evidence on the health effects of pollutants (paragraph 2.11).
- 4 **The Department should review the extent to which future air quality could differ from its forecasts.** AEA Technology has assessed the extent of uncertainty in the estimates of pollution emissions. But the Department needs also to assess the scope for future air quality to differ from the forecasts based on these estimates, to consider, in particular, possible mistakes or misunderstandings in the computer models; simplifications within the models; and the effect of factors, such as future levels of car use, whose exact impact cannot be predicted in advance (paragraph 3.13).
- 5 **In future reviews of the Strategy, the Department needs to do more to communicate and respond to the scope for future air quality to differ from forecast levels and to incorporate uncertainties into its assessment of options.** The Department should ensure that the assumptions made and potential uncertainty in the forecasts are clearly indicated within the Strategy; grade emissions estimates to indicate their reliability; carry out sensitivity analysis on the potential impact on the Strategy if key assumptions and estimates are wrong; develop a range of scenarios within its modelling to help assess the scope for air quality to differ from the best-estimate forecast; and include in its policy proposals contingency plans for responding to differences between future air quality and the levels forecast (paragraph 3.16).
- 6 **The Department should consider using multi-criteria analysis to help inform the setting of objectives.** The work of the Interdepartmental Group on Costs and Benefits was inconclusive, in part because of the difficulty of satisfactorily putting a monetary value on the health benefits of improving air quality. Multi-criteria analysis is a process for establishing preferences between options by reference to an explicit set of weighted objectives, instead of evaluating all options in financial terms. It has recently been commended by the Department for use in policy appraisal<sup>11</sup> and in view of the Department's difficulties in valuing benefits it may offer a more conclusive basis for setting air quality objectives (paragraphs 3.21 to 3.25).





- 7 The Department should seek to make the following enhancements to its consultation processes:
- In future public consultation exercises, **report publicly how it has responded to comments received, and why**, in line with the Cabinet Office's *Code of Practice on Written Consultation* (November 2000) (paragraph 3.28).
  - **Consider how to minimise the burden on consultees**, for example by highlighting changes in documents arising from initial consultations, and focusing consultation on issues where there is a decision to be made (paragraph 3.29).
  - **Use advertisements to identify potential members of consultative bodies**, as well as internal discussion within the Department (paragraph 3.33).
  - Although there are merits in including as many stakeholders as possible within the Forum, **consider setting up Forum sub-groups on specific issues**, to enable stakeholders to make a more effective contribution to the Department's work (paragraph 3.36).
- 8 The Department should review local authorities' progress in implementing action plans to improve local air quality. Most local authorities have now completed their review and assessments of air quality in their areas and the Department is monitoring local authorities' development of action plans to improve local air quality. However, achieving the air quality objectives will be very challenging for some authorities, and the Department needs also to monitor authorities' implementation of their plans and to review local authorities' achievements in improving air quality (paragraph 4.12).